Symbia Pro.specta

Instructions for Use – Symbia Pro.specta X3
SPECT*syngo* VA10

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Symbia Pro.specta

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SPECT*syngo* VA10

Legend

	Indicates a hint Is used to provide information on how to avoid operating errors or information emphasizing important details
	Indicates the solution of a problem Is used to provide troubleshooting information or answers to frequently asked questions
■	Indicates a list item
✓	Indicates a prerequisite Is used for a condition that has to be fulfilled before starting a particular operation
◆	Indicates a one-step operation
1 2 3	Indicates steps within operating sequences
Italic	Is used for references and for table or figure titles
➔	Is used to identify a link to related information as well as previous or next steps
Bold	Is used to identify window titles, menu items, function names, buttons, and keys, for example, the Save button Is used for on-screen output of the system including code-related elements or commands
Orange	Is used to emphasize particularly important sections of the text
`Courier`	Is used to identify inputs you need to provide
Menu > Menu Item	Is used for the navigation to a certain submenu entry
<variable>	Is used to identify variables or parameters, for example, within a string

⚠ CAUTION

CAUTION

Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or material damage.

CAUTION consists of the following elements:

- Information about the nature of a hazardous situation
- Consequences of not avoiding a hazardous situation
- Methods of avoiding a hazardous situation

⚠ WARNING

WARNING

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

WARNING consists of the following elements:

- Information about the nature of a hazardous situation
- Consequences of not avoiding a hazardous situation
- Methods of avoiding a hazardous situation

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1 Legal Notice

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CAUTION

- Federal law of the United States of America restricts this device to sale by or on the order of a physician. (21 CFR 801.109(b)(1))

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As the manufacturer, assembler, installer, or importer of the system, Siemens does not accept liability for the safety functions, reliability, or performance of the system, if one of the following circumstances applies:

- Installation, upgrade, readjustment, modification, repair, or upgrading by persons not authorized to do so by Siemens.
- Components not properly replaced with original parts from Siemens.
- Electrical installation in the room does not comply with the requirements of VDE standard 0107 or other binding codes of practice.
- Operation of the system in a way which deviates from the instructions given in the user documentation.

1.2 Patient health information

Teamplay contains an option for utilization management. To use utilization management from Teamplay, you must export patient data from the Pro.specta system to Teamplay. Compliance to local or governmental regulations governing the transfer of Patient Health Information (PHI) is the sole responsibility of the medical facility. Export of data used for Teamplay can be enabled or disabled.

1.3 Copyrights, trademarks, and licensing

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- Symbia Pro.specta™
- AUTOFORM™
- IQ•SPECT™
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1.4 Availability of Products and Features

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1.5 System and Software Representations

The photographs, graphics, figures, and medical images used in this documentation are examples only. Their actual display and design may be slightly different on your system.

1.6 Regulatory Information

1.6.1 Intended use

The Symbia Pro.specta X3 device is a radiological imaging system that combines a single photon emission computed tomography (SPECT) camera system for nuclear medicine images, and a computed tomography (CT) camera system for x-ray images.

The SPECT system is intended to detect the location and distribution of gamma ray radionuclides in the body and produce cross-sectional images through computer reconstruction of the data, and the CT system is intended to produce cross-sectional images of the body by computer reconstruction of x-ray transmission data from the same axial plane taken at different angles. The nuclear medicine images and the x-ray images may be registered and displayed in a fused format (overlaid in the same orientation) for the anatomical localization of the nuclear medicine data (that is, distribution of radiopharmaceuticals). The SPECT and CT portions of the system may be used independently or in combination, and may include signal analysis and display equipment, patient and equipment supports, radionuclide anatomical markers, component parts, and accessories. The SPECT and CT images may be transferred to other systems for radiation therapy planning or additional uses.

1.6.2 Indications for use

The Siemens Pro.specta series is intended for use by appropriately trained health care professionals to aid in detecting, localizing, diagnosing, staging and restaging of lesions, tumors, disease and organ function for the evaluation of diseases and disorders such as, but not limited to, cardiovascular disease, neurological disorders and cancer. The images produced by the system can also be used by the physician to aid in radiotherapy treatment planning or additional uses.

SPECT: The SPECT component is intended to detect or image the distribution of radionuclides in the body or organ (physiology), using the following techniques: planar imaging, whole body imaging, and tomographic imaging for isotopes with energies up to 588 keV.

CT: The CT component is intended to produce cross-sectional images of the body by computer reconstruction of x-ray transmission data (anatomy) from either the same axial plane taken at different angles or spiral planes taken at different angles.

SPECT+CT: The SPECT and CT components are used together to acquire SPECT/CT images. The SPECT images can be corrected for attenuation with the CT images, and can be combined (image registration) to merge the patient's physiological (SPECT) and anatomical (CT) images.

Software: The SPECT*syngo* software is an acquisition, display and analysis package intended to aid the clinician in the assessment and quantification of pathologies in images produced from SPECT, PET, CT, and other imaging modalities.

1.6.3 Clinical benefits

Symbia Pro.specta series achieve their intended performance under normal conditions of use. Symbia Pro.specta series have a positive impact on the health of an individual when used as an aid in detecting, localizing, diagnosing, staging and restaging of lesions, tumors, disease and organ function for the evaluation of diseases and disorders. Symbia Pro.specta series have a positive influence on the health of an individual when used as an aid in managing neurology, cardiology, oncology, and other diseases.

1.6.4 Contraindications

There are no known specific situations that contraindicate the use of the Symbia system.

1.6.5 Imaging newborns

There is no clinical data on imaging newborns. The judgment regarding the propriety of any specific procedure or course of action must be made by the practitioner.

1.6.6 Patient population

No patient population restrictions are known.

1.6.7 Regulation Compliance

Compliance to local or governmental regulations which may govern the installation, operation, and/or maintenance of the system is the sole responsibility of the medical facility.

1.6.8 Legal Manufacturer



Siemens Medical Solutions USA, Inc.
Molecular Imaging
2501 N. Barrington Road
Hoffman Estates, IL 60192
USA

1.6.9 EU Authorized Representative

EC REP

Siemens Healthcare GmbH
Henkestr. 127
91052 Erlangen
Germany

2 Introduction

These instructions for use provide you with detailed information about the SPECT*syngo* software, your Symbia system, the system components, and the accessories.

2.1 Scope

The Instructions for Use are only valid for the stated software version, in conjunction with the latest Release Information.

These Instructions for Use apply to the following devices:

- Symbia Pro.specta X3

The Release Information can extend the validity of the instructions for use for these medical devices.

Components or software functionalities that may not be part of your system configuration are nevertheless described in the present instructions for use. It may be that not all of them are marked explicitly as optional. The availability of these components or software functionalities depends on your purchase contract.

2.2 Proper and improper use

Improper use means that the systems or parts of the systems are used against their intended use and indications for use.

CAUTION

Impermissible or faulty manipulations or changes of the hardware or software, or connection of the system to a network can cause the system to malfunction!

Unauthorized access, injury to the patient or damage to the equipment.

- Make sure that all necessary precautions with respect to the existing level of security are considered when adding a functionality or altering the shipped configuration.
- Do not open or remove the cover of the equipment nor install third-party software.

Operation in patient vicinity

Only medical components of the system (gantry, patient table, accessories) are suitable for use within the patient environment.

Operation mode

The system is developed for continuous operation with intermittent loading. Thus, it should be switched off and restarted regularly. For details, see System Owner Manual.

2.3 Additional information on pediatric imaging

Be careful when scanning patients outside of the typical adult size range. For more details and further literature on pediatric imaging, please check the FDA's Pediatric x-ray Imaging web page:

http://www.fda.gov/radiation-emittingproducts/radiationemittingproductsandprocedures/medicalimaging/ucm298899.htm

2.4 New features in SPECT*syngo* VA10

The following features have been introduced in this release of SPECT*syngo* VA10 and your Pro.specta system.

2.4.1 SMART Neuro AC

The SMART Neuro AC feature allows the user to perform attenuation correction without a CT scan for brain studies. SMART Neuro AC uses an estimation of attenuation from projection data and a mu-map model with two components: skull and soft tissue.

To enable SMART Neuro AC, select **Calculated** under the **Attenuation Correction** parameter. This feature is only available if the **basic recon mode** parameter is selected as brain.

2.4.2 Continuous gating

The continuous gating feature allows the user to acquire and create cardiac gated data with a continuous motion acquisition. This feature can be enabled with multiple scan and recon parameters. Click the **Physio Scan** parameter button. From the MI Gating dropdown, select **Cardiac** to set MI Gating on (selecting **Off** disables it). From the Scan parameter, click the **General Scan** parameter button. From the Motion dropdown, select **Continuous**. Under the **Image Impression** recon parameter button, select **Recon Gated Tomo** in the **Image Type** parameter

2.4.3 Respiratory motion correction

Respiratory Motion Correction extracts respiratory gating signals from list mode SPECT data using Laplacian eigenmaps and automatically compensates for cardiac axial respiratory motion in the list mode data. Respiratory motion correction is defined as motion correction in the axial direction only. The same correction is applied to all reconstruction jobs in a group recon. From the Recon parameter, click the **General Recon** parameter button. From the Respiratory Motion Correction dropdown, select **On** or **Off**.

2.4.4 Gated attenuation correction and scatter correction

The system allows you to perform gated reconstruction with attenuation correction and/or scatter correction. In the **General Recon** parameter button, set the **Attenuation Correction** parameter to a valid CT reconstruction for attenuation correction, and set the **Scatter Correction** parameter to **On** for a recon with **Image type** set to **Recon Gated Tomo** in the **Image Impression** recon parameter.

2.4.5 Trending isotope for intrinsic

Intrinsic calibrations calculate a running mean of the uniformity results in order to check the constancy of the values and trend of the results. If you choose to perform alternate energy intrinsic floods, you will no longer need to update these calibrations every time you perform the primary isotope (Tc99 or Co57) calibration. When the results of the monthly intrinsic calibration using the primary isotope (Tc99 or Co57) fall outside of the constancy limits, the system will notify you to update the existing alternate isotopes intrinsic calibration. You will not need to run intrinsic calibration monthly for all the isotopes to keep flood corrections for those isotopes.

2.4.6 Energy correction linearity calibration

Energy Correction Linearity calibration is a system-specific NaI correction calibration which is performed during detector manufacturing and that will allow linear energy channel output, eliminating the need to perform peaking calibrations. You can perform peaking verification to test the system performance.

2.4.7 AutoPlanar

You can create synthetic planar data from a SPECT tomographic acquisition, creating two types of data, planar and tomographic from a single SPECT tomographic acquisition. The Molecular Acquisition and Reconstruction System (MARS) provides the means to generate synthetic planar images from a reconstructed volume based on the View and Dwell time parameters. The virtual projection images are restricted to a single view or two opposing views, corresponding to a detector configuration of 180 degrees.

This feature can be enabled by selecting **On** in the **Save Synthetic Planar** recon parameter under **Inline Results**. Then proceed to select the number of views from 1 or 2 from a whole-body tomo acquisition and 1, 2, 4 or 8 from a single-bed tomo acquisition. Finally, the dwell time can be define in the **Synthetic Planar Duration** parameter. This feature is available for all Basic Recon modes except for Brain and Cardiac, for all recon methods except for FBP, and for all recon data types except for recon gated tomo.

2.4.8 Power save state

While in the Power Save state, the system removes or reduces power to all non-essential subsystems while it is idle until you need to resume normal system operation.

When the following criteria is met, the system enters the Power Save state:

- System has been left idle for 10 minutes.
- System is in the System On state.
- An acquisition is not in progress.
- A collimator change is not in progress.
- A remote connection to the system is not present.

When the system is in the Power Save state and a user interaction with the system occurs, it will cause the system to enter the System On state.

When the system is in the Power Save state and the time of a scheduled AQC is reached, the system will enter the System On state and proceed with the AQC.

If a remote device requests access to the system while it is in the Power Save state, the system will switch to the System On state.

The default period of time after which the system enters the Power Save state is 10 minutes.

When interacting with any part of the system, the system will wake up, apart from the Gantry Display, only the Gantry Display may take up to 10 seconds to wake up.

When the system is in the Power Save state, the power button pulses quickly and all monitors are off.

Any background tasks that are running on the computers continue while the system is in the Power Save state.

When system is not in use for configured time, the system will go to Power Save and the gantry display turns black. During the Power Save state, the gantry display's touch interaction is still operational. By touching the screen, it brings the monitor out of Power Save mode.

The system is prevented from going into Power Save mode while it is being used in a Remote session or Service device is connected to the system.

The system is prevented from going into Power Save mode during an active scan or a collimator change.

2.4.9 System off state

You can turn the system off when it is not going to be used for a longer period of time, overnight for example, while maintaining the detectors power so that when needed, the system can be turned on and is ready for use. This minimizes power consumption while maintaining readiness for scanning upon all subsystems switching to the System On state when in the System Off state. When the system is in the System Off state and the On/Off button is pressed, the system powers up all subsystems. An emergency stop must be cleared once the system is powered on before all subsystems can be used. When the system is in the System Off state, the On/Off button slowly pulses, indicating that it is in the System Off state.

2.4.10 Plan&GO

The Plan&GO feature allows the technologist to visualize and edit the scan range on the patient table in relation to the patient.

The Plan&GO feature provides the following functionality for the first scan in the protocol:

- Visualize the current planned scan range with relation to the patient.
- Edit the current plan scan range for Topogram, CT Tomogram and Whole-body planar acquisitions by setting the start and stop position.
- Edit the current plan scan range for SPECT tomogram acquisition by setting the center of the field-of-view.
- Edit the current plan scan range for multi-bed SPECT tomogram acquisition by adding or removing beds to be acquired.

For more information on using Plan&GO, see (➔ Page 332 *Scan range planning with Plan&Go*).

2.4.11 Teamplay connectivity

Teamplay is a network that connects medical institutions and their imaging devices as a virtual team. This allows users to get information about all the radiology modalities located in different departments of an organization. Symbia Pro.specta X3 supports Teamplay functionality, for example utilization, protocol, and dose management.

For more information on using Teamplay with your Symbia Pro.specta X3, contact your Customer Care Center.

2.4.12 SMARTZOOM HRX Collimator (SZHRX)

The **SMART**ZOOM HRX collimator (SZHRX) is designed to magnify objects in the center of the field-of-view in order to more efficiently take advantage of the large detector size of your Symbia Pro.specta X3 system, while sampling regions near the edge of the field-of-view in order to avoid the effects of truncation. This collimator achieves a gain in sensitivity without compromising resolution, and it is designed to improve image focusing for the brain and other small organs.

2.4.13 TrueCalc

This technology enables stable uniformity, energy resolution and reconstructed resolution at high count rates. This enables consistent quantification across a therapy cycle seen in use cases such as therapeutic Lu-177 and Iodine-131.

2.4.14 Broad Quantification

Broad Quantification provides a streamlined clinical workflow for performing quantitative SPECT studies for common SPECT radiopharmaceuticals with most collimators. For information on preparing your system for Broad Quantification, see (➔ Page 767 *Quality control and assurance*).

2.4.15 xSPECT Bone

xSPECT Bone is an advanced bone imaging reconstruction software that uses CT data as the frame-of-reference for image reconstruction, enabling sharper definition for bone imaging. To enable xSPECT Bone, begin with a SPECT-CT examination and ensure the following parameters are set.

- **Basic Recon Mode**: Skeletal
- **Recon Method**: xSPECT-CG
- **Zone Preset**: Bone

2.4.16 xSPECT Quant

xSPECT Quant is an absolute, accurate and reproducible quantitative software solution for select isotopes and collimators. This advanced reconstruction technique enables absolute quantification of disease uptake that is both accurate and reproducible. With xSPECT Quant, quantitative values are derived automatically during the reconstruction in units of Bq/ml or SUV's. These values can be compared across patients, systems and time. The supported isotopes include:

- Indium-111 (^{111}In) with MELP collimators
- Iodine-123 (^{123}I) with MELP collimators
- Iodine-131 ($^{131}I^{2}$) with HE collimators
- Lutetium-177 (^{177}Lu) with MELP collimators
- Technetium-99m (^{99}mTc) with LEHR and LPHR collimators

To enable xSPECT Quant, begin with a SPECT-CT examination and ensure the **Quant Recon** parameter, under the **Image Impression** tab, is set to **On**. For information on preparing your system for xSPECT Quant examinations, see.

3 Safety information

Follow the safety information in this document.

To ensure the safe use of your product and the safety of people, you must adhere to the safety information provided in the Instructions for use documents. In addition, also observe your country-specific regulations and guidelines.

Safety information is located in the safety section and repeated within context where a hazardous situation may occur. To make sure safety information is understood, always read it in context of the situation.

WARNING and CAUTION are highlighted in the text:

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

WARNING and CAUTION have the same structure. The following example CAUTION instructs you how to read a WARNING or a CAUTION:

CAUTION

This text describes the hazardous situation: Images with lossy compression are used for diagnosis!

This text describes the hazard: **Wrong diagnosis.**

- **This text describes how to avoid the hazardous situation:** Always verify your evaluation results with the original DICOM images (first reader duty).
- Never use lossy ...

3.1 General safety information

For the secure operation of your medical device, it is the responsibility of the system owner to ensure that each person who operates the system reads and understands the provided Instructions for Use.

WARNING

Not observing the Instructions for Use and the safety information of the medical device and the equipment!

Injury to the patient or personnel, and damage to the equipment.

- Always observe the Instructions for Use of the particular units used. This includes the labels applied on the equipment as well as the Instructions for Use documents.
- Always use this Instructions for Use document in conjunction with all Instructions for Use documents provided.
- Follow the safety instructions and safety signs.
- For references purposes, store the Instructions for Use near your workplace.

Electronic Instructions for Use are provided on your CT system and on the workplace.

3.1.1 Read Instructions

Before using the system, read the operating instructions contained within this manual, as well as:

- SPECT*syngo* online help
- Release Information
- other Symbia and SPECT*syngo* manuals provided with the system

WARNING

Not observing the Instructions for Use and the safety information of the medical device and the equipment!

Injury to the patient or personnel, and damage to the equipment.

- Always observe the Instructions for Use of the particular units used. This includes the labels applied on the equipment as well as the Instructions for Use documents.
- Always use this Instructions for Use document in conjunction with all Instructions for Use documents provided.
- Follow the safety instructions and safety signs.
- For references purposes, store the Instructions for Use near your workplace.

3.1.2 Residual risk

The residual risk has been judged as being acceptable. User-relevant safety information is provided in the Instructions for Use documents of the medical device.

3.1.3 Training Required

Only properly trained and authorized users with specialized knowledge such as trained physicians, trained radiologists, or trained technologists should operate the system and its accessories. Improper or unauthorized use of the system can cause injury to the user or patient, damage to the system, or incorrect diagnosis or treatment due to misinterpretation of image information. Nuclear medicine training, medical training, and specific training on the Symbia system are mandatory.

It is recommended that each site send users to, or provide on-site, a training program that includes refresher courses, training on application updates, and a specific program for new users.

3.1.4 Qualification and competence

CAUTION

Operation of the system, applications, or functionality by non-trained users!

Injury to the patient or personnel, or damage to the equipment.

- Only trained and qualified users, certified in accordance with country-specific regulations, are authorized to operate the system. For example, physicians, radiologists, or technologists.

  For appropriate training, contact your Representative at Siemens Healthineers.

WARNING

Not observing the Instructions for Use and the safety information of the medical device and the equipment!

Injury to the patient or personnel, and damage to the equipment.

- Always observe the Instructions for Use of the particular units used. This includes the labels applied on the equipment as well as the Instructions for Use documents.
- Always use this Instructions for Use document in conjunction with all Instructions for Use documents provided.
- Follow the safety instructions and safety signs.
- For references purposes, store the Instructions for Use near your workplace.

3.1.5 Serious Incident Reporting

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

3.1.6 Statutory regulations

The *System Owner Manual* provides information that is required for your Symbia Pro.specta system.

These documents must be observed for the following subjects:

- Operating conditions, see *Technical specification*.
- Forms for recording test results, see *Forms*.
- Preventative maintenance, see *Maintenance plan*.
- Disposal, see *Green performance and disposal*.
- Tube description, see *X-ray tube technical description*.
- Use of OSS software, see *Open source software notice*.

3.1.7 In the event of system malfunction

CAUTION

Monitor failure!

Uncontrolled system.

- Do not make any more entries via the keyboard.
- Interrupt the examination.
- If necessary, press a **STOP** key or, in case of an emergency, an **EMERGENCY OFF** button.

CAUTION

This X-ray unit may be dangerous unless safe exposure factors, operating instructions, and maintenance schedules are observed.

Patient or personal injury can result.

- Follow all national, regional, and site-specific radiation safety requirements.

CAUTION

Unresponsive touch pads!

Failing to test the system's touch pads can lead to system damage and/or patient injury.

- Perform the touch pad test daily.

3.1.8 In the event of fire

Observe the following safety information when working at the CT scanner or the CT console.

WARNING

Fire inside or in the vicinity of the system!

Injury to the patient or the personnel, or damage to the equipment. Gas poisoning due to burning plastic.

- Switch off the acquisition system in the event of fire.
- Make sure that you and the patient know where the escape routes are.
- Make sure that you know where the fire extinguishers are located and familiarize yourself with the use of them.

Observe the following safety information when working at the second workplace.

WARNING

Flammable anesthetic mixtures with air, oxygen, or nitrous oxide can ignite!

Fire can occur, resulting in equipment damage and or patient or operator injury and/or death.

- Do not use this system or its accessories in the presence of flammable anesthetic mixtures with air, oxygen, or nitrous oxide.

3.1.9 In the event of liquids in the vicinity of the medical equipment

Observe the following safety information in the vicinity of the medical equipment.

WARNING

Liquids or food and drinks in the vicinity of medical equipment!

Injury to the patient or personnel, and malfunction of or damage to the equipment.

- Shut down the system immediately if liquid is detected within the equipment.
- Contact and leave all repairs to the Customer Service at Siemens Healthineers.
- Clean the equipment with a damp, not wet, cloth.
- Wring the cloth out well and make sure that no liquids get onto, or into, the equipment.
- After cleaning, make sure that no water remains on the floor to avoid slipping.
- Keep food and drinks away from the equipment.

3.1.10 Visual check before use

Observe the following safety information before using the system, components, or accessories.

CAUTION

Use of damaged system components or accessories!

Injury to the patient or personnel and damage to the equipment.

- Perform visual check of system components or accessories before usage to check if parts are broken or mechanical damaged. Do not use damaged system components or accessories.

  Replace damaged system components or accessories immediately.

  Contact, and leave all repairs to, the Customer Service at Siemens Healthineers.

3.1.11 Radiation precautions

WARNING

Hazardous situations can expose the patient or operator to unexpected radiation or system contact!

Patient or personal injury, and system damage, can result.

- Press an Emergency Stop button to stop X-ray radiation and system motion. Examples of hazardous situations: a system movement is performed that has not been initiated during an acquisition from the workplace or CT control box; a button sticks or a movement does not stop immediately when the button is released; the patient bed or pallet does not stop as expected; the patient pallet handle does not allow for manual patient extraction; the patient bed position displayed differs by more than 10 mm from the actual position; the patient is not correctly positioned during system movements; the patient bed or pallet moves in the wrong direction; the suspend button does not respond during an acquisition.

CAUTION

Attenuation Correction parameters are edited to increase the dose beyond what is required!

There is a possible risk of increased radiation exposure to the patient.

- Do not change Attenuation Correction parameters unless properly trained.

CAUTION

Radiation in the examination room after the **Start** key has been pressed!

Undesired radiation exposure.

- Leave the examination room before initiating scanning or for interventional CT examination, wear protective clothing.

CAUTION

Do not begin source installation or removal procedures before reading instructions!

Personal or system damage can result.

- Read the safety instructions in the *Safety and External Labeling* chapter, in the section titled *Radiation Protection During Source Installation*, prior to attempting source storage or removal from the AutoQC.

CAUTION

Improperly installed sources can leak radiation!

There is possible risk of increased radiation exposure to patient and personnel.

- Perform a leak test of the automated quality control device after replenishing source.

3.1.12 Radiation Exposure: Undesirable Side Effects

Please note the following statement prior to operating your system.

In clinical use, CT systems produce X-rays which are a type of ionizing radiation. Ionizing radiation has the potential to cause long-term biological effects in the human body such as cancer, fetal effects, and genetic effects.

3.1.13 Radiation protection

For your own and the patient's protection, you must observe the radiation protection regulations.

For the diagrams that show the distribution of scatter radiation in the horizontal and the vertical plane through the system axis (according IEC 60601-2-44: 2009+A1: 2012 (clause 203.13), IEC 60601-2-44: 2001+A1: 2002 (clause 29.208)), refer to the *System Owner Manual, chapter Dosimetry and imaging performance report*.

Symbia Pro.specta X3 (top view)

For the diagram, refer to the *System Owner Manual, chapter Dosimetry and imaging performance report*.

Symbia Pro.specta X3 (side view)

For the diagram, refer to the *System Owner Manual, chapter Dosimetry and imaging performance report*.

Radiation protection equipment

Special equipment is part of the radiation protection regulations.

Control area

The console is located outside the radiation control area. The patient can be observed through a lead glass window. The gantry and the patient table can be operated by remote control.

- When scanning, operate the system from the console whenever possible.

Radiation shielding

If scans need to be released from inside the control area, or if accompanying personnel need to remain there, safety measures must be taken. For example, lead aprons, protective walls, and so forth. (➔ Page 53 *Protective measures*)

Protective measures Take the following measures to protect both yourself and the patient.

CAUTION

This X-ray unit may be dangerous unless safe exposure factors, operating instructions, and maintenance schedules are observed.

Patient or personal injury can result.

- Follow all national, regional, and site-specific radiation safety requirements.

CAUTION

Radiation in the examination room after the **Start** key has been pressed!

Undesired radiation exposure.

- Leave the examination room before initiating scanning or for interventional CT examination, wear protective clothing.

Personnel

Anyone who needs to be near the patient during scanning must observe the following precautions:

- Wear protective clothing, for example, a lead apron.
- Wear a PEN dosimeter and/or film badge.
- Stay in the zone shielded by the system i.e., to the side of the gantry or behind a mobile protective wall.

Patients

You are responsible for protecting the patient from unnecessary radiation, for example:

- Always use a gonadal shield, if possible.
- Use the pediatric mode for children.
- Use *CARE* products.

Reduction of the radiation exposure

You can avoid repeating a measurement and therefore reduce the radiation exposure to the patient by taking certain precautions.

- Observe the calibration and maintenance instructions in the manual.

3.1.14 System misuse

CAUTION

The system does not support interventional CT procedures!

There is a potential risk for non-clinical radiation exposure.

◆ Do not use the system in ways it was not intended to be used.

3.2 Safety information on data management

Observe the following sections when updating or deleting data in the **Patient Browser**.

3.2.1 Updating patient data

Observe the following safety information when updating the patient data after the examination and reconstruction of images.

CAUTION

Inconsistent patient data or image information for SPECT syngo and post-processing applications!

Wrong basis for diagnosis.

◆ Do not modify patient data after results have been calculated.

Note: More specifically, modifying patient information after the results have been computed may cause wrong basis for diagnosis.

CAUTION

Invalid patient demographic data when updating an emergency patient afterwards!

Patient demographic data may become invalid by mistaking the identity when updating the identification attributes of an emergency patient afterwards.

- Take special care when updating identification attributes of an emergency patient.
- Verify the patient identity by using additional identification measures like patient photo or identification bracelet.

CAUTION

Patient data is changed using the correct and rearrange function while a time-critical workflow for this patient is in progress!

Delayed diagnosis due to restart of workflow.

- Do not perform correct and rearrange actions while time-critical cases are in progress. Always check the **Workflows** section in the **Job View** for time-critical workflows.

3.2.2 Synchronizing with central information systems

Observe the following safety information when updating patient information locally in the **Patient Browser**.

CAUTION

Medical information entered in the Organizer is updated only locally!

Updates to patient information (e.g. medical alerts like pregnancy status and allergies) done locally in Organizer are not communicated to central information systems (like RIS or HIS). If the information being updated has to be centrally available across modalities, consider updating this information in the RIS.

- Enter medical information at the RIS and refresh the patient information in the Organizer. - or - After local update of medical information enter these medical information at the RIS too.
- Remind the patient to mention the medical information before the next examination, again.

3.2.3 Deleting raw data

Observe the following safety information before deleting raw data.

CAUTION

Raw data has been deleted, but additional reconstructions are needed for the final diagnosis!

Wrong diagnosis or additional radiation neccessary because of insufficient information.

- Before deleting raw data make sure that all potentially neccessary reconstructions are available for final diagnosis.

3.3 Safety information on patient registration

Observe the following safety information before performing an examination, make sure that the registered patient data and patient position are correct.

CAUTION

If the Patient ID is not unique, studies may be listed which do not belong to the patient selected and displayed in the information area!

Import of wrong patient data possible.

- Always check the patient data before importing them into your system.

CAUTION

Wrong entry of patient sex or age!

Wrong basis for diagnosis.

- Make sure that the patient sex and age are correct.

CAUTION

Inconsistent patient data or image information for SPECT syngo and post-processing applications!

Wrong basis for diagnosis.

- Do not modify patient data after results have been calculated.

  Note: More specifically, modifying patient information after the results have been computed may cause wrong basis for diagnosis.

3.4 Safety information on patient transport and patient positioning

For safe and secure patient transport and patient positioning, observe the following the sections depending on your workflow.

3.4.1 Using positioning aids

Observe the following safety information when using positioning aids.

WARNING

The pediatric and scintimammography pallets can become unattached and fall from the system if the user undocks the patient bed using the foot pedal!

Patient injury and system damage can result.

- Do not press the foot pedal to undock the patient bed while a pediatric or scintimammography pallet is attached.

WARNING

Radiation Therapy Pallet accessories can be in the path of motion!

Patient injury and system damage can result.

- Monitor the patient at all times, and do not leave the patient unattended.

WARNING

Radiation Therapy Pallet accessories may not be detected by the system's body contour system!

Patient injury and system damage can result.

- Do not perform auto contour studies with third-party radiation therapy pallet accessories attached.

WARNING

The pediatric and scintimammography pallets may not be sensed by the system!

Patient injury and system damage can result.

- Do not start any system motion if the system does not indicate that the pediatric or scintimammography pallet is attached.

CAUTION

The patient uses the whole-body armrest as a support and the armrest moves while the patient is moving on or off the pallet!

Patient injury can result.

- The whole-body armrests are designed to hold the patient's arms during whole-body planar acquisitions. They are not designed to support the patient's weight while moving on or off the pallet. Do not let the patient use the whole-body armrest as a support.

Head holder

CAUTION

If a head holder or support does not engage securely, it can come loose!

Injury to the patient.

- Make sure that the pluggable positioning aids are seated firmly and securely engaged in the receptacle at the end of the table top.

3.4.2 Avoiding tensile stress of connected equipment lines

Observe the following safety information when the patient is connected any medical equipment.

CAUTION

Use of infusion lines that are too short!

Injury to the patient due to tensile stress on infusion lines.

- Make sure you only use infusion lines that are long enough.

  Movement of equipment or table top must not cause tensile stress.

3.4.3 Securing the patient

Observe the following safety information when securing the patient on the table.

WARNING

Patient not properly secured to pediatric pallet!

Patient injury and system damage can result.

- In order to safely secure the patient and to limit motion artifacts, always use the three pieces of body wrap attached to the pediatric pallet, and the larger, fourth body-wrap piece.

CAUTION

Never position the patient directly in the gantry!

Patient injury can result.

- If repositioning is required, retract the patient from the gantry.

3.4.4 Moving the patient table or gantry

Observe the following safety information when moving the patient table or gantry.

WARNING

Improper patient positioning or patient movement after proper positioning puts the patient in the path of system motion!

Patient injury and system damage can result.

- Always observe the patient and maintain communication to ensure that the patient's body parts (patient limbs, clothing, hair, IVs, etc.) are clear of contact to avoid pinching or crushing.

CAUTION

Pinch points exist between the patient bed's pallet and the system!

Hand and finger injury can result.

- Keep hands from beneath the patient bed's pallet. Do not place hands between patient bed and system. Avoid possible contact between the system's detectors, gantry, or rear bed.

CAUTION

Pallet and index move freely when there is no power or when the system is in Emergency Stop!

Patient or personal injury or system damage can result.

- The patient nor the user should lean, brace, or push on the pallet or bed index or their handles, as they can freely move. While this design enables the user to quickly remove the patient from the gantry in an emergency situation, caution should be used.

CAUTION

An undocked patient bed can move!

Personal injury can result.

- Check that the patient bed is securely docked in front of the gantry. The patient bed should not be pivoted with a patient on it, nor should the patient sit or lie upon a pivoted patient bed.

3.4.5 Using the laser light marker

Observe the following safety information when using the laser light marker.

CAUTION

Eyes can be exposed to positioning lasers!

Patient or operator eye injury can result.

- Do not view patient positioning lasers directly with optical instruments. Do not stare into the laser's beam. Avoid exposing the patient's eyes to laser beams.

3.4.6 Observing the maximum load

Observe the following safety information to avoid overloading the table, accessories, or the assembly of accessories.

CAUTION

Exceeding the maximum load of the patient table!

Injury to the patient or the personnel, or damage to the equipment is possible.

- Make sure that the permissible maximum load of the patient table is not exceeded. This includes the patient and attached equipment.
- The maximum loads of the equipment are displayed on the applied labels.

3.5 Safety information on patients with implanted devices

Observe the following safety information when examining patients with implanted devices.

CAUTION

ECG triggering devices are not intended for monitoring patient vital signs and may count pacemaker impulses during cardiac arrest or arrhythmias!

This masking effect may cause a delay in providing emergency care for patients in cardiac arrest.

- Do not use ECG triggering devices to monitor patient vital signs.
- Monitor pacemaker patients closely.

CAUTION

Scanning patients with implanted devices such as pacemakers or neuro stimulators!

Interferences may cause malfunctions of the implanted device.

- Observe the patient closely during examination.

Contact the manufacturer of the active implanted device for more information.

3.6 Safety information on configuring the system

Observe the following safety information and the following sections when configuring the system equipment.

WARNING

During a collimator change, the system can come in contact with the patient!

Patient injury and system damage can result.

- Never change collimators while the patient is on the patient bed!

CAUTION

Collimator drawers must only be opened while the collimator cart is docked to prevent the cart from tipping over!

Personal injury or system damage can result.

- Do not open more than one drawer at a time, and never move a collimator cart with a drawer open.

CAUTION

When approaching with or removing the collimator cart, the weight of the collimator cart with or without collimators requires time and distance to stop its momentum!

Personal injury and system damage can result.

- Move the collimator cart at a controlled speed so effort is not required to bring it to a stop.
- Never try to stop a collimator cart's movement by placing a foot in front of a wheel as this will result in an injury.
- Keep hands on collimator cart handle to avoid pinching between collimator cart and patient bed.

CAUTION

A system collision can occur with a collimator cart!

System damage can result.

- A collimator cart should not be docked with the patient bed unless collimators are being removed or installed.

CAUTION

Using the collimator change handle incorrectly can cause the hand to come into contact with the system!

Personal injury and system damage can result.

- Use the collimator drawer handle to open and close a drawer. Place fingers inside the handle. Gently open the drawer handle. When closing the drawer, slide it completely closed.

WARNING

Detectors in the process of reconfiguring can come into contact with the patient if the patient is on or near the system!

Patient injury can result.

- Remove the patient from the system and its vicinity before initiating a reconfigure of the detectors.

WARNING

The ACC/ICC lowers to floor level and can crush objects beneath it!

Personal injury or system damage can result.

- When lowering the ACC/ICC or installing collimators, keep feet, hands, and clothing away from the ACC/ICC, as well as any other object from beneath it.

CAUTION

Throughout the collimator change process, system motion can automatically occur as a result of a user selection or action, and can also occur as part of an automatic function of the system!

Patient or personal injury, as well as system damage, can result.

- Anticipate system motion and stay clear of system motion (for example, closing collimator clamps).

3.7 Safety information on performing an examination

Observe the following safety information before and during an examination.

CAUTION

Radiation in the examination room after the **Start** key has been pressed!

Undesired radiation exposure.

- Leave the examination room before initiating scanning or for interventional CT examination, wear protective clothing.

3.7.1 Preparing for an examination

CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

- Calibrate the system as part of the CT checkup. Repeat calibration if ring artifacts occur.

3.7.2 Stopping system movements and radiation

In case of an emergency, all system movements and radiation can be interrupted by pressing the **STOP** or **EMERGENCY OFF** key.

1 Make sure that you know where the **STOP** key and **EMERGENCY OFF** key are located.

2 Always observe the patient directly. Press the nearest **STOP** key in case of danger.

You find **STOP** keys at the gantry, control box, and the gantry display.

3 Press an **EMERGENCY OFF** if the system does not respond to the **STOP** keys in any hazardous situation.

The **EMERGENCY OFF** key interrupts the power supply of the system. Data can be lost.

3.7.3 Electrical safety

WARNING

Extreme cases like a patient emergency, smoke, fire, etc. require a shutdown of electrical power to the whole system!

Patient or personal injury, or system damage, can occur.

- Pressing the **Emergency Power Off** button shuts down electrical power to the whole system. System movement will be stopped.

WARNING

A patient is defibrillated on patient bed pallet that does not support defibrillation!

Patient or personnel in contact with the patient bed or pallet are subjected to electrical shock.

- Do not perform defibrillation on a patient lying on the patient bed pallet.

WARNING

Patient contact with conductive parts can put the patient's safety at risk!

Electrical shock and system damage can occur.

- Do not bring the ECG electrodes' conductive parts, associated connectors, and other patient-applied parts into contact with other conductive parts, including earth ground.

WARNING

Do not plug other devices into the external ECG Power Outlet!

Patient injury or system damage can result.

- The external ECG Power Outlet is for ECG devices only. Plugging any other device into this power outlet can affect its operation, and may cause damage to the system. Do not plug other devices into this outlet.

WARNING

There is a risk of electrical shock from handling system components like the UPS and its batteries!

Electrical shock and system damage can result.

- Only connect approved electrical devices. See the System Owner's Manual for more information.

WARNING

Non-medical equipment must use a suitably sized, medical grade, isolation transformer!

If not, electrical damage to equipment and/or loss of system power during a procedure can result.

- If the workplace or other non-medical equipment must be located in the patient vicinity, it must be powered through a suitably sized, medical grade, isolation transformer. A suitable isolation transformer can be obtained from Siemens.

WARNING

Portable RF communications equipment is operated too close to the system!

Degradation of system performance could result.

- Only operate portable RF equipment including peripherals such as antenna cables and external antennas at least 30 cm (12 in) to any part of the system.

WARNING

The system when used with adjacent equipment or with additional equipment stacked on the system can lead to electromagnetic interference!

Inconsistent operation of system and nearby equipment is possible.

- If the system is used while positioned adjacent to other equipment or with additional equipment stacked on the system, it should be observed to verify normal operation in the configuration in which it will be used.

WARNING

Unapproved electrical devices are used!

Electrical shock and system damage can result.

- Only connect approved electrical devices. See the System Owner's Manual for more information.

WARNING

Accessories, transducers and cables other than those specified or provided by Siemens are used.

Increased electromagnetic emissions or decreased electromagnetic immunity could result in improper operation!

- Only connect approved electrical devices. See the System Owner's Manual for more information.

3.7.4 Examination settings

Check the examination settings before scanning.

CAUTION

The user may not be aware of CT scan parameters prior to starting CT acquisition!

There is the possible risk of the patient being exposed to non-clinical radiation.

- Before pressing the Start button to begin an acquisition, verify CT parameters.

CAUTION

Patient's orientation on the patient bed differs from the acquisition settings!

There is a potential risk of misdiagnosis.

- Verify that the patient's orientation and acquisition settings match.

CAUTION

Injection times can be entered incorrectly!

There is a potential risk for misdiagnosis.

- It is important that the time and date be accurately entered, and that the time throughout a department be synchronized so that when entering times for a calibration, initial assay, or patient's injection time, values entered will correctly reflect the passage of time for an isotope or radiopharmaceutical's decay.

WARNING

Follow the instructions provided by the gantry display!

Personal injury or system damage can result.

- The gantry display provides safe usage instruction through graphics, audible warnings, and text messages.

CAUTION

Performing a 90 degree NCO scan without a pre-scan may lead to image truncation!

There is a risk of potential misdiagnosis.

- Select the NCO pre-scan orbit type or the 76 degree detector configuration to optimize NCO imaging.

CAUTION

Wrong table feed direction!

CT dose not, or only partially, usable.

- Always keep an eye on the patient.
- Stop scanning in case of wrong table feed direction.

CAUTION

Wrong table feed direction!

X-ray not, or only partially, usable.

- Always keep an eye on the patient.
- Stop scanning in case of wrong table feed direction.

CAUTION

Patient data or data sets are modified using the correct and rearrange function!

Additional radiation exposure. Delayed diagnosis.

- Always check the patient data and the corresponding data sets for their accuracy. Take special care with patient data that is modified locally and sent back to the RIS, as the RIS will not overwrite locally modified values.
- Do not modify data sets that are already processed by other applications; case reading or results calculation may fail or need to be redone. Especially, do not perform correct and rearrange actions while time-critical cases are in progress.

WARNING

Patient intercom system nonfunctional!

Patient cannot be understood in case of an emergency.

- Leave the intercom system switched on during the examination (**Listen to patient** key).
- Keep eye contact with the patient when talking or listening to him or her.

3.7.5 Communication with the patient

Observe the following safety information to ensure constant attention to the patient.

WARNING

Communication between the patient and operator is important during an acquisition, and especially in an emergency situation!

Patient injury can result.

- Observe the patient at all times and maintain communication.

WARNING

Patient intercom system nonfunctional!

Patient cannot be understood in case of an emergency.

- Leave the intercom system switched on during the examination (**Listen to patient** key).
- Keep eye contact with the patient when talking or listening to him or her.

3.7.6 During system movements

Observe the following safety information during system movements to avoid injuries and radiation damage.

Injury to the patient

CAUTION

Unintentional activation of table movement keys of the control box!

Possible injury to the patient by moving parts.

- Make yourself familiar with the function of the control box keys.
- Always keep an eye on the patient during table movements.

CAUTION

The detector tilt function is activated when the detector handles are squeezed!

Patient injury or system damage can result.

- Instruct the patient not to squeeze the detector handles so as to prevent accidentally activating the detector tilt function. Assist the patient to comfortably position arms and hands.

WARNING

Certain scan protocols may initiate automated system motion!

Patient or personnel injury or system damage can result.

- When Move to scan position is initiated by the user, depending on the system configuration, automatic system movement may occur. Be aware of system motion when initiating Move to scan position.

WARNING

Moving system components (manual or automated) can pinch body parts!

Patient or personal injury can result.

- Keep body parts away from system pinch points.

WARNING

Obstructions are left in the path of system motion!

Patient injury and system damage can result.

- Prior to and during any system movement, ensure there are no obstructions (IV poles, chairs, collimator carts, etc.) in the path of system motion.

3.7.7 During an examination

Observe the following safety information during an examination.

CAUTION

A CT scan can be interrupted by the patient accidentally pressing the pallet release button!

There is a possible risk of increased radiation exposure to the patient.

- Assist patients to comfortably position their arms and hands, instructing them not to press the pallet release button.

CAUTION

Patient movement between NM and CT acquisitions can cause image registration inaccuracies!

There is a potential risk of misdiagnosis.

- Instruct the patient not to move between NM and CT acquisitions.

CAUTION

When operating the system, radiation from an acquisition or calibration is present!

Radiation exposure to personnel is possible.

- When operating the system, limit personnel in the area to only those required for performing an acquisition or calibration.
- Avoid unnecessary radiation exposure to personnel.
- Observe all required radiation monitoring, safety, and reporting requirements of your site and regulatory agency.

CAUTION

An interrupted CT scan could require the scan to be repeated!

There is a possible risk of increased radiation exposure to the patient.

- If an application failure, error, or emergency stop should occur, perform reconstruction of the saved data.

CAUTION

Topogram range does not match intended CT scan range!

There is a possible risk of increased radiation exposure to the patient.

- Ensure that the topogram scan range is covering the CT scan area of interest.

3.7.8 Contrast examinations

Observe the following safety information when performing a contrast examination.

CAUTION

Misunderstanding of reference point for start delay in bolus examination!

Faulty synchronization between bolus and scanning.

- Make sure that the chosen delay time fits to the characteristics of the bolus injection.

CAUTION

Wrong start delay!

X-ray not, or only partially, usable.

- For acquisition with contrast medium, select the flooding time of the contrast medium as the delay.

3.7.9 Cardiac CT examinations

Observe the following safety information when performing a Cardiac CT examination.

CAUTION

Missing ECG-Sync due to the disconnection of the patient's ECG electrodes or ECG cable!

X-ray not, or only partially, usable.

- Check the ECG electrodes and ECG cable connection before scanning.
- A contrast enhanced scan should not be aborted but operated with synthetic ECG-data.

CAUTION

ECG triggering devices are not intended for monitoring patient vital signs and may count pacemaker impulses during cardiac arrest or arrhythmias!

This masking effect may cause a delay in providing emergency care for patients in cardiac arrest.

- Do not use ECG triggering devices to monitor patient vital signs.
- Monitor pacemaker patients closely.

The physiological measurement module (PMM) does not issue warning messages or information messages.

CAUTION

Wrong setting in display!

Ionizing radiation

- Set the ECG pulsing window to clinically relevant value.

CAUTION

Missing ECG-Sync due to the disconnection of the patient's ECG electrodes or ECG cable!

X-ray not, or only partially, usable.

- Check the ECG electrodes and ECG cable connection before scanning.
- A contrast enhanced scan should not be aborted but operated with synthetic ECG-data.

Additional safety information on cardiac sequence ranges

Observe the following safety information before performing a cardiac sequence range.

CAUTION

Wrong ECG signal detection!

Undesired radiation

- Check the correct position of the ECG electrodes before scan start.

3.7.10 Examinations for radiotherapy treatment planning (RTP)

Observe the following safety information when performing an examination for radiotherapy treatment planning.

CAUTION

Insufficient image information for RT planning caused by table misalignment requires new CT scan after quality assurance!

Additional dose of radiation.

- Check the table alignment accuracy regularly according to this manual and national quality assurance regulations. In case of misalignment, contact the Customer Service at Siemens Healthineers.

CAUTION

Use of the RTP overlay!

Contusion of patients fingers during table movement.

- Always use both arm supports with RTP overlay.
- Observe that the hands of the patient are completely covered by the arm support.
- Always fix and observe the patient during table movement.

CAUTION

Mounting of RTP overlay!

Contusion of operator's fingers between RTP overlay and patient table.

- Take care not to pinch your fingers when mounting the RTP overlay.

CAUTION

RTP overlay is an additional absorber in the scan field!

Reduced low contrast resolution at soft tissue tumors.

- Consider reduced low contrast resolution when identifying soft tissue tumors.

CAUTION

Design of the RTP overlay generates image artifacts!

Additional dose due to scan repetition.

- Image artifacts are normal during scanning with the RTP overlay. It is not necessary to repeat the scan.

3.7.11 Scan errors

Be aware of the following cautions that may indicate errors during a scan.

Under very high count rate conditions, the communication and synchronization between the detector and the acquisition computer may be compromised, which can potentially affect the imaging fidelity of the system. When the system detects that this has happened, it will pause the acquisition and display the following caution:

CAUTION

Detector information has been lost.

Data from the nuclear acquisition just completed may be compromised, resulting in reconstruction artifacts.

- Delay the scan until the count rate is reduced.

The acquisition cannot be effectively continued from this point. The acquisition should be repeated when the activity in the patient has been reduced (through radioactive decay or biological elimination).

CAUTION

Detector information has been lost.

The acquisition is paused and data may be compromised.

- Prior to your next acquisition, follow *Perform Daily Shutdown and Start-up* as described in the operator manual. If the problem persists, contact Customer Service.

CAUTION

Detector information has been lost.

The acquisition is stopped and data may be compromised.

- Prior to your next acquisition, follow Perform Daily Shutdown and Start-up as described in the operator manual. If the problem persists, contact Customer Service.

3.8 Safety information on reconstruction and image review

Observe the following safety information and the following sections when reconstructing and reviewing images.

CAUTION

An irregular NCO orbit (for example, non-elliptical) during an NCO continuous-mode acquisition with a 76 or 90-degree gantry configuration may degrade image quality!

There is potential for misdiagnosis.

- For a continuous NCO acquisition with 76 or 90-degree gantry configuration, the patient and accessories (for example, ECG leads, sheets, IV lines) must be properly and securely positioned to ensure a smooth elliptical NCO orbit.
- Monitor the pre-scan and acquisition to minimize movement of the patient and accessories and ensure a smooth, elliptical orbit of the detectors.
- Review the projection views, linogram, and sinogram, in Quality Check for image quality and motion, and review final images.
- Depending on the degree and type of motion, motion correction may not be able to compensate, and an assessment for re-scan may be required.

CAUTION

Invalid patient demographic data when updating an emergency patient afterwards!

Patient demographic data may become invalid by mistaking the identity when updating the identification attributes of an emergency patient afterwards.

- Take special care when updating identification attributes of an emergency patient.
- Verify the patient identity by using additional identification measures like patient photo or identification bracelet.

CAUTION

Images with lossy compression are used for diagnosis!

Wrong basis for diagnosis.

- Always verify your evaluation results with the original DICOM images (first reader duty).
- Never use lossy compressed images for primary diagnosis.
- Check the image text for information on lossy compression before starting an evaluation.

CAUTION

The display quality at the remote assistance workplace cannot be guaranteed!

Wrong basis for diagnosis.

- If the remote assistance workplace shall be used for diagnostic purposes, ensure that all necessary regulatory and legal requirements for the monitor are fulfilled.

CAUTION

Image size and quality of preview images provided in the patient browser are not sufficient for clinical diagnosis!

The diagnosis and treatment may be based on incorrect information.

- When performing clinical diagnosis only use the high resolution images in the imaging area.

3.8.1 Image artifacts

Observe the following safety information to avoid image artifacts.

CAUTION

There are artifacts resulting from incorrect patient positioning!

There is a possible risk of misdiagnosis.

- Correctly position the patient (for example, so that the area of interest is within detector's field of view and is iso-centered) to ensure optimal image quality.

CAUTION

Using third-party radiation therapy pallet accessories may cause nuclear image artifacts!

There is the potential risk of misdiagnosis.

- When using these images for planning or diagnosis, be aware of and look for possible artifacts.

CAUTION

The extrinsic calibration and verification floods with **SMART**ZOOM collimators will have a different appearance than those from a parallel hole collimator!

There is a potential risk of misdiagnosis.

- Be aware that calibration and verification floods with **SMART**ZOOM collimators will have a different appearance than those from a parallel hole collimator when performing quality control.

CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

- Calibrate the system as part of the CT checkup. Repeat calibration if ring artifacts occur.

3.8.2 Image registration

CAUTION

SPECT and CT acquisitions can become incorrectly registered (for example, patient movement between SPECT and CT acquisitions)!

There is a potential risk of misdiagnosis.

- After the SPECT and CT acquisitions are complete, review the image registration and make adjustments if necessary.

3.8.3 Automatically generated reconstructions

Observe the following safety information for **Auto** reconstructions.

CAUTION

Automatically generated results are archived without being reviewed by a physician or a technician!

Wrong diagnosis

- Always review automatically generated results before sending them to other DICOM nodes.

CAUTION

Check mark for automatic archiving is configured by the system owner, for example, Auto send or Auto recon!

Wrong diagnosis

- Always check that automatically generated results are verified by a physician or technician before diagnosis.
- Make sure that the results of the currently active workflow are verified.
- Make sure that automatically stored data on the remote system is being verified in a timely manner.

3.8.4 Inline Results reconstructions

CAUTION

Operation of the system, applications, or functionality by non-trained users!

Injury to the patient or personnel, or damage to the equipment.

- Only trained and qualified users, certified in accordance with country-specific regulations, are authorized to operate the system. For example, physicians, radiologists, or technologists.

  For appropriate training, contact your Representative at Siemens Healthineers.

3.8.5 Imported studies

Observe the following safety information when using imported studies for diagnosis.

CAUTION

Incomplete import of studies!

Wrong diagnosis due to wrong or incomplete measurements.

- Check that imported studies have been completely copied to the system.
- If an error has occurred, try to re-import the study.
- If the error reoccurs, decide whether the incomplete data should be kept on the system or if it poses a risk of wrong diagnosis.
- Set the ECG pulsing window to clinically relevant value.

3.8.6 Wrong basis for diagnosis

Observe the following safety information to avoid a wrong basis for diagnosis.

CAUTION

Image units of SUV are intrinsically variable!

SUVs are not intended to be used as a primary factor in the clinical interpretation of SPECT images, and if they are used as such, a misleading image impression could be reported in some circumstances.

- SUVs should be used to support the formation of a visual impression of SPECT images but never override the visual interpretation. In addition, if images are to be compared, efforts should be made to control the inherent variability by standardizing the patient imaging and image formation conditions between the two scans.

CAUTION

Acquiring images with a non-verified system!

Wrong basis for diagnosis.

- Only use systems that have been released by Siemens Healthineers.

CAUTION

Derived images are used for diagnosis!

Failure to review data and use incorrect data may lead to patient misdiagnosis.

- Recommend to review the original data as well as attenuation maps for reconstructions with attenuation correction, before using them for diagnosis purposes.

CAUTION

Paper printouts or film may not correspond to source images that contain evidence objects, such as measurements, graphical objects, or annotations!

Wrong diagnosis.

- Always compare printouts with their source images on the system to ensure correct anatomical positioning of evidence objects on the printouts.

CAUTION

Derived images are used for diagnosis!

Potential for misdiagnosis.

- Planar derived images must always be assessed in conjunction with the corresponding original SPECT imaging.

CAUTION

The display quality at the remote assistance workplace cannot be guaranteed!

Wrong basis for diagnosis.

- If the remote assistance workplace shall be used for diagnostic purposes, ensure that all necessary regulatory and legal requirements for the monitor are fulfilled.

CAUTION

Paper printouts or film may not correspond to source images that contain evidence objects, such as measurements, graphical objects, or annotations!

Wrong diagnosis.

- Always compare printouts with their source images on the system to ensure correct anatomical positioning of evidence objects on the printouts.

3.8.7 Basic Postprocessing

The *Basic Postprocessing* Instructions for Use and Online help provide procedural information and background information on Basic Postprocessing, which is intended for basic visualization of medical images.

CAUTION

Loading image data sets of different patients!

Mix-up of patients and incorrect diagnosis possible.

- When loading reference and model series, make sure that you select the data of the correct patient.

CAUTION

The pixel lens has a constant size and is independent of the zoom factor of the image!

Wrong diagnosis due to misleading image information.

- Please note that the pixel lens is only a pointer indicating the position (not the size) of the measured area.

CAUTION

The diagnosis and the treatment plan solely based on the CAD results!

Wrong diagnosis and treatment plan.

- Complete the interpretation for diagnosis with the original data set first.
- Do not change your first read findings based on the CAD results. Use the CAD results as a second reader tool only.

CAUTION

Modified images are used for diagnosis!

Wrong basis for diagnosis.

- Use modified images as supplemental information only.
- Always base your diagnosis on unmodified images.

CAUTION

True Size printouts depend on printer settings, calibration, or other factors!

True Size printouts do not correlate to the real anatomic dimensions.

- Check and validate the precision limitations when printing in True Size.

  Usage of True Size printouts is in your own responsibility.

  Always compare the image scale bar on printed images with a physical measurement unit, for example, a ruler.

InSpace

CAUTION

Execution of reconstruction algorithms requires a reduced matrix size. As a consequence, result images inherently lose information because of classification and overlapping view!

Incorrect diagnosis or treatment possible.

- Take these system limitations into account when evaluating InSpace images.

3.9 Safety information on Dual Energy reconstructions

CAUTION

Operation of the system, applications, or functionality by non-trained users!

Injury to the patient or personnel, or damage to the equipment.

- Only trained and qualified users, certified in accordance with country-specific regulations, are authorized to operate the system. For example, physicians, radiologists, or technologists.

  For appropriate training, contact your Representative at Siemens Healthineers.

CAUTION

Images of Single Source Dual Energy: Suspicious lesion on result images due to motion or registration artifacts!

Wrong diagnosis

- After detecting or assessing a lesion, verify the absence of motion or registration artifacts.

CAUTION

Raw data has been deleted, but additional reconstructions are needed for the final diagnosis!

Wrong diagnosis or additional radiation neccessary because of insufficient information.

- Before deleting raw data make sure that all potentially neccessary reconstructions are available for final diagnosis.

3.9.1 Before deleting raw data of Dual Energy scans

Before deleting raw data of **Dual Energy** scans, make sure that diagnosis has been completed. If diagnosis has not yet been completed, make sure that the potentially necessary result series are available for further diagnostic evaluation.

The suitable result series depends on the clinical use case.

- To allow for further analysis of the scanned Dual Energy data in *syngo*.CT Dual Energy, one of the following result series is required:
  - Thin-slice **SPP** result series
  - Thin-slice **L&H** result series
- To confirm correct motion correction, especially for **DE Parallel Ranges** reconstructions, you can use the following result series:
  - **Application Class > Mixed > Difference** result series
- To provide a reference series with minimal impact of patient motion, you can reconstruct one of the following result series, or, both:
  - **L3D** result series with the same reconstruction parameters (➔ Page 578 *Reconstructing low energy images*)
  - **H3D** result series with the same reconstruction parameters (➔ Page 579 *Reconstructing high energy images*)

3.10 Safety information on storing and archiving

Observe the following safety information and the following sections when storing and archiving images. (➔ Page 308 *About the archiving of data (images)*)

CAUTION

Incomplete or missing archiving!

Loss of clinically relevant data.

- Make sure that the archiving rules are correctly set, for example, archiving flags.
- Verify that all relevant data has been successfully transferred to a long-term archive before deleting data from your local storage or short term storage.

3.10.1 Archiving image data

Observe the following safety information when archiving image data.

CAUTION

Acquiring images with a non-verified system!

Wrong basis for diagnosis.

- Only use systems that have been released by Siemens Healthineers.

3.10.2 Loss of data

Observe the following safety information to avoid a loss of data.

CAUTION

Low-quality storage media are used!

Data loss due to improper handling or low-quality storage media can result.

- Use only quality media approved for medical applications when storing patient data.
- Observe proper handling guidelines for storage media.

CAUTION

Switching to multi session mode may destroy data previously recorded on this medium!

Previously stored data can no longer be read.

- Only delete the data that you have exported on a CD-R or DVD-R from the local database after you have completed the session.

CAUTION

Low-quality storage media are used!

Data loss due to improper handling or low-quality storage media can result.

- Use only quality media approved for medical applications when storing patient data.
- Observe proper handling guidelines for storage media.

CAUTION

Switching to multi session mode may destroy data previously recorded on this medium!

Previously stored data can no longer be read.

- Only delete the data that you have exported on a CD-R or DVD-R from the local database after you have completed the session.

CAUTION

Removing the storage media too early!

Loss of data.

- Do not remove any storage media until the recording process is completed.
- Do not open the CD drive or DVD drive until a message appears that writing is completed.
- Do not remove the USB device before performing safe removal of the hardware.

3.11 Safety information on networking and remote access

WARNING

Remote and uncontrolled patient movement!

Possible injury to the patient by moving parts.

- Do not leave the *syngo* Acquisition Workplace unattended if full access is enabled. Local user still has full responsibility for appropriate usage of system.

CAUTION

Misuse of data handling!

Wrong diagnosis

- Make sure that only a trained user gets remote access to the system.

CAUTION

Security breach of network, removable media, or directly accessed system can modify or delete patient data or try to initiate system motion!

There is a potential risk for misdiagnosis, additional doses of radiation, and patient injury or system damage.

- Apply standard network security practices.

CAUTION

If the Patient ID is not unique, studies may be listed which do not belong to the patient selected and displayed in the information area!

Import of wrong patient data possible.

- Always check the patient data before importing them into your system.

CAUTION

The display quality at the remote assistance workplace cannot be guaranteed!

Wrong basis for diagnosis.

- If the remote assistance workplace shall be used for diagnostic purposes, ensure that all necessary regulatory and legal requirements for the monitor are fulfilled.

WARNING

Remote and uncontrolled patient movement!

Possible injury to the patient by moving parts.

- Do not leave the *syngo* Acquisition Workplace unattended if full access is enabled. Local user still has full responsibility for appropriate usage of system.

3.12 Safety information on the system

The following sections discuss the operating conditions, site requirements and safety equipment of the system. It also informs you what to observe when you modify or dispose of the system.

Please observe the information given in *System Owner Manual*.

For further details about system safety, please contact your Customer Care Center.

3.12.1 Operating conditions

Only operate the system in rooms intended for medical purposes.

The following requirements must be fulfilled for operation of the system:

(➔ Page 99 *Protective measures*) (➔ Page 101 *Safety equipment*)

Climatic requirements in the examinations room

CAUTION

System temperature is above or below the defined temperature range! Image quality is not guaranteed because the system calibration may not be correct.

Artifacts may occur which might affect patient diagnosis.

- Maintain room temperature and humidity in accordance with specifications.
- Perform quality assurance procedures as scheduled to ensure optimal image quality.

The air inside the examination room must fulfill the following requirements while running the system:

Temperature range: 18–25 °C (65–77 °F)

Relative humidity: 20%–75%

3.12.2 Transport and storage conditions

The following requirements must be fulfilled for transport and storage of the system:

	Transport and storage
Ambient temperature	From -20–49 °C (-4–120.2 °F)
Relative air humidity	From 10% to 90%
Barometric pressure	From 700 hPa to 1060 hPa

3.12.3 External radiation

CAUTION

The system can detect radiation from another radiation-emitting system that is too close!

There is a potential risk of misdiagnosis.

- Be aware of potential elevated background radiation due to nearby external sources of radiation.

3.12.4 Weight limits

CAUTION

An overloaded patient pallet may crack!

Patient injury and system damage can result.

- Do not exceed the weight limit of the pallet.

WARNING

The pediatric pallet can support a pediatric patient with a maximum weight 60 lb (27.22 kg) and a patient length up to 38 in. (96.52 cm)!

Patient injury or system damage can occur.

- Do not load a patient onto the pediatric pallet that exceeds 60 lb (27.22 kg) or a length of 38 in. (96.52 cm).

WARNING

The scintimammography pallet can support a patient with a maximum weight 300 lbs (135 kg)!

Patient injury and system damage can result.

- Do not load a patient onto the scintimammography pallet that exceeds 300 lb (135 kg).

3.12.5 Explosion protection

The system, components, and accessories are not suitable for operation or storage in areas containing explosive gases.

3.12.6 Protective measures

The following protective measures must be followed when installing the system:

- (→ Page 99 *Power connection*)
- (→ Page 99 *Fire extinguishers*)
- (→ Page 100 *Site On/Off switch*)
- (→ Page 100 *Radiation warning lamps*)

3.12.7 Power connection

The power supply must be provided to all products operated as part of an X-ray system through a fixed wiring connection and a multipole interrupting device provided by the customer. The equipment must be installed according to specification IEC 60364-7-710 or must meet the respective national regulations.

3.12.8 Fire extinguishers

Fire extinguishers must be located in easily accessible and visible locations.

3.12.9 Site On/Off switch

In compliance with the MDD (Medical Device Directive), an **On/Off** switch (EMERGENCY OFF) must be installed on site by the customer.

Operating the **Site On/Off** switch connects or disconnects the system to the main power supply. The **On/Off** state must be visible.

If the **Site On/Off** switch is used for switching off, the uninterruptible power supply (UPS) starts up. If a power failure occurs directly afterwards, the UPS may not have enough energy to supply the system.

Unless absolutely necessary, do not switch off the system at the **Site On/Off** switch. Otherwise you have to calibrate the system several times when you restart it.

3.12.10 Radiation warning lamps

Radiation warning lamps are recommended to be installed on all doors of the examination room. They must be visible from all areas where radiation can be released.

3.12.11 System accessories

CAUTION

Accessories are damaged or are improperly used (for example, used to move on and off patient bed, etc.) on the system!

Patient injury, potential for misdiagnosis, or system damage can result.

- Only use Siemens accessories, and only as intended. Replace defective or damaged accessories immediately.

CAUTION

Non-Siemens ECG cables and non-CE-marked electrodes can cause invalid ECG triggering!

There is a potential risk of misdiagnosis.

- Only original Siemens-recommended ECG cables and CE-marked electrodes can be used.

CAUTION

The system allows the use of 3rd party SPECT collimators. Siemens does not validate the quality, safety or efficacy of 3rd party collimators. Siemens collimator change protocols only ensure that the touch pad is functioning, and that the collimator has been recognized by the system.

There is a potential risk for misdiagnosis.

- For any questions regarding performance or quality, contact the 3rd party collimator supplier.

CAUTION

Collimators may be damaged and used in clinical studies!

There is a potential risk of misdiagnosis.

- Review the extrinsic calibration results, including corrected floods and uniformity values, and then ensure that the uniformity values are within allowable limits.
- Review the head alignment values, including sinograms and linograms and ensure the values are within allowable limits.
- Replace damaged collimators.

3.12.12 Safety equipment

The system contains several items of safety equipment to protect the patient, the operating personnel, accompanying people and the system itself.

In addition to the measures already mentioned, the system has the following safety equipment:

(➔ Page 102 *Temperature monitoring of the X-ray tube assembly*)
(➔ Page 102 *Overheating*)

3.12.13 Temperature monitoring of the X-ray tube assembly

The temperature of the X-ray tube assembly is permanently monitored and calculated in advance. This function runs in the background. If the temperature rises above the limit value, a warning is given.

If necessary, scanning is postponed until the required cooling period has elapsed. This means that you might have to wait a certain time before you can continue with the examination as planned.

3.12.14 Operating temperature

To avoid workplace and other equipment from overheating, keep all ventilation areas clear and open so that air may circulate freely.

For proper system operation, the following room temperatures and humidity should be maintained.

Temperature Range	Relative Humidity	Temperature Gradient
18° to 30° Celsius 64.4° to 86° Fahrenheit	20% to 75% non-condensing	4.4° Celsius per hour 8° Fahrenheit per hour

3.12.15 Overheating

The possible causes of overheating are:

- Ambient temperature too high
- Ventilation openings covered
- Defective cooling system
- Dirty air filters

If certain parts of the equipment overheat, a warning is displayed on the monitor.

- In this case, finish the current measurement as quickly as possible and shut down the system.

3.12.16 Uninterruptible power supply (optional)

The computers and SPECT components of the system can be equipped with an optional uninterruptible power supply (UPS). Furthermore, the entire system can be connected to the emergency power supply of the hospital.

If the uninterruptible power supply is active, a message or an acoustic signal indicates this.

- Finish the current examination as quickly as possible and shut down the system.

3.12.17 Risk of tripping

Observe the following safety information when installing the system.

CAUTION

System components located on the floor!

Personal injury or system damage can result.

- Watch for objects on the floor and avoid tripping over floor guides, wear plates, sockets, or stops for collimator carts or patient beds.

3.12.18 Equipment modifications

Modifications or upgrades of the system must be made in compliance with all legal stipulations by Siemens Healthineers Service or other authorized personnel.

Manipulation of hardware

WARNING

System covers are removed!

Personal injury and system damage can result.

- Do not remove system covers. Covers are only to be removed by trained service personnel. Electrical and moving components are behind the covers and can cause personal injury or be damaged if incorrectly handled.

CAUTION

Unauthorized applications, manipulation or alteration of applications or hardware can change the operating system's settings, which may affect system performance!

This can also lead to incorrect functioning of the product, resulting in patient injury, misdiagnosis, or product damage.

- Modifications or upgrades to the system must be made in compliance with all legal stipulations by a Siemens Customer Service Representative or other authorized personnel.

WARNING

Wrong handling of batteries!

Electric shock or burn from high short-circuit current.

- Observe proper precautions.
- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions.
- Keep unauthorized personnel away from batteries.

WARNING

The system carries line voltage!

Electric shock or burn from high short-circuit current.

- Never open components of the system.
- Contact, and leave all repairs to, the Customer Service at Siemens Healthineers.
- Make sure that no objects, for example, necklaces, paperclips, or liquids can get into the interior of the system (electric shock, short circuit).

Manipulation of software

CAUTION

System infected by a computer virus!

Manipulation of the software.

- Never use a data medium that could contain a computer virus (e.g., game CD) or download data which could contain a virus.
- Check disks for viruses before using them.

CAUTION

System applications and settings can be overwritten, thus interfering with system operation!

Patient injury and system damage can occur.

- Do not install third-party applications on your system that are not approved by Siemens. Your system is only warranted and supported as delivered and configured.

CAUTION

Third party software offers the user the possibility to modify files in the system!

Manipulated software leads to loss of or inconsistent data, or damage to the system.

- Do not modify files in the file menu, except within folders explicitly allowed by the Instructions for Use.

  Any software manipulation is forbidden.

CAUTION

System infected by a computer virus!

Manipulation of the software.

- Never use a data medium that could contain a computer virus (e.g., game CD) or download data which could contain a virus.
- Check disks for viruses before using them.

Limitation of liability

As the manufacturer, assembler, installer, or importer of the system, Siemens Healthineers does not accept liability for the safety functions, reliability, or performance of the system if one of the following circumstances applies:

- Installation, upgrade, readjustment, modification, repair, or upgrading by persons not authorized to do so by Siemens Healthineers.
- Components not properly replaced with original parts from Siemens Healthineers.
- Electrical installation in the examination room that does not comply with the requirements of the currently valid standard DIN VDE 0100 Part 710 or other binding codes of practice.
- Operation of the system in a way which deviates from the instructions given in these manuals.

Certificate of conformity from other manufacturers

We therefore recommend that you obtain a certificate of conformity containing the following information:

- Type, extent and date of the work performed on the system
- Names of all those involved in the work (and their companies)
- Their signatures

Please note that this does *not* imply that the repairs are authorized. Siemens Healthineers does *not* accept liability for repairs that are carried out without our written permission.

Equipment of other manufacturers

If you are planning to install equipment of other manufacturers, you must obtain information about potential dangers in connecting or using systems or equipment of other manufacturers. This information can be drawn from the system specification.

If this information is not sufficient, you must consult the manufacturer of such systems/equipment or a specialist about the following topics:

- Reliability and performance of the systems/equipment
- Potential safety risks for people and equipment

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards. Furthermore, all configurations must comply with the applicable standards, for example, IEC 60950 for data processing equipment and IEC 60601-1 for medical electrical equipment.

Any person who connects additional equipment to the signal input part or signal output part is configuring a medical system and is therefore responsible for ensuring that the system complies with the applicable standards.

For further information, contact your local Siemens Healthineers Representative or your Siemens Healthineers Country Organization.

3.12.19 Disposal of the system

In European Union (EU) states, Siemens will take back and dispose of the packing material of your system.



On disposing of the system or parts, currently valid environmental legislation must be observed. Examples of environmentally relevant components are:

- Accumulators and batteries
- Transformers
- Capacitors
- Phantoms

For details, contact your local customer service representative or your Siemens regional office.

System components hazardous to people or the environment must be disposed of with care and in compliance with legally binding ordinances.

WARNING

Do not improperly dispose of system components!

Potential environmental hazards can result.

◆ Follow proper disposal regulations.

3.13 Safety information for administrators

CAUTION

Operation of the system, applications, or functionality by non-trained users!

Injury to the patient or personnel, or damage to the equipment.

- Only trained and qualified users, certified in accordance with country-specific regulations, are authorized to operate the system. For example, physicians, radiologists, or technologists.

  For appropriate training, contact your Representative at Siemens Healthineers.

CAUTION

User access may be prevented due to forgotten or unknown accounts or passwords, or wrong setup (for example, in case of an emergency)!

Inaccessible system.

- Do not forget to define a general user account for emergency access and assign it to a group and a role both called Emergency Access.
- Define a local user account for emergencies. The password for this account should never expire.
- Regardless as to whether you specify a password for the emergency account or not, users shall be prohibited from changing any passwords (especially for the emergency account).
- The users shall contact administrators immediately in case of problems.

3.13.1 Emergency access

CAUTION

User access may be prevented due to forgotten or unknown accounts or passwords, or wrong setup (for example, in case of an emergency)!

Inaccessible system.

- Do not forget to define a general user account for emergency access and assign it to a group and a role both called Emergency Access.
- Define a local user account for emergencies. The password for this account should never expire.
- Regardless as to whether you specify a password for the emergency account or not, users shall be prohibited from changing any passwords (especially for the emergency account).
- The users shall contact administrators immediately in case of problems.

CAUTION

Limited system access because security measures, for example, licensing issues!

System access might be hindered or restricted in emergency cases.

Set up an emergency access environment if necessary. This may include:

- Creating an emergency user account with limited access rights and ensuring that this account is available to appropriate personnel only.
- Disabling the screen saver at the designated emergency treatment clients.
- Establishing a license strategy to ensure that sufficient licenses are always available at the designated emergency treatment clients.

3.13.2 Short Term Storage (STS)

CAUTION

Short-term storage (STS) is full!

System not available, no new image storage possible, system lock-up.

- Regularly check the fill level indication for the STS.
- Initiate archiving and deletion of data from the STS.

3.14 Safety information on system shutdown and restart

Observe the following safety information when shutting down and restarting the system.

CAUTION

Forced shutdown will stop all running applications and may lead to a data loss or data inconsistency!

A forced shutdown performed by any user may cause data loss or data inconsistency in open workflows at any connected client.

- Ensure that there isn't any unsaved finding before performing a forced shut down of the system.
- Close all open workflows and running applications before forced shut down of the system.
- Inform other users at secondary workplaces to also close all open workflows before forced shut down of the system.

CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

- Calibrate the system as part of the CT checkup. Repeat calibration if ring artifacts occur.

3.15 Safety information on quality assurance

Make sure to regularly perform the necessary tests on the equipment.

CAUTION

The system requires periodic quality-control procedures to be performed to ensure system performance!

There is a potential for misdiagnosis or radiation re-dose.

- Perform calibrations and image checks on a regularly scheduled basis as described in the instructions. If a defect is detected or system damage is found, do not use the system. Contact your Siemens Customer Service Representative.

CAUTION

During QC procedures, system movement occurs!

Personal injury or system damage can result.

- Check that no objects can obstruct system motion, and that the system does not come in contact with its own components.

CAUTION

Lightmarker not positioned correctly!

X-ray not, or only partially, usable.

- Perform the lightmarker test regularly as part of the monthly constancy test.

CAUTION

Missing constancy test of the monitor!

Wrong basis for diagnosis.

- Perform the monitor test regularly at the recommended intervals.

CAUTION

Missing camera test!

Wrong basis for diagnosis.

- Perform the camera test regularly at the recommended intervals.

3.16 Safety information on system maintenance

- Do not perform a patient examination during periodic maintenance, routine checks, and service activities.

3.16.1 Cleaning and disinfecting the equipment

The following safety information has to be followed in general.

WARNING

The system is improperly cleaned!

Personal injury and system damage can result.

- Follow proper cleaning instructions provided in the operating instructions.

Workplace

WARNING

Liquids or food and drinks in the vicinity of medical equipment!

Injury to the patient or personnel, and malfunction of or damage to the equipment.

- Shut down the system immediately if liquid is detected within the equipment.
- Contact and leave all repairs to the Customer Service at Siemens Healthineers.
- Clean the equipment with a damp, not wet, cloth.
- Wring the cloth out well and make sure that no liquids get onto, or into, the equipment.
- After cleaning, make sure that no water remains on the floor to avoid slipping.
- Keep food and drinks away from the equipment.

3.16.2 Preventive maintenance

WARNING

Preventative maintenance has not been performed according to schedule and system does not perform according to specifications!

Critical injuries are possible if the system is not maintained properly.

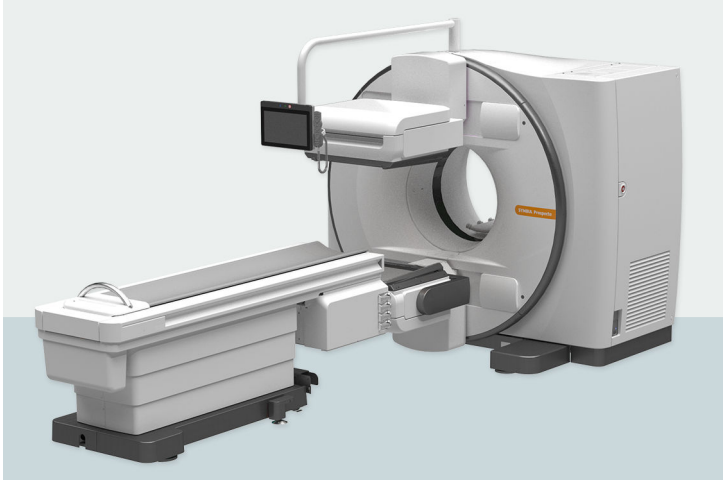
- Ensure that qualified service personnel perform all required preventative maintenance according to the schedule included in your System Owner's Manual.

4 System description

This section provides information on the system, system components, and accessories.

- Components or software functionalities that may not be part of your system configuration are nevertheless described in the present instructions for use. It may be that not all of them are marked explicitly as optional. The availability of these components or software functionalities depends on your purchase contract.
- The pictures of the components shown here are only examples. The appearance and availability of the components depend on your system configuration.

The system consists of the following parts:



Gantry and patient table



Acquisition console

4.1 Gantry

This section describes displays, operating elements, and connectors of the gantry.

WARNING

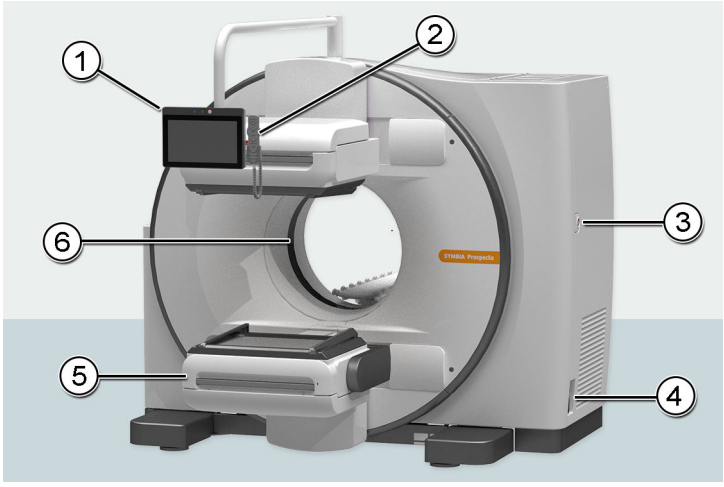
The system carries line voltage!

Electric shock or burn from high short-circuit current.

- Never open components of the system.
- Contact, and leave all repairs to, the Customer Service at Siemens Healthineers.
- Make sure that no objects, for example, necklaces, paperclips, or liquids can get into the interior of the system (electric shock, short circuit).

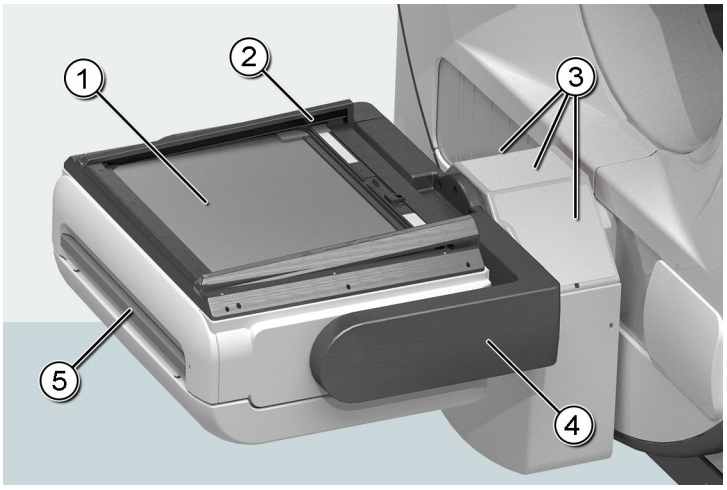
4.1.1 Gantry front

The following operating elements and displays are located on the gantry front:



(1) Gantry display
(2) Hand controller
(3) **STOP** key
(4) Gantry connections
(5) NM detector
(6) CT subsystem

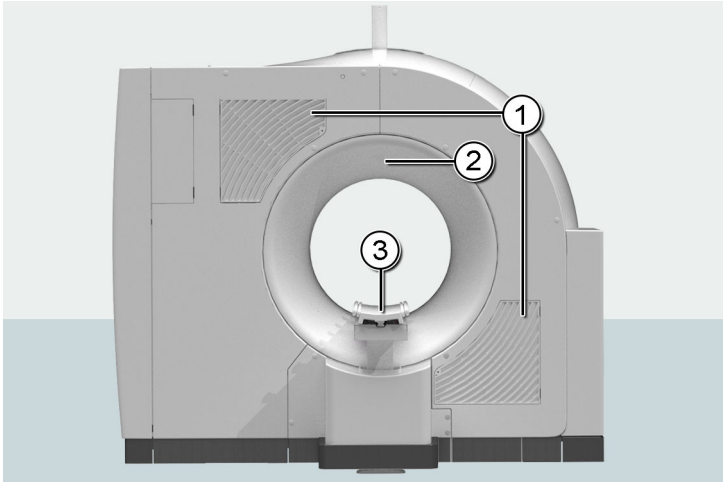
The following operating elements are located on the detectors:



(1) Detector crystal
(2) Automatic Infrared Body-Contour System (Light Rails) for automatically adjusting detector position, patient bed position, and detector orbit, thus avoiding contact with collimator touch pad surface
(3) A touch pad covers three sides of the detector's yoke
(4) Detector 2's pivot arm
(5) Detector 2's handle

4.1.2 Gantry back

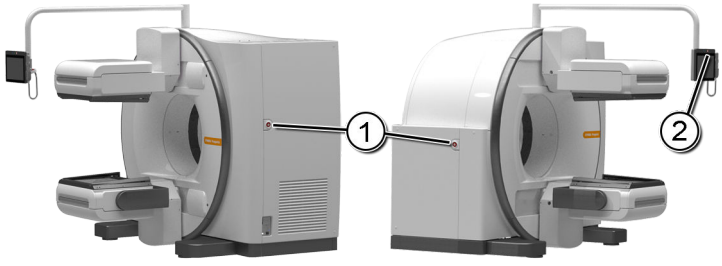
The following operating elements and displays are located on the gantry back:



(1) Air filters
(2) Gantry intercom
(3) Rear patient-handling system

4.1.3 Gantry STOP key

The **STOP** keys allow you to interrupt all system functions and switch off radiation. They are located on either side of the gantry.



(1) Emergency **STOP** buttons
(2) Emergency **STOP** button on the gantry display

An emergency **STOP** button is also located on the control box.

In an emergency, press the **STOP** key. All system movements, such as table movement or detector rotation, are interrupted and radiation is stopped.

Once the emergency situation has been resolved, follow the steps below to restart the system.

- Click the green **Reset** button on the gantry display.

4.1.4 Laser light markers

The laser light markers are laser beams that emanate from three points in the gantry opening. These points indicate the position of the scan center and the slice plane in the middle of the detector rows for the inner scan level and the outer offset level. The laser beams fan out so that you see lines as a mark or a cross at the intersection of the beams.

The laser beams visualize the gantry isocenter and the radiation exposure plane. To turn on the laser light marker, press the **Light Marker** key on the control box or the hand controller.



After approximate 1 minute, the laser light marker is switched off automatically. If you want to switch off the laser light marker immediately, press the **Light Marker** key again.

CAUTION

Lightmarker not positioned correctly!

X-ray not, or only partially, usable.

- Perform the lightmarker test regularly as part of the monthly constancy test.



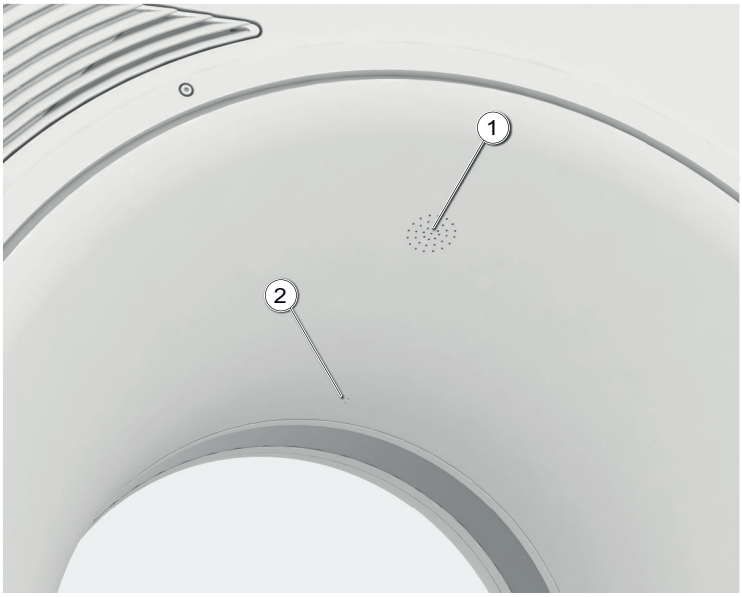
LASER RADIATION

DO NOT EXPOSE USERS OF TELESCOPIC OPTICS

CLASS 1M LASER PRODUCT

4.1.5 Gantry intercom

The gantry is equipped with a communication device. It consists of a speaker and a microphone that enable you to talk with the patient.



(1) Speaker
(2) Microphone

You can operate the intercom with the keys on the control box.

WARNING

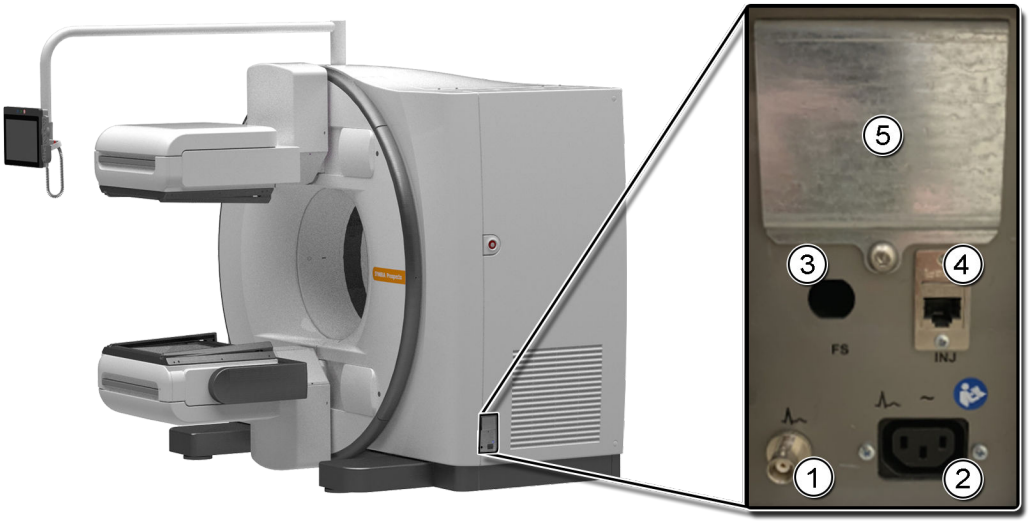
Patient intercom system nonfunctional!

Patient cannot be understood in case of an emergency.

- Leave the intercom system switched on during the examination (**Listen to patient** key).
- Keep eye contact with the patient when talking or listening to him or her.

4.1.6 Gantry interfaces

The side of the gantry provides various connection interfaces.



(1) External ECG device trigger connection
(2) External ECG device power connection
(3) Placeholder port - do not use
(4) Placeholder port - do not use
(5) Service panel

- Only connect equipment approved by Siemens Healthineers, including Ivy Biomedical System's Model 7600 cardiac trigger monitor.
- See (→ Page 67 *Electrical safety*) for information on safely connecting to the system interfaces.

4.2 Gantry display

The gantry display is mounted on an arm extending from the top of the gantry. The arm can be moved to either side of the gantry with the gantry display swiveling left or right and tilting up or down.

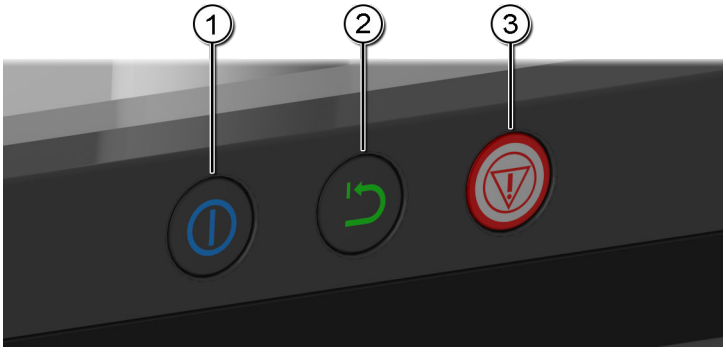
Through its persistence images and other controls, the gantry display facilitates patient positioning, detector and collimator configuration, and some protocol steps. The following sections describe the gantry display and its various functions.



The gantry display does not swivel a full 360°.

4.2.1 Gantry display buttons

The three buttons at the top of the gantry display control system power, restart, and emergency stop functions.



(1) Power on and off

(2) Reset
(3) Emergency stop

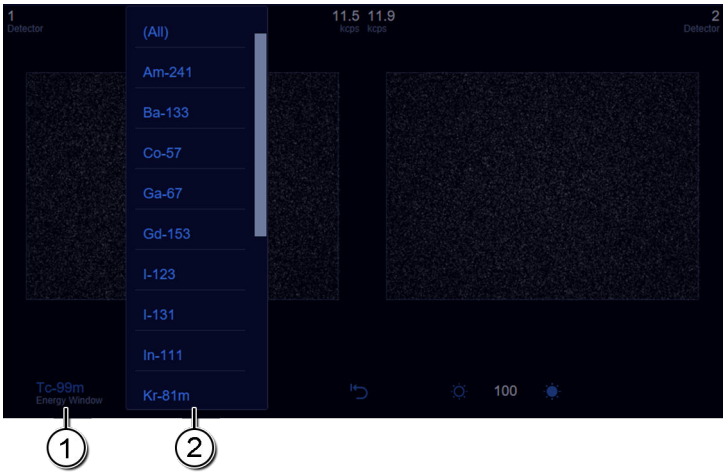
4.2.2 User interface prior to examination

Before a patient and examination protocol are loaded, the gantry display shows limited information.



(1) Indication that no patient is registered
(2) Energy Window
(3) Persistence value controls
(4) Tools area
(5) Persistance image refresh button
(6) Persistence window level controls
(7) Persistance images

Until a patient and protocol are loaded, the **Unload** button will not be available. Additionally, you can choose from various istopes in the **Energy Window** list by selecting it on screen.

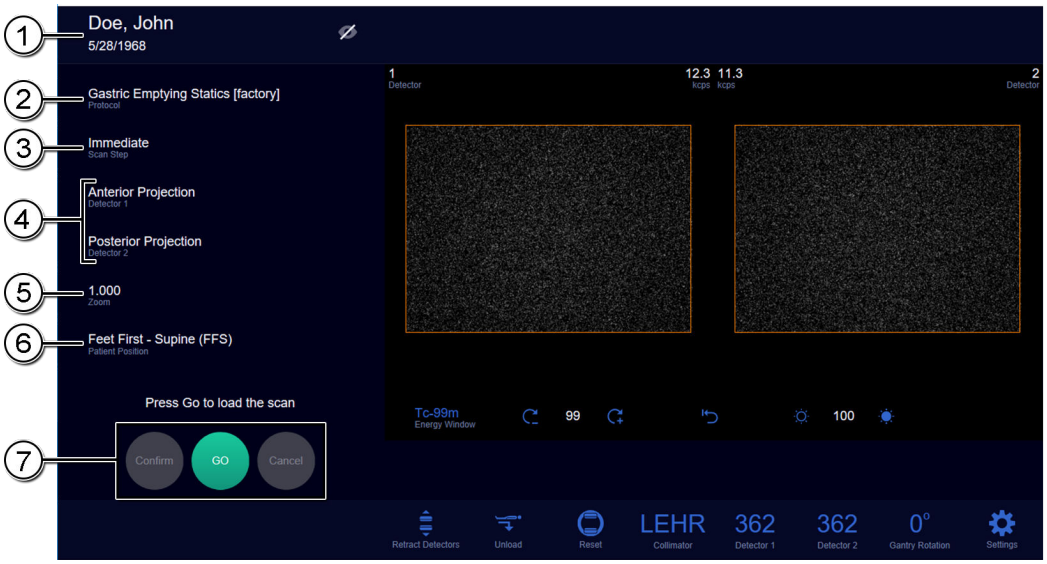


Energy window list

(1) Selectable **Energy Window** control
(2) List of isotopes

4.2.3 User interface during an examination

During an examination, the gantry display shows additional information unique to the patient and active protocol.

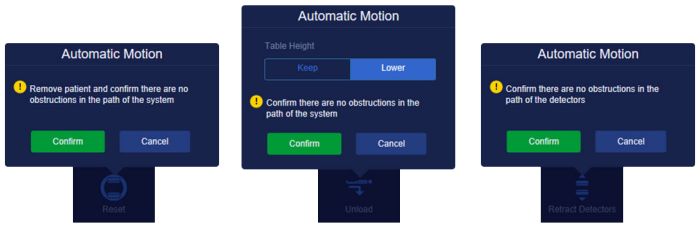


(1) Patient name and date of birth
(2) Protocol name
(3) Current scan step
(4) Detector views (only for planar scans)
(5) Zoom (only for planar scans)
(6) Patient position
(7) Workflow controls

When a patient and protocol are loaded, the **Unload** button will be available. The **Energy Window** isotope cannot be changed and is defined by the current examination protocol.

4.2.4 System motion tools

The **Retract Detectors**, **Unload**, and **Reset** tools on the gantry display initiate automatic motion to facilitate your workflow.



Retract Detectors - This tool retracts the detectors to the furthest position away from the gantry bore.

Unload - This tool retracts the detectors, retracts the patient table, and then will lower the table if the **Lower** option is selected for **Table Height**.

Reset - This tool rotates the gantry ring and detectors to the default position for the current detector configuration. Do not use this tool when a patient is on the table.

4.2.5 Collimator tool

The **Collimator** tool on the gantry display shows available collimator configurations, initiates collimator changes, and enables you to simultaneously set your desired detector configuration.



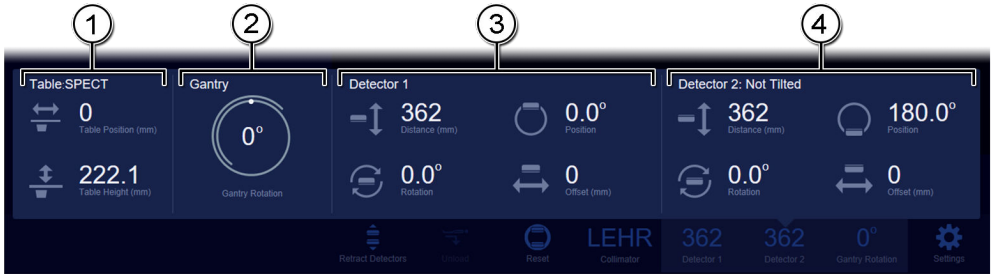
(1) **Collimator** section
The **Collimator** section displays all collimators registered on your system and their storage location. If more than five collimators are available, a horizontal scroll bar will appear at the bottom of the section, enabling you to select off-screen options.

(2) **Detector** section
The **Detector** section displays all supported detector configurations for the selected collimators. If a configuration is not supported by your collimator choice, the configuration square will be disabled.

(3) Collimator-pairing toggle control
This toggle control enables mixing of collimators between the two detectors. When slid left, in the **Match collimators** position, the system will install matching pairs of collimators to the detectors. When slid right, in the **Change only detector 2** position, the system will install the selected collimator only to detector 2. Before using this option, ensure that your desired collimator is already installed on detector 1.

4.2.6 Table and gantry position tool

The table and gantry position tool provides a visual overview of your system's configuration, including the patient table position, gantry rotation, and detector positions.



(1) **Table** position
This section includes the table's horizontal position and height. It also displays the table index position (SPECT, for the example above).

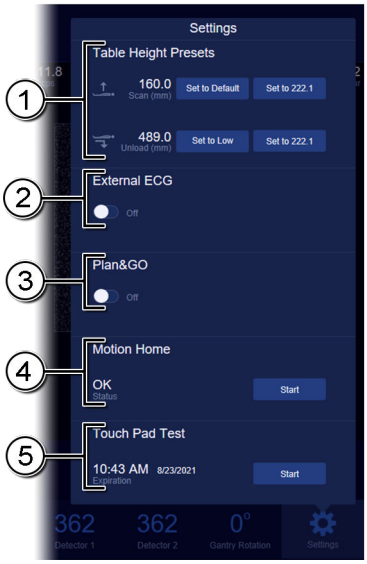
(2) **Gantry** rotation
This section displays the gantry rotation, which is measure in degrees. The dot that moves around the spiral represents detector 1.

(3) **Detector 1**
This section provides up to four measurements, including **Distance (mm)**, **Position** (°), **Rotation** (°), and **Offset (mm)**.
Distance (mm) - the distance away from the center of the gantry bore.
Position - the position around the gantry, measured in degrees.

(4) **Detector 2**
This section provides up to four measurements, including **Distance (mm)**, **Position** (°), **Rotation** (°), and **Offset (mm)**. Additionally, it displays whether detector 2 is tilted or not.

4.2.7 Settings tool

The **Settings** tool enables you to perform various tasks related to the system, its features, and its accessories.



(1) **Table Height Presets**
This section includes two presets for the patient table: **Scan (mm)** height and **Unload (mm)** height. There are two buttons for each preset. The two right-most buttons reflect the current table height and allow you to set the preset to that height. The two left-most buttons, **Set to Default** and **Set to Low**, set the respective presets to the default values (160.0 mm for scan height and 489.0 for unload height).

(2) **External ECG** toggle
This toggle sets the system to use an external ECG instead of the internal ECG.

(3) **Plan&GO** toggle
This toggle turns the patient table's Plan&GO ruler on and off.

(4) **Motion Home** control
Pressing the **Start** button will initiate the motion home sequence, which moves the detectors, gantry, and table. This section also displays the current status of the motion home test and whether it should be run.

(5) **Touch Pad Test** control
Pressing the **Start** button will initiate the touch-pad test. This section also displays the expiration date of the latest run touch-pad test.

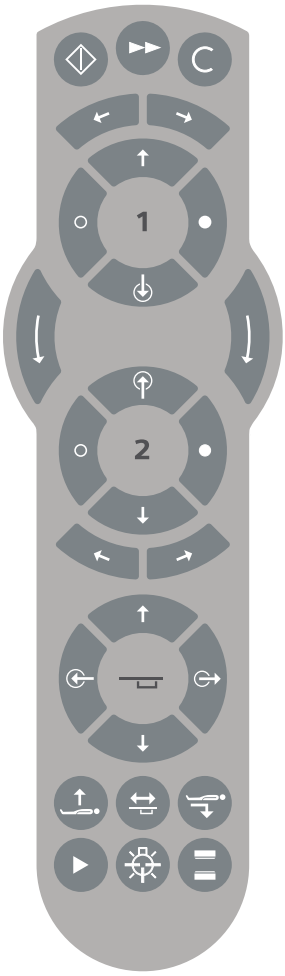
4.2.8 Viewing the gantry display from the acquisition console

You can view and control the gantry display from the acquisition console. Hover over the **Settings** menu (⚙) in the top-right of the acquisition console screen, and then select **Gantry Display** from the menu options. During some examination steps, the gantry display window will be hidden to ensure it does not cover any workflow information or controls.



(1) **Settings** menu
(2) **Gantry Display** menu option

4.3 Hand control



The hand control is used to manually communicate with the system. It can control gantry, patient table, and detector movements, as well as initiate acquisitions and programmed positioning.

The hand control uses single, double, and timed clicks. Holding a button down will repeat the button's function request.

For the hand control buttons:

- The hand control buttons are lit when available.
- All buttons that continuously control movement work the same way. Pressing a button activates a movement, and releasing stops it.
- By pressing two hand control buttons at the same time, simultaneous motion can occur. For example, both detectors can move out, or the patient table can move up or down while the pallet moves in or out.
- Each button on the hand control is identified with a graphic, indicating the button's function.
- All hand control actions and motion failures are recorded in the system logs.

If the hand control becomes disabled, the gantry display can be used for some system movements.

4.3.1 General function buttons

The following buttons perform general system functions:

Start/Stop Acquisition button - Pressing this button begins or cancels an acquisition.



Fast Motion button - Pressing this button increases the speed at which system motions occur. Once the **Fast Motion** button has been pressed it will begin to blink, and most system motions, including table and detector motion, will be accelerated until the button is turned off.



Clear button - Pressing the **Clear** button resets the gantry display's persistence image.



Move button - Press and hold this button to move the patient table to a preselected position.



Positioning laser button - Double clicking this button activates/deactivates the external positioning lasers used for aligning the patient to the center of the CT field of view.



180° configuration button - Double clicking this button moves the detectors to the 180° home position.

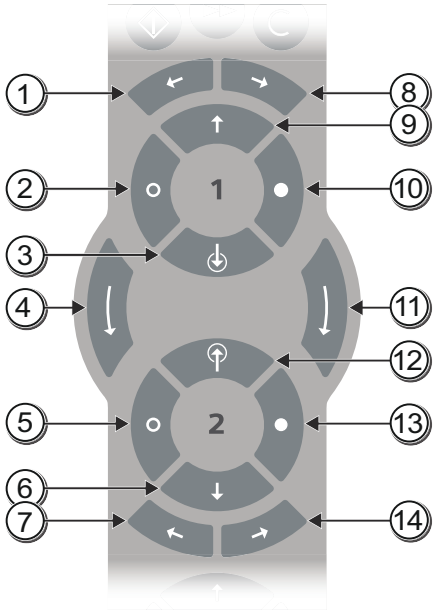


When reconfiguring the system, all motion buttons are inactive.

4.3.2 Detector and gantry ring motion buttons

The following buttons control motion of the gantry ring and detectors.

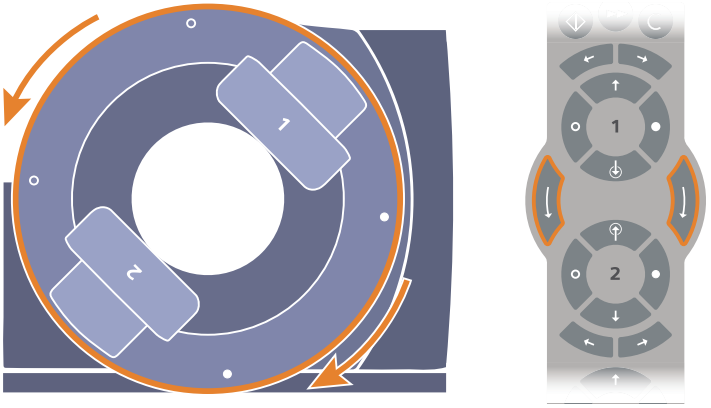
To better understand the hand control and system motions, use the detector numbers (**1** and **2**), and the circle (◯) and dot (●) orientation symbols on the hand control as reference for a motion's direction. The detector number, appearing on the fronts of the detectors, and the circle and dot orientation symbols, appearing on the the gantry, help in identifying the relationship between system orientation and the hand control.



(1) Rotate detector 1 counterclockwise
(2) Move detector 1 towards the orientation circle
(3) Move detector 1 inward
(4) Rotate gantry ring counterclockwise
(5) Move detector 2 towards the orientation circle
(6) Move detector 2 outward
(7) Rotate detector 2 clockwise
(8) Rotate detector 1 clockwise
(9) Move detector 1 outward
(10) Move detector 1 towards the orientation dot
(11) Rotate gantry ring clockwise
(12) Move detector 2 inward
(13) Move detector 2 towards the orientation dot
(14) Rotate detector 2 counterclockwise

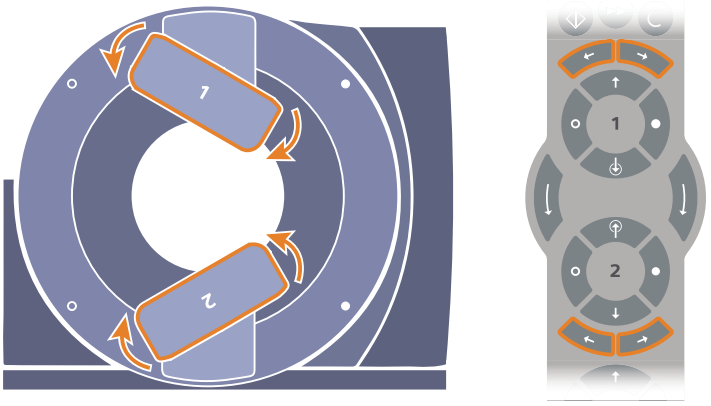
4.3.3 Gantry ring motion buttons

The following buttons rotate the gantry ring and its detectors, either clockwise or counterclockwise.



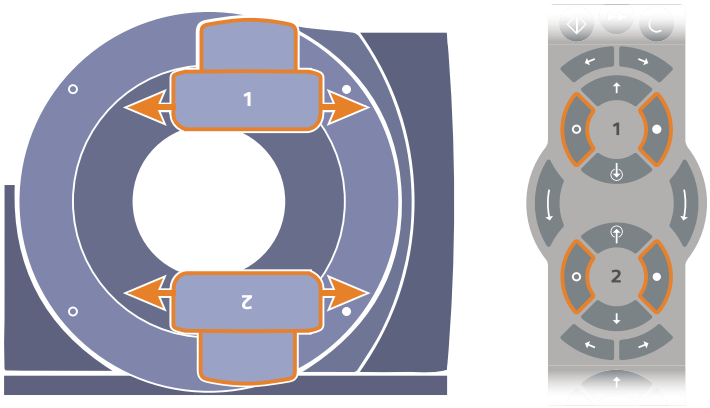
4.3.4 Detector rotation buttons

The following buttons rotate each detector, either clockwise or counterclockwise, on its yoke.



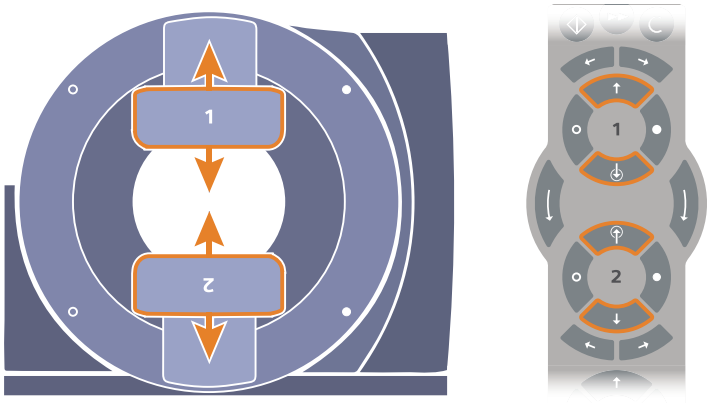
4.3.5 Detector lateral motion buttons

The following buttons move each detector laterally, towards the gantry's circle and dot orientation symbols.



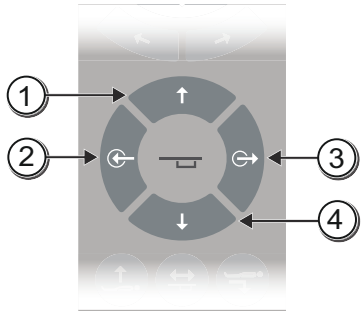
4.3.6 Detector outward and inward motion buttons

The following buttons move each detector towards or away from the center of the gantry. The hand control's detector numbers (**1** and **2**) and the gantry direction symbols (/) can be used to determine whether the detector motion will be towards or away from the center of the gantry.



4.3.7 Table motion buttons

The following buttons control manual pallet extension and table height.



1 Table-up button

Pressing the table-up button raises the patient table.

2 Table-in button

Pressing the table-in button moves the pallet toward the gantry.

3 Table-out button

Pressing the table-out button moves the pallet away from the gantry.

4 Table-down button

Pressing the table-down button lowers the patient table.

4.3.8 Table preset motion buttons

The following buttons control preset motions for the patient table and detectors:

Scan height button - Double clicking this button moves the patient table to a preset height, convenient for transferring a patient to and from a gurney.



Table index button - Double clicking this button is used to move the patient table to one of three predefined acquisition positions.



Unload button - Press and hold this button to retract both detectors, retract the patient table, and lower the table to a defined height.



When reconfiguring the system, all motion buttons are inactive.

4.3.9 Table index positions

The table index button is used to move the patient table to one of three predefined acquisition positions using the table motion buttons.

The following example assumes that accessories have been attached and that the patient is positioned on the patient table for the study.

1 Using the hand control, click the **Table Index** button once.



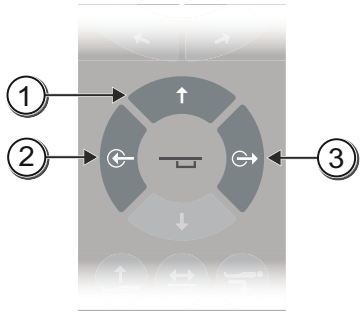
Most of the hand control buttons are disabled. The **Table Up**, **Table In** and **Table Out** pallet motion buttons are now used for predefined table index positions.

2 Press the **SPECT**, **CT Brain**, or **CT Body** study position button to move to a table index position.

136.0 cm - for SPECT

36.9 cm - for CT Brain

-19.0 cm - for CT Body

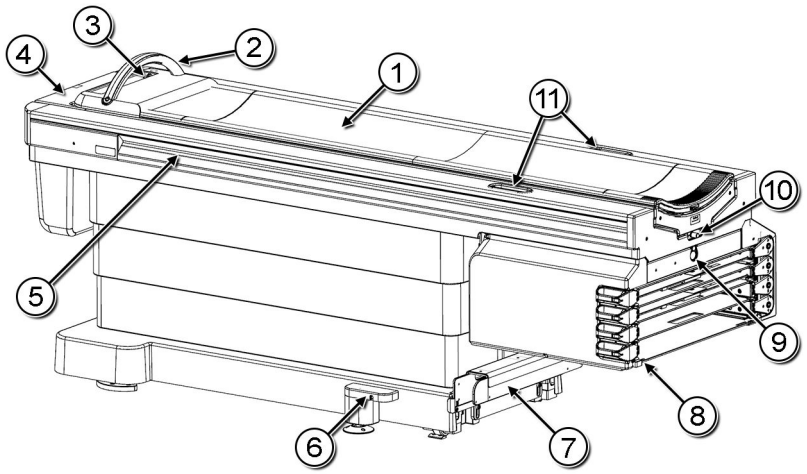


(1) CT Brain Study Position (**Table Up** button) - Patient positioned head in
(2) CT Body Study Position (**Table In** button) - Patient positioned feet in
(3) SPECT Study Position (**Table Out** button) - Patient usually positioned feet in

The table index positions are predefined and cannot be changed. Use these values to verify that the patient table is in the correct position.

4.4 Patient table and pallet

The patient table supports the pallet and table index, and it raises them to go between the detectors and through the gantry. The rear table and index support the pallet when it extends through the gantry.



(1) Patient pallet and pallet pad
(2) Patient pallet handle
(3) Internal ECG connector
(4) Patient table index
(5) Patient table ruler or Plan&GO ruler
(6) Foot pedal and docking pin
(7) Collimator cart connector
(8) Optional integrated collimator changer (ICC) or automatic collimator changer (ACC)
(9) Optional Automated Quality Control (AutoQC) device
(10) Integrated point-source holder
(11) Patient table handles

4.4.1 Patient table handles

Recessed handles are located on each side of the patient table to provide a hand grip when pivoting the table.

4.4.2 Pallet

The pallet is the surface that the patient lies on during an acquisition. It travels horizontally and can be moved using the hand control, CT control box, or the pallet handle in some situations.

The head end of the pallet is nearest to the pallet handle. The foot end is nearest to the gantry.

4.4.3 Pallet Pad

The pallet pad is attached to the pallet and provides patient comfort. The pad can be removed for cleaning or quality control procedures.

Removing and attaching the pallet pad

The pallet pad is attached to a patient pallet with hook and loop fasteners that run the length of the pallet and pallet pad.

To remove the pallet pad, lift the pad from either end of the pallet, peeling the pad's hooks away from the loops on the pallet. Lifting the pad from the middle of the pallet may result in tearing.

To attach the pallet pad to the pallet, start at the head end of the pallet. Center the pad with the pallet, and then smoothly lower the pad until you reach the foot end. The pad should be flush with the foot end of the pallet, nearest to the gantry.

The pallet pad has a ribbed end that should be located at the foot of the pallet.

4.4.4 Pallet handle

The pallet handle is not used for routine patient positioning. It is used to retract the pallet in an emergency. In an emergency situation, pressing the pallet-release button will release the pallet and enable you to retract it.

Routine pallet movement should be controlled with the hand control.



(1) Pallet handle
(2) Pallet-release button

The pallet handle is sometimes accidentally squeezed by patients during an acquisition. Squeezing this handle can release the pallet, causing an acquisition to be canceled.

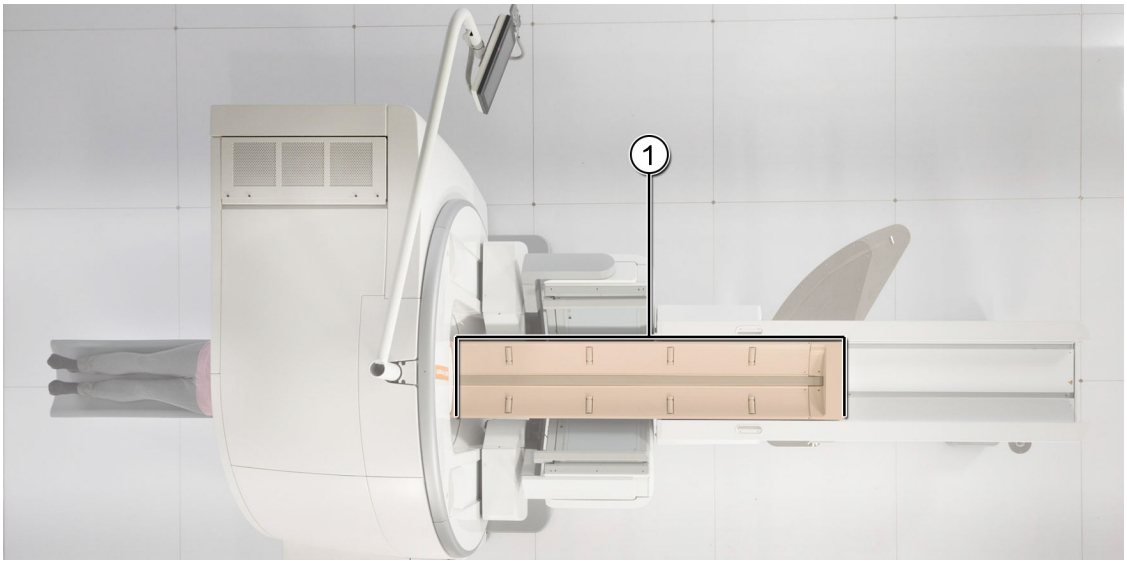
To prevent an accidental release, a cover is installed beneath the handle to limit access to the handle's release mechanism. A circular opening the size of a thumb is available to the operator to release the pallet, while the rest of the handle is covered from accidental patient squeezing.



Handle cover

4.4.5 Patient table index

The index lies beneath the pallet and moves horizontally to predetermined positions, supporting the pallet during CT acquisitions. For NM acquisitions, the index does not move.



(1) Patient table index

4.4.6 Foot pedal

The patient table is typically *docked* (securely positioned) in front of the gantry. It can be undocked and pivoted away from the gantry for acquisitions between the detectors or gurney imaging.

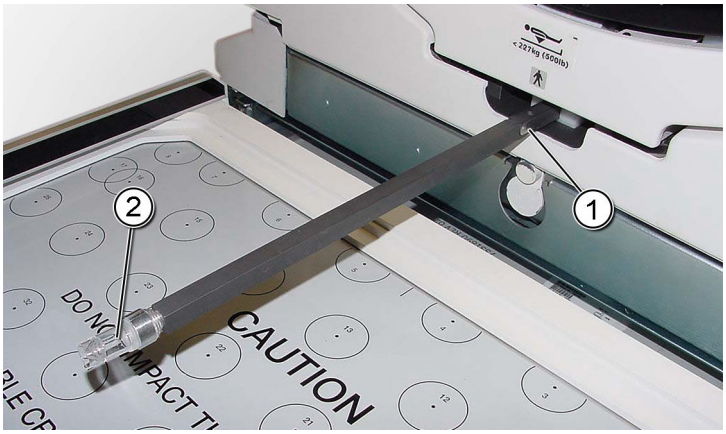
The foot pedal is used to release and secure the patient table at the end closest to the gantry. The right side of the foot pedal is pressed down to raise the docking pin from the floor socket and releases the patient table for pivoting. The left side of the foot pedal is pressed down (leveling the foot pedal) to lower the docking pin.

The patient table pivots in only one direction, which is determined at installation. Pivot the patient table by pressing the foot pedal's right side and **pushing** the patient table, thus avoiding any trip hazards that might occur if the patient table were pulled. The patient table always pivots to the side opposite the foot pedal.

4.4.7 Integrated source holder

The integrated source holder is a retractable rod built into the foot end of the patient table. It is manually pulled out of the patient table for quality control and assurance procedures. A point source vial is inserted into the end of the integrated source holder, enabling source positioning for peaking, tuning, and intrinsic verifications and calibrations. The integrated source holder can be retracted by pushing it back into the patient table.

By removing the integrated source holder's cap, a precision source can be installed for sensitivity calibration procedures..



(1) Hinge enables holder to be lifted up if detector is accidentally raised.
(2) Integrated Source Holder

Do not lean or press down on the point source holder. Applying weight or pressure can bend and damage the holder. Similarly, do not allow detectors to contact the source holder.

4.4.8 Automated Quality Control (AutoQC)

The Automated Quality Control (AutoQC) option allows unattended automated verifications and calibrations. The device is installed on the underside of the patient table and contains:

- a 50 µCi Co-57 point source,
- a 10 mCi Gd-153 line source,
- and a slotted shield for the line source.

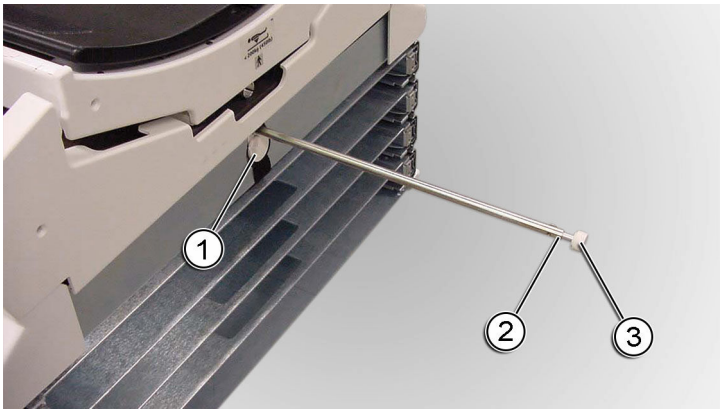
These automatically extend and retract for the following uses:

- intrinsic tuning and intrinsic flood verification/calibration,
- extrinsic sweep verification activity,
- and detector alignment verification/calibration

Using AutoQC, a technologist can set up quality control workflows at the end of the work day. The workflows will automatically run at set start/finish times. When the technologist returns, the finished results are ready to view.

4.4.9 AutoQC Point Source Holder

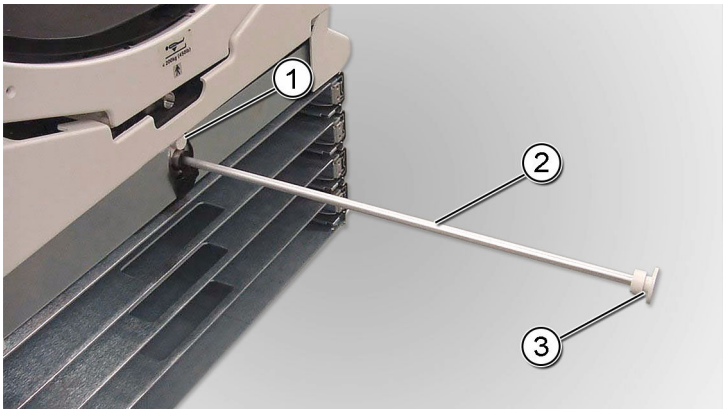
The point source holder will extend or retract a source as required to complete system quality control. A 50 µCi Co-57 point source is installed by a Siemens Customer Service Representative.



(1) Line Source Holder
(2) Point Source Holder
(3) Lead Cap

4.4.10 AutoQC Line Source Holder

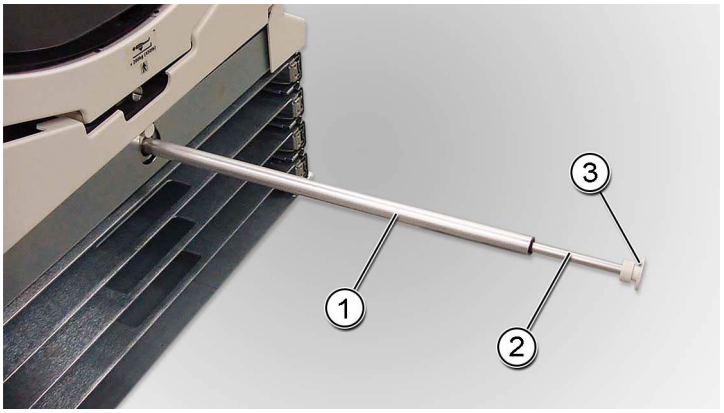
The line source holder will extend or retract a line source as required to complete system quality control. A 10 mCi Gd-153 line source is installed by a Siemens Customer Service Representative.



(1) Point Source Holder
(2) Line Source Holder
(3) Lead Cap

4.4.11 AutoQC Line Source Holder Shielding

In addition, the line source has an extendable or retractable lead shield which has slots enabling five points along the line source to emit radiation for five locations in the field of view (FOV).



(1) AutoQC Line Source Holder Lead Shielding
(2) Line Source Exposed
(3) Lead Cap



When the AutoQC line source is exposed, a status icon is displayed on the patient positioning monitor, warning of the presence of radiation.

4.4.12 Integrated ECG

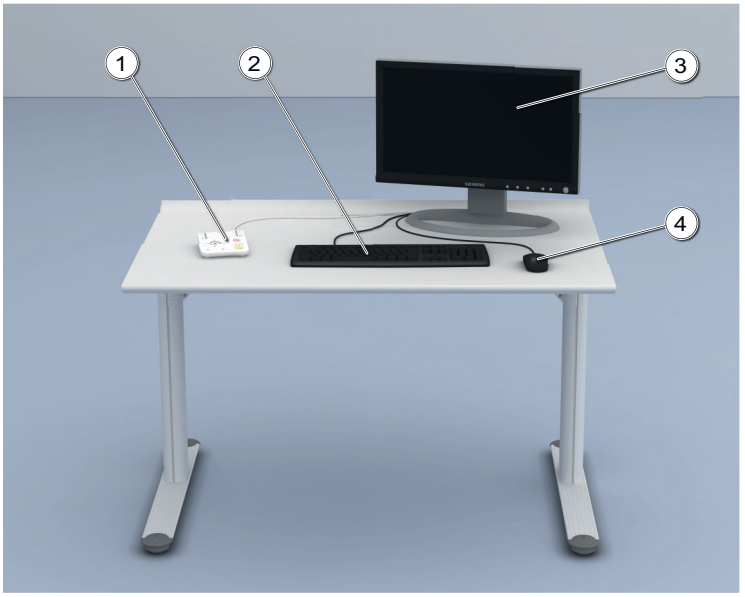
This accessory is housed beneath the pallet handle with an ECG leads connection opening directly behind where the patient's head lies. The ECG information is displayed and controlled using the gantry display.



(1) Integrated ECG Connection

4.5 Console

The console is your main workstation. Here you enter all characteristic values and patient data, perform examinations and view the tomographic images on the screen.



(1) Control box
(2) Keyboard
(3) Monitor
(4) Mouse

CAUTION

Liquids or food and drinks in the vicinity of medical equipment!

Injury to the patient or personnel, and malfunction of or damage to the equipment.

- Shut down the system immediately if liquid is detected within the equipment.
- Contact, and leave all repairs to the Customer Service at Siemens Healthineers.
- Clean the equipment with a damp, not wet, cloth.
- Wring the cloth out well and make sure that no liquids get onto, or into, the equipment.
- After cleaning, make sure that no water remains on the floor to avoid slipping.
- Keep food and drinks away from the equipment.

You can use the keyboard, the mouse and the control box to inform the computer, mounted in the gantry, what actions to perform. A USB hub on the monitor is to connect mass storage devices, like USB hard disk or memory stick.

With the operating elements of the console, you enter patient data, plan the examination and trigger measurement. You acquire data and use them to reconstruct images, which you then evaluate.

- The computer components of your system have already been installed and optimally configured by Siemens Healthineers Service. However, if errors occur, contact your Customer Care Center.
- The pictures of the components shown here are only examples. The appearance and availability of the components depend on your system configuration.

4.5.1 Control box

The control box enables you to start and stop a measurement and move the gantry and the table from outside of the examination room. The operating elements for the intercom system are also located on the control box.

CAUTION

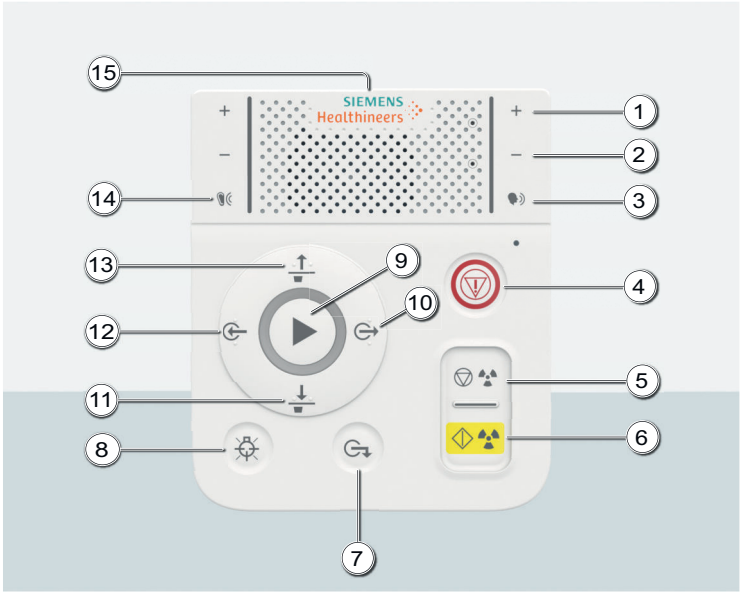
Unintentional activation of table movement keys of the control box!

Possible injury to the patient by moving parts.

- Make yourself familiar with the function of the control box keys.
- Always keep an eye on the patient during table movements.

The words **key** and **button** are used interchangeably.

The following scanner functions are controlled by hardware keys on the control box:



(1) **Volume up** key
(2) **Volume down** key
(3) **Call patient** key: Press and hold this key while speaking into the microphone.
(4) **STOP** key: Press this key to stop radiation and movements altogether in an emergency.
(5) **Suspend** key: Press this key to hold the scan procedure. This is the preferred method for interrupting a scan before completion. Do not use the **STOP** key for this purpose.
(6) **Start** key: Press this key to trigger a scan (staying activated). The X-ray indicator is illuminated when ready for a scan or during the scan.
(7) **Unload** key: Use this key to unload a patient.
(8) **Light Marker** key: Press this key to turn the light marker on or off.
(9) **Move** key: Press this key to move the table to the preselected scanning position.
(10) **Feed Out** key: Press this key to move the table out of the gantry.
(11) **Feed Down** key: Press this key to move the patient table down (not active if the table does not support this motion).
(12) **Feed In** key: Press this key to move the table into the gantry.
(13) **Feed Up** key: Press this key to move the patient table up (not active if the table does not support this motion).

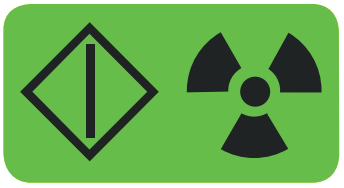
(14) **Listen to patient** key: Press this key if you want to hear what the patient is saying.
(15) Headset connector: TRRS 3.5 mm jack for headset connection

4.5.2 Audible X-ray indicator on the control box

The **Start** key on the control box is equipped with an X-ray indicator. A warning signal sounds when radiation is being generated.

The color of the X-ray indicator indicates the operating state of the system:

- Illuminated in green: ready for scanning



- Illuminated in yellow: radiation active



4.5.3 Monitor, keyboard and mouse

Your system provides you with interfaces to support conventional keyboard, mouse and monitor in the control room.

CAUTION

Monitor failure!

Uncontrolled system.

- Do not make any more entries via the keyboard.
- Interrupt the examination.
- If necessary, press a **STOP** key or, in case of an emergency, an **EMERGENCY OFF** button.

CAUTION

Liquids or food and drinks in the vicinity of medical equipment!

Injury to the patient or personnel, and malfunction of or damage to the equipment.

- Shut down the system immediately if liquid is detected within the equipment.
- Contact, and leave all repairs to the Customer Service at Siemens Healthineers.
- Clean the equipment with a damp, not wet, cloth.
- Wring the cloth out well and make sure that no liquids get onto, or into, the equipment.
- After cleaning, make sure that no water remains on the floor to avoid slipping.
- Keep food and drinks away from the equipment.

The monitor, the keyboard and the mouse are connected to the image control system (ICS) inside the gantry with a cable.

For standard configuration, your system is equipped with one color monitor in the control room. One additional monitor can be installed in the control room.

Your system supports the following keyboard languages: English, German, French, Swedish, Portuguese, and Spanish.

4.5.4 USB ports on monitor

The monitor has four USB ports, two for mouse and keyboard which are permanently plugged in, and two free USB ports that can be used, for example, for headset, mass storage, or other USB media.

For data export, the ICS supports Microsoft Windows 10 compatible media burners.

The following devices qualify:

- LG GP50NB40
- Samsung SE-506

Only use qualified USB devices.

4.5.5 Supported paper printer devices

You can print images on a paper printer. Note that only Microsoft Windows 10® certified printers are supported.

4.5.6 Supported DICOM printer devices

Your system supports the following DICOM printers:

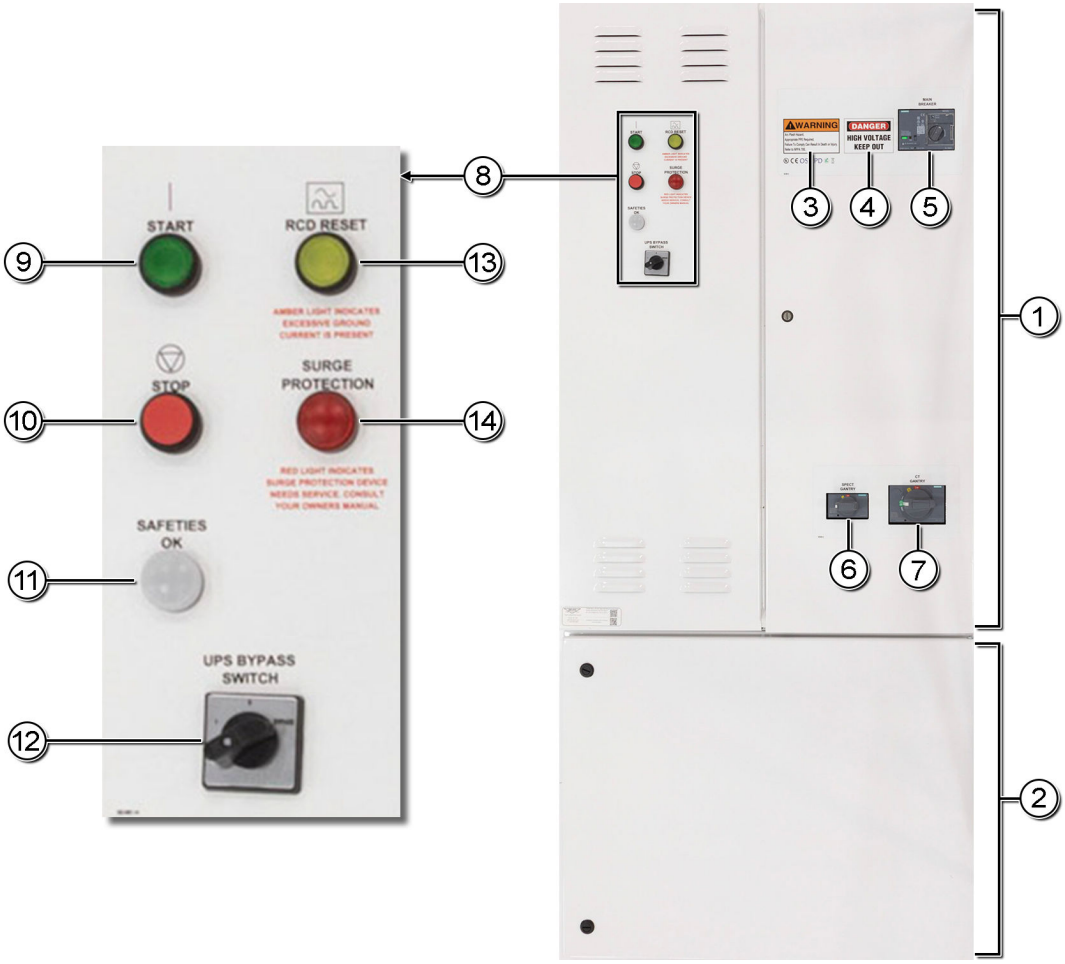
- DryStar 5301
- DryStar 5302
- DryStar 5503
- DryStar AXYS
- DryView 5800
- DryView 6800
- DryView 5850
- DryView 6850
- DryView 6950

- DryView Chroma
- DryView 5950
- DryPix 5000/7000
- DryPix 4000
- DryPix PLUS
- DryPro 793
- DryPro 832
- DryPro 832
- UP DF 500
- UP DF 550
- UP DF 750

4.6 Integrated electrical cabinet and uninterruptible power supply

The integrated electrical cabinet (IEC) and uninterrupted power supply (UPS) are electrical componenets of your system. The IEC offers a single electrical interface between your site power infrastructure and the Symbia Pro.specta system. The UPS can maintain power to the system computers and SPECT gantry for up to ten minutes, in case of a power failure.

The IEC and UPS are not part of any routine power procedures. Interaction with these components will generally be limited to system service and situations that require a complete disconnect from mains electricity.



(1) Integrated electrical cabinet (IEC)
(2) Uninterrupted power supply (UPS)
(3) **WARNING**
Arc Flash Hazard.
Appropriate PPE Required
Failure To Comply Can Result in Death or Injury.
Refer to NFPA 70E.
(4) **DANGER**
HIGH VOLTAGE KEEP OUT
(5) MAIN BREAKER

This breaker controls all electrical power to the system, including SPECT and CT gantries.

(6) SPECT GANTRY
This breaker controls electrical power to the SPECT gantry.

(7) CT GANTRY
This breaker controls electrical power to the CT gantry.

(8) IEC status lights and controls

(9) START

(10) STOP

(11) SAFETIES OK
Must be illuminated to re-energize the system.

(12) UPS BYPASS SWITCH
This switch allows you to bypass the UPS power circuit, in cases of UPS failure or system service.

(13) RCD RESET
AMBER LIGHT INDICATES EXCESSIVE GROUND CURRENT IS PRESENT
This button resets the residual-current device (RCD), which quickly breaks an electrical circuit to prevent serious harm from an ongoing electric shock.

(14) SURGE PROTECTION
RED LIGHT INDICATES SURGE PROTECTION DEVICE NEEDS SERVICE. CONSULT YOUR OWNERS MANUAL.

4.7 User guidance on operating keys

For easy operation, a user guidance is integrated in the operating elements of the system to guide you through the typical workflow.

The following operating elements are equipped with this user guidance:

- Keys on the control box
- Keys on the hand control

Design

The operating keys are backlit.

- Possible operation or ready for operation:

  indicated by illuminated keys

- Next required operation:

  indicated by blinking keys

The blinking stops when the operation is finished (for example, position reached).

For safety reasons, the **STOP** keys are not backlit but are always available.

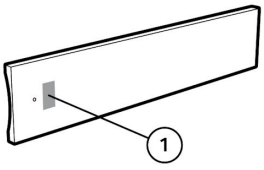
4.8 Location of labels

The system typically has the following types of labels:

- Product identification
- Product status
- Identification of electrical connection
- DHHS identification
- NRTL identification
- UL classification
- CSA classification
- CE identification
- Country-specific labels

These labels are applied on the outside of the system and its accessories. Locations of the labels are also described.

Example:



(1) Label title

Label title

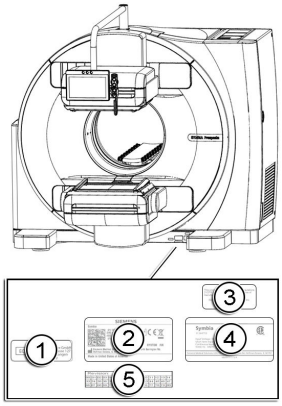


A reference number may be used more than once if the corresponding label is applied several times.

- The numbers and parameters on the labels are examples only. Always refer to the original labels that are applied on the system and system components.
- Depending on your system configuration, some system components or accessories described here may be optional or not available.

4.8.1 Gantry

Gantry front side



(1) European authorized representative label
(2) Product identification of system
(3) DHHS (Department of Health and Human Services) label
(4) CSA (Canadian Standards Association) label
(5) System revision label

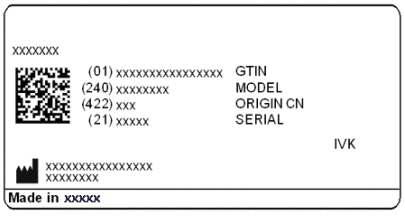
(1)

European authorized representative label



(2)

Product identification of gantry



(3)

DHHS (Department of Health and Human Services) label

This product complies with DHHS regulations 21CFR Subchapter J, applicable at date of manufacture: [Month][Year]

Siemens Medical Solutions USA, Inc.
2501 N. Barrington Road
Hoffman Estates, IL, USA

(4)

CSA (Canadian Standards Association) label

Symbia
12345678

Input Voltage: 380/400/420/440/460/480 VAC ~
Short Term Input Power: 115 kVA
Continuous Input Power: 4 kVA
50/60 Hz 3/N/PE

Siemens Medical Solutions USA, Inc. 2501 N. Barrington Rd, Hoffman Estates, IL 60192

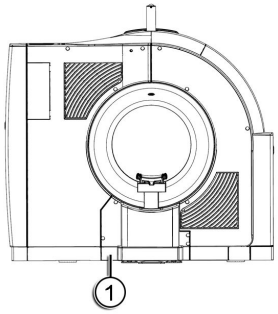
Made in U.S.A

(5)

System revision label

Revision:														Model-No.:																	
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98

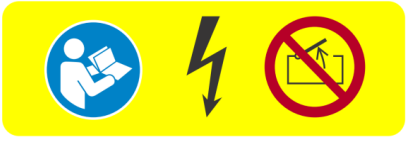
Gantry back side



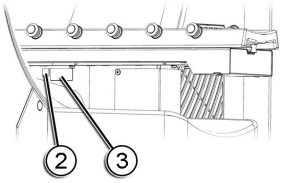
(1) Warning labels
(2) Disposal label
(3) Component identification label

(1)

Warning labels



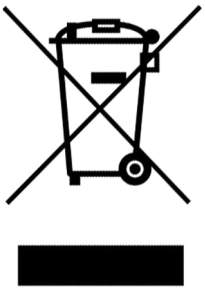
Consult accompanying documents
Risk of electrical shock



Do not open

(2)

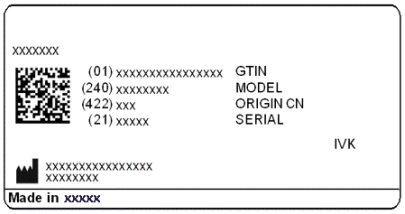
Disposal label



[redacted]

(3)

Component identification label



Detector Crystal Caution

The detector crystals bear the following caution.

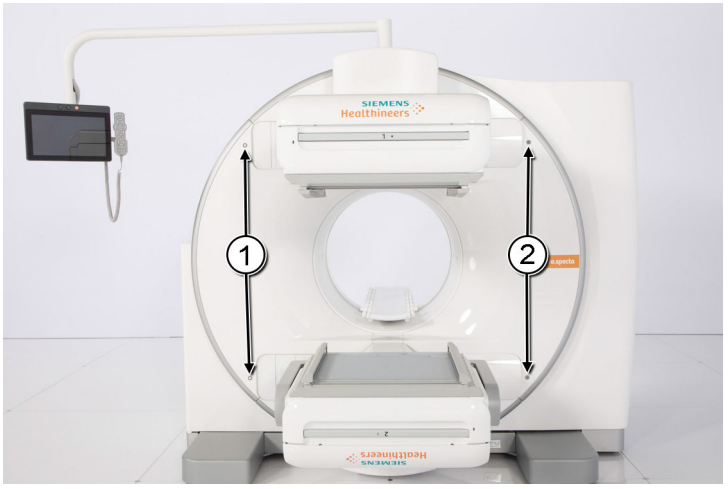
CAUTION

DO NOT IMPACT THIS SURFACE AS

IRREPARABLE CRYSTAL DAMAGE MAY OCCUR

Gantry-orientation symbols

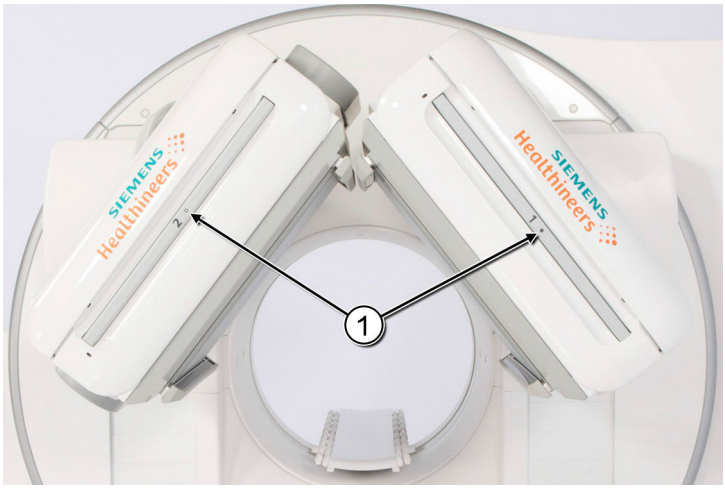
Circle (◯) and dot (●) orientation symbols appear on each side of the gantry. These symbols work as reference points when moving the detectors with the hand control. These also appear on the hand control to indicate towards which gantry symbol a detector will move when a motion button is pressed.



(1) Orientation circles
(2) Orientation dots

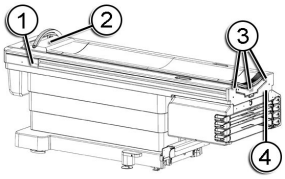
Detector-orientation symbols

Circle (◯) and dot (●) orientation symbols appear on the front of each detector. When moving the detectors in unison, as a preset configuration (76°, 90°, and gurney), these symbols correlate to the hand control's motion buttons. Rather than indicating the direction of motion in relationship to the gantry's orientation symbols, these detector-orientation symbols indicate the direction of motion in terms of the detectors themselves.

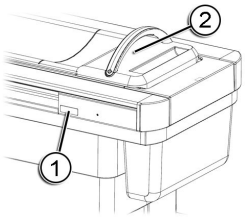


(1) Orientation symbols

4.8.2 Patient table



(1) Plan&GO caution label
(2) ECG lead-placement label
(3) Patient table weight-limit label
and
Degree of protection label - type B
(4) Radioactive-material label for Auto Quality Control Option



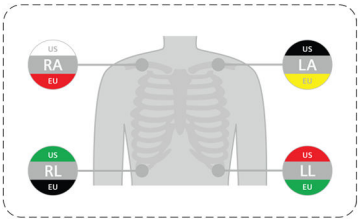
(1)

Smart Ruler caution label



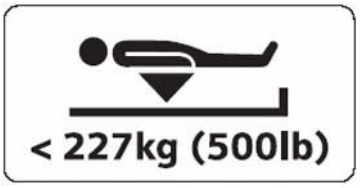
(2)

ECG lead-placement label



(3)

Patient table weight-limit label

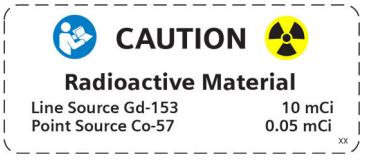


Degree of protection label - type B

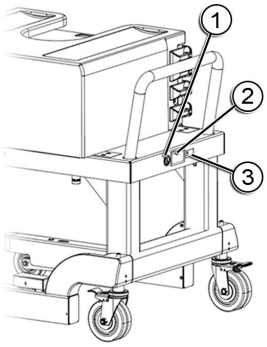


Type B applied part (degree of protection against electrical shock in accordance with IEC 60601-1)

(4)



4.8.3 Collimator cart



(1) Do not park cart on uneven surfaces label
(2) Product identification of collimator cart
(3) Collimator cart maximum weight label

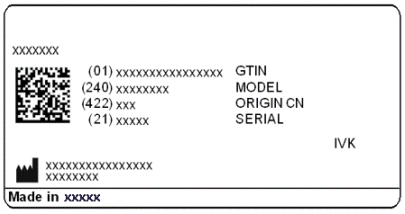
(1)

Do not park cart on uneven surfaces label



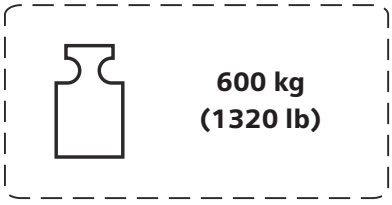
(2)

Product identification of collimator cart



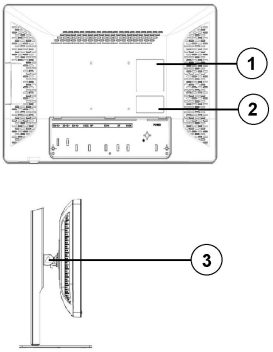
(3)

Collimator cart maximum weight label



4.8.4 Acquisition console

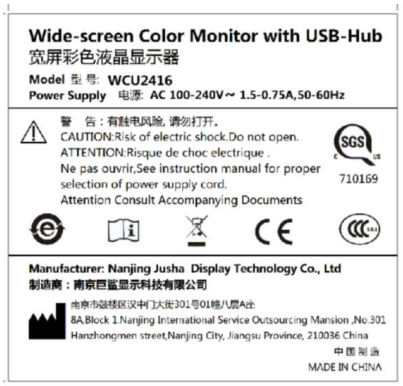
Monitor



(1) Product label
(2) Identification label
(3) Warning of hand injuries

(1)

Product label for WCU2416 model



- or -

Product label for WCU2416-C model



(2)

Identification label for WCU2416 model (one of the following)



- or -

Identification label for WCU2416-C model (one of the following)

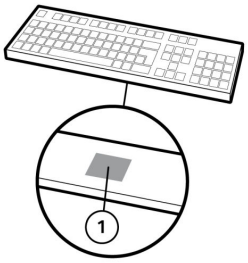


(3)

Warning of hand injuries



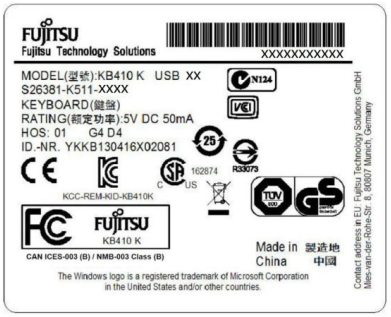
Keyboard



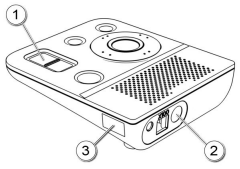
(1) Product identification

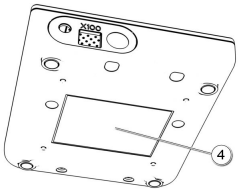
(1)

Product identification



Control box





(1) Ionizing radiation
(2) Consult accompanying documents
(3) Warning label
(4) DHHS label (mandatory for USA and optional for other countries)

(1)

Ionizing radiation



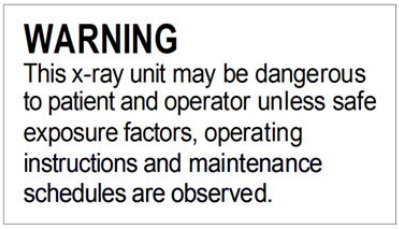
(2)

Consult accompanying documents



(3)

Warning label



Warning: This x-ray unit may be dangerous to patient and operator unless safe exposure factors, operating instructions and maintenance schedules are observed.

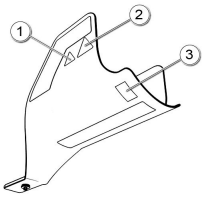
(4)

DHHS label



4.8.5 Accessories

Head holder



The locations of the labels of the 240N head holder are represented as follows:

(1) Maximum load
(2) Risk of collision
(3) Product identification

(1)

Maximum load



The maximum permissible weight must not exceed 240 N, which corresponds to approximate 24 kg.

(2)

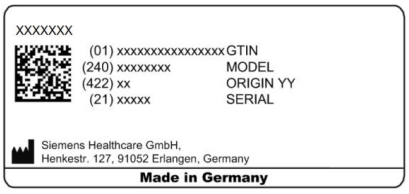
Risk of collision

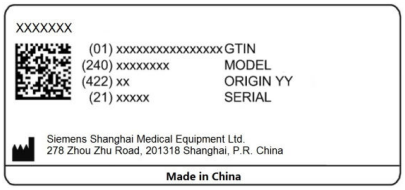


Increased risk of the patient's head hitting the gantry. Always watch the patient while the table is moving.

(3)

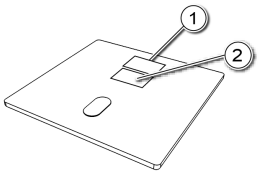
Product identification (one of the following)





Cushions and pads

The locations of the labels of the flat cushions are represented as follows:



(1) Product identification
(2) Disposal label

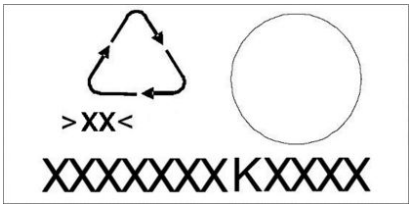
(1)

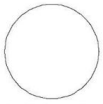
Product identification

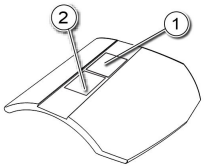


(2)

Disposal label



	Indicates that the product is recyclable and the type of material.
	Indicates the date of manufacture.

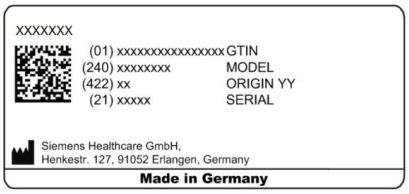


The locations of the labels of the wedge shaped cushions are represented as follows:

(1) Product identification
(2) Disposal label

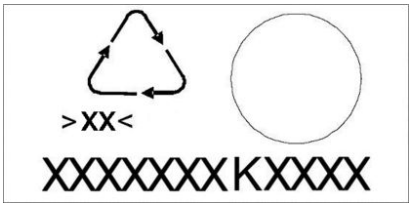
(1)

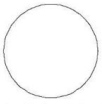
Product identification

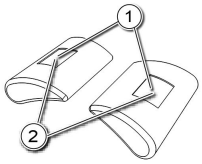


(2)

Disposal label



	Indicates that the product is recyclable and the type of material.
	Indicates the date of manufacture.



The locations of the labels of the pads are represented as follows:

(1) Product identification
(2) Disposal label

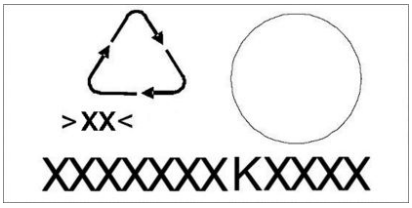
(1)

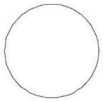
Product identification



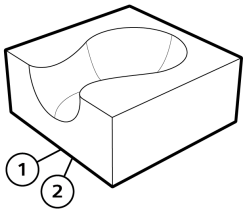
(2)

Disposal label



	Indicates that the product is recyclable and the type of material.
	Indicates the date of manufacture.

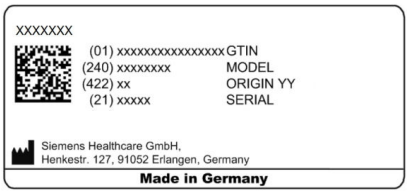
Headrest



(1) Product identification
(2) Type of material

(1)

Product identification



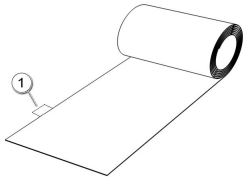
(2)

Type of material



Indicates the date of manufacture and the type of material.

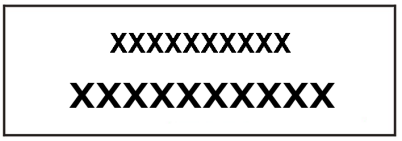
Patient straps

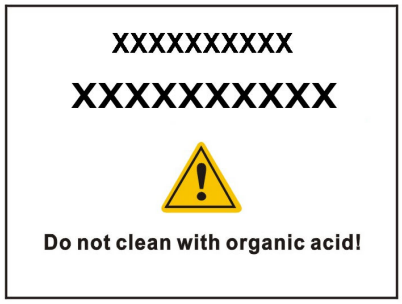


(1) Product identification

(1)

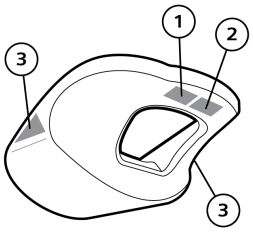
Product identification (one of the following)





Do not clean with organic acid!

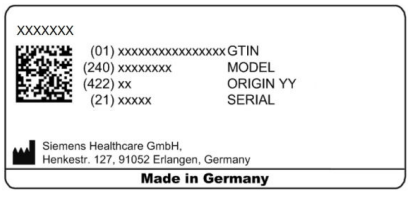
Head-arm support

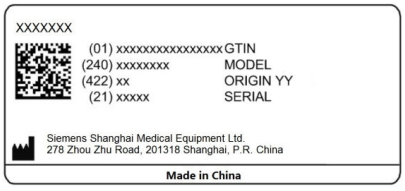


(1) Product identification
(2) Disposal label
(3) Risk of collision

(1)

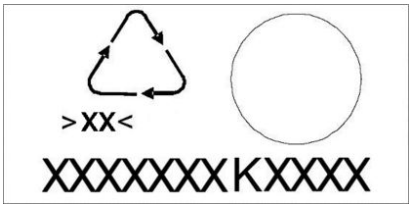
Product identification (one of the following)

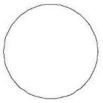




(2)

Disposal label



	Indicates that the product is recyclable and the type of material.
	Indicates the date of manufacture.

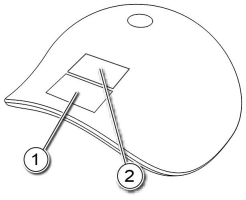
(3)

Risk of collision



Increased risk of the patient's head hitting the gantry. Always watch the patient while the table is moving.

Locations of the labels of the cushion of head arm support are represented as follows:

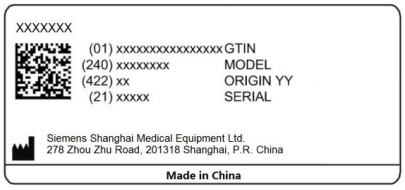


(1) Product identification
(2) Disposal label

(1)

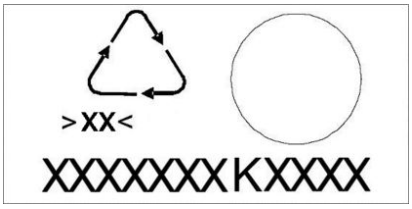
Product identification (one of the following)

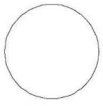




(2)

Disposal label



	Indicates that the product is recyclable and the type of material.
	Indicates the date of manufacture.

5 Accessories

For safe and comfortable positioning of the patient and, for your convenience, Siemens Healthineers provides you with certain accessories.

- (➔ Page 183 *Positioning accessories*)

Accessories that are used in the region of interest are made of special radio-translucent material. The way they are shaped causes the least possible artifacts. Nevertheless, use the accessories in such a way that they do not protrude into the slice plane, if possible.

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards. Furthermore, all configurations must comply with the applicable standards. Any person who connects additional equipment to the signal input part or signal output part is configuring a medical system and is therefore responsible for ensuring that the system complies with the applicable standards.

- Remove all impurities, especially residual contrast medium, as quickly as possible.
- No more than the maximum permitted weight can be placed on the accessories.
- Components or software functionalities that may not be part of your system configuration are nevertheless described in the present instructions for use. Not all of them may be marked explicitly as optional. The availability of these components or software functionalities depends on your purchase contract.
- The pictures of the components shown here are only examples. The appearance and availability of the components depend on your system configuration.

5.1 Positioning accessories

For safe and comfortable positioning of the patient and for your convenience, Siemens Healthineers provides you with the following accessories:

- (➔ Page 185 *Headrest*)
- (➔ Page 186 *Cushions*)

5.1.1 Safety of positioning accessories

To avoid danger of injuring the patient during table or gantry movements, only Siemens Healthineers approved positioning accessories should be used. In this way also artifacts can be avoided which impair the image quality.

CAUTION

If a head holder or support does not engage securely, it can come loose!

Injury to the patient.

- Make sure that the pluggable positioning aids are seated firmly and securely engaged in the receptacle at the end of the table top.

No more than the maximum permitted weight can be placed on positioning accessories. For more information, refer to the System Owner Manual.

CAUTION

Exceeding the maximum load of the patient table!

Injury to the patient or the personnel, or damage to the equipment is possible.

- Make sure that the permissible maximum load of the patient table is not exceeded. This includes the patient and attached equipment.
- The maximum loads of the equipment are displayed on the applied labels.

- Positioning accessories are subject to wear and tear. They must be replaced with original parts if they become dirty or damaged.
- Replace damaged or worn positioning accessories, especially if mechanical strength is required.

5.1.2 Head holder

The head holder is used to position the patient's head. It is provided with various cushions, including flat and wedge shaped cushions, which can be inserted to secure the patient's head. For better immobilization, you can attach Velcro straps on both sides of the head holder.



Head holder for the patient table

The head holder is attached at the head end of the table.

You can use it for cranial examinations:

- Standard cranial examination (supine)

5.1.3 Headrest



The headrest is for the comfortable positioning of the patient's head. It can be placed directly on the patient table within the scan range (head end/foot end or on the table top extension).

You can use the headrest for the following examinations:

- Cranial examinations, standard (supine)
- Neck and cervical spine examinations
- Examinations of thorax and abdomen

5.1.4 Cushions

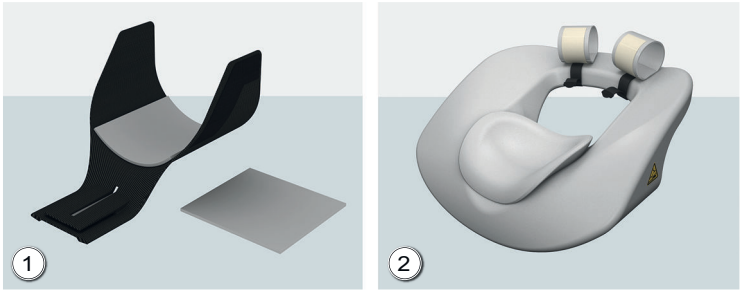
Different cushions are supplied to position the patient safely and comfortably:

- Flat cushions
- Wedge shaped cushions
- Pads

Cushions can be used in several examinations.

Flat cushions

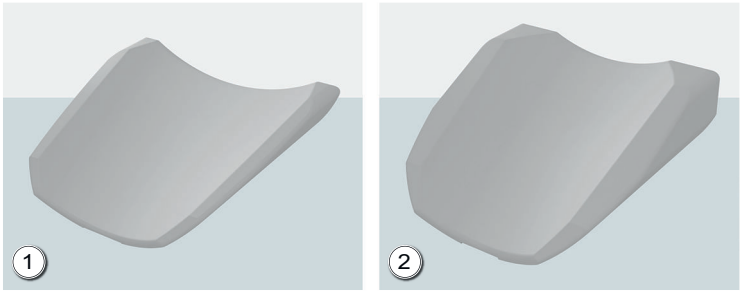
Flat cushions are used for comfortable positioning of the patient's head in a head support. They are delivered together with the positioning aid that they are used in.



(1) Flat cushion: head holder
(2) Flat cushion: head arm support

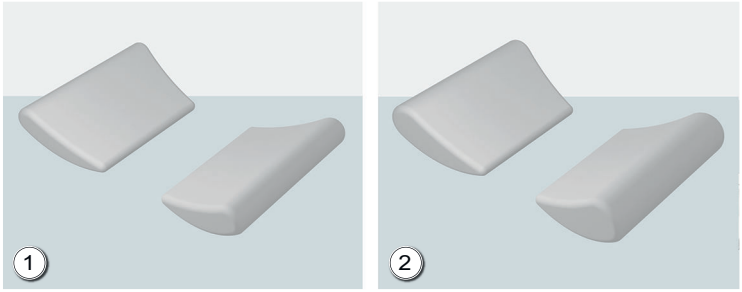
Wedge shaped cushions

Wedge shaped cushions are used for a more comfortable or accurate positioning of the patient's head.



(1) Head cushion 15°
(2) Head cushion 25°

Pads Pads are typically used for lateral immobilization of the patient's head in a head holder.



(1) Pad thin
(2) Pad thick

5.1.5 Straps

Straps are used to restrain the patient.

1 Position the restraint straps below the mattress.

2 Fasten them on top of the patient with the Velcro strip.

- The edges of the straps may cause artifacts.
- Remove any contamination, particularly contrast medium residues, as quickly as possible.
- Do not clean the straps with organic acid.

Forehead support strap Use the forehead support straps to immobilize the head in the head holder. They restrain the head in a stable position to avoid motion artifacts.



- Run the soft fabric straps over the patient's forehead and fasten them to the Velcro fixing strips on the outside of the head holder.

If necessary, use the lateral fixing pads from the cushion set.

Chin support strap

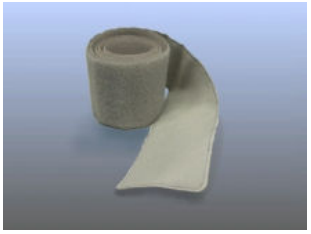
Use the chin support strap if you want to position and immobilize the patient's head or jaw more effectively.



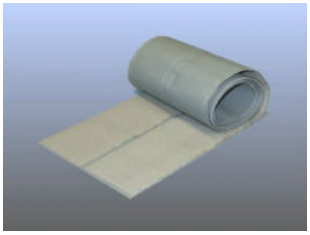
1. Adjust the strap so that the patient's chin is placed in the slit of the strap.
2. Attach the strap the same way as the forehead support strap to the shaped Velcro fixing strips on the outside of the head holder.

Body support strap

Use one or several immobilizing straps to position and immobilize the patient, depending on the requirement (mobility, cooperation).



Dimensions: 10 cm × 165 cm



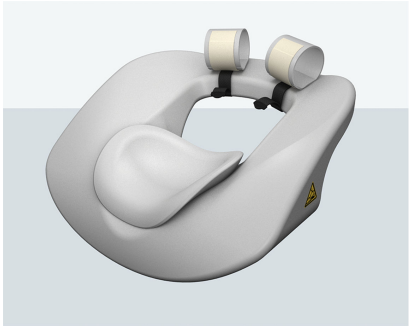
Dimensions: 20 cm × 180 cm

1 Run the straps underneath the positioning mat.

2 Fasten the straps with the Velcro strips over the patient so that the patient is positioned symmetrically with his/her arms immobilized.

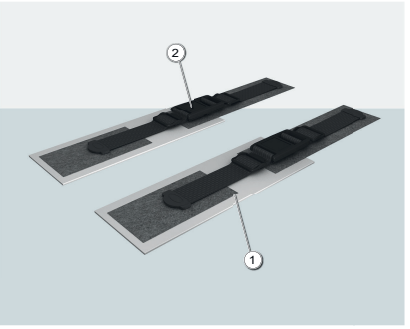
5.1.6 Head-arm support

The head-arm support is used to position the patient comfortably with arms crossed above their head. You can place the head-arm support directly on the patient table within the scan range. The head-arm support is supplied with a flat cushion, which can be placed inside.



Head-arm support with straps and cushion

For better immobilization, the support provides two fixation straps to immobilize the patient's hands or wrists.



(1) Velcro strap for fixation of the patient's wrists
(2) Fixation for head-arm support

You can use the head-arm support for the following examinations:

- Thoracic and lumbar spine examinations
- Pelvis
- Thorax and abdomen
- Lower extremities

This head-arm support is not recommended for head and neck examinations.

5.2 Specialty pallets

Your Symbia Pro.specta X3 supports the following specialty pallets:

- scintimammography pallet (➔ Page 191 *Scintimammography pallet*)
- pediatric pallet
- radiation therapy pallet

5.2.1 Scintimammography pallet

This section describes the optional scintimammography pallet for the Symbia Pro.specta X3. This specialty pallet allows a scintimammography scan in the prone position for breast imaging. The scintimammography pallet can be used for planar scans, and circular and non-circular SPECT scans with detectors in the 180° configuration. Resolution and sensitivity are improved as the scintimammography pallet allows detectors to be positioned closer to the unattenuated breasts, and the maximal separation of breast tissues from the myocardium is achieved as well as exclusion of any activity present in the opposite breast.

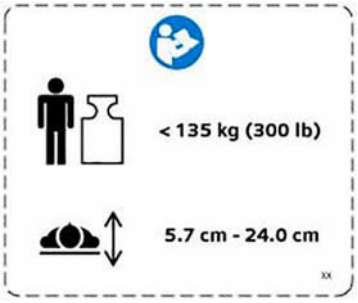


(1) The pallet bracket beneath the pallet is connected onto the second set of wheels at the front of the rear table.
(2) The hand strap is available for the patient to hold during imaging.
(3) Removable panels for breast access

Safety labeling

The following safety labels appear on the scintimammography pallet's pad.

This label cautions not to exceed the maximum weight limit (135 kg or 300 lb) for the scintimammography pallet and provides the patient-table height limit (5.7 cm to 24 cm) so that it aligns with the rear table. The rear table does not lower or raise as far as the front table, and the two must align for the scintimammography pallet to rest between them.



Scintimammography Pallet Weight Limit Label

WARNING

The scintimammography pallet can support a patient with a maximum weight 300 lbs (135 kg)!

Patient injury and system damage can result.

- Do not load a patient onto the scintimammography pallet that exceeds 300 lb (135 kg).

Do Not Press Hand Label

This symbol indicates not to press the hand or apply body weight against an area. This symbol appears on the scintimammography pallet's removable panels which can be removed for breast imaging. Because they are removable, applying hand pressure to them can cause them to slide out of the pallet if a patient places her hand on the panel when trying to push up or lower herself to the pallet.



Points to Remember

- On power up, if the scintimammography pallet is already installed, remove it from the patient table, home the Symbia system, select a scintimammography pallet configuration, and attach the pallet.
- Before attaching the scintimammography pallet, verify that the AutoQC option's line and point sources are retracted, and the patient table height is between 5.0 cm and 21.5 cm.
- Once the scintimammography pallet is attached, do not:
  - press the patient table's foot pedal to raise the docking pin or move (undock) the patient table,
  - squeeze the patient pallet's handle to release the pallet
  - start any motion if the gantry display does not display the *Specialty Pallet* icon indicating that the scintimammography pallet is attached.



Specialty Pallet (SP) Icon

There are three pallets (pediatric, scintimammography, and radiation therapy) which are referred to as the Specialty Pallets. When the pediatric or scintimammography pallets are attached to a Symbia system, the Specialty Pallet icon is displayed on the gantry display.

There is no system motion if the scintimammography pallet is installed and the configuration is at 76° or 90°.

- This accessory allows for positioning one or two breasts in the field of view while the patient's upper body is in the prone position.
- A maximum patient weight of 300 lb (135 kg) is allowed using the pallet.
- With the pallet attached, do not reconfigure the detectors. To prevent system damage, use the Auto Height buttons, or lower the patient table beyond 21.5 cm, or raise the patient table above 5.0 cm.

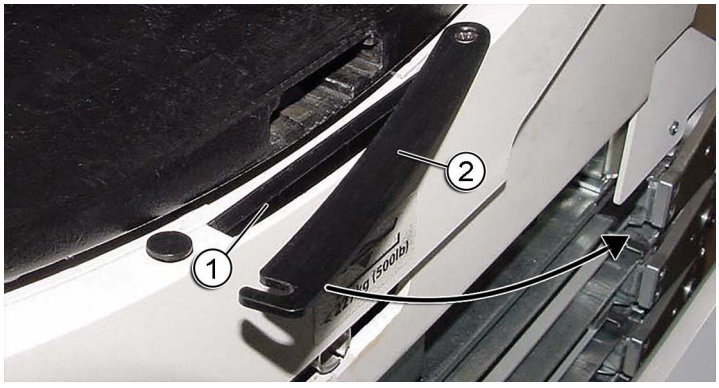
- The following studies can be performed with the scintimammography pallet:
  - planar (180° or 90° configuration)
  - tomo (180° circular and non-circular orbit (NCO) configuration)

There is no system motion if the scintimammography pallet is installed and the configuration is at 76° or 90°.

Attaching the scintimammography pallet

To attach the scintimammography pallet, perform the following steps.

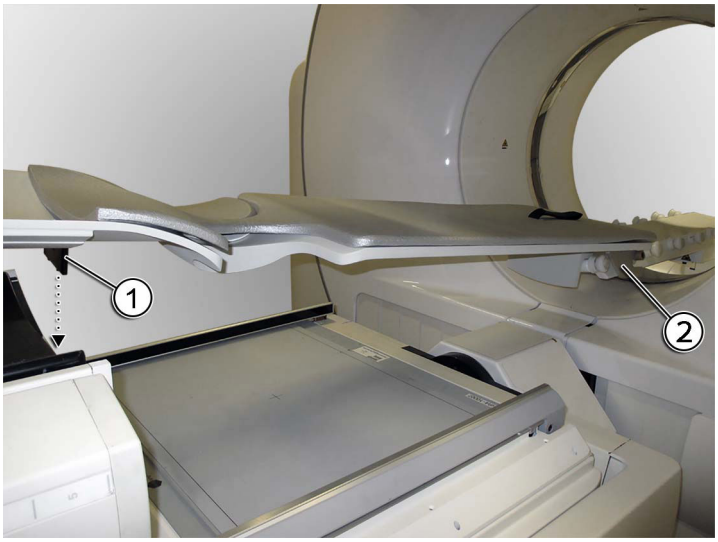
1. Home the system.
2. Configure the Symbia system to 90° or 180° before attaching the scintimammography pallet to the system.
3. Using the hand control, set the patient table height between 5.0 cm and 21.5 cm.
4. Using the hand control, fully retract the patient pallet and CT index.
5. Fold back the pallet pad to the pallet handle.
6. At the gantry end of the patient table, swivel the black plastic panel, which covers the slot for the specialty pallet sensor, to the other side.



(1) Sensor Slot
(2) Sensor Cover

When attaching the pallet, the support plate on the bottom of the pallet slides into the slot, anchoring and stabilizing the pallet and activating the sensor which confirms the pallet is in place.

7 Lift the scintimammography pallet with two hands, and angle the pallet so that the bracket beneath the pallet (padded end) fits onto the second set of wheels on the rear table.



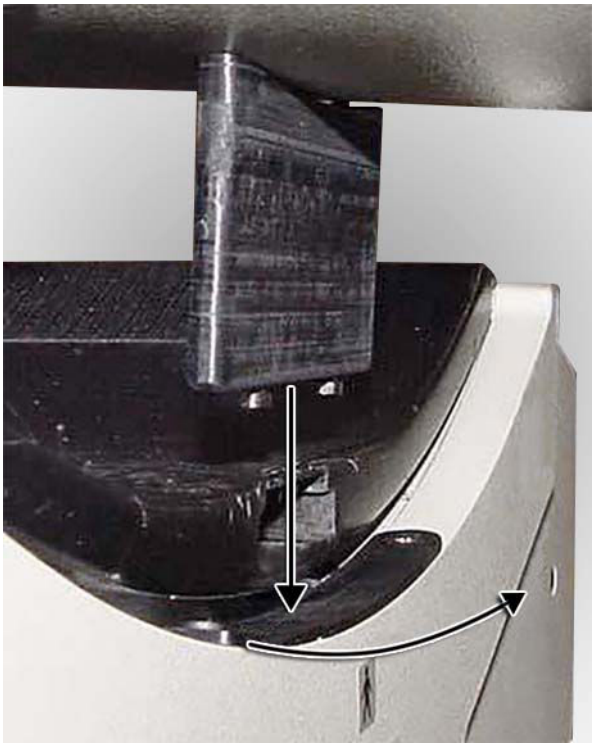
(1) Support plate which is lowered into patient table slot containing scintimammography pallet sensor.
(2) Bracket attaching to rear table between first and second set of wheels



Close-up of pallet being attached to rear table with bracket between the second set of wheels.

8 Lower the scintimammography pallet onto the edge of the patient table.

The support plate beneath the pallet slides into the slot at the front of the patient table.



Remember to swivel the slot cover before attaching the pallet.

The specialty pallet icon indicating that the scintimammography pallet is attached is displayed on the gantry display.



Specialty Pallet (SP) Icon

9 Verify the scintimammography pallet is securely attached between the front and rear tables by moving the pallet from side to side and in and out, checking that the pallet does not come loose and will not roll sideways when a patient lies on the pallet.

10 Unfold the patient pallet pad down on top of the scintimammography pallet, aligning the pad with the padding of the scintimammography pallet.

Positioning a patient

To position the patient on the scintimammography pallet, perform the following steps.

1 Configure the Symbia system to 90° or 180° before attaching the scintimammography pallet to the system.

2 Follow all safety procedures for preparing the system and preparing and transporting the patient to the pallet.

WARNING

Detectors in the process of reconfiguring can come into contact with the patient if the patient is on or near the system!

Patient injury can result.

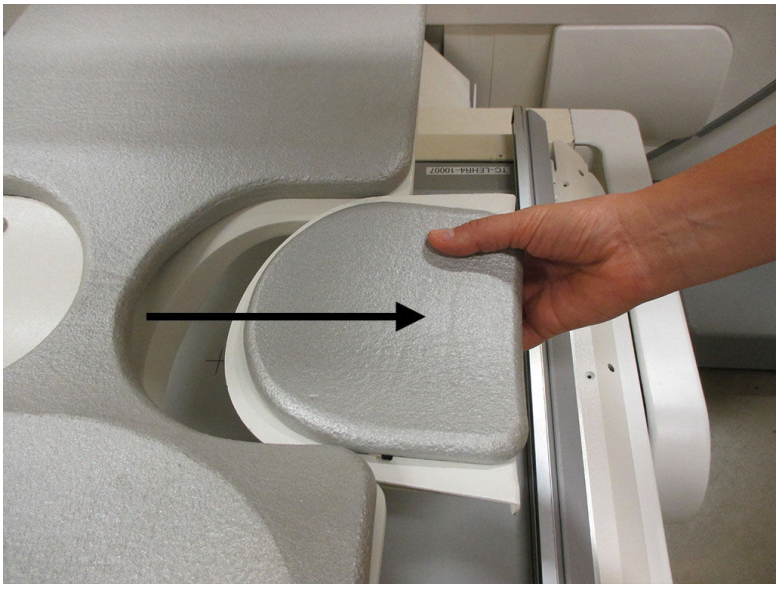
- Remove the patient from the system and its vicinity before initiating a reconfigure of the detectors.

3 Verify the scintimammography pallet is securely attached between the front and rear tables by moving the pallet from side to side and in and out, checking that the pallet does not come loose and will not roll sideways when a patient lies on the pallet.

4 Verify that the specialty pallet icon appears on the gantry display.

5 Use the hand control to rotate the detectors to +90° or -90° at a 180° configuration, or to -135° or +135° at a 90° configuration.

6 Remove one or both panels to allow the patient's breast access through the pallet.



7 Position the patient head-in and prone on the pallet.

- Assist the patient to move into the scanning position.
- Position one or both breast over the cutout.

If only one panel is removed, instruct the patient not to place their hand on the remaining panel as it can slide out from the pallet!

8 Assist the patient with using the hand strap to aid in supporting the arms and keeping elbows out of the field of view.



9 Do not lower the patient table beneath the rear table limit of 21.5 cm or raise it above 5.0 cm.

10 Position the detectors for the acquisition.

Removing a patient from the scintimammography pallet

To remove the patient from the scintimammography pallet, perform the following steps.

1 Follow all safety procedures for the system and transporting the patient from the pallet.

2 Retract the detectors away from the patient.

3 Rotate the detectors to +90° or - 90°.

4 Assist the patient in rising from the pallet and back onto the patient table.

5 Remove the patient from the pallet.

Removing the pallet

To remove the scintimammography pallet, perform the following steps:

1 Remove the patient from the pallet.

2 Fold back the pallet pad.

3 Using both hands, lift the scintimammography pallet from the patient table at an angle, and pull the pallet from between the rear table's wheels.

4 Return one or both panels to the scintimammography pallet.

Handle the specialty pallet with care when moving it. Avoid making unintended contact between the pallet, nearby objects, and the system.

5 Store the pallet and its accessories off the floor.

6 Unfold and reattach the pallet pad.

Scintimammography Pallet Storage

The hook and its mounting hardware for the scintimammography pallet as well as determining its mounting location are the responsibility of the site.

Width (14 in / 36 cm)

Length (73 in / 185 cm)

Weight (20 lb / 9 kg)

Storage Device Size - Hook that could support the pallet.

Storage Device to be provided with pallet - No

Hardware - Not provided

A 2 inch / 5.08 cm hole in the pallet can be used to hang the pallet.



Example of a possible pallet hook and its use

5.2.2 Pediatric pallet

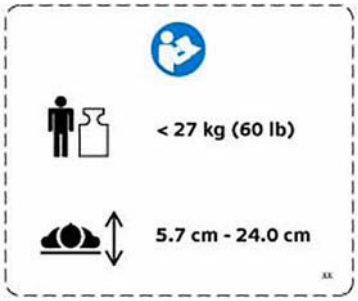
This section describes the optional pediatric pallet for the Symbia Pro.specta X3. This specialty pallet allows for the positioning of only small patients with a maximum weight 60 lb (27.22 kg) and a patient length up to 38 in. (96.52 cm) in the field of view with the upper body in the supine position. It can only be used for planar scans with detectors in the 180° configuration, 90° and 180° circular SPECT scans, and 180° non-circular orbit SPECT scans. Resolution is improved as the pediatric pallet allows the detectors to be positioned closer to the patient.



Safety labeling

The following safety label appears on the pediatric pallet's pad.

This label cautions not to exceed the maximum weight limit for the pediatric pallet (27 kg or 60 lb) and provides the maximum and minimum heights (5.7 cm to 24 cm) for the patient table so that it aligns with the rear table. The rear table does not lower as far as the front table, and the two must align for the pallet to rest between them.



Pediatric Pallet Weight Limit Label

WARNING

The pediatric pallet can support a pediatric patient with a maximum weight 60 lb (27.22 kg) and a patient length up to 38 in. (96.52 cm)!

Patient injury or system damage can occur.

- Do not load a patient onto the pediatric pallet that exceeds 60 lb (27.22 kg) or a length of 38 in. (96.52 cm).

Points to remember

- On power up, if the pediatric pallet is already installed, remove it from the patient table, home the Symbia system, select a pediatric pallet configuration, and attach the pallet.
- Before attaching the pediatric pallet, verify that the AutoQC option's line and point sources are retracted, and the patient table height is between 5.0 cm and 21.5 cm.
- Once the pediatric pallet is attached, do not:
  - press the patient table's foot pedal to raise the docking pin or move (undock) the patient table
  - squeeze the patient pallet handle to release the pallet
  - start any motion if the gantry display does not display the *Specialty Pallet* icon indicating that the pediatric pallet is attached.



Specialty Pallet Specialty Pallet (SP) Icon

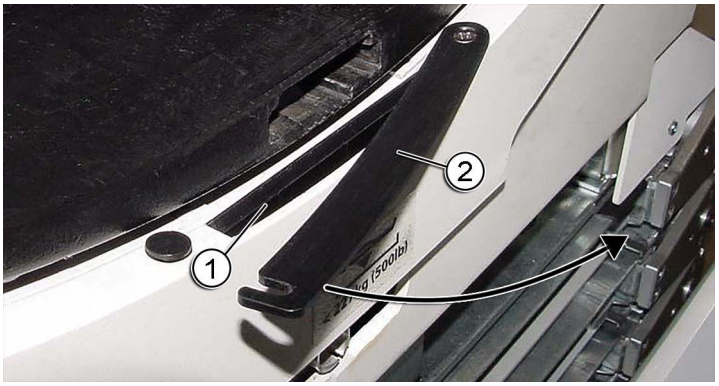
There are three pallets (pediatric, scintimammography, and radiation therapy) which are referred to as the Specialty Pallets. When the pediatric or scintimammography pallets are attached to a Symbia system, the Specialty Pallet icon is displayed on the gantry display.

- With the pallet attached, do not reconfigure the detectors. To prevent system damage, use the Auto Height buttons, or lower the patient table beyond 21.5 cm, or raise the patient table above 5.0 cm.
- The following studies can be performed with the pediatric pallet:
  - planar (180° or 90° configuration)
  - tomo (180° circular or non-circular orbit (NCO) configuration) or circular - 90° SPECT
- The following studies cannot be performed with the pediatric pallet:
  - 76° circular orbit SPECT
  - 76° or 90° non-circular orbit (NCO) SPECT

Attaching the pallet

To attach the pediatric pallet, perform the following steps.

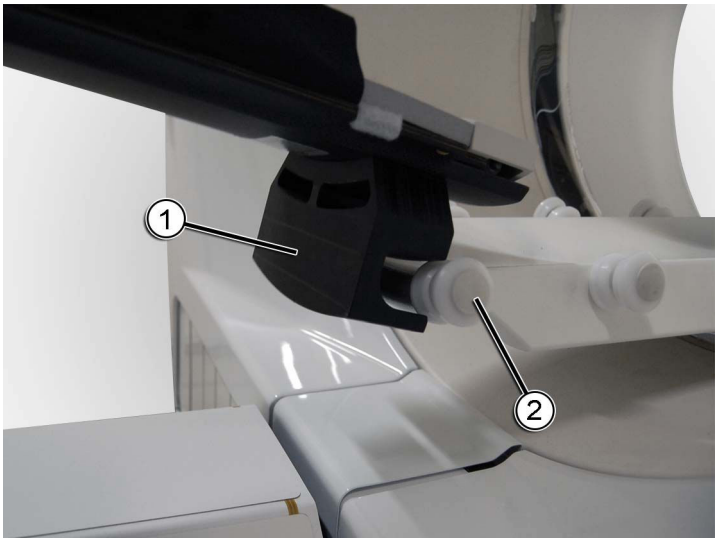
1. Home the system.
2. Configure the Symbia system to 180° or 90° before attaching the pediatric pallet to the system.
3. Using the hand control, set the patient bed height between 5.0 cm and 21.5 cm.
4. Using the hand control, fully retract the patient bed pallet and CT index all the way out from the gantry.
5. Remove the pallet pad.
6. At the gantry end of the patient table, swivel the black plastic panel, which covers the slot for the specialty pallet sensor, to the other side.



(1) Sensor Slot
(2) Sensor Cover

When attaching the pallet, the support plate on the bottom of the pallet slides into the slot, anchoring and stabilizing the pallet and activating the sensor which confirms the pallet is in place.

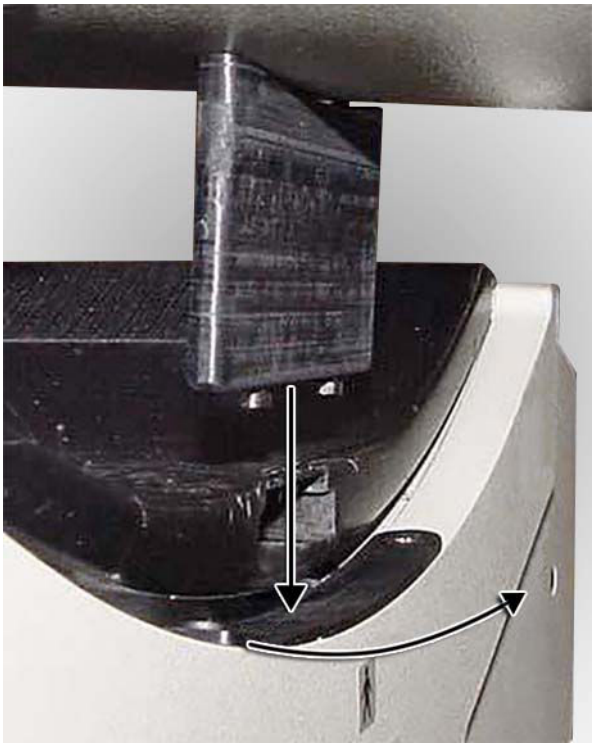
7 Lift the pediatric pallet with two hands, and angle the pallet so that the bracket beneath the pallet (opposite handle end) snaps between the wheels on the rear table.



(1) Bracket
(2) Rear table Wheels

8 Lower the pediatric pallet's handle end onto the edge of the patient table.

A support plate beneath the pediatric pallet slides into a slot at the front of the patient table, anchoring and stabilizing the pediatric pallet.



Remember to swivel the slot cover before attaching the pallet.

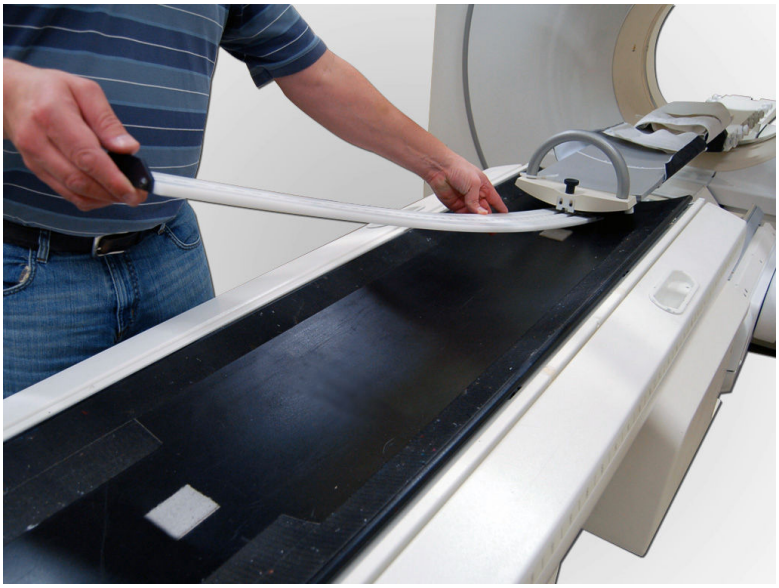
The specialty pallet icon indicating that the pediatric pallet is attached is displayed on the gantry display.



Specialty Pallet (SP) Icon

9 Verify the pediatric pallet is securely attached between the front and rear tables by moving the pallet from side to side and in and out to check that the pallet does not come loose and will not roll sideways when a patient lies on the pallet.

10 Place the track on the patient pallet which has a strip of hook and loop fasteners.



Do not press the track down on the hook and loop fasteners; the track is self-centering and securing when the pediatric pallet is pulled across the track.

11 Lift the pediatric pallet up slightly by the handle, and align the edge of the track with the track sleeve on the pallet so that the pallet can be pulled back onto the patient table.

12 Lift the locking pin knob and pull the pallet across the track. As the pallet is pulled, it centers the track and presses the hook and loop fasteners together. Fully retract the pallet.



13 Release the locking pin knob into a pin hole, securing the pallet.

WARNING

The pediatric and scintimammography pallets can become unattached and fall from the system if the user undocks the patient bed using the foot pedal!

Patient injury and system damage can result.

- Do not press the foot pedal to undock the patient bed while a pediatric or scintimammography pallet is attached.

WARNING

The pediatric and scintimammography pallets may not be sensed by the system!

Patient injury and system damage can result.

- Do not start any system motion if the system does not indicate that the pediatric or scintimammography pallet is attached.

Positioning the patient

To position the patient on the pediatric pallet, perform the following steps.

1 Follow all safety procedures for preparing the system and preparing and transporting the patient to the pallet.

WARNING

Detectors in the process of reconfiguring can come into contact with the patient if the patient is on or near the system!

Patient injury can result.

- Remove the patient from the system and its vicinity before initiating a reconfigure of the detectors.

2 Verify the pediatric pallet is securely attached between the front and rear tables by moving the pallet from side to side and in and out to check that the pallet does not come loose and will not roll sideways when a patient lies on the pallet.

3 Verify that the specialty pallet icon appears on the gantry display.

4 Lift the locking pin knob, and use the pallet handle to fully retract the patient out of the detectors' field of view so that the entire pediatric pallet sits on the patient bed.

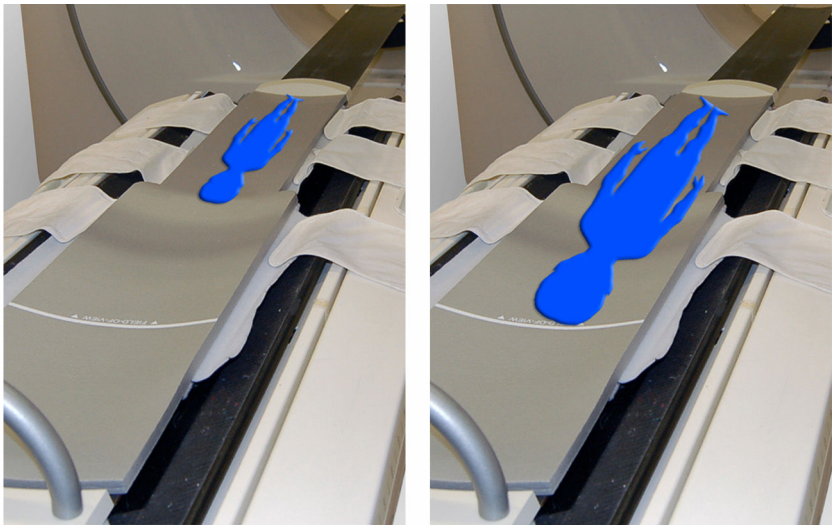
5 Position the patient in a feet-in, supine orientation on the pallet below the field of view line marked on the pallet pad.

WARNING

Communication between the patient and operator is important during an acquisition, and especially in an emergency situation!

Patient injury can result.

- Observe the patient at all times and maintain communication.



Patient pallet positioning for a child up to 60 lb and positioning for smaller infant

6 Attach the three pieces of body wrap attached to the pediatric pallet to secure the patient.

7 Once secure, lift the locking pin knob and use the pallet handle to slide the patient into the detectors' field of view.

8 Lower the locking pin knob to set the pallet position.

9 Wrap the unattached fourth larger body wrap around the patient and pallet to further secure the patient to the pallet.

(1) Fourth Larger Body Wrap

WARNING

Pediatric patient not properly secured to pediatric pallet!

Patient injury and system damage can occur.

- In order to safely secure the patient and to limit motion artifacts, always use the three pieces of body wrap attached to the pediatric pallet, and the fourth larger body wrap when using the pediatric pallet.

10 Position the patient bed, but do not lower the patient bed beyond 21.5 cm or raise the patient bed above 5.0 cm.

11 Position the detectors for the acquisition.

Removing a patient from the pediatric pallet

✓ Follow all safety procedures for the system and transporting the patient from the pallet.

To remove the patient from the pediatric pallet, perform the following steps.

1 Retract the detectors away from the patient.

2 Unwrap the fourth larger body wrap around the patient and pallet.

3 Lift the locking pin knob, and use the pallet handle to fully retract the patient out of the detectors' field of view so that the entire pediatric pallet sits on the patient pallet.

4 Unattach the three pieces of body wrap attached to the pediatric pallet to release the patient.

5 Remove the patient from the pallet.

Removing the pallet

To remove the pediatric pallet, perform the following steps.

1 Lift the locking pin knob and use the pediatric pallet handle to push the pallet into the gantry and lock onto the bridge assembly (which supports the pediatric pallet on the patient table).

2 Place one hand on the pediatric pallet's handle and another hand on the patient pallet.

3 Hold down on the patient pallet while lifting the pediatric pallet to separate the hook and loop fasteners.

4 Angle the pediatric pallet, lift, and pull the pallet's bridge assembly away from the rear table's wheels.

Handle the specialty pallet with care when moving it. Avoid making unintended contact between the pallet, nearby objects, and the system.

5 Store the pallet and its accessories off the floor.

6 Place one hand on the patient bed's pallet and another hand on the track.

7 Hold down on the patient bed's pallet while lifting the track to separate the hook and loop fasteners on the patient bed pallet and store the track.

8 Reattach the patient bed’s pallet pad.

Pediatric Pallet Storage

The hook and its mounting hardware for the pediatric pallet as well as determining its mounting location are the responsibility of the site.

Width (10 in / 25 cm)

Length (57 in / 145 cm)

Weight (20 lb / 9 kg)

Storage Device Size - Hook that could support the pallet.

Storage Device to be provided with pallet - No

Hardware - Not provided

The pallet handle can be used to hang the pallet.



Example of a possible pallet hook and its use

5.2.3 Radiation therapy pallet

The radiation therapy pallet (RTP) is an optional, specialty pallet. It enables the fusion of SPECT and SPECT/CT data with CT simulation data, for planning radiation therapy. This pallet attaches to the patient table's carbon-fiber pallet. The radiation therapy pallet can be used for circular and non-circular SPECT and SPECT/CT scans, with detectors in the 180° configuration. Imaging on a flat surface is mandatory to achieve the required accuracy for fusing the SPECT or SPECT/CT data with CT simulation data.



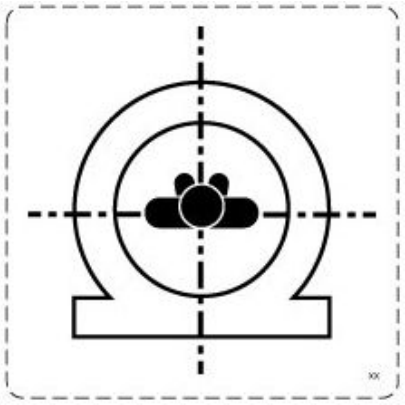
Radiation therapy pallet on patient table

Radiation therapy pallet weight limit

The radiation therapy pallet's weight limit is the same as the Symbia system's patient table weight limit. Follow the weight limitations as noted on the patient table before using the radiation therapy pallet.

Isocentering Positioning Label

Two labels, one appearing on the top and another on the bottom of the radiation therapy pallet reminds the operator that the patient should always be positioned at the isocenter of the gantry.



Isocentering Positioning Label

Points to Remember

- The radiation therapy pallet's length is 203.5 cm (80.13 in).
- The radiation therapy pallet's width is 53 cm (20.87 in).
- The radiation therapy pallet's weight is less than 21 lb (9.5 kg).

Attaching the pallet

To attach the radiation therapy pallet, perform the following steps.

1 Home the system.

2 If necessary, use the hand control, fully retract the patient pallet and CT index all the way out from the gantry.

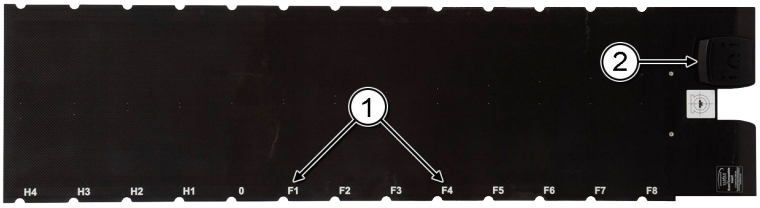
3 Remove the pallet pad.

4 Lift the radiation therapy pallet with two hands, and lay it on top of the patient table's pallet with the radiation therapy pallet's latch mechanism nearest the patient table's handle.

To balance the pallet while lifting, be aware that the pallet's latch mechanism end is the heavier end.

---

5 There are letter and number markings on the side of the pallet to show where to connect the radiation therapy pallet's accessories. The markings with the letter **H** (for Head) should be closest to the gantry and the markings with the letter **F** (for Feet) should be closest to the patient table handles.



(1) Index Markers
(2) Latch Mechanism

There are two pins at the latch mechanism end of the radiation pallet which are docked with circular receptacles on the patient table.

6 Align the pins with the receptacles, but wait before pushing the radiation therapy pallet's pins into the receptacles.

7 Go to the head end of the radiation therapy pallet (nearest the gantry), and align the connector beneath the radiation therapy pallet with the patient table's radiation therapy pallet connection slot.



The connector at the foot end of the RTP is pushed into the patient pallet's connection slot.

(1) Connection slot at foot end of patient pallet
(2) Connector at foot end of Radiation Therapy Pallet

8 Slide the radiation therapy pallet towards the patient table's handle, docking the pallet's pins with the circular receptacles on the patient table.

Positioning a patient

To position the patient on the radiation therapy pallet, perform the following the steps.

1 Home the system.

2 Follow all safety procedures for preparing the system and preparing and transporting the patient to the pallet.

WARNING

Radiation Therapy Pallet accessories can be in the path of motion!

Patient injury and system damage can result.

- Monitor the patient at all times, and do not leave the patient unattended.

WARNING

Radiation Therapy Pallet accessories may not be detected by the system's body contour system!

Patient injury and system damage can result.

- Do not perform auto contour studies with third-party radiation therapy pallet accessories attached.

3 If necessary, retract the patient pallet completely out of the gantry.

4 Position the patient table at an appropriate height for the patient.

The gantry display displays the patient bed position.

5 Verify the radiation therapy pallet is securely positioned on the patient pallet by moving the pallet from side to side and in and out to check that the pallet does not come loose and will not roll sideways when a patient lies on the pallet.

6 Assist the patient onto the radiation therapy pallet.

WARNING

Communication between the patient and operator is important during an acquisition, and especially in an emergency situation!

Patient injury can result.

- Observe the patient at all times and maintain communication.

7 Position the patient for the acquisition in a feet-in, supine orientation for SPECT or SPECT/CT.

Removing a patient from the radiation therapy pallet

✓ Follow all safety procedures for the system and transporting the patient from the pallet.

To remove the patient from the radiation therapy pallet, perform the following the steps.

1 Retract the detectors.

2 Retract the patient pallet completely out of the gantry.

3 Remove any required accessories per their accompanying documentation.

4 Position the patient table at an appropriate height for the patient to leave the patient table.

5 Assist and remove the patient from the radiation therapy pallet.

Removing the radiation therapy pallet

To remove the radiation therapy pallet from the patient table, perform the following steps:

1 Fully retract the patient pallet.

2 Squeeze the radiation therapy pallet's latch mechanism to release the docking pin, and pull the pallet back until it is released.

Ensure that the pallet does not hit a detector.

Handle the specialty pallet with care when moving it. Avoid making unintended contact between the pallet, nearby objects, and the system.

3 Using both hands, lift the radiation therapy pallet from the patient table.

4 Store the pallet.

5 Return the pallet pad back onto the pallet.

Storing the Pallet

Siemens is providing a wall-mounted hanger on which to store the Radiation Therapy Pallet (RTP) accessory when not in use.

Although Siemens is providing this wall-mounted hanger for installation, Siemens Service will not install this wall-mounted hanger, nor be responsible for its installation.

Customer facilities are required to handle the installation of the wall-mounted hanger and obtain the necessary hardware to attach it. Siemens Service will provide weight and dimension information with the wall-mounted hanger for its installation.

The following instructions explain how to use the wall-mounted hanger to store the RTP once the wall-mounted hanger is installed.

RTP Wall-Mounted Hanger Weight and Dimension Information

Dimensions and Weight	Wall Mounted Hanger	Radiation Therapy Pallet
Width (in. / cm)	23 in. / 58 cm	21 in. / 53 cm
Length (in. / cm)	10 in. / 25 cm	80 in. / 203 cm
Weight (lb. / kg)	3.5 lb. / 2 kg	21 lb. / 9.5 kg

Storing the RTP on the Wall-Mounted Hanger

The recommended RTP storage orientation is with the pins and latch mechanism at the bottom and the pallet connector at the top. The RTP pins should be above the floor. The RTP's flat top should be stored against the wall-mounted hanger with the RTP's bottom facing out.

The RTP notches allow the pallet to be stored at various heights.

To store the RTP, perform the following steps:

1 Open the wall-mounted hanger handles by rotating them so that the handles point away from the wall-mounted hanger.



Radiation Therapy Pallet (RTP) Hanger with handles pointing away, indicating they are open to receive the RTP for storage.

2 Lift the RTP, and insert it in between the handles, so that the RTP will be stored off the floor.



The RTP notches allow pallet to be stored at various heights.

3 Check that the RTP is flat against the wall-mounted hanger. Its weight is held by the wall-mounted hanger handles.

If the RTP is not held flat against the wall-mounted hanger, it cannot be properly released. The RTP can then fall from the wall-mounted hanger and cause damage to the RTP or injury to a person with which it might come in contact. Hold the RTP flat against the wall-mounted hanger until the handles are rotated, pointing away from each other, releasing the RTP from storage.

4 Rotate the four handles inward to lock the RTP for storage.

When the handles point towards each other, the RTP is locked for storage.



Releasing RTP from the Wall-Mounted Hanger

To release the RTP, perform the following steps:

1 Open the wall-mounted hanger handles by rotating them so that the handles point away from the wall-mounted hanger.

If the RTP is not held flat against the wall-mounted hanger, it cannot be properly released. The RTP can then fall from the wall-mounted hanger and cause damage to the RTP or injury to a person with which it might come in contact. Hold the RTP flat against the wall-mounted hanger until the handles are rotated, pointing away from each other, releasing the RTP from storage.

2 Lift the RTP away from the wall-mounted hanger.

Once the RTP is pulled away from the wall-mounted hanger, the individual holding the RTP will be holding its full weight. Dropping the RTP can cause potential foot injury and/or damage to the pallet. Use caution when lifting or carrying the RTP from the wall-mounted hanger to avoid injury and damage.

6 Customer support

Your system provides dedicated functions to achieve support from Siemens Healthineers Service if you need advice or if you encounter a problem with the system.

You can access the support functions from the **Settings** menu:

(➔ Page 229 *Smart Remote Services*)

(➔ Page 229 *Creating a screenshot*)

6.1 Remote Assistance

If you require technical support or remote training, you can ask Siemens Healthineers for assistance by requesting a remote desktop connection to your Siemens Healthineers Service.

With your permission, Siemens Healthineers Service can then connect to your system using TeamViewer and an Smart Remote Services (SRS) secure connection.

(➔ Page 225 *Using Remote Assistance*)

When the system is connected it is able to report malfunctions to Siemens Healthineers Service. A remote connection enables inline monitoring, error analysis/identification and remote repair possibilities. Furthermore, you can share your desktop with Siemens Healthineers Service to receive direct support in case of problems or questions.

6.2 Using Remote Assistance

With your system, you can request and establish remote connections to Siemens Healthineers Service.

To grant remote access to your workplace:

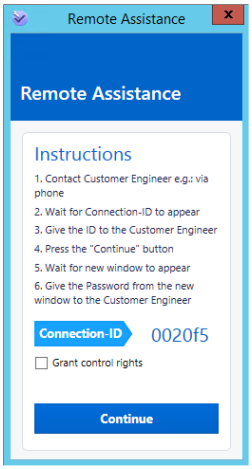
1 From the **Settings** menu, choose **syngo Remote Assist**.

  The **Remote Assistance** legal disclaimer opens.

2 Click **Agree** to accept the legal disclaimer and to allow the remote desktop connection.

The **Remote Assistance** dialog box opens containing detailed instructions on how to continue.

It also provides the unique **Connection-ID** for Siemens Healthineers Service.

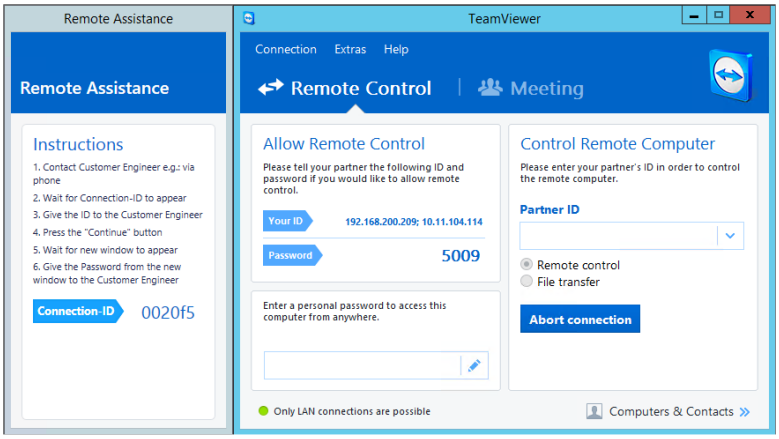


3 Select the **Grant control rights** check box if you wish to allow Siemens Healthineers Service to interact with your system.

Without this right, only view access is possible.

4 Click **Continue**.

The **TeamViewer** window opens displaying the individual **TeamViewer Password** required for the remote desktop connection.



5 Contact your Siemens Healthineers Service by phone and provide the assigned **Connection-ID** and the **TeamViewer Password**.

When you have entered the access data provided, your Siemens Healthineers Service initiates a remote desktop connection to your system.

When the **TeamViewer** window opens, the remote connection has been successfully established. Your Siemens Healthineers Service starts interaction with your workstation for dedicated application support.

6 When the support session has ended, close the **TeamViewer** window to terminate the remote desktop connection.

To start a new remote desktop connection, a new **Connection-ID** and a new password are required.

6.3 SaveLogs

With the help of SaveLog files, the Siemens Healthineers Service can investigate the system health status, check for error events, and then troubleshoot the system.

SaveLogs are essential to understand the activity of complex systems.

Your system includes the logging of various software components, frameworks, and services.

Log files can be accessed with the Message Viewer.

Log files are classified by severity:

- Information
- Warning
- Error
- Success

Log files contain at least the following information:

- Affected component
- Timestamp
- Message details

(→ Page 228 *Creating a SaveLog*)

6.3.1 Creating a SaveLog

If you need support by Siemens Healthineers Service, you can collect and store configuration and status information of your scanner.

1 Log on to the scanner which needs support.

2 Start the examination software.

3 From the **Settings** menu, choose **SaveLog**.

The **SaveLog** dialog box opens.

4 In the **Add your error description** field, describe the problem that you encounter.

5 Select the **Attach screenshot ...** check box, to include a screenshot to the SaveLog.

6 Click the **Run SaveLog** button.

The SaveLog zip package is created. The **SaveLog** dialog box closes.



SaveLog continues working in the background. Depending on the log size, it may take 15 minutes or longer.

6.4 Smart Remote Services

The Smart Remote Services (SRS) infrastructure provides a secure data link that connects your medical systems to the service experts in the Siemens Healthineers Service.

Over SRS, the performance and condition of your equipment can be monitored in real time. It makes a broad range of proactive and interactive services available – including fast error identification, remote repair and software updates, preventive maintenance, and collaboration services.

Most of the services that formerly required on-site visits are now available by data transfer due to automatic reporting or by remote access to your system.

The connection to the SRS can be established by two different ways:

- SRS router

  Through a dedicated SRS router within the customer network.

- VPN tunnel

  A virtual network adapter on your system's server will be used.



The Siemens Healthineers Service can only access the system from a remote location if you explicitly grant remote access.

The following prerequisites must be fulfilled:

- A minimum broadband Internet connection bandwidth for uncompromised service support with 2000 kBit/s downstream and 512 kBit/s upstream. Otherwise, certain support services may not be provided, and the agreed remote response time cannot be guaranteed.
- To enable your system to perform SRS-based services, specific communication ports need to be opened and the SRS has to be configured.
- A dedicated router is only needed if you want to use the **SRS Router** option.

6.5 Creating a screenshot

The system provides the **Create Screenshot** function to take screenshots and store them as image files to a default folder.

1 From the **Settings** menu, choose **Create Screenshot**.

The system takes a screenshot of the currently displayed monitor content.

The **Create Screenshot** dialog box opens. The name and the storage location of the created image file are displayed.

2 Click **OK**, to close the dialog box.

6.6 Fast Contact

With the **Fast Contact** function, your system provides you with the option to contact a Customer Care Center.

The **Fast Contact** function can be accessed in the following situations:

- You experience an issue with the scanner or software, or you need advice. It this case, you manually open the **Fast Contact** function.
- The system experiences an issue during system startup. In this case, the **Fast Contact** function is opened automatically. (➔ Page 231 *Reporting a detected system malfunction*)

6.6.1 Sending a request to the Customer Care Center

If you experience an issue with your system or software, or if you need advice, contact your local Customer Care Center.

1 From the **Settings** menu, choose **Fast Contact**.

The **Fast Contact** dialog box opens.

The system checks if a connection to the Customer Care Center can be established. If no connection can be established, you are prompted to phone the Customer Care Center.

If a connection can be established, a **Fast Contact** dialog box is displayed.

2 Select the option that classifies as your request.

3 To report an incident, select **I have a problem with the system**.

– or –

To ask for advice, select **I have questions regarding system use or other**.

When you enter text in the free comment field, do not use special language characters (for example ä, è, ã) as this will lead the service ticket to fail.

4 If appropriate, select the **Danger to patient** check box.

If you have selected the **Danger to patient** check box, **Fast Contact** will output a message that prompts you to phone the Customer Care Center and state the equipment number and functionality location. The request cannot be submitted by means of the **Fast Contact** function.

Please call the Customer Care Center if there is a potential risk to the patient or other persons.

5 Ensure that your contact telephone number is correct.

6 Enter a short description of your request.

7 Ensure that the entered data is correct.

8 Click the **Submit** button.

Your request is sent to the Customer Care Center.

You receive a ticket number. You are informed if the remote support function is disabled on your system.

9 Proceed as instructed.

10 Click **Close**.

Fast Contact uses a LifeNet interface that is currently rolled out into the IT infrastructure of the various countries. The entry **Fast Contact** is dimmed if the roll-out is not completed in your country.

6.6.2 Reporting a detected system malfunction

If the system experiences an issue, the **Fast Contact** function opens.

The system checks if a connection to the Customer Care Center can be established. If no connection can be established, you are prompted to phone the Customer Care Center.

If a connection can be established, a **Fast Contact** dialog box is displayed.

1 If appropriate, select the **Danger for patient** check box.

2 Ensure that your contact telephone number is correct.

3 Enter a short description of your request.

4 Ensure that the entered data is correct.

5 Click the **Submit** button.

Your request is sent to the Customer Care Center.

You receive a ticket number.

6 You are informed if the remote support function is disabled on your system. Proceed as instructed.

7 Click the **Close** button.

7 System startup

This section provides information on how to start the system, and a description of the **Home** screen.

7.1 Switching on the system

You can switch on the system by pressing the **On/Off** button on the gantry display.

✓ Before starting the system, make sure all other components, such as the printer, also function correctly.

1 Press the blue **On/Off** button above the gantry display's screen.

The system connects power to all components and the medical software displays the splash screen.

2 Click the green **Reset** button on the gantry display to enable system motion.

3 Perform a Motion Home procedure from the gantry display.

Full operability is reached when the system displays the **Home** screen and the keys on the control box remain illuminated.

To ensure safe operation and correct any irregularities, the system provides a checkup procedure. (➔ Page 960 *System check*)



The system will need to start up twice for it to operate normally after the main power is recovered in the following two scenarios:

- The system has an LCB but no UPS or an exhausted UPS, and the input power of the LCB is disconnected.
- The system has an LCB and a UPS, and after the input power of the LCB is disconnected, the emergency power off button is pressed.

7.2 Executing a system calibration after system checkup

To ensure excellent image quality even under variable environmental conditions, it is important you perform a system checkup once you start the system, and then run a system calibration approximately one hour later.

The calibration will only take approximately 5 to 6 minutes and is required regardless of whether the CT scanner was used continuously or intermittently.

The calibration is important when the gantry has been powered off, for example, overnight or between working shifts.

CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

- Calibrate the system as part of the CT checkup. Repeat calibration if ring artifacts occur.

1 After system startup, execute the system checkup.

(➔ Page 960 *System check*)

Once the system checkup is completed, you can start to perform patient examinations.

2 Approximately one hour after the system checkup, execute a system calibration.

(➔ Page 961 *System calibration*)

If you do not run the calibration procedure, a pop-up window displays to remind you to do so. To start the calibration, follow the instructions provided. You can reject the calibration if necessary or choose a later reminder.

7.3 Function checks

To ensure that the system is ready for operation and all functions relevant to safety are working correctly, you must perform function tests daily before beginning with the actual examination procedures.

During the tests, the most important function procedures and the safety equipment of the system are checked.

7.3.1 Checking the STOP keys (mandatory)

1 Press and hold one of the table movement keys on the control box.



2 When the patient table moves, press the **STOP** key on the control box.



The table movement must stop immediately.

A notification window displays on the screen.

3 Check that you can move the patient table out of the gantry manually after you have pressed a **STOP** key.

4 Click **Resume** in the notification window to restore system readiness.

5 Follow step 1-4 to check the **STOP** key on the gantry.

Please contact Siemens Healthineers Service if the system does not behave as expected.

7.3.2 Checking the patient table top (mandatory)

You must check the mobility and cleanness of the table top.

1 Make sure that you can manually retract the table top from the gantry.

2 Make sure that the scan field is free of residual contrast medium, blood, or other contaminations.

The table top can only be retracted manually when the **STOP** key is pressed.

7.3.3 Checking radiation block and warning lamps

You must check the radiation warning lamps on the control box, the gantry and, if present, next to the doors of the examination room.

1 Check the proper function of the radiation warning lamps during the daily image quality tests.

The radiation warning lamps must light up when radiation is generated.

2 Make sure that radiation stops immediately when a door of the examination room is opened.

When the door is closed again, follow the instructions on your screen.

7.3.4 Checking the laser light marker

◆ Switch on the laser light marker and check the projections of the light beams on a white sheet of paper.

The laser beam must project a crosshair and the reference level laser beam a line mark.

The laser light marker does not work.

- Stop scanning to rule out any danger to patients.
- Call your Customer Care Center.

7.3.5 Checking the intercom system (optional)

- Apply the **Call patient** and **Listen to patient** keys on the control box.



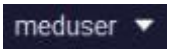
(1) **Call patient** key
(2) **Listen to patient** key

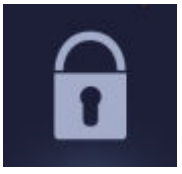
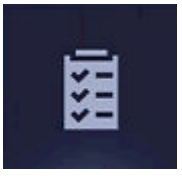
The intercom system must work in both directions.

7.4 Home screen

Home screen is the entry point to the system. From here you can, for example, launch tasks, perform system checks, lock the screen, and shut down or restart the system.

The **Home** screen provides the following functionalities:

	Manages system logon.
	• Clicking this icon opens the **Help** page. • Moving the mouse over this icon enables you to open the Online Help, and the system and version information.
	Provides Expert-i access and connect.

	• Clicking this icon opens the **Configuration Panel**. • Moving the mouse over this icon opens the **Settings** menu.
	Opens the **Job View**.
	Opens the **Patient Browser**.
	Initiates the checkup procedure.
	Locks the workplace.
	Highlights open maintenance tasks. It displays as soon as there is at least one open task. If calibrations are not due on the system, the maintenance tasks may not be displayed.
	Provides options to shut down or restart the system.



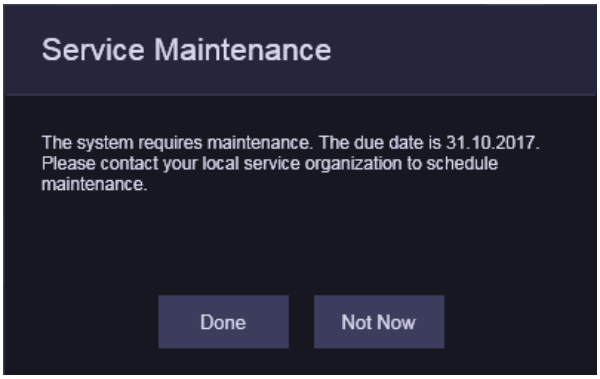
You can access the **Home** screen by clicking the **Home** icon in the access bar or after closing all applications.

7.4.1 Open maintenance tasks

During startup, the system checks for open maintenance tasks. If there is an open maintenance task, for example, the air filter exchange, the corresponding full screen instruction window is displayed after the splash screen. You can decide whether to perform the maintenance task immediately or at a later date.

(➔ Page 241 *Maintenance task instruction window*)

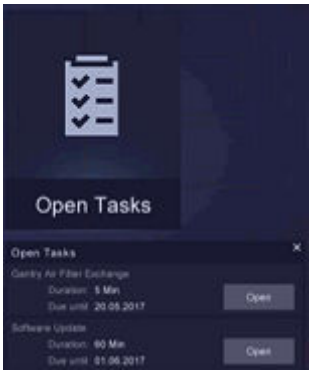
If a service technician task is also due, and there has been no network connection to the Siemens Healthineers Headquarters for three consecutive days, a dialog box is shown instead of the full screen instruction window. You can choose to contact the service organization immediately or at a later date.



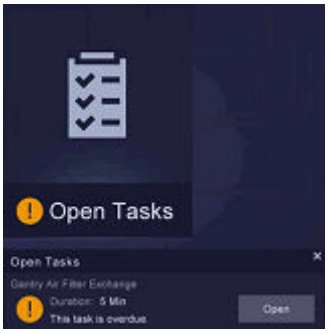


On the **Home** screen, the **Open Tasks** tile, if visible, highlights the open maintenance tasks. These tasks should be performed within a predefined time period.

The **Open Tasks** list is displayed below the **Open Tasks** tile. It disappears automatically after a certain period of time. Up to four items can be displayed in one page. Scroll down to view more tasks.



If at least one task is overdue, you will also get the notification.



To open the maintenance tasks instruction window:

- In the **Open Tasks** dialog box, click **Open**.

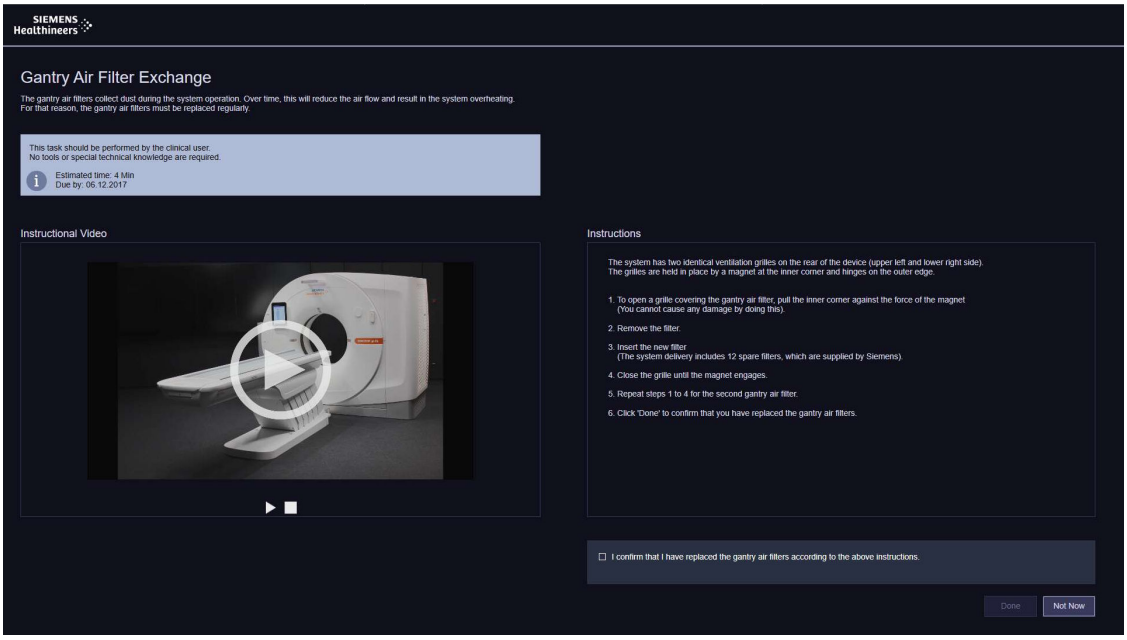
  – or –

  On the status bar, click the **Open Tasks** icon to open the **Open Tasks** dialog box. This icon is available when you switch to a sub-screen of the **Home** screen, for example, the **System Check** or the **Examination** screen.



Maintenance task instruction window

In the maintenance task instruction window, you can view the details of the task, such as relevant user information, estimated time, and due date in the highlighted box in the upper left corner. Based on this, you can decide whether to perform the maintenance task immediately or at a later date.



1 Follow the steps in the **Instructional Video** or in the **Instructions** to perform the maintenance task.

2 Confirm completion of the task:

- Select the confirmation check box.
- Click **Done**.

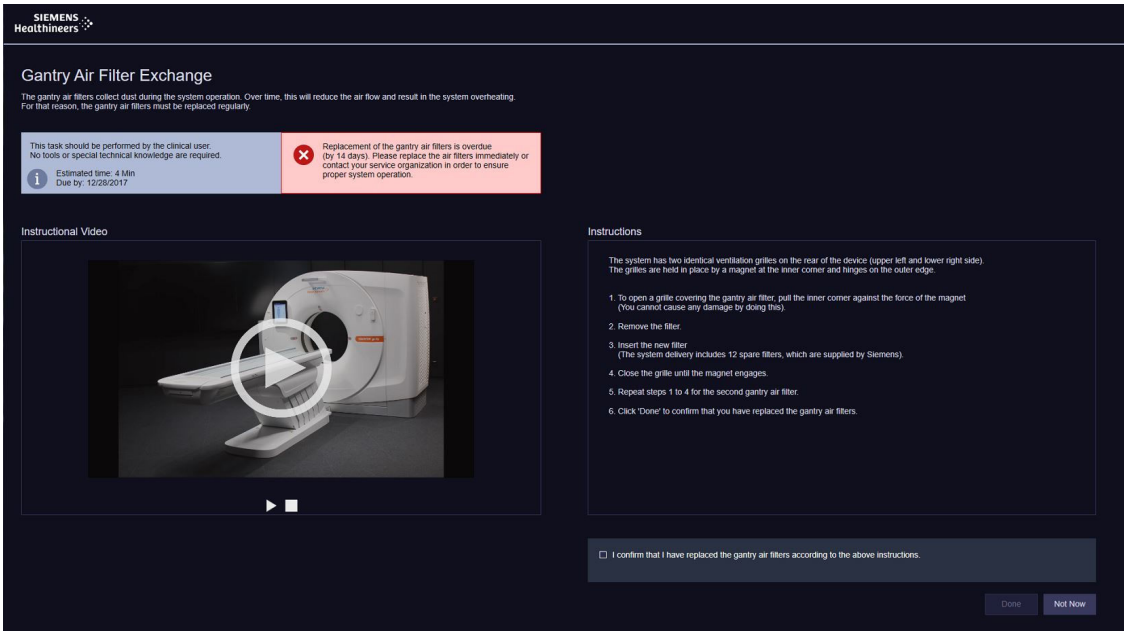
The maintenance task instruction window closes.

– or –

Click **Not now** to perform the task at a later date.

Overdue maintenance task instruction window

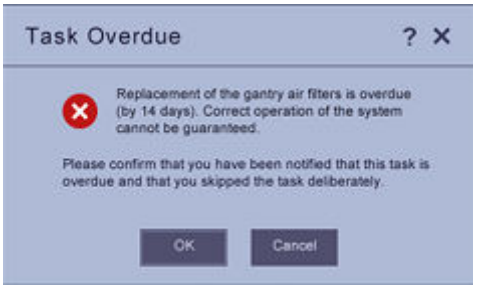
When a maintenance task has been open for too long, the overdue maintenance task instruction window is displayed.



In addition to the highlighted box, which provides details of the task, a warning message box is displayed to inform you that this task is now overdue.

You can decide whether to perform the maintenance task immediately or at a later date.

If you click **Not now**, the **Task Overdue** dialog box opens.



- Click **OK** to confirm that you know that the task is already overdue. The **OK** button closes the dialog box and the overdue task instruction window.
- Click **Cancel**, The dialog box closes but the overdue maintenance task instruction window remains open.

7.4.2 Logging on to your system

Depending on the security policy at your site, you have to log on to your system after system startup.

If no logon is put in place after the system starts, you are logged on as "meduser".

1 Open the **Logon** dialog box by clicking the user name on the access bar.

2 Enter your user name and password in the corresponding field.

The password is case-sensitive.

3 Select a domain, if required. After initial logon, the system will remember the domain.

4 Click **OK** to confirm.

7.4.3 Changing your password

Depending on the security policy at your site, you have to change the password at regular intervals.

If your password is about to expire, for example, it will expire within the next 10 days, you can change your password when you are logging on to your system.

The password for the user account "meduser" can only be changed by an administrator.

1 Select the "Other User" entry from the users list in the access bar.

The **Logon** dialog box opens.

2 Fill in valid credentials including the old password.

3 Click the **Change Password** button.

4 Type your new password into the corresponding fields.

- The password is case-sensitive.
- We advise to use a password that contains at least eight characters. Use capital letters, lower case letters, numbers, and special characters.

5 Click **OK** to confirm.

The new password takes effect the next time you log on.

7.4.4 Switching user

You can switch the current user in the **Home** screen.

On the access bar, you can see the current user name.

1 On the access bar, click the current user name.

A list of recently logged on users opens.

2 Select a user name or select **Other User**.

The **Logon** dialog box opens.

3 Enter **User name** and **Password** for the selected user.

Note that the password is case-sensitive.

4 Click **OK** to confirm.

7.4.5 Locking your workplace

You can lock the workplace so that no unauthorized user is able to use the system.



1 On the access bar, click the **Home** icon to open the **Home** screen.



2 On the **Home** screen, click the **Lock** icon to lock your workplace.

The workplace is locked. To unlock the workplace, click the **Unlock** icon.

7.5 Information on the status bar

The status bar is in the area at the bottom of the screen. It displays information on the system status and time.

Depending on your monitor settings, the display of information may differ. In single screen mode, all information icons are displayed in the lower right corner of the monitor. In dual screen mode, the information is distributed over both monitors.



Some of the icons on the status bar are always visible. Other icons are only visible in the case of system notifications.

The following information is represented by status icons:

Icon	Description
	System messages and message history The system sends system messages, for example, when you close a patient and start a new examination. Click the icon to open the **Message History** window. Select the **Show only new messages** check box to display only unread messages. Additionally, you can filter on the **Type** of message to be displayed when opening the window, for example, filtering to display only errors and warnings. To have the latest messages on top, you can adapt the sorting of the **Date and Time** column.

Icon	Description
	General system and error messages The icon indicates the type of the most severe unread message, and the total number of unread messages. Click the icon to display a history of all available messages.
	Job types, such as running print jobs, media jobs, or network jobs In case of issues, small indicators are displayed:  Click a job type icon to open the **Job View**. (➔ Page 314 *Job status icons*)
  	Free CT raw data disk space (color-coded) • Green: Filling level of CT raw data disk space on your system does not exceed the low watermark. • Yellow: Filling level of CT raw data disk space on your system exceeds the low watermark but does not exceed the high watermark. • Red: Filling level of CT raw data disk space on your system exceeds the high watermark. Move the mouse pointer over the icon to view the percentage of free CT raw data disk space on your system.
  	Available disk space for images (color-coded) • Green: Filling level of available disk space for images does not exceed the low watermark. • Yellow: Filling level of available disk space for images exceeds the low watermark but does not exceed the high watermark. • Red: Filling level of available disk space for images exceeds the high watermark. Move the mouse pointer over the icon to view the approximate approximate number of images that can be stored on your system.

Icon	Description
	Server load (color-coded) • Green: Filling level of the server load does not exceed the low watermark. • Yellow: Filling level of the server load exceeds the low watermark but does not exceed the high watermark. • Red: Filling level of the server load exceeds the high watermark. Move the mouse pointer over the icon to view the percentage of the server load on your system.
	Collaboration status (Expert-i) Indicates whether an Expert-i remote connection is established to your workplace.
	Used disk space (color coded) • Green: Used disk space on your system does not exceed the low watermark. • Yellow: Used disk space on your system exceeds the low watermark, but does not exceed the high watermark. • Red: Used disk space on your system exceeds the high watermark. Move the mouse pointer over the icon to view the percentage of used disk space on the system. In case of a low amount of free disk space, delete old images to free up disk space.
	Keyboard input language Click this icon to switch the keyboard input language. Alternatively, press the **Alt** + **Shift** keys.
	RIS connection error Indicates that the connection to the default RIS has been interrupted.

Icon	Description
	System error Move the mouse pointer over the icon to view the error description and follow the instructions in the tooltip. The status icon disappears from the status bar as soon as the problem has been resolved.

The warning icon on the status bar is displayed if unread messages are available. If a warning message is displayed next to the name of a workflow step, the indicator icon may disappear even if you have only read the workflow step message.

8 Data management

SPECT*syngo* enables you to manage patient data and procedure data throughout the whole lifecycle: from planning procedures up to managing studies.

CAUTION

Patient data or data sets are modified using the correct and rearrange function!

Additional radiation exposure. Delayed diagnosis.

- Always check the patient data and the corresponding data sets for their accuracy. Take special care with patient data that is modified locally and sent back to the RIS, as the RIS will not overwrite locally modified values.
- Do not modify data sets that are already processed by other applications; case reading or results calculation may fail or need to be redone. Especially, do not perform correct and rearrange actions while time-critical cases are in progress.

You can manage this data with two tools:

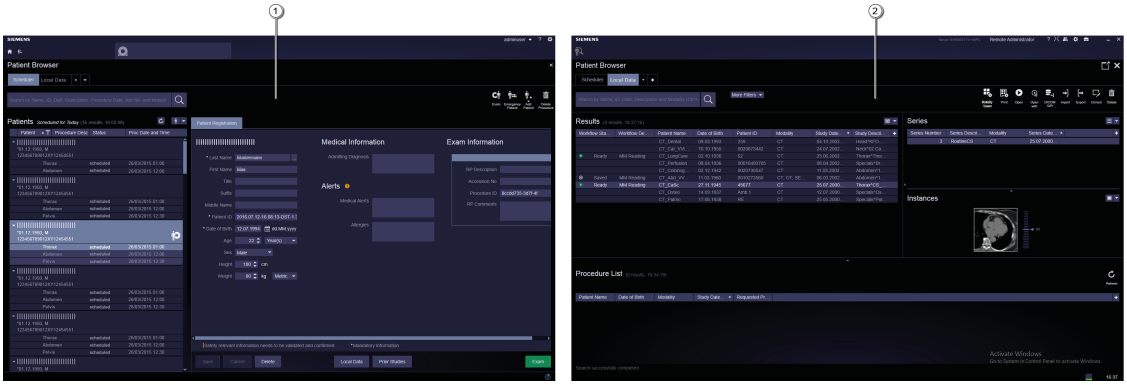
- **Scheduler**

  The **Scheduler** enables you to find and plan procedures and to start the examination workflow at the scanner workplace.

- **Patient Browser**

  The **Patient Browser** enables you to find and manage studies and to start the reading workflow.

  (➔ Page 276 *The Patient Browser*)



(1) **Scheduler**
(2) **Patient Browser**

8.1 The Scheduler

The **Scheduler** is the entry point to the examination workflow at your workplace.

You can search for planned procedures and corresponding patient data, start the examination, or open the **Patient Browser** to see the studies of a performed procedure belonging to the selected patient.

The **Scheduler** provides the following functionality:

- Visualizing planned procedures and corresponding patient data. This includes both the procedures scheduled in the RIS as well as locally registered procedures.

  (➔ Page 256 *Screen layout of the Scheduler*)

- Retrieving planned procedures and corresponding patient data from the RIS (Radiology Information System)

  (➔ Page 263 *Refreshing the Patients list of the Scheduler*)

  (➔ Page 264 *Querying procedure data for a certain time range from the RIS (Broad Query)*)

- Adding or deleting planned procedures and corresponding patient data locally at your workplace

  (→ Page 267 *Registering a patient locally*)

  (→ Page 268 *Registering an emergency patient*)

  (→ Page 272 *Adding a procedure to a patient*)

  (→ Page 273 *Removing procedures and patients from the Patients list*)

- Correcting planned procedures and corresponding patient data before the examination starts

  (→ Page 273 *Correcting patient data in the Scheduler*)

- Searching for patients and procedures

  (→ Page 262 *Searching for patients and procedures in the Scheduler*)

- Indication of the procedure status

  (→ Page 254 *Procedure state in the Scheduler*)

- Calling up the **Patient Browser** to see the studies belonging to the selected patient

  (→ Page 275 *Calling up the Patient Browser from the Scheduler*)

- Grouping related procedures of a patient for a single examination workflow

  (→ Page 270 *Grouping procedures for examination*)

- Starting and completing an examination

  (→ Page 274 *Starting an examination from the Scheduler*)

  (→ *Completing an examination in the Scheduler*)

- Retrieving prior studies from DICOM nodes

  (→ Page 266 *Retrieving prior studies from DICOM nodes*)

8.1.1 About the Scheduler

The following concepts of the **Scheduler** are important to understand:

- The **Patients** list is the worklist for your daily work.

  (→ Page 252 *About the Patients list of the Scheduler*)

  (→ Page 254 *Procedure state in the Scheduler*)

- A **Patients** list item represents one or more planned procedures of a registered patient.

  (→ Page 252 *About procedures and patients in the Scheduler*)

- In the **Scheduler**, you can change the patient and procedure data before you start the examination.

  (→ Page 253 *About correcting patient data in the Scheduler*)

About the Patients list of the Scheduler

The **Patients** list is the worklist for your daily work. It is a view of available procedure data and patient data at your workplace.

You can switch between the procedure view and the patient view of the **Patients** list.

The procedure view offers a flat list of procedures. The patient view offers a list of patients with the assigned procedures.

- If connected to a RIS, the workplace retrieves data from the RIS at regular intervals. You can request additional data with user-defined queries.

  (→ Page 264 *Querying procedure data for a certain time range from the RIS (Broad Query)*)

  (→ Page 265 *Querying planned procedures of a patient from the RIS*)

- You can search and filter the available procedure data and patient data in the **Patients** list.

  (→ Page 262 *Searching for patients and procedures in the Scheduler*)

About procedures and patients in the Scheduler

A patient entry can contain one or multiple procedures.

All procedures of one patient match the following criteria:

- The procedures have the same unique patient identification.

  (→ *About unique patient identification*)

- The status of the procedures is **scheduled**.

- The procedures match the current search and filter criteria.

In the patient view of the **Patients** list, multiple procedures are grouped under the same patient.



In the procedure view of the **Patients** list, this icon shows, that multiple procedures for the same patient are available.

Procedures that do not match these criteria are assigned to separate patients in the **Patients** list.

(→ Page 270 *Grouping procedures for examination*)

About correcting patient data in the Scheduler

In the **Patient Registration** tab of the **Scheduler**, you can modify the patient data before you start the examination. Once the examination is started, you cannot change the patient data anymore.

The changed patient data will only be saved on your local system.

The attributes that can be corrected depend on the type of patient data:

- (→ Page 253 *Rules for correcting locally registered patient data*)
- (→ Page 254 *Rules for correcting patient data received from a RIS*)

Rules for correcting locally registered patient data

- You can change any patient data.
- Correcting the following attributes only affects the selected procedure:
  - **Last Name**
  - **Patient ID**
  - **Date of Birth**
  - **Age**
  - **Height**
  - **Weight**

  If there is more than one procedure for the same patient, you have to change these attributes for every procedure separately.

  Correcting any other attribute affects all procedures of the selected patient.

Rules for correcting patient data received from a RIS

When you correct patient data in the **Scheduler**, the changes are only saved on your local system and will not be sent back to the RIS.

Therefore, it is highly recommended to perform all patient data changes in the RIS and refresh the worklist in the **Scheduler**.

- Only empty fields can be adapted in the **Scheduler**.

  But consider that the RIS overwrites the local values of the **Scheduler**.

  If you have entered data in an empty field, that was also changed in the RIS, the value of this field would be overwritten with the next refresh.

- The attributes **Height**, **Weight** and **Patient Comments** can be updated, even if the field was filled out in the RIS.

  For these attributes, the local values have precedence. Once these attributes are locally updated, these values will not be overwritten by RIS values.

- Correcting the following attributes only affects the selected procedure:

  – **Last Name**

  – **Patient ID**

  – **Date of Birth**

  – **Age**

  – **Height**

  – **Weight**

  If there is more than one procedure for the same patient, you have to change these attributes for every procedure separately.

  Correcting any other attribute affects all procedures of the selected patient.

Procedure state in the Scheduler

The procedures in the **Scheduler** can have the following state:

	Scheduled	The procedure is ready for examination.

	In Progress	The examination procedure is in progress.
	Completed	The examination is completed.
	Discontinued	The examination procedure is discontinued.
	Recon	The reconstruction procedure is in progress.

Search syntax and rules in the Scheduler

The **Scheduler** search supports common basic search syntax and rules.

(→ Page 262 *Searching for patients and procedures in the Scheduler*)

Syntax and rules for names and values:

- Text strings are not case-sensitive, for example, **`Meyer`** and **`meyer`** lead to the same results.
- You can enter a fragment of a name or a value, for example, **`Me`** to search for all patients whose name begins with “Me”.
- You can use **`*`** as a wildcard character.

  Examples:

  - **`*eyer`** will find “Meyer”, “Breyer”, “Dreyermann”, etc.
  - **`Me*er`** will find “Meyer”, “Meier”, “Meuller”, etc.
- To search for patients with composite surnames you have to place a **`*`** between the first and the second part of the name.

  Example: **`van*Houten`** will find “van Houten”.

Syntax and rules for date and time ranges:

- In the **Quick search** field, you can enter a date manually.
- You can combine a date or a time range with a name or a value.

  Example:

  `2013/10/25 Meyer` will find all patients whose name is “Meyer”, and whose birth date is “2013/10/25”.

Ensure you adhere to the DICOM format (YYYYMMDD) or to the Windows regional settings for date and time formats.

8.1.2 Screen layout of the Scheduler

The **Scheduler** window consists of the following areas:



(1) On single monitor systems, you can use the icons to switch between **Patient Browser** and **Scheduler**.
On dual monitor systems, the **Scheduler** is on the left hand side and the **Patient Browser** is on the right hand side.

(2) Search area
Enables you to search for procedures and corresponding patient data.

(3) Toolbar
(➔ *Toolbar of the Scheduler*)

(4) **Patient Registration** tab
Displays patient data.
(➔ Page 257 *Patient Registration tab of the Scheduler*)

(5) **Patients** list

Shows the available procedure data and patient data at your workplace.
Patients view: Hierarchical list of patients with the assigned procedures
Procedure view: Flat list of procedures for patients
(➔ Page 252 *About the Patients list of the Scheduler*)

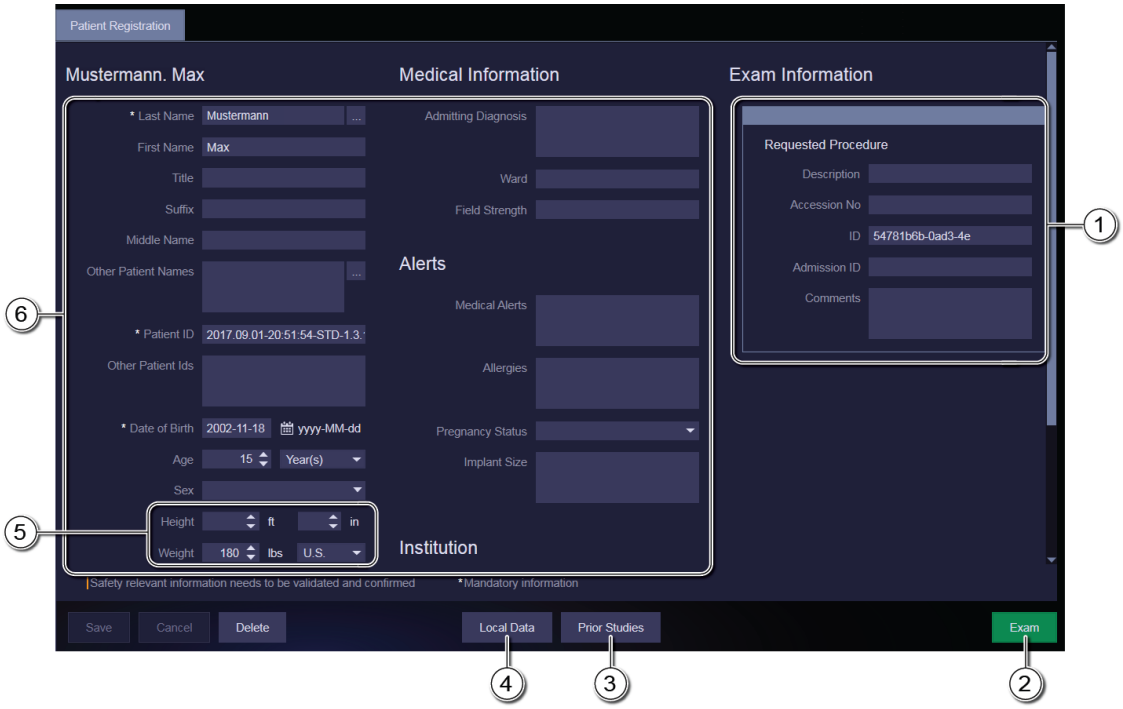
(6) Procedure

(7) Patient

Patient Registration tab of the Scheduler

In the **Patient Registration** tab of the **Scheduler**, you can perform the following actions:

- Viewing and correcting patient data
- Registering patients locally
- Planning procedures



(1) **Exam information**
(➔ Page 252 *About procedures and patients in the Scheduler*)
Description: Describes the requested procedure. The value should match the DICOM standard.

Accession No: Accession number
ID: Requested procedure ID
Comments: Comment field

(2) **Exam** button
Triggers the examination.

(3) **Prior Studies** button
Opens the **Prior Studies** dialog box to search for prior studies.
(➔ Page 266 *Retrieving prior studies from DICOM nodes*)

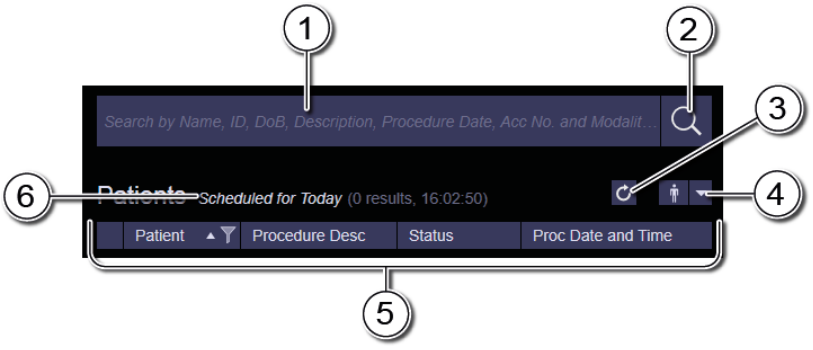
(4) **Local Data** button
Opens the **Patient Browser** to see the studies belonging to the selected Patient.

(5) **Height** and **Weight**
Even if the patient data was received from a RIS, the attributes **Height** and **Weight** are editable, until the examination is started.
(➔ Page 253 *About correcting patient data in the Scheduler*)

(6) Patient data
Fields to specify the patient data. Mandatory fields are marked by an asterisk *****.
(➔ Page 253 *About correcting patient data in the Scheduler*)

The search area of the Scheduler

In the search area of the **Scheduler**, you can search for planned procedures and corresponding patient data. The search results are displayed in the **Patients** list. You can sort and filter the **Patients** list.



(1) **Search** field
Lets you enter the search criteria.

(2) **Search** icon
Starts searching for patient and procedure data with the selected search criteria.

(3) **Refresh** icon

Refreshes the patient list.
(➔ Page 263 *Refreshing the Patients list of the Scheduler*)

(4) View selection
Toggles the view of the **Patients** list.
Patients view: Hierarchical list of patients with the assigned procedures
Procedure view: Flat list of procedures for patients

(5) Column headers
You can sort by the columns that are designed for sorting.
You can sort and filter by clicking on the **Patient** column header.
(➔ Page 264 *Sorting and filtering search results in the Scheduler*)

(6) Current filter criteria

The toolbar of the Scheduler

The toolbar of the **Scheduler** provides access to the following tools.

 **Exam**	Starts the scan for a selected patient(s). (➔ Page 274 *Starting an examination from the Scheduler*)
 **Emergency Patient**	Lets you register an emergency patient. (➔ Page 268 *Registering an emergency patient*)
 **Register Patient**	Lets you register a new patient locally at your scanner workplace. (➔ Page 267 *Registering a patient locally*)
 **Add Examination**	Lets you add a examination to a registered patient. (➔ Page 272 *Adding a procedure to a patient*)
 **Delete Procedure**	Removes a locally registered patient from the **Patients** list as long as the examination has not been started yet. (➔ Page 273 *Removing procedures and patients from the Patients list*)

8.2 Working with the Scheduler

In the **Scheduler** you can perform the following actions:

Patients list

- (→ Page 261 *Changing the RIS in the Scheduler*)
- (→ Page 262 *Searching for patients and procedures in the Scheduler*)
- (→ Page 264 *Sorting and filtering search results in the Scheduler*)
- (→ Page 263 *Refreshing the Patients list of the Scheduler*)
- (→ Page 264 *Querying procedure data for a certain time range from the RIS (Broad Query)*)
- (→ Page 265 *Querying planned procedures of a patient from the RIS*)
- (→ Page 266 *Retrieving prior studies from DICOM nodes*)

Adding, correcting & deleting procedures and patient data

- (→ Page 267 *Registering a patient locally*)
- (→ Page 268 *Registering an emergency patient*)
- (→ Page 272 *Adding a procedure to a patient*)
- (→ Page 273 *Removing procedures and patients from the Patients list*)
- (→ Page 270 *Grouping procedures for examination*)
- (→ Page 273 *Correcting patient data in the Scheduler*)

Examination / Patient Browser

- (→ Page 274 *Starting an examination from the Scheduler*)
- (→ Page 275 *Calling up the Patient Browser from the Scheduler*)
- (→ *Completing an examination in the Scheduler*)

8.2.1 Opening the Scheduler

You can open the **Scheduler** in two ways:



- On the access bar, click the **Scheduler** icon.

  – or –



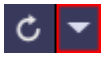
  On the **Home** screen, click the **Examination** icon.

8.2.2 Changing the RIS in the Scheduler

The **Scheduler** displays the planned procedures from the connected RIS as well as locally registered data.

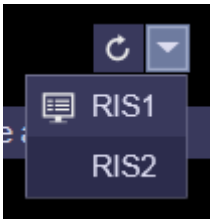
You can change the connected RIS which serves as the worklist provider. This might be necessary, if your system is shared between different institutions and you want to display the worklists of another RIS in the **Scheduler**.

✓ The required RIS is configured as remote DICOM node in the **Administration Portal**.



1 Click the arrow head next to the **Refresh** icon.

  A list with configured RIS nodes is displayed:



  The currently selected RIS is marked with an icon.

2 Select the required RIS.



If the required RIS is not displayed, contact your IT Administrator to configure the RIS as remote DICOM node in the **Administration Portal**.

(→ *Configuration of remote DICOM nodes*)

The **Scheduler** requests the worklists from the selected RIS and displays them.

Locally registered procedures remain visible.

To display the currently selected RIS, move the mouse pointer over the **Refresh** icon.

The selection of the current RIS is synchronized between the **Scheduler** and the **DICOM Modality Worklist Query** dialog box of the **Administration Portal**.

(→ *Configuring the worklist query settings*)

8.2.3 Searching for patients and procedures in the Scheduler

In the **Scheduler**, you can search for patient and procedure data.

1 In the **Search** field, enter your search criteria:

- Patient name
- Date of birth
- Patient ID
- Accession number
- Procedure description
- Procedure start date
- Modality

Ensure you adhere to the DICOM format (YYYYMMDD) or to the Windows regional settings for date and time formats.



2 Click the **Search** icon.

While the search process is running, the **Search** icon changes shape. To abort the search process, click this icon.



The results are shown in the **Patients** list.

You can sort the **Patients** list.

The displayed **Patients** list may become outdated. To make sure that the displayed **Patients** list is up to date, you can refresh it.



8.2.4 Refreshing the Patients list of the Scheduler

If connected to a RIS, the **Scheduler** receives procedure data and patient data from the RIS.

Depending on the configuration, the procedures are received in regular intervals or on demand.

Thus the displayed **Patients** list may become outdated. To make sure that the displayed **Patients** list is up to date, you can refresh it.



If the connection to the default RIS is disrupted, this icon is shown in the status bar.



- Click the **Refresh** icon.

The **Patients** list is updated according to the search criteria, specified in the search area of the **Scheduler**.

8.2.5 Sorting and filtering search results in the Scheduler

In the **Scheduler**, you can sort the **Patients** list by columns ascending or descending. Within this sorting, the results are sorted by date and time.

You can also filter the **Patients** list by time or by status. The current filter setting is displayed above the column headers.

- In the **Patients** list, click a column header.



The results are sorted by the attributes of this column and the column is marked by an arrow head icon.

– or –

Click the **Patients** column header to open a sort and filter menu.

You can sort for the patient name, the patient ID or the date of birth, or you can filter by time or by status.

8.2.6 Querying procedure data for a certain time range from the RIS (Broad Query)

In the **Scheduler**, you can retrieve procedure data and patient data from the RIS, that covers a user-defined time range.

✓ The system is connected to a RIS.



1 Click the **Broad Query** icon.

The **Broad Query** dialog box opens.

2 In the **Start Date** fields and **End Date** fields, specify the time range.

Only data within this given time range is retrieved from the RIS.

3 Click **OK** to confirm.

The data in the **Scheduler** is updated accordingly.



You can refresh the displayed **Patients** list.



8.2.7 Querying planned procedures of a patient from the RIS

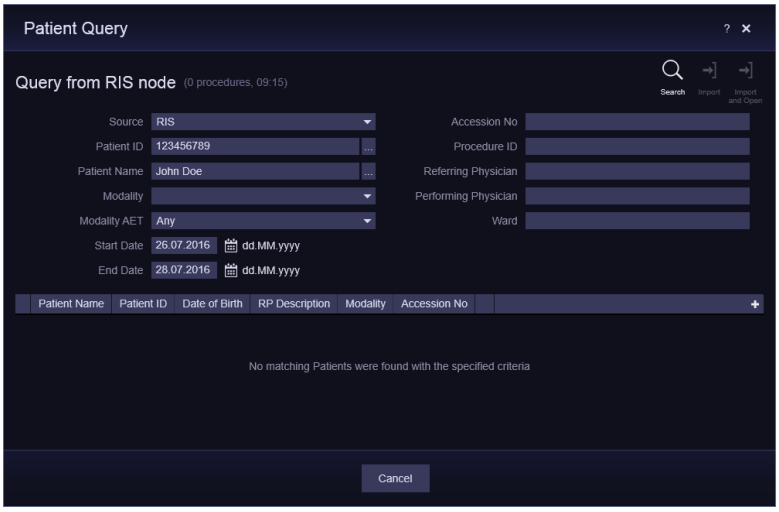
In the **Scheduler**, you can retrieve procedure data and patient data from a selected RIS, that matches specific patient attributes.

✓ The system is connected to a RIS.



1 Click the **Patient Query** icon.

The **Patient Query** dialog box opens.



2 From the **Source** list, select a RIS.

3 Enter the attributes you want to search for, for example, **Patient ID** and **Patient Name**.

To search for ideographic and phonetic patient name attributes, click the **[...]** button next to the **Patient Name** field. (➔ Page 269 *Entering Japanese patient names*)

To search for alternative Patient IDs, click the **[...]** button next to the **Patient ID** field.



4 Click the **Search** icon.

The results are listed.



5 Select a result and click the **Import** icon.

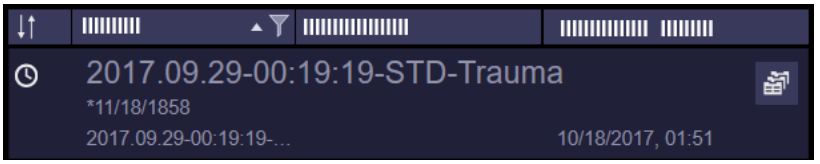
– or –

Select a result and click the **Import and Open** icon.

The procedures are added to the **Patients** list.

8.2.8 Retrieving prior studies from DICOM nodes

The **Scheduler** indicates available prior studies in the database of the system.



This icon shows, that prior studies are available.

In the **Administration Portal**, you can specify the default settings for manual prior study search. (➔ Page 760 *Configuring the manual prior study search*)

In addition, you can also search on external media or DICOM nodes for prior studies and import them to your local system.

✓ Pre-fetch nodes are configured.

✓ The available data are DICOM-compliant.

1 In the **Patients** list, select the patient or procedure for which you want to search for prior studies.

2 In the **Patient Registration** tab, click the **Prior Studies** button.

– or –



If the **Scheduler** already detected available prior studies, click the **Prior Studies** icon in the list item.

The **Prior Studies** dialog box opens with predefined search criteria.

3 Click **Source Selection** to select the source from which you want to retrieve studies.

The preset sources are the pre-fetch nodes and the default archive.

4 If you want to modify the search criteria, click **Search Filters** to specify the search criteria.

If you modify the predefined search criteria, the found studies might not be realized as prior studies of the selected patient or procedure.



5 Click the **Search** icon.

The results are listed.



6 Select a study and click the **Retrieve** icon to retrieve the study.



In the list item, this icon shows that prior studies are available.

When you call up the **Patient Browser**, the prior studies are provided in the **Results** list of the **Patient Browser**.

8.2.9 Registering a patient locally

In the **Scheduler**, you can register a patient locally. The data of this locally registered patient will not be sent back to the RIS.



1 On the toolbar of the **Scheduler**, click the **Register Patient** icon.

A new item in the **Patients** list is created and an empty **Patient Registration** tab opens.

2 Enter the required patient data.

In some fields, when you start typing, the system provides a list with previously entered values.

Once the **Last Name**, **Patient ID**, and **Date of Birth** fields are filled in, you can save the data.

Once all mandatory fields (marked by an asterisk *****) are filled in, you can start the examination.

If you leave the **Patient ID** field empty, it gets automatically filled when you save the data.

3 To save the data and finish the registration, click the **Save** button.

– or –

To save the data and start the examination, click the **Exam** button.

A new patient is registered. The data of this registered patient will **not** be sent back to the RIS.

If you register patient data, that is not distinguishable from an already existing patient, you are asked whether the newly registered patient should be appended:

OK: The procedure is appended to the existing patient.

Cancel: Go back to the **Patient Registration** tab to adapt the patient data.

8.2.10 Registering an emergency patient

In case of an emergency, you can perform an emergency registration in the **Scheduler**.

The mandatory fields of the **Patient Registration** tab are filled in with default values. You can change any of these values depending on your knowledge of the patient.



1 On the toolbar, click the **Emergency Patient** icon.

A new item in the **Patients** list is created and an empty **Patient Registration** tab opens.

The mandatory fields are filled in with default values.

2 Optionally, you might enter further patient data depending on your knowledge of the patient.

3 To save the data and finish the registration, click the **Save** button.

– or –

To save the data and start the examination, click the **Exam** button.

A new patient is registered. The registered patient will **not** be sent back to the RIS.

8.2.11 Entering Japanese patient names

In the **Scheduler**, you can enter Japanese patient name attributes in ideographic or phonetic representation.

- Use the Ideographic area for entering KANJI
- Use the Phonetic area for entering KATAKANA or HIRAGANA

The following patient name attributes can be entered in ideographic or phonetic representation:

- Title
- Last Name
- First Name
- Middle Name
- Suffix

1 In the **Patient Registration** tab or in the **Patient Query** dialog box, click the **[...]** button next to the **Last Name** field.

A dialog box opens to enter the ideographic and phonetic patient name attributes.

2 Enter the necessary patient name attributes.

You can use the Microsoft Input method editor to enter East Asian characters and symbols.

You can mix ideographic and phonetic patient name attributes. For example, you can enter the last name ideographically and the first name phonetically.

3 To close the dialog box, click outside the dialog box.

8.2.12 Switching the units for height and weight (Metric / U.S.)

In the **Scheduler**, you can switch the display of units for **Height** and **Weight** to either metric units (cm / kg) or to U.S. customary units (ft, in / lbs).

◆ Select the units in the list next to the **Weight** field.

The units of measurement for height and weight are switched accordingly. Any already entered values are converted.

8.2.13 Grouping procedures for examination

In the **Scheduler**, you can group related procedures of a patient for a single examination workflow.

The procedures must meet the following criteria:

- The procedures belong to the same patient.
- The procedure status is **scheduled**.

Grouped procedures are indicated by an icon in the patient and procedure view.



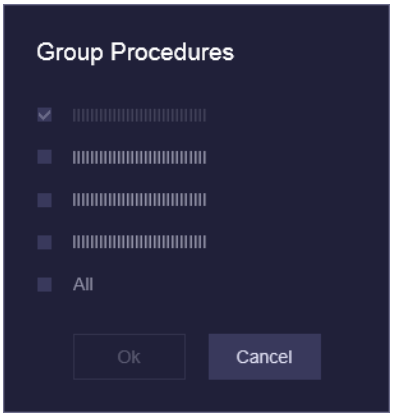
Grouping procedures for a single examination

1 In the **Patients** list, select multiple procedures and choose **Group** from the context menu.

– or –

In the procedure view of the **Patients** list, right-click a single procedure and choose **Group** from the context menu.

The **Group Procedures** dialog box opens and provides all matching procedures.



2 Select the procedures to be grouped and click **OK**.

The selected procedures are combined to one list item. In the **Patient Registration** tab, you can see all grouped procedures.

If the values for the attributes **Height**, **Weight** and **Age** are inconsistent, these fields are left empty. You can edit these attributes to locally update them for the grouped procedures.

Grouping procedures and starting the examination immediately

◆ Select multiple procedures of a patient and click the **Exam** icon on the toolbar.

– or –

In the patient view of the **Patients** list, double-click the patient.

The procedures are grouped and the examination is started.

The examination is performed in a single examination workflow.

Limit for grouping procedures

Grouping procedures fails if you try to group more than 15 procedures.

However, you can continue the grouping workflow. In that case, the systems selects excess procedures at random and does not include these into the group. You will not be informed which procedures have not been included.

8.2.14 Adding a procedure to a patient

In the **Scheduler**, you can add further procedures to an already registered patient, so that this patient has more than one procedure assigned.

1 In the **Patients** list, select the patient or procedure to which you want to add another procedure.



2 On the toolbar, click the **Add Examination** icon.

A new item in the **Patients** list is created and the **Patient Registration** tab is filled with the patient data of the selected patient or procedure.

3 Enter the procedure information in the **Exam Information** area.



If required, you can change all fields in the **Patient Registration** tab except the following:

- **Last Name**
- **Patient ID**
- **Date of Birth**
- **Age**

The changes are applied to all procedures of the selected patient.

---

4 Click **Save** to save the data and to finish the registration.

In the patient view of the **Patients** list, the procedures are grouped under the same patient.



In the procedure view of the **Patients** list, this icon shows, that multiple procedures for the same patient are available.

8.2.15 Removing procedures and patients from the Patients list

In the **Scheduler**, you can remove locally registered procedures from the **Patients** list as long as the examination has not started yet.

If you remove all procedures of a locally registered patient, also the patient is removed from the **Patients** list.

Patient data that come from a RIS cannot be removed from the **Patients** list.

✓ The patient was locally registered.

✓ The examination has not started yet.

1 In the **Patients** list, select the procedure you want to delete.



2 Click the **Delete Procedure** icon to remove the procedure.

– or –

In the **Patient Registration** tab, click the **Delete** button.

The **Delete Procedure(s)** dialog box opens.

3 Click **OK**.

The procedure data is removed.

If you remove all procedures of a locally registered patient, the patient is removed from the **Patients** list.

8.2.16 Correcting patient data in the Scheduler

In the **Scheduler**, you can correct the patient data before you start the examination.

Note that the corrected patient data will **not** be sent back to the RIS.

✓ Examination has not started yet.

1 From the **Patients** list, select the patient or procedure you want to correct.

2 In the **Patient Registration** tab, correct the patient data.

(➔ Page 253 *About correcting patient data in the Scheduler*)

3 To save the data and finish the correction, click the **Save** button.

– or –

To save the data and start the examination, click the **Exam** button.

If you correct patient data to an extent, that it is not distinguishable from other existing patient data, you are asked whether the patients should be merged:

OK: The patients are merged.

Cancel: Go back to the **Patient Registration** tab to adapt the patient data.

The patient data is corrected on your local system.

To avoid inconsistent patient data, you have to redo the corrections in the RIS.

8.2.17 Starting an examination from the Scheduler

You can start the examination workflow from the **Scheduler**.

You can either start the examination workflow for a single procedure or for all procedures of a patient in a single examination workflow.

Starting a single procedure

- In the **Patients** list, double-click the procedure.

  – or –

  In the **Patients** list, select a single procedure and click the **Exam** icon on the toolbar.

  – or –

  In the **Patient Registration** tab, click the **Exam** button.

Starting all procedures of a patient in a single examination workflow

- In the patient view of the **Patients** list, double-click a patient.

  – or –

  Select multiple procedures of a patient and click the **Exam** icon on the toolbar.

  – or –

  Group the procedures for examination and start the grouped procedure.

  (➔ Page 270 *Grouping procedures for examination*)

8.2.18 Repeating a completed examination from the Scheduler

In the **Scheduler**, you can repeat the examination workflow for a completed procedure. Multi-selection is not possible.

To view completed procedures in the **Patients** list, you may have to adapt the filter criteria.

- In the **Patients** list, double-click a completed procedure.

  – or –

  In the **Patients** list, select a completed procedure and click the **Exam** icon on the toolbar.

  – or –

  In the **Patient Registration** tab, click the **Exam** button.

8.2.19 Calling up the Patient Browser from the Scheduler

In the **Scheduler**, you can open the **Patient Browser**.

For each procedure, all available studies are provided in the **Results** list of the **Patient Browser**. Prior studies are also included, if available.

✓ Examination data is available.

1 In the **Patients** list of the **Scheduler**, select a procedure.

2 In the **Patient Registration** tab, click the **Local Data** button.

8.3 The Patient Browser

The **Patient Browser** is the entry point to find and manage studies and to start the reading workflow.

(→ Page 281 *Opening the Patient Browser*)

In the **Patient Browser** you can do the following actions:

- Search, sort, and refresh the search results.

  Create work lists and customize them.

  (→ Page 283 *About handling of studies and work lists in the Patient Browser*)

- Load data for reading.
- Manage raw data

  (→ Page 296 *Manage raw data*)

- Import and export data.

  (→ Page 299 *About the import of data (images)*)

  (→ Page 300 *About the export of data (images)*)

- Correct patient data as well as study, series, or instance data.

  Rearrange studies.

  (→ Page 283 *Data correction and rearrangement*)

- Delete studies, series, or instances from the Short Term Storage (STS).
- Select data for archiving.

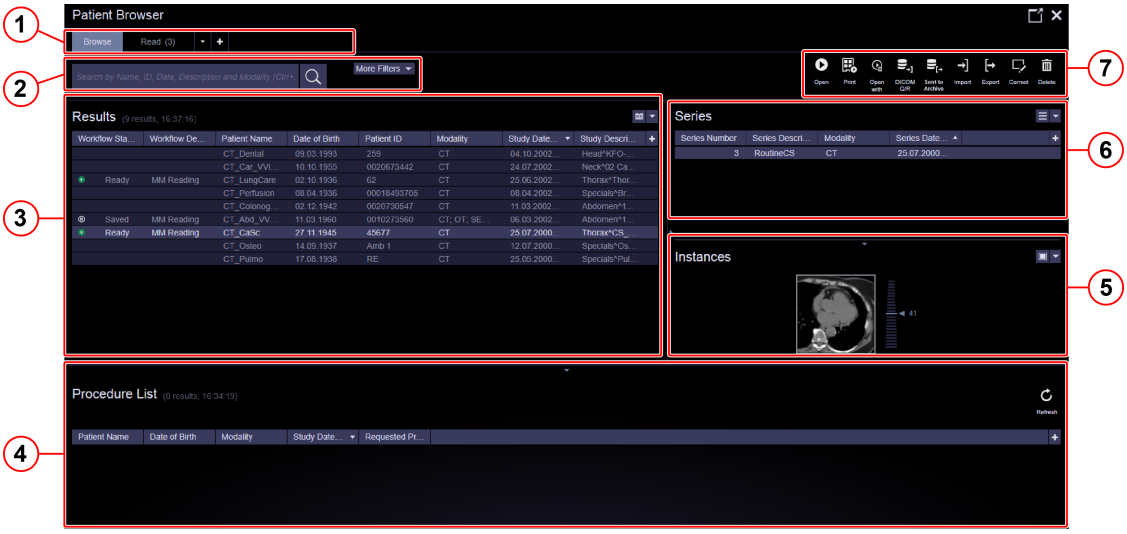
  (→ Page 310 *Selecting data for archiving*)

- Search for prior or related studies on external media or DICOM nodes and import these studies to your local system.
- Display DICOM header attributes.

You can configure the **Patient Browser** in the **Administration Portal** and the **Configuration Panel**.

8.3.1 Screen layout of the Patient Browser

The **Patient Browser** consists of the following areas:



(1) **Work list** bar
Shows up to five work lists
Enables you to create lists

(2) **Search** area
Enables you to set the current search criteria to search for data or to set up work lists
(➔ Page 280 *The search area of the Patient Browser*)

(3) **Results** list
Shows the data that matches the current search criteria in two different views:
- **Studies**: Lists the studies one by one
- **Patients**: Lists the studies grouped on patient level

(4) **Procedure List**
Enables searching for scheduled procedures and assigning studies and series to a selected scheduled procedure
(➔ Page 292 *Assigning studies or series to scheduled procedures*)
This list is not available for all user roles.

(5) **Instances** list
Shows the images and results of the selected series in three different views:
- **List**: Lists the instances of the selected series
- **Preview**: Shows a preview of the selected series. You can scroll through the preview.
- **Thumbnails**: Shows a thumbnail for each instance of the selected series

(6) **Series** list
Shows the series of the selected study in two different views:
- **List**: Lists the series of the selected study
- **Thumbnails**: Shows a thumbnail for each series of the selected study

(7) **Toolbar**
(➔ *Toolbar of the Patient Browser*)

Depending on your screen orientation (landscape or portrait), the layout of the **Patient Browser** may vary.

The toolbar of the Patient Browser

The toolbar of the **Patient Browser** provides access to the following tools.

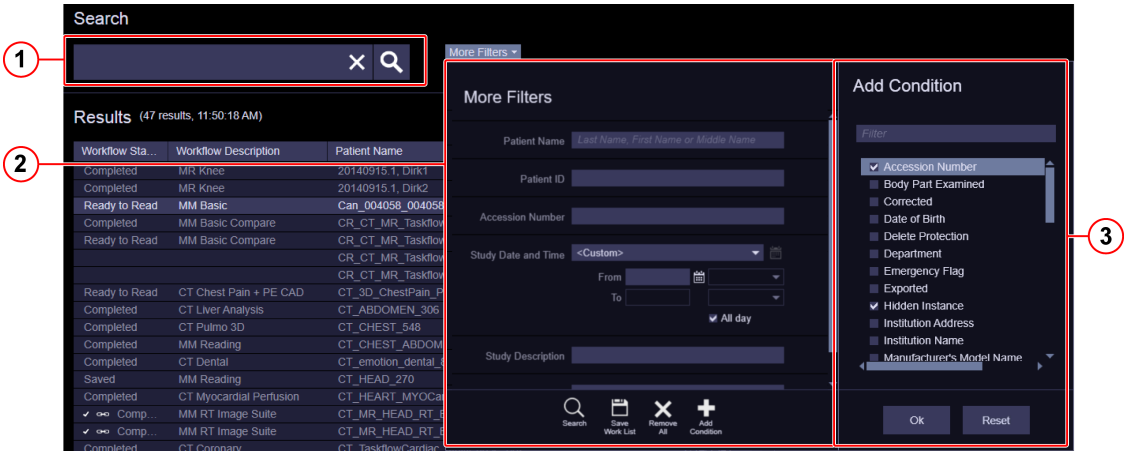
 MI View&GO **View&GO**	Loads patient data for reading into MI View&GO.
 **Open**	Loads patient data for reading with the assigned workflow. If no workflow is assigned, a default workflow is assigned and the workflow is started. The corresponding Patient tab is displayed in the access bar. Keyboard shortcut: **Ctrl** + **O**
 **Open with**	Lets you select the workflow and loads patient data for reading. The corresponding Patient tab is displayed in the access bar.

 **Print**	Opens the **Print** workflow step for printing the selected data Keyboard shortcut: **Ctrl** + **P**
 **DICOM Q/R**	Searches and retrieves studies from external media or DICOM nodes. This function only works, if remote DICOM nodes are configured or a CD/DVD/USB media containing a DICOMDIR is inserted on the local client PC. Keyboard shortcut: **Ctrl** + **R**
 **Import**	Imports files from external media, file systems, or network nodes. This function works even if no DICOMDIR is available. Keyboard shortcut: **Ctrl** + **I** (➔ Page 299 *About the import of data (images)*)
 **Export**	Exports DICOM data to external media, file systems, or network nodes. Keyboard shortcut: **Ctrl** + **E**
 **Correct Data**	Lets you correct patient data. (➔ Page 283 *Data correction and rearrangement*)
 **Delete**	Deletes data from Short Term Storage (STS). Only available, if the data is not protected from deletion. Note that the data cannot be restored after deletion.

Manage Raw Data	Opens the **Manage Raw Data** dialog box to delete, export or import raw data. (➔ Page 296 *Manage raw data*)
Recon	Starts the offline reconstruction. (➔ Page 671 *Performing an offline reconstruction*)

The search area of the Patient Browser

The search area of the **Patient Browser** consists of the following areas:



(1)	**Quick search** field	Finds a combination of the following data: • Patient Name • Date of Birth • Patient ID • Study Description • Study Date • Accession Number • Modality
(2)	**More Filters** area	Provides additional search conditions
(3)	**Add Condition** area	Adds or removes search condition fields from the **More Filters** area

Opening the Patient Browser

From the Scheduler, you can open the **Patient Browser** in two ways:



- On the access bar, click the **Patient Browser** icon.

  – or –

  At the bottom of the **Patient Registration** tab, click the **Local Data** button to see the studies belonging to the selected patient.

Adding / removing columns in the Patient Browser

You can add and remove columns in the displayed lists of the **Patient Browser**.

✓ The **Patient Browser** is open.



1 In the **Results** list, the **Series** list, or the **Instances** list, click the **Plus** icon to add or remove columns.

– or –

Right-click the header of the **Results** list, the **Series** list, or the **Instances** list.

The **Show Columns** dialog box opens.

2 To add a column, select the check box next to the column name.

The column will be added to the rightmost position of the list.

– or –

To remove a column, clear the check box next to the column name.



In the text field at the top, you can type a string to filter the list for column names containing this string.

You can restore the default column set with the **Reset** button.

3 Click **OK** to close the list.



You can reorder the columns with drag & drop.

Docking / undocking windows

You can undock certain windows, for example, the **Patient Browser** window, and make them a floating window.



1 Click this icon to undock the window and make it a floating window.

You can move the window to a convenient position. This position is preserved when you log on to the system next time.



2 Click this icon to dock the window.



In case you undock the **Patient Browser** window on a secondary monitor, it will cover the complete monitor and stays on top, even if images are loaded for reading.

8.4 About handling of studies and work lists in the Patient Browser

In the **Patient Browser**, you can manage studies and work lists according to your needs.

- You can search for studies and sort the search results by columns.
- You can group studies if you want to combine multiple studies into a single activity.
- You can select studies for archiving and you can earmark studies, so that you can locate them easily.

  (➔ Page 310 *Selecting data for archiving*)
- You can create and modify work lists as predefined queries. You can add or remove work lists from the work list bar.
- You can display DICOM header attributes of one specific instance, for example, a single image.

8.5 Data correction and rearrangement

In the **Patient Browser**, you can correct, add, or rearrange patient data and information.

Please note the communication between the RIS and the **Patient Browser**:

- Corrections in the **Patient Browser**:

  If you correct patient data and information in the **Patient Browser**, these corrections will **not** be sent back to the RIS.
- Corrections in the RIS:

  If patient data are corrected in the RIS, your system inherits these changes.

- To correct patient data and information, you can use the correction function of the **Patient Browser**.

  (➔ Page 285 *Correcting patient data*)

  (➔ Page 286 *Correcting study, series or instances data*)

- To rearrange studies, you can use cut and paste.

  (→ Page 287 *Merging patient data*)

  (→ Page 288 *Rearranging studies*)

  (→ Page 289 *Merging studies*)

  (→ Page 291 *Rearranging series*)

  (→ Page 291 *Merging series*)

- To split series, you can use a dedicated context menu entry.

  (→ Page 290 *Splitting series*)

- If the assignment between an acquired study and a scheduled procedure failed, you can manually assign studies or series to scheduled procedures.

  (→ Page 292 *Assigning studies or series to scheduled procedures*)

Effects of data correction and rearrangement

Data correction and rearranging of data has the following effect on the affected data:

- Affected reading applications are canceled.
- The **Corrected** flag is set.

  A tooltip shows you a list of the corrected attributes.

- A history entry is written into the Audit Log file.

  You can view this log file to keep track of all changes. (→ *See: Audit trail*)

- The last access time is set to the time of correction.
- The **Correction** dialog box forces you to decide whether to keep or discard results and findings as they may become inconsistent.

When you correct or rearrange data that has already been archived or exported, some PACS refuse to re-archive this data.

To avoid this, ask your IT Administrator to enable DICOM UID change in the **Administration Portal**.

(➔ *Enabling DICOM UID change for corrected data*)

8.5.1 Correcting patient data

In the **Patient Browser**, you can correct the personal data of a patient.

Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.

1 In the Patient View of the **Results** list, select a patient.

– or –

In the Study View of the **Results** list, select a study.



2 On the toolbar, click the **Correct** icon to open the **Correction of Patient/Study** dialog box.

3 Click the **Patient** tab.

If you have selected a patient from the Patient View of the **Results** list, you cannot select any other tab.

4 Correct or add data.

5 Click **OK** to confirm.

The **Correction** message prompts you to confirm your changes.

If you correct patient data to an extent, that it is not distinguishable from other patient data, you are informed that the patients will be merged.

Patient data are corrected.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(➔ Page 283 *Data correction and rearrangement*)

8.5.2 Correcting study, series or instances data

In the **Patient Browser**, you can correct any attribute of the selected element (study, series, or instance).

Additionally, you can correct the following attributes of sub-elements and the superior element:

- Attributes with identical values for all sub-elements
- All attributes of the superior element

For example, when selecting a series, you can correct any attribute on the **Series** tab. In addition, you can correct attributes with identical values for all instances on the **Instances** tab, and you can correct the attributes on the **Studies** tab.



Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.

1 In the **Results** list, select a study.

– or –

In the **Series** list, select the series.

– or –

In the **Instances** list, select the instance.



2 On the toolbar, click the **Correct** icon to open the **Correction of Study**, **Correction of Series**, or **Correction of Instance** dialog box.

3 Select the **Study**, **Series** or **Instances** tab.

4 Correct or add data.

Data correction can affect the modification of several studies, series, or instances depending on the attribute level. The number of affected studies, series, or instances is displayed.

The number of affected series and instances reflects the state of the system at the time point the correction was initiated.

5 Click **OK** to confirm.

The **Correction** message prompts you to confirm your changes.

6 Carefully decide whether to remove results and findings.

If critical attributes were changed, for example, the patient position, the results and findings are removed automatically.

Data is corrected.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(→ Page 283 *Data correction and rearrangement*)

8.5.3 Merging patient data

In the **Patient Browser**, you can merge patient data by cutting the patient data of one patient and pasting it to another patient.

Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.



1 In the **Results** list, activate the Patient View.

2 In the **Results** list, select the patient you want to merge with another patient.

   This patient will be removed at the end of the operation.

3 Right-click and choose **Cut** from the context menu to mark the source patient you want to merge.

4 In the **Results** list, select the target patient.

5 Right-click and choose **Paste** from the context menu to merge the source patient with the target patient.

   The **Merge Patients** message prompts you to confirm your changes.

All studies of the source patient will be moved to the target patient. The source patient is deleted.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(➔ Page 283 *Data correction and rearrangement*)

8.5.4 Rearranging studies

In the **Patient Browser**, you can move a study from one patient to another patient.

Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.



1 In the **Results** list, activate the Patient View.

2 In the **Results** list, select the study you want to assign to another patient.

You can only cut a single study. If more than one study is selected, the **Cut** menu item is deactivated.

3 Right-click and choose **Cut** from the context menu to mark the study you want to move to another patient.

4 In the **Results** list, select the patient, that shall own the study.

5 Right-click and choose **Paste** from the context menu to move the study.

The **Move Studies** message prompts you to confirm your changes.

6 Carefully decide whether to remove results and findings.

Patient data is corrected.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(→ Page 283 *Data correction and rearrangement*)

8.5.5 Merging studies

In the **Patient Browser**, you can merge studies by cutting the study and pasting it to another study.

Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.



1 In the **Results** list, activate the Study View.

2 In the **Results** list, select the study you want to merge with another study.

This study will be removed at the end of the operation.

3 Right-click and choose **Cut** from the context menu to mark the source study you want to merge.

4 In the **Results** list, select the target study.

5 Right-click and choose **Paste** from the context menu to merge the source study with the target study.

The **Merge Studies** message prompts you to confirm your changes.

6 Carefully decide whether to remove results and findings.

The studies are merged.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(→ Page 283 *Data correction and rearrangement*)

8.5.6 Splitting series

In the **Patient Browser**, you can split series by selecting instances of the series and creating a new series containing the selected instances.

Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.

1 In the **Instances** list, select the instances you want to create a new series with.

2 Right-click the instances and choose **Split to New Series** from the context menu.

The **Split Series** message prompts you to confirm your changes.

3 Carefully decide whether to remove results and findings.

The series is split.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(→ Page 283 *Data correction and rearrangement*)

8.5.7 Rearranging series

In the **Patient Browser**, you can move a series from one study to another study.

Already saved results and findings may become inconsistent.

You cannot move a series consisting only of Presentation States. Therefore, move the image series and the system will automatically move the PS series.

✓ You have appropriate user rights.

1 In the **Series** list, select the series you want to assign to another study.

You can only cut a single series. If more than one series is selected, the **Cut** menu item is deactivated.

2 Right-click and choose **Cut** from the context menu to mark the series you want to move to another study.

3 In the **Results** list, select the study, that shall own the series.

4 Right-click and choose **Paste** from the context menu to move the series.

The **Move Series** message prompts you to confirm your changes.

5 Carefully decide whether to remove results and findings.

The series are rearranged.

- The **Corrected** flag is set.
- Affected reading applications of the source study are canceled.
- Already saved results and findings may become inconsistent.

(→ Page 283 *Data correction and rearrangement*)

8.5.8 Merging series

In the **Patient Browser**, you can merge series by cutting the series and pasting it to another series.

Already saved results and findings may become inconsistent.

✓ You have appropriate user rights.

1 In the **Series** list, select the series you want to merge with another series.

This series will be removed at the end of the operation.

2 Right-click and choose **Cut** from the context menu to mark the source series you want to merge.

3 In the **Series** list, select the target series.

4 Right-click and choose **Paste** from the context menu to merge the source series with the target series.

The **Merge Series** message prompts you to confirm your changes.

5 Carefully decide whether to remove results and findings.

The series are merged.

- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

(→ Page 283 *Data correction and rearrangement*)

8.5.9 Assigning studies or series to scheduled procedures

If the assignment between an acquired study or series and a scheduled procedure failed, you can manually assign studies or series to scheduled procedures in the **Patient Browser**.

The information on scheduled procedures is acquired from the RIS by a DICOM Modality Worklist broad query.

Already saved results and findings may become inconsistent.

You cannot assign a series consisting only of Presentation States. Therefore, assign the image series and the system will automatically handle the PS series, too.

✓ You have appropriate user rights.

1 Click the arrow at the bottom of the **Patient Browser** to open the **Procedure List**.

Note that this tab is not available for all user roles.



2 To refresh the list, click the **Refresh** icon.

While the refreshing process is running, the **Refresh** icon changes its shape. To abort the refreshing process, click this icon.



3 From the **Results** list, select the study you want to assign to the planned procedure.

– or –

From the **Series** list, select the series you want to assign to the planned procedure.

You can only cut a single study or series. If more than one study or series is selected, the **Cut** icon is deactivated.

4 Right-click and choose **Cut** from the context menu to mark the study or series you want to assign to a scheduled procedure.

5 From the **Procedure List**, select the scheduled procedure, that should contain the study or series.

6 Right-click and choose **Paste** from the context menu to assign the study or series to the selected scheduled procedure.

The **Move Studies** or **Move Series** message prompts you to confirm your changes.

7 Decide whether to remove results and findings.

The study or series is assigned to the scheduled procedure.

- The **Results** list displays the study or series.
- The **Corrected** flag is set.
- Affected reading applications are canceled.
- Already saved results and findings may become inconsistent.

8.5.10 Removing the Corrected flag

Every time you correct or rearrange data in the **Patient Browser**, the **Corrected** flag is set for the data. This flag enables you to check whether data were corrected.

Information on the correction state are shown in the **Corrected** column of the **Results** list. A tooltip shows you the list of the corrected attributes.

If necessary, you can add this column to the displayed columns.
(→ Page 281 *Adding / removing columns in the Patient Browser*)

✓ The **Corrected** flag is set for a study.

1 In the **Results** list, select the study whose **Corrected** flag you want to remove.

2 Right-click and choose **Remove Correction state** from the context menu.

The **Corrected** flag is removed.

8.6 Loading of patient data

In the **Patient Browser**, you can load patient data for reading.

You can simultaneously load data for different patients which are then represented by different Patient tabs.

(→ Page 295 *Loading patient data for reading*)

(→ Page 295 *Loading additional data from the Patient Browser*)

8.6.1 Loading patient data for reading

In the **Patient Browser**, you can load studies, series, or instances for reading.

1 In the **Patient Browser**, select the corresponding study, series, or instance that should be opened.



2 To open the selected element in **MI View&GO**, click the **View&GO** icon.

– or –



To open the selected element with the assigned workflow, click the **Open** icon.

If no workflow is assigned, a default workflow is assigned and the workflow is started.

– or –



To assign another workflow before opening, click the **Open with** icon and select the appropriate workflow.

The Patient tab is opened, the workflow is started, and the images are loaded for reading.



If you re-open a workflow, the workflow will be displayed in the previous view. Ensure that the segments are displaying the data you expect.



If the image area remains empty after loading:

- The workflow assignment may not match. Use the **Series** panel to drop data into the image area.
- The default layout may not match. Select another layout.

8.6.2 Loading additional data from the Patient Browser

In the **Patient Browser**, you can load additional studies, series, or images for an already loaded patient.

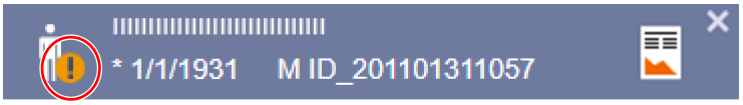
1 In the **Patient Browser**, select the desired data from the **Results** list, **Series** list, or **Instances** list.

2 Make sure that the selected data really belongs to the same patient.

3 Drag the data onto the corresponding Patient tab.

If additionally loaded data is not identified as belonging to the same patient, confirm the load operation.

In this case, the Patient tab displays an indicator for inconsistencies.



Depending on the layout, data is displayed in the image area.

(→ *See: Adding studies to the Series panel*)

8.7 Manage raw data

Every CT examination generates raw data that is used for the image reconstruction. Raw data is the persistent result of a scan and is the collection of related physical data.

CAUTION

Third party software offers the user the possibility to modify files in the system!

Manipulated software leads to loss of or inconsistent data, or damage to the system.

- Do not modify files in the file menu, except within folders explicitly allowed by the Instructions for Use.

  Any software manipulation is forbidden.

In the **Manage Raw Data** dialog box, you can use the following tabs to delete, export, or import raw data:

- **Delete** tab

  You can delete raw data, for example, images with insufficient image quality or corrupt images.

  You cannot delete raw data if the corresponding patient is open in the scan application or in the recon application.

  (→ Page 297 *Deleting raw data*)

- **Export** tab

  You can export raw data, for example, to send raw data to Siemens Healthineers Service to get support. You can refine the raw data series for the export, select the export destination, and specify whether the exported raw data will be anonymized or not. You can export raw data to external media or to the Windows file system.

- **Import** tab

  You can import data, for example, to reconstruct unfinished recon jobs offline of raw data that was previously exported. You can select the raw data files for the import. You can import raw data from external media or from the Windows file system.

8.7.1 Deleting raw data

In the **Patient Browser** from the **Results** list, you can select the raw data to be deleted. You can also simultaneously delete raw data for different patients.

You cannot delete raw data if one of the following conditions applies:

- The corresponding patient is open in the scan application or in the recon application.
- The recon job of the raw data is in status “Planning”, “Active” or “Queued”.
- The raw data job for export is in status “Active” or “Queued”.
- The raw data is protected manually. Protection is restored after restarting the system.

CAUTION

Raw data has been deleted, but additional reconstructions are needed for the final diagnosis!

Wrong diagnosis or additional radiation neccessary because of insufficient information.

- Before deleting raw data make sure that all potentially neccessary reconstructions are available for final diagnosis.

The necessary reconstructions depend on the clinical use case in terms of examination and diagnosis.

✓ The **Patient Browser** is open.

✓ The patients are listed in the **Results** list of the **Patient Browser**.

1 From the **Results** list, select the study that includes the raw data to be deleted.

– or –

From the **Results** list, select multiple studies of different patients that include the raw data to be deleted.



2 In the toolbar of the **Patient Browser**, click the **Manage Raw Data** icon.

The **Manage Raw Data** dialog box opens. In the **Delete** tab, all available raw data for the selected patient is displayed.

3 Select the check boxes of the raw data that you want to delete.

– or –

Select the check box in the heading to delete all displayed raw data.



You can only delete raw data that is not protected from deletion. Check the protection status in the **Protection Flags** column.

4 Click **Delete** to permanently delete the selected raw data.

The **Confirm Delete Raw Data** dialog box opens.

5 Click **Yes**.

The selected raw data is permanently deleted.

8.8 About the import of data (images)

With the help of the **Patient Browser**, you can import external image data into the database.

There are two ways to import data:

- **DICOM Retrieve**

  You can search for patients and studies on external media or on DICOM network nodes and import them to your local system.

  Only DICOM-compliant data are supported.

- **Import of images**

  You can import data from external media or from the Windows file system.

  Only DICOM-compliant data are supported.

  (➔ Page 299 *Importing images*)

8.8.1 Importing images

You can import image data from external media or from the Windows file system to the database of your system.

(➔ Page 299 *About the import of data (images)*)



1 On the toolbar of the **Patient Browser**, click the **Import** icon.

  The **Import** dialog box opens.

2 On the left of the **Import** dialog box, browse for a source or network path, or use the **Address** bar.

3 Select the data you want to import.

4 Click the **Import** button.

  A job is started. You can display information about the progress in the **Job View** ((➔ *About the Job View*)) or you can view the status icon on the status bar.

To remove a USB device after you are done, use the **Safely Remove Hardware** system tray icon provided by the operating system.

8.9 About the export of data (images)

Exporting data in DICOM format

Using the **Export Data** dialog box, you can export selected data in DICOM format.

You can export to the following locations:

- CD/DVD

  In case there is no CD/DVD drive available at your system, an image file (*.iso) will be created, and can be saved to a local drive.

- File system
- DICOM nodes

  For example, for archiving in the PACS

First, you select the data to be exported in the **Patient Browser** or in the Viewer:

(➔ Page 301 *Exporting from the Patient Browser*)

In the **Export Data** dialog box, you can refine the data selection and select the export target (➔ Page 303 *Screen layout of the Export Data dialog box*):

(➔ Page 302 *Exporting data to the file system*)

(➔ Page 302 *Exporting/sending data to DICOM nodes*)

For configuration, see:

(➔ Page 691 *Defining media writing profiles*)

Differences in exporting conditions:

- From the **Viewer**: Data of the **currently active** evaluation can be transferred as one data set.
- From the **Patient Browser**: **Any** data (for example, DICOM Structured Reports, Encapsulated PDFs, segmentations) can be transferred as one data set.

Exporting data in non-DICOM format is not supported. You cannot export images and movies in non-DICOM image formats (such as .JPG, .AVI, and .WMV).

8.9.1 Exporting from the Patient Browser

From the **Patient Browser** **any** data can be transferred as one data set such as:

- the complete data set of a patient

  To export the complete data set of a patient, you have to select all studies of the patient.
- selected studies and series
- single images or image stacks

  These images are transferred as secondary captures including all evidence objects, such as measurements.

1 In the **Results**, **Series** or **Instances** list of the **Patient Browser**, select the series, studies or images you want to export.

  In the Patient View, you can only select studies. You cannot select patient entries.



2 On the toolbar of the **Patient Browser**, click the **Export** icon.

  The **Export Data** dialog box opens and the data you have selected is displayed.

3 Adjust the relevant settings in the **Export Data** dialog box.

(➔ Page 302 *Exporting data to the file system*)

(➔ Page 302 *Exporting/sending data to DICOM nodes*)

(➔ Page 303 *Screen layout of the Export Data dialog box*)

8.9.2 Exporting data to the file system

You can export DICOM data to your local file system or to shared network drives by using the **Export Data** dialog box.

✓ The **Export Data** dialog box is open and data to be exported are available.

1 In the **Export Data** dialog box, deselect the data you want to exclude from export.

2 Select **File System**.

3 Select the **Target** and **Properties**.

4 Click the **Export** button.

An export job is started. You can display information about the progress in the **Job View** or you can view the status icon on the status bar.

(➔ *See: About the Job View*)

If you selected a USB device as target: to remove the USB device after you are done, use the **Safely Remove Hardware** system tray icon provided by the operating system.

8.9.3 Exporting/sending data to DICOM nodes

You can send DICOM data over network to other DICOM nodes by using the **Export Data** dialog box.

✓ The **Export Data** dialog box is open and data are available to be exported.

1 In the **Export Data** dialog box, deselect the data you want to exclude from export.

2 Select **Network**.

3 Select a **Target**. Only predefined DICOM nodes are available.

(➔ *See: Administration Online Help Configuring the DICOM export path*)

4 Click the **Export** button.

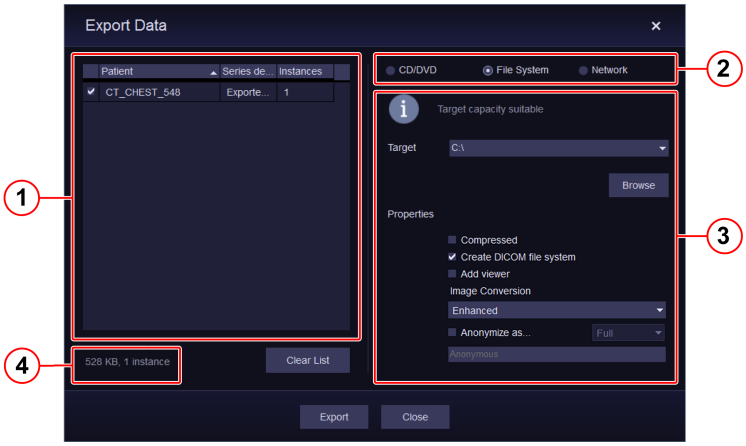
An export job is started. You can display information about the progress in the **Job View** or you can watch the status icon on the status bar.

(➔ *See: About the Job View*)

8.9.4 Screen layout of the Export Data dialog box

In the **Export Data** dialog box, you can adjust settings for the export of data to the local hard disk, to removable media, or to network nodes and start the export job.

The **Export Data** dialog box comprises the following sections:



(1) Data selection area
Contains a list of data available for export and check boxes for marking data to be exported
(➔ Page 301 *Exporting from the Patient Browser*)
The **Clear List** button removes all entries in the data selection area

(2) Export target area
Enables you to select whether to export data to a CD or DVD, to the file system, or to a network node
(➔ Page 302 *Exporting data to the file system*)

(➔ Page 302 *Exporting/sending data to DICOM nodes*)

(3) Export settings area
Changes with the selected export target option. You can select the target.

(4) Amount of selected data to be exported

8.9.5 Settings for data export

In the operations area of the **Export Data** dialog box, you can adjust all relevant settings for the selected export target.

(➔ Page 303 *Screen layout of the Export Data dialog box*)

In the following, you find an overview of all parameters to be adjusted when exporting selected data to **CD/DVD**, your **File System**, or other DICOM nodes in the **Network**.

- For exports to **CD/DVD**, parameters are set by the media profile. The parameters are displayed in the **Export Data** dialog box but cannot be modified. To change these settings, you have to adapt the media profile.
- For exports to the **File System**, parameters can be set and selected in the **Export Data** dialog box.

---

syngo.via can display incoming images that have DICOM grayscale Presentation States associated. The image display obeys the presentation parameters (like windowing, zoom/pan, annotations, measurements) described by these Presentation States.

For the export of such DICOM data to media or local file system, it is possible to choose between two output format types:

- **Interoperability**: the graphics on the source images are transformed into an interchangeable output format. Note that this output format might not have the best quality.
- **Enhanced**: the graphics format on the output images is the same as on the input, which ensures an optimal image quality.

If you selected **CD/DVD** as export target, the following parameters are available:

Target	Determines the drive of the media device
Action	When exporting data to CD/DVD, an ***.iso** image file containing a copy of the original CD/DVD is generated and stored on your local hard disk. In the **Export Data** dialog box, you can select your preferred option for proceeding: • **Burn** Automatically burns the data on CD/DVD on the basis of the ***.iso** image file. This option is selected by default. • **Open with Explorer** Opens the ***.iso** image file in the Windows Explorer, for example, to first view the file before burning the data on CD/DVD. **Note:** The last two ***.iso** image files are stored on your computer. **Image Conversion** • **Interoperability**: assures that the data is "understood" by any DICOM node, but enhanced features cannot be guaranteed. • **Enhanced**: preserves the enhanced features of the source images.

Media label	User-defined supplement of the CD/DVD label **Note:** Only letters, numbers and underscore are allowed, maximum 6 characters. The user-defined media label is extended with the current date and time (YYMMDDhhmm).
Profile	Determines the profile of the target medium, for example, Demo Medium, Patient Medium, or Standard (and private profiles) An export profile defines settings such as image compression, DICOM file system, addition of a viewer, and image conversion. You can add, modify, and delete these profiles. (➔ *See: Defining media writing profiles*).

If you selected **File System** as export target, the following parameters are available:

Target capacity	Shows if the capacity of the target medium is suitable for the current export job, or not
Target	Path in the file system (including shared network drives and USB devices). For easy navigation use the icons.
Properties	Export options: • **Compressed** Data is compressed before export • **Create DICOM file system** A file directory according to DICOM standards is created • **Add Viewer** A DICOM viewer software is added for viewing of the exported data • **Image Conversion** The options are: – **Interoperability**: assures that the data is "understood" by any DICOM node, but enhanced features cannot be guaranteed. If **Add Viewer** is selected, it cannot be modified. – **Enhanced**: preserves the enhanced features of the source images. • **Anonymize as** Data are anonymized – **Full**: DICOM-conform anonymization – **Reduced**: DICOM-conform anonymization. This option keeps UIDs, patient characteristics and date. Enter the name you want to have displayed as patient name.

If you selected **Network** as export target, the following parameter is available:

Target	Allows you to establish a connection to defined DICOM network nodes.

8.10 About the archiving of data (images)

If your system is connected to a PACS or a corresponding DICOM node, relevant data can be sent to an archive automatically or manually.

At least one DICOM node must be configured as a PACS.

For the archiving of data, you have the following general options:

- Globally all relevant data are archived automatically according to specific archiving rules
- Individually mark data in the **Patient Browser** for automatic archiving (➔ Page 310 *Selecting data for archiving*)
- Individually select data in the **Patient Browser** to send them to the archive manually (➔ Page 311 *Archiving data manually*)

The archive status of objects may change to "Archive failed" after archiving.

If the following factors are combined, the archive status of objects may change to **Archive failed** after archiving:

- low bandwidth
- lossy compression
- disabled storage commitment

To avoid this situation please check the following options:

- **Transfer format optimizations** is set to **Preference to uncompressed format (Optimize CPU Load)**
- **Default Media Compression** priority contains only lossless compression algorithm.
- **Storage Commitment** is enabled.
- **Transfer Syntaxes** are not excluded on SCU and SCP side.

Depending on the configuration, data is archived with the following settings:

- **Interoperability**: the graphics on the source images are transformed into an interchangeable output format. Note that this output format might not have the best quality.
- **Enhanced**: the graphics format on the output images is the same as on the input, which ensures an optimal image quality. (➔ Page 691 *Defining media writing profiles*)

You may also be interested in the following topics:

- View information on the archive status of data (➔ Page 309 *Information on the archive status of data*)
- Check for successful archiving (➔ Page 311 *Checking for successful archiving*)
- Prevent data from being archived (➔ Page 310 *Preventing data from being archived*)

8.10.1 Information on the archive status of data

Information on the archive status of data is shown in the **Study Archived**, **Series Archived**, and **Archive Status** columns of the Patient Browser.

The following archive statuses are possible:

- **Not to be archived**

  Data will not be archived.

- **To be archived**

  Data will be archived during the next archiving interval, as defined in the **Administration Portal**.

- **Queued for archiving**

  Archiving is running and the data is in the queue to be archived.

- **Archived**

  Data was successfully archived.

- **Archive failed**

  Data could not be archived.

To check if data was archived successfully, you can search for data that was neither archived nor deleted in the **Patient Browser**. (➔ Page 311 *Checking for successful archiving*)

You may also be interested in the following:

(➔ Page 310 *Selecting data for archiving*)

8.10.2 Preventing data from being archived

Information on the archiving state are shown in the **Study Archived**, **Series Archived**, and **Archive Status** columns of the **Patient Browser**. If necessary, you can add these columns.

1 In the **Results** list of the **Patient Browser**, select the desired studies.

2 Right-click and choose **Set Archive state > Prevent from Archiving** from the context menu.

You may also be interested in the following:

(➔ Page 309 *Information on the archive status of data*)

(➔ Page 310 *Selecting data for archiving*)

(➔ *Configuring archives*)

8.10.3 Selecting data for archiving

In the **Patient Browser**, you can mark data for archiving.

Data will be archived by the next archiving session as defined in the **Administration Portal**. If required, you can trigger archiving of selected data manually.

Information on the archive status of data is shown in the **Study Archived**, **Series Archived**, and **Archive Status** columns of the **Patient Browser**.
(➔ Page 309 *Information on the archive status of data*)

✓ You have the appropriate user rights.

1 In the **Results** list of the **Patient Browser**, select the required studies, series, or instances.

2 Right-click and choose **Set Archive state > Mark for Archiving** from the context menu.

Archiving will start as defined in the **Administration Portal**.

You may also be interested in the following:

- (→ *Configuring archives*)
- (→ Page 311 *Archiving data manually*)
- (→ Page 308 *About the archiving of data (images)*)

8.10.4 Archiving data manually

In the **Patient Browser**, you can archive data manually.

Information on the archive status of data is shown in the **Study Archived**, **Series Archived**, and **Archive Status** columns of the **Patient Browser**. (→ Page 309 *Information on the archive status of data*)

✓ A default archive is configured.

✓ You have the appropriate user rights.

1 In the **Results** list of the **Patient Browser**, select the required studies, series, or instances.



2 Click the **Send to Archive** icon.

Archiving will start without delay.

You may also be interested in the following:

- (→ *Configuring archives*)
- (→ Page 310 *Selecting data for archiving*)
- (→ Page 308 *About the archiving of data (images)*)

8.10.5 Checking for successful archiving

In the **Patient Browser**, you can search for data that was neither archived nor deleted.

✓ The **Patient Browser** is open.

1 Click **More Filters** to open the **More Filters** area.

2 In the **Study Archived** field, select “Queued for archiving”.

In the **Workflow Status** field, select “Completed”.

If required, you must add these fields to the **More Filters** dialog box first.

3 In the **Results** list, search for archivable data older than 48 hours.

4 Check why this data was neither archived nor set to “not to be archived”.

Data in status “Queued for archiving” are waiting for a storage commit response from the archive. Depending on the archive, this process can take a couple of days.

Also check whether there are workflows in status “Saved” and complete them. Otherwise the results may be automatically deleted as they are in status “Not to be archived”.

You may also be interested in the following:

(➔ *Configuring archives*)

(➔ Page 310 *Selecting data for archiving*)

9 The Job View

The **Job View** provides an overview of queued, active, and executed jobs. (➔ Page 313 *Screen layout of the Job View*)

It allows you to check the job status and progress as well as to manage jobs, for example in the **Recon Job View**. (➔ Page 319 *Recon Job View*) (➔ Page 316 *Working with the Job View*)

Additionally, you can use the **Job View** for error handling and monitoring.

9.1 Screen layout of the Job View

The **Job View** screen contains the following main areas:



(1) **All Jobs/My Jobs**
For each job type, you can select to display all jobs available in the system, or only jobs that you have initiated.

(2) **Job Type Control** area

Allows selection of a certain job type, for example **Network** jobs. The currently selected job type is highlighted and the corresponding jobs are displayed in the job list.

(3) **Job list**
Shows the jobs corresponding to the selected job type. The columns provide job-related information, for example, the job status or the patient name. The column headers allow filtering.

(4) **Messages**
Displays status and processing messages for the selected job.

(5) **Buttons**
Provides various buttons for the selected jobs, depending on job type and status.

(6) **Status** bar
Shows small icons as indicators for different job types and statuses.
(➔ Page 314 *Job status icons*)
Additionally, the current time is displayed.

9.1.1 Job status icons

Jobs are displayed as small icons on the status bar of the application.

In case of exceptions, warning symbols or error symbols are displayed together with the job type icon. You can move the mouse pointer over a status icon to display details in a tooltip.

The following describes the possible statuses using the print job icons as an example:

	At least one job is running. There are currently no failed jobs of this job type.
	At least one job of the job type failed.
	At least one job of the job type failed and failures have been looked up.
	The job cannot be processed, for example the printer is out of paper.

9.2 About jobs

A job is the representation of a longer-running background task, normally using a dedicated processing resource, for example, a network connection, a printer, a media device, or a processor.

Depending on the resource, different job types are defined. These job types can summarize several single jobs, for example the network job type can include send and retrieve jobs.

Depending on your installation, different job types are available.

Typical examples of jobs are:

- Sending a series of images to a PACS in the network (network job).
- Exposing a film sheet on a DICOM printer (print job).

9.2.1 Initiation of jobs

You can initiate jobs on the local application, for example in the **Export Data** dialog box or in the **Print** workflow step.

Some jobs require clinical administrator rights, for example deleting procedures permanently. Other jobs, such as automated jobs, are started by the system.

9.2.2 Statuses of jobs

Each job has a specific status that is displayed in the **Status** column of the job list area. The type of status can vary according to job type. For example, a print job may have other statuses available than a media job.

9.2.3 Job behavior when closing Symbia Pro.specta X3

If you close the system while a job is running which uses local resources, for example, writing data on a CD, or if the system is forced to shut down, the running jobs are stopped and set to status *failed*. You can restart the jobs the next time you start the system.

Some jobs may run on the server and are not affected by closing the local application. Spooled jobs at the server are not terminated, such as network send jobs or DICOM print jobs.

Certain operations have expiration times which result in an automatic deletion of jobs. These expiration times are not reset when you stop and restart the Symbia Pro.specta X3 server.

9.3 Working with the Job View

Depending on the job type, you can perform different actions in the **Job View**. For example, for better orientation, you can filter jobs and customize the information displayed on jobs.

- View information on the jobs
- Filter and sort the displayed jobs (except for **Raw Data**)

  (➔ Page 317 *Filtering and sorting jobs*)

  (➔ Page 318 *Customizing filter attributes in the Job View*)
- Prioritize, cancel, or delete recon jobs

  (➔ Page 320 *Managing recon jobs*)

9.3.1 Opening the Job View

You can open the **Job View** in two ways:



◆ On the access bar, click the **Job View** icon.

– or –



On the status bar, click a job status icon.

9.3.2 Viewing job information

In the **Job View**, you can view detailed information on the jobs.

✓ The **Job View** is open. (➔ Page 316 *Opening the Job View*)

1 In the **Job Type Control** area, select a job type.

   In the **Status** column the current job status is displayed.

   In the **Progress** column the percentage of completion of the job is displayed.

2 In the job list, click a job to view the corresponding information in the **Message** field.

   Note that after the message field has displayed a result, the corresponding data may not already be available for processing.

3 On the status bar, place the mouse on a status icon to view more information.

After a media import job has been canceled, the number of imported instances might not be equal to the number of instances displayed as imported in the **Job View**. Check the number of instances in **Job View** and compare it with the number of the actually imported instances in the **Patient Browser**.

For information on group job progress, go to (➔ Page 648 *Group reconstruction job progress*).

9.3.3 Filtering and sorting jobs

For better orientation in the **Job View**, you can filter jobs.

You can sort the job list by any column header in ascending or descending order.

Filtering cannot be applied on **Raw Data** jobs.

To make the display of sorted jobs more efficient, you can rearrange and replace columns. (➔ Page 318 *Customizing filter attributes in the Job View*)

Your settings for filtering and sorting is retained when you close the **Job View** and open it next time.

✓ The **Job View** is open.

1 In the **Job Type Control** area, click a job type to display only the corresponding jobs in the job list.

2 Select **All Jobs** to display all jobs that have been initiated in the system for the displayed job type.

– or –

Select **My Jobs** to display only jobs that you have initiated for the displayed job type.

3 In the job list, select the desired filter criteria from the column headers.

4 In the job list, click a column header to sort the information in the job list in ascending or descending order.

A small arrow icon indicates the current sort sequence.

9.3.4 Customizing filter attributes in the Job View

In the **Job View**, you can customize your filter attributes.

✓ The **Job View** is open.

1 In a job list, right-click a column header.

The **Column Settings** dialog box opens.

2 Select an attribute and click the **Move left** or **Move right** arrows to add or remove the selected attributes to or from the **Selected Attributes** field.

3 To arrange the sequence of columns, select an entry in the **Selected Attributes** field and click the **Move up** and **Move down** arrows.

4 Click **OK** to confirm.



You can also change the order of the columns in job lists by using drag & drop.

The attributes displayed in the **Column Settings** dialog box differ depending on the selected job type. The attributes are displayed in two lists:

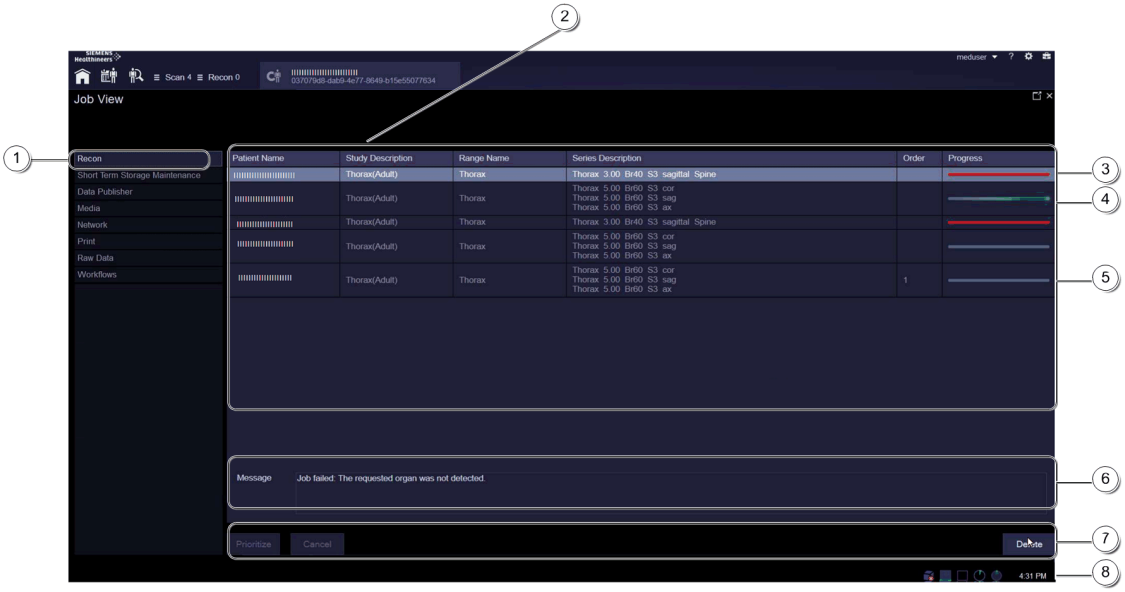
Selected Attributes	Lists the attributes which are currently displayed as column headers
All Attributes	Lists the attributes which are available to be displayed as column headers

9.3.5 Recon Job View

The **Recon Job View** provides a job list of active, queued, or failed recon jobs of all examination workflows.

You can open the **Recon Job View** in one of the following ways:

- Clicking the **Recon** job status icon in the status bar
- Clicking the **Job View** icon in the access bar and selecting **Recon** in the **Job Type Control** area



Recon Job View

(1) Job type **Recon**
(2) Recon job list
(3) Failed recon job

(4) Active recon job
(5) Queued recon job
(6) Message area
(7) Action buttons: **Prioritize**, **Cancel**, **Delete**
The operability of the buttons depends on the status of the selected recon job.
(8) Recon job status icon ("failed" in this example)

Managing recon jobs

The sub-recon jobs of a **Multi Recons** recon job are treated as one.

Prioritizing queued recon jobs

You can move a queued recon job to the top of the processing queue of recon jobs.

1 Among the queued recon jobs, select the one that is to be processed next.
2 Click the **Prioritize** button.

The selected recon job is moved to the top position in the processing queue. The sequence of the remaining recon jobs is not affected.

Once a recon job is completed, it is deleted from the job list.

This is not applicable to MI reconstruction jobs.

Canceling recon jobs

You can cancel an active or a queued recon job in the processing queue.

1 Select the recon job.
2 Click the **Cancel** button.

If you selected an active recon job, it is stopped and set to **Canceled**.

If you selected a queued recon job, it is removed from the processing queue.

For information on group reconstruction canceling, go to (➔ Page 648 *Group reconstruction job progress*).

Deleting failed recon jobs

You can delete a failed recon job from the recon job processing queue.

1 Select the failed recon job.

   In the **Message** area, the reason for the failure is displayed.

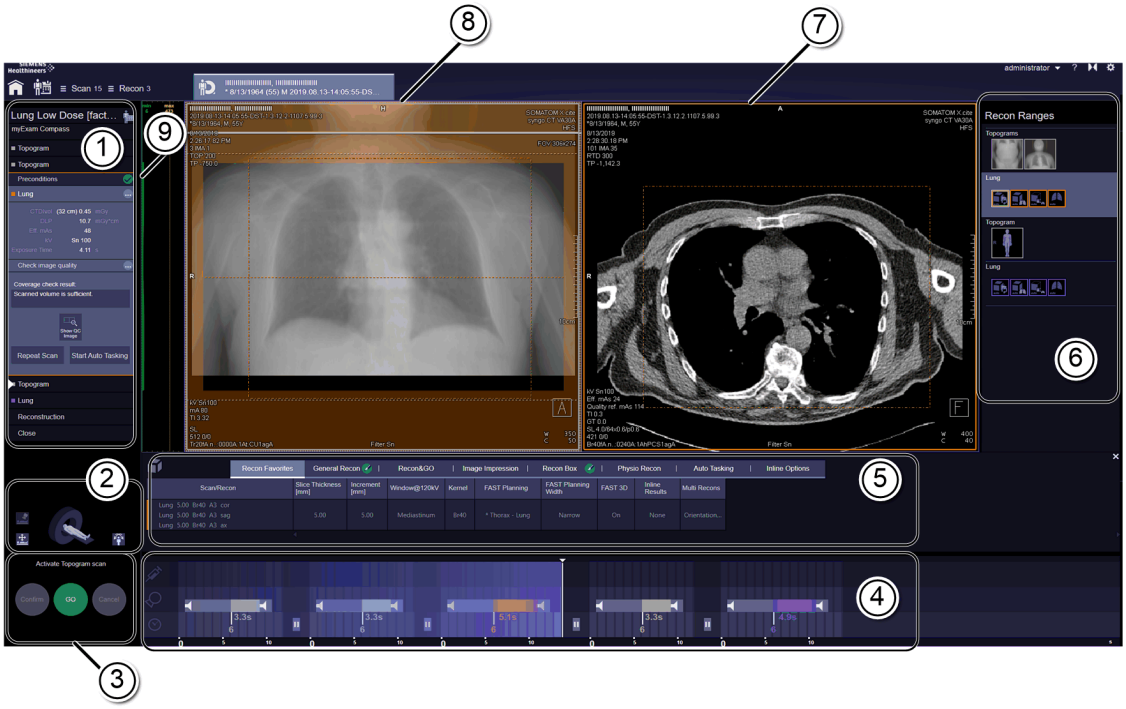
2 Click the **Delete** button.

   The failed recon job is deleted from the job list.

You can repeat the recon job by opening the patient as a **Recon** patient, correcting the reason that led to the failure and performing a new reconstruction.

For information on group reconstruction deleting, go to (➔ Page 646 *Group reconstruction delete*).

10 Screen layouts of the *syngo* Acquisition Workplace



(1) Taskflow control
Displays the examination tasks in chronological order:
Protocol (➔ Page 361 *Protocol selection*)
myExam Compass (➔ Page 375 *myExam Compass*)
Topogram
Scan
Reconstruction
Close (➔ Page 673 *Finalizing the examination*)

(2) Patient position area
Displays the current patient position and position control icons.

(3) Execution control
Displays the control buttons.

(4) Timeline

Displays the scan ranges in the chronological order in which they appear on a time axis.

(5) Parameter panel
Displays the available scan and recon parameters. The parameter panel is not displayed by default.

(6) **Recon Ranges** area
Displays the recon ranges for each scan range. A recon range is indicated by a recon icon.

(7) Tomogram segment
Displays the acquired tomogram. (➔ Page 455 *Tomogram scan acquisition*)

(8) Topogram segment
Displays the acquired topogram. (➔ Page 436 *Representation of a topogram in the topo segment*)

(9) CARE Profile
Displays the dose curve. (➔ Page 505 *CARE Profile*)



(1) **Scan Worklist** icon
Opens the list of patients that are scheduled for scanning.

(2) **Recon Worklist** icon
Opens the list of patients with at least one open recon job.

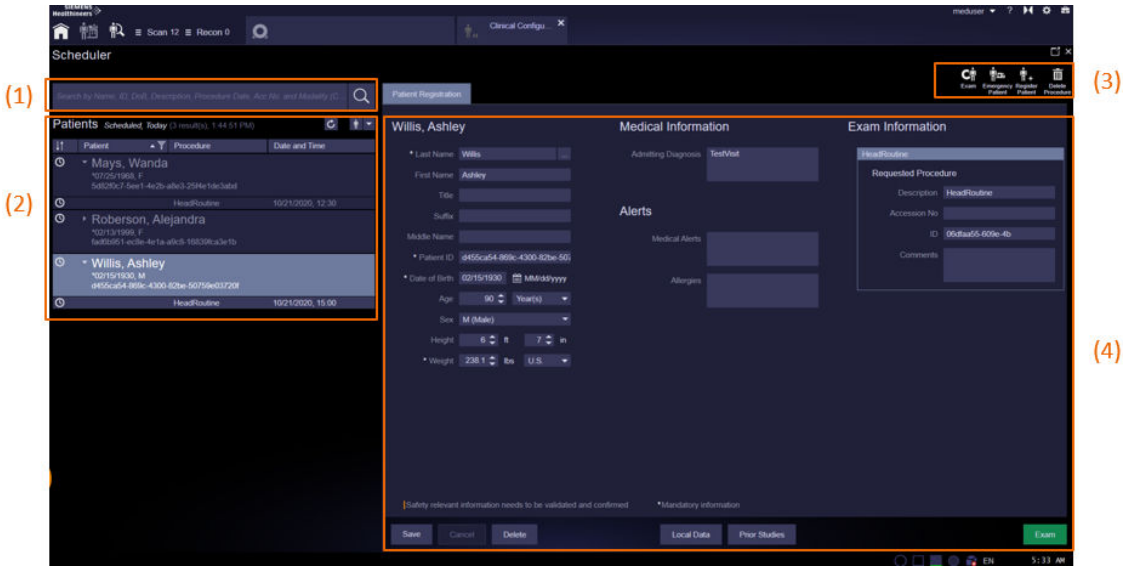
(3) **Scan Patient** tab
Contains the current scan patient.

(4) **Recon Patient** tab
Contains an open recon patient. Several recon patients can be opened.

10.1 Screen layout - Scheduler

From the **Home** page, click the **Examination** tile. The Scheduler screen is displayed.

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) Search Area
(2) Patient List
(3) Toolbar
(4) Patient Registration

Toolbar Icons:

- **Exam**: Starts the scan workflow.
- **Emergency Patient**: Automatic registration of an emergency patient.
- **Add Patient**: Registration of a new patient.
- **Add Procedure**: To add a procedure to a registered patient.
- **Broad Query**: Refreshes the Patient List from the RIS (Radiological Information System). (Only available if the system is connected to RIS.)
- **Patient Query**: Retrieves patient data from a selected RIS. (Only available if the system is connected to a RIS.)
- **Delete Procedure**: Removes a locally registered patient from the Patient Lists as long as the examination has not been started yet.

10.2 Screen layout - protocol selection

From the **Scheduler** screen, select a patient from the **Patients** , and click the **Exam** button. The Protocol Selection screen is displayed.

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) Requested Procedure Linkage
(2) Protocol Folders
(3) Physiological Signal
(4) Protocol List

Requested Procedure Linkage: If check box is selected, then the protocol used will be linked and appears in short-list or is automatically selected. If clicked (unchain), the selected protocol will be unlinked.

Protocol Folders: Click the folders or body parts to browse.

Physiological Signal: Available for Internal ECG Advanced and Symbia Pro.specta X7 system with the CT Cardiac option.

To select a protocol from the **Protocol List**:

- Double click the protocol.

  Single click the protocol, and then click the **Add** button.

- Single click the protocol, and then click the **Replace** button.

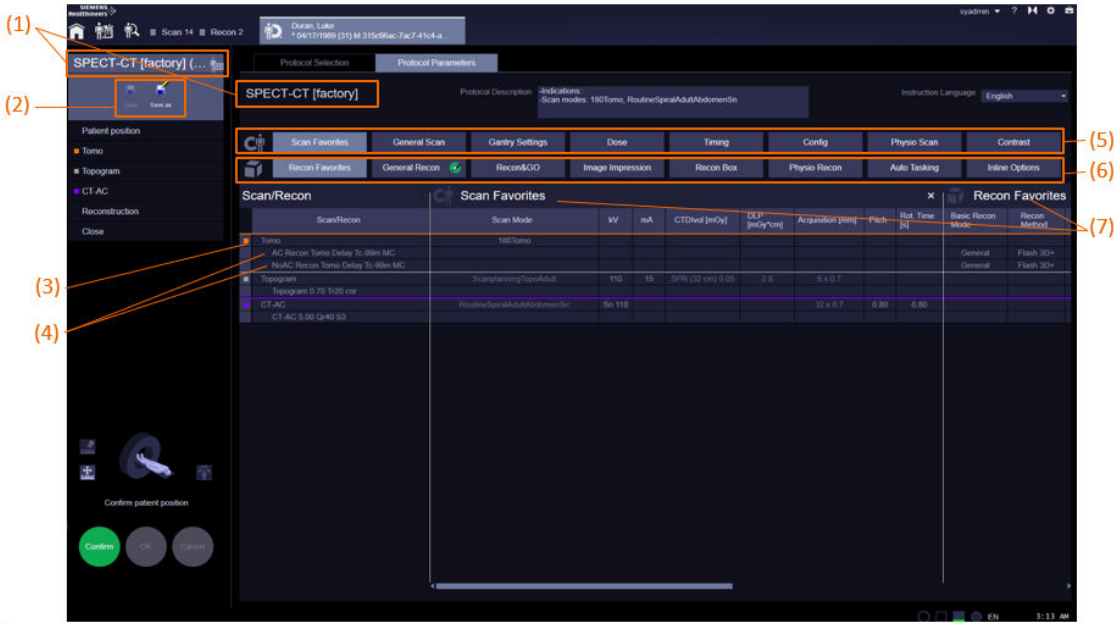
If available, the system displays the protocol's short-list based on the requested procedure.

10.3 Screen layout - parameter list view

With the Protocol Selection screen displayed, click the **Protocol Paramter** tab to display the Parameter List View (PLV).



The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) Protocol Name
(2) Save Protocols
(3) Scan Range Name
(4) Recon Range Name
(5) Scan Categories
(6) Recon Categories
(7) Category name

10.4 Screen layout - exam

Once a protocol is selected, click the **OK** button to display the exam.

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

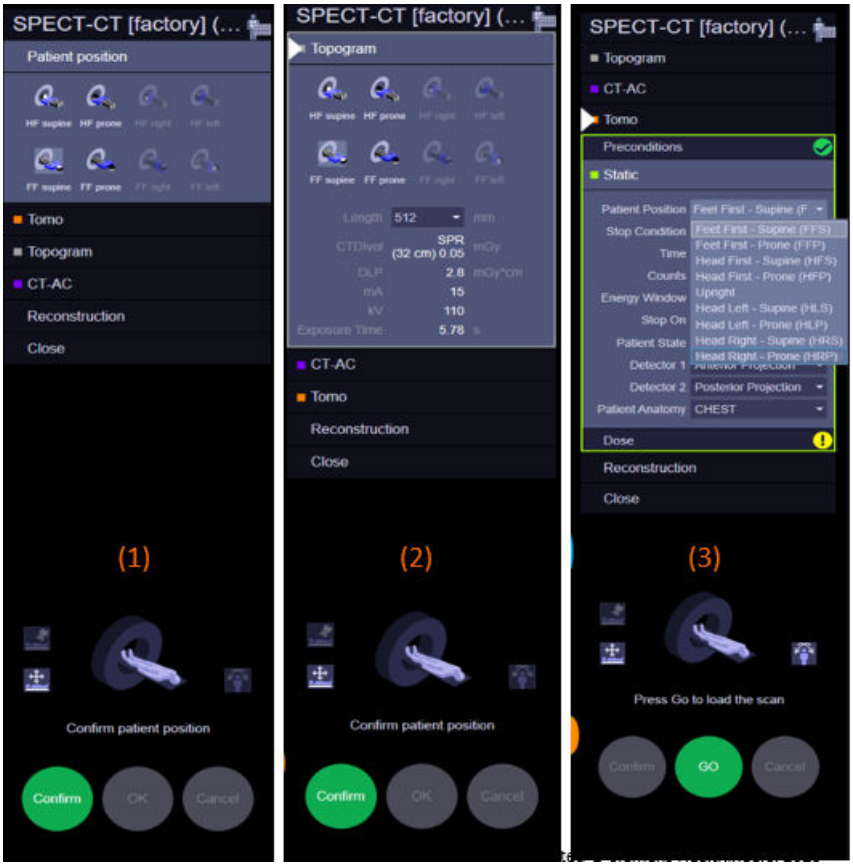


(1) Protocol
(2) Scan Tasks
(3) Patient and Table Position
(4) Control Buttons
(5) Patient Information
(6) Image Display
(7) Physiological signal
(8) Heart Beats Histogram
(9) Timeline
(10) Recon (Reconstrution) Browser

10.5 Screen layout - patient position selection

Once a protocol is selected, click the **OK** button to display the exam.

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) SPECT
(2) Topogram
(3) Planar

Confirm Patient Position

The task **Patient position** will appear or be added to the task list for various protocols.

The displayed instruction **Confirm Patient Position** can be acknowledged by clicking the console **Confirm** button or pressing the **Confirm** button on the gantry display.

If a SPECT scan is performed first, a separate **Patient position** task is added to the task list.

If a topogram scan is performed first, a **Patient position** task is included for the **Topogram** task.

For a planar scan, the **Patient position** task is included in the task list.

Same Patient Position for multiple scans

When performing consecutive scans (for example: Topogram, CT tomogram, and SPECT), the **Patient position** task is confirm for the first scan. This **Patient position** task is used for all subsequent tomographic scans. The system assumes that the patient is in the same position for all scans; therefore any 2D image (Quality Control Image (QCI) and topogram) of a completed scan can be used as a planning image for the others.

Each planar scan will always have a separate **Patient position** task.

Change Patient Position

To change patient position, click the **Change Patient Position** icon



The patient position is automatically changed when selecting **Examination Resume**.

10.6 Performing scan range planning

To perform the scan range planning, you can use:

- Plan&Go ruler
- Hand Control
- Control Box

Using Plan&Go, press start and stop points on the patient table's lighted ruler running the length of the patient table to set the patient's scan range.

Using the hand control, press the patient table and pallet movement buttons or use the predefined motion buttons to move the patient table pallet to the area of interest under the SPECT detectors.



Patient Table and Pallet Movement Buttons

For a topogram and CT scan, press the predefined motion buttons to automatically move the patient table pallet to a predefined location (index) for the CT position (Brain or Body).



Patient Table Motion Buttons

For a topogram and CT scan, press the predefined motion buttons to automatically move to a predefined location (index) to the CT position, and press the **Laser** button to activate the lasers to aid in positioning the patient in the area of interest for the start of the scan.

10.7 Scan range planning with Plan&Go

Plan&Go provides a finger-controlled, Light Emitting Diode (LED) ruler along the side of the patient table to quickly see and set the planned scan range distance for a patient.



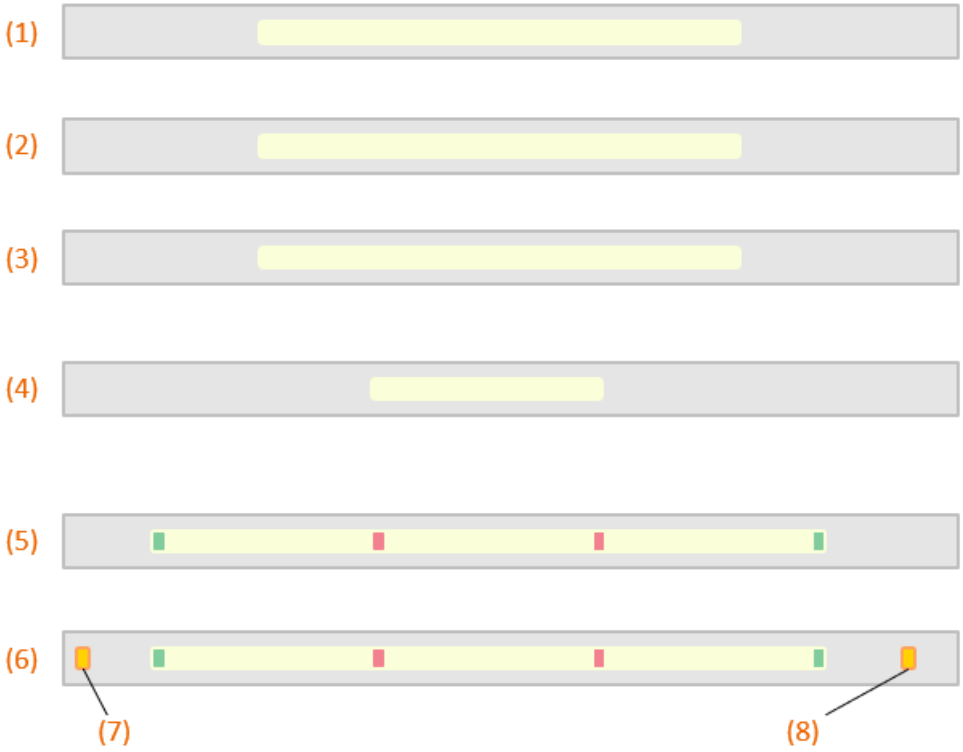
The patient table must be fully retracted and the patient position confirmed to use Plan&Go.

- The default position is based on a Target Region from the protocol.
- The system plans the first scan of the protocol, and subsequent tomographic scans with the same patient position can be planned using graphical range planning.

Plan&Go can be used with the following scan types:

- CT Topogram
- CT Tomogram
- Single-bed SPECT scan
- Multi-bed SPECT scan
- Wholebody Planar

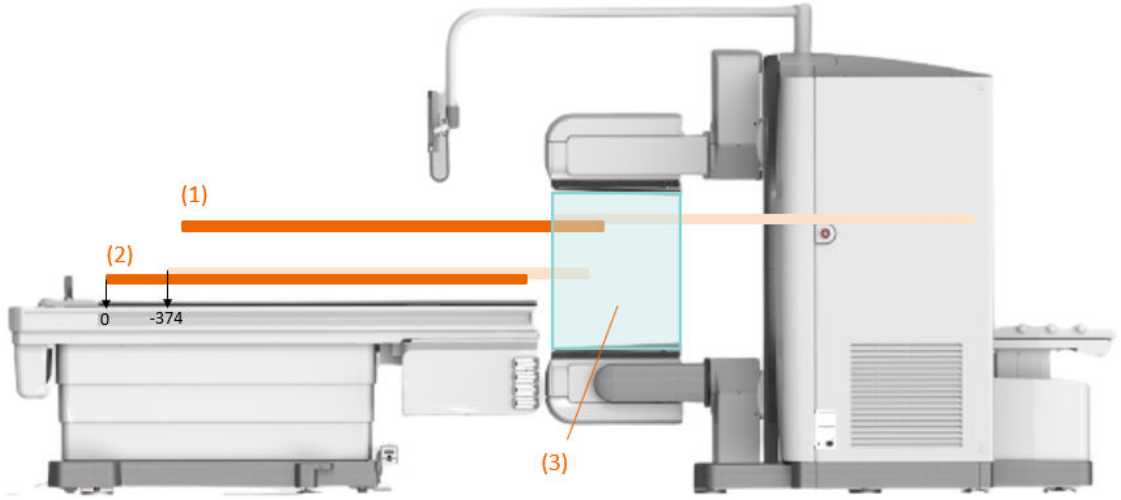
Plan&Go is not available for brain protocols, or static, dynamic, or gated planar protocols.



Plan&Go Ruler Graphical Range for Planning

To set the scan range on the ruler, hover your finger over the initial scan start position on the ruler. The ruler's sensor will detect your finger movement. The LEDs will light as you hover your finger across the ruler to define the scan length.

- (1) Wholebody Planar - Continuous Mode: Hover your finger across the start and stop positions.
- (2) CT Topogram- Continuous Mode: Hover your finger across the start and stop positions.
- (3) CT Tomogram- Continuous Mode: Hover your finger across the start and stop positions.
- (4) Single-bed SPECT - Single-Bed Mode: Hover your finger over the center of scan range, and then move your finger across the scan range.
- (5) Multi-bed SPECT - Multi-Bed Mode: Hover your finger over the green area to add a bed. Hover your finger over the red area to remove a bed. Hover and move your finger to set the overall scan range.
- (6) For SPECT and CT scan ranges, these lights mark where a CT scan is not possible.
- (7) The distance is set at 7 centimeters for CT scans.
- (8) Variable depending on SPECT and CT scan setting for small rooms.



An example of the CT Body Index and CT Brain Index scan range:

- (1) Body Scan - Moves to CT Body Index
- (2) Brain Scan - Moves to CT Brain Index
- (3) Planned Scan Range

When the pallet is positioned between 0 and -374, then CT Brain Index is chosen.

When the pallet is positioned beyond -374, then CT Body Index is chosen.

10.8 Scan Preconditions

Scan preconditions are designed to help correct scan conflicts. There are two different types of scan preconditions:

 **Error** – A scan is blocked until the precondition is resolved. For example: **Perform touchpad test.**

 **Warning** – A scan is able to continue. For example: **CT scan range is shorter than SPECT range.**

For SPECT scans, the preconditions are available in the following areas:

- Gantry Check
- Calibration Check
- Parameter Check

Possible SPECT Scan Precondition messages are:

 Text explanations appearing in parentheses in the table are information only and do not appear in the messages.

Gantry Check	Gantry Check	Calibration Check	Parameter Check
Collimator match protocol	Adapt scan length based on planned position for WB (WholeBody) SPECT	Flood correction calibration is missing or overdue	Invalid scan parameters

Gantry Check	Gantry Check	Calibration Check	Parameter Check
Touchpad test expired	Pallet is declutched (released and can move)	Head alignment calibration is missing or overdue	Trims (cuts off) length of WB planar based on table position
System not motion homed	Bed (patient table) is undocked	NMCT FOV (Nuclear Medicine Computed Tomography Field Of View) calibration is missing	Trims number of bed of WB SPECT based on table position
E-Stop (emergency stop) is engaged	Scintimammography pallet present	Sensitivity calibration is missing or overdue	
Detector rotation and lateral offset is not 0	Pediatric pallet present		
ECG (electrocardiogram) signal present for cardiac scans	Collimator cart docked		
Detector 2 is tilted			
NCO (Non-Circular Orbit) Pre-scan not selected for cardiac scans			
CT range if it is less than SPECT range			

10.9 CT scan preconditions

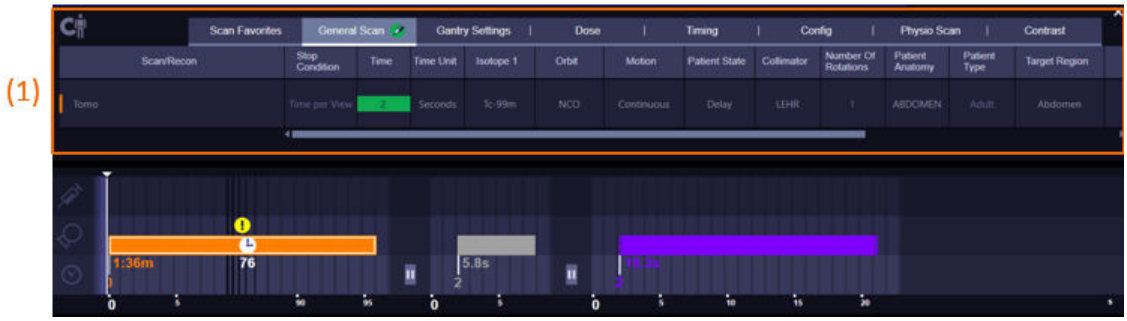
If the CT scan range cannot be loaded, possible causes might include:

- Not enough disk space or system capacity available
- Invalid position of the patient table
- Topogram too short
- Reconstruction ranges contain gaps
- Tube load conflict

10.10 Scan parameter panel

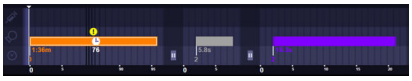
The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

Parameters can be changed from either the parameter panel or scan panel. Both display a protocol's scan or reconstruction's parameters which can be modified.

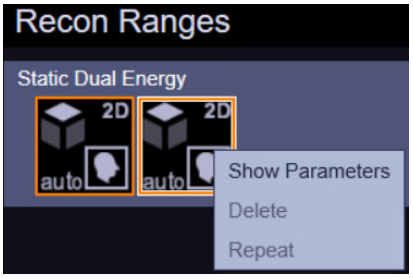


(1) Example Parameter Panel

A parameter panel is displayed by either double-clicking on a scan's timeline or a reconstruction in the **Recon Ranges** area. It can also be displayed by right-clicking over scan timeline or reconstruction range. A pop-up appears from which you can select **Show Parameters**.

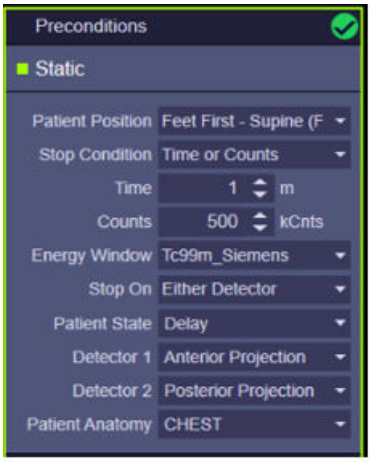


Example Scan Timeline



Example Recon Ranges Area

A scan panel can be displayed by clicking and expanding a task in the task list. Its parameters are displayed and can be modified.



Example Scan Panel

10.11 Rearranging scans within exam workflow

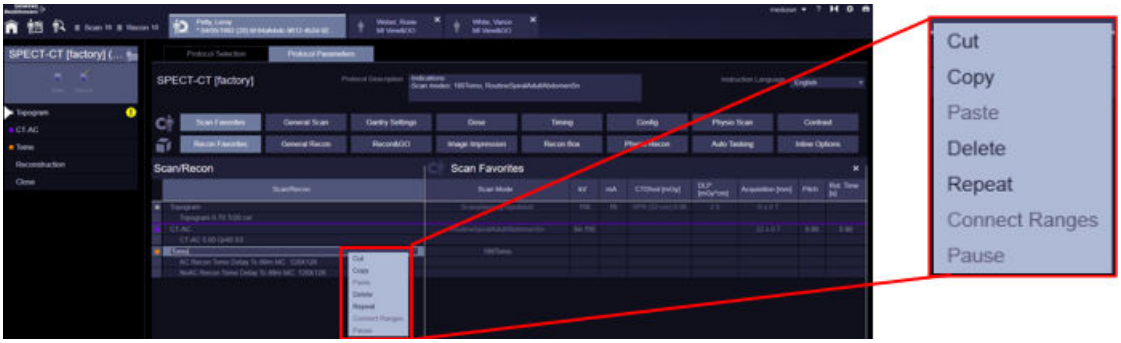
The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

To rearrange a scan within the timeline, you can drag and drop a scan task to move it. Click the scan area to be moved on the timeline, hold down the mouse button and move (drag) the cursor to the new location, and release the mouse button to insert (drop) the scan.



(1) Scan area to be rearranged.
(2) New location to drop scan.
(3) Another location to drop scan.

You can also rearrange a scan task from the **Protocol Parameters** tab. Select a scan or reconstruction task from within the protocol's Parameter List View (under **Scan/Recon**).



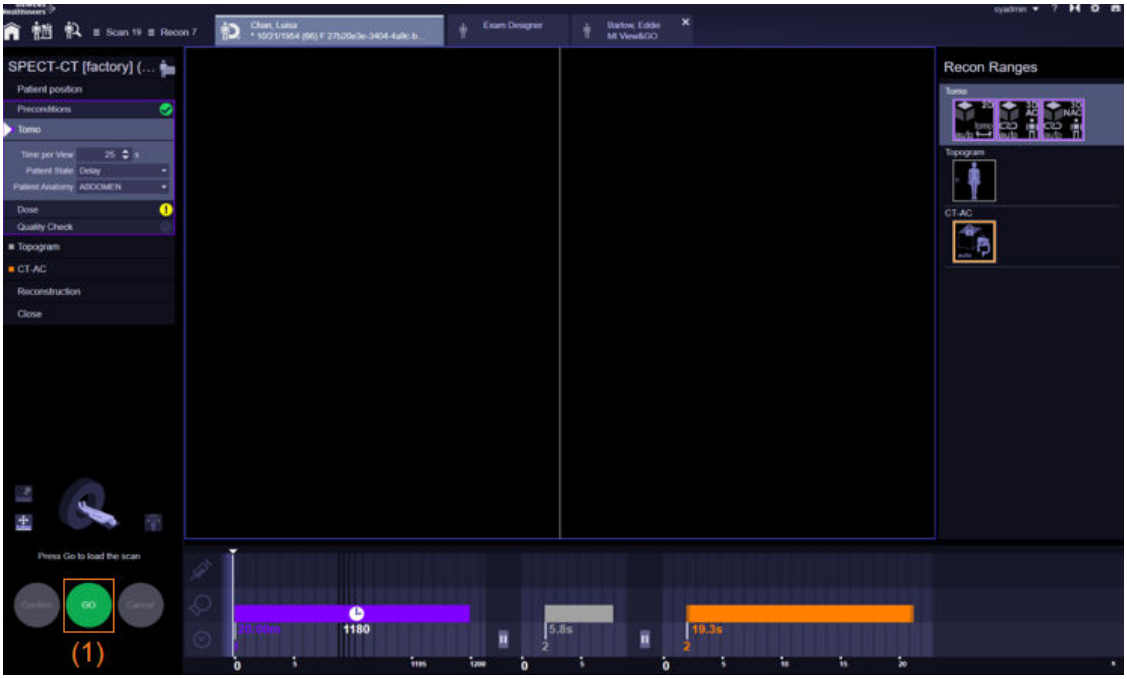
Right click to display a pop-up, and then select to **Cut**, **Copy,** or **Paste**. Selections for **Delete**, **Repeat**, **Connect Ranges**, and **Pause** are also available depending on the action being performed.

10.12 Loading a scan

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

To begin performing a protocol and its tasks in the task list, click the **GO** button at the bottom of the screen's control area to load a scan which will begin the setup for acquisition.

When a parameter or patient table position is changed, the scan will need to be loaded again to ensure the changes are saved.



(1) Go Button

10.13 Moving to start

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

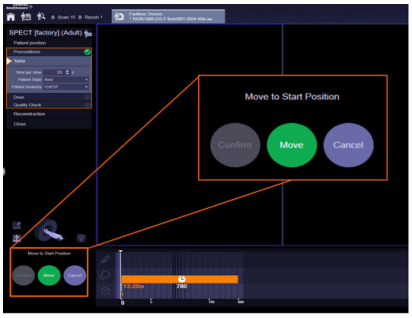
When the **Move** button is clicked, the system performs the following actions:

If detector reconfiguration is needed, the system:

- retracts the detectors
- retracts the patient table
- reconfigures the detectors

Otherwise, the system:

- moves the patient table into the set position
- moves the detectors to the start angle
- moves the detectors to the autocontour position



Move to Start Position: Confirm, Move, Cancel Buttons

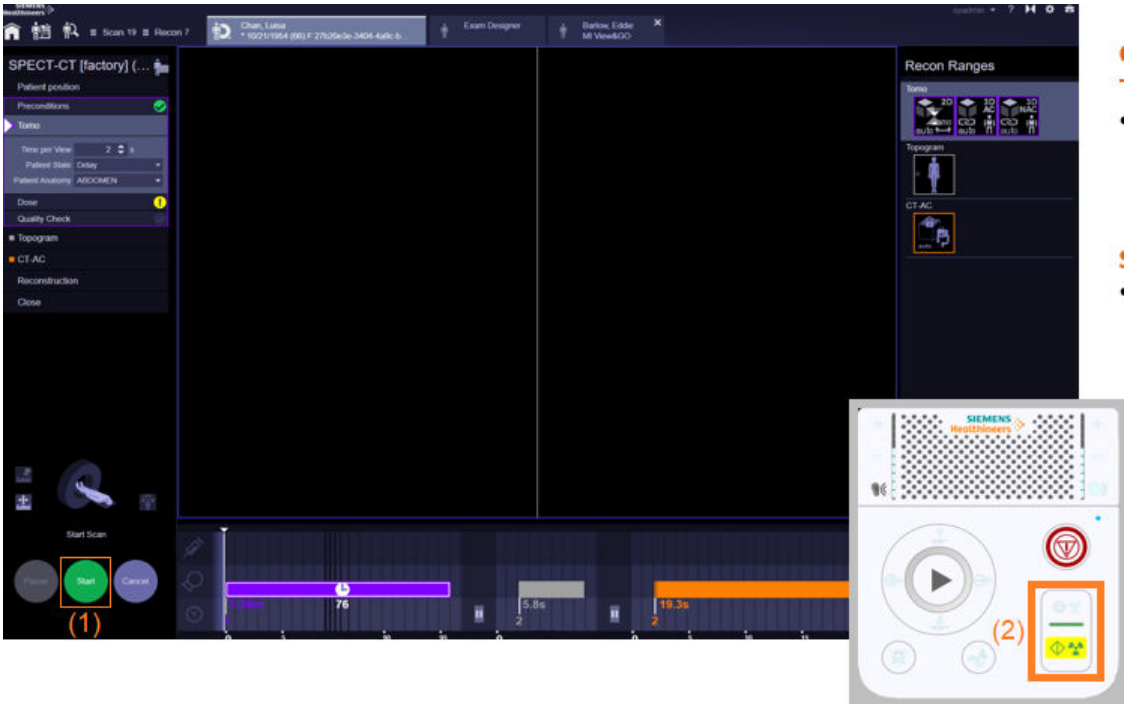
Only during an examination workflow, the system may automatically configure the detectors when the user presses the **Move** button prior to SPECT scan or in between SPECT and CT scans.

Observe the patient during system motion.

Remove the patient from the system and its vicinity before reconfiguring the detectors.

10.14 Starting a scan

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) Console Start Button, (2) Control Box Start Button

For a CT Topogram and Tomogram scan, only use the Control Box **Start** button.

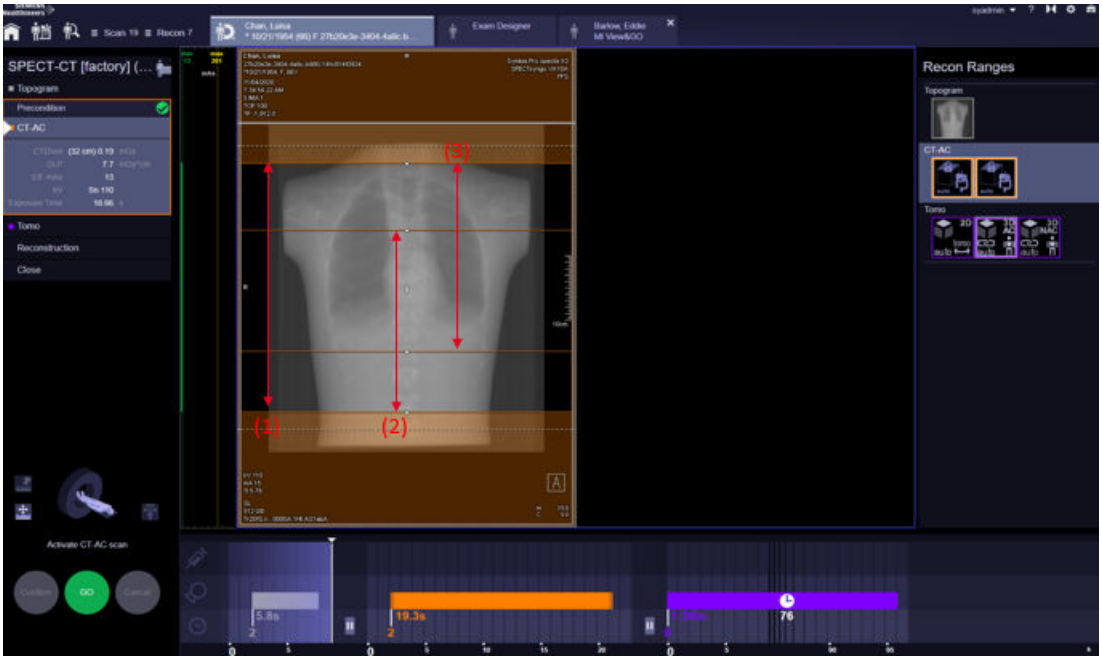
For SPECT and planar scans, click the **Start** button on either the:

- Console
- Control Box
- Hand Control
- Gantry Display

10.15 Graphical range planning

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

Once the first scan for a series of continuous scans with same patient position is completed, the 2D image displayed can be used to perform graphical range planning. The scan range is planned as a combination of all recon (reconstruction) ranges. The recon range planning is based on the range selection. Multiple recons can be selected to be planned together. Linked CT and SPECT ranges (for attenuation correction) are updated when either is changed.



(1) Scan Range
(2) Recon Range 1
(3) Recon Range 2

10.16 Planning image selection

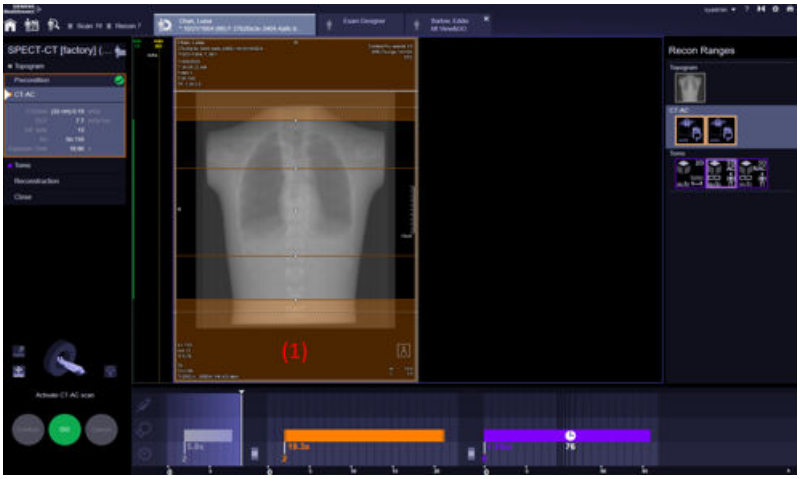
✓ Default planning image: The last 2D image completed will be selected by default.

✓ Planning images available: Topogram image and Anterior view of Nuclear Medicine (NM) Fast Recon (reconstruction)

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

To select a planning image:

1 For a Topogram scan, click the topogram recon job.

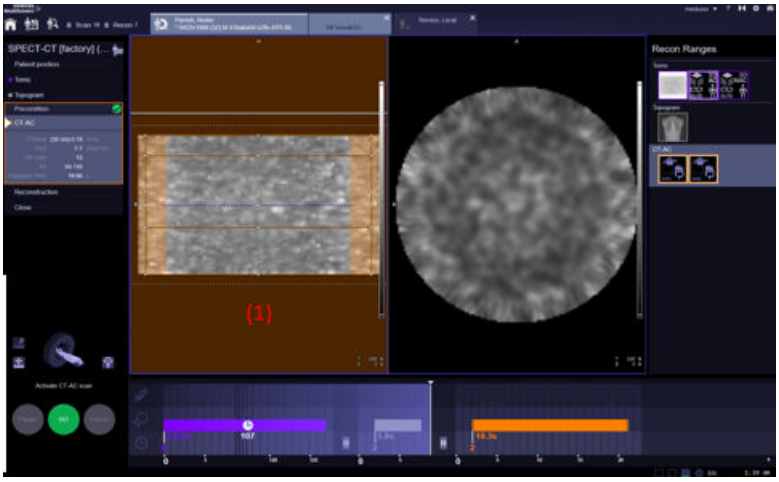


(1) Topogram as Planning Image

or

2 For a SPECT scan, click the tomo projection recon job (Quality Control Image - QCI).

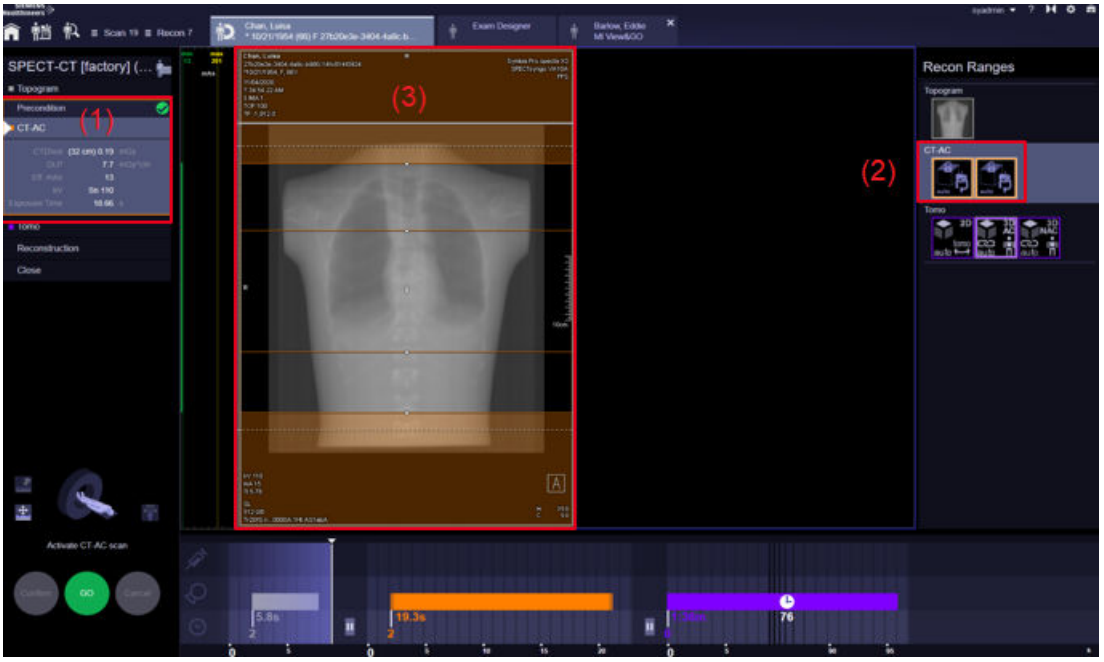
3 Click the recon jobs to plan.



(1) SPECT as Planning Image

10.17 Scan task selection

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) Scan Task
(2) Reconstructions
(3) Topogram

By selecting the scan task, all recon (reconstruction) ranges which belong to the scan task are selected.

Multiple resconstructions can be selected by holding the **Ctrl** key or **Shift** key.

All recons ranges are shown in the Topogram.

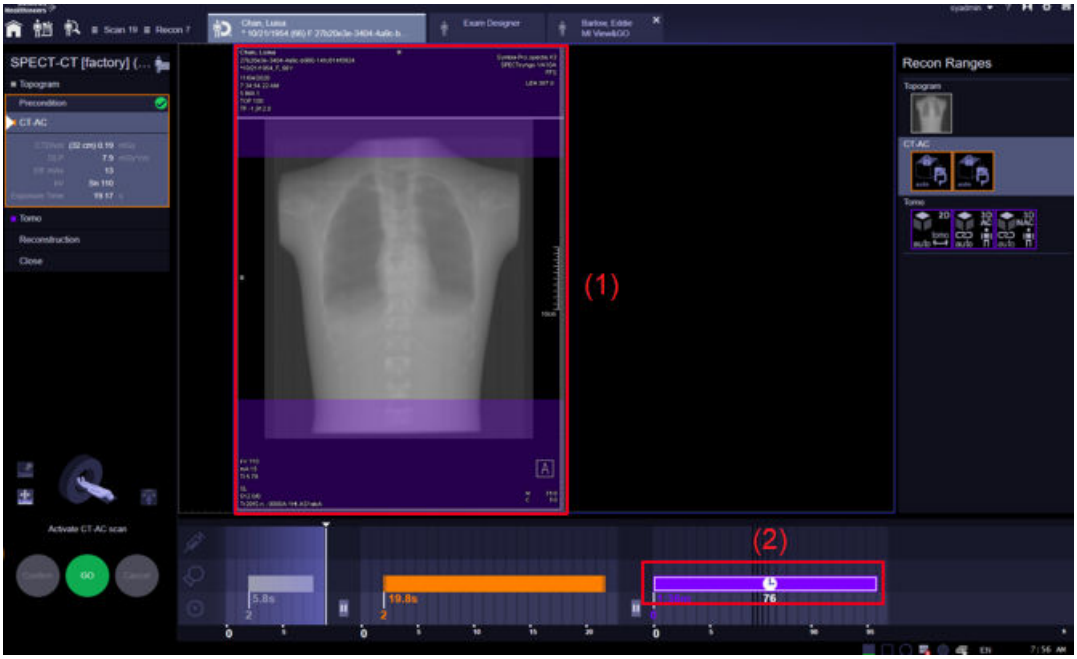
When all recon ranges are selected, changing one changes all others.

To change only one recon, click that recon range in the planning image.

Matching colors for screen objects are used to identify related items. For example, an orange square in front of the CT AC scan task, the topogram's orange scan shutter (masking defining the recon range), the orange timeline, and the orange bordered recon range jobs indicate these objects are all related.

10.18 Timeline scan selection

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



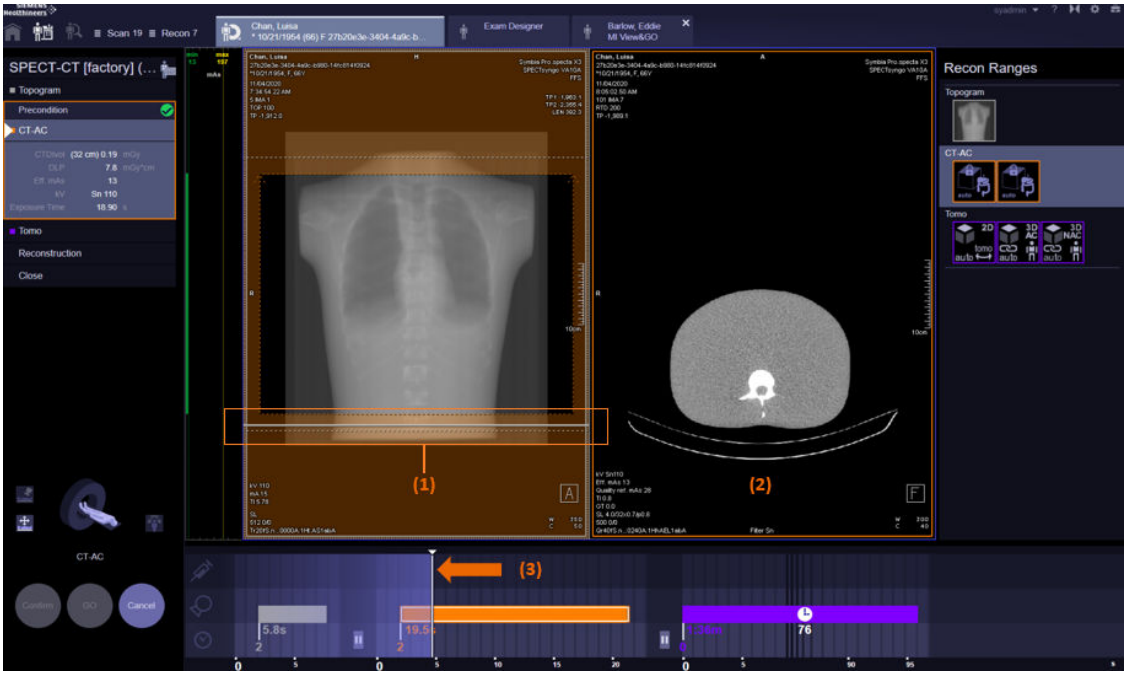
(1) Scan Range
(2) An individual scan selected in the timeline.

Clicking an individual scan in the timeline displays only that scan range and its selection in the graphical range planning image.

10.19 Scan progress layouts - CT scans

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

The CT scan progress screen layout is designed for its specific acquisition.



(1) Topogram with CT detector image slice marker
(2) Real time CT reconstruction
(3) Scan progress bar

The CT scan has a topogram view and a real time CT view. The topogram view has horizontal line across the CT detector image marking the image slice position in relation to the image slice shown in the real time CT reconstruction. The real time CT reconstruction image shows the slice acquired as per CT detector's horizontal line image slice marker.

A translucent-shaded progress bar is displayed over the timelines to indicate the progress of the scan across multiple scans and their individual timelines.

For all SPECT and planar scans, the timeline is replaced by a solid progress bar due to longer scan times.

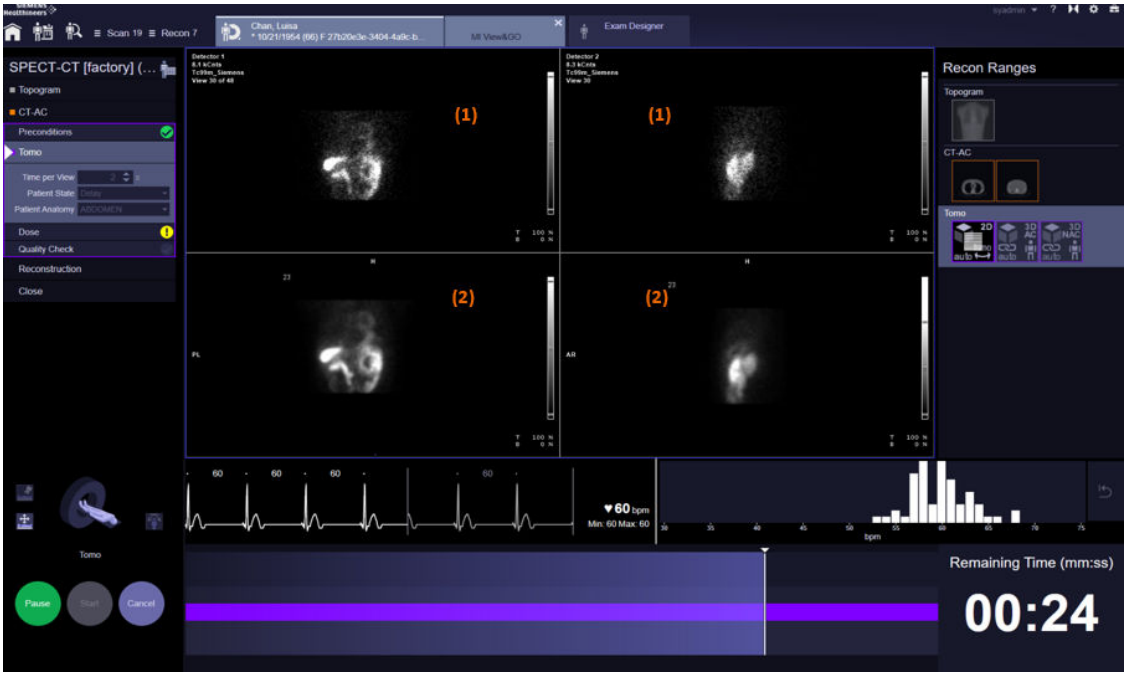


SPECT and Planar Scans Progress Bar

10.20 Scan progress layouts - SPECT scans

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

The SPECT scan progress screen layout is designed for its specific acquisition.



(1) Growing images
(2) Cine of acquired data

The SPECT scans have the same layout as the CT scans other than image text:

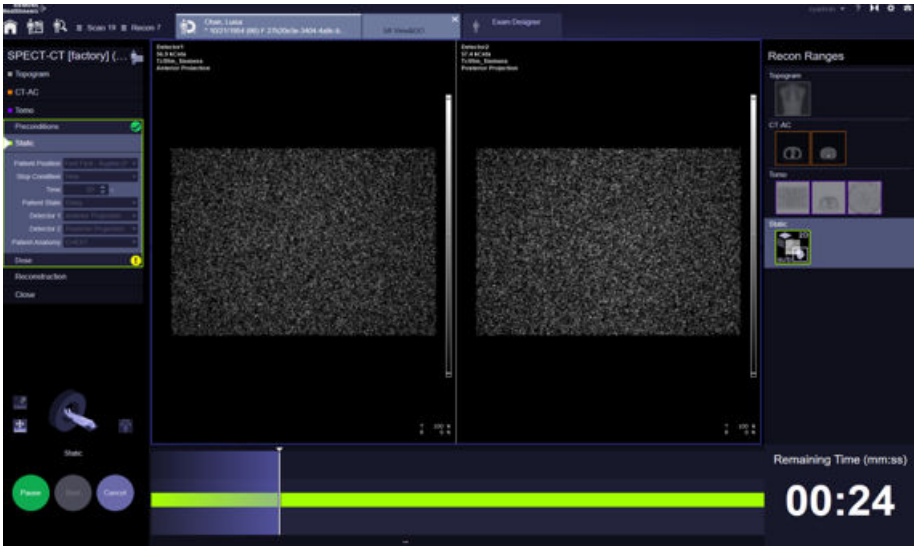
- Tomo
- Wholebody Tomo (Bed number of totol number)
- Dynamic Tomo (Rotation number of total number)
- Composite Tomo (Rotation number of total number)

Unlike a CT scan, a SPECT scan's timeline is replaced by a solid progress bar due to a longer scan time.

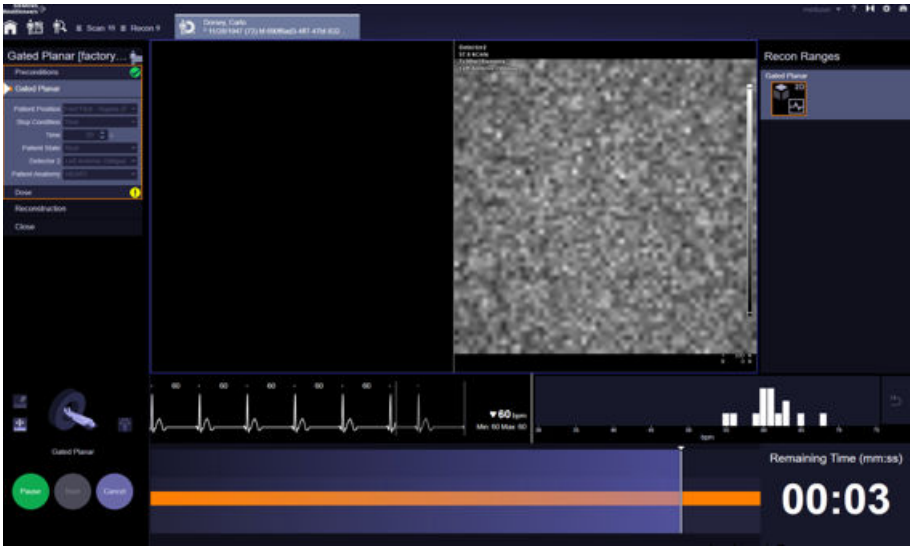
10.21 Scan progress layouts - planer scans

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

The planar scan progress screen layout is designed for its specific acquisition.



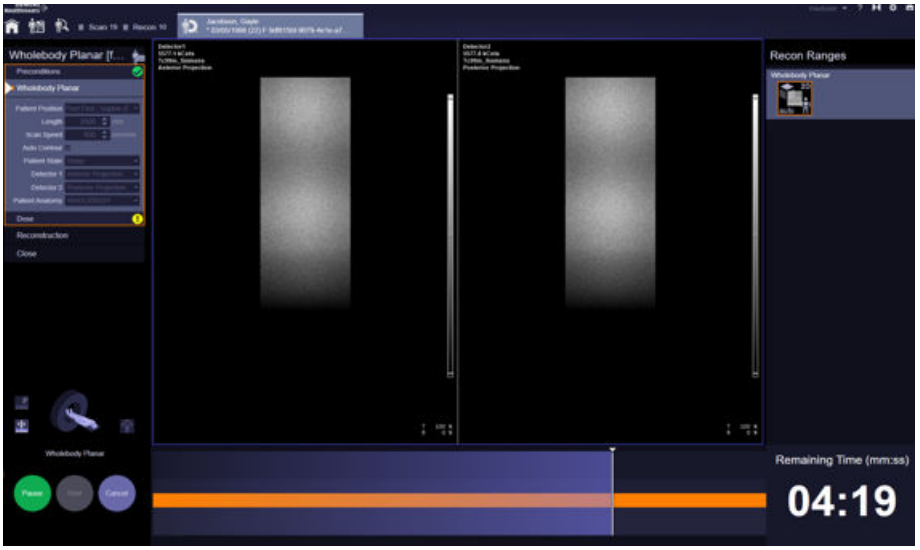
Planer Scan with Static Images



Planer Scan with Gated Images

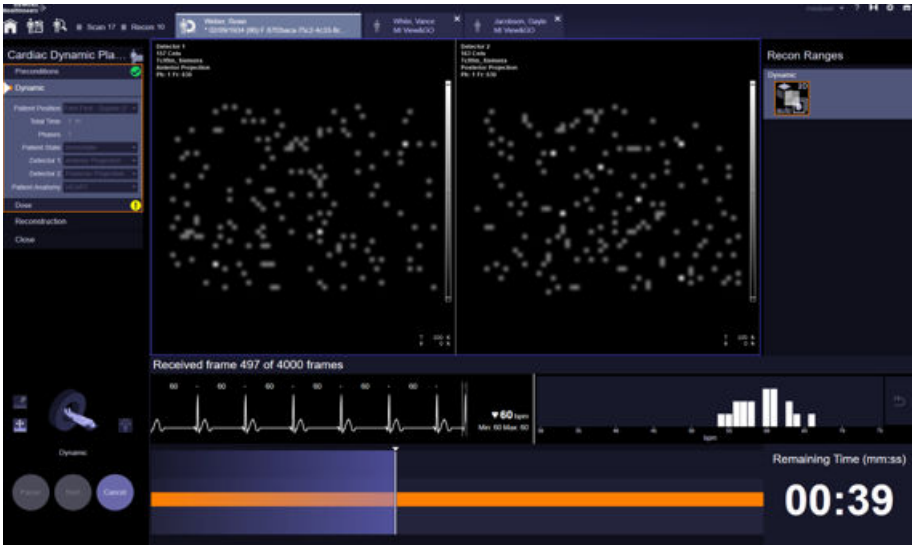
The static and gated planar scans display growing images for each detector.

Detector 1 does not have caudal tilt and so does not support gated planar.
Detector 2 does have caudal tilt and supports gated planar.



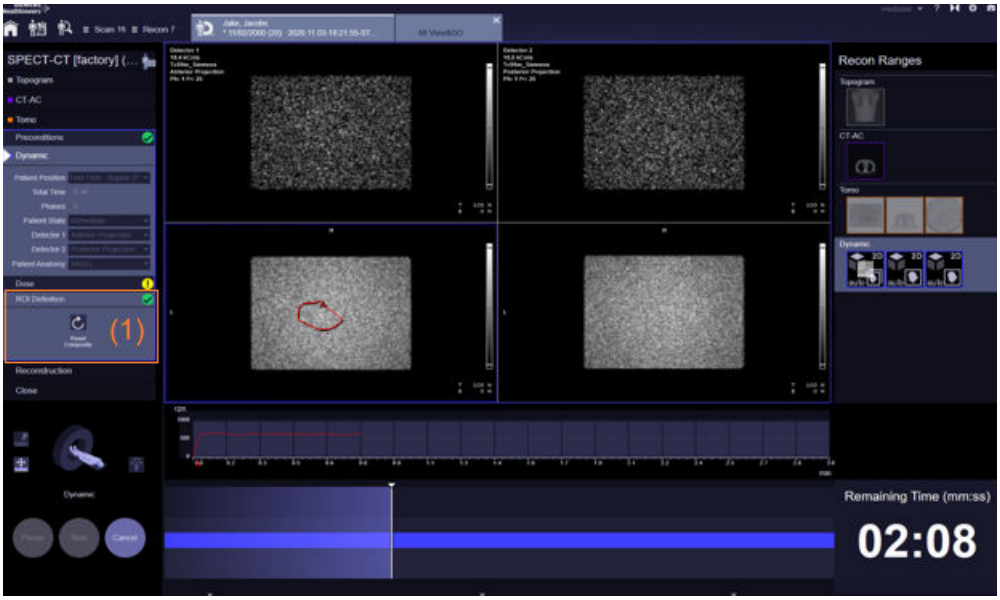
Planar Scan with Wholebody Images

The wholebody planar scan displays current anterior and posterior views.



Planar Scan with Cardiac Dynamic Images

The dynamic planar scan has two different scan progress displays depending if bolus tracking is enabled. The cardiac dynamic planar scan displays growing images per phase and the total number of received frames.



Planar Scan with Cardiac Dynamic Images and Bolus Tracking

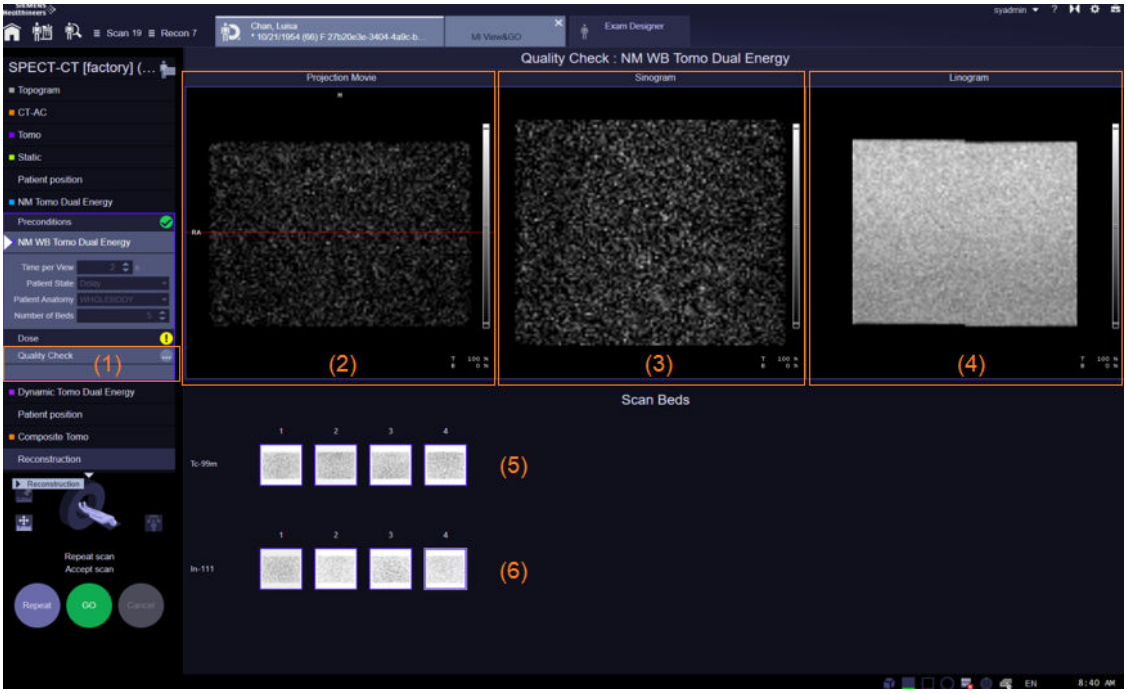
While an acquisition is running, you can create one or more ROIs to track the activity bolus. To enable this feature, click the **ROI Definition** task. The two lower images show a composite image of each detector. You can create an ROI on either image. The time activity curve is displayed above the timeline. To update the composite image, click the **Reset Composite** button.

Unlike a CT scan, a planar scan's timeline is replaced by a solid progress bar due to a longer scan time.

10.22 Quality check - wholebody

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

You can select a scan bed to display its quality control data (projection movie (quality control image - QCI), sinogram, and linogram.

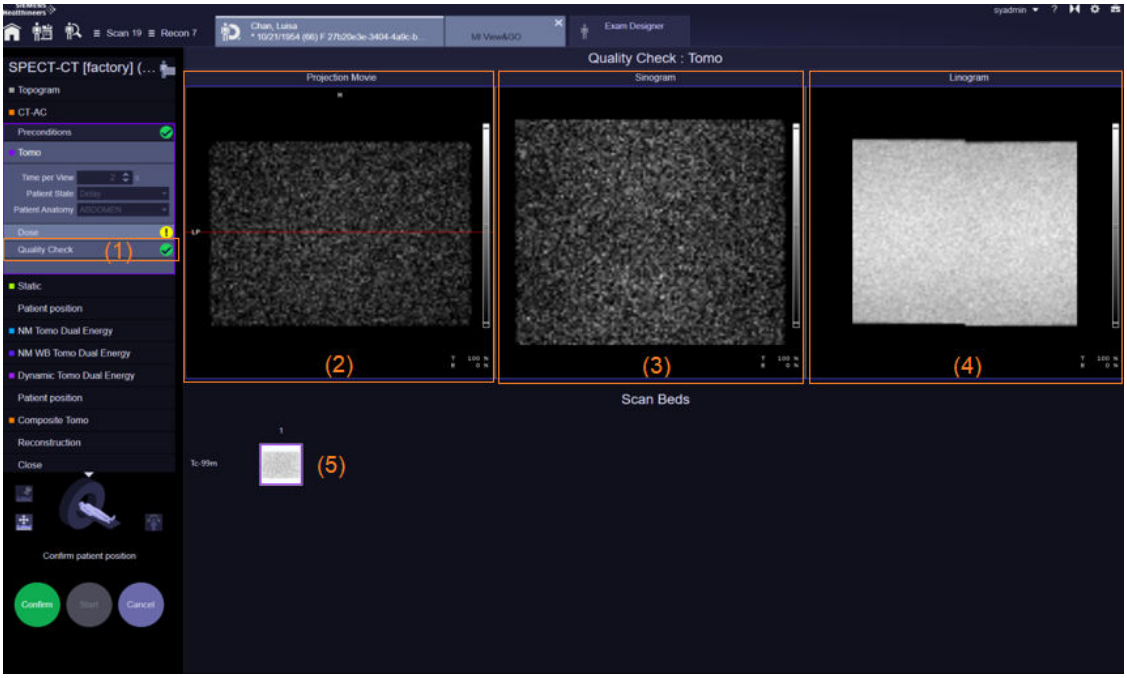


(1) Quality Check task
(2) Projection Movie
(3) Sinogram
(4) Linogram
(5) Beds for Isotope 1
(6) Beds for Isotope 2

10.23 Quality check - SPECT

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

You can select a scan bed to display its quality control data (projection movie (quality control image - QCI), sinogram, and linogram.

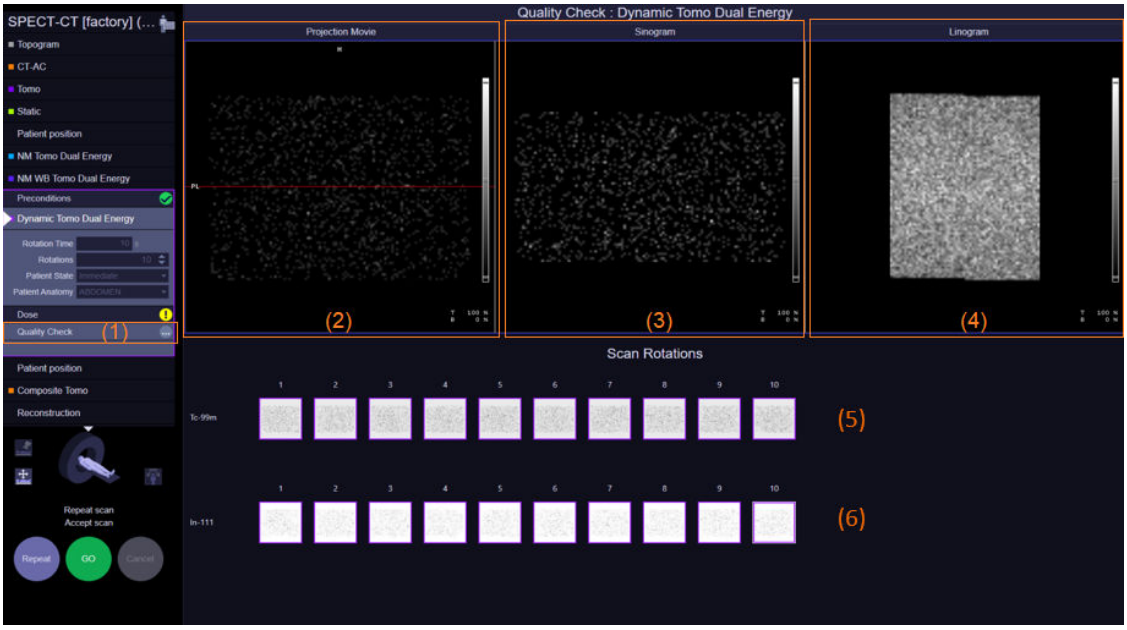


(1) Quality Check task
(2) Projection Movie
(3) Sinogram
(4) Linogram
(5) Beds for Isotope 1

10.24 Quality check - dynamic SPECT

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

You can select a scan rotations to display its quality control data (projection movie (quality control image - QCI), sinogram, and linogram.

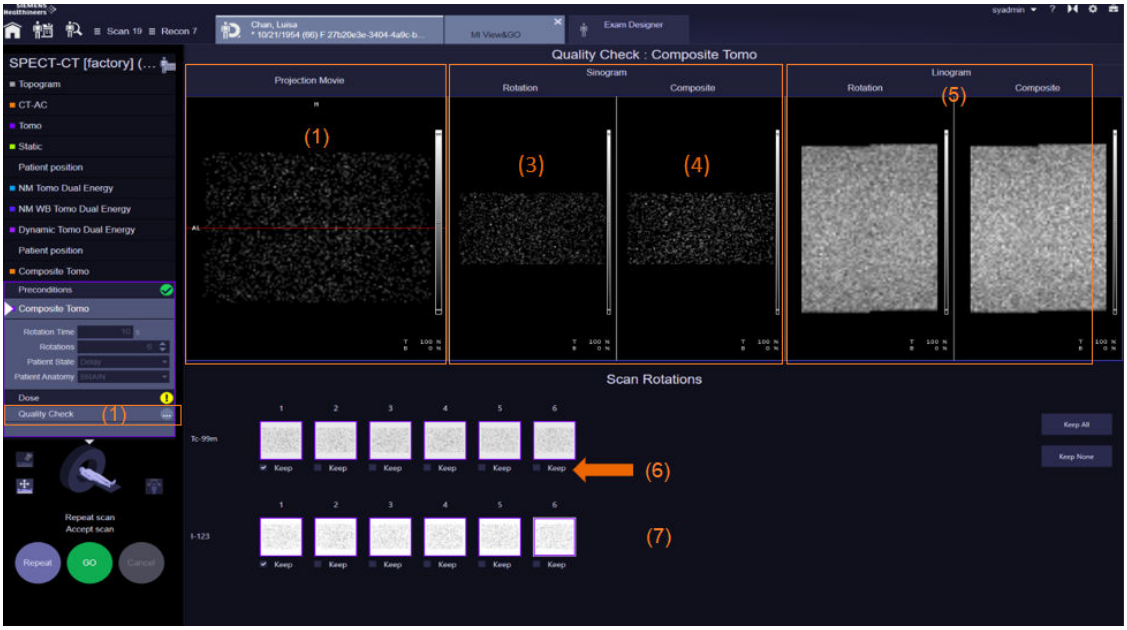


(1) Quality Check task
(2) Projection Movie
(3) Sinogram
(4) Linogram
(5) Rotations for Isotope 1
(6) Rotations for Isotope 2

10.25 Quality check - composite SPECT

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

You can select a scan rotations to display its quality control data (projection movie (quality control image - QCI), sinogram, and linogram.



(1) Quality Check task
(2) Projection Movie
(3) Sinogram Rotation selected
(4) Sinogram Composite (sum of rotations to keep)
(5) Linogram Rotation and Composite
(6) Rotations for Isotope 1 with checkbox next to Keep (selected) or discard (not checkmarked)
(7) Rotations for Isotope 2

10.26 Unload button

While the protocol is loaded, you can click the **Unload** button on the gantry display to:

- Retract detectors
- Retract patient table
- Lower patient table to unload position if chosen and not a Head First Supine (HFS) patient position.

10.27 Close task

The **Close** task appears at the end of the task list. There are two selections, Click the **Close** task to close the patient protocol or **Open Recon Tab**.

10.28 Resume examination

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

If a patient is undergoing a stress/rest examination, the patient will leave the patient table after the stress portion, and return later to continue the examination for the rest portion. Likewise, if a patient must leave the patient table during a examination for another reason, the examination may continue at another time. In both cases, the patient position will have changed, and patient will need to be positioned again on the patient table and the examination resumed.

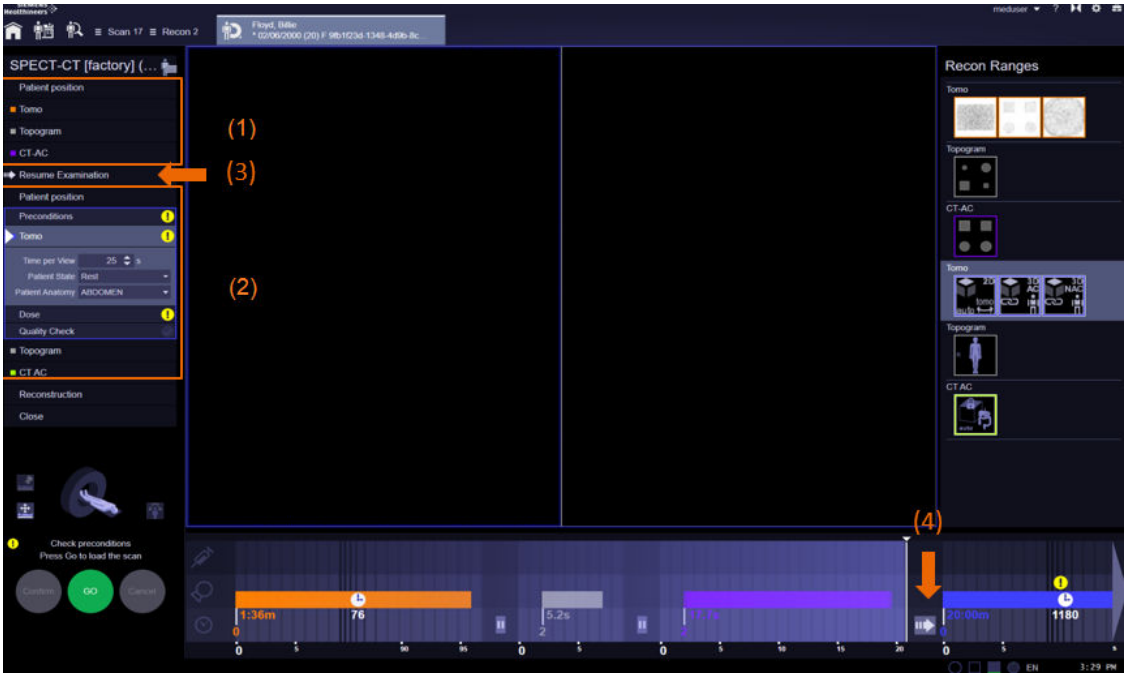
To resume an examination:

- From the **Patient Browser**, select the specific patient *examination* and right-click. From the pop-up that appears, click either **Resume Examination** or **New Examination**.
- If you right click the patient's *name* (not a specific examination under the patient's name), the pop-up will only show **New Examination** is available.

The patient examination will show in the patient **Scheduler** as scheduled (a checkmark in a green circle). You can open the patient examination.

A study cannot be resumed while reconstructions are running.

If a protocol does not have any unperformed scans, you are instructed to select a new scan protocol. A new scan will have a new patient position. Hence, the previous scan cannot be used for planning.



(1) Completed Scans
(2) Unperformed Scans
(3) Resume Examination task separator is inserted in the task list.
(4) The Resume Examination task has a corresponding seperator in the the timeline.

11 Protocol selection

Once the patient is loaded, the scan protocol for the current examination must be selected.

A scan protocol contains predefined scan parameters, reconstruction parameters, and processing parameters for a specific examination. Factory protocols are available for standard and advanced scan workflows. The naming of the factory protocols follows a common strategy.

The **Protocol Selection** tab provides an overview of the most important patient's details which influence the selection of the most suitable protocol for the current examination.

You can select a protocol as follows:

- (➔ Page 368 *Selecting the protocol based on the requested procedure*)
- (➔ Page 369 *Selecting the protocol by keyword*)
- (➔ Page 370 *Selecting the protocol from a folder*)

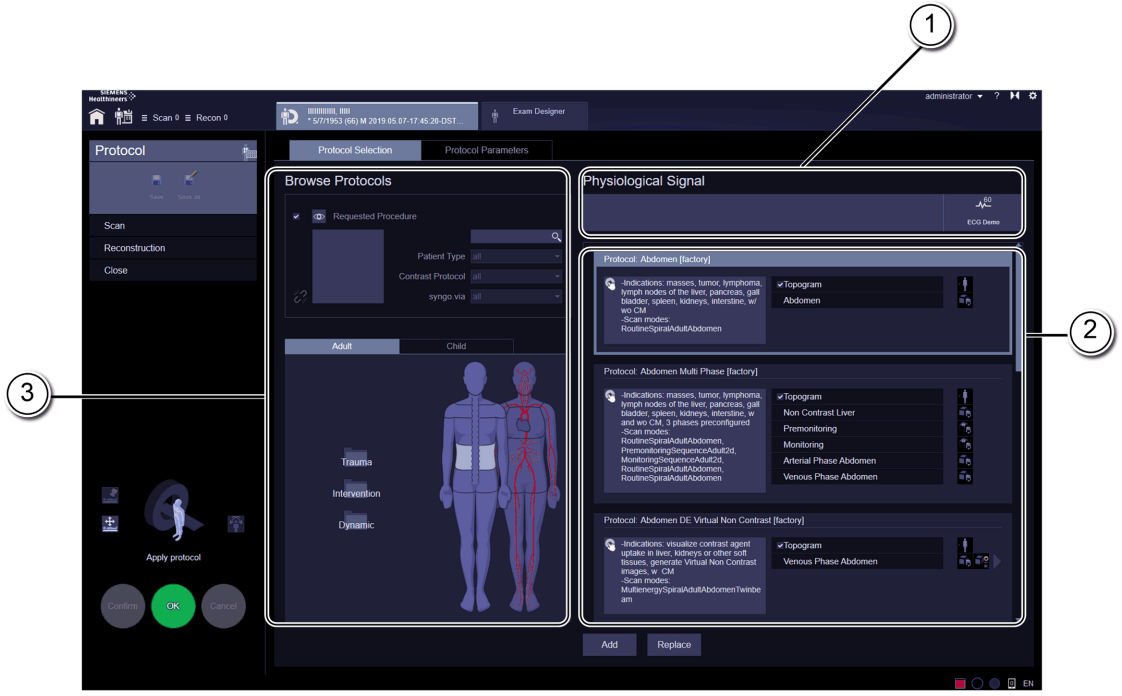
Only one selection option can be active at a time. You cannot combine the options.

If a protocol is loaded automatically, for example, in an emergency patient registration, the **Protocol Selection** tab is not displayed.

11.1 Protocol Selection tab

On the **Protocol Selection** tab, you select the scan protocol for the loaded patient and the required examination.

The **Protocol Selection** tab consists of the following areas:



(1) **Physiological Signal** area
(2) Protocol preview area
(➔ Page 363 *Protocol preview area*)
(3) **Browse Protocols** area
Including:
Requested Procedure area
(➔ Page 367 *Requested Procedure area*)
Search area
(➔ Page 366 *Search area*)
Patient model area

The names of factory protocols include information on the organ to be scanned and the use case of the examination. The names are built up according to the following sequence:

- Organ name, for example, **Shoulder**, **Brain**, **Pelvis**
- Contrast phase, if applicable, for example, **CTA**
- Information for differentiation, for example, **Perfusion**, **DE**, **soft tissue or bone**
- **[factory]** suffix

11.1.1 Physiological Signal area

The **Physiological Signal** area displays the ECG curve of the patient when ECG electrodes are applied and an ECG signal is available.

If a cardiac protocol is loaded, the ECG curve is always displayed.

11.1.2 Protocol preview area

The protocol preview area displays the preselection of protocols based on the current filter settings and search criteria. If no protocols are found, a corresponding message displays.

The protocol preview area includes the following elements:



(1) Protocol description
Supports you in selecting the most adequate protocol for the current examination. The descriptions of factory protocols include, for example, possible indications and possible applications for post processing and automatic reconstruction. You can adapt the protocol descriptions according to your requirements.

(2) List of scan ranges
Displays the individual scan ranges within the protocol. A check box is provided on the left of the **Topogram** range. If selected, the topogram is scanned. If cleared, no topogram is scanned.

(3) Reconstruction icons
Displays the recon icons for the individual scan ranges.

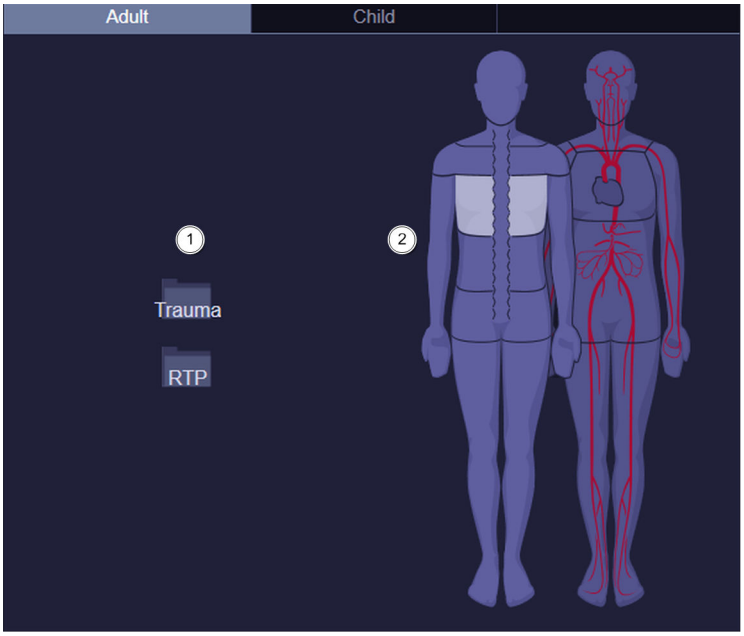
(4) **Replace** button
In unscanned ranges, replaces the protocol assignment.

(5) **Add** button
Adds the selected protocol to the protocol assignment.

11.1.3 Patient model area

The patient model area consists of the **Adult** tab and the **Child** tab.

Each tab includes the following elements:



(1) Folder buttons
Represent groups of special protocols that are stored in protocol folders, for example, protocols that are not assigned to a body region. The folder buttons are only displayed if the corresponding folder contains at least one protocol.
Selecting a folder button displays the protocols that are available for the selected folder group in the protocol preview area. A selected folder button is highlighted.

(2) Patient models (standard and vascular) with body region buttons
Represent body regions to be scanned.
Selecting a body region displays the protocols that are available for the selected body region in the protocol preview area. A selected body region is highlighted in the patient model.

11.1.4 Search area

In the search area, you can create a selection of scan protocols for the current patient. Protocols that match the search criteria are displayed in the protocol preview area.

Element	Description
Search field	Text field for entering keywords, for example, names of protocols or scan ranges. If at least four characters are entered, the search starts.
Search icon	Manually activates the search.
Patient Type	Active if a keyword is entered in the search field. Limits the displayed protocols to the selected patient type: **Adult** or **Child**.
Contrast Protocol	Active if a keyword is entered in the search field. Limits the displayed protocols to the selected contrast protocol type: **all** or **Manual**.
syngo.via	Active if a keyword is entered in the search field. Limits the displayed protocols to those that provide the selected *syngo*.via post processing workflow.

11.1.5 Protocol filters

The protocol filters appear under the **Protocol Selection** tab in the **Browse Protocols** area. The protocol filter selections **CT Protocols** and **NM Protocols** display groups of protocols appropriate for an examination. Either one or both filter selections can be selected. Specific protocol groups appear when the **Adult** or **Child** tab is selected.

Protocol Filters	Adult	Child
CT Protocols	Trauma	Trauma
		Baby
NM Protocols	NM Basic	NM Basic

Protocol Filters	Adult	Child
	NM Dual Isotope	
	NM NEMA	

For example, selecting both **CT Protocols** and **NM Protocols**, and then selecting the **Adult** tab would display the four protocol groups shown in the table. Selecting **NM Basic** would display a filtered list of protocols applicable for the examination.

11.1.6 Requested Procedure area

In the **Requested Procedure** area, you can control the mapping of scan protocols to the currently requested procedure (Smart Protocol).

Element	Description
Requested Procedure list	Lists the requested procedures that are coming from the HIS/RIS system. Every requested procedure is displayed in one row.
Requested Procedure check box	If the **Requested Procedure** check box is selected when a patient is opened, the protocols that are linked to the requested procedure or procedures are preselected and displayed in the protocol preview area. If only one protocol is linked, this protocol is loaded automatically. If the **Requested Procedure** check box is selected and at least one range has been scanned when the patient is finalized or converted into a recon patient, the protocol is linked to the currently requested procedure or procedures.
Requested Procedure icon	Lists all protocols that have been used with the currently requested procedure or procedures. If no protocols are found, a corresponding message is displayed in the protocol preview area.

Element	Description
Unlink Requested Procedure button:  Enabled if the selected protocol is linked to at least one requested procedure.  Disabled if no protocol is selected or if the selected protocol is not linked to at least one requested procedure.	Removes the link to the requested procedure that is selected in the **Requested Procedure** list after confirming the **Unlink Protocol** message box with **OK**.

11.2 Selecting the protocol based on the requested procedure

Selecting the protocol by requested procedure is one of the selection options on the **Protocol Selection** tab.

If the scanner system is connected to a HIS/RIS system, the protocols that match the requested procedure are automatically preselected. The preselected protocols are displayed in the protocol preview area where you can select the most adequate protocol.

✓ The **Requested Procedures** check box is selected.

1 In the protocol preview area, check the content of the protocol descriptions, if present.

2 Select the most adequate protocol.

3 In the execution control, click **OK**.

The protocol is assigned to the patient.

4 Continue with confirming the patient position.

If the **Requested Procedure** check box is selected and only one adequate protocol is linked, this protocol is assigned automatically. The **Protocol Selection** tab is skipped.

After the initial installation, the **Requested Procedure** check box is selected by default.

The state of the **Requested Procedure** check box is stored for the next patient.

Selecting the **Requested Procedure** check box is useful for automating the protocol selection for standard examinations.

The **Unlink Requested Procedure** button allows you to remove the link if the protocol is no longer to be linked to this requested procedure.

11.3 Selecting the protocol by keyword

Selecting the protocol by searching for a keyword is one of the selection options on the **Protocol Selection** tab.

1 In the search area, enter a keyword in the search field.

The keyword is searched for in the protocol description, in the protocol name, and in the scan range name.

Once the entered search word can be matched to one or more protocols, a preselection of protocols is displayed in the protocol preview area.

2 Check the content of the protocol descriptions, if present.

3 Select the most adequate protocol.

4 In the execution control, click **OK**.

The protocol is assigned to the patient.

5 Continue with confirming the patient position.

If applicable, you can use the filters (**Patient Type**, **Contrast Protocol**, **syngo.via**) to narrow down the preselection of protocols.
(→ Page 366 *Search area*)

11.4 Selecting the protocol by body region

Selecting the protocol by body region is one of the selection options on the **Protocol Selection** tab.

1 In the patient model area, select the **Adult** or **Child** tab depending on the patient type.

2 In the relevant patient model, select the corresponding body region.

The selected body region is highlighted in the patient model. The matched protocols are displayed in the protocol preview area.

3 In the protocol preview area, check the content of the protocol descriptions, if present.

4 Select a protocol.

5 In the execution control, click **OK**.

The protocol is assigned to the patient.

6 Continue with confirming the patient position.

11.5 Selecting the protocol from a folder

Selecting the protocol from a folder is one of the selection options on the **Protocol Selection** tab. The folder buttons are only displayed if the corresponding folder contains at least one protocol.

1 In the patient model area, select the **Adult** or **Child** tab depending on the patient type.

2 Select the corresponding folder.

The selected folder is highlighted. The protocols contained in the folder are displayed in the protocol preview area.

3 In the protocol preview area, check the content of the protocol descriptions, if present.

4 Select the most adequate protocol.

5 In the execution control, click **OK**.

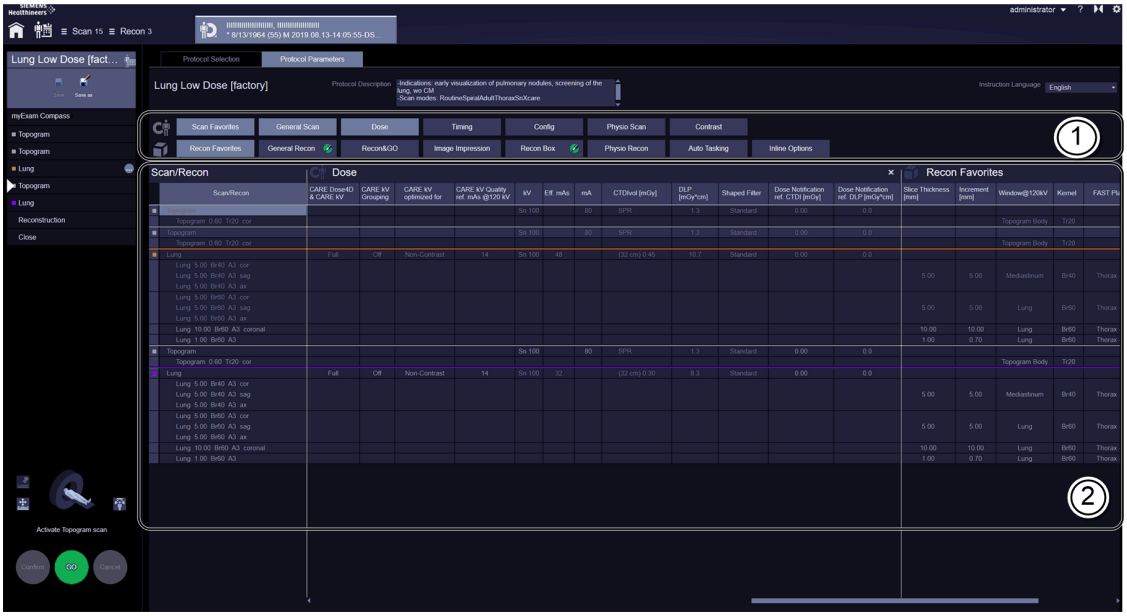
The protocol is assigned to the patient.

6 Continue with confirming the patient position.

11.6 Protocol Parameters tab

On the **Protocol Parameters** tab, you can view and modify the scan and the reconstruction parameters of the currently selected protocol.

The **Protocol Parameters** tab consists of the following areas:



(1) Category button area
In the category button area, the protocol parameters are assigned to logical groups. Each group is represented by a button.
The upper row of buttons groups the scan parameters.
The lower row of buttons groups the recon parameters.
Clicking a category button turns on and off the display of the corresponding protocol parameters in the parameter panel. The category button is highlighted if its parameters are displayed.

(2) Parameter panel area
The parameter panel displays the parameter settings of the parameter categories that are currently selected in the category button area.

11.7 Viewing and checking the protocol parameters

On the **Protocol Parameters** tab, you can view and modify the scan and reconstruction parameters of the currently selected protocol.
(→ Page 371 *Protocol Parameters tab*)

These parameters are divided into the scan parameters and the recon parameters, for example, **General Scan**, **Dose**, and **General Recon**, **Image Impression**, **Auto Tasking**.

In addition, the most common parameters are summarized in the **Scan Favorites** and the **Recon Favorites**.

1 In the taskflow control, click the **Protocol** task.

  The **Protocol Selection** tab and the **Protocol Parameters** tab display.

2 Click the **Protocol Parameters** tab.

3 In the category area, click the button of the parameter category to be checked, for example, the **Scan Favorites** or the **Recon Favorites**

  The selected parameter category button is highlighted. The parameters of the selected category are displayed in the parameter panel.

You can select several parameter categories.

In the parameter panel, the selected categories are displayed in the same sequence as in the category button area.

---

4 Check the parameter settings.

5 If necessary, adapt the parameters for the current examination.

  The background color changes for the modified parameter and all dependant parameters. The background becomes green if the new setting is valid. The background becomes yellow if the new setting is invalid.

Invalid settings cannot be processed, for example, you cannot save a protocol with invalid settings or you cannot start a recon job with invalid settings. To proceed, you must correct the setting to a valid value that is indicated by a green background.

You can modify parameters on the **Protocol Parameters** tab without the privileges of a clinical administrator. The modifications apply only to the current examination.

If you have the privileges of a clinical administrator, you can save a modified and valid protocol.

In addition, you can use the **Scan Protocols** workspace in the **Exam Designer** which is the more powerful expert tool for creating, changing, and managing protocols. For details, refer to the Online Help.

11.7.1 Saving modified protocols

Users with the access privileges of a clinical administrator can save a modified and valid protocol.

If you modified a factory protocol, you can save it as a customer protocol under a new name.

If you modified a customer protocol, you can overwrite the original protocol or save it under a new name.

1 To overwrite the original protocol, click **Save** in the **Protocol** task.

  The protocol is saved.

  – or –

  To save a modified protocol under a new name, click **Save as** in the **Protocol** task.

  The **Save protocol as** dialog box opens.

2 In the **Protocol Name** field, change the name as appropriate, for example, delete the **[factory]** suffix of a modified factory protocol.

3 Optional: To change the storage location, click another folder in the folder list.

  The selected folder is displayed in the **Save in** field.

4 Click the **Save** button.

  The **Save protocol as** dialog box closes.

12 myExam Compass

In scan protocols including ranges that are linked to a decision tree, the **myExam Compass** task is added to the taskflow control during the examination. The purpose of **myExam Compass** is to collect information about the current patient to dynamically adapt the scan parameters or exchange recon jobs according to the patient's characteristics.

Depending on the information that is needed:

- You are prompted to answer questions referring to the examination.
- Specific values are retrieved from the patient registration or from measurements of medical equipment that is connected to the patient.

Based on the collected information, the protocol dynamically adapts the necessary scan parameters or exchanges recon jobs according to the characteristics of the current patient. The adapted parameters are marked with a thin green perpendicular line. Do not change these parameters during the examination.

Alternatively, you can skip the questions and proceed with the examination. In that case, the parameters are not dynamically adapted.

In a Dual Energy examination with a factory protocol, for example, the values that are retrieved for the **Dual Energy Recommendation** attribute determine whether a Dual Energy scan appears to be feasible for the patient or if a Dual Energy scan should not be considered. If not, the scan mode automatically switches to an appropriate single energy scan mode and the recon jobs are exchanged accordingly. (→ Page 572 *Dual Energy Recommendation attribute*)

13 Patient positioning

Safe and proper patient positioning is a prerequisite for achieving quality image results.

When necessary, use positioning aids to help secure the patient.
(→ Page 183 *Accessories*)

CAUTION

Scanning patients with implanted devices such as pacemakers or neuro stimulators!

Interferences may cause malfunctions of the implanted device.

- Observe the patient closely during examination.

Contact the manufacturer of the active implanted device for more information.

CAUTION

Exceeding the maximum load of the patient table!

Injury to the patient or the personnel, or damage to the equipment is possible.

- Make sure that the permissible maximum load of the patient table is not exceeded. This includes the patient and attached equipment.
- The maximum loads of the equipment are displayed on the applied labels.

13.1 Positioning overview

Depending on the type of scan, various controls can be used to move the table and pallet to position the patient.

Scan Type	Plan&Go Ruler	Hand Control	Hand Control Table Index	CT Control Box	Patient Position Dialog Box
CT topogram	x	x	x	x	x
CT tomogram	x	x	x	x	x
SPECT	x	x		x	x
Wholebody Planar	x	x		x	x
All other planar scan types		x		x	x

13.2 Moving the table to the topogram start position

CAUTION

Unintentional activation of table movement keys of the control box!

Possible injury to the patient by moving parts.

- Make yourself familiar with the function of the control box keys.
- Always keep an eye on the patient during table movements.

Once the patient is lying securely on the table, move the table to the topogram start position. You have the following options to move the table:

- Use the CT control box.
- Use the **Patient Position** dialog box at the *syngo* Acquisition Workplace in the control room to move the table.

You can move the table continuously or step-wise:

- For continuous table movement, press and hold the respective key.
- For a step-wise table movement, press and release the respective key. The table is moved in 1 mm increments.

The following functions support you when moving the table:

- You can use laser light markers to help position the patient in the topogram start position.
- To observe the patient while the table moves into the gantry, a 2D Camera is available.

13.2.1 How to move the patient table

When moving the patient table, you can use the keys on the control box.

Key	Icon	Function
Feed Up		Press this key to move the patient table up.
Feed Down		Press this key to move the patient table down.
Feed In		Press this key to move the patient table into the gantry.
Feed Out		Press this key to move the patient table out of the gantry.
Move		Press this key to move the table to the preselected scanning position.

In case of an emergency, all system movements and radiation can be interrupted by pressing the **STOP** or **EMERGENCY OFF** key.

13.2.2 Laser light markers for assisted patient positioning

With the laser light markers, you can define the topogram start position and the isocenter of the gantry.

✓ The patient is correctly positioned on the table.



1 Using the hand control or control box, press the **Light Marker** button.

A laser line, perpendicular to the patient table, marks the topogram start position.



The light markers turn off after 60 seconds or as soon as a scan is started.





2 For horizontal table positioning, use the **Feed In** or **Feed Out** key on the hand control or control box.

(➔ Page 379 *How to move the patient table*)

Press and hold the respective key until the patient table is in the topogram start position.

3 For vertical table positioning, use the **Feed Down** or **Feed Up** key on the hand control or control box.

(➔ Page 379 *How to move the patient table*)

Press and hold the respective key until the body parts to be examined are in an isocentric position within the gantry.

The patient is ready to be scanned and must lie motionless in this position until all scans have been performed.



If you used laser light markers, check the laser line on the patient surface to verify the topogram start position before acquiring a topogram.

13.3 Patient position selection

Before you can activate a scan, you must confirm the patient position.
(➔ Page 381 *Setting the patient position*)

Make sure that the patient's position on the patient table matches the patient position that is displayed in the patient position pictogram. (➔ Page 384 *Patient position pictogram*)

In addition, you can set the following:

- Table direction (➔ Page 381 *Setting the direction of the table movement*)
- X-ray tube position (➔ Page 382 *Setting the X-ray tube position*)

13.3.1 Setting the patient position

The CT system automatically selects the position that is defined in the scan protocol. The patient position pictogram visualizes the currently selected patient position. (➔ Page 384 *Patient position pictogram*)

Make sure that the patient position is correct.

✓ After you select a scan protocol, the patient positions are displayed as icons in the **Topogram** task or in the **Patient Position** task.

1 Check the preselected position.

– or –

To change the selected position, click a patient position icon.



2 In the execution control, click **Confirm**.

(➔ Page 383 *Topogram task*)

13.3.2 Setting the direction of the table movement

To make sure that the table moves in the required direction during the topogram scan, you can check or change the horizontal direction in which the table moves.

✓ The patient position pictogram is displayed in the image area of the selected **Topogram** task.

◆ To change the direction, click the arrows in the patient position pictogram.

The white arrow indicates the currently set direction:



Table movement towards gantry



Table movement out of gantry

13.3.3 Setting the X-ray tube position

Topograms are acquired with a fixed X-ray tube position in the gantry. To acquire a topogram in the required view, make sure that the tube position is correct with regards to the patient's position on the table.

(➔ Page 433 *Topogram orientation*)

✓ The patient position pictogram is displayed in the image area of the selected **Topogram** task. (➔ Page 384 *Patient position pictogram*)

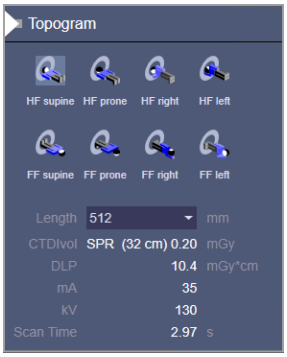
◆ To change the tube position, click one of the four tube icons on the gantry in the patient position pictogram.



The white tube icon indicates the currently set tube position.

You can activate the scan.

13.3.4 Topogram task



The **Topogram** task displays the icons with the available patient positions, the dose parameters, and the planned length of the topogram.

If no topogram is available, the icons are displayed in the **Patient Position** task.

The required topogram length is already set in the **Length** field. To change the topogram length, select a value from the **Length** list. In the **Length** list, the maximum possible length is available. The maximum topogram length depends on the system and table.

The CT system automatically selects the position that is defined in the scan protocol. The patient position pictogram visualizes the currently selected patient position. (➔ Page 381 *Setting the patient position*)

Before you can start a scan, you must make sure that the selected patient position is correct. (➔ Page 381 *Setting the patient position*)

You can change the patient position if necessary.

A wrongly selected patient position will result in invalid orientation information in CT images.

The following patient positions are available:

Icon	Patient position
	**HF supine**: Head first supine
	**HF prone** : Head first prone
	**HF right**: Head first decubitus right
	**HF left**: Head first decubitus left
	**FF supine**: Feet first supine

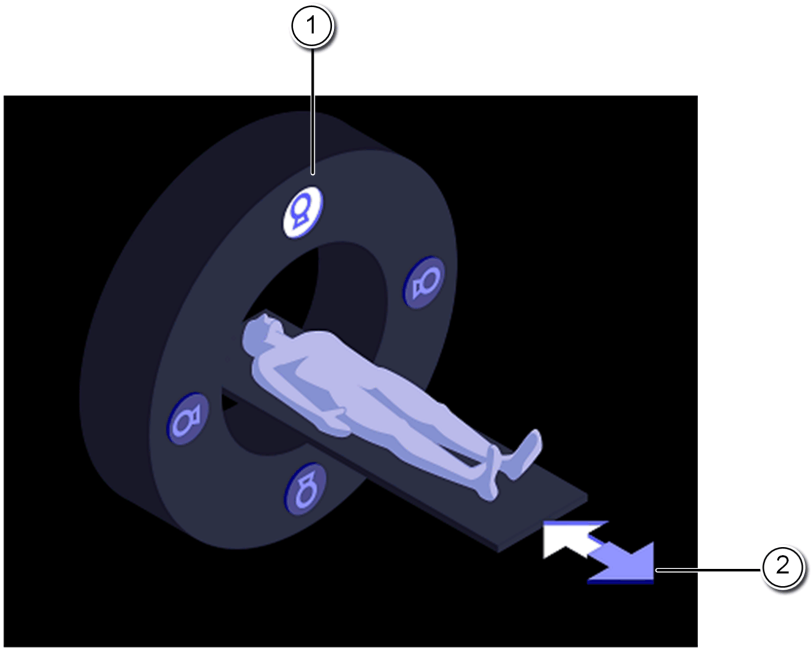
Icon	Patient position
	**FF prone**: Feet first prone
	**FF right**: Feet first decubitus right
	**FF left**: Feet first decubitus left

13.3.5 Patient position pictogram

The patient position pictogram shows the patient in the currently selected position on the table and provides icons to change the X-ray tube position and the direction in which the table moves.

The patient position pictogram is updated whenever you change the patient position icon. (➔ Page 381 *Setting the patient position*)

The patient position pictogram is displayed in the image area of the selected **Topogram** task:



(1) X-ray tube icon
The white tube icon indicates the currently set X-ray tube position. The position of the X-ray tube determines the view in which a topogram is acquired. You can change the position by clicking one of the four X-ray tube icons. (➔ Page 382 *Setting the X-ray tube position*)
To acquire a topogram in the required view, make sure that the tube position is appropriate with regards to the patient's position on the table. (➔ Page 433 *Topogram orientation*)

(2) Table movement arrows
The white arrow indicates the currently set direction of the table movement. You can change the direction by clicking the arrows. (➔ Page 381 *Setting the direction of the table movement*)

The pictogram is only available for unscanned topograms and if the **Topogram** task is selected.

13.3.6 Table position dialog box

The **Table Position** dialog box offers controls for vertical and horizontal table movement, allowing you to set the patient table position from the control room before a scan.





In the **Topogram** task or the **Scan** task, click the **Table Position** icon from the positioning area. The **Table Position** dialog box opens.

The current horizontal and vertical table position is displayed in the **Position** and **Height** fields:

- **Position** field - for the horizontal movement:

  The value of the horizontal table position is displayed with reference to a zero position (fully retracted). The minimum is 0 mm.

  – A negative value indicates that the table top is moved into the gantry from the zero position. The maximum is -2140 mm (fully extended).

- **Height** field - for the vertical movement:

  The value of the table height is measured relative to the scan field axis of the gantry.

  – A positive value indicates that the table is moved up from the zero position. The maximum is 540 mm (highest) and minimum is -100.7 mm (lowest).

You have the following options to change the position:

- By entering a value directly in the fields. (➔ Page 387 *Entering a table position*)
- By clicking the following icons:

	Moves the table horizontally towards the gantry.
	Moves the table horizontally out of the gantry.
	Moves the table up.
	Moves the table down.

You can move the table continuously or step-wise:

- For continuous table movement, click and hold the respective icon.
- For a step-wise table movement, click and release the respective icon.



For a step-wise horizontal movement, the table is moved in 1 mm increments. If an intervention protocol is loaded, the table is moved in increments equal to half of the reconstruction slice.

For a step-wise vertical movement, the table is moved in 10 mm increments.

Entering a table position

In the **Table Position** dialog box, you can enter a precise horizontal table position and vertical table position.

✓ The patient is positioned securely on the table.



1 Click the **Table Position** icon.

The **Table Position** dialog box opens.

2 Enter a value in the fields:

- **Position** field: horizontal table movement
- **Height** field: vertical table movement



3 On the control box, press the **Move** key.

To cancel the movement, click the **Cancel Move** button.

The table is moved to the specified position.

For recon jobs of any scan range, a rectangle is displayed on the topogram image. (➔ Page 436 *Representation of a topogram in the topo segment*)

13.4 Changing the patient position after repositioning the patient

If you have repositioned a patient before a scan or during an examination, you have to select the corresponding patient position icon. Make sure that the patient position that is currently defined by the set patient position icon in the system matches the patient's position on the table. You can also change the patient's position after a topogram scan and before a tomogram scan.

✓ No scan is running.

✓ At least one tomogram range has been acquired.

✓ You have changed the patient's position on the table.



1 In the positioning area, click the **Change patient position** icon.

The **Topogram** task or **Patient position** task displays the patient position icons.

2 Select the required icon.



3 Click **Confirm** to confirm the patient position.

All following scan ranges are updated with the new patient position.

You can activate the topogram or tomogram scan.

(→ Page 455 *Tomogram scan acquisition*)

After the topogram scan, you can still correct the patient position if required, by selecting the required patient position icon.

13.5 Planar as a first scan

There are various parameters set when positioning the patient for the first scan when acquiring SPECT and CT scans.

There are several basic scan modes, each of which having specific parameters.

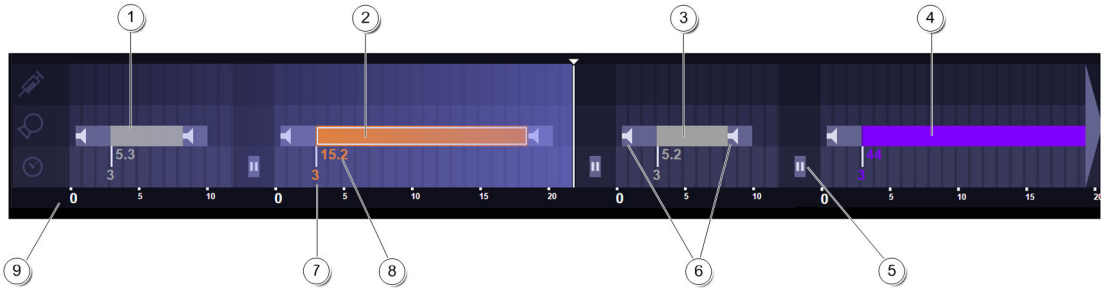
- Static Planar
- Dynamic Planar
- Dynamic Planar Pinhole
- Dynamic Planar Cardiac
- Wholebody Planar
- Cardiac Planar
- Cardiac Planar Pinhole

14 General scan information

14.1 Timeline

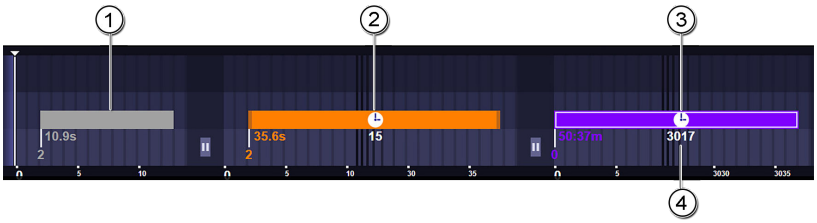
The *syngo* Acquisition Workplace provides you an overview of the whole examination progress.

The timeline indicates the scan progress in chronological order by displaying all ranges, scan delay times, injection phases, and automatic patient instructions from left to right at the time they occur.



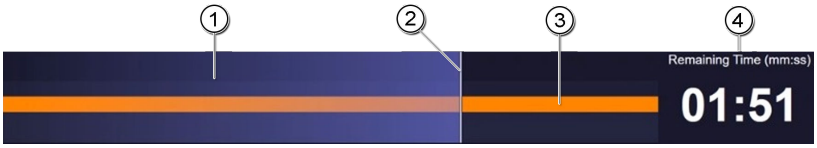
(1) Scanned topogram range
(2) Scanned tomogram range
(3) Unscanned topogram range
(4) Unscanned tomogram range (➔ Page 403 *Planning scan ranges*)
(5) Pause (➔ Page 407 *Splitting an autorange into two ranges*)
(6) Patient instruction pair (➔ Page 420 *Communicating with the patient*)
(7) Scan delay time (➔ Page 409 *Scan delay time*)
(8) **Exam Time**
(➔ Page 450 *Spiral CT*)
(➔ Page 451 *Sequence CT*)
(9) Time axis in seconds

When performing acquisitions, a timeline is displayed. If an acquisition has a longer acquisition time which would be out of the scope of the timeline's screen width, the timeline is compressed and is indicated by the scan delay time in seconds and the **Discontinued Timer** icon displayed on the timeline.



(1) Topogram portion of timeline
(2) CT tomogram portion of timeline
(3) MI SPECT portion of timeline
(4) SPECT Discontinued Timer icon and scan delay time in seconds

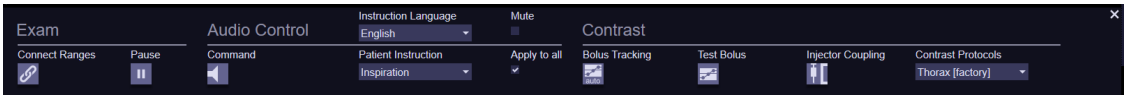
Once the SPECT acquisition is started, a progress bar is displayed which horizontally fills from left to right along with a digital **Remaining Time (mm:ss)** countdown for the completion of the acquistion.



(1) Portion of scan completed
(2) Current progress position of scan
(3) Progress bar
(4) Remaining Time in minutes (mm) and seconds (ss) countdown

14.1.1 Edit Mode toolbar

The **Edit Mode** toolbar contains various instructions and commands that you can apply to a CT scan range. It is not applicable for a SPECT scan.



Edit Mode toolbar

To access the **Edit Mode** toolbar, right-click an unscanned range and choose **Open Edit Mode** from the context menu. The **Edit Mode** toolbar is displayed above the timeline.

The toolbar comprises three areas:

- **Exam**
- **Audio Control**
- **Contrast**

The functions of the commands are explained in the following tables.

Exam area:

Element	Function
 **Connect Ranges** icon	Use the **Connect Ranges** icon to connect ranges to an autorange. (➔ Page 405 *Connected scan ranges (autorange)*)
 **Pause** icon	Use the **Pause** icon to add a pause between two scan ranges in order to split an autorange. (➔ Page 405 *Connected scan ranges (autorange)*)

Audio Control area:

Element	Function
 **Command** icon	Use the **Command** icon to add a patient instruction to the scan range. (➔ Page 425 *Adding patient instructions to a scan range*)
Instruction Language list	From the **Instruction Language** list, you can select the instruction language for all scan ranges of the same examination. (➔ Page 428 *Changing the instruction language*)
Patient Instruction list	From the **Patient Instruction** list, you can select the instruction text for each scan range individually (➔ Page 430 *Changing the patient instruction of a single scan range*) or for all scan ranges of the same examination (➔ Page 431 *Changing the patient instructions of all unscanned scan ranges*).

Element	Function
Mute check box	If you select the **Mute** check box before the start of specific scan ranges, the examination will be performed without playing the instructions. The scan delay time will remain the same.
Apply to all check box	The **Apply to all** check box is selected by default. The selected instruction text pair will be applied to all patient instructions of all unscanned ranges. If you clear the **Apply to all** check box, the selected patient instruction will only be added to newly inserted instruction commands.

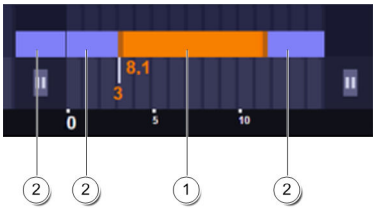
Contrast area:

Element	Function
 **Bolus Tracking** icon	Use the **Bolus Tracking** icon to configure a range for *syngo* CARE Bolus.
 **Test Bolus** icon	Use the **Test Bolus** icon to configure a range for a Test Bolus examination. (➔ Page 542 *Test Bolus*)

To delete a command from an unscanned scan range, right-click the icon in the timeline, and, from the context menu, select **Delete**.

14.1.2 Applying commands to a scan range in the timeline

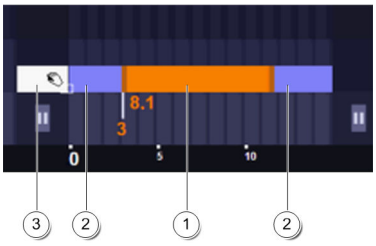
To apply a command to a scan range, click and drag an icon to a scan range in the timeline. The areas where you can place the icon become highlighted. These highlighted areas correspond to a scan range.



Scan range with highlighted areas

(1) Scan range
(2) Highlighted area

If you drag the icon over a highlighted area, the area changes to white. If you release the icon over the white area, the command is applied to the according scan range.



Scan range with selected area in white

(1) Scan range
(2) Highlighted area
(3) Selected area in white

To delete a command from an unscanned scan range, right-click the icon in the timeline, and, from the context menu, select **Delete**.

14.1.3 Timeline rearrangement

You can change the order in which a scan is performed. Positioning the cursor at the end of a timeline changes the cursor to a cross-shaped cursor. Pressing the left mouse button and dragging the cursor outside the timeline changes the cursor to a hand holding a timeline. A circle with a slash appears when the timeline cannot be inserted into the current position you are hovering. You can move the cursor to a blue rectangle before or after the other timelines where available. When hovering the cursor over the rectangle, it changes its color to white and the circle with a slash disappears, indicating that you can release the mouse button to insert the timeline. The order of the timelines is then updated. Note that a planar scan cannot be positioned between a CT and its planning topogram.

14.2 SPECT graphical range planning

A difference between a single-bed SPECT scan and a wholebody SPECT scan is in the range planning. The range planning appears as a graphical outline with matching color for a scan's timeline (CT or SPECT) to define an area to be scanned. A wholebody SPECT scan will have a scan range for each bed on the graphical range planning display. The number of SPECT beds can change based on the SPECT and CT recon range, and can cover more than the CT range. The graphical outline can be resized by hovering the cursor over its handles (white dots) and pressing the left mouse button and dragging. Information regarding the range is displayed outside the graphical outline. The bed position is indicated, for example as Bed 1, and then the starting position for each bed SP1 (starting position 1), SP2 (starting position 2). There is an overlap between the bed positions. For a wholebody SPECT scan, the number of beds can be 1 to 5. For all SPECT reconstructions with CT attenuation correction, the CT and SPECT recon ranges are linked. When you modify the CT recon range, the SPECT recon range modifies as well. This is applicable to both single-bed and wholebody SPECT recon ranges. For a single-bed SPECT scan, the scan range is fixed to the SPECT detector field of view (53.3 x 38.7 cm) . For wholebody SPECT scans, the SPECT scan is a multiple of beds. If the recon range is adjusted larger than the current number of beds, then an additional bed is added.

(➔ Page 412 *Graphical recon range planning*)

If you perform a SPECT scan first, you will not see the CT graphical scan planning. You will need to click the **Settings** icon (gear shaped graphic) in the top right corner, and select **Gantry Display** to display the gantry display window with the persistence image. You will have the first bed displayed in the Detector 1 persistence image display. After it is completed, the second bed will appear in the Detector 1 persistence image display. You position the patient under the Detector 1 and Detector 2 to plan the first bed. If you do a topogram first, then you can do graphical scan planning.

Because of graphical scan planning, it is recommended to do CT first so that you plan both CT and SPECT together based on the anatomy. However for a cardiac scan, the SPECT scan is performed first.

14.2.1 SPECT graphical range planning dose isotope

Dose changes are the same across all tomo and planar SPECT scans. Dose Isotope selection is always disabled as it is part of the protocol, but it can be changed by double clicking the timeline to open the scan parameters. You can click the **General Scan** button, and then the **Isotope 1** button. You can then select an isotope from the dropdown. You will probably not change the istope and pharmeuceutical as they are set by the protocol. You will probably change the Injection Date, Injection Time, and Dose value.

The Syringe button displays the Radiopharmaceutical Dose dialog box.

Dose is primarily related to the scan process, although it can be changed in reconstruction.

The Radiopharmaceutical Dose dialog box is primarily used for quantification studies, but can also be used to make edits to information that may have entered earlier. You can then create new reconstructions with the updated information. The dose values have conditions which are verified, and are highlighted in yellow if there is a error. For example, the **Pre-Injection Time** cannot be after a **Post-Injection Time**.

For information on dose, go to MI Dose Management.

14.2.2 Graphical range planning using gantry display

If you perform a SPECT scan first, you will not see the CT range planning. You will need to click the **Settings** icon (gear shaped graphic) in the top right corner, and select **Gantry Display** to display the gantry display window with the persistence image. You will have the first bed displayed in the Detector 1 persistence image display. After it is completed, the second bed will appear in the Detector 1 persistence image display. You position the patient under the Detector 1 and Detector 2 to plan the first bed. If you do a topogram first, then you can perform range planning.

14.2.3 SPECT graphical range planning quality check examination task

CT has a quality check as does SPECT. CT's is called **Check&GO**. SPECT's is called **Quality Check**. Quality Check displays a Projections Movie, Sinogram, and Linogram across the top of the display. Beneath these are displayed the isotope and number of beds. If you have a dual isotope, a second row appears beneath the first istotope listing the second isotope and the number of beds. If you are doing a dynamic tomo or composite tomo, the bottom area is displayed differently.

14.2.4 SPECT graphical range planning reconstruction

After you perform a SPECT only scan, the data will be available in the range planning as part of a Fast Recon and 2D projections. Based on these, you can then do range planning.

A range planning image is displayed in the left segment of the planning layout. The range planning image is based on the selection in the Reconstruction Browser. An anterior view of a maximum intensity projections (MIP) generated from the Fast Recon (reconstruction) of the tomographic image is displayed when a tomographic quality control image (QCI) is selected. A topogram is displayed when the topogram is selected.

For a cardiac study, a SPECT study would be performed instead of a topogram.

For range planning, it is recommended to perform at CT scan first so that you plan both CT and SPECT together based on the anatomy.

14.2.5 SPECT graphical range planning textual information

In the graphical range planning, nuclear medicine textual information appears in the corners. These include:

Top Left Corner	Top Right Corner	Bottom Left Corner	Bottom Middle	Bottom Right Corner
Patient Name	Institution Name	3D Filter	Image Comments 1	Quick Quant
Patient ID	Referring Physician's Name	Acquisition Number	Image Comments 2	Orientation Cube
Birth Date, Patient's Sex and Age	Manufacturer/ Manufacturer's Model Name	Matrix Size	Slab Thickness	Slice Thickness
Time Point	Software Version	Kernel/Reconstruction Paratmeters	- - -	Spacing between Slices
Study Date	Patient Position Acquisition	FOV	- - -	Alpha Blending
Series Description	Operator	Compression Rate	- - -	Zoom Factor
Temporal Location	Radioisotope	- - -	- - -	Window Top
Data Role	Radiopharmaceutical	- - -	- - -	Window Bottom
Study Description	Dose	- - -	- - -	- - -
Accession Number	Imaging Delay	- - -	- - -	- - -
Acquisition Date	- - -	- - -	- - -	- - -
Acquisition Time	- - -	- - -	- - -	- - -
Protocol Name	- - -	- - -	- - -	- - -
Image Number	- - -	- - -	- - -	- - -
Slice Position	- - -	- - -	- - -	- - -
Frame View Name	- - -	- - -	- - -	- - -

14.3 Parameter panel

The parameter panel displays the scan and recon parameters that are defined in the selected scan protocol.

The protocol parameters are grouped into categories for scanning and reconstruction.

If you need to modify a parameter or check your parameter settings for a topogram or tomogram range, you can access the parameter panel from the *syngo* Acquisition Workplace within the scan workflow.

If you cannot find a parameter in the parameter panel, check the **Protocol Parameters** tab. (➔ Page 372 *Viewing and checking the protocol parameters*)

The content of the parameter panel depends on the selected range or recon job:

- Scan parameter panel
- Recon parameter panel

14.3.1 Accessing the recon parameter panel

✓ The **Recon Ranges** area is displayed.

◆ In the **Recon Ranges** area, double-click a recon icon of a recon job.

– or –

Right-click a recon icon and choose **Show Parameters** from the context menu.

The recon parameter panel opens.



Recon parameter panel

Only those recon parameters that are set for the particular recon range of the corresponding scan protocol are displayed.

If you modify any parameters, the background color of the modified parameters changes to green.

The icon identifies categories that include modified parameter settings.

A '*' indicates that the FAST Planning results have been modified.
(→ Page 415 *Enabling FAST Planning*)

14.3.2 Accessing the scan parameter panel

✓ The timeline is displayed.

◆ In the timeline, double-click a scan range.

– or –

In the timeline, right-click a scan range and choose **Show Parameters** from the context menu.

The scan parameter panel opens.

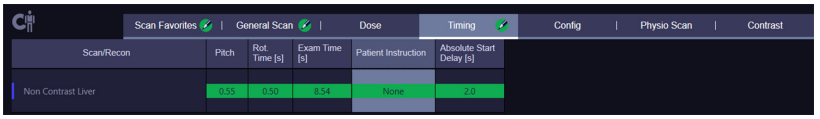


Scan parameter panel

Only those scan parameters that are set for the particular scan range of the corresponding scan protocol are displayed.

If you modify any parameters, the background color of the modified parameters changes to green.

The icon identifies categories that include modified parameter settings.



Scan parameter panel with modifications

A '*' indicates that the FAST Planning results have been modified.
(→ Page 415 *Enabling FAST Planning*)

14.4 Repeating a scan range

In the timeline, you can repeat scan ranges.

1 In the timeline, right-click the scan range you want to repeat.

2 From the context menu, select **Repeat**.

The scan range is added immediately after the selected scan range in the timeline.

When acquiring a second topogram with **FAST Planning** enabled, the resulting recon range may be shifted in z-direction on the topogram if the following settings have been made:

Two topograms are acquired in succession.

The view of the second topogram has been changed from AP to lateral or vice-versa.

The table direction of the second topogram has been reversed.

◆ If this scenario occurs, adapt the recon range manually.

14.5 Deleting a scan range

In the timeline, you can delete unscanned topogram ranges and unscanned tomogram ranges.

1 In the timeline, right-click the scan range you want to delete.

2 From the context menu, select **Delete**.

The scan range is removed.

14.6 Range planning

You can plan the following ranges:

- (➔ Page 403 *Planning scan ranges*)
- (➔ Page 412 *Planning recon ranges*)

14.6.1 Planning scan ranges

The scan range is the sum of all corresponding recon ranges. If several recon jobs are defined for a tomogram scan, the size of the scan range adapts to the length and the location of the recon ranges on the body region in z-direction.

You can do the following:

- Display multiple scan ranges simultaneously. (➔ Page 403 *Displaying scan ranges*)
- Connect individual scan ranges to an autorange. (➔ Page 405 *Connected scan ranges (autorange)*)
- Move scan ranges in the timeline. (➔ Page 407 *Moving scan ranges in the timeline*)
- Change the scan delay time. (➔ Page 409 *Scan delay time*)



If necessary, you can plan a scan range without a topogram.

Displaying scan ranges

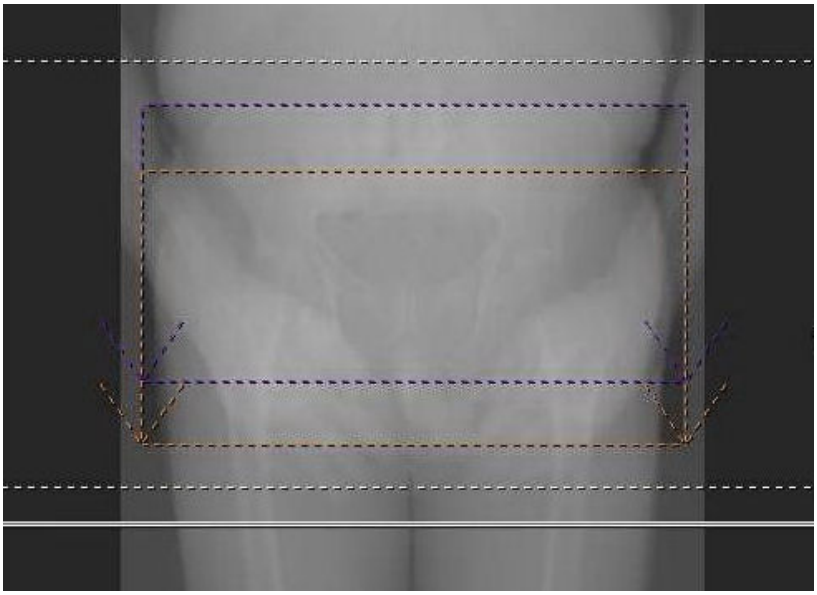
To check the position and extension of your scan ranges, select multiple scan ranges. The display of multiple scan ranges provides an overview of the different positions of the ranges on the topogram. This allows you to check and compare the various scan ranges.



Scan ranges in timeline

In the timeline, you can perform the following actions:

Target	Action
Display one scan range on the topogram.	Click a scan range. A box with dashed outlines in the corresponding color appears on the topogram.
Display multiple scan ranges on the topogram.	Pressing and holding the **Ctrl** key, click the scan ranges you want to display. The scan ranges on the topogram are indicated by their distinct color.



Multiple scan ranges on topogram image

To reduce or enlarge a scan range, modify the recon ranges along the z-axis on the topogram. (➔ Page 412 *Graphical recon range planning*)

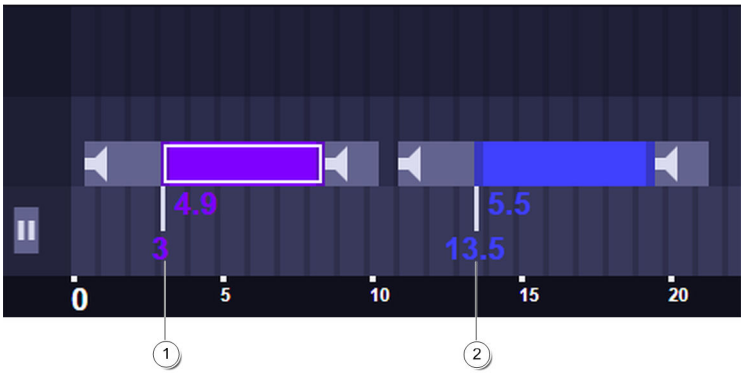
You can change the display in the topogram image from scan range to recon range. You can either select scan ranges or recon ranges.
(➔ Page 413 *Selecting recon ranges*)

Connected scan ranges (autorange)

You can use a scan protocol with autoranges or you can connect consecutive tomogram ranges to an autorange. The system adheres to the preconfigured delay time between the scans. As a result, you need to start an autorange only once. All subsequent scan ranges that are connected to an autorange are started automatically. You can connect scan ranges in the timeline or on the **Protocol Parameters** tab.

You can connect either spiral scan ranges, ranges of a sequence examination, or both spiral and sequence ranges.

(➔ Page 406 *Connecting ranges to an autorange*)



Autorange

(1) Scan delay time in seconds until the start of the first range
(2) Time from the autorange start until the start of the second range

You can set the absolute delay time before the start of each range of the autorange. The absolute delay time of all ranges of an autorange always refers to 0. (➔ Page 409 *Scan delay time*)

For two consecutive scan ranges with contrast medium, for example, a thorax and an abdomen scan range, you can connect the two scan ranges to start the abdomen scan range immediately after the thorax scan range. The injection and the autorange are started at 0 seconds.

Connecting ranges to an autorange

✓ At least two unscanned tomogram ranges are available and displayed in the timeline.

1 Right-click a range in the timeline.

A context menu opens.

2 From the context menu, choose **Open Edit Mode**.

A toolbar is displayed above the timeline.



3 Click and drag the **Connect Ranges** icon to the highlighted area between two unscanned ranges in the timeline.

– or –

Move the range to the highlighted area before or after another scan range. (➔ Page 407 *Moving scan ranges in the timeline*)

4 Release the mouse button when the highlighted area becomes white.



The **Pause** icon in the timeline disappears. The two ranges are connected.

You need to start an autorange only once. All subsequent scan ranges that are combined to an autorange are started automatically. (→ Page 455 *Tomogram scan acquisition*)



Optionally, you can increase or reduce the scan delay time.
(→ Page 410 *Changing the scan delay time*)

Splitting an autorange into two ranges

You can add a pause between two scan ranges in order to split an autorange.

✓ An unscanned autorange is displayed in the timeline.

1 Right-click the autorange.

A context menu opens.

2 From the context menu, choose **Open Edit Mode**.

A toolbar is displayed above the timeline.



3 Click and drag the **Pause** icon to the highlighted area between the two scan ranges in the timeline.

4 Release the mouse button when the highlighted area becomes white.

The **Pause** icon is added to the timeline. Two independent scan ranges are created.

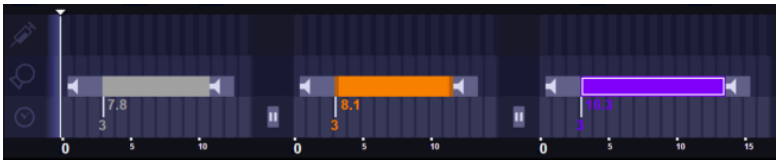
Moving scan ranges in the timeline

In the timeline, you can change the order in which the ranges are to be scanned. Depending on where you place the ranges in the timeline, you can move individual scan ranges before or after another scan range with a pause in between or you can create autoranges.

✓ At least two unscanned tomogram ranges are available and displayed in the timeline.

1 In the timeline, click a scan range to be moved to another position.

The range is selected. A white border around the scan range indicates the selection.

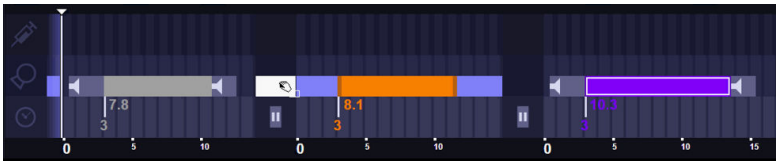




2 Move the mouse pointer to the upper right edge of the selected range until the mouse pointer changes its shape.



3 To change the order of two individual scan ranges to be scanned separately, click and drag a range to the highlighted area above a **Pause** icon:

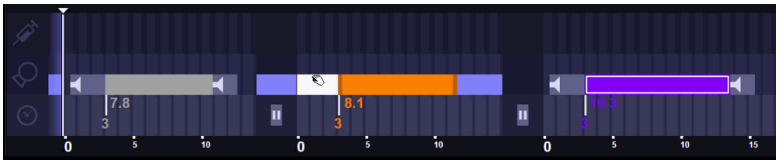


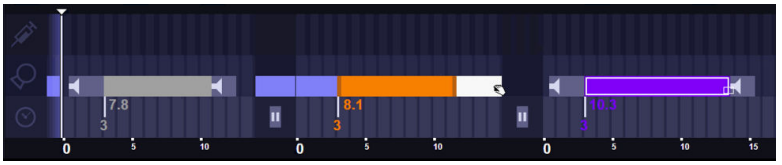


The areas where you can place a scan range are highlighted as soon as you move a scan range.

– or –

To connect two ranges to an autorange, click and drag a range to the highlighted area directly before or after another range:



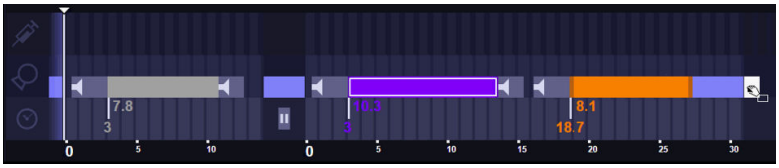


(➔ Page 405 *Connected scan ranges (autorange)*)

– or –

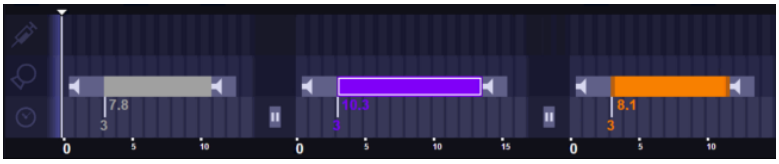


To separate an autorange into individual scan ranges, click and drag a range to the highlighted area above a **Pause** icon:



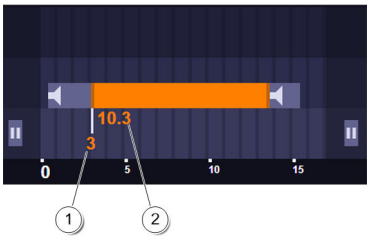
4 Release the mouse button when the highlighted area becomes white.

The scan range is placed.



Scan delay time

The scan delay time of a range is the time before radiation is started and image data is acquired. The scan delay time of a scan range is displayed in the timeline. You can change the scan delay time of a scan range by modifying the **Absolute Start Delay** parameter in the parameter panel.

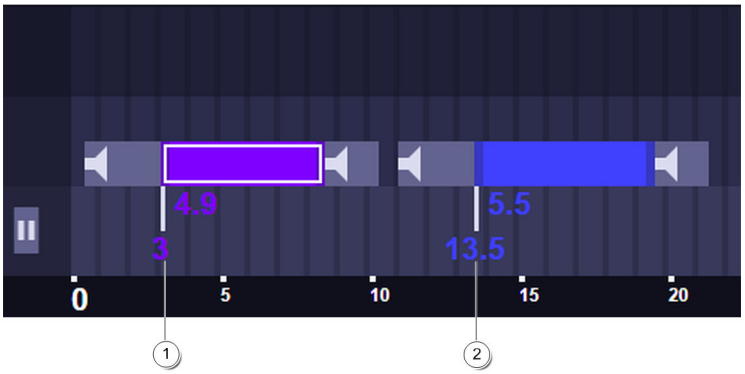


Unscanned tomogram range

(1) Scan delay time in seconds until the start of the range
(2) Duration of the scan range in seconds

The absolute delay time of all ranges of an autorange always refers to 0. This means that the scan delay time of all ranges of an autorange is measured from the autorange start at 0 seconds.

In the example of the autorange below, the scan delay time until the start of the first range is indicated. For the subsequent scan range, the time from the autorange start until the start of the second range is indicated.



Unscanned autorange

(1) Scan delay time in seconds until the start of the first range
(2) Time from the autorange start until the start of the second range



If the scan delay time until the next scan range is so large that it would be out of the scope of the screen width, the **Discontinued Timer** icon is displayed in front of the next scan range.

Changing the scan delay time

Before scanning a range, you can manually adapt the scan delay time of a range.

✓ An unscanned tomogram range is available and displayed in the timeline.

1 To increase or reduce the scan delay time, move the mouse pointer over a scan range until the mouse pointer changes its shape.

2 Click and drag a range to the left or right.

The scan delay time is updated.

Scanning without a topogram

If necessary, you can also plan the scan ranges without a topogram.

If no topogram has been scanned, you must switch off **CARE Dose4D**. If not switched off, you cannot start the scan. (➔ Page 503 *CARE Dose4D*)

✓ The patient has been correctly positioned on the table.

✓ The patient is registered.

1 Select a scan protocol. (➔ Page 361 *Protocol selection*)

2 On the **Protocol Selection** tab, clear the **Topogram** check box of the required protocol. (➔ Page 361 *Protocol Selection tab*)

Alternatively, you can also delete the topogram range on the **Protocol Parameters** tab or in the timeline. (➔ Page 458 *Deleting a scan range*)

3 In the execution control, click **OK**.

The protocol is loaded. In the taskflow control, the **Patient position** task is available instead of the **Topogram** task.

4 In the **Patient position** task, choose the correct patient position.

If no topogram is available, the patient position pictogram is not displayed either. (➔ Page 384 *Patient position pictogram*)



5 In the execution control, click **Confirm**.

6 In the **Scan** task, adapt the **Scan Length** if necessary.

The scan length is automatically adapted for all scan ranges of the planned examination. The size and position of the recon ranges is also automatically adapted: All recon ranges have the same length and the same position.

In the **Scan** task, the **Scan Direction** and **Scan Length** parameters are displayed if no topogram is available. As no topogram is available, you can change the **Scan Length** parameter directly in the **Scan** task. You can change the **Scan Direction** parameter in the parameter panel.

7 Move the patient table to the starting position of the first scan range using the control box.

– or –

Enter a precise table position in the **Table Position** dialog box and then move the table using the control box.

8 Load the scan range. (➔ Page 455 *Activating the tomogram scan*)

9 Scan the range.

After the scan has been acquired, the topo segment remains empty. The acquired real-time images are displayed in the tomo segment.

10 Continue with reconstructing the images.

14.6.2 Planning recon ranges

You can plan the recon ranges as follows:

- Plan the recon ranges graphically on the topogram (➔ Page 412 *Graphical recon range planning*)
- Enable **FAST Planning** to automatically detect the body region to be scanned (➔ Page 415 *Enabling FAST Planning*)

Graphical recon range planning

To cover the required anatomic region during the diagnostic range, you can plan the recon ranges of each tomogram range on the acquired topogram before scanning. For each tomogram range, you can define a number of recon ranges. The recon ranges are defined in the scan protocol or you can repeat a recon job in the **Recon Ranges** area.

The scan range is the sum of all corresponding recon ranges. If several recon jobs are defined for a tomogram range, the size of the scan range adapts to the length and the position of the recon ranges on the body region in z-direction.

You can display one ore more recon ranges on the topogram.
(➔ Page 413 *Selecting recon ranges*)

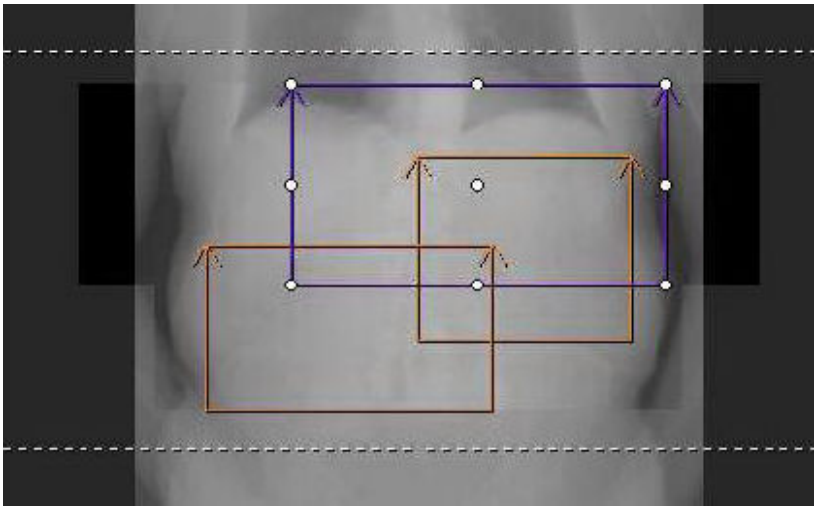
You can graphically manipulate recon ranges.

You can add more recon jobs after scanning by using the **Reconstruction** task, if required.

Selecting recon ranges

When you graphically plan a CT examination on the acquired topogram, you can select multiple recon ranges, even of different tomogram scans. Selecting the recon ranges of different tomogram scans provides an overview of the different positions of the ranges on the topogram. This allows you to easily plan and compare the recon ranges of the different scans.

After a topogram has been acquired, the **Scan** task of the next scan range is selected in the taskflow control. In the **Recon Ranges** area, all recon icons of the selected scan range are automatically selected and displayed on the topogram image.



Multiple selection of recon ranges

You can display specific recon ranges on the topogram image:

Target	Action
Display one recon range on the topogram.	In the **Recon Ranges** area, click the required recon icon.

Target	Action
Display multiple recon ranges on the topogram.	In the **Recon Ranges** area, press and hold the **Ctrl** key, and click the recon icons you want to display.

You can change the display in the topogram image from recon range to scan range. Click the scan range in the timeline to display the scan range inside the topogram image. You can either select and display scan ranges or recon ranges.

Modifying recon ranges

You can graphically manipulate a recon range.

To move or resize more than one recon range, you must select all recon ranges. (➔ Page 413 *Selecting recon ranges*)

1 In the **Recon Ranges** area, click a recon icon.

The selected recon range is displayed on the topogram.

2 Move or resize the recon range as described in the table below.

Target	Action	Mouse pointer
Move	Click and drag the recon range.	
Resize vertically (along z-axis)	Click and drag the upper or lower border only on the dot of the recon range.	 
Resize horizontally	Click and drag the left or right border only on the dot of the recon range.	 
Resize diagonally	Click and drag a corner of the recon range.	

Target	Action	Mouse pointer
Set the range tilt	Setting the range tilt graphically on the topogram is only possible if a topogram with tube position left or right has been acquired. Click and drag the upper or lower border of the recon range.	

Only **Move** and **Resize Vertically** are applicable for NM reconstruction jobs.

The current scan range may be reduced or enlarged if the recon ranges are moved along the z-axis on the topogram.

For planning NM attenuation correction reconstruction, go to (➔ Page 622 *CT NM Reconstruction FOV Synchronization*)

Enabling FAST Planning

In the scan protocol, you can enable **FAST Planning** and specify a body region for each recon range. Depending on the specified body region, **FAST Planning** automatically positions the recon ranges on the specified body regions after a topogram has been acquired. The recon ranges are displayed on the topogram image in the topo segment.

If **FAST Planning** is not enabled in the scan protocol, proceed as follows:

1 From the **Recon Ranges** area, select a recon icon.

You can select more than one recon icon. (➔ Page 413 *Selecting recon ranges*)

2 Open the recon parameter panel.

3 In the **Recon Box** category, select the **FAST Planning** parameter.

4 From the list, select a body region to be detected.

For some body regions, you can choose from a number of variants.

5 Option: In the **FAST Planning Width** column, select **Wide** to include soft tissue.

– or –

Select **Narrow** to exclude soft tissue.

For some recon ranges, the **FAST Planning Width** parameter is not available.

On the topogram image, the recon range is automatically positioned on the corresponding body region. The scan range is adapted accordingly.

- If the body region could not be detected by **FAST Planning**, the **Preconditions** task in the taskflow control displays information about inadequately set recon ranges and which body region you need to check on the topogram or in the parameter panel.
- If you adapt the recon range to suit your needs, a '*' indicates that the **FAST Planning** result has been modified.

FAST Planning for DE You can automatically plan scan ranges for the most common DE examinations.

14.7 Scan and recon reference lines

You can use reference lines to document reconstructed slices on topogram images.

You can create additional images with scan reference lines and recon reference lines. Scan reference lines show a box on the topogram image that indicates the scan range. Recon reference lines indicate the reconstructed slices on the topogram or on the 3D reference image.

Images with reference lines can be created automatically, or you can create them manually.

- (→ Page 417 *Enabling automatic reference lines*)
- (→ Page 417 *Creating reference lines manually*)

- Scan reference lines are created on the topogram.
- Recon reference lines for 2D (**Fix Axial**) reconstructions are created on the topogram.
- Recon reference lines for 3D (Non-**Fix Axial**) reconstructions are created on a 3D reference image.

14.7.1 Enabling automatic reference lines

You can enable the automatic creation of reference lines in the parameter panel of the recon range or scan range before the start of a scan or reconstruction.

To enable recon reference lines, proceed as follows:

1 In the **Recon Ranges** area, double-click a recon range.

The parameter panel opens.

2 Navigate to the **Auto Tasking** category.

3 In the **Recon Ref. Lines** parameter column, select **On**.

The automatic creation of images with recon reference lines is enabled.

To enable scan reference lines, proceed as follows:

1 In the timeline, double-click a scan range.

The parameter panel opens.

2 Navigate to the **Config** category.

3 In the **Scan Ref. Lines** parameter column, select **On**.

The automatic creation of topogram images with scan reference lines is enabled.

14.7.2 Creating reference lines manually

After the tomogram images have been reconstructed, you can still create images with reference lines. You can create recon reference lines and scan reference lines:

1 In the **Recon Ranges** area, right-click an icon of a reconstructed range to create recon reference lines.

– or –

In the timeline, right-click a scan range to create scan reference lines.

2 From the context menu, select **Create image with reference lines**.

An image with reference lines is created. You can see the image in the **Patient Browser** tab of the Patient Browser.

14.8 Check&GO

You can enable an additional quality check (**Check&GO**) before scanning a range, allowing you to check the quality of the scan before the images are reconstructed.

If the scan range contains automatic reconstruction jobs, a quality check ensures that the auto reconstructions are blocked as soon as the range has been scanned. After you confirm the check, the auto reconstructions are enabled. However, if no quality check is specified for a scan range containing automatic recon jobs, the recon jobs are started automatically as soon as the range has been scanned.

Before you start scanning, you can activate the **Check&GO** parameter and specify the type of quality check.

You can enable the following quality checks:

- **Contrast**

  An algorithm automatically checks whether contrast medium was injected, the homogeneity (HU) value, and whether a defined threshold of contrast medium in the images has been reached.

- **Coverage**

  An algorithm automatically checks if the scanned range on the reconstruction images matches the planned scan range on the topogram.

- **Contrast and Coverage**

  Combines both checks.

- **Manual**

  No check algorithms are applied. You must perform a sight check once you finished scanning the range.

In addition, you can set the following parameters:

- **Check&GO Image Type**

  Image type of the images displayed for the quality check: **MIP Thin** or **MPR**

- **Check&GO Image Orientation**

  Viewing orientation of the quality check image series: **Axial**, **Coronal**, **Sagittal**

The quality check image series is displayed in the tomo segment after the range has been scanned.

If you have navigated to another scan range, click **Show QC Images** to display the quality check image series in the tomo segment again.

The result of the automatic quality check is displayed in the taskflow control:

Check&GO algorithm	Message in taskflow control	Meaning
Coverage	**Detection failed**	The algorithm failed to detect the coverage.
	Missing Topogram to detect coverage	No topogram has been acquired. The algorithm could not be executed.
	Check actual scan range	The algorithm successfully detected the coverage but the coverage is not sufficient.
	Scanned volume OK	The algorithm successfully detected the coverage and the coverage is sufficient.
Contrast	**Detection failed**	The algorithm failed to detect any contrast medium.
	No contrast enhancement detected	The algorithm could not find any level of contrast medium enhancement.
	Contrast enhancement inhomogeneous	The algorithm detected an adequate average HU value in some body levels but detected an inconsistency between different body levels (deviation between layers).

Check&GO algorithm	Message in taskflow control	Meaning
	Contrast enhancement OK	The algorithm detected an adequate average HU value with consistent distribution of contrast medium in all body levels (low or acceptable deviation).
Manual	**Check image quality**	No algorithm has been performed. Manually check the image quality in the tomo segment.

Even if the algorithm produces positive results, for example, **Scanned volume OK**, check the quality of the image series in the tomo segment.

Proceed as follows:

- If you are not satisfied with the quality of the scan, click **Repeat Scan** to repeat the scan range.
- If you are satisfied with the quality of the scan, click **Start Autotasking** to start autotasking the images with the defined autotasking settings.
- You could also ignore the quality check and proceed with your workflow.

Check&GO is not available for the following ranges:

- **Premonitoring** and **Monitoring** (*syngo* CARE Bolus)
- **Test Bolus** (➔ Page 542 *Test Bolus*)
- Planning and i-Sequence (CT-guided intervention)

14.9 Communicating with the patient

You can communicate with the patient directly from the control room at any time. To listen and talk to the patient, press the respective keys on the control box. If the noise level is too high, you can configure the noise reduction in the Administration Portal. (➔ Page 755 *Configuring default settings of the patient instruction*)



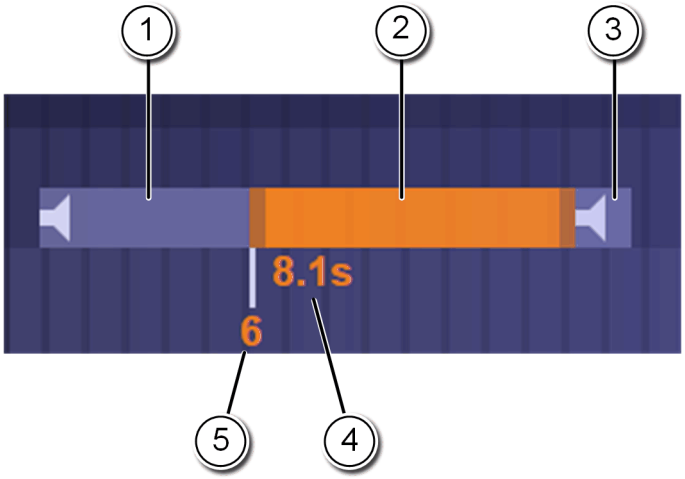
(1) **Call patient** key
(2) **Listen to patient** key

In addition, you can add patient instructions to one or more scan ranges. These instructions will automatically be played to the patient before and after the scan. (➔ Page 421 *Patient instructions*)

14.9.1 Patient instructions

To ensure optimum image quality, you can add automatic patient instructions to each scan range to avoid movement artifacts. For each scan range, you can select audio instruction text and language. If you add an audio instruction to a scan range, a text pair is inserted. Each text pair comprises instruction text A, which is played at the start of the scan range and instruction text B, which is played at the end of the scan range. For example, before the start of a scan range, an inspiration audio instruction automatically tells the patient to breathe in and hold their breath. At the end of the scan range, an audio instruction tells the patient to start breathing again.

In addition to audio instructions, visual guidance is provided.
(➔ Page 424 *Visual Countdown lighting*)



(1) Patient instruction text A
(2) Scan range
(3) Patient instruction text B: Start breathing again.
(4) **Exam Time**
Indicates the X-ray on time and **Breath Hold Time** in seconds.
(5) **Absolute Start Delay**
Indicates the scan delay time in seconds. (➔ Page 409 *Scan delay time*)

Most scan protocols have default patient instructions for certain examinations, where necessary. For head, cervical, thoracic, pelvis and lumbar spine examinations, and for scanning of extremities, scan protocols do not need to have predefined patient instructions.

You can perform the following tasks:

- Add an instruction pair to a scan range. (➔ Page 425 *Adding patient instructions to a scan range*)
- Delete an instruction pair from a scan range. (➔ Page 427 *Deleting a patient instruction pair*)
- Change the instruction language of all scan ranges. (➔ Page 428 *Changing the instruction language*)

- Change the instruction text of each scan range individually. (➔ Page 430 *Changing the patient instruction of a single scan range*)
- Change the instruction text of all scan ranges. (➔ Page 431 *Changing the patient instructions of all unscanned scan ranges*)

The following table shows the available instructions:

Instruction	Text A	Text B
Inspiration	Please breathe in and hold your breath.	Start breathing again.
Expiration	Please breathe in, breathe all the way out, and hold your breath.	Start breathing again.
Do not swallow	Please breathe in, hold your breath and do not swallow.	Start breathing again.
Cardiac	Please breathe in, breathe all the way out, breathe in, and hold your breath.	Start breathing again.
Perfusion	Take a deep breath in, breathe all the way out, take a deep breath in, breathe half way out, and hold your breath.	Start breathing again.
Short Inspiration	Please breathe in and hold your breath.	Start breathing again.
TwinSpiral Dual Energy (➔ Page 569 *TwinSpiral Dual Energy scan*)	There will be a pause in the middle of this examination. Take a deep breath in and hold your breath until you are asked to start breathing again.	Start breathing again.

In the Administration Portal, you can change the following default settings:

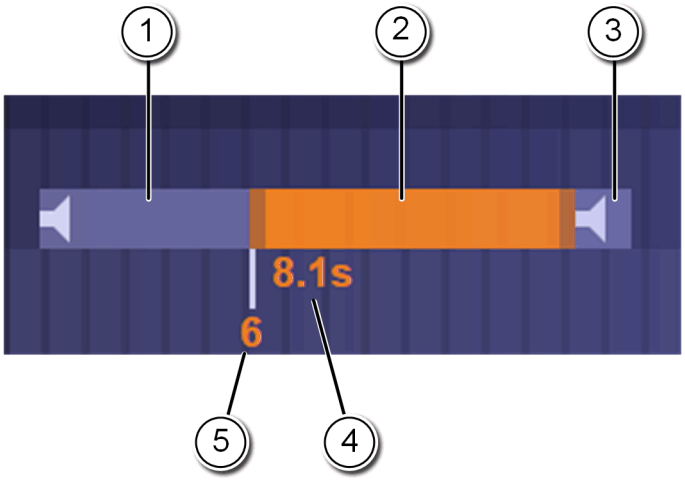
- Select another instruction language as the default language.
- Modify the instruction volume.
- Reduce the audio noise.

(➔ Page 755 *Configuring default settings of the patient instruction*)

In the Administration Portal, you can also define language-specific instructions and record new text pairs. (➔ Page 755 *Recording and editing additional patient instructions*)

Visual Countdown lighting

The Visual Countdown lighting consists of a number of LEDs which provide visual guidance to the automatic patient instruction. All LEDs are switched on when the audio patient instruction starts, and one after the other is switched off from the start of the scan range until the end of the scan range.



(1) Patient instruction text A
The LEDs are switched on when the audio instruction is played.
(2) Scan range
The LEDs are switched off one after the other from the start of the scan range until the end of the scan range.
(3) Patient instruction text B: Start breathing again.
The LEDs are switched off.
(4) **Exam Time**

Indicates the time in seconds during which the LEDs are switched off one after the other.

(5) **Absolute Start Delay**
Indicates the time in seconds until the scan range starts and the LEDs are switched off one after the other.

Adding patient instructions to a scan range

You can add patient instructions to individual scan ranges on the **Protocol Parameters** tab, in the parameter panel and in the timeline.

✓ One or more unscanned scan ranges are available.

Protocol Parameters tab

1 In the taskflow control, click the **Protocol** task.

2 Click the **Protocol Parameters** tab. (➔ Page 371 *Protocol Parameters tab*)

The scan ranges and recon ranges of the current examination are displayed in the **Scan/Recon** column.

3 In the category button area, click the **Timing** button.

4 From the **Patient Instruction** parameter list for a scan range, select the instruction to be played to the patient. For each scan range of the current examination, you can select a patient instruction pair.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)

The patient instruction is added to the selected scan range.

Parameter panel

1 In the timeline, double-click the scan range.

– or –

In the timeline, right-click the scan range and choose **Show Parameters** from the context menu.

The scan parameter panel opens showing the scan parameters of the selected scan range.

2 Click the **Timing** tab.

3 From the **Patient Instruction** list, select the instruction to be played to the patient.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)

The patient instruction is added to the selected scan range.

Timeline

1 In the timeline, right-click any unscanned scan range.

2 From the context menu, choose **Open Edit Mode**.

A toolbar is displayed above the timeline.

3 From the **Patient Instruction** list, select the instruction to be played to the patient.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)

4 The **Apply to all** check box is selected by default. The selected instruction text pair will be applied to all patient instructions of all unscanned ranges.

Optional: Clear the **Apply to all** check box. The selected patient instruction will only be added to newly inserted instruction commands.

5 Optional: Select the **Mute** check box before the start of specific scan ranges.

The examination will be performed without playing the instructions. The scan delay time will remain the same.

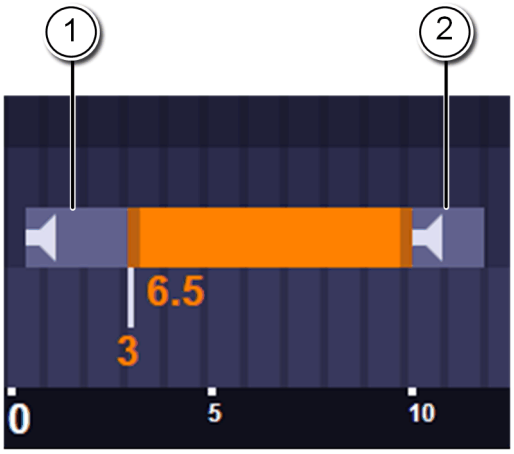
Audio instructions can also be turned off at the tablet for the current patient.



6 In **Audio Control**, click and drag the **Command** icon to the scan range in the timeline.

A patient instruction pair is added to the scan range. One instruction is added before the start of the scan range, and one instruction after the end of the scan range.

The **Command** icon visually represents the instruction pair in the timeline. The duration of an instruction is also visible in the timeline.



Scan range with patient instruction pair

(1) Patient instruction text A
(2) Patient instruction text B

The scan delay time may be updated. (➔ Page 409 *Scan delay time*)

Deleting a patient instruction pair

You can delete patient instructions from individual scan ranges on the **Protocol Parameters** tab, in the parameter panel and in the timeline.

✓ The scan range, from which you want to delete the patient instruction pair, is unscanned.

Protocol Parameters tab

1 In the taskflow control, click the **Protocol** task.

2 Click the **Protocol Parameters** tab. (➔ Page 371 *Protocol Parameters tab*)

The scan ranges and recon ranges of the current examination are displayed in the **Scan/Recon** column.

3 In the category button area, click the **Timing** button.

4 From the **Patient Instruction** parameter list for a scan range, select **None**.

The patient instruction of the selected scan range is removed from the scan range.

Parameter panel

1 In the timeline, double-click the scan range.

– or –

In the timeline, right-click the scan range and choose **Show Parameters** from the context menu.

The scan parameter panel opens showing the scan parameters of the selected scan range.

2 Click the **Timing** tab.

3 From the **Patient Instruction** list, select **None**.

The patient instruction of the selected scan range is removed from the scan range.

Timeline

1 In the timeline, right-click the **Command** icon of the scan range and choose **Delete** from the context menu.

The patient instruction of the selected scan range is removed from the scan range.

– or –

In the timeline, right-click the scan range and choose **Open Edit Mode** from the context-menu.

The **Edit Mode** toolbar is displayed above the timeline.

2 From the **Patient Instruction** list in the **Edit Mode** toolbar, choose **None**.

The patient instruction of the selected scan range is removed from the scan range.

Changing the instruction language

You can set the instruction language for all scan ranges of the same examination on the **Protocol Parameters** tab and in the timeline.

Protocol Parameters tab

1 In the taskflow control, click the **Protocol** task.

2 Click the **Protocol Parameters** tab. (➔ Page 371 *Protocol Parameters tab*)

3 From the **Instruction Language** list in the upper right corner of the **Protocol Parameters** tab, select an instruction language.

The language will be applied to all instruction texts.

If the desired instruction language is missing from the **Instruction Language** list, you can add instruction languages to the list in the Administration Portal. (➔ Page 755 *Recording and editing additional patient instructions*)

The selected language is not saved to the scan protocol. For example, if you save a protocol with a patient instruction in Spanish and reload it with a configured default English instruction language, the patient instruction will be announced in English when the range is scanned. To avoid this, make sure that the correct language is configured for the patient before scanning.

Timeline

✓ One or more unscanned scan ranges with patient instructions are available in the timeline.

1 In the timeline, right-click an unscanned scan range.

2 From the context menu, choose **Open Edit Mode**.

The **Edit Mode** toolbar is displayed above the timeline.

3 From the **Instruction Language** list, select an instruction language.

The language will be applied to all instruction texts.

If the desired instruction language is missing from the **Instruction Language** list, you can add instruction languages to the list in the Administration Portal. (➔ Page 755 *Recording and editing additional patient instructions*)

4 Optional: Select the **Mute** check box before the start of specific scan ranges.

The examination will be performed without playing the instructions. The scan delay time will remain the same.

Audio instructions can also be turned off at the tablet for the current patient.

Changing the patient instruction of a single scan range

Changing the patient instruction of a single scan range is possible on the **Protocol Parameters** tab, in the parameter panel and in the timeline.

✓ The scan range, for which you want to change the patient instruction pair, is unscanned.

Protocol Parameters tab

1 In the taskflow control, click the **Protocol** task.

2 Click the **Protocol Parameters** tab. (➔ Page 371 *Protocol Parameters tab*)

The scan ranges and recon ranges of the current examination are displayed in the **Scan/Recon** column.

3 In the category button area, click the **Timing** button.

4 From the **Patient Instruction** parameter list for a scan range, select the instruction to be played to the patient. For each scan range of the current examination, you can select a patient instruction pair.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)

The patient instruction of the selected scan range is changed accordingly.

Parameter panel

1 In the timeline, double-click the scan range.

– or –

In the timeline, right-click the scan range and choose **Show Parameters** from the context menu.

The scan parameter panel opens showing the scan parameters of the selected scan range.

2 Click the **Timing** tab.

3 From the **Patient Instruction** list, select the instruction to be played to the patient.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)

The patient instruction of the selected scan range is changed accordingly.

Timeline

1 In the timeline, right-click the scan range and choose **Open Edit Mode** from the context-menu.

The **Edit Mode** toolbar is displayed above the timeline.

2 Clear the **Apply to all** check box.

3 Delete the patient instruction in the timeline. (➔ Page 427 *Deleting a patient instruction pair*)

4 From the **Patient Instruction** list, select the instruction to be played to the patient.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)



5 In **Audio Control**, click and drag the **Command** icon to the scan range in the timeline.

The patient instruction of the selected scan range is changed accordingly.

Changing the patient instructions of all unscanned scan ranges

✓ The scan range, for which you want to change the patient instruction pair, is unscanned.

1 In the timeline, right-click the unscanned range .

2 From the context-menu, choose **Open Edit Mode**.

The **Edit Mode** toolbar is displayed above the timeline.

3 Select the **Apply to all** check box.

The selected instruction text pair will be applied to all patient instructions of all unscanned ranges.

4 From the **Patient Instruction** list, select the instruction to be played to the patient.

Not all instructions may be available for the selected language. In this case, you can record additional patient instructions or edit prerecorded instructions. (➔ Page 755 *Recording and editing additional patient instructions*)

All patient instructions of all unscanned ranges are changed accordingly.

Availability of customized patient instructions

When a new customized patient instruction is recorded and inserted in the timeline, it may not display correctly.

To avoid this issue, proceed as follows:

1 Change the general patient instruction language.

2 Select any default patient instruction available in that language.

3 Change the patient instruction language back to the required language (in which the custom patient instruction was recorded).

4 Select the recorded patient instruction again.

15 CT Topogram scan

A topogram provides an overview of a patient's anatomy and helps you to define the ranges to be scanned for the following tomogram scans. It is also a basis for dose modulation. After assigning a scan protocol to the patient, including a topogram, the **Topogram** task is selected in the taskflow control. A topogram is displayed in real-time in the topo segment as soon as you start acquiring a topogram.

If necessary, you can also scan without first acquiring a topogram.

However, if you require dose modulation, you must acquire a topogram first.

A topogram scan involves the following steps:

- (→ Page 435 *Activating the topogram scan*)
- (→ Page 435 *Performing the topogram scan*)

You can use a topogram for the following purposes:

- (→ Page 403 *Range planning*)
- (→ Page 416 *Scan and recon reference lines*)

- If the topogram length is too long for the current patient table position, the topogram length is automatically shortened to a certain length depending on the patient table position. This information is displayed in the execution control.
- If the topogram length is too short for the planned examination, adjust the topogram length to a reasonable value.

15.1 Topogram orientation

The appearance of the scanned topogram depends on the patient position and tube position. If the patient position is supine, the topogram is displayed in the following views:

 AP view	The X-ray tube position is at the top or bottom of the gantry. A topogram scan produces a topogram in the anterior-posterior (AP) view.
 Lateral view	The X-ray tube position is left or right. A topogram scan produces a topogram in lateral view. The patient table is displayed on the right-hand side of the topogram image.

- If a topogram is acquired from the left or right tube position, a **Fix Axial** recon job of a tilted range is displayed as a parallelogram on the topogram image.
- If a topogram is acquired from the top or bottom tube position, a **Fix Axial** recon job of a tilted range is displayed as a rectangle on the topogram image.
- For recon jobs of ranges without a tilted gantry, a rectangle is displayed on the topogram image.

15.2 How to start a scan

When a scan range is loaded, start the scan by pressing the control box **Start** key once.



15.3 Activating the topogram scan

If you used laser light markers, check the laser line on the patient surface to verify the topogram start position before acquiring a topogram.



- To activate a topogram, click **GO** in the execution control.

  The topogram scan is ready to be performed.

CAUTION

Scanning patients with implanted devices such as pacemakers or neuro stimulators!

Interferences may cause malfunctions of the implanted device.

- Observe the patient closely during examination.

Contact the manufacturer of the active implanted device for more information.

If the system displays a general error and requests you to restart the system when you click **GO** to load a scan, make sure you do so.

If the system is not restarted and the scan is executed, it can occur that the resulting scanned raw data cannot be reconstructed.

15.4 Performing the topogram scan



- Start the scan.

As the table moves through the gantry, the topogram is displayed in real-time to indicate the scan progress.

You can suspend the topogram scan as soon as the required volume has been scanned.

15.5 Representation of a topogram in the topo segment

A topogram is displayed in a standardized way:

- Independent of the patient position, the head is always displayed at the top of the image.
- For tube position left or right, the table is always displayed on the right-hand side.

You can zoom, pan, and window the topogram. (➔ Page 436 *Zooming, panning, and windowing the topogram*)

15.5.1 Zooming, panning, and windowing the topogram

You can zoom, pan, and window the topogram. Move the mouse pointer over the topogram image until the mouse pointer changes its shape as indicated in the table below.

Target	Action	Mouse pointer
Zoom	To zoom in the topogram, click and move the mouse upwards. To zoom out of the topogram, click and move the mouse downwards.	
Pan	To move the topogram image inside the topo segment, click and move the mouse in any direction.	

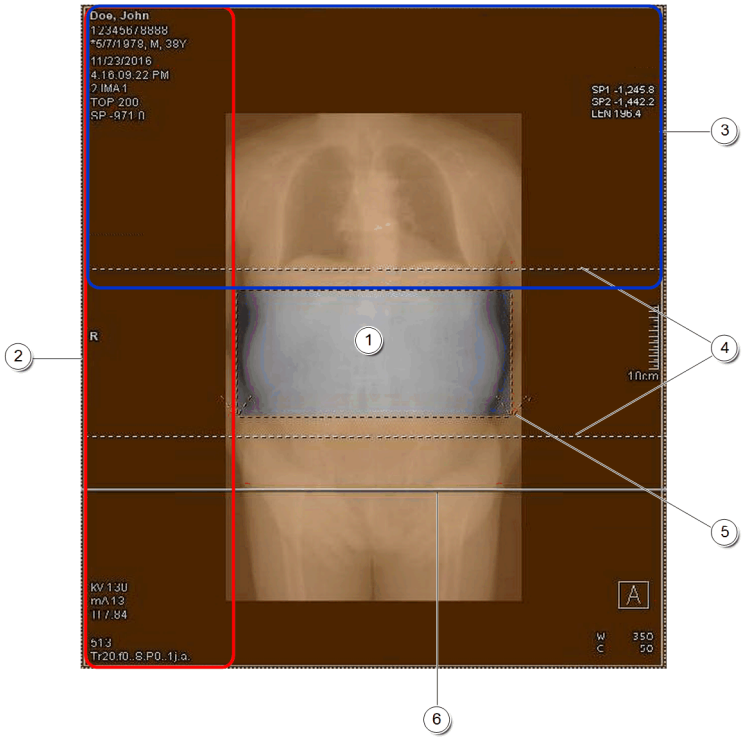
Target	Action	Mouse pointer
Window	To increase or decrease the window centre, press the middle mouse button and move the mouse up or down. To increase or decrease the window width, press the middle mouse button and move the mouse to the left or right. Manipulation of the window centre and window width is continued if the mouse leaves the segment borders with the mouse button pressed. Manipulation ceases as soon as you release the mouse button.	

Organ-specific window width and window center values are set by default.

15.5.2 Topogram image

Once the topogram is acquired, the next **Scan** task is selected in the taskflow control and the topogram image is displayed in the topo segment. The dimensions of the displayed ranges are based on the parameter settings in the scan protocol.

If **CARE Dose4D** is enabled and if more than 3 cm of a scan range lie outside of the topogram in z-direction, a message is displayed in the taskflow control that the topogram is too short for the planned examination.



Topogram image with scan range selection

(1) Scan range
The scan range is the area inside the dashed colored lines in which image acquisition is possible. The scan range is the sum of all recon ranges of a tomogram scan. The volume of a scan range depends on the volume of the corresponding recon ranges. Each scan range is indicated by a different color.

(2) Lateral shutter

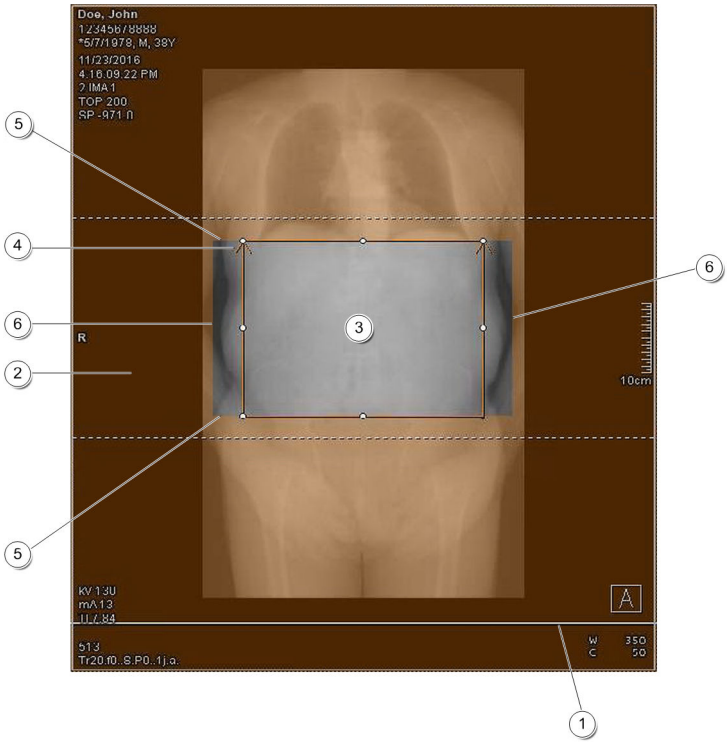
(3) Range shutter

(4) Exposed area
The area inside the dashed gray lines is the area that is exposed to radiation.

(5) Scan direction
The arrow heads on the left and right borders of the scan range indicate the scan direction.

(6) Table position

(➔ Page 403 *Range planning*)



Topogram image with recon range selection

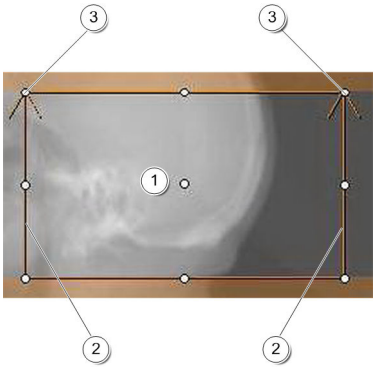
(1) Table position
(2) Exposed area
The area inside the dashed gray lines is the area that will be exposed to radiation.
(3) Recon range of a scan range (➔ Page 439 *Reconstruction (recon) range*)
(4) Image order (➔ Page 439 *Reconstruction (recon) range*)
(5) Range shutter
(6) Lateral shutter

(➔ Page 403 *Range planning*)

Reconstruction (recon) range

When you select a recon job from the **Recon Ranges** area, a recon box is displayed on the topogram image. The recon range is the area inside the recon box. The recon range defines the volume to be reconstructed. Its color is the same as for the corresponding scan range.

The dimensions of the displayed recon range are based on the parameter settings in the scan protocol.



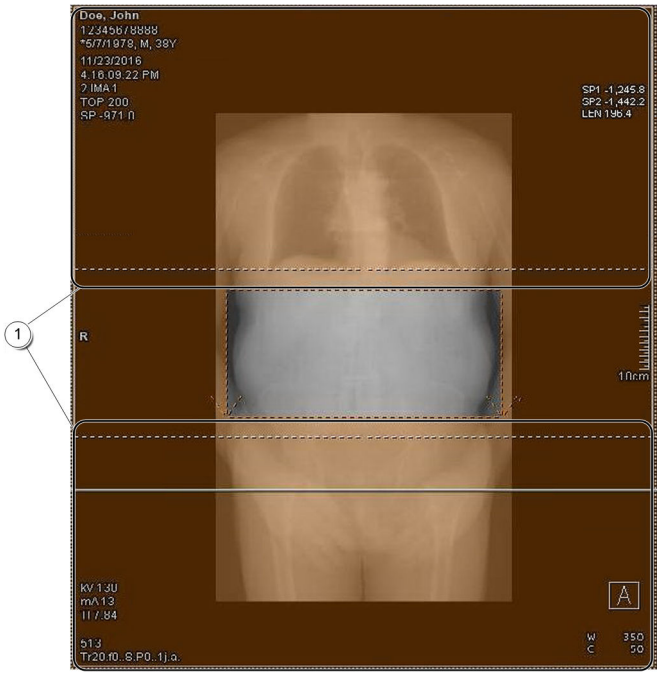
Recon range on topogram

(1) Recon box
Indicates the size of the recon range. The recon box can be resized and moved to change the recon range for the following diagnostic scans.
(➔ Page 403 *Range planning*)

(2) Field of View (FoV)
The left and the right borders enclose the image reconstruction scope (FoV) of a **Fix Axial** recon job.

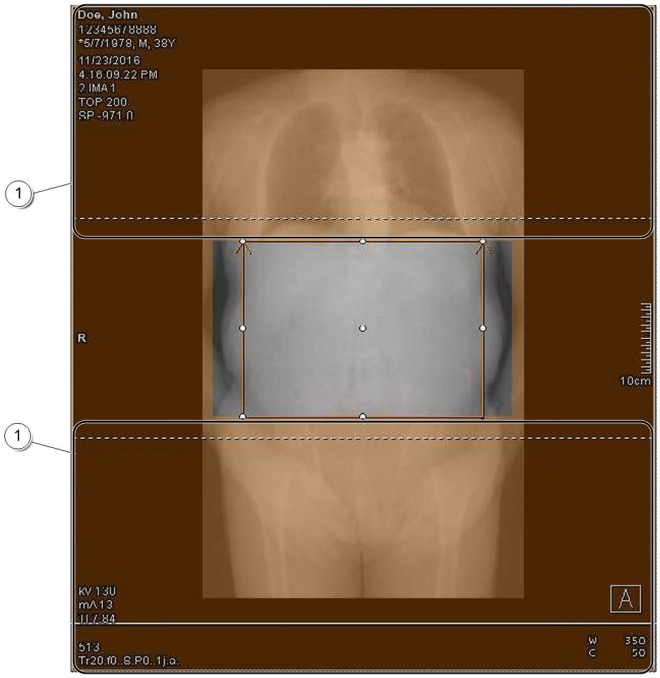
(3) Image order
The arrow heads on the left and right borders of the recon ranges indicate the order in which the images will be acquired.

Range shutter The range shutter limits the area of a scan range that will be scanned and that can be reconstructed. If more than one scan range is selected, the enclosed area displays the sum of all scan ranges to be scanned. The area that will not be covered by the scan range is indicated by a semi-transparent overlay in the same color as the selected scan range. If more than one range is selected, the semi-transparent area is gray.



Topogram image with scan range

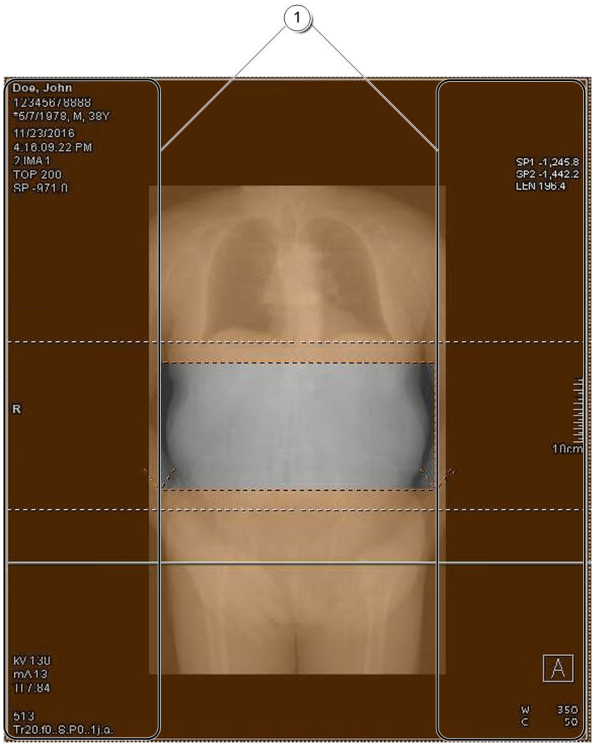
(1) Range shutter



Topogram image with recon range

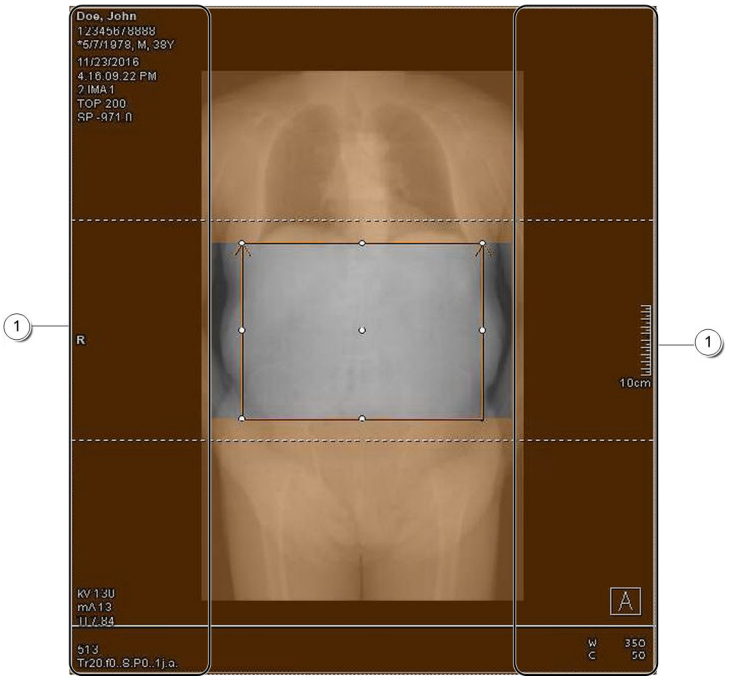
(1) Range shutter

Lateral shutter The lateral shutter of a scan range is displayed over the length of a scan range, around the scan field of view (FoV). The shutter limits the area in which image reconstruction is possible. The shutter is a semi-transparent overlay, which has the same color as the corresponding scan range. If more than one range is selected, the semi-transparent area is gray.



Topogram image with scan range

(1) Lateral shutter



Topogram image with recon range

(1) Lateral shutter

15.6 Suspending the topogram scan

During the acquisition of a topogram, you can suspend the topogram scan. You can check the progress of the acquired image on the monitor.

In the **Topogram** task, the **Length** field displays the topogram length that was originally set. (➔ Page 383 *Topogram task*)

As soon as the relevant anatomy has been covered, you can interrupt the topogram scan.



- In the execution control, click **Cancel**.

  – or –



On the control box, press the **Suspend** key.

The topogram scan is stopped immediately.

Do not use the **STOP** key to suspend the scan. Pressing the **STOP** key stops the entire system. Resuming the scan is not possible.

In an emergency, however, press the **STOP** key. Unit movements (table movement or gantry tilting) are interrupted and radiation is stopped. To start the system again once the critical situation is resolved, click the **Resume** button in the dialog box.

15.7 Check&GO Metal Detection

Metal objects on or near the patient produce artifacts in the acquired images and may reduce the quality of diagnostically important images. The system detects any metal objects on or near the patient, including objects required for the examination, for example, ECG wires. Yellow boxes on the topogram image highlight the areas where metal has been detected.

The system does not detect metal objects inside the patient, for example, screws or metal plates.



1. If metal has been detected, in the **Topogram** task, click the **Mark Metal** button to hide or display the detected areas on the topogram image.
2. Remove all metal objects from the patient that are not required for the examination before starting the scan, for example, keys or zippers.
3. Proceed with the examination.

15.8 Correcting the patient position after a topogram scan

After a topogram has been acquired, you can correct the patient position in the **Topogram** task or the **Patient Position** task before acquiring a tomogram or another topogram if the patient position icon does not match the patient's position on the patient table.

Ensure that the patient position that is currently defined by the set patient position icon in the system matches the patient's position on the patient table.

You can also change the patient's position on the patient table after a topogram scan and before a tomogram scan.

✓ A topogram has been acquired.

1 From the **Topogram** task, select the required position icon.



2 Click **Confirm** to confirm the patient's position.

All following scan ranges are updated with the new patient position.

You can activate the tomogram scan. (➔ Page 455 *Tomogram scan acquisition*)

If the patient position for the already scanned topogram was incorrectly set to **Head First Supine**, for example, and for the tomogram scan the position is corrected to **Feet First Prone**, the topogram image labels are updated to the corrected position. The topogram image itself is not changed.

15.9 Changing the patient position after repositioning the patient

If you have repositioned a patient before a scan or during an examination, you have to select the corresponding patient position icon. Make sure that the patient position that is currently defined by the set patient position icon in the system matches the patient's position on the table. You can also change the patient's position after a topogram scan and before a tomogram scan.

✓ No scan is running.

✓ At least one tomogram range has been acquired.

✓ You have changed the patient's position on the table.



1 In the positioning area, click the **Change patient position** icon.

The **Topogram** task or **Patient position** task displays the patient position icons.

2 Select the required icon.



3 Click **Confirm** to confirm the patient position.

All following scan ranges are updated with the new patient position.

You can activate the topogram or tomogram scan.

(➔ Page 455 *Tomogram scan acquisition*)

After the topogram scan, you can still correct the patient position if required, by selecting the required patient position icon.

16 CT Tomogram scan

A tomogram represents the cross-sectional view of a scanned body region. A tomogram is acquired for diagnostic purposes and is typically based on a preceding topogram scan, which helps you to define the scan range on the body region to be scanned.

If necessary, you can acquire a tomogram without a topogram.

16.1 Planning an examination

- (➔ Page 449 *Display of dose information*)
- (➔ Page 403 *Range planning*)
- (➔ Page 416 *Scan and recon reference lines*)

16.1.1 Display of dose information

Before you start a scan, you can check the dose that will be applied to the patient during a CT examination.

The dose parameters in the taskflow control provide information about the dose. In addition, the CARE Profile graphically indicates how much radiation will be applied to the patient.

The CARE Profile displays the following information:

- Dose distribution along the z-axis next to the topogram
- Dose limits for the currently selected scan range
- Markers if any limits are exceeded.

(➔ Page 505 *CARE Profile*)

The CT system provides information about the $CTDI_{vol}$ (CT Dose Index Volume) and DLP (Dose Length Product) as defined by the IEC 60601-2-44 standard. Both values are displayed on the **Topogram** task and **Scan** task. In addition, these values are stored in the scan protocol and the DICOM Dose Structured Report.

(➔ Page 525 *DICOM Dose Structured Report (Dose SR)*)

16.2 General CT scan modes

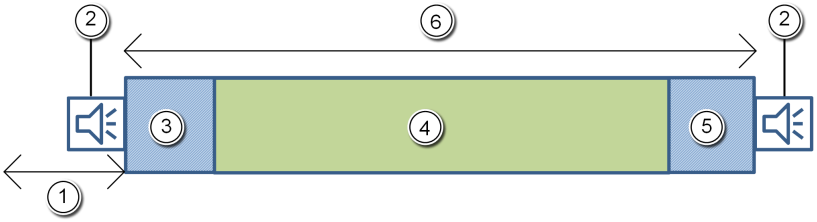
The following general CT scan modes are available:

- (➔ Page 450 *Spiral CT*)
- (➔ Page 451 *Sequence CT*)

16.2.1 Spiral CT

For CT, a scan is the technical procedure that is performed by the scanner between "X-ray on" and "X-ray off".

A spiral range consists of a single scan whereas a sequence range typically consists of multiple scans. You can acquire a spiral scan by means of continuous X-ray exposure and table movement.



Spiral range

(1) Scan delay time (➔ Page 409 *Scan delay time*)
(2) Patient instruction (➔ Page 420 *Communicating with the patient*)
(3) Table acceleration
(4) **Exposure Time**
Indicates the scan time of a single spiral range from X-ray on to X-ray off. The **Exposure Time** is displayed in the taskflow control and indicates the number of all scan times of all spiral ranges of the protocol.

(5) Table deceleration
(6) **Exam Time**
Indicates the time of the complete spiral range including **Exposure Time** and table movements.

Acquiring a spiral range

To acquire a spiral range, proceed as follows:

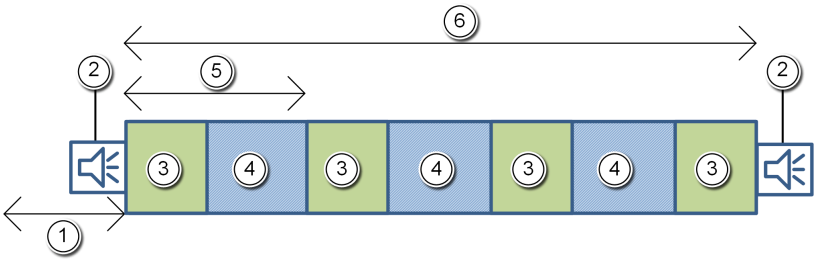
✓ A scan protocol for a spiral range is loaded.

◆ Perform the tomogram scan. (➔ Page 455 *Tomogram scan acquisition*)

You can optimize the applied dose with **CARE Dose4D**. (➔ Page 503 *Dose optimization*)

16.2.2 Sequence CT

In the sequence mode, scan data is acquired by the sequential slicing of a scan range. A single scan range is divided into a number of scans. You can perform a single scan range with identical scan parameters, and with or without table movement between the individual scans.



Sequence range

(1) Scan delay time (➔ Page 409 *Scan delay time*)
(2) Patient instruction (➔ Page 420 *Communicating with the patient*)
(3) **Scan Time**
Indicates the time of a single sequence scan from X-ray on to X-ray off. The number of all scan times indicates the **Exposure Time**. The **Exposure Time** is displayed in the taskflow control.
(4) Table movement
(5) **Cycle Time**

Indicates the time of one sequence scan and table movement.

(6) **Exam Time**
Indicates the time of all sequences scans and table movements of a complete sequence range.

- (➔ Page 452 *Acquiring a sequence range*)
- (➔ Page 452 *Sequence clustering*)

Acquiring a sequence range

To acquire a sequence range, proceed as follows:

✓ A scan protocol for a sequence range is loaded.

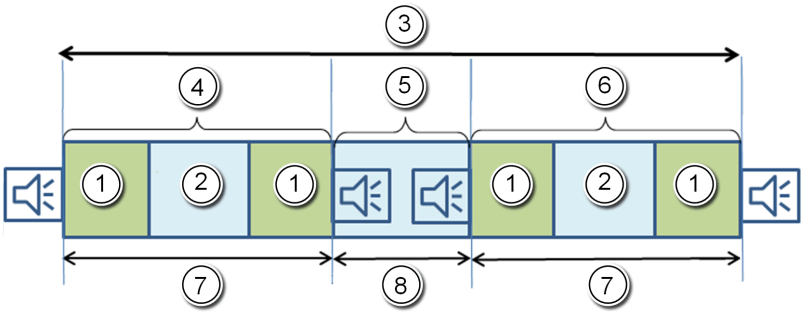
◆ Perform the tomogram scan. (➔ Page 455 *Tomogram scan acquisition*)

You can optimize the applied dose with **CARE Dose4D**. (➔ Page 503 *Dose optimization*)

Sequence clustering

To allow the patient to breathe in between the scans and to acquire images without breathing artifacts, the CT system automatically groups sequence scans into equal clusters if the **Breath Hold Time** and **Breathing Time** parameters are set accordingly.

A cluster consists of a scan, table movement, and another scan, as the following figure shows:



Sequence range with clusters

(1) **Scan Time**

Indicates the time of a single sequence scan from X-ray on to X-ray off. The number of all scan times indicates the **Exposure Time**.

(2) Table movement

(3) **Exam Time**
Indicates the time of all sequences scans and table movements of a complete sequence range. If a sequence range is grouped into clusters, the total **Exam Time** of the complete range increases.

(4) Cluster 1

(5) **Pause**
Indicates the **Breathing Time** between two clusters during which the patient can breathe. Audio patient instructions prepare the patient to hold their breath. The table is moved to the scan start position of the next cluster.
The length of the pause between the clusters depends on the breathing time and the length of the instruction text pair. If you change the instruction text, and the text becomes longer or shorter, the pause between the clusters is adapted.

(6) Cluster 2

(7) **Breath Hold Time**

(8) **Breathing Time**

A sequence range is automatically grouped into clusters, if the following preconditions apply:

- The table feed is larger than 0.
- The total time between the first and the last scan must exceed the breath hold time.
- You added a patient instruction to a sequence range.

The number of scans per cluster, the number of clusters, and the number of scans in the last cluster depend on the following parameters:

- **Cycle Time**
- **Breath Hold Time**
- **Scan Time**
- **Number of Scans**

Grouping a sequence range into clusters

✓ A scan protocol for a sequence range is loaded.

To group a sequence range into clusters:

1 Open the parameter panel.

2 In the **General Scan** category, check the **Feed** parameter.

The table feed value must be larger than 0.

3 In the **Timing** category, check the following parameters:

- **Breathing Time**

  Determines the length of the pause between the clusters.

- **Breath Hold Time**

  Determines the number of scan clusters.

The total time between the first and the last scan must exceed the **Breath Hold Time** parameter.

4 In the timeline, right-click a scan range and select **Open Edit Mode**.

A toolbar opens above the timeline.

5 Click and drag the **Command** icon to the start of a sequence range.

A patient instruction is played to the patient at the beginning and end of each cluster. A clustered sequence range is indicated in the timeline follows:



Clustered sequence range

16.2.3 Switching scan modes

Switching, for example, from a spiral scan mode to a sequence scan mode, and vice-versa, is possible without modifying the current scan protocol, the scan or recon parameters, or the previously planned scan ranges.

To switch scan modes:

✓ A scan range is loaded.

1 Open the scan parameter panel for the required scan range.

The parameters that are set for the scan range are displayed.

2 Click the arrow to the right of the **Scan Mode** parameter.

The list of alternative scan modes opens.

3 From the list, select the scan mode to which you want to switch.

The new scan mode is applied. All previous planning is saved.

16.3 Tomogram scan acquisition

After you have defined the scan range, you can perform the tomogram scan:

- (➔ Page 455 *Activating the tomogram scan*)

16.3.1 How to start a scan

When a scan range is loaded, start the scan by pressing the control box **Start** key once.



16.3.2 Activating the tomogram scan

✓ The scan range is valid.



◆ In the execution control, click **GO**.

The tomogram range is loaded.

If the system displays a general error and requests you to restart the system when you click **GO** to load a scan, make sure you do so.

If the system is not restarted and the scan is executed, it can occur that the resulting scanned raw data cannot be reconstructed.

16.3.3 Performing the tomogram scan



1 From the console screen, click the **GO** button



2 On the control box, press the **Move** key.

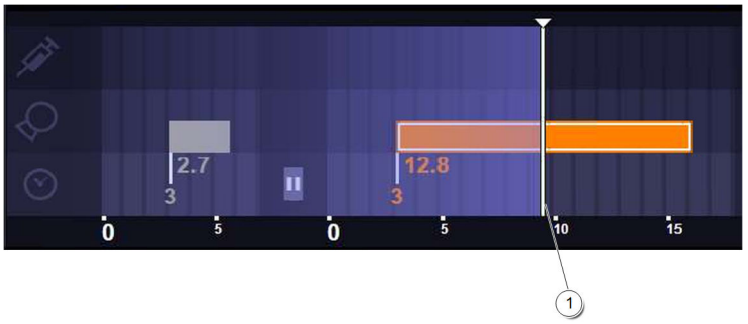
The patient table is moved to the scan start position.



3 On the control box, press the **Start** key to start the scan.

The scan range is started. Radiation starts as soon as the scan delay time is over. (➔ Page 409 *Scan delay time*)

The scan progress is displayed in the timeline.



Running scan range in timeline

(1) Scan progress indicator
The white vertical marker indicates the progress of the scan. The scanned part of the range becomes brighter as the scan proceeds.

16.3.4 Suspending the tomogram scan

During the acquisition of a tomogram you can suspend the scan.

✓ The scan has been started.

1 Watch the data in the tomo segment.



2 In the execution control, click **Cancel**.

– or –



On the control box, press the **Suspend** key.

The scan is stopped.

Do not use the **STOP** key to suspend the scan. Pressing the **STOP** key stops the entire system. Resuming the scan is not possible.

In an emergency, however, press the **STOP** key. Unit movements (table movement or gantry tilting) are interrupted and radiation is stopped. To start the system again once the critical situation is resolved, click the **Resume** button in the dialog box.

16.3.5 Repeating a scan range

In the timeline, you can repeat topogram and tomogram ranges.

1 In the timeline, right-click the scan range you want to repeat.

2 From the context menu, select **Repeat**.

The scan range is added immediately after the selected scan range in the timeline.

When acquiring a second topogram with **FAST Planning** enabled, the resulting recon range may be shifted in z-direction on the topogram if the following settings have been made:

Two topograms are acquired in succession.

The view of the second topogram has been changed from AP to lateral or vice-versa.

The table direction of the second topogram has been reversed.

- If this scenario occurs, adapt the recon range manually.

16.3.6 Deleting a scan range

In the timeline, you can delete unscanned topogram ranges and unscanned tomogram ranges.

1 In the timeline, right-click the scan range you want to delete.

2 From the context menu, select **Delete**.

The scan range is removed.

17 MI SPECT Tomo scans

A SPECT scan involves administing a radiopharmaceutical to a patient for target organ imaging. Prior to acquiring imaging data, the scan's parameters are confirmed. The patient is positoned between detectors so that the area desired to be imaged can be aligned within the detector's field of view (FOV). After patient positioning, the study is acquired, reconstructed, and saved.

Scan Types	Acqusitions	Scan Mode Parameters
SPECT	Tomo scan	180Tomo, 180SingleDetectorTomo Cardiac90Tomo Cardiac76Tomo SZCardiacCentricTomo SZ180Tomo
	Wholebody Tomo scan	Wholebody180Tomo Wholebody180SingleDetector-Tomo
	Composite Tomo scan	Composite180Tomo SZ180CompositeTomo
	Dynamic Tomo scan	Dynamic180Tomo Dynamic90Tomo Dynamic76Tomo SZ180DynamicTomo

The Basic Scan Mode **SZCardiacCentricDynamicTomo** does not display a reconstruction job in the Recon Ranges area.

For information on performing a SPECT tomo acquisition:

- StaticTomo (➔ Page 460 *Acquiring a static tomographic acquisition*)
- Wholebody Tomo (➔ Page 462 *Wholebody tomo acquisition*)

- Dynamic Tomo (➔ Page 465 *Dynamic tomo acquisition*)
- Composite Tomo (➔ Page 467 *Composite tomo acquisition*)
- Gated Tomo (➔ Page 470 *Gated tomo acquisition*)
- IQ•SPECT Tomo (➔ Page 474 *IQ•SPECT Tomo acquisition*)

17.1 Static tomo acquisition

The static tomographic acquisition (also called Tomo) provides computed estimates of the concentration of a radiopharmaceutical throughout a selected volume of a patient's body. It does so by the detectors rotating around the patient collecting and recording a frame at multiple angles or views.

For information on performing a static tomo acquisition, go to (➔ Page 460 *Acquiring a static tomographic acquisition*).

17.1.1 Acquiring a static tomographic acquisition

Use the following steps to perform a static tomo acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a static tomo acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Check all entered information.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **SPECT**, **tomo**, or **static**. A list of protocols appears. Scroll to the desired protocol. For this example, **SPECT [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic. Click the **Confirm** button .

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Move** button to move to Start position.

System motion occurs.

6 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating rotations and views displayed. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the **Quality Check** screen with a Projection Movie (cine) of the acquired data, a sinogram and a linogram for each rotation. **Scan Beds** are displayed beneath the images.

The sinogram image is helpful in evaluating the quality of the acquired study. All edges in a sinogram image should be smooth. A rough or displaced edge may indicate patient movement during the acquisition.

The linogram image is helpful in evaluating the quality of the acquired study. Motion appears as a gap in the image. One or more columns appear shifted or out of sync with the rest of the image as a whole.

7 Review the results. The message **Repeat scan**, **Accept scan** is displayed, followed by the **Repeat** and **GO** buttons. Click the **Repeat** button to repeat the scan or the **GO** button to accept the scan.

   Clicking **GO** displays a planning (anterior projection) image and the reconstruction job selected in the Recon Ranges area.

8 Click the **Next** button to switch to close.

9 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

17.2 Wholebody tomo acquisition

The wholebody tomo (tomographic) acquisition provides computed estimates of the concentration of a radiopharmaceutical throughout a selected volume of a patient's body. Wholebody tomo uses bed position indexing to perform multiple tomo acquisitions in a single imaging protocol. The patient bed will automatically advance to the next tomo position.

For information on performing a wholebody tomo acquisition, go to (→ Page 462 *Acquiring a wholebody tomographic acquisition*).

17.2.1 Acquiring a wholebody tomographic acquisition

Use the following steps to perform a wholebody tomo acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Perform the following steps:

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Enter patient information and check. Click the **Exam** button.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **SPECT**, **tomo**, or **wholebody**. A list of protocols appears. Scroll to the desired protocol. For this example, **Wholebody SPECT [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic. Click the **Confirm** button .

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Move** button to move to Start position.

System motion occurs.

6 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating rotations and views displayed. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the **Quality Check** screen with a Projection Movie (cine) of the acquired data, a sinogram and a linogram for each rotation. **Scan Beds** are displayed beneath the images.

The sinogram image is helpful in evaluating the quality of the acquired study. All edges in a sinogram image should be smooth. A rough or displaced edge may indicate patient movement during the acquisition.

The linogram image is helpful in evaluating the quality of the acquired study. Motion appears as a gap in the image. One or more columns appear shifted or out of sync with the rest of the image as a whole.

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7 Review the results. The message **Repeat scan**, **Accept scan** is displayed, followed by the **Repeat** and **GO** buttons. Click the **Repeat** button to repeat the scan or the **GO** button to accept the scan.

Clicking **GO** displays a planning (anterior projection) image and the reconstruction job selected in the Recon Ranges area.

8 Click the **Next** button to switch to close.

9 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

17.3 Dynamic tomo acquisition

For a dynamic tomo (tomographic) acquisition, a reconstructed volume is created for each of the scanned rotations. During reconstruction, the reconstructed volumes can be grouped into different phases.

For a composite tomo acquisition, you can choose which rotations are to be kept for reconstruction. Choosing rotations to keep is performed as part of the Quality Check step. All kept rotations are combined into a single volume during reconstruction.

Dynamic tomo acquisition and composite tomo acquisition are two separate protocols.

For information on performing a dynamic tomo acquisition, go to (➔ Page 465 *Acquiring a dynamic tomographic acquisition*).

For information on performing a composite tomo acquisition, go to (➔ Page 467 *Acquiring a composite tomographic acquisition*).

17.3.1 Acquiring a dynamic tomographic acquisition

Use the following steps to perform a dynamic tomo acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a dynamic tomo acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Enter patient information and check. Click the **Exam** button.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **SPECT**, **tomo**, or **dynamic**. A list of protocols appears. Scroll to the desired protocol. For this example, **Dynamic SPECT [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic. Click the **Confirm** button .

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Move** button to move to Start position.

System motion occurs.

6 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating rotations and views displayed. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the **Quality Check** screen with a Projection Movie (cine) of the acquired data, a sinogram and a linogram for each rotation. **Scan Beds** are displayed beneath the images.

The sinogram image is helpful in evaluating the quality of the acquired study. All edges in a sinogram image should be smooth. A rough or displaced edge may indicate patient movement during the acquisition.

The linogram image is helpful in evaluating the quality of the acquired study. Motion appears as a gap in the image. One or more columns appear shifted or out of sync with the rest of the image as a whole.

7 Review the results. The message **Repeat scan**, **Accept scan** is displayed, followed by the **Repeat** and **GO** buttons. Click the **Repeat** button to repeat the scan or the **GO** button to accept the scan.

   Clicking **GO** displays a planning (anterior projection) image and the reconstruction job selected in the Recon Ranges area.

8 Click the **Next** button to switch to close.

9 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

17.4 Composite tomo acquisition

A composite tomo (tomographic), multi-rotation SPECT acquisition allows you to create a single SPECT reconstruction from multiple SPECT rotations. The benefit of composite SPECT imaging is improved contrast and resolution through the ability to include or discard SPECT rotations that represent poor patient or organ position due to patient motion.

For information on performing a composite tomo acquisition, go to (→ Page 467 *Acquiring a composite tomographic acquisition*).

17.4.1 Acquiring a composite tomographic acquisition

Use the following steps to perform a composite tomo acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a composite tomo acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Enter patient information and check. Click the **Exam** button.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **SPECT**, **tomo**, or **composite**. A list of protocols appears. Scroll to the desired protocol. For this example, **Composite SPECT [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic. Click the **Confirm** button .

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Move** button to move to Start position.

System motion occurs.

6 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating rotations and views displayed. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the **Quality Check** screen with a Projection Movie (cine) of the acquired data, a sinogram and a linogram, each with rotation and composite. **Scan Rotations** are displayed beneath the images.

The system allows you to include the required rotations for a composite tomo reconstruction. There is a check box to include or exclude individual rotations for reconstruction, a **Keep All** button to include all rotations for reconstruction, and a **Keep None** button to exclude all rotations.

If you change the list of rotations included for the reconstruction in the Quality Check layout for a dual isotope acquisition, corresponding rotations for each isotope are selected together.

When no rotations are included for a composite tomo reconstruction, a message is displayed about invalid reconstruction for the scan. **You must keep at least one rotation. Otherwise the reconstruction will be marked invalid.** A warning is displayed for the restruction job in reconstruction browser.

The acceptance or rejection of rotations is performed using the Quality Check.

The sinogram image is helpful in evaluating the quality of the acquired study. All edges in a sinogram image should be smooth. A rough or displaced edge may indicate patient movement during the acquisition.

The linogram image is helpful in evaluating the quality of the acquired study. Motion appears as a gap in the image. One or more columns appear shifted or out of sync with the rest of the image as a whole.

7 Review the results. The message **Repeat scan**, **Accept scan** is displayed, followed by the **Repeat** and **GO** buttons. Click the **Repeat** button to repeat the scan or the **GO** button to accept the scan.

   Clicking **GO** displays a planning (anterior projection) image and the reconstruction job selected in the Recon Ranges area.

8 Click the **Next** button to switch to close.

9 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

17.5 Gated tomo acquisition

A gated cardiac tomographic (tomo) acquisition creates a set of frames representing different portions of the cardiac cycle. Gamma events are placed into frames based on the time of their occurrence within the heartbeat (R-R interval). Only those gamma events which occur during heartbeats whose durations are within defined beat acceptance windows will be managed. During the acquisition, the detectors rotate around the patient, collecting and recording the gated image at multiple angles or views. Gated acquisitions require an electrocardiogram (ECG) trigger accessory.

For gated tomo data, all heartbeats can be reconstructed. The beat acceptance window can be manually set to specifically accept or reject heartbeats. A reconstrution can be repeated multiple times. Adjusting the beat acceptance window can accept or reject heartbeat so that a reconstruction does not need to be repeated.

For information on performing a gated tomo acquisition, go to (→ Page 471 *Acquiring a gated tomographic acquisition*).

17.5.1 Acquiring a gated tomographic acquisition

Use the following steps to perform a gated tomo acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a gated tomo acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Enter patient information and check. Click the **Exam** button.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **SPECT**, **tomo**, or **cardiac**. A list of protocols appears. Scroll to the desired protocol. For this example, **Cardiac SPECT [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

Gated reconstruction with Attenuation Correction (AC) and or Scatter Correction (SC) can perform if the applicable license is present on the system. Additional parameters need to be set appropriately in order to enable gated reconstruction with AC and SC.

When the gating parameter is set to **Cardiac**, **Continuous** can be selected as the motion parameter if the license is available on the system. If the license is not available, the only motion parameter available is **Step&Shoot**.

The Physio gating parameter labelled **MI Gating** in the parameter list view is either **Cardiac** (enabled) or **Off** (disabled). Enabling cardiac gating displays a waveform and a beat histogram, and provides selectable reconstruction options. From the scan panel, the Physio gating parameter is labelled as **Gating**.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

4 Check that the ECG leads are attached to the patient.

When the ECG signal is lost, the acquisition is paused, and a message is displayed within the scan room, as well as on the console. For example, **ECG connection lost. Connection to ECG leads was lost during the scan. Scan is continuing without gating.** An audio alert also plays on the control box. The **Resume** button is disabled until a trigger is regained. Note that when the state of the ECG trigger changes (either lost or regained), the system logs an event, indicating the state change and includes the following information: Trigger type (external/internal).

Review the quality of the ECG signal directly on the console by displaying:

- the current waveform signal (integrated ECG only)
- the location of the trigger on the ECG wave form(integrated ECG only)
- a beat histogram that shows the distribution of beat durations of the accumulated beats

When the ECG signal is lost, the acquisition is paused, and you will be notified within the scan room, as well as on the console.

5 The patient position is displayed as a graphic. Click the **Confirm** button .

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

6 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

7 Click the **Move** button to move to Start position.

System motion occurs.

8 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating rotations and views displayed. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss). A beat histogram displays the patient's heart rate. in beats per minute (bpm).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the **Quality Check** screen with a Projection Movie (cine) of the acquired data, a sinogram and a linogram for each rotation. **Scan Beds** are displayed beneath the images.

The sinogram image is helpful in evaluating the quality of the acquired study. All edges in a sinogram image should be smooth. A rough or displaced edge may indicate patient movement during the acquisition.

The linogram image is helpful in evaluating the quality of the acquired study. Motion appears as a gap in the image. One or more columns appear shifted or out of sync with the rest of the image as a whole.

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9 Review the results. The message **Repeat scan**, **Accept scan** is displayed, followed by the **Repeat** and **GO** buttons. Click the **Repeat** button to repeat the scan or the **GO** button to accept the scan.

Clicking **GO** displays a planning (anterior projection) image and the reconstruction job selected in the Recon Ranges area.

10 Click the **Next** button to switch to close.

11 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

17.6 IQ•SPECT Tomo acquisition

The IQ•SPECT tomo (tomographic) acquisition automatically focuses detectors with **SMART**ZOOM collimators on a target organ. Cardiac-centering graphics are displayed as an overlay on the persistence image displayed on the gantry display. You can position the center of the cardiac-centering graphic at the desired position by tapping on the persistence image display. Instructions such as **Please set focus** and **Focus saved. Please re-adjust or press Move** are displayed on the gantry display during IQ•SPECT organ centering. When moving the cardiac-centering graphic on the persistence image, the movements are synchronized between the detectors vertically in the persistence image. Once the cardiac-centering graphic is positioned on the persistence image display, you can auto-focus the detectors by pressing the gantry display **Move** button. You can center and focus in multiple times until the organ is focused correctly. If you have not performed at least one focusing operation, the system prevents you from starting an IQ•SPECT scan. The scan **Start** button is enabled only after focusing the detectors is complete.

To perform an IQ•SPECT tomographic acquisition, go to (➔ Page 474 *Acquiring an IQ•SPECT tomographic acquisition*).

17.6.1 Acquiring an IQ•SPECT tomographic acquisition

Use the following steps to perform a IQ•SPECT tomo acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform an IQ•SPECT tomo acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Enter patient information and check. Click the **Exam** button.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **SPECT**, **tomo**, **cardiac** or **IQ**. A list of protocols appears. Scroll to the desired protocol. For this example, **Cardiac IQSPECT [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

4 Check that the ECG leads are attached to the patient.

When the ECG signal is lost, the acquisition is paused, and a message is displayed within the scan room, as well as on the console. For example, **ECG connection lost. Connection to ECG leads was lost during the scan. Scan is continuing without gating.** An audio alert also plays on the control box. The **Resume** button is disabled until a trigger is regained. Note that when the state of the ECG trigger changes (either lost or regained), the system logs an event, indicating the state change and includes the following information: Trigger type (external/internal).

Review the quality of the ECG signal directly on the console by displaying:

- the current waveform signal (integrated ECG only)
- the location of the trigger on the ECG wave form(integrated ECG only)
- a beat histogram that shows the distribution of beat durations of the accumulated beats

When the ECG signal is lost, the acquisition is paused, and you will be notified within the scan room, as well as on the console.

5 The patient position is displayed as a graphic. Click the **Confirm** button .

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

6 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

7 Click the **Move** button to move to Start position.

System motion occurs.

8 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating rotations and views displayed. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bars displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss). A beat histogram displays the patient's heart rate. in beats per minute (bpm).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the **Quality Check** screen with a Projection Movie (cine) of the acquired data, a sinogram and a linogram for each rotation. **Scan Beds** are displayed beneath the images.

The sinogram image is helpful in evaluating the quality of the acquired study. All edges in a sinogram image should be smooth. A rough or displaced edge may indicate patient movement during the acquisition.

The linogram image is helpful in evaluating the quality of the acquired study. Motion appears as a gap in the image. One or more columns appear shifted or out of sync with the rest of the image as a whole.

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9 Review the results. The message **Repeat scan**, **Accept scan** is displayed, followed by the **Repeat** and **GO** buttons. Click the **Repeat** button to repeat the scan or the **GO** button to accept the scan.

Clicking **GO** displays a planning (anterior projection) image and the reconstruction job selected in the Recon Ranges area.

10 Click the **Next** button to switch to close.

11 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

18 MI Planar scans

A planar scan involves injecting a patient with a radiopharmaceutical designed to target an organ or area of the body intended for imaging. Prior to acquiring imaging data, the scan's parameters are confirmed. The patient is positoned between detectors so that the area desired to be imaged can be aligned within the detector's field of view (FOV). After patient positioning, the study is acquired, and then reconstructed, and saved.

Scan Types	Acqusitions	Scan Mode Parameters
Planar	Static Planar scan	StaticPlanar PinholeStaticPlanar
	Wholebody Planar scan	WholebodyPlanar
	Dynamic Planar scan	DynamicPlanar PinholeDynamicPlanar
	Gated Planar scan	CardiacPlanar PinholeCardiacPlanar
	Dynamic Planar with R-wave scan	CardiacDynamicPlanar

For information on performing a planar acquisition:

- Static Planar (➔ Page 480 *Acquiring a static planar acquisition*)
- Dynamic Planar (➔ Page 481 *Acquiring a dynamic planar acquisition*)
- Wholebody Planar (➔ Page 483 *Acquiring a wholebody planar acquisition*)
- Gated Planar (➔ Page 485 *Acquiring a gated planar acquisition*)

18.1 Static planar acquisition

A static planar acquisition creates a series containing images, one image per detector/energy window set combination, acquired at a single camera position.

For information on performing a static planar acquisition, go to (➔ Page 480 *Acquiring a static planar acquisition*).

18.1.1 Acquiring a static planar acquisition

Use the following steps to perform a static planar acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a static planar acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Check all entered information.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **planar** or **static**. A list of protocols appears. Scroll to the desired protocol. For this example, **Static Planar [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic.

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with the dynamically updating counts. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

When the scan is complete, the system displays the final images for Dectector 1 and 2.

6 Review the results.

7 Click the **Next** button to switch to close.

8 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

18.2 Planar dynamic acquisition

A dynamic planar acquisition creates a series containing sequentially acquired frames. The acquisition time can be divided into distinct groups called phases. Up to 32 different phases can be acquired, each phase having its own time-based stop conditions.

For information on performing a dynamic planar acquisition, go to (➔ Page 481 *Acquiring a dynamic planar acquisition*).

18.2.1 Acquiring a dynamic planar acquisition

Use the following steps to perform a dynamic planar acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a dynamic planar acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Check all entered information.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **planar** or **dynamic**. A list of protocols appears. Scroll to the desired protocol. For this example, **Dynamic Planar [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic.

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with dynamically updating counts. Beneath them are two more images displays containing cines (data displayed as a cinematic animation of sequential images) with views from the current rotation being acquired. Hovering the cursor beneath a cine displays its cine control. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

A **Pause** button is available to temporarily pause the scan. When clicked, the **Resume** button is displayed, which when clicked continues the scan. Clicking the **Cancel** button cancels the scan.

6 Review the results.

7 Click the **Next** button to switch to close.

8 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

18.3 Wholebody planar acquisition

A wholebody planar acquisition allows you to acquire data from a patient that is larger than the camera's field of view. This is done by moving the patient table into or out of the gantry while the image is being acquired. This type of acquisition typically consists of an anterior or posterior view, or both.

For information on performing a wholebody planar acquisition, go to (→ Page 483 *Acquiring a wholebody planar acquisition*).

18.3.1 Acquiring a wholebody planar acquisition

Use the following steps to perform a wholebody planar acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a wholebody planar acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Check all entered information.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **planar** or **wholebody**. A list of protocols appears. Scroll to the desired protocol. For this example, **Wholebody Planar [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

The patient position is displayed as a graphic.

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

4 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

5 Click the **Move** button to move to Start position.

System motion occurs.

6 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with dynamically updating counts. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

7 Review the results.

8 Click the **Next** button to switch to close.

9 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

18.4 Gated planar acquisition

This section explains performing planar gated acquisition.

A gated planar acquisition creates a set of frames representing different portions of the cardiac cycle. Gamma events are placed into frames based on the time of their occurrence within the heartbeat (R-R interval). Only those gamma events which occur during heartbeats whose durations are within defined beat acceptance windows will be imaged. Gated planar acquisitions require an electrocardiogram (ECG) trigger accessory.



Gated planar is only available on detector 2 because it has caudal tilt. It is not available on detector 1 or both detectors.

For information on performing a gated planar acquisition, go to (→ Page 485 *Acquiring a gated planar acquisition*).

18.4.1 Acquiring a gated planar acquisition

Use the following steps to perform a gated planar acquisition.

Check the following prerequisites:

✓ Patient table is docked at the gantry.

✓ Emergency stop is not engaged.

✓ Correct collimators are installed.

✓ System has no motion obstructions.

Use the following steps to perform a gated planar acquisition.

1 Register the patient. (➔ Page 259 *Working with the Scheduler*)

Check all entered information.

2 Select a protocol from the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

Click the search field. Enter a protocol category search term. For example, **planar** or **gated**. A list of protocols appears. Scroll to the desired protocol. For this example, **Cardiac Gated Planar [factory]**. Click the protocol, and then click the **OK** button, or double click the protocol to select it.

3 Position the patient. (➔ Page 377 *Patient positioning*)

Ensure that the patient is oriented properly according to the orientation settings. Incorrect patient orientation can result in an inaccurate acquisition, leading to a possible incorrect diagnosis. Verify that the patient orientation conforms to the settings.

Ensure that the patient is positioned so that the detectors do not come in contact with the patient, medical devices, or equipment accessories. Patient injury or system damage can result. Before rotating the system's detectors, or lowering, raising, or pivoting the patient table, or sliding the pallet, verify that the patient or people in the area are clear of contact, and that the system can travel without its movements being obstructed.

Plan the scan range by positioning the patient with the hand control or Plan&GO if available.

4 Check that the ECG leads are attached to the patient.

When the ECG signal is lost, the acquisition is paused, and a message is displayed within the scan room, as well as on the console. For example, **ECG connection lost. Connection to ECG leads was lost during the scan. Scan is continuing without gating.** An audio alert also plays on the control box. The **Resume** button is disabled until a trigger is regained. Note that when the state of the ECG trigger changes (either lost or regained), the system logs an event, indicating the state change and includes the following information: Trigger type (external/internal).

Review the quality of the ECG signal directly on the console by displaying:

- the current waveform signal (integrated ECG only)
- the location of the trigger on the ECG wave form(integrated ECG only)
- a beat histogram that shows the distribution of beat durations of the accumulated beats

When the ECG signal is lost, the acquisition is paused, and you will be notified within the scan room, as well as on the console.

5 The patient position is displayed as a graphic.

The console screen displays two growing image frames, a scan progress timeline, and the **Recon Ranges** area.

6 In the taskflow control, if there are any **Preconditions** highlighted in yellow with an exclamation point, fix these preconditions. Click the **GO** button to load the scan.

7 Click the **Move** button to move to Start position.

System motion occurs.

8 Click the **Start** button to start the scan.

While the acquisition is in progress, an image display for Detector 1 and Detector 2 appears with dynamically updating counts.. A status bar displays the scan's progress as well as a **Remaining Time (mm:ss)** timer which counts down in minutes (mm) and seconds (ss).

9 Review the results.

10 Click the **Next** button to switch to close.

11 The **Job Status** screen is displayed with the **Recon Progress** status. The message **Close patient** is displayed. Click the **Close** button to close the patient scan.

19 Source Management

The Source Management page is used to add, edit, and delete integrated sources, precision sources, and the dose calibrator. Clinical Administrator or Service-level user access is required.

For information on:

- Logging into source management (➔ Page 489 *Logging into source management*)
- Installing integrated sources (➔ Page 490 *Installing integrated sources*)
- Adding, deleting, or editing a precision source (➔ Page 491 *Adding a precision source*)
- Adding, deleting, or editing a dose calibrator (➔ Page 493 *Adding a Dose Calibrator*)
- Registering an integrated source, precision source, or a dose calibrator on the system (➔ Page 952 *Source management*).

19.1 Logging into source management

To log into the Source Management page:

1. Right click the **Settings** (gear graphic) icon, and select **Administration Portal**.
2. To access the Administration Portal's **Service, Local** page, enter a user name and password.
3. Click the **Login** button.
4. From the Service, Local page, click the **Quality Assurance** tab.
5. From the pane on the left, click the **MI Quality Assurance** tab to expand it.
6. Click the **Source Management** tab.

   Integrated sources, precision sources, and dose calibrator fields are displayed.

   For **Integrated Sources**, line and point sources can be installed and registered. (➔ Page 490 *Installing integrated sources*)

For **Precision Source**, sources can be added, deleted, or edited.
(➔ Page 491 *Adding a precision source*)

For **Dose Calibrator**, calibrators can be added, deleted, or edited.
(➔ Page 493 *Adding a Dose Calibrator*)

19.2 Installing integrated sources

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

✓ Duplicate Source IDs are not allowed.

✓ Check the system and have the source available

An integrated source line or point can be added with following details by selecting the **Install** button from the Source Management page unless the appropriate license is not found.

To install an integrated line or point source:

1 Click the **Install** button for the line source or the point source.

The **Extend Source** dialog box appears asking **Caution, Do you want to extend the source? Motion and radiation may occur. Yes No**. Click **Yes** to proceed, or **No** to cancel.

If Yes, the line source or point source is extended from the table storage area. An **Installing A Line Source** or **Installing A Point Source** window appears. The windows have the same entry fields. Only the video demontrating the source replacement differs.

2 Follow the steps. The first step is to **Enter Source ID** information.

3 In the **Enter Source ID** field, enter the source ID.

4 The **Select reminder** dropdown list contains time durations by when to send a reminder to replace the source.

Select a reminder between:

- No reminder
- **1 Week** through **8 Weeks**.

5 From the **Enter reference date** field, enter the current date using the MM/dd/yyyy (month/date/year) format or click the calendar icon to the right of the field and select one.

6 The second line source installation instruction is to **Install or exchange source with drilled spanner**.

7 Click the video image to display the video controls.

8 Click the start arrow to play the brief line source installation video.

A pause button halts the video. A timer and status bar displays the current play time, a visual update status on the horizotal status bar, and an end time for the duration of the video. A control for volume (if there is audio), and an expand and reduce button for zooming the video's display screen of the video and reducing it.

9 The third step is to **Click Save or Cancel (System motion will occur.)**

10 Click the **Save** button to save the line source information, or **Cancel** to exit the process.

Clicking **Save** retracts the line or point source back into the table's storage area.

11 After installing the line or point source and saving the information, an **Edit** button is available and displays either **Editing A Line Source** or **Editing A Point Source** window when selected.

The **Source ID** name, **Reminder** time duration, and **System Apparent Activity** (the **Enter reference date** for current date that the line or point source was installed) can be edited.

Click the **Edit** button to proceed, make any desired edits, and then click the **Save** button to accept the edits, or click **Cancel** to cancel the editing process.

19.3 Adding a precision source

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

✓ Duplicate Source IDs are not allowed.

✓ Dose units are either MBq or mCi.

A precision source can be added with following details by selecting the **Add Source** button from the Source Management page unless the appropriate license is not found.

For a precision source:

- Source ID
- Isotope (limited to Co-57, Se-75, and Sn-113)
- Apparent Activity
- Unit (of measure of dose)
- Reference Date
- Status (number of day until replacement)

To add a precision source:

1 Click the **Add Source** button.

  The Register xSPECT Quant Precision Source dialog box appears.

2 Enter the **Source ID**.

3 Select the **Isotope** from the dropdown list.

4 Enter the **Reference Date** or use the calendar to the right of the field to select it.

5 Enter the **System Apparent Activity**.

6 Select the activity's **Unit** from the dropdown list.

7 Select a **Reminder** date (in quantities of weeks) for the replacement of the precision source.

8 Click the **Save** button.

  The added precision source appears on the Source Management page under **Precision Source**.

19.3.1 Editing a precision source

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

A precision source can be edited by selecting the **Edit** button from the Source Management page unless the appropriate license is not found.

To edit a precision source:

1 Click the **Edit** button for the specific source.

A dialog box message appears asking **Do you wish to modify this precision source entry? All calibration data associated with this precision source will be modified from the system? Yes No.**

2 Click the **Yes** button to proceed, or **No** to cancel the edit.

If Yes, the Edit xSPECT Quant Precision Source dialog box appears. The Source ID field cannot be edited.

3 Edit the desired fields.

4 Click the **Save** button.

The edited precision source appears on the Source Management page under **Precision Source**.

Deleting a precision source

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

A precision source can be deleted by selecting the **Delete** button from the Source Management page unless the appropriate license is not found.

To delete a precision source:

1 Click the **Delete** button for the specific source.

A dialog box message appears asking **Do you wish to delete this precision source entry? All calibration data associated with this precision source will be removed from the system? Yes No.**

2 Click the **Yes** button to proceed, or **No** to cancel the deletion.

The deleted precision source is removed from the Source Management page under **Precision Source**.

19.4 Adding a Dose Calibrator

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

✓ A maximum of 10 dose calibrators are available.

✓ If there are many sources or calibrators already saved or to be added, use the scroll bar to scroll through the list.

✓ Duplicate Source IDs are not allowed.

A dose calibrator can be added with following details by selecting the **Add Calibrator** button from the Source Management page unless the appropriate license is not found.

For a dose calibrator:

- Enter ID
- Enter Location

To add a dose calibrator:

1 Click the **Add Calibrator** button.

The Register Dose Calibrator dialog box appears.

2 Enter the **ID**.

3 Enter the **Location**.

4 Click the **Save** button.

The added dose calibrator appears on the Source Management page under **Dose Calibrator**.

19.4.1 Editing a dose calibrator

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

✓ The dose calibrator ID field is not editable.

A precision source can be edited by selecting the **Edit** button from the Source Management page unless the appropriate license is not found.

To edit a dose calibrator:

1 Click the **Edit** button for the specific calibrator.

An Edit Dose Calibrator dialog box appears. The dose calibrator ID is not editable, only the location.

2 If desired, edit the **Location**. If not, click the **Cancel** button.

3 If edited, click the **Save** button.

The edited dose calibrator appears on the Source Management page under **Dose Calibrator**.

19.4.2 Deleting a dose calibrator

✓ Appropriate license is required.

✓ Clinical Administrator or Service-level user access is required.

A dose calibrator can be deleted by selecting the **Delete** button from the Source Management page unless the appropriate license is not found.

To delete a dose calibrator:

1 Click the **Delete** button for the specific source.

A **Dose Calibrator will be Deleted!** dialog box message appears asking **Do you wish to delete this dose calibrator entry? All calibration data associated with this dose calibrator will be removed from the system? Yes No.**

2 Click the **Yes** button to proceed, or **No** to cancel the deletion.

The deleted dose calibrator is removed from the Source Management page under **Dose Calibrator**.

19.5 Dose management during scan and reconstruction

This section contains information on dose management during scan and reconstruction.

19.5.1 Basic dose panel

This section explains the basic dose panel.

19.5.2 Dose precondition copy dose across scans for single isotope

When dose parameters **Injection Date**, **Injection Time**, and **Dose** are modified in the Dose precondition step, the modified values are automatically copied to all other unperformed MI scan steps in the workflow that contain the same isotope and pharmaceutical.

19.5.3 Dose precondition copy dose across scans with mixed single and or dual isotope scans

If a workflow contains a mixture of dual and single isotope scans, the dose is copied from between the scans as long as the isotope and pharmaceutical match.

For example, a workflow contains single isotope for scan A and contains a dual isotope scan B. If the dose, injection date, or injection time is entered for scan A, they are only copied to the dose for the matching isotope and pharmaceutical in scan B.

19.5.4 Dose precondition date time format

Regional settings are used for the display format of injection date and time. They can be changed from configuration panel.

19.5.5 Dose precondition disabled after scan start

All entries in the dose precondition step are disabled when the scan starts, and remain disabled after the scan is completed.

If you need to change the dose information during or after the scan completes, you can perform it using the Advanced Radiopharmaceutical Dose dialog box.

19.5.6 Dose precondition dose unit

The unit of dose for the radiopharmaceutical as configured for the system is displayed.

19.5.7 Dose precondition dual isotope selection

For dual isotope scans, select either an isotope from the isotope dropdown list in the dose precondition step, or enter dose information for that selection.

19.5.8 Dose precondition injection date time

The injection date and time for the isotope selected for the scan will be given the current day's date and time as of when the workflow is loaded.

19.5.9 Dose precondition injection date time modification

The injection date and time for each isotope being acquired in the scan can be modified.

19.5.10 Dose precondition pharmaceutical

When entering the pharmaceutical information, select from a list of pharmaceuticals depending on the selected isotope, or enter free text in the pharmaceutical field.

19.5.11 Dose precondition single isotope selection

For single isotope scans, the isotope configured is displayed for the scan as a read-only parameter in the dose precondition step.

19.5.12 Dose precondition step

Select and enter values in the dose precondition step.

For example:

Isotope **Tc99m**

Pharmaceutical **Sestamibi**

Injection Date **11/23/17** M/d/yyyy

Injection Time **14:25** hh:mm

Dose value **300.00** MBq

19.5.13 Advanced radiopharmaceutical dose

This section explains the advanced radiopharaceutical dose.

19.5.14 Displaying radiopharmaceutical dose dialog box

In the dose precondition check panel, there is a button that allows the you to display an Advanced Radiopharmaceutical Dose calculation dialog box. The button is located to the right of the **Injection Time** amount and has a graphic of a syringe.

19.5.15 Dose precondition check quantitative scans

For quantitative NM scans, the Dose step displays a message if the dose values are not specified. The scan can proceed, but the Dose step message remains displayed until the dose values are entered. For example: **Isotope Tc-99m**, **Phramaceutical Pertechnetate**, **Injection Date 08/09/2019 MM/ddd/yyyy**, **Injection Time 01:57 PM**, and **Dose 0 mCi**.

19.5.16 Dose precondition check with scan allowed

For non-quantitative NM scans, the scan can proceed when no dose information is entered. There is no text message displayed to you. However, a yellow bubble with an exclamation mark is displayed in the Dose step when no dose information is entered. Once the dose information has been entered, the bubble color changes to green with a checkmark displayed indicating complete.

19.5.17 Radiopharmaceutical precondition

This section describes how dose is handled prior to performing a scan.

19.5.18 Radiopharmaceutical advanced dose dialog box

The radiopharmaceutical Advanced Dose dialog box will be checked for the following conditions to allow you to accept the dose values:

- **Injection Date/Time** prior to **Pre-injection Assay** and **Post-Injection** assay are allowed.
- **Pre-Injection Time** cannot be after Post-Injection Time.
- **Pre-Injection Dose** cannot be less than Post-Injected Dose
- **Post-Injection Time** cannot be before Injection Time

19.5.19 Radiopharmaceutical dose assay dose calculation

When the Edit checkbox is unchecked, the Assay Dose field is disbled for editing in the Injection Assay and the Assay Dose is computed using the following formula:

Calculations of Total Radionuclide Dose (Effective or Corrected Dose)

Calculation of corrected dose

Corrected Dose = Effective Initial Assay - Effective Residual Assay

Effective Assay = CCF x $\{A[T_c] \times \exp(-\ln(2)(T_c-T_1)/T_{1/2})\}$

The measured activity (either initial or residual), A, at calibration time, T_c, is decay-corrected to the injection time, T_1. This yields the (potentially biased) Radionuclide Total Dose (effective dose). To remove bias from errors in the calibration of the dose calibrator, the cross-calibration factor, CCF, must be applied) specific to the dose calibrator used to assay the syringe).

If the user has performed cross calibration (values per head and photopeak) for a specific preset/collimator combination using the dose calibrator DC used in the assay, the dose calibrator referenced sensitivity $S_{H\_PP.DC}$ for head H, photopeak PP, and dose calibrator DC will be saved to the patient data. The cross-calibration factor is the ratio of this value with the system sensitivity $S_{H\_PP.DC}$. Potentially, the result is different for each peak on each head. The net cross calibration factor should be calculated from a weighted average over head (H) and peak (PP) of the system sensitivity ($S_{H\_PP.DC}$) and a weighted average over head and peak of the dose calibrator referenced sensitivity ($S_{H\_PP.DC}$)

Cross Calibration Factor = $\sum_{Head}\sum_{pp}S_{H\_PP.DC} / \sum_{Head}\sum_{PP}S_{H\_PP.DC}$

19.5.20 Radiopharmaceutical dose assay dose editing

When the **Edit** checkbox is checked, the Advanced Radiopharmaceutical Dose dialog box Assay Dose field is enabled. The Assay Dose can be entered. The pre-injection and post-injection assay fields UI elements are disabled. Any displayed values are removed. The pre-injection and post-injection assays values are retained in case the checkbox is uncheck.

19.5.21 Radiopharmaceutical dose calibrator license

The Dose Calibrator dropdown is shown only for pre- and post-injection assay if a license is available on the system.

19.5.22 Radiopharmaceutical dose calibrator values

The Dose Calibrator dropdown list contains all of the calibrators that have been cross-calibrated for the collimator that is installed on the detectors and for the selected isotope for the scan. **None** is also an entry.

19.5.23 Radiopharmaceutical dose editing

The **Quant Dose** button is enabled in the dose precondition step after the scan is completed to allow second chance editing of radiopharmaceutical dose parameters.

Note that the dose, date, and time can only be corrected for open reconstructions.

19.5.24 Radiopharmaceutical dose information

In the Radiopharmaceutical Dose dialog box, fields are provided for **Isotope** (read-only, for example, Isotope Tc99m), **Pharmaceutical** (for example, Pharmaceutical Sestamimi), and radiopharmaceutical **Volume** (for example, Volume 50 ml) to view and or enter radiopharmaceutical information.

19.5.25 Radiopharmaceutical dose injection assay

When the radiopharmaceutical dialog box is displayed, the fields **Effective Dose** (for example, Effective Dose 46 mCi), **Date** (for example, Date 11/23/2017 m/d/yyyy), **Time** (for example, Time 11:23 hh:mm), and **Edit** check box are provided to view and or enter information for the injection assay.

19.5.26 Radiopharmaceutical dose injection date and time

In the Radiopharmaceutical Dose dialog box, fields are provided for **Injection Date** (for example, Injection Date 11/23/2017 m/d/yyyy), **Injection Time** (for example, 11:23 hh:mm) to view and or enter the injection date and time.

The values and format of the injection date and time fields will always match what is displayed in the dose step.

19.5.27 Radiopharmaceutical dose parameter modification

When modifying radiopharmaceutical parameters after a scan has been completed, a message is displayed indicating that the modified dose parameters are only applied to open and new reconstructions if they have been decay corrected to injection time: **For reconstructions that are decay corrected to injection time, any modifications will be applied to open or new reconstructions only.**

19.5.28 Radiopharmaceutical (quantitative) dose pre-injection assay and post-injection residual assay

In the Radiopharmaceutical (quantitative) Dose dialog box, similarly labeled fields **Dose** (for example, Dose 50 mCi for pre-injection and Dose 4 mCi for the post-injection), **Date** (for example, Date 11/23/2017 m/d/yyyy), **Time** (for example, 11:23 hh:mm), and **Dose Calibrator** (for example, None) are provided to view and or enter information for the pre-injection assay and the post injection residual assay.

20 CT Dose management

As with all other imaging modalities that use ionizing radiation, CT scanning must be used appropriately. To reduce radiation exposure to patients, determine appropriate clinical indications before performing a CT examination.

20.1 Dose optimization

During a CT examination, the patient is exposed to a certain amount of radiation. Therefore, it is important to limit the patient dose by using dose reduction techniques and applications. Common practice is to apply the As Low As Reasonably Achievable (ALARA) principle. The aim of ALARA is to reduce the risk of radioactive exposure by using dosages as low as reasonably achievable to attain the desired diagnostic information.

The following features help you to apply the optimal dose for each patient:

- (→ Page 503 *CARE Dose4D*)
- (→ Page 505 *CARE Profile*)
- (→ Page 515 *X-CARE*)

20.2 CARE Dose4D

CARE Dose4D automatically adapts the tube current to the patient's body size and shape. Using the patient's topogram, CARE Dose4D evaluates two profiles of the patient's body size in the anterior-posterior and lateral directions, related to the X-ray attenuation of the patient's body. Based on these profiles, the mAs value is adapted to the patient during the subsequent CT scans.

You can enable CARE Dose4D for each tomogram range if CARE Dose4D is available for the CT scan mode of the range. Depending on whether the CARE kV license is available, CARE Dose4D is represented by the following parameters:

Parameter	Description
CARE Dose4D (Only available without CARE kV license)	CARE Dose4D is enabled if the **CARE Dose4D** parameter is turned on.
CARE Dose4D & CARE kV (Only available with CARE kV license)	CARE Dose4D is enabled if the **CARE Dose4D & CARE kV** mode is either **Full** or **Manual**.

In the Administration Portal, you can configure the dose modulation strength for a patient depending on the patient size and organ characteristics.
(→ Page 743 *Setting dose configurations*)

For more information on CARE Dose4D, see the *System Owner Manual – Dosimetry and imaging performance report*.

20.2.1 X-ray tube conflicts

The following X-ray tube conflicts may occur:

- Image quality conflict:

  To achieve the required image quality, **CARE Dose4D** calculates the optimal current profile of the X-ray tube that is based on the reference mAs and the patient attenuation, as extracted from the topogram. If the optimal tube current exceeds the maximum tube current that can be delivered by the tube and the generator, the optimal tube current cannot be applied. In this case, image quality may be reduced.

Scanning is still possible despite an image quality conflict. However, **FAST Adjust** can solve the conflict.

- Tube load conflict:

  A tube load conflict occurs if the X-ray tube temperature is expected to exceed the system limits during the subsequent scan range.

  If the conflict can be solved by a maximum waiting time of 10 minutes, a countdown is automatically started to cool down the system. The countdown is displayed in the execution control.

  If the cooling time exceeds 10 minutes, the scan range cannot be performed. In this case, no countdown is displayed and the **GO** button is disabled.



In case of a tube load conflict, the **Adjust** button is displayed in the execution control to solve the conflict.

20.3 CARE Profile

The CARE Profile is the dose profile of a scan range.

The CARE Profile indicates the dose that will be applied to the patient for a scan range, depending on the z-position. The CARE Profile displays the dose for all scan ranges you have selected in the timeline or all recon ranges you have selected in the **Recon Ranges** area. (➔ Page 403 *Range planning*)

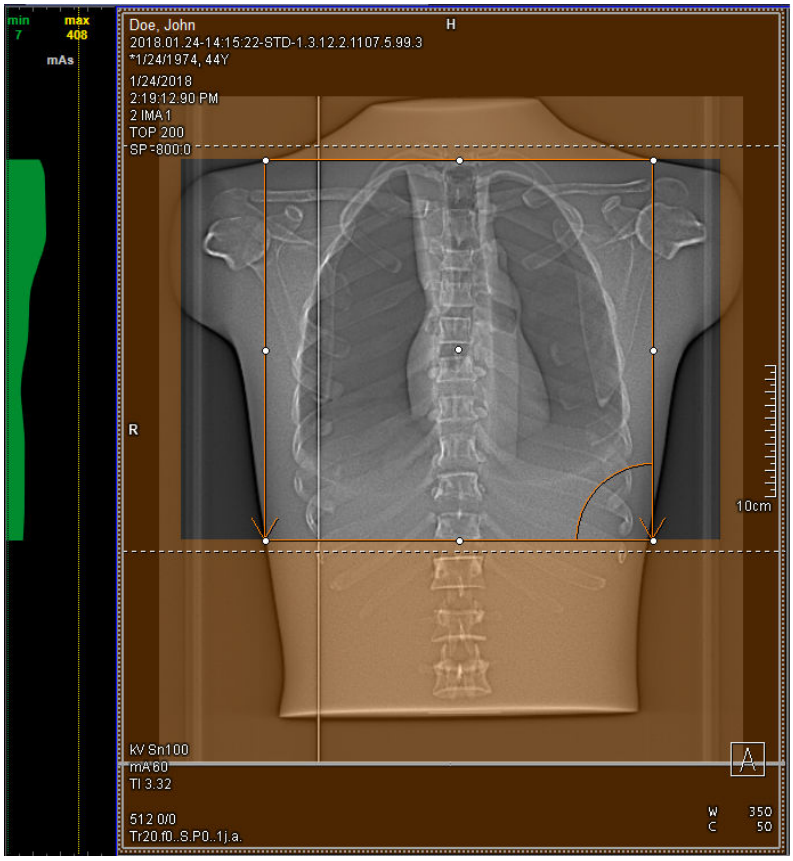
For scan modes with continuous table movement, such as for spiral ranges, the CARE Profile is displayed as a curve in z-direction along the topo segment.

If the scan range, for which the CARE Profile is displayed, has a scan mode with discrete table positions, such as for sequence ranges, the *syngo* Acquisition Workplace displays the CARE Profile as bars.

The CARE Profile is displayed from the start position of the lowest table start position of a range to the highest table end position of a range.

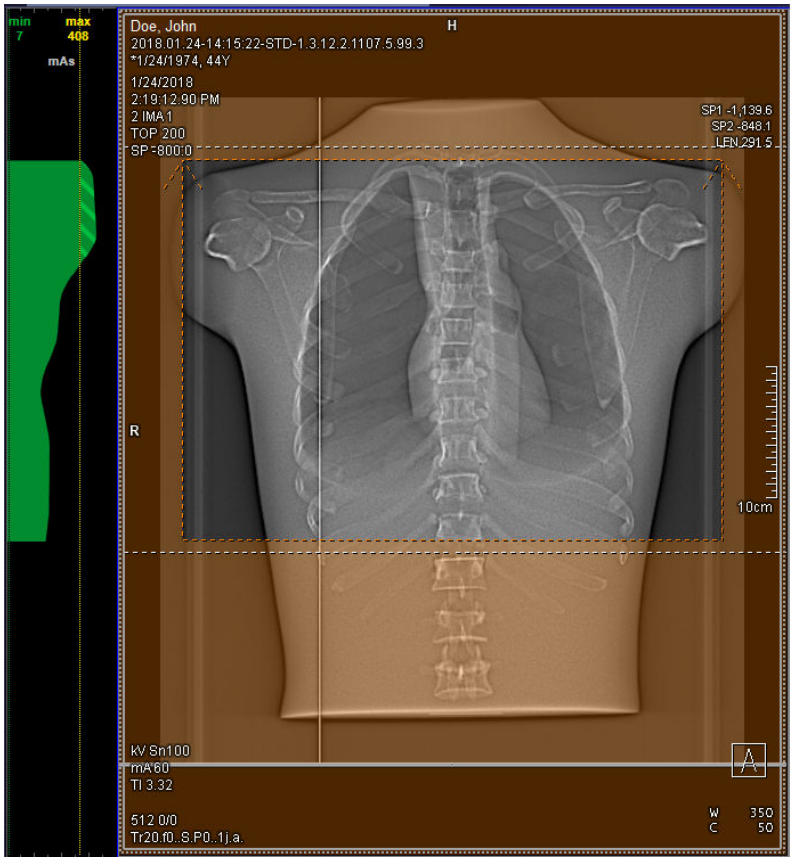
If only one range is selected, the CARE Profile is filled with a distinct color.

CARE Profile with topogram



The CARE Profile is green if no conflict occurs.

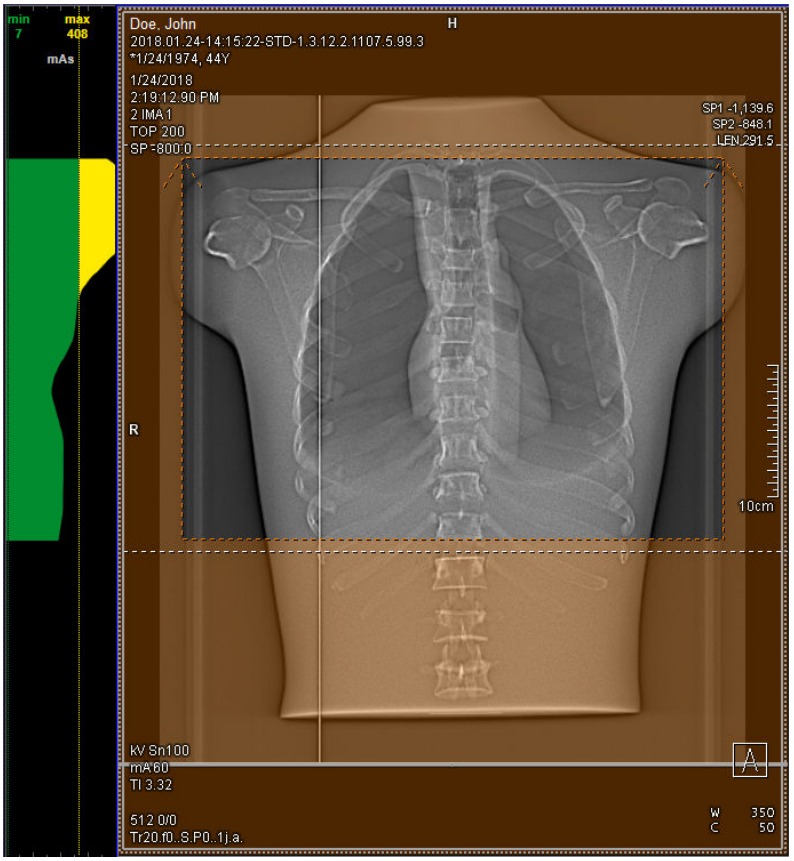
CARE Profile with topogram



The mAs slightly exceeds the system limits for some regions.

Loading the scan range is recommended, since the impact on the image quality will be negligible. The peak of the CARE Profile will be lowered to the maximum possible mAs in this case.

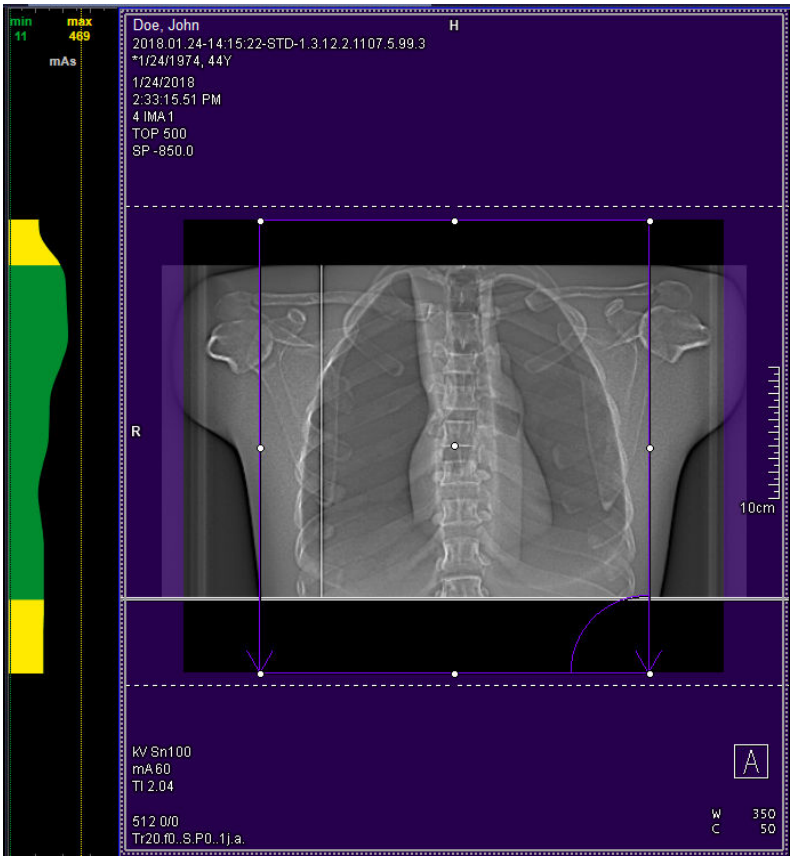
CARE Profile with topogram



In case of an image quality conflict, the theoretically optimal tube current profile cannot be applied because it exceeds the maximum possible tube current. (➔ Page 504 *X-ray tube conflicts*)

In the yellow areas in z-direction, the image quality may be reduced.

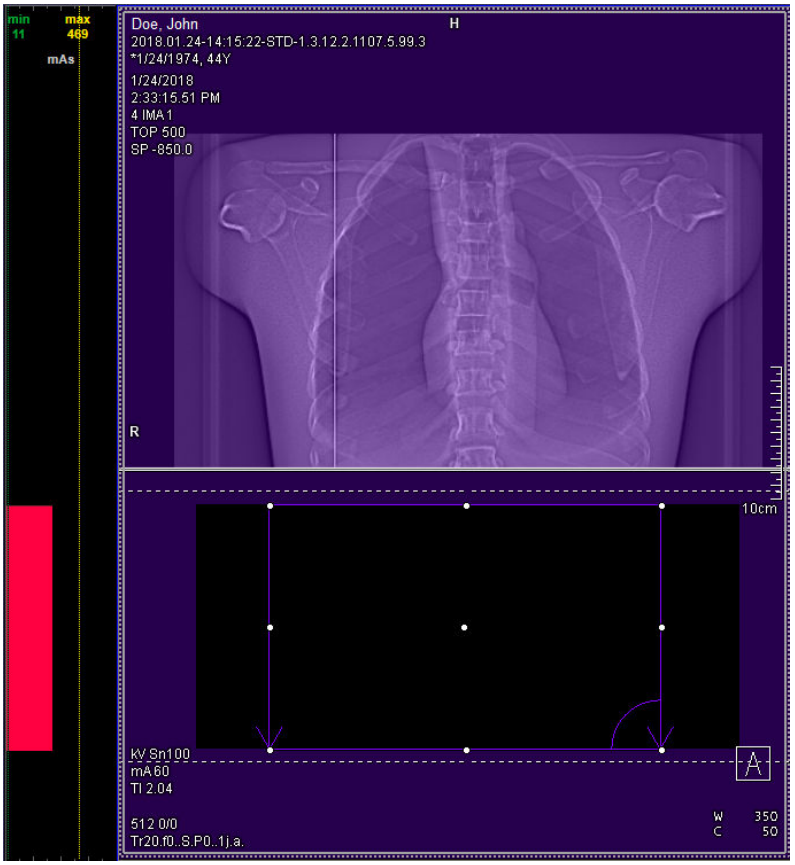
CARE Profile with topogram



If the topogram only partially covers the scan range, all uncovered parts are yellow.

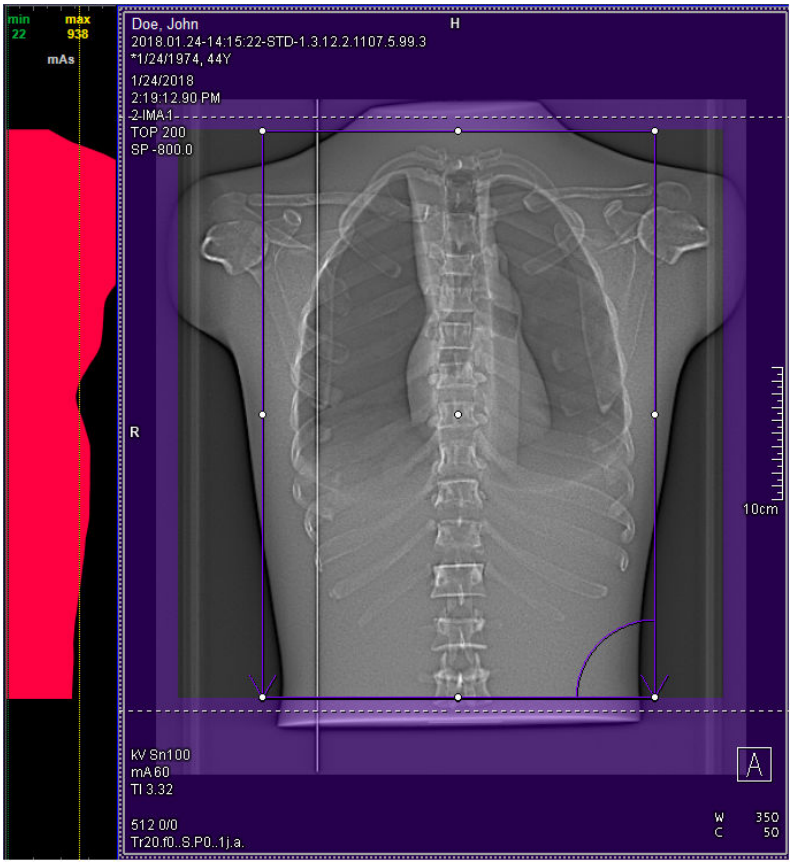
In the yellow areas in z-direction, the image quality may be reduced.

CARE Profile with topogram



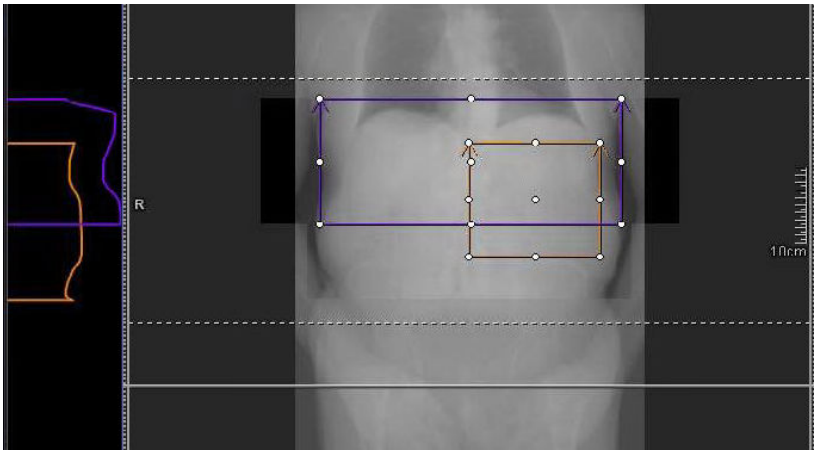
The topogram does not cover the scan range at all.

CARE Profile with topogram



The tube cooling time exceeds 10 minutes.

If more than one range is selected, only the outlines of the CARE Profile are displayed in the color of the corresponding ranges:



CARE Profile of two recon ranges of two different scan ranges

When you click **GO** to load a range for scanning, only the CARE Profile for the tomogram range to be scanned next is displayed.

If the **CARE Dose4D** parameter is not activated, yellow warning icons are displayed for the scan range. (→ Page 503 *CARE Dose4D*)

20.4 Flex Dose Profile

The CT system provides a dose modulation mechanism to reduce radiation outside of an organ by a certain factor. Within one scan, you can acquire two different organ specific ranges with organ adapted image quality. For example, with the Chestpain protocol, you can acquire images of the thorax and heart within a single scan to clarify the reasons for non-specific chest pain. As images of the heart require a larger amount of dose than the remaining thorax area, less dose can be applied to the thorax.

The CT system allows you to select a basic scan mode with two different dose areas to plan organ specific ranges with organ-adapted image quality. You can select a basic scan mode from the **Scan Mode** parameter list in the parameter panel. Scan modes including a Flex Dose Profile are indicated by **Flexdose** in the name, for example, **RoutineSpiralAdultAbdomenFlexdose**.

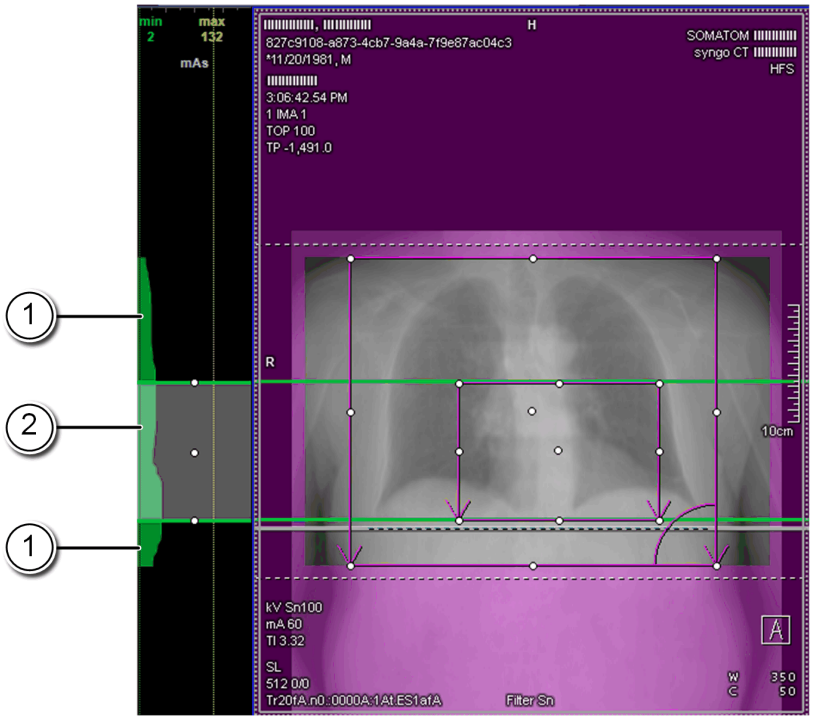
The scan modes are only available in the parameter panel if they have been selected from the **Accessible Scan Modes** list in the **General Scan** parameters category in the **Exam Designer**.

Flexdose scan modes are only available for the following scan protocols:

- Thorax (adult and child)
- Abdomen (adult and child)
- Thorax Coronary CTA (adult)

As soon as the topogram has been acquired, the Flex Dose Profile is displayed graphically on the topogram. The Flex Dose Profile consists of a low dose area and a high dose area. Before performing a tomogram range, you can move and resize the high dose area graphically on the topogram within the CARE Profile to plan the organ-specific ranges.

FAST Planning is enabled by default.



Topogram with Flex Dose Profile

(1) Low dose area
(2) High dose area
You can move and resize the high dose area within the CARE Profile.

The Flex Dose Profile is only displayed on the topogram if the following conditions are met:

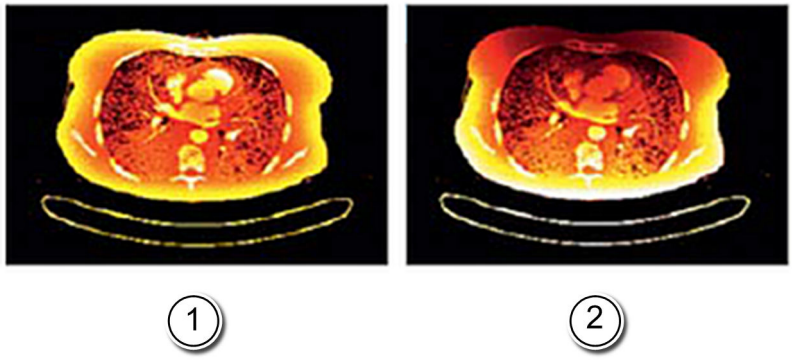
- A basic scan mode including a Flex Dose Profile is selected for the tomogram range.
- At least one topogram is available in the scan protocol.
- No gantry tilt is planned for the scan range.
- Dose modulation is switched on. (➔ Page 503 *Dose optimization*)
- On the topogram image, only one scan range or recon range is selected and displayed.

Be aware of the following when switching from one basic scan mode to another:

- If you switch from a basic scan mode with **CARE Dose4D** or **CARE Dose4D & CARE kV** disabled to a basic scan mode including a Flex Dose Profile, the Flex Dose Profile will only be displayed if you manually enable the **CARE Dose4D** parameter. (➔ Page 503 *CARE Dose4D*)
- If you switch from a basic scan mode including a Flex Dose Profile to another basic scan mode including a Flex Dose Profile, the position of the Flex Dose Profile on the topogram remains the same.

20.5 X-CARE

X-CARE is an organ-based dose modulation mode that applies the lowest possible dose to sensitive tissue, for example, the eyes or the breast. As a result, X-CARE reduces radiation exposure to these organs during a CT examination, while the image quality remains unaffected. To achieve this, X-CARE reduces the tube current when the patient is irradiated from the front.



Radiation doses

(1) Radiation dose without X-CARE.
(2) Radiation dose with X-CARE: The darker areas indicate where a lower dose has been absorbed.

X-CARE can only be used in thorax and head examinations.

Dose modulation with X-CARE is active if the following applies:

- X-CARE is the selected scan mode in the scan protocol of a thorax or head examination.
- CARE Dose4D is enabled.

To use X-CARE in a thorax or head examination:

- select a scan protocol with **X-CARE**. (→ Page 361 *Protocol selection*)

  – or –

- select **X-CARE** from the **Scan Mode** parameter list in the parameter panel. (→ Page 454 *Switching scan modes*)
- set the **CARE Dose4D & CARE kV** parameter to **Full** or **Manual** mode.

  – or –

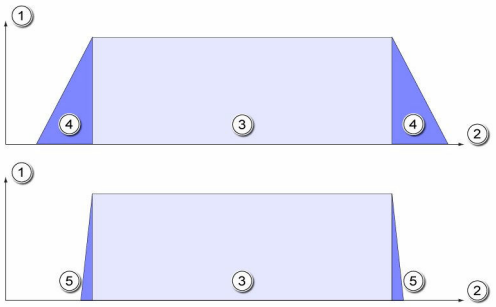
- enable the **CARE Dose4D** parameter if no CARE kV license is available.

20.6 Adaptive Dose Shield

The Adaptive Dose Shield dynamically adapts the X-ray beam collimation to reduce the overrange dose at the edges of the scanned volume for spiral acquisitions.

In spiral scan modes, to collect all the required data for image reconstruction, the scan range must overrange the imaged range. This effect partly causes unused dose, unless the overrange dose is dynamically collimated.

The overrange dose can be reduced with the use of dynamic collimation, which controls the tube collimator opening at the start and end of the spiral acquisition. The spiral scan starts with the smallest possible aperture and gradually opens to the nominal collimation. Then it closes again at the end of the scan range.



(1) mAs
(2) Z-direction
(3) Nominal spiral length with full dose
(4) Additional dose without Adaptive Dose Shield
(5) Additional dose with Adaptive Dose Shield

The $CTDI_{vol}$ is not affected by the Adaptive Dose Shield, but the DLP is corrected when the Adaptive Dose Shield is employed for the scan.

20.7 Dose modulation if patient not in isocenter

Based on a topogram, a patient attenuation profile is calculated. The resulting CARE Profile is the dose profile of a scan range.

The calculations require precise patient positioning in the isocenter of the gantry. If the patient is not positioned in the isocenter of the gantry, the patient appears larger or smaller in the topogram, which leads to an overestimation or underestimation of the patient attenuation. Patient centering is therefore mandatory for accurate dose optimization.

If patient positioning within the isocenter is not possible, you can acquire a second orthogonal topogram. The **CARE Dose4D** algorithm uses the additional topogram to correct any positioning inaccuracies. (➔ Page 503 *CARE Dose4D*)

For example, if the topogram was acquired with tube position top or bottom, acquire a second topogram with tube position left or right. If the topogram was acquired with tube position left or right, acquire a second topogram with tube position top or bottom respectively.

20.8 Dose Alert and Dose Notification

Each scan protocol contains information about the dose to be applied to the patient during scanning.

Dose Alert and **Dose Notification** are two dedicated safety features that inform you if a certain critical preconfigured X-ray dose has been exceeded.

(➔ Page 518 *Dose Alert*)

(➔ Page 521 *Dose Notification*)

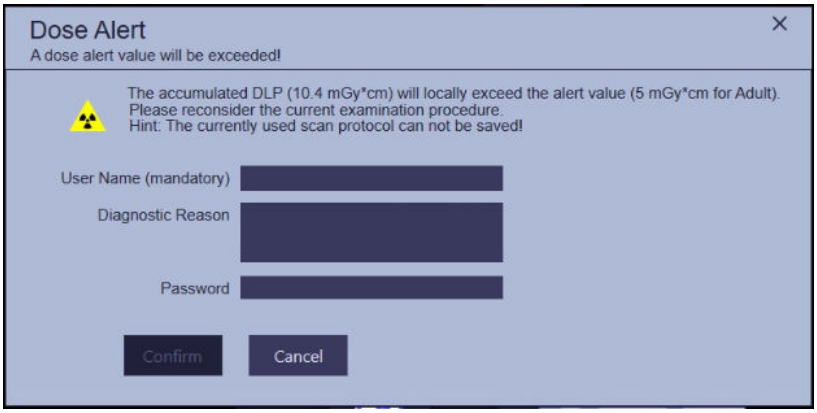
For more information about **Dose Alert** and **Dose Notification**, see *System Owner Manual*, chapter DIP report.

20.8.1 Dose Alert

The **Dose Alert** monitors the maximum of the accumulated $CTDI_{vol}$ as well as the accumulated DLP for all scan ranges of the current examination. It informs you if one of the specified alert values will be exceeded when performing the scan.

- You can configure the dose alert thresholds for both adult and child examinations in the Administration Portal. (➔ Page 746 *Setting the dose alert thresholds*)
- The *syngo* Acquisition Workplace uses the child threshold values if the scan protocol contains at least one scan range with **Child** as **Patient Type**, otherwise the *syngo* Acquisition Workplace uses the threshold values for adults.
- Your operation will be recorded and saved to `H:\siteData\DoseLogs`. Ensure that you back up the data in case of a system upgrade.

If you are loading a scan range for which the defined thresholds exceed the alert values, the **Dose Alert** dialog box opens.



In addition, the **Dose Alert** is displayed in the taskflow control.

The corresponding scan range and parameters display a red error icon.

In case of a **Dose Alert** for an i-Sequence range in a CT-guided intervention, the **Do Not Show Again** check box is displayed in the **Dose Alert** dialog box. If you enable the **Do Not Show Again** check box and then confirm the **Dose Alert**, the **Dose Alert** will not be shown again for the next i-Sequence scans.

Proceed as follows:

- Adapt the dose before continuing with the scan. (➔ Page 519 *Adapting the dose before scanning*)

  – or –

  Perform a scan without correcting the exceeded scan parameters only if clinically justifiable. (➔ Page 520 *Confirming the Dose Alert*)

Adapting the dose before scanning

✓ You clicked **GO** to load a range for scanning.

✓ A dialog box is open, notifying you that the dose values have exceeded the defined threshold.

1 Click **Cancel**.

The dialog box closes.

2 In the timeline, double-click the affected scan range.

The parameter panel of the scan range opens.

3 In the **Dose** parameters category, modify one of the following parameters:

Without CARE kV license		With CARE kV license	
Quality ref. mAs parameter	If **CARE Dose4D** is enabled	**CARE kV Quality ref. mAs @ 120 kV** parameter	If **CARE Dose 4D & CARE kV** mode is **Full** or **Manual**
Eff. mAs parameter	If **CARE Dose4D** is disabled	**Eff. mAs** parameter	If **CARE Dose 4D & CARE kV** mode is **Off**

4 Continue to load the range. (→ Page 455 *Activating the tomogram scan*)

5 If the dose alert occurs again, repeat the steps 1 to 4.

Confirming the Dose Alert

Continue a scan without correcting the exceeded scan parameters only if clinically justifiable.

Only users with the appropriate access privileges can confirm a dose alert.

✓ A **Dose Alert** dialog box is displayed.

✓ You checked the scan parameters for the current examination.

✓ You can clinically justify continuing the scan with the exceeded parameters.

✓ You have the appropriate access privileges to confirm the dose alert.

1 Enter your user name in the **User Name (mandatory)** field.

2 Optional: Enter the diagnostic reason in the **Diagnostic Reason** field.

3 If configured, enter your dose alert password in the **Password** field.

By default, no dose alert password is configured and the **Password** field is not displayed.

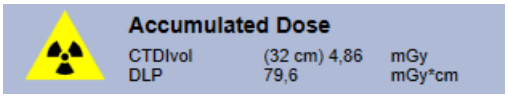
However, if a password is configured, you must enter the password to proceed with the examination. You are only allowed to confirm a dose alert and proceed with the examination if your user account was assigned to the *syngo* **DoseAlertAdministrator** role.

For Guide&GO ranges, the **Do Not Show Again** check box is displayed.

4 Optional: Enable the **Do Not Show Again** check box.

After you clicked **Confirm**, you can perform all following i-Sequence scans in this protocol without entering your user name and password. The **Dose Alert** dialog box will not be displayed anymore.

Instead, at the bottom of the **Recon Ranges** area, the **Accumulated Dose** values of all performed i-Sequence scans are displayed for the remaining examination as a reminder that **Dose Alert** is on:



5 Click **Confirm**.

The **Dose Alert** dialog box closes and your entries are saved.

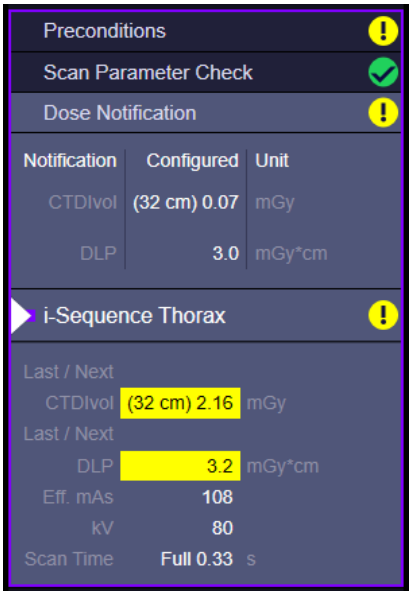
6 Continue with scanning the range.

20.8.2 Dose Notification

The **Dose Notification** monitors the $CTDI_{vol}$ as well as the DLP for each scan range. It informs you if the specified notification values will be exceeded when performing the scan.

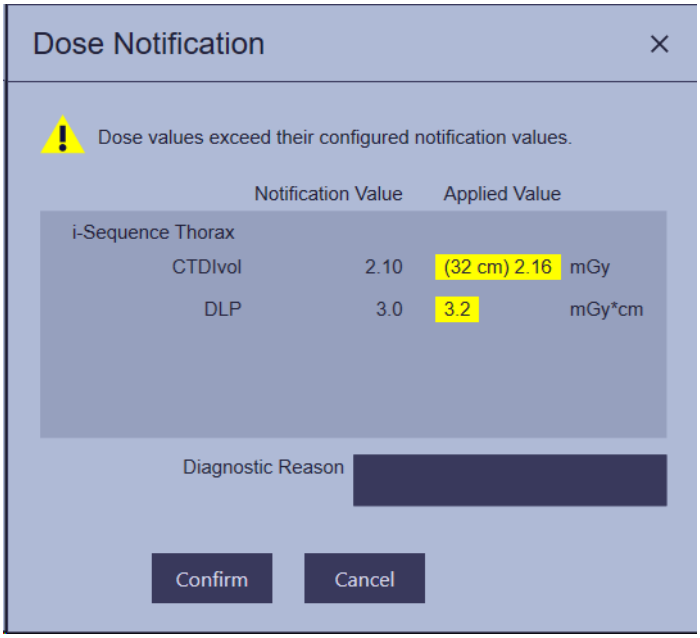
- For each scan range, you can set a threshold for $CTDI_{vol}$ (**Dose Notification ref. CTDI [mGy]** parameter) and a threshold for DLP (**Dose Notification ref. DLP [mGy*cm]** parameter).
- Your operation will be recorded and saved to `H:\siteData\DoseLogs`. Ensure that you back up the data in case of a system upgrade.

The **Dose Notification** is displayed in the taskflow control.



The corresponding scan range and parameters display a yellow warning icon.

If you are loading a scan for which one, or both, thresholds defined for the next scan ranges exceed the notification values, a **Dose Notification** dialog box opens.



Proceed as follows:

- Adapt the dose before you continue.

  – or –

  Perform a scan without correcting the exceeded scan parameters only if clinically justifiable. (➔ Page 524 *Confirming the Dose Notification*)

Adapting the dose before scanning

✓ You clicked **GO** to load a range for scanning.

✓ A dialog box is open, notifying you that the dose values have exceeded the defined threshold.

1 Click **Cancel**.

  The dialog box closes.

2 In the timeline, double-click the affected scan range.

  The parameter panel of the scan range opens.

3 In the **Dose** parameters category, modify one of the following parameters:

Without CARE kV license		With CARE kV license	
Quality ref. mAs parameter	If **CARE Dose4D** is enabled	**CARE kV Quality ref. mAs @ 120 kV** parameter	If **CARE Dose 4D & CARE kV** mode is **Full** or **Manual**
Eff. mAs parameter	If **CARE Dose4D** is disabled	**Eff. mAs** parameter	If **CARE Dose 4D & CARE kV** mode is **Off**

4 Continue to load the range. (➔ Page 455 *Activating the tomogram scan*)

5 If the dose alert occurs again, repeat the steps 1 to 4.

Confirming the Dose Notification

Scan a range without correcting the exceeded scan parameters only if clinically justifiable.

✓ You clicked **GO** to load a range for scanning.

✓ A **Dose Notification** dialog box is open.

✓ You checked the scan parameters for the current scan range.

✓ You can clinically justify to continue the scan with the exceeded parameters.

1 Enter a **Diagnostic Reason** (optional) in the **Dose Notification** dialog box.

2 Click **Confirm**.

The **Dose Notification** dialog box closes and your entries are saved.

3 Continue with scanning the range.

20.9 Documentation of the applied dose

The CT system documents the applied dose as follows:

- (➔ Page 525 *DICOM Dose Structured Report (Dose SR)*)
- (➔ Page 525 *Patient Protocol*)

20.9.1 DICOM Dose Structured Report (Dose SR)

After closing an examination, a Dose SR can be generated automatically, if configured, according to the DICOM standard for archiving and evaluation purposes.

A dose report contains the following information:

- Patient data, such as name and ID
- Administrative data, such as referring physician, date of the report
- Device information, such as scanner type or software version
- Dose parameters of the whole examination and of each scan range, like $CTDI_{vol}$ and DLP

The Siemens Healthineers Dose Structured Report is compliant with the Radiation Exposure Monitoring (REM) profile defined by the Integrated HealthCare Enterprise (IHE). *http://www.siemens.com/ihe*, *http://www.aapm.org/meetings/amos2/pdf/42-12234-94897-404.pdf*

20.9.2 Patient Protocol

The Patient Protocol summarizes examination data. Therefore, you can use it to document examinations.

The Patient Protocol is generated in an image format. It can also be filmed and sent, for example, from the **Patient Browser**.

A Patient Protocol contains the following information:

- Patient data, such as name and ID
- Administrative data, such as referring physician and ward
- Examination scan data, such as patient position
- Contrast medium data, such as quantity and injection parameters, if entered
- Range name for each scan
- Dose parameters, such as $CTDI_{vol}$ and DLP

20.9.3 MI dose management

The task flow control's **Dose** task is used to manage dose (administered activity) by selecting and entering information for a scan and reconstruction.

For example:

Isotope **Tc99m**

Pharmaceutical **Sestamibi**

Injection Date **11/23/17** M/d/yyyy

Injection Time **14:25** hh:mm

Dose **300.00** MBq

For more information:

- **Isotope** (➔ Page 527 *Dose isotope*)
- **Pharmaceutical** (➔ Page 527 *Dose pharmaceutical*)
- **Injection Date** (➔ Page 528 *Dose injection date*)
- **Injection Time** (➔ Page 528 *Dose injection time*)
- **Dose** (➔ Page 528 *Dose amount and unit of measure*)
- **Radiopharmaceutical Dose** (➔ Page 529 *Radiopharmaceutical dose*)



When the dose parameters **Injection Date**, **Injection Time**, and **Dose** are modified for the Dose task, the modified values are automatically copied to all other unperformed MI scan tasks in the workflow that contain the same isotope and pharmaceutical.

All entries in the dose precondition step are disabled when the scan starts, and remain disabled after the scan is completed.

If you need to change the dose information during or after the scan completes, you can perform it using the Radiopharmaceutical Dose dialog box.
(➔ Page 529 *Radiopharmaceutical dose*)

For example:

- Isotope **Tc-99m**
- Phramaceutical **Pertechnetate**

- Injection Date **08/09/2019** MM/ddd/yyyy
- Injection Time **01:57 PM**
- Dose **0** mCi

For nuclear medcine (NM) scans, the Dose task displays a message if the dose values are not specified. The scan can proceed with no dose values, but the Dose task message remains displayed until the dose values are entered.

For non-quantitative NM scans, the scan can proceed when no dose information is entered for the Dose task. No message indicating no dose values is displayed, but a yellow bubble with an exclamation mark is displayed. Once the dose information has been entered, the bubble color changes to green with a checkmark is displayed indicating complete.

20.9.4 Dose isotope

For single isotope scans, the isotope displayed in the Dose task for the scan is a read-only parameter. It can be changed in the protocol parameters. For dual isotopes, the protocol has be be created from a dual-isotope factory protocol.

For dual isotope scans, select either isotope from the list. The other Dose parameters will change based on the isotope selected. If an isotope is not change, you can still change the other Dose parameters.

If a workflow contains a mixture of dual and single isotope scans, the dose is copied from between the scans as long as the isotope and pharmaceutical match.

For example, a workflow contains single isotope for scan A and contains a dual isotope scan B. If the dose, injection date, or injection time is entered for scan A, they are only copied to the dose for the matching isotope and pharmaceutical in scan B.

20.9.5 Dose pharmaceutical

When entering the pharmaceutical information, select from the list of pharmaceuticals (isotope dependent), or enter the pharmaceutical name in the pharmaceutical field.

When the dose parameters **Injection Date**, **Injection Time**, and **Dose** are modified for the Dose task, the modified values are automatically copied to all other unperformed MI scan tasks in the workflow that contain the same isotope and pharmaceutical.

20.9.6 Dose injection date

The injection date and time for the isotope selected for the scan will be given the current day's date and time as of when the workflow was loaded.

The injection date and time for each isotope being acquired in the scan can be modified.

When the dose parameters **Injection Date**, **Injection Time**, and **Dose** are modified for the Dose task, the modified values are automatically copied to all other unperformed MI scan tasks in the workflow that contain the same isotope and pharmaceutical.

20.9.7 Dose injection time

The injection date and time for the isotope selected for the scan will be given the current day's date and time as of when the workflow is loaded.

The injection date and time for each isotope being acquired in the scan can be modified.

When the dose parameters **Injection Date**, **Injection Time**, and **Dose** are modified for the Dose task, the modified values are automatically copied to all other unperformed MI scan tasks in the workflow that contain the same isotope and pharmaceutical.

20.9.8 Dose amount and unit of measure

The **Dose** field accepts an entered amount, and the system displays a unit of measure, for example **mCi**. The default value is 0.

When the dose parameters **Injection Date**, **Injection Time**, and **Dose** are modified for the Dose task, the modified values are automatically copied to all other unperformed MI scan tasks in the workflow that contain the same isotope and pharmaceutical.

20.9.9 Radiopharmaceutical dose

Located to the right of the **Isotope** selection on the task flow control's **Dose** task is a syringe icon. When clicked, it displays the **Radiopharmaceutical Dose** dialog box to view and or enter radiopharmaceutical information.

Dose information can be entered and selected for:

- Radiopharmaceutical
- Injection Date and Time
- Pre-injection Assay
- Post-injection Residual Assay
- Injection Assay

The Radiopharmaceutical Dose dialog box will be verified for the following conditions before allowing you to accept the dose values:

- Injection date and time is prior to Pre-injection Assay and Post-injection Residual Assay date and time.
- Pre-injection Assay time is before the Post-injection Residual Assay time.
- Pre-injection Assay dose is greater than the Post-injection Residual Assay dose
- Post-injection Residual Assay time is after the Injection time

For **Radiopharmaceutical**, fields are provided for:

- **Isotope** (read-only, for example, Isotope Tc99m)
- **Pharmaceutical** (for example, Pharmaceutical Sestamimi)
- **Volume** (for example, Volume 50 ml)

For **Injection Date and Time**, fields are provided to view and or enter the injection date and time.

- **Injection Date** (for example, Injection Date 11/23/2017 m/d/yyyy)
- **Injection Time** (for example, 11:23 hh:mm)

  The values and format of the injection date and time fields will always match what is displayed in the Dose task.

For **Pre-injection Assay** and **Post-injection Residual Assay** (similarly labeled fields) are provided to view and or enter information for the pre-injection assay and the post injection residual assay.

- **Dose** (for example, Dose 50 mCi for pre-injection, and Dose 4 mCi for the post-injection)
- **Date** (for example, Date 11/23/2017 m/d/yyyy)
- **Time** (for example, 11:23 hh:mm)
- **Dose Calibrator** (for example, None)

The Pre-injection Assay and Post-injection Residual Assay **Dose Calibrator** dropdown list is shown only if a license is available on the system. The list contains all of the calibrators that have been cross-calibrated for the collimators that are installed on the detectors and for the selected isotope for the scan. **None** is also an entry.

For **Injection Assay**, the fields are provided to view and or enter information for the injection assay.

- **Effective Dose** (for example, Effective Dose 46 mCi)
- **Date** (for example, Date 11/23/2017 m/d/yyyy)
- **Time** (for example, Time 11:23 hh:mm)
- **Edit** check box

For information on the Injection Assay Edit checkbox:
(→ Page 531 *Radiopharmaceutical dose assay dose calculation*)

After a scan has been completed, the syringe icon can be clicked again to display the Radiopharmaceutical Dose dialog box. The radiopharmaceutical dose parameters can be edited again. Note that the dose, date, and time can only be corrected for open reconstructions. A message at the bottom of the dialog box states: **For reconstructions that are decay corrected to injection time, any modifications will be applied to open or new reconstructions only.**

20.9.10 Radiopharmaceutical dose assay dose calculation

When the **Edit** checkbox is checked, the Radiopharmaceutical Dose dialog box Assay Dose field is enabled. The Assay Dose can be entered. The pre-injection and post-injection assay fields are disabled. Any displayed values are removed. The pre-injection and post-injection assays values are retained in case the checkbox is uncheck.

When the Edit checkbox is unchecked, the Assay Dose field is disabled for editing in the Injection Assay, and the assay dose is computed.

20.9.11 MI dose calibrator management tool information

For information on:

- Broad quantification with dose calibrator selection, go to (➔ Page 531 *Broad quantification with dose calibrator selection*).
- Cross calibration validate dose calibrator selection (➔ Page 532 *Cross calibration validate dose calibrator selection*).
- Cross calibration dose calibrator selection (➔ Page 532 *Cross calibration dose calibrator selection*).
- Quantification dose calibrator values (➔ Page 532 *Quantification dose calibrator values*).
- Quantitative dose calibrator license (➔ Page 532 *Quantitative dose calibrator license*).

Broad quantification with dose calibrator selection

When the Broad Quantification protocol is selected, the Dose Calibrator Selection is conditionally displayed if the system contains a registered Dose Calibrator and Cross Calibration license.

Cross calibration validate dose calibrator selection

When the Cross Calibration protocol is selected, the **Start** button is available when at least one Dose Calibrator is selected and completed. Note for the dose's time, the time information must be completely entered.

Cross calibration dose calibrator selection

Any registered dose calibrator 1- 10 is available for selection based upon user licenses.

Quantification dose calibrator values

The Dose Calibrator dropdown list is populated with all of the calibrators that have been cross-calibrated for the collimator that is installed on the detectors, and for the selected isotope for the scan. This list also contains the entry **None**.

Quantitative dose calibrator license

The Dose Calibrator dropdown only displays for pre and post-injection assay when a license is available on the system.

21 Enhanced examination

Besides the routine examination modes, the CT system also supports enhanced examination modes:

- (→ Page 569 *TwinSpiral Dual Energy scan*)

21.1 Contrast examination

CT examinations often involve the intravenous (I.V.) injection of contrast media to increase the visibility of internal organs or cavities. Contrast examinations improve the characterization of tissue and lesions and increase the opacity of vessels. The contrast scan yields good results only if the acquisition occurs during the optimal phase of enhancement in the region of interest (ROI). Therefore, it is essential to determine the exact timing of the contrast injection and the scan.

Perform contrast examinations with a manual injection. Integrated contrast injectors are not supported. You can also configure predefined scan start delays and the following features for contrast examinations:

- (→ Page 542 *Test Bolus*)

21.1.1 *syngo* CARE Bolus

Many examinations are performed with intravenous (I.V.) injection of contrast medium.

For all vascular examinations, precise timing of the contrast medium is essential. This means that the scan must be performed when the organ or vessel of interest has the optimal contrast enhancement.

Bolus Tracking (*syngo* CARE Bolus) monitors the flow of the contrast medium in a vessel, and can start a diagnostic spiral scan as soon as the vessel enhancement has reached a defined HU (Hounsfields units) trigger level.
(→ Page 535 *HU diagram*)

In most cases, the scan protocol of a scheduled patient has predefined Bolus Tracking settings, if Bolus Tracking is required for the diagnosis. If the scan protocol does not have predefined Bolus Tracking settings, you can activate Bolus Tracking manually for any diagnostic spiral or sequence range that has not yet been scanned. (→ Page 534 *Preparing a diagnostic range for Bolus Tracking*)

Bolus Tracking is generally performed with a bolus injector. To use the injector, see the manufacturer's operator manual of the injector.

Bolus Tracking is not supported for respiration correlated scan ranges.

Preparing a diagnostic range for Bolus Tracking

If Bolus Tracking is not defined in the scan protocol for a diagnostic range, you can add the Bolus Tracking feature to a diagnostic range manually.

✓ An unscanned range is available in the timeline.

1 In the timeline, right-click a scan range you want to configure for Bolus Tracking.

2 From the context menu, choose **Open Edit Mode**.

A toolbar is displayed above the timeline.



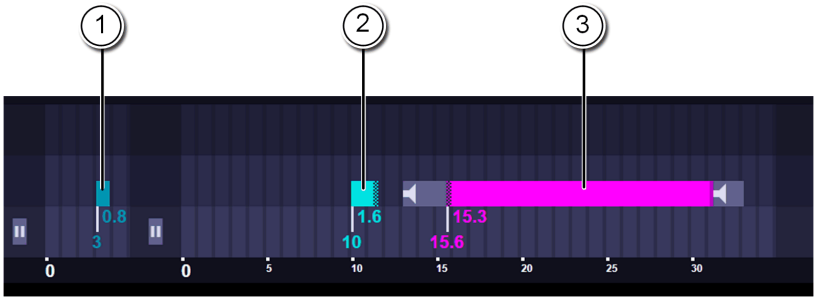
3 Click and drag the **Bolus Tracking** icon to the highlighted area in front of the scan range in the timeline.

The **Premonitoring** scan/recon range and the **Monitoring** scan/recon range are added to the following areas:

- Taskflow control
- Timeline

***syngo* CARE Bolus in timeline**

After you prepared a diagnostic range for **Bolus Tracking**, the **Premonitoring** range and the **Monitoring** range are added in the timeline.



***syngo* CARE Bolus in timeline**

(1) **Premonitoring** range
(2) **Monitoring** range
(3) Diagnostic range

All scan ranges are color-coded and can be identified by their distinct color.

The duration of the **Monitoring** range is not indicated yet. When the **Monitoring** range is started, the range 'grows' along the timeline.

As the end of the **Monitoring** range is determined by the time the contrast medium reaches a defined enhancement threshold, the **Absolute Start Delay** of the diagnostic range cannot be planned. **Absolute Start Delay** is measured from the **Monitoring** range begin at the time 0 to the X-ray start of the diagnostic range. Instead, **Post Bolus Delay**, a Bolus-specific **Timing** parameter, represents a relative start delay of the diagnostic range. You can set the **Post Bolus Delay** parameter to determine a relative delay time from the end of the **Monitoring** range to the X-ray start of the diagnostic range. If set, any automatic patient instructions will be adapted accordingly.

HU diagram

The enhancement threshold is measured in Hounsfield units (HU) and is indicated by the **Trigger Level [HU]** line in the HU diagram. When the **Trigger Level [HU]** is reached the diagnostic range is started. The trigger level is defined by the **Trigger Level@120kV [HU]** parameter. (➔ Page 539 *Defining the HU Trigger Level*)



HU diagram with Trigger Level [HU] line at 100 HU

(1) **Trigger Level [HU]** line
The default trigger level is 100 HU.
(2) **HU** axis
The **HU** axis is the vertical axis of the HU diagram.
(3) Time axis
The time axis is the horizontal axis of the HU diagram. It corresponds to the time axis in the timeline.

Planning Bolus Tracking

The ranges of a CT examination with Bolus Tracking are acquired in the following order:

- **Premonitoring** range
- **Monitoring** range (➔ Page 538 *Preparing the Monitoring range*)
- Diagnostic range (for example, **Thorax**)

Before starting a CT examination with Bolus Tracking, press the **Start** key on the injector *and* initiate the scan at the control box.

The scan parameters of the diagnostic range are used to determine the parameter settings of the **Premonitoring** and **Monitoring** ranges. If the following parameters of the **Monitoring** range and diagnostic range differ, the system increases the delay time between the **Monitoring** range and the diagnostic range:

- **Rot. Time**: rotation time
- Position of the recon ranges

For the system to detect the aorta or the pulmonary trunk on the premonitoring image, you can enable the automatic ROI detection option. (➔ Page 537 *Enabling automatic ROI detection*)

Enabling automatic ROI detection

Automatic ROI detection requires a license.

If enabled, the system automatically defines the region of interest (ROI) on the acquired premonitoring image for contrast enhancement evaluation in the aorta or pulmonary trunk. The system detects the ascending or descending aorta. If both parts of the aorta are visible in the **Premonitoring** range, the ROI is placed inside the descending aorta. Even if the ROI is set automatically, you can still adapt it manually before you start the **Monitoring** range.

If automatic ROI detection is not enabled, you must set the ROI manually before you start the **Monitoring** range. (→ Page 539 *Defining the ROI manually*)

1 In the timeline, double-click the **Monitoring** range.

   The scan parameter panel opens.

2 Navigate to the **Timing** category.

3 In the **FAST ROI** parameter column, select **Aorta** or **Pulmonary Trunk** from the list.

The automatic ROI detection option is enabled.

Performing the Premonitoring range

Before the diagnostic range is performed, the system performs a **Premonitoring** range to define the position of the **Monitoring** range and the position of the ROI. In the **Premonitoring** range, an axial image at a reference slice is acquired without using any contrast medium. A **Premonitoring** range is always acquired using sequence mode without contrast medium.

When Bolus Tracking is activated for a scan range, the optimal start delay for the diagnostic range defines the scan start position of the **Premonitoring** and **Monitoring** ranges.

If necessary, you can modify the parameters of the **Premonitoring** range in the parameter panel before you activate the **Premonitoring** range.

1 Select **Premonitoring** range in the timeline.

2 Click and drag the rectangle of the **Premonitoring** range in the topogram to define the position and the Field Of View (FOV) depending on the organ to be examined.



3 Click **GO**.

The **Premonitoring** range is activated.



4 On the control box, press the **Move** key.

The patient table is moved to the range start position.



5 Start the scan.

The **Premonitoring** range is started.

Preparing the Monitoring range

Before you start the **Monitoring** range:

1 Place the region of interest (ROI) in the **Premonitoring** image. (➔ Page 539 *Defining the ROI manually*)

If the **FAST ROI** option is enabled, the ROI is defined automatically. (➔ Page 537 *Enabling automatic ROI detection*)

2 Define the **Trigger Level [HU]**. (➔ Page 539 *Defining the HU Trigger Level*)

The **Auto Trigger** option is enabled by default. The diagnostic range is started automatically after the **Trigger Level [HU]** has been reached.

Even if the **Auto Trigger** option is enabled, you can abort the **Monitoring** range and start the diagnostic range manually by pressing the **Start** key or by stepping on the X-ray foot switch. This may be necessary if the measured vessel has moved outside the trigger ROI or if the enhancement threshold is too high.

Defining the ROI manually

After the **Premonitoring** range is acquired, place a region of interest (ROI) inside the cross-sectional view of a vessel on the premonitoring image.

✓ The premonitoring image is available.

1 Click inside a vessel.

The ROI is placed. The color of the ROI corresponds to the magenta-colored diagnostic range.

If automatic ROI detection is enabled, the ROI is placed automatically. (➔ Page 537 *Enabling automatic ROI detection*)

2 Optional: Move the mouse pointer to the edge of the ROI and click to enlarge or reduce the ROI.

Defining the HU Trigger Level

As soon as the **Trigger Level [HU]** has been reached during the **Monitoring** range, the diagnostic range is triggered. The default **Trigger Level [HU]** is 100 HU. You can define a different **Trigger Level [HU]** before starting the **Monitoring** range.

✓ The **Premonitoring** image is available.

1 In the timeline, double-click the **Monitoring** range.

The scan parameter panel opens.

2 Navigate to the **Timing** category.

3 In the **Trigger Level@120kV [HU]** parameter column, select a different value from the list.

– or –

In the HU diagram, drag the **Trigger Level [HU]** line to a threshold along the **HU** axis. (➔ Page 535 *HU diagram*)

The trigger level is updated accordingly.

Performing the Monitoring range with automatic scan start

As soon as the defined **Trigger Level [HU]** within the ROI is reached, the diagnostic range is started automatically.

Even if the **Auto Trigger** option is enabled, you can abort the **Monitoring** range and start the diagnostic range manually by pressing the **Start** key. This may be necessary if the measured vessel has moved outside the trigger ROI or if the enhancement threshold is too high.

CAUTION

Misunderstanding of reference point for start delay in bolus examination!

Faulty synchronization between bolus and scanning.

- Make sure that the chosen delay time fits to the characteristics of the bolus injection.

CAUTION

Wrong start delay!

X-ray not, or only partially, usable.

- For acquisition with contrast medium, select the flooding time of the contrast medium as the delay.

✓ The ROI is defined.

✓ The **Auto Trigger** option is enabled.



1 Click **GO**.

The **Monitoring** range and the diagnostic range are activated.



2 Start the scan at one of the CT control box and trigger the injector.

The **Monitoring** range and the injection are started.

The contrast enhancement in the vessel is indicated by an increase in HU at the ROI, which is displayed on the acquired real time images and in the HU diagram.

The diagnostic range is automatically started when the HU value rises above the defined **Trigger Level [HU]**.



HU diagram with reached Trigger Level [HU] at 100 HU

(1) **Trigger Level [HU]** line
(2) Enhancement curve of **Monitoring** range
The enhancement curve indicates the contrast enhancement in HU.
(3) Diagnostic range start

To allow more time for the delivery of the contrast medium, the **Monitoring** delay time is set to 10 seconds by default.

3 Optional: start the diagnostic range as soon as the HU value reaches the required level.



At the control box, press the **Start** key.

The **Monitoring** range is stopped and the diagnostic range is started.

Documentation of the Bolus Tracking data

When Bolus Tracking is completed, the data is saved to the local database and can be displayed in the **Patient Browser**:

- **Premonitoring** range (since the raw data is not stored, images cannot be reconstructed)
- **Monitoring** range (since the raw data is not stored, images cannot be reconstructed)
- Diagnostic images of the diagnostic range
- Raw data of the diagnostic range (further retrospective recon jobs can be performed, for example, with complete FoV)

21.1.2 Test Bolus

Test Bolus is another method of contrast examination, an alternative to the Bolus Tracking method. The differences to Bolus Tracking are that contrast media is injected twice, the ROI evaluation and therefore the delay calculation of the diagnostic range is performed after the **Test Bolus** range has been scanned.

A **Test Bolus** range is used to define the start delay of the diagnostic range. On the acquired **Test Bolus** image, you place a region of interest (ROI) which defines the delay. You can change the start delay in the enhancement curve.

If Test Bolus is not defined in the scan protocol, you can configure Test Bolus manually. (➔ Page 542 *Preparing a diagnostic range for Test Bolus*)

Preparing a diagnostic range for Test Bolus

If Test Bolus is not defined in the scan protocol for a diagnostic range, you can add the Test Bolus feature to a diagnostic range manually.

✓ An unscanned range is available in the timeline.

1 In the timeline, right-click a scan range you want to configure for **Test Bolus**.

2 From the context menu, choose **Open Edit Mode**.

A toolbar is displayed above the timeline.



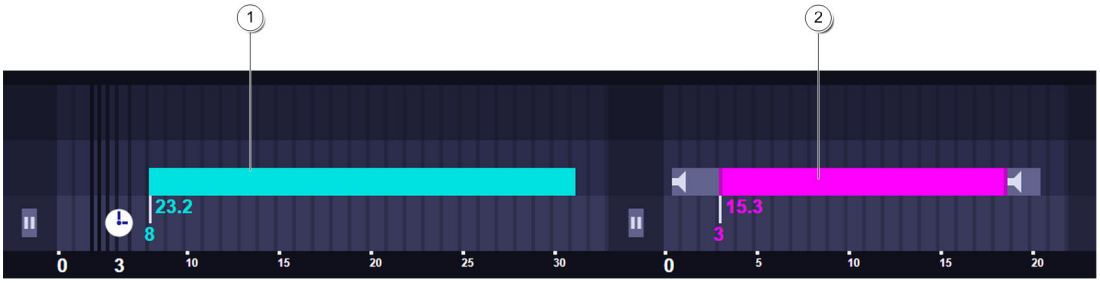
3 Click and drag the **Test Bolus** icon to the highlighted area in front of the scan range in the timeline.

The **Test Bolus** scan/recon range is displayed in the following areas:

- Taskflow control
- Timeline (➔ Page 542 *Test Bolus in timeline*)

Test Bolus in timeline

After you prepared a diagnostic range for a Test Bolus examination, the **Test Bolus** range is added in the timeline.



Test Bolus in timeline

(1) **Test Bolus** range
(2) Diagnostic range

All scan ranges are color-coded. You can identify them by their distinct color.

The diagnostic range start delay is calculated by pressing the **Start** key until the X-ray start of the diagnostic range.

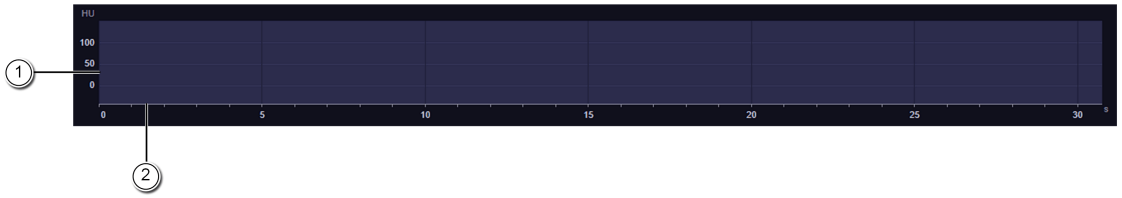
Setting the region of interest (ROI) in the **Test Bolus** image defines the highest enhancement of contrast medium, and, therefore, the start delay of the diagnostic range.

The smaller Bolus injection in the **Test Bolus** range arrives earlier than the bigger Bolus injection in the diagnostic range. To handle the deviation in time, you can set the parameter **Post Bolus Delay** for a **Test Bolus** range before performing the **Test Bolus** range.

The **Post Bolus Delay** time includes the diagnostic range start delay and is measured from the time the highest enhancement of contrast medium is reached to the X-ray start of the diagnostic range.

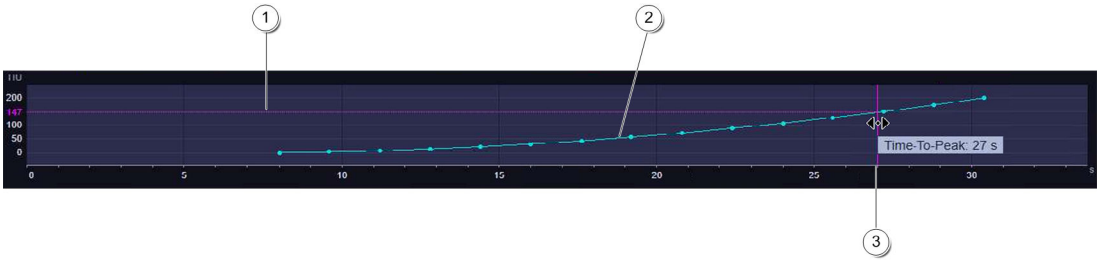
HU diagram

The enhancement curve of the **Test Bolus** range is displayed in the HU (Hounsfield units) diagram after you defined the ROI. After defining the ROI, you can adapt the **Absolute Start Delay [s]** of the diagnostic range to an optimal value for diagnosis. The HU value required for the start delay of the diagnostic range will automatically be adapted.



HU diagram before ROI placement

(1) **HU** axis
The **HU** axis is the vertical axis of the HU diagram.
(2) Time axis
The time axis is the horizontal axis of the HU diagram. It corresponds to the time axis in the timeline.



HU diagram after ROI placement

(1) **HU** value line
(2) Enhancement curve of **Test Bolus** range
(3) **Time-To-Peak** line
Indicates the start delay of the diagnostic range. The start delay of the diagnostic range is also displayed in the timeline.

Performing the Test Bolus range

Performing a **Test Bolus** examination requires two injections: one small injection to acquire the **Test Bolus** image, and the actual injection at the delay start of the diagnostic range.

CAUTION

Misunderstanding of reference point for start delay in bolus examination!

Faulty synchronization between bolus and scanning.

- Make sure that the chosen delay time fits to the characteristics of the bolus injection.

✓ A scan protocol with predefined **Test Bolus** range parameters is loaded.

1 On the topogram, click and drag the rectangle to define the position and the FOV depending on the vessel of interest.



2 Click **GO**.

The **Test Bolus** range is loaded.



3 On the control box, press the **Move** key.

The patient table is moved to the range start position.



4 Start the scan at the control box and trigger the injector.

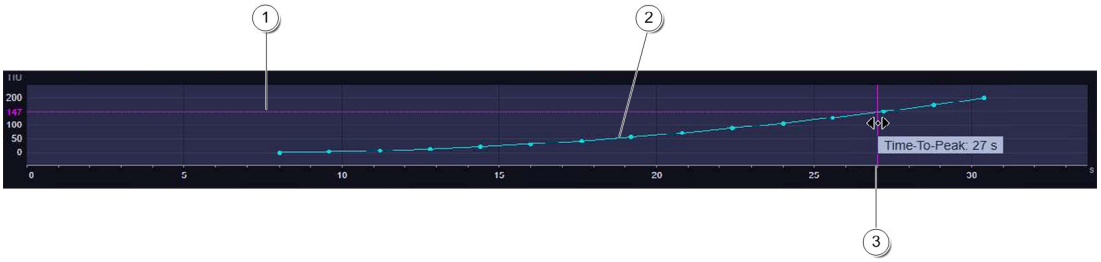
The **Test Bolus** range and the first injection are started simultaneously. The **Test Bolus** images are acquired in the tomogram segment. The number of images depend on the number of scans defined by the **No. of Scans** parameter.

To allow more time for the delivery of the contrast medium, a **Test Bolus** delay time of 8 seconds is set by default.

5 In the tomogram segment, scroll through the image stack to select an image.

6 On the selected **Test Bolus** image, click a vessel to place the region of interest (ROI).

In the HU diagram, the enhancement curve is displayed. The ROI (peak enhancement) defines the start delay of the diagnostic range (**Time-To-Peak**).



HU diagram with enhancement curve of Test Bolus range

(1) **HU** value line
(2) Enhancement curve of **Test Bolus** range
(3) **Time-To-Peak** line
Indicates the start delay of the diagnostic range. The start delay of the diagnostic range is also displayed in the timeline.

7 To change the start delay of the diagnostic range, drag the **Time-To-Peak** line in the HU diagram to a certain HU value along the time axis.

– or –

Change the **Absolute Start Delay [s]** parameter for the diagnostic range.



8 In the execution control, click **GO**.

The diagnostic range is loaded for scanning.



9 On the control box, press the **Move** key.

The patient table is moved to the range start position.



10 Start the scan on the control box and trigger the injector.

The start delay of the diagnostic range and the second injection are started. Radiation of the diagnostic range starts automatically after the delay. The real-time images are acquired in the tomogram segment.

21.2 Perfusion CT

In perfusion scanning, the CT scanner measures the perfusion to an organ or tissue, which enables you to ascertain data on the blood flow to vital organs, such as the heart and the brain.

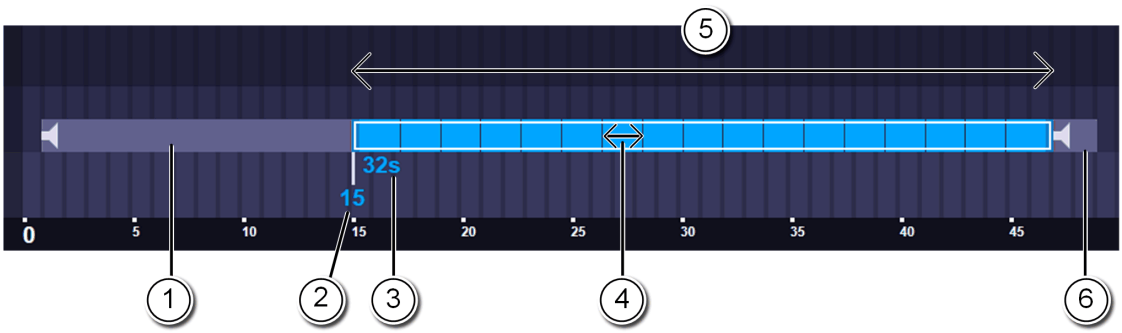
The area of interest is scanned a defined number of times over a defined period of time. The injection of contrast medium prior to the scan results in images that provide detailed information on the dynamics of the contrast medium traveling through the affected organs or tissue.

In certain perfusion-related postprocessing applications, such as *syngo*.CT Neuro Perfusion, the acquired CT images are processed to obtain information on various functional parameters, such as cerebral blood flow (CBF), cerebral blood volume (CBV), or mean transit time (MTT).

21.2.1 Dynamic Sequence CT

In a Dynamic Sequence range, all cycles are scanned at the same table position without table feed. Each image is acquired at the same table position.

A Dynamic Sequence range is indicated by the keyword **DynamicSequence** in the **Scan Mode** parameter entry.



Dynamic Sequence range in timeline

(1) Text A of the audio patient instruction
Tells the patient to prepare to hold their breath. You can apply a **Perfusion** patient instruction to the Perfusion range. (➔ Page 421 *Patient instructions*)

(2) **Absolute Start Delay**
Indicates the scan delay time in seconds. (➔ Page 409 *Scan delay time*)

(3) **Exam Time**
Indicates the time of the Perfusion range. The **Exam Time** is the sum of all cycles. All cycles have the same **Cycle Time**. You can define the **Exam Time** in the **Timing** category in the scan parameter panel or on the **Protocol Parameters** tab. Increasing the **Exam Time** increases the number of cycles. Reducing the **Exam Time** reduces the number of cycles.

(4) **Cycle Time**
Indicates the time of one cycle including the **Scan Time** (the time from X-ray on to X-ray off) and a pause before the next cycle. All cycles have the same **Cycle Time**. The **Scan Time** defines the image acquisition time. During the rest of the **Cycle Time**, no images are acquired.
Changing the **Cycle Time** changes the number of cycles as the CT system keeps the **Exam Time** value as constant as possible. For example, reducing the **Cycle Time** increases the number of cycles, however, the **Exam Time** stays close to the defined value.
You can change the **Cycle Time** parameter in the **Timing** category in the scan parameter panel or on the **Protocol Parameters** tab.
The sum of the **Scan Time [s]** of the complete Perfusion range is indicated by the **Exposure Time** entry in the taskflow control.
The **Exposure Pattern** allows you to include cycles in the Perfusion range. You can also exclude cycles from the Perfusion range, which means that the cycle is still performed during the scan, however, X-ray is turned off and no images are acquired in that cycle. (➔ Page 549 *Exposure Pattern*)

(5) Perfusion range
Graphically displays the number of cycles.

(6) Text B of the audio patient instruction
Tells the patient to start breathing again at the end of the scan.

Acquiring a Dynamic Sequence range

1 Register the patient for the examination. (➔ Page 267 *Registering a patient locally*)

2 Select the required **Perfusion** protocol for a Dynamic Sequence range. A Dynamic Sequence scan mode includes **DynamicSequence** as a keyword in the **Scan Mode** parameter entry. (➔ Page 369 *Selecting the protocol by keyword*)

3 Make sure that the injector is properly connected to the system.

4 Position the patient on the table.

5 Acquire the topogram.

The scan range is displayed on the topogram image.

6 Open the scan parameter panel to specify the **Exam Time**.

The number of cycles is automatically adapted.

7 In the scan parameter panel, check the **Cycle Time** and adapt it if necessary.

If the **Cycle Time** is adapted, the number of cycles is automatically adapted.

8 Optional: specify the **Scan Time** of a cycle.

9 If required, exclude individual cycles from the scan range.
(➔ Page 551 *Excluding or including cycles*)

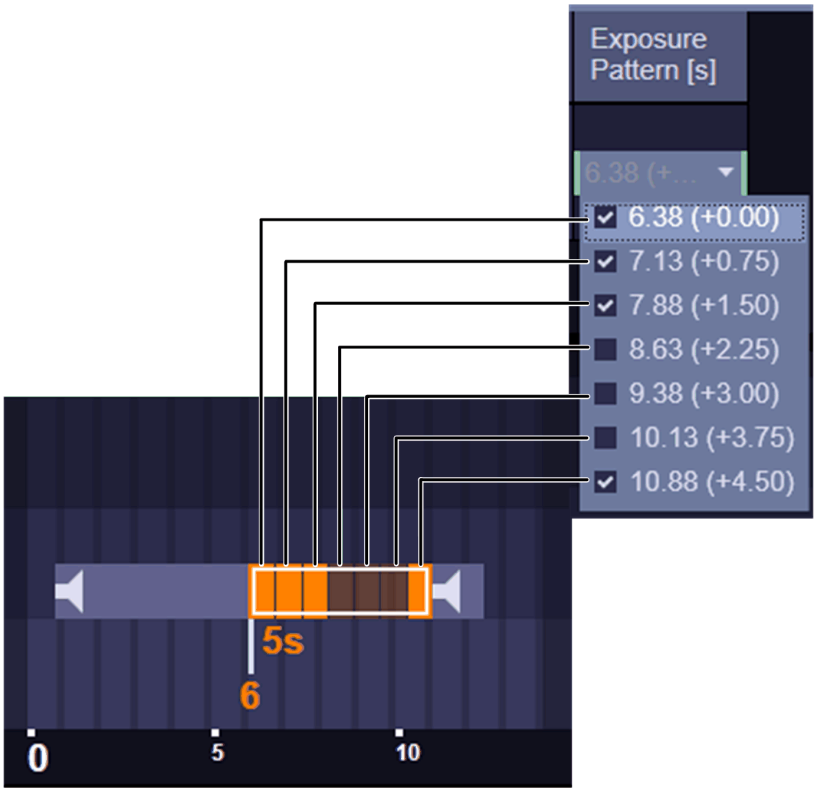
10 In the execution control, a message is displayed informing you that multiple scans are at the same table position. To confirm that you have read and understood the message, click **Confirm**.

11 Acquire the scan range. (➔ Page 455 *Tomogram scan acquisition*)

From the acquired cycles, you can select specific cycles for reconstruction.
(➔ Page 552 *Selecting cycles for reconstruction*)

21.2.2 Exposure Pattern

The **Exposure Pattern** parameter provides a list of cycles that are available for a Perfusion range. During each cycle of a Perfusion range, a stack of images is created. The number of cycles that are included in a Perfusion range depends on the **Exam Time**. Each cycle has the same **Cycle Time**.



Perfusion range in timeline

For each cycle, the absolute time and the relative **Cycle Time** are displayed in the **Exposure Pattern** list. The relative **Cycle Time** is given in parenthesis.

The absolute time of a cycle indicates the time from 0 until the middle of the cycle, in accordance with the timeline.

The relative cycle time of a cycle indicates the start time of that cycle in relation to the start time of the first cycle. The relative cycle time of the first cycle is always zero. The **Cycle Time** of the previous cycle is added to the relative cycle time of the next cycle. For example, if the **Cycle Time** is 0.75 seconds, the relative cycle time of the second cycle is 0.75 seconds, the relative cycle time of the third cycle is 1.5 seconds, and so forth.

You can exclude a cycle from the Perfusion range. An excluded cycle is grayed out in the Perfusion range in the timeline. Excluding a cycle means that the cycle is still performed during the scan but the X-ray is turned off and no images are acquired in that cycle. (➔ Page 551 *Excluding or including cycles*)

For some **DynamicSpiral** scan modes, image reconstruction constraints require that the X-ray is kept on for a fraction of the excluded cycles near the reversal points.

Excluding or including cycles

The **Exposure Pattern** allows you to define at which time points radiation will occur.

For some **DynamicSpiral** scan modes, image reconstruction constraints require that the X-ray is kept on for a fraction of the excluded cycles near the reversal points.

✓ A scan protocol including a Perfusion range is applied.

1 In the timeline, double-click the Perfusion range.

– or –

Right-click the Perfusion range and choose **Show Parameters** from the context menu.

The scan parameter panel is displayed.

2 Select the **Timing** category.

3 Click into the **Exposure Pattern [s]** parameter field.

A list with the selectable cycles is displayed.

4 Clear the check box of a cycle to exclude this time point from the scan.

In the timeline, the cycle is grayed out, indicating that the cycle will be skipped during the scan. Excluded cycles cannot be reconstructed. (➔ Page 552 *Selecting cycles for reconstruction*)

5 Select the check box of a cycle to include this time point in the scan.

21.2.3 Selecting cycles for reconstruction

The **Reconstruction Pattern** allows you to select specific cycles for reconstruction. Only the cycles that were enabled for radiation in the **Exposure Pattern** prior to the scan are available for reconstruction.
(→ Page 551 *Excluding or including cycles*)

1 Open the parameter panel for the recon job that you want to reconstruct.

2 From the **Reconstruction Pattern(s)** list, select the scanned cycles that you want to reconstruct.

3 Repeat the steps for other recon jobs, if necessary.

4 To create one image series of all cycles, turn off **Series Splitting** in the **Auto Tasking** parameter category.

– or –

To create an individual image series for each cycle, turn on **Series Splitting** in the **Auto Tasking** parameter category.

5 To reconstruct the selected recon job, click the **Recon** button in the recon control area.

– or –

To reconstruct all recon jobs, click the **Recon All** button in the execution control.

21.3 Cardiac CT

Cardiac CT helps you to plan and acquire images of the heart in **Coronary Calcium Scoring** (CaScoring) and **Coronary CTA** (Angiography) examinations.

The appropriate license is required to perform Cardiac CT examinations.

Symbia Prospecta X3 supports Cardiac CT features related to CaScoring only.

An ECG is used as a trigger for capturing images in the same heart phase. The ECG reduces or even suppresses motion artifacts. The image data is synchronized to the heart cycle.

CAUTION

ECG triggering devices are not intended for monitoring patient vital signs and may count pacemaker impulses during cardiac arrest or arrhythmias!

This masking effect may cause a delay in providing emergency care for patients in cardiac arrest.

- Do not use ECG triggering devices to monitor patient vital signs.
- Monitor pacemaker patients closely.

To achieve the synchronization, several methods are available:

- For ECG mode, spirals are employed. ECG and CT raw data is recorded simultaneously. Retrospective gating then selects only a portion of the spiral data to reconstruct images of the selected heart phase. (➔ Page 556 *Cardiac spiral CT*) (➔ Page 563 *BiSegment spiral*)
- For prospective triggering mode, sequences are employed. The ECG signal is used to trigger a CT scan at the appropriate heart phase. It is triggered with a certain delay after the R-wave. (➔ Page 564 *Cardiac sequence CT*)

For monitoring and controlling purposes, the ECG trace is available as soon as an ECG is connected. (➔ Page 554 *ECG trace*)

syngo offers many possibilities to optimize the dose applied to a patient.

For CaScoring examinations and Coronary CTA examinations, the following steps are required:

- (➔ Page 673 *Finalizing the examination*)

21.3.1 Cardiac CT examinations

Observe the following safety information when performing a Cardiac CT examination.

The physiological measurement module (PMM) does not issue warning messages or information messages.

CAUTION

Wrong setting in display!

Ionizing radiation

- Set the ECG pulsing window to clinically relevant value.

CAUTION

Missing ECG-Sync due to the disconnection of the patient's ECG electrodes or ECG cable!

X-ray not, or only partially, usable.

- Check the ECG electrodes and ECG cable connection before scanning.
- A contrast enhanced scan should not be aborted but operated with synthetic ECG-data.

21.3.2 ECG trace

An online ECG trace provides information about the heart rate and variance. An online ECG trace is a live display of the patient's heart rate as it is measured by the physiological measurement module.

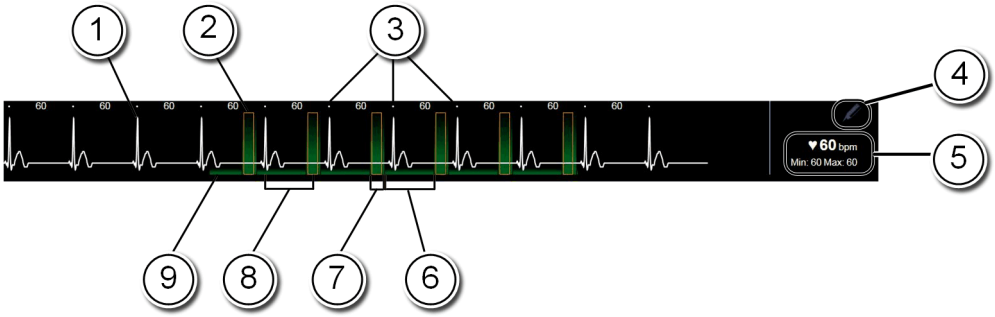
If the ECG electrodes are attached to the patient, the ECG trace is displayed in the following areas:

- Preparation of a Cardiac CT for preview purposes:

  On the **Protocol Selection** tab, under **Physiological Signal**.

- Performance of a Cardiac CT:

  On the examination page, in the ECG trace area above the timeline.



(1) R-peaks (syncs try to match R-peaks)
(2) Scan/recon window (the width corresponds to the temporal resolution of the images)
(3) Syncs (set by R-peak detection algorithm, retrospectively editable)
Dots above the trace indicate detected R-peaks. The corresponding heart rate in bpm is displayed in between the R-peaks.
(4) Displays the offline trace to edit syncs.
(5) Heart rate (in beats per minute)
Minimum, maximum, and average heart rates based on the last 10 cycles.
(6) Low dose level
(7) Pulsing window (defines the area where the entered dose is applied)
Color in recon boxes indicates the dose corresponding to the dose profile.
(8) Phase start: Delay for starting the scan window (sequence, prospective triggering), delay for positioning the recon window (spiral, retrospective gating)
(9) Green line: Indicates that radiation is on during and after scanning.

After the green line reaches the right-hand boundary, the display is dimmed and restarted from the left. New samples overwrite old samples and are separated by a needle.

ECG amplitudes are scaled for optimal resolution.

If an error occurs during scanning, an error message and a **Retry** button is displayed inside the ECG trace. To resolve the error and resume the scan, click the **Retry** button.

21.3.3 ECG Demo mode

For training and presentation purposes, the ECG Demo mode provides a simulated ECG signal that allows you to perform a complete simulated cardiac examination using the physiological measurement module.

To switch the ECG Demo mode on or off:

1 In the **Protocol** task, click the **Protocol Selection** tab. (➔ Page 361 *Protocol Selection tab*)

2 In the upper right corner of the **Physiological Signal** area, click the **ECG Demo** icon.

As soon as a cardiac range, combined with the ECG Demo mode, has been scanned, an offline ECG trace is displayed. (➔ Page 566 *Reconstruction of cardiac measurements*)

As soon as a real patient ECG signal is detected, the CT system disables the ECG Demo mode and displays the online ECG trace. (➔ Page 554 *ECG trace*)

21.3.4 Cardiac spiral CT

In Cardiac spiral CT, data acquisition proceeds continuously while the patient table is moving forward with a constant pitch. The ECG and the CT raw data are recorded simultaneously throughout the entire heart cycle.

A physiological measurement module must be available to measure the ECG and to detect R-peaks.

Due to the continuous data acquisition, the spiral mode allows maximum flexibility for data reconstruction. If necessary, you can also edit the ECG in this mode for challenging patients.

Compared with non-gated spirals, the pitch depends on the heart rate of the patient, therefore, very low pitch values of approximately 0.4 (= lowest possible pitch value) are required. This may be at the expense of a higher radiation dose.

To alleviate this effect, the tube current is modulated with ECG Pulsing, depending on the current heart phase.

The Cardiac Gating option supports ECG-gated scans with retrospective reconstruction. Retrospective reconstruction uses a portion of the spiral data to reconstruct images of the selected heart phase.

If a cardiac spiral scan protocol is loaded, the following features can be enabled and performed during the scan:

- The **ECG Synthetic Sync Spiral** feature makes scan continuation possible in case of a missing ECG signal.
- **ECG Pulsing** lowers the dose during heart phases that are of less interest. (➔ Page 560 *ECG Pulsing*)
- Automatic pitch adaptation calculates the optimal table speed based on the patient's heart rate. (➔ Page 561 *Pitch adaption*)

Image reconstruction is performed afterwards based on time stamps that are calculated from the ECG signal.

In the parameter panel or on the **Protocol Parameters** tab, you can define the area of the heart phase range that is intended for high dose reconstructions in % or ms values with a start and end phase value. (➔ Page 558 *Setting scan parameters*)

Preparing the acquisition

In addition to the usual preparations in the examination room and in the control room, some actions specific to Cardiac CT are required.

1. Position the patient on the table.
2. Immobilize the patient using the positioning aids, if necessary.
3. Apply the electrodes for the electrocardiogram (ECG) and connect the ECG cable to the socket at the table. (➔ Page 558 *Placing ECG electrodes*)

The ECG cables shall be applied outside the heart region to avoid artifacts.

---

4. Register the patient for examination.
5. Select the required **Cardiac** scan protocol on the **Protocol Selection** tab.

On the **Protocol Selection** tab, an online ECG trace is displayed under **Physiological Signal**.

6 Scan a topogram and define the ranges for the spiral or sequence scan.

7 To acquire Coronary CTA ranges, prepare the range for Bolus Tracking. (➔ Page 534 *Preparing a diagnostic range for Bolus Tracking*).

8 Adapt scan-related parameters. (➔ Page 564 *Setting trigger parameters*) (➔ Page 560 *Activating synthetic syncs*)

Using *syngo* CARE Bolus, you can synchronize the cardiac scan with administration of the contrast medium. Add the CARE Bolus examination to the diagnostic range after you have set the scan and trigger parameters of the spiral range. The cardiac scan is started like any CARE Bolus examination as soon as the defined Bolus threshold is reached. In addition to the ECG signal, the HU diagram is also displayed. For scans with contrast medium, always activate synthetic syncs. This prevents a scan stopping if problems arise with the ECG signal. (➔ Page 560 *Activating synthetic syncs*)

Placing ECG electrodes

The proper placement of ECG electrodes is essential for a strong and stable signal. The loss of the ECG signal during the acquisition may result in images without diagnostic value.

1 Position and immobilize the patient on the patient table.

2 Ensure that the patient is warm and relaxed.

3 Shave the relevant area of the patient's skin to enable proper placement of the ECG electrodes.

4 Thoroughly clean the shaved skin area with alcohol for an oil-free surface.

5 Wait until the skin is dry and apply the electrolyte gel.

6 Place the ECG electrodes on the skin.

Setting scan parameters

Before acquiring a cardiac spiral range, you can define the area of the heart phase range that is intended for high dose reconstructions in % or ms values with a start and end phase value.

In the **Physio Scan** category in the **Exam Designer**, you can check the cardiac spiral scan parameters and adapt them, if necessary.

You cannot change the **Pitch**, **Exam Time**, or **Rot. Time** (rotation time) parameters of a cardiac spiral range.

Pitch adaption is controlled by the **Est. Heart Rate** parameter.
(➔ Page 561 *Pitch adaption*)

In the **Physio Recon** category, you can check the cardiac spiral recon parameters.

ECG Synthetic Sync Spiral

ECG Synthetic Sync Spiral ensures scan continuation in case of a missing ECG signal.

ECG Synthetic Sync Spiral is enabled by default. (➔ Page 747 *Deactivating ECG Synthetic Sync Spiral*)

CAUTION

Missing ECG-Sync due to the disconnection of the patient's ECG electrodes or ECG cable!

X-ray not, or only partially, usable.

- Check the ECG electrodes and ECG cable connection before scanning.
- A contrast enhanced scan should not be aborted but operated with synthetic ECG-data.

If **ECG Synthetic Sync Spiral** is enabled and the ECG monitor fails to detect R-peaks for more than 3.5 seconds during an examination, for example, because an electrode fell off the patient, the scan will be continued with synthetic syncs. A message inside the ECG trace area indicates that synthetic syncs are used.

If **ECG Synthetic Sync Spiral** is disabled and the system detects a missing ECG signal during an examination, the scan is canceled after 3.5 seconds after the last R-peak has been detected. A dialog box informs you that the scan has been canceled due to missing R-peaks.

The gap between the last detected sync and the first synthetic sync in the recorded ECG trace of a spiral scan is not automatically filled. Synthetic syncs have the same appearance as the detected syncs.

Activating synthetic syncs

The **ECG Synthetic Sync Spiral** feature ensures that the scans are continued in case of ECG signal loss.

ECG Synthetic Sync Spiral is enabled by default.

1 Check if **ECG Synthetic Sync Spiral** is enabled in the Administration Portal.

2 If it is not enabled, select the **ECG Synthetic Sync Spiral** check box, and click the **Save** button to activate the synthetic sync for examinations with contrast medium in particular. (➔ Page 747 *Deactivating ECG Synthetic Sync Spiral*)

You can activate the **ECG Synthetic Sync Spiral** check box in an examination with ECG pulsing. If the system detects a missing ECG signal during measurement, the ECG pulsing will be switched off automatically. At that time, the mAs (tube current) will be reset to 100% of the initially adjusted value.

ECG Pulsing

Scanning with **ECG Pulsing** offers you the option to activate a dose modulation mechanism. With **ECG Pulsing**, you can reduce the dose beyond the high dose plateau. **ECG Pulsing** is a time-based dose modulation according to the patient's current heart phase. An ECG triggers the modulation of the X-ray intensity, where the high dose reconstruction area can be restricted to a particular range of the cardiac cycle.

CAUTION

Wrong setting in display!

Ionizing radiation

◆ Set the ECG pulsing window to clinically relevant value.

Heart examinations are a typical application of **ECG Pulsing** where one of the following points is required:

- Functional analysis
- A functional image impression based on a reduced dose level

ECG Pulsing adjusts the specified timing of pulsing to the characteristics of the cardiac cycle, for example, the significant variations of the heart rate. A stable pulsing time is provided in case of extra systoles, that is, very irregular heart beats.

If required, you can modify the predefined values of the configuration in the **Physio Scan** parameters category, for example, the start and end point of the high dose plateau.

The system measures the patient's ECG continuously. If **ECG Synthetic Sync Spiral** is enabled and the system detects a missing ECG signal during an examination, for example, if an electrode falls off the patient, **ECG Pulsing** will be switched off automatically and the scan will be continued with synthetic syncs.

Pitch adaption

It is possible to adapt the pitch automatically or manually according to the heart rate of the patient. The heart rate is monitored during at least 10 heart cycles to achieve a stable heart rate overview.

Pitch adaption is controlled by the **Est. Heart Rate** parameter, which is defined in the Cardiac Spiral CT scan protocol. (➔ Page 558 *Setting scan parameters*)

The pitch is adapted until the **GO** button is clicked. After you clicked **GO** to activate the scan, the current heart rate is compared to the estimated heart rate that is specified in the scan protocol.

If a fixed heart rate that is specified for the **Est. Heart Rate** parameter exceeds the actual heart rate, a warning message is displayed under **Pitch Adaption** in the taskflow control.

Continuing the scan without pitch adaption or adapting the pitch manually may result in reduced image quality.

- By clicking the **Start** key, the scan is continued without pitch adaption.
- By clicking the **OK** button, the CT system adapts the estimated heart rate automatically. The range is canceled.
- By clicking the **Cancel** button, the range is canceled.

Adapting the pitch

◆ Set the **Est. Heart Rate** parameter to **Auto**.

The automatic pitch adaption is activated. The pitch is adapted automatically to the minimum heart rate. Automatic pitch adaption calculates an optimal table speed based on the last 10 heart cycles.

– or –

Set the **Est. Heart Rate** parameter to a fixed value, for example **>60**.

The pitch is adapted to the specified value.

During the breath hold command, the heart rate may drop by approximately 8 beats per minute (bpm). Therefore, artifacts may occur. Observe the heart rate of the patient during the breath hold command.

Acquiring an ECG-gated spiral scan

You can synchronize an ECG-gated spiral with application of the contrast medium.

Perform the spiral acquisition:

✓ A topogram has been acquired.

✓ The scan ranges are defined. (➔ Page 403 *Range planning*)

✓ In the taskflow control, the respective cardiac spiral range task is selected.

✓ ECG signals are clear and stable.

1 If not already present, add a suitable patient instruction, such as **Cardiac**, to the spiral range. (➔ Page 421 *Patient instructions*)



2 Click **GO**.

The spiral range is loaded for scanning.

A pitch warning message may be displayed. (➔ Page 561 *Pitch adaption*)



3 On the control box, press the **Move** key.

The patient table is moved to the range start position.



4 Start the scan.

ECG Pulsing adjusts the specified timing of pulsing to the characteristics of the cardiac cycle. If the **ECG Synthetic Sync Spiral** function is enabled and the system detects a missing ECG signal during the measurement, the scan proceeds with synthetic syncs. (➔ Page 560 *ECG Pulsing*)

When the spiral range is acquired, the acquired images are displayed in real-time in the tomo segment. Axial images are displayed based on timestamps, which were calculated from the ECG signal.

In the ECG trace of the **Scan** task and **Reconstruction** task, you can define the ECG phase for reconstruction.

21.3.5 BiSegment spiral

A BiSegment spiral is recommended for increased heart rates. A high temporal resolution is not guaranteed.

To improve the temporal resolution, you can acquire and reconstruct a retrospective cardiac spiral and perform a BiSegment reconstruction.

You can acquire and reconstruct a BiSegment spiral.

In an existing scan protocol, you can switch the scan mode from **Standard** to **BiSegment**.

For an enabled BiSegment scan mode, you can define and start a standard cardiac quick scan and reconstruction.

21.3.6 Cardiac sequence CT

Prospective ECG triggering combined with step-and-shoot acquisition of axial slices acquires the appropriate amount of scan data needed for image reconstruction during the previously selected heart phase. The ECG signal of the patient is monitored during examination, and axial scans are started with a predefined time offset relative to the R-waves.

If the ECG signal is lost during a scan, for example, if an electrode fell off the patient, the scan will be aborted.

In the ECG-triggered sequence mode, the patient table moves the patient to the first z-position. The scan is triggered depending on the ECG. Then the patient is moved to the next z-position. The procedure is repeated until the range to be scanned is completed. Reconstruction is done prospectively based on timestamps from the recorded ECG.

For low heart rates up to moderate heart rates, the optimum time point for data acquisition is in the end-diastolic phase at a heart phase of approximately 70%.

Setting trigger parameters

In the **Physio Scan** category, you can define the area of the heart phase range that is intended for high dose reconstructions in % or ms values with a start and end phase value.

You can set the following parameters for a cardiac sequence range:

- **Phase Unit**
- **Phase Start**
- **Phase End**

(➔ Page 372 *Viewing and checking the protocol parameters*)

The **Scan Time** parameter and the **Cycle Time** parameter depend on the heart rate and cannot be modified.

The **Scan Time** represents the single length of a scan. The examination time of the sequence depends on the heart rate. The more irregular the heart rate, the longer the sequence scanning will take.

Additional safety information on cardiac sequence ranges

Observe the following safety information before performing a cardiac sequence range.

CAUTION

Wrong ECG signal detection!

Undesired radiation

- Check the correct position of the ECG electrodes before scan start.

Acquiring an ECG-triggered sequence

After you start the scan, it is no longer possible to change the trigger delay time.

If the ECG signal is lost during a scan, for example, if an electrode fell off the patient, the scan will be aborted.

- Perform the sequence and subsequent reconstructions in the usual way. (➔ Page 452 *Acquiring a sequence range*)

Ensure that you give the patient breathing instructions.

21.3.7 kV and filter independent CaScoring

The Agatston Score Quantification of coronary artery calcium (CAC) is an established method of stratifying risk in coronary artery disease.

The CT system provides an Agatston-equivalent calcium scoring (CaScoring) method for coronary risk assessment. With the "kV and filter independent Calcium Scoring" feature, a dedicated reconstruction kernel is available that allows you to use all tube voltage levels, independent of the kV setting for the scan: **Artificial120**.

Lowering the tube voltage for the scan below 120–130 kV increases the score due to an increase in contrast. With the introduction of the tin filter (Sn filter) technology, an Sn filter scan for a non-contrast examination of the heart can be performed.

21.3.8 Reconstruction of cardiac measurements

As soon as a cardiac scan range is completed, or a scanned cardiac range has been selected, an offline trace displays the recorded ECG samples. The offline trace serves as a basis for reconstruction planning and timestamp calculation. One single phase can be reconstructed within one recon job.

The selected reconstruction phases are displayed as recon boxes in the offline ECG trace. The color of the recon boxes corresponds to the color of the corresponding scan range. The center of each recon box is set in accordance with the recon phase, and the width is set in accordance with the temporal resolution.

The temporal resolution controls the reconstruction angle and corresponds to the number of projections considered for the reconstruction of a cardiac image. A higher resolution (the value itself becomes lower) leads to reduced motion artifacts but may result in decreased image quality.

Setting recon parameters

In the **Physio Recon** category, you can check the cardiac recon parameters.

For manual phase definition, you can view and edit the **Recon Phase(s)** parameter and the **Recon Phase Unit** parameter.

For Cardiac BiSegment spiral ranges, the **Temporal Resolution** parameter allows you to switch between BiSegment reconstruction with improved temporal resolution and standard reconstruction.



The temporal resolution is fixed for Cardiac spiral ranges. Therefore, you cannot edit the **Temporal Resolution** parameter.

Reconstructing after editing syncs

For additional reconstruction of Cardiac CT spiral scans, you can move, delete, insert, and disable syncs on the offline ECG trace. The syncs are indicated by dots that are located above the R-peaks. A sync dot is a visual representation of a detected R-peak.



1 Before you can edit the trace, click a button to enable it.

Button	Action
Move	If enabled, click and drag a sync dot to move it to a new position. Example: You can reposition a sync in case the system has misinterpreted a high P-wave as an R-peak.
Delete	If enabled, click a sync dot to delete it.
Insert	If enabled, click into the upper ECG trace area to insert a new sync dot. The corresponding scan window will be considered for image reconstruction.
Disable	If enabled, click into a heart cycle to disable it. The corresponding scan window will not be considered for image reconstruction. Example: You can disable a sync to skip extra systoles.
Reset	Reverts your settings in the modified ECG signal and displays the original ECG signal.

2 To exit the ECG offline trace, click the cross in the upper right corner.

For reconstruction, the currently displayed ECG is used.

Performing a True Stack reconstruction

With True Stack reconstruction, the individual cardiac cycles are displayed without data overlap. By performing a reconstruction with True Stack, you can create a reconstruction without stack mixing, which generates an image set with sharp boundaries.

To perform a reconstruction without stack overlapping, turn on the **True Stack** parameter.

1 Click the **Protocol Parameters** tab. (➔ Page 372 *Viewing and checking the protocol parameters*)

2 Select the **Physio Recon** parameter category.

3 Set the **True Stack** parameter setting to **On**.

4 Confirm your changes.

Performing a Single Phase reconstruction

With a **Single Phase** reconstruction, you can reconstruct a single phase within one recon job.

1 Open the parameter panel for the recon job that you want to reconstruct as a **Single Phase** reconstruction.

2 From the **Recon Type** parameter list, select **Single Phase**.

3 From the **Recon Phase Unit** parameter list, select the required unit.

4 In the **Recon Phase(s)** parameter field, enter the required phase value.

5 Repeat the steps for other recon jobs, if necessary.

6 To reconstruct the selected recon job, click the **Recon** button in the recon control area.

– or –

To reconstruct all recon jobs, click the **Recon All** button in the execution control.



A **Single Phase** reconstruction can be combined with all **Inline Results** parameters and **Multi Recons**.

Performing a Multi Phase reconstruction

With a **Multi Phase** reconstruction, you can reconstruct multiple different phases within one recon job.

1 Open the parameter panel for the recon job that you want to reconstruct as a **Multi Phase** reconstruction.

2 From the **Recon Type** parameter list, select **Multi Phase**.

3 From the **Recon Phase Unit** parameter list, select the required unit.

4 From the **Recon Phase(s)** parameter list, select the phases that you want to reconstruct.

5 From the **Recon Phase Step** parameter list, select the required increment of recon steps per recon phase.

6 Repeat the steps for other recon jobs, if necessary.

7 To split the result images of a **Multi Phase** reconstruction into individual series, turn the **Series Splitting** parameter in the **Auto Tasking** parameter category **On**.

– or –

To create one series of the reconstructed result images of a **Multi Phase** reconstruction, turn the **Series Splitting** parameter in the **Auto Tasking** parameter category **Off**.

8 To reconstruct the selected recon job, click the **Recon** button in the recon control area.

– or –

To reconstruct all recon jobs, click the **Recon All** button in the execution control.

A **Multi Phase** reconstruction cannot be combined with **Multi Recons** or any **Inline Results** parameter.

21.4 TwinSpiral Dual Energy scan

TwinSpiral Dual Energy scans allow you to acquire low energy images and high energy images for the same scan range. This can be used for material characterization.

A TwinSpiral Dual Energy scan mode is only available in dedicated Dual Energy scan protocols that do not use contrast agent injection.

A TwinSpiral Dual Energy scan consists of two spiral scans in opposite directions and at different tube voltages:

- A first spiral scan at a low voltage
- A second spiral scan in the opposite direction at a high voltage that is performed after a short delay

For TwinSpiral Dual Energy scans, the following kV values are possible:

- 80/Sn140
- 100/Sn140

Tilting the gantry is not possible in TwinSpiral Dual Energy scans.

Several scan modes are available for TwinSpiral Dual Energy scans. These modes include **Twinspiral** as a keyword in the **Scan Mode** parameter entry.

The maximum scan range of a TwinSpiral Dual Energy scan mode is 30 cm or 100 cm, depending on the hardware configuration.

Spectral Recon reconstructions and special **Inline Results** reconstructions are available for TwinSpiral Dual Energy scans. (➔ Page 573 *Dual Energy reconstructions*)

21.4.1 CARE kV and TwinSpiral Dual Energy scans

For CT systems with the corresponding licence, **CARE Dose4D & CARE kV** is set to **Full** in Dual Energy factory protocols using a TwinSpiral scan mode. CARE kV always assumes a non-contrast scan.

CARE Dose4D & CARE kV selects the tube voltage depending on the patient's diameter and the tube load.

kV (L/H), **Quality ref. mAs (L)**, and **Quality ref. mAs (H)** are set to values that achieve an image quality for the mixed image equivalent to that of a 120 kV conventional CT image.

21.4.2 Acquiring a TwinSpiral Dual Energy scan

✓ The patient is registered and correctly positioned on the patient table.

✓ The **Protocol Selection** tab is open.

1 Select and apply a Dual Energy protocol with a TwinSpiral Dual Energy scan mode for the required body region.



2 In the execution control, click **GO** to load the topogram scan. (➔ Page 435 *Activating the topogram scan*)

3 Perform the topogram scan. (➔ Page 435 *Performing the topogram scan*)

If a "TwinSpiral possible" decision tree is linked to a scan range in the protocol, **myExam Compass** checks if a Dual Energy scan appears to be feasible for the patient. (➔ Page 572 *Dual Energy Recommendation attribute*)

If **myExam Compass** does not classify a Dual Energy scan to be feasible, it switches to an appropriate single energy scan mode and single energy recon jobs. **myExam Compass** issues a message. Click the **Accept** button below the message to proceed with a single energy scan.

4 Plan the scan and recon ranges. (➔ Page 403 *Range planning*)



5 In the execution control, click **GO** to load the tomogram scan. (➔ Page 455 *Activating the tomogram scan*)

6 Perform the tomogram scan.

7 Make sure that the patient does not move during or between the two spiral scans as instructed in the **TwinSpiral Dual Energy Inspiration** patient instruction.

If a TwinSpiral Dual Energy scan is aborted, only **Spectral Recon** reconstructions of the type **L3D** will allow for the maximum reconstruction range. Reconstructions of any other type will either be truncated to the range that was scanned with both spectra or turn invalid if there is not enough raw data for the second spectrum. The **Spectral Recon** type **None** will automatically be converted to **L3D**.

21.4.3 Dual Energy Recommendation attribute

Some factory Dual Energy protocols include ranges that are linked to a "Dual Energy possible" decision tree. These trees deploy the **Dual Energy Recommendation** attribute. The purpose of this attribute is to avoid scanning patients with Dual Energy when scanning with single energy appears to be more appropriate. The attribute can be used for TwinBeam and TwinSpiral scan protocols.

Please note that the **Dual Energy Recommendation** attribute is evaluated for each scan range or autorange separately, which is not the case for other attributes in decision trees.

The **Dual Energy Recommendation** attribute is based on patient age and patient diameter where threshold values may depend on the scanner type.

The patient diameter in the topogram is assessed based on the reconstructions, which are identical for all strategies. If there are no identical reconstructions, the **Dual Energy Recommendation** attribute will not have a value. In that case, you are prompted for a decision in **myExam Compass**.

Also, in one of the following cases, there may be reasons to correct the suggestion provided by the **Dual Energy Recommendation** attribute in **myExam Compass**:

- If there are other criteria that would exclude a Dual Energy scan, for example, if the patient cannot comply with the breathing instructions, you can manually switch to a single energy scan even if a Dual Energy scan is suggested in **myExam Compass**.
- If the Dual Energy evaluation is the main purpose of an examination, you can manually switch to the Dual Energy scan mode if even a single energy scan is suggested in **myExam Compass**. However, the result quality will be suboptimal.

In general, the value of the **Dual Energy Recommendation** does not immediately change the scan mode to Dual Energy or single energy scanning. Instead, the suggestion of the attribute can be modified by following attributes before the corresponding strategy is applied.

21.4.4 Brain Hemorrhage scan requirements

If you perform a Dual Energy scan for an evaluation with Brain Hemorrhage, the scan has to meet the following requirements:

- The scan is performed with the scan protocol Brain DE Hemorrhage post Intervention or a scan protocol derived from it.
- The images have to be reconstructed with the standard kernels as defined in the standard protocol for Brain Hemorrhage:
  - Qr36 or Qr40 with iBHC (**Bone** setting)
- No additional contrast agent is injected.
- The patient does not move his head during the scan. Otherwise, the two Dual Energy data sets may not be registered successfully.

21.5 Dual Energy reconstructions

You can select the Dual Energy reconstruction types in the **Recon&GO** parameter category. The use cases are characterized as follows:

- Dual Energy **Spectral Recon** for grey-scale routine reconstructions that are required to show other image types than 120 kV equivalent images. (➔ Page 576 *Dual Energy Spectral Recon reconstructions*)
- Dual Energy reconstructions with Inline DE functionality for colored VRT images or organ ranges (➔ Page 580 *Dual Energy reconstructions with Inline DE functionality*)
- Dual Energy reconstructions for postprocessing with MI View&GO or the *syngo*.CT Dual Energy workflow (➔ Page 595 *Dual Energy reconstructions for postprocessing*)

Also for Dual Energy reconstructions, you can combine parameters of the **Recon&GO** category. However, some parameter combinations are not possible. If a combination is invalid, a conflict message is displayed.

For example, you cannot combine a **Spectral Recon** recon type with an **Inline Results > Multi Energy** type.

To make sure that only valid combinations are suggested in the parameter panel, select the parameters from left to right in the **Recon&GO** category.

- In Dual Energy protocols:

  Spectral Recon > Inline Results > Multi Recons > Fix Axial

- In single energy protocols:

  Inline Results > Multi Recons > Fix Axial

21.5.1 Safety information on Dual Energy reconstructions

CAUTION

Operation of the system, applications, or functionality by non-trained users!

Injury to the patient or personnel, or damage to the equipment.

◆ Only trained and qualified users, certified in accordance with country-specific regulations, are authorized to operate the system. For example, physicians, radiologists, or technologists.

For appropriate training, contact your Representative at Siemens Healthineers.

CAUTION

Images of Single Source Dual Energy: Suspicious lesion on result images due to motion or registration artifacts!

Wrong diagnosis

- After detecting or assessing a lesion, verify the absence of motion or registration artifacts.

CAUTION

Raw data has been deleted, but additional reconstructions are needed for the final diagnosis!

Wrong diagnosis or additional radiation neccessary because of insufficient information.

- Before deleting raw data make sure that all potentially neccessary reconstructions are available for final diagnosis.

Before deleting raw data of Dual Energy scans

Before deleting raw data of **Dual Energy** scans, make sure that diagnosis has been completed. If diagnosis has not yet been completed, make sure that the potentially necessary result series are available for further diagnostic evaluation.

The suitable result series depends on the clinical use case.

- To allow for further analysis of the scanned Dual Energy data in *syngo*.CT Dual Energy, one of the following result series is required:
  - Thin-slice **SPP** result series
  - Thin-slice **L&H** result series
- To confirm correct motion correction, especially for **DE Parallel Ranges** reconstructions, you can use the following result series:
  - **Application Class > Mixed > Difference** result series

- To provide a reference series with minimal impact of patient motion, you can reconstruct one of the following result series, or, both:
  - **L3D** result series with the same reconstruction parameters (➔ Page 578 *Reconstructing low energy images*)
  - **H3D** result series with the same reconstruction parameters (➔ Page 579 *Reconstructing high energy images*)

21.5.2 Dual Energy Spectral Recon reconstructions

The **Spectral Recon** parameters provide basic grey-scale reconstruction types for Dual Energy images. **Spectral Recon** types can be combined with all reconstruction parameters that are available for single energy reconstructions.

Spectral Recon recon jobs are indicated by a colored circle in the top left corner.



This example shows an automatic **Spectral Recon** recon job for the head with a bone-specific setting for **Kernel** and **Window**.

You can select the **Spectral Recon** reconstruction types in the **Recon&GO** parameter category.

The following reconstruction types are available:

- **None** (➔ Page 576 *Performing conventional CT reconstructions of Dual Energy images*)
- **Monoenergetic Plus** (➔ Page 577 *Reconstructing Monoenergetic Plus images*)
- **L3D** (➔ Page 578 *Reconstructing low energy images*)
- **H3D** (➔ Page 579 *Reconstructing high energy images*)

The maximum reconstruction length may be limited, depending on the configuration. In that case, the length is indicated in brackets.

21.5.3 Performing conventional CT reconstructions of Dual Energy images

A conventional CT reconstruction of Dual Energy scans generates images equivalent to 120 kV or 140 kV.

In case of a TwinSpiral scan, a mixed image of both energy spectra is generated. The mixing ratio is displayed in the image text.

In case of a TwinBeam scan, a composed image of both energy spectra is generated for which the projection data of the spectra is merged in raw data space.

In case of a single energy scan, a conventional CT image is reconstructed corresponding to the tube voltage that was used for the scan.

Select **Spectral Recon > None** to perform conventional CT reconstructions of Dual Energy images.

✓ A Dual Energy protocol is selected.

1 Open the recon parameter panel.

2 Click the **Recon&GO** tab.

The **Recon&GO** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 In the **Spectral Recon** column, select **None** for the required recon job.

5 Set the required reconstruction parameters in remaining parameter categories. You can, for example, add a single energy **Inline Results** reconstruction.

6 Set the required parameters in the **Auto Tasking** parameters category.

21.5.4 Reconstructing Monoenergetic Plus images

Select **Spectral Recon > Monoenergetic Plus** to reconstruct images that are equivalent to images scanned with a single photon energy beam, depending on the energy (keV). A motion correction is performed.

Observe the limitations of **Monoenergetic Plus** images.

✓ A Dual Energy protocol is selected.

1 Open the recon parameter panel.

2 Click the **Recon&GO** tab.

The **Recon&GO** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 In the **Spectral Recon** column, select **Monoenergetic Plus** for the required recon job.

The **Spectral Recon keV** column is displayed.

You can change the monoenergetic keV value to enhance the contrast between different materials and to visualize regions of interest according to your needs. For example, to visualize iodine, energies between 40 keV and 70 keV are recommended.

5 If necessary, adapt the **Spectral Recon keV** value.

Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

21.5.5 Reconstructing low energy images

Select **Spectral Recon > L3D** to reconstruct the low energy images of a Dual Energy scan.

✓ A Dual Energy protocol is selected.

1 Open the recon parameter panel.

2 Click the **Recon&GO** tab.

The **Recon&GO** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 In the **Spectral Recon** column, select **L3D** for the required recon job.

L3D images are not suitable for Dual Energy postprocessing. To reconstruct images for postprocessing, use an **Inline Results > L&H** reconstruction.
(→ Page 596 *Reconstructing high energy and low energy images for postprocessing*)

Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

21.5.6 Reconstructing high energy images

Select **Spectral Recon > H3D** to reconstruct the high energy images of a Dual Energy scan.

✓ A Dual Energy protocol is selected.

1 Open the recon parameter panel.

2 Click the **Recon&GO** tab.

The **Recon&GO** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 In the **Spectral Recon** column, select **H3D** for the required recon job.

H3D images are not suitable for Dual Energy postprocessing. To reconstruct images for postprocessing, use an **Inline Results > L&H** reconstruction.
(→ Page 596 *Reconstructing high energy and low energy images for postprocessing*)

Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

21.5.7 Dual Energy reconstructions with Inline DE functionality

Dual Energy reconstructions with Inline DE functionality allow you to set up and activate image reconstruction and image post-processing within one step.

The Inline DE functionality is available for **DE Parallel Ranges** or **DE Radial Ranges** in the **Recon&GO** category or in the **Inline Options** category. You can choose application classes depending on the range types:

- **Inline Results > Multi Energy > DE Parallel Ranges** (➔ Page 581 *DE Parallel Ranges application classes*)
- **Inline Results > Multi Energy > DE Radial Ranges** (➔ Page 582 *DE Radial Ranges application classes*)

21.5.8 Function description of Inline DE

Inline DE is based on CT images which have been acquired with Symbia Pro.specta X3.

The various materials of an anatomical region of interest have different attenuation coefficients, which depend on the used energy. These differences provide information on the chemical composition of the scanned body materials.

Inline DE combines images acquired with low and high energy spectra to visualize this information. Depending on the region of interest, contrast agents may be used.

The functionality of the Inline DE applications is as follows. The availability of each feature is depending on the Dual Energy scan mode:

- Monoenergetic Plus
- Gout

- Kidney Stones

  Kidney Stones is designed to support the visualization of the chemical composition of kidney stones and especially the differentiation between uric acid and non-uric acid stones. For full identification of the kidney stone additional clinical information should be considered such as patient history and urine testing. Only a well-trained radiologist can make the final diagnosis under consideration of all available information. The accuracy of identification is decreased in obese patients.

- Bone Marrow
- Brain Hemorrhage
- Rho/Z

21.5.9 DE Parallel Ranges application classes

The following application classes are available for **DE Parallel Ranges**:

Recon icon	Application class
	**Monoenergetic Plus**
	**Mixed**
	**Gout**
	**Kidney Stones**

Recon icon	Application class
	**Bone Marrow**
	**Brain Hemorrhage**
	**Rho/Z**

21.5.10 DE Radial Ranges application classes

The following application classes are available for **DE Radial Ranges**:

Recon icon	Application class
	**Monoenergetic Plus**
	**Gout**
	**Kidney Stones**
	**Bone Marrow**

21.5.11 Monoenergetic Plus application class

The **Monoenergetic Plus** application class simulates images that are equivalent to images scanned with a single photon energy beam, depending on the energy (keV).

By changing the energy (keV), you can enhance the contrast between different materials.

21.5.12 Reconstructing images for an evaluation with Monoenergetic Plus

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges** or **DE Radial Ranges**.

Additional **Inline Options** parameters that can be set for the selected ranges type are displayed.

5 For the required recon job, in the **Application Class** column, select **Monoenergetic Plus**.

Additional **Inline Options** parameters that can be set for **Monoenergetic Plus** are displayed.

6 In the **Energy in keV** column, select the required keV value.

7 For parallel ranges, in the **Data Set** column, select the required data set or data sets: **Monoenergetic Plus**, **Mixed**, **3D**. Multi-selection is possible. See Inline Options for application class Monoenergetic Plus in the Online Help

8 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**, **Angle Between Images** (for radial ranges only). See Inline Options for DE Parallel Ranges or DE Radial Ranges in the Online Help

21.5.13 Identifiers in Monoenergetic Plus reconstructions

Recon jobs for the application class **Monoenergetic Plus** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Application class	Data Set	Identifier in image comment	Identifier in series description
Monoenergetic Plus	**Monoenergetic Plus**	**ME <energy> keV** to indicate the energy level	No identifier
	Mixed	**MIX**	**MIX**
	3D	**3d**	**3d**

21.5.14 Gout application class

The Gout application class images allow you to distinguish between urate, bone, bone marrow, and contrast agent. Urate and contrast agent are highlighted with different colors.

21.5.15 Reconstructing images for an evaluation with Gout

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges** or **DE Radial Ranges**.

   Additional **Inline Options** parameters that can be set for the selected ranges type are displayed.

5 For the required recon job, in the **Application Class** column, select **Gout**.

   Additional **Inline Options** parameters that can be set for **Gout** are displayed.

6 For parallel ranges, in the **Data Set** column, select the required data set or data sets: **Mixed**, **Classified (Gray)**, **Fused**, **3D**. Multi-selection is possible.

7 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**, **Angle Between Images** (for radial ranges only), **VRT Presets** (for radial ranges only).

Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

21.5.16 Identifiers in Gout reconstructions

Recon jobs for the application class **Gout** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Application class	Data Set	Identifier in image comment	Identifier in series description
Gout	**Classified (Gray)**	**CLA**	**CLA**
	Fused	**MIX/CLA**	No identifier
	Mixed	**MIX**	**MIX**
	3D	**MIX 3d** or **CLA 3d**	**MIX 3d** or **CLA 3d**

21.5.17 Limitations of the Gout application class

- Tophi with CT values below the minimum threshold (150 HU by default) will not be detected by the algorithm.
- Tophi with a volume of less than 0.1 ccm may not be detected by the algorithm.
- Body materials in the vicinity of metal may be falsely shown in green (in TwinBeam Dual Energy scan modes only).

21.5.18 Kidney Stones application class

The **Kidney Stones** application class visualizes the chemical differences between kidney stones by decomposing the kidney stones into their component parts: tissue, uric acid, and oxalate (calcium stone).

The **Kidney Stones** application class requires non-enhanced CT data. For an optimal postprocessing, patient motion should be avoided during the scan.

21.5.19 Reconstructing images for an evaluation with Kidney Stones

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges** or **DE Radial Ranges**.

Additional **Inline Options** parameters that can be set for the selected ranges type are displayed.

5 For the required recon job, in the **Application Class** column, select **Kidney Stones**.

Additional **Inline Options** parameters that can be set for **Kidney Stones** are displayed.

6 For parallel ranges, in the **Data Set** column, select the required data set or data sets: **Mixed**, **Classified (Gray)**, **Fused**, **3D**. Multi-selection is possible.

7 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**, **VRT Preset** (for radial ranges only), **Angle Between Images** (for radial ranges only).

Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

21.5.20 Identifiers in Kidney Stones reconstructions

Recon jobs for the application class **Kidney Stones** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Application class	Data Set	Identifier in image comment	Identifier in series description
Kidney Stones	**Classified (Gray)**	**CLA**	**CLA**
	Fused	**MIX/CLA**	No identifier
	Mixed	**MIX**	**MIX**
	3D	**MIX/3d** or **CLA/3d**	**MIX/3d** or **CLA/3d**

21.5.21 Bone Marrow application class

The **Bone Marrow** application class allows you to visualize the bone marrow composition which is based on non-enhanced CT data. The application class generates virtual non-calcium (VNCa) images by subtracting calcium from the Dual Energy data sets.

Bone Marrow is only available for TwinSpiral Dual Energy protocols.

21.5.22 Reconstructing images for an evaluation with Bone Marrow

✓ A TwinSpiral Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges** or **DE Radial Ranges**.

Additional **Inline Options** parameters that can be set for the selected ranges type are displayed.

5 For the required recon job, in the **Application Class** column, select **Bone Marrow**.

Additional **Inline Options** parameters that can be set for **Bone Marrow** are displayed.

6 For parallel ranges, in the **Data Set** column, select the required data set or data sets: **Mixed**, **VNCa (Gray)**, **Fused**, **3D**. Multi-selection is possible.

7 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**, **VRT Preset** (for radial ranges only), **Angle Between Images** (for radial ranges only).

Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

If fractured bones in the extremities are not detected by the **Bone Marrow** application class, proceed as follows:

- Reconstruct each extremity separately.
- In the configuration of the **Bone Marrow** application class, clear the **Calcium BHC** checkbox. (➔ Page 701 *Bone Marrow parameters*)

21.5.23 Identifiers in Bone Marrow reconstructions

Recon jobs for the application class **Bone Marrow** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Data Set	Identifier in image comment	Identifier in series description
VNCa (Gray)	**VNCA**	**VNCA**
Fused	**MIX/VNCA**	No identifier
Mixed	**MIX**	**MIX**
3D	**VNCA/3d** or **MIX/3d**	**VNCA/3d** or **MIX/3d**

21.5.24 Limitations of the Bone Marrow application class

Increased CT values in the **Bone Marrow** application class image do not always indicate pathology because of the variability of marrow composition in the human body, consideration should therefore be made to patient age, body part and relevant clinical history such as anemia.

21.5.25 Brain Hemorrhage application class

The **Brain Hemorrhage** application class allows you to distinguish contrast agent from a hemorrhage in the brain.

Brain Hemorrhage is only available for TwinSpiral Dual Energy protocols.

The main indication for a head scan with TwinSpiral Dual Energy is to examine the outcome of an interventional procedure intended to resolve intracranial clots (intra-arterial embolectomy or thrombolysis).

If you scan shortly after the angiography examination, contrast agent can be recognized as diffuse staining in the parenchyma. The contrast agent concentration is stable enough for the evaluation of TwinSpiral Dual Energy data in the **Brain Hemorrhage** application class. The scan does not require additional contrast agent.

21.5.26 Reconstructing images for an evaluation with Brain Hemorrhage

✓ A TwinSpiral Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges**.

Additional **Inline Options** parameters that can be set for the selected ranges type are displayed.

5 For the required recon job, in the **Application Class** column, select **Brain Hemorrhage**.

Additional **Inline Options** parameters that can be set for **Brain Hemorrhage** are displayed.

6 In the **Data Set** column, select the required data set or data sets: **VNC**, **Iodine**, **Fused**, **3D**. Multi-selection is possible.

7 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**.

21.5.27 Identifiers in Brain Hemorrhage reconstructions

Recon jobs for the application class **Brain Hemorrhage** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Application class	Data Set	Identifier in image comment	Identifier in series description
Brain Hemorrhage	**VNC**	**VNC**	**VNC**
	Iodine	**IOD** for iodine	**IOD** for iodine *)
	Iodine	**IMD** for iodine density	**IMD** for iodine density *)
	Fused	**VNC/IOD** or **VNC/IMD**	No identifier
	3D	**IOD/3d** or **IMD/3d**	**IOD/3d** or **IMD/3d**
	*) The iodine image type depends on settings in **DE Inline Results** configuration.		

21.5.28 Limitations of the Brain Hemorrhage application class

- This application cannot be used to differentiate between healthy and ischemic parenchyma for stroke patients.
- Diffuse accumulation of calcium can mimic hemorrhage with contrast agent uptake.
- This application cannot be used for arterial phase Single Source Dual Energy imaging.
- Best image quality is achieved for CT scans after interventional reperfusion therapy and without a new injection of contrast agent.
- Dark/bright sheets at the surface of bones and vessels in the resulting iodine and VNC images indicate remaining motion artifacts and should not be confused with true patient anatomy.

21.5.29 Rho/Z application class

With the **Rho/Z** application class you can measure electron density as well as effective atomic number and thus perform a basic characterization of the material of interest.

21.5.30 Reconstructing images for an evaluation with Rho/Z

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Create a new recon job by repeating an existing one.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges**.

Additional **Inline Options** parameters that can be set for the selected ranges type are displayed.

5 For the required recon job, in the **Application Class** column, select **Rho/Z**.

Additional **Inline Options** parameters that can be set for **Rho/Z** are displayed.

6 In the **Data Set** column, select the required data set or data sets: **Rho**, **Z**, **Fused**, **3D**. Multi-selection is possible.

7 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**, or **Thick Axial**.

When you want to use **Rho** or **Z** images for further quantitative evaluation, set **Thick Axial** to **On**.



Set other reconstruction parameters as required, for example, **Multi Recons** or **FAST Planning**.

21.5.31 Identifiers in Rho/Z reconstructions

Recon jobs for the application class **Rho/Z** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Application class	Data Set	Identifier in image comment	Identifier in series description
Rho/Z	**Rho**	**RHO**	**RHO**
	Z	**Z**	**Z**
	Fused	**RHO/MIX** **Z/MIX**	No identifier
	3D	**RHO/3d** or **Z/3d**	**RHO/3d** or **Z/3d**

21.5.32 Limitations of the Rho/Z application class

- This image type is only valid for natural body materials such as fat, soft tissue or bone. Results for materials with a higher atomic number and especially those with a contrast agent may not be correct.
- This image type is not valid if there are obvious image artifacts in the original images, such as, metal artifacts.

21.5.33 Mixed application class

The **Mixed** application class generates motion corrected low energy and high energy images. This application class can be used to assess the image quality of the original low and high energy images and to verify the absence of motion artifacts after motion correction.

21.5.34 Reconstructing images with application class Mixed

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > DE Parallel Ranges**.

Additional **Inline Options** parameters that can be set for **DE Parallel Ranges** are displayed.

5 For the required recon job, in the **Application Class** column, select **Mixed**.

6 In the **Data Set** column, select the required data set or data sets: **Mixed**, **Low E (Motion Corrected)**, **High E (Motion Corrected)**, **Difference**, **3D**. Multi-selection is possible. See Inline Options for application class Mixed in the Online Help

7 Set the remaining **Inline Options** parameters as appropriate: **Organ**, **Viewing Direction**, **High Resolution**. See Inline Options for DE Parallel Ranges in the Online Help

21.5.35 Identifiers in reconstructions with application class Mixed

Recon jobs for the application class **Mixed** have the following identifiers in the series descriptions and image comments, depending on the selected **Data Set**.

Application class	Data Set	Identifier in image comment	Identifier in series description
Mixed	**Low E (motion corrected)**	**L_MC**	**L_MC**
	High E (motion corrected)	**H_MC**	**H_MC**
	Mixed	**L_MC/MIX** or **L_MC/MIX**	No identifier
	Difference	**DIFF**	**DIFF**
	3D	**MIX/3d**	**3d**

21.5.36 Dual Energy reconstructions for postprocessing

Select Dual Energy reconstructions for postprocessing with MI View&GO or the *syngo*.CT Dual Energy workflow in the **Recon&GO** category or in the **Inline Options** category. The following reconstruction types are available:

- **Inline Results > Multi Energy > SPP** (→ Page 595 *Reconstructing SPP images for postprocessing*)
- **Inline Results > Multi Energy > L&H** (→ Page 596 *Reconstructing high energy and low energy images for postprocessing*)

21.5.37 Reconstructing SPP images for postprocessing

Select **Inline Results > Multi Energy > SPP** to produce reconstructed image series in spectral postprocessing image format for further processing in MI View&GO or in the *syngo*.CT Dual Energy workflow.

Observe the limitations of **Monoenergetic Plus** images.

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, in the **Inline Results** column, select **Multi Energy > SPP**.

5 For the required recon job, in the **Application Class** column, select the required application:

- **Conventional CT** for a conventional CT reconstruction of the high energy and low energy images

  If you select **Conventional CT**, you can use all available reconstruction kernels and the extended Field of View.

  Or

- **Monoenergetic Plus** for a monoenergetic-equivalent image reconstruction.

If you select **Monoenergetic Plus**, the parameter **Energy in keV** is displayed in the **Inline Options** category.

You can change the monoenergetic keV value to enhance the contrast between different materials and to visualize regions of interest according to your needs. For example, to visualize iodine, energies between 40 keV and 70 keV are recommended.

6 Set other reconstruction parameters as required.

7 If you want to send the reconstructed series to the **Viewing** step in MI View&GO, select **Auto View&GO** in the **Auto Tasking** parameters category.

21.5.38 Reconstructing high energy and low energy images for postprocessing

Select **Inline Results > L&H** to produce low energy and high energy images for further processing in MI View&GO or in the *syngo*.CT Dual Energy workflow.

✓ A Dual Energy protocol is selected.

1 Open the parameter panel.

2 Click the **Inline Options** button.

The **Inline Options** parameters are displayed.

3 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

4 For the required recon job, click **Inline Results > Multi Energy** and select **L&H**.

5 Set other reconstruction parameters as required.

6 If you want to send the reconstructed series to the **Viewing** step in MI View&GO, select **Auto View&GO** in the **Auto Tasking** parameters category.

22 Reconstruction

Every examination generates raw data that is used for the image reconstruction. Depending on the diagnostic purpose, you can reconstruct several image sets with different parameter settings (recon jobs) from one raw data set.

After a scan is completed and the image quality is approved, you can proceed to the **Reconstruction** task.

You can reconstruct the images as a part of the current examination while the scan patient is open. As long as the raw data is available, another option is the offline reconstruction after the scan patient has been closed and has been converted into a recon patient. (➔ Page 671 *Performing an offline reconstruction*)

The reconstruction parameters are preset in the scan protocol but they can still be adapted.

The reconstruction workflow differs depending on the reconstruction scenario:

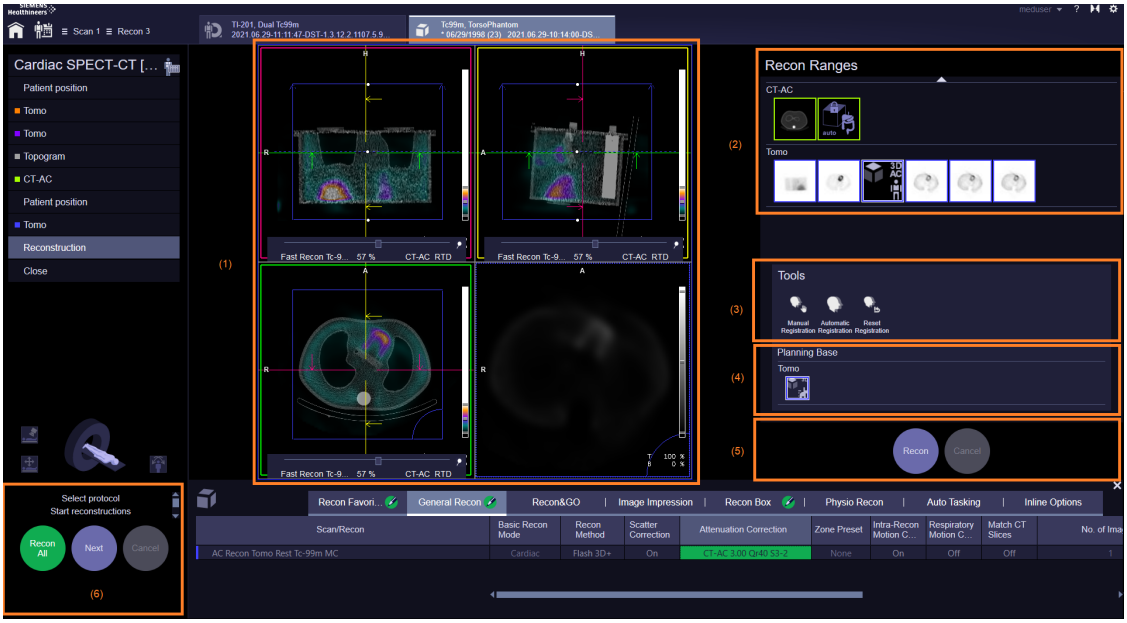
- (➔ Page 632 *Planning a reconstruction*)
- (➔ Page 671 *Performing an offline reconstruction*)

22.1 Screen layout during reconstruction planning

The screen layout during reconstruction provides the elements and tools for planning recon jobs and performing recon jobs.



The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.



(1) Image area
(2) **Recon Ranges** area
(3) **Recon Tools** area
(4) **Planning Base** area
(5) Recon control area
(6) Execution control buttons after scanning

In the execution control buttons area, click the **Recon All** button to reconstruct all the reconstrution jobs.

In the recon control area, click the **Recon** button to reconstruct a single reconstruction job.

In the recon tools area, click the **Manual Registration**, **Automatic Registration**, or **Reset Registration** icons for the desired registration.

In the Recon Ranges (or recon browser) area, there are all the reconstructions that are planned for a particular scan. You can Repeat or Delete reconstructions if needed using a right click. When a recontruction is finished, the icon will be displayed with an image slice from the middle of the reconstructed patient job. When the reconstruction is open, the icon will be displayed with graphical information.

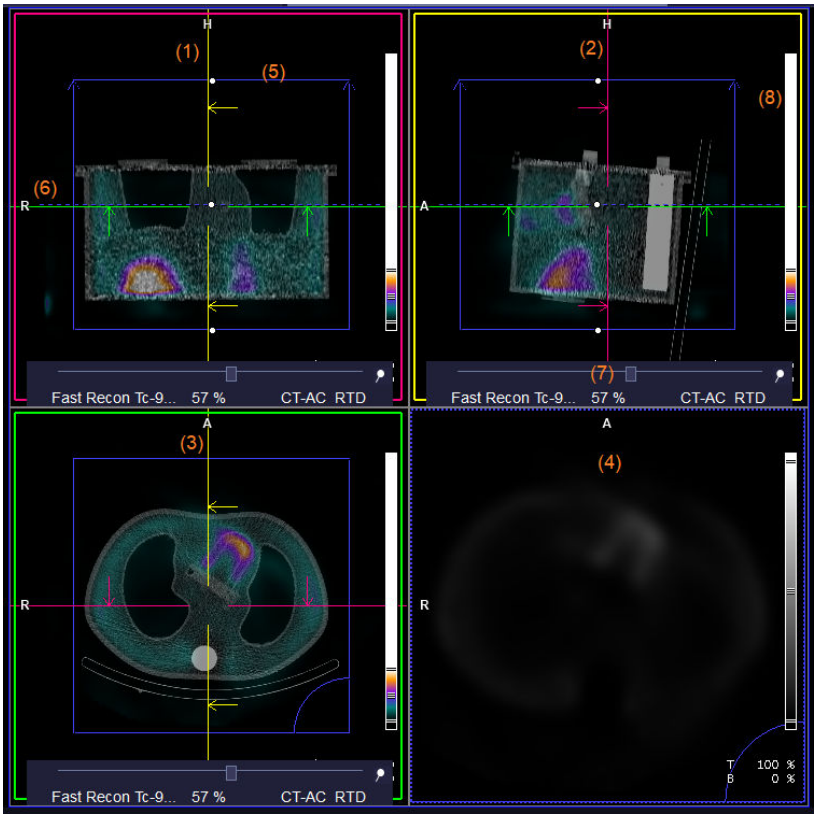
Reconstructions that are completed cannot be deleted.



Finished Reconstruction Icon and Open Icon

There is color matching for easy identification of tasks with the reconstruction range defined on the image and Recon Range reconstruction jobs.

Within the image area are the coronal, sagittal, axial, and preview areas.



(1) Coronal
(2) Saggital
(3) Axial
(4) Preview
(5) Reconstruction Box
(6) Reference Lines
(7) Alpha-blend Bar
(8) Look Up Table (LUT) Bar

The coronal, sagittal, and axial views can be used for reconstruction range planning or registration. The preview provides a view of how the reconstruction will look in terms of reconstructed field of view, using one of the Planning Base objects, by default Fast Recon is selected. There are vertical and horizontal reference lines indicating the recontructed slices.
(➔ Page 416 *Scan and recon reference lines*)

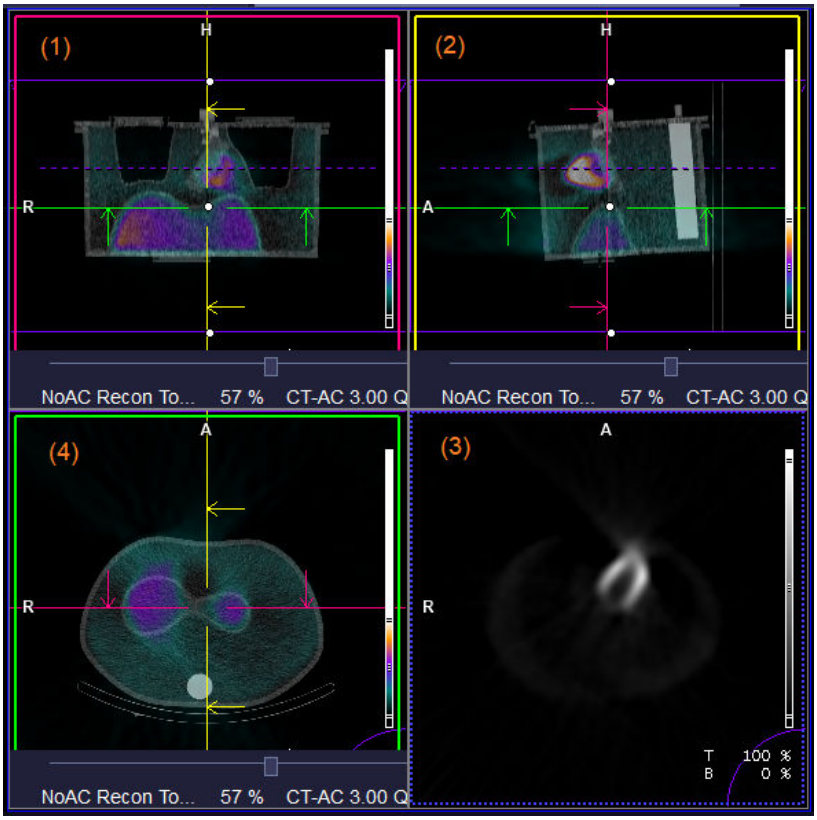
At the bottom of the images is an alpha-blend bar for hybrid-blend scan or reconstruction. You can adjust the ratio of alpha blending between base and overlay data in a fused image. The blending ratio is changeable from the coronal, sagittal and axial (transverse) planning views of the reconstruction layout. The change of blending ratio is synchronized in all planning views of the reconstruction planning layout. The slider control in the planning views adjusts the blending ratio.

The Look Up Table (LUT) bar can change the color scheme of the coronal, saggital, axial, and preview images. The LUTs are synchronized across planning views.

The Blow-Up Tool can be used by double clicking an image view (also referred to as an image segment). The image is blown-up (enlarged) to make the image easier to see for more precise image registration. Completed reconstructions will display blown-up images by default.

22.1.1 Image area

The image area can have a four segments layout or a blow-up layout of one segment. (➔ Page 606 *Blow-up layout*)



Four segments layout

(1) (➔ Page 605 *Coronal segment*)
(2) (➔ Page 605 *Sagittal segment*)
(3) (➔ Page 605 *Preview and result images segment*)
(4) (➔ Page 605 *Axial segment*)

NM images are displayed as a base image, and CT images are displayed as the overlay images.

You can move and rotate in x, y, or z axis directions. Keyboard keys can be used to incrementally move up, down,left, and right.

If the CT FoV (field of view) is smaller than SPECT, then SPECT AC recon FoV will be limited by the CT FoV.

The blow-up tool can be used to display images in a larger view for more precise changes.

Coronal segment

The coronal segment displays one of the following images:

- the coronal projection of the planning base
- an anterior-posterior topogram
- a posterior-anterior topogram

The coronal segment has a pink frame.

The coronal is the FoV segment in recon jobs with a coronal image orientation and it is the default reference segment in recon jobs with an axial image orientation.

Sagittal segment

The sagittal segment displays the sagittal projection of the planning base or a lateral topogram. This segment has a yellow frame.

The sagittal segment is the FoV segment in recon jobs with a sagittal image orientation and it is the default reference segment in recon jobs with a coronal image orientation.

Axial segment

The axial segment displays the axial projection of the planning base.

The axial segment has a green frame.

The axial segment is the FoV segment in recon jobs with an axial image orientation and it is the default reference segment in recon jobs with a sagittal image orientation.

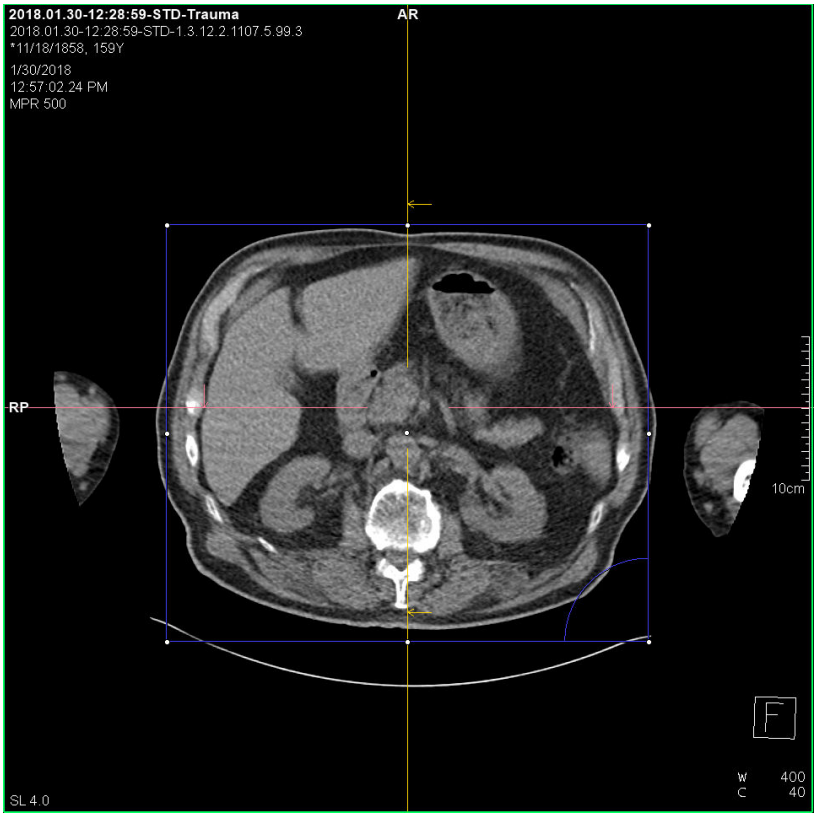
Preview and result images segment

When an unperformed recon job is selected, the lower right segment displays a preview that indicates the expected result of the image reconstruction. This segment has a frame in the color of the scan.



Recon&GO recon jobs and recon jobs of ranges that were scanned with tilted gantry do not display previews.

Blow-up layout



Blow-up layout

To blow up the display of a segment, double-click the segment. To return to the four segments layout, double-click the blown up segment.

In the following cases, the *syngo* Acquisition Workplace automatically switches between four segment layout and blow-up layout:

- If you select a finished recon job or if you selected a recon job that becomes finished, the content of the preview segment is automatically displayed in the blow-up layout.
- If you select an unfinished recon job while the blow-up layout is active, the display is switched to the four segments layout.
- If you select another planning base while the blow-up layout is active, the display is switched to the four segments layout.

Fly out box

The system displays the primary reconstruction information in the form of a **fly out** box when hovering the cursor over a reconstruction tomographic job from a dynamic tomo acquisition in the reconstruction browser.

The information displayed includes the reconstruction tomographic image type with series description, reconstruction method, reconstruction parameter setting, iterations, subsets, scatter correction, motion correction, image type, and number of phases.

For iterations:

Filtered Back Projection - if Filtered Back Projection, then show **Iterations ---**

Custom - show custom value pre- and post-reconstruction

Data-driven - show the parameter with **Pending...** as the value pre-reconstruction and show with the value from the Molecular Acquisition and Reconstruction System (MARS) post-reconstruction

For subsets:

Filtered Back Projection - if Filtered Back Projection, then show **Subsets ---**

Custom - show custom value pre- and post-reconstruction

Data-driven - show the parameter with **Pending...** as the value pre-reconstruction and show with the value from the MRS post-reconstruction

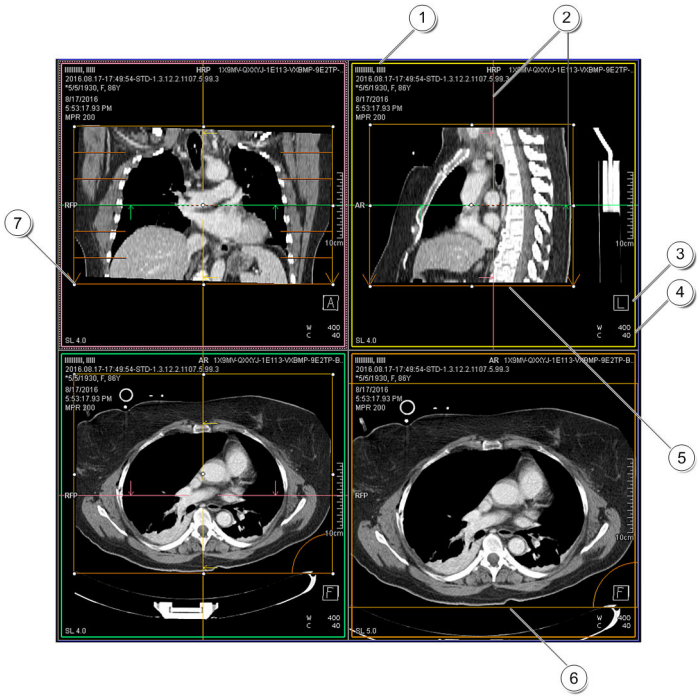
For Scatter Correction: **On or Off**

for Motion Correction: **On or Off**

The system saves viewable tomo projection images as one image with multiple rotations as an NM series with image type set to TOMO.

Elements in an image segment

The following elements are possible in axial, coronal, and sagittal segments.



(1) Image text
Displays information on the examination and on the image.

(2) Segment reference lines
In each of the planning segments, indicate the positions of the image in the other two projections by using the color of the corresponding segment frame. You can shift the segment reference lines. In Non-**Fix Axial** reconstructions, you can rotate the segment reference lines. The segment reference lines are always perpendicular to each other.

(3) Orientation cube
Indicates the spatial orientation of the segment:
A: Front view (anterior-posterior)
P: Rear view (posterior-anterior)
L: Left view (left-right)
R: Right view (right-left)
H: Top view (head-feet)
F: Bottom view (feet-head)

(4) Windowing settings
Indicate the window width and the window center.

(5) Recon box

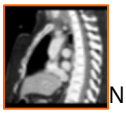
Indicates the size of the recon range and the recon direction. The recon box can be resized and moved. In Non-**Fix Axial** reconstructions, you can rotate the reference lines and thus adapt the spatial position of the recon volume.

(6) FoV frame
Indicates the orientation of the result images. The FoV frame can be rotated. The 1/4 circle at a corner of the FoV frame indicates the lower right corner for the images to be reconstructed.

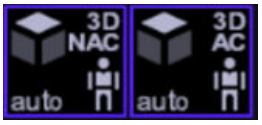
(7) Reference recon box
Indicates the orientation of the reference image that is saved in a separate image series. The reference recon box displays additional lines.

22.1.2 Recon Ranges area

Displays the ranges in the protocol from top to bottom. Each range is visualized by a row that carries the name of the range. Each recon job is represented by a recon icon in this row. The icons are framed in the color of the range and indicate the execution state and the characteristics of the recon job.

Element	Description
 Recon icon before reconstruction (example)	Open reconstructions are indicated by a cube and an icon that represents the image impression (**Kernel** and **Window**). The colored side of the cube indicates the spatial orientation of the images (axial, coronal, sagittal). Icons for open **Recon&GO** reconstructions visualize the type of the **Recon&GO** job instead of the cube and the organ characteristic.
 CT  NM Recon icon after reconstruction (example)	Performed reconstructions are indicated by a real reconstructed CT image on the recon icon.

Element	Description
 CT  NM **Auto** recon icon before reconstruction (example)	Displays the **Auto** label. Indicates a recon job for automatic reconstruction without user interaction.
 CT Tomogram icon for a **Fix Axial** reconstruction (example)	Indicates a **Fix Axial** reconstruction (2D reconstruction). The axes are locked and cannot be rotated.
 Topogram icons for unscanned topogram ranges	Indicate the topogram orientation.
 Topogram icon after scan (example)	Represents the scanned topogram.
 Static Planar	2D graphic indicates a 2D image. For static, a single-face profile graphic  indicates 2D.

Element	Description
 Gated Planar	2D graphic indicates a 2D image. The waveform  graphic indicates gated.
 Dynamic Planar	2D graphic indicates a 2D image. The face profile, multiple-frames graphic indicates an image series for dynamic or composite.
 Tomo Projection	3D graphic indicates a 3D image. The text **tomo** appears above a graphic of a line with arrows at both ends  .
 Tomo Recon	3D graphic indicates a 3D image. The body  graphic indicates tomographic reconstruction. The **AC** text indicates for Attenuation Correction; the **NAC** text indicates No Attenuation Correction.
 Gated Tomo Recon	3D graphic indicates a 3D image. The waveform  graphic indicates gated. The **AC** text indicates for Attenuation Correction; the **NAC** text indicates No Attenuation Correction.
 Composite Tomo	3D graphic indicates a 3D image. The face profile, multiple-frames  graphic indicates an image series for dynamic or composite.The **AC** text indicates for Attenuation Correction; the **NAC** text indicates No Attenuation Correction.

Element	Description
 Dynamic Tomo	3D graphic indicates a 3D image. The multiple-face profile  graphic indicates an image series for dynamic or composite. The **AC** text indicates for Attenuation Correction; the **NAC** text indicates No Attenuation Correction.
Summary information	Moving the mouse pointer over the recon icon displays a tooltip with basic information on the recon job.
Context menu	Right-clicking a recon icon opens a context menu with further processing options.



Definitions of Reconstruction Range Icon Graphics

(1) The chain link graphic indicates group reconstruction is enabled.
(2) The **auto** text indicates automated reconstruction is enabled, and indicates that as soon as an acquisition is completed, the reconstruction will start.
(3) The **2D** text indicates a 2D image; **3D** text indicates a 3D image. 2D images can be planar or tomographic projection.

(4) The **AC** text indicates for Attenuation Correction; the **NAC** text indicates No Attenuation Correction.

(5) The waveform  graphic indicates gated; the body  graphic indicates tomographic reconstruction; the single-face profile  graphic indicates 2D; the face profile, multiple-frames  graphic indicates an image series for dynamic or composite.

For a Quality Control Image (QCI) tomo projection, the text **tomo** appears above a graphic of a line with arrows at both ends  .

Window-specific and kernel-specific recon icons

Icon	Description
	Automatic recon job for the head with a soft-tissue setting for **Kernel** and **Window**.
	Automatic recon job for the head with a bone-specific specific setting for **Kernel** and **Window**.
	Automatic recon job for the body with a lung-specific setting for **Kernel** and **Window**.
	Automatic recon job for the body with a soft-tissue setting for **Kernel** and **Window**.

Icon	Description
	Automatic recon job for the body with a bone-specific setting for **Kernel** and **Window**.

Execution states

Icon	Description
	The recon job is queued.
	The recon job is running.
	The recon job is cancelled.
	The recon job failed.
	The recon job has a parameter conflict and cannot be processed. Check the parameter settings and solve the conflict.

Options in the context menu

Option	Description
Show Parameters	Opens the parameter panel of the selected recon job. If necessary, you can adapt the parameters.
Delete	Deletes the selected recon job.

Option	Description
Repeat	Repeats the selected recon job within the range. The new recon job is appended to right of the selected recon job.
Copy all Recon Parameters	(CT only) Copies all parameters of the selected recon job including the autotasking functions. This option is useful if a recon job is to be used as a template for other recon jobs. (➔ Page 635 *Copying all recon parameters*)
Paste all Recon Parameters	(CT only) Applies the copied parameters to the selected recon job. The copied parameters can be applied between ranges. A multi-selection is not possible. After applying the copied parameters, you can still adapt them.
Copy Recon Volume	Copies the recon box of the selected recon job.
Paste Recon Volume	Applies the copied recon box to the selected recon job while keeping the other parameters including the image orientation of the target volume. The copied recon box can be applied between ranges. A multi selection is not possible. This option is useful if you need to apply a complex recon box in its exact size and spatial orientation to other recon jobs in different recon ranges.
Create Image with Reference Lines	Creates images with reference lines for the selected recon job.
Send to MI View&GO	Sends the reconstructed images of the selected recon job to MI View&GO.
Edit in MI View&GO	Opens the reconstructed images of the selected recon job in MI View&GO. Only available for **Inline Results** that can be edited in MI View&GO.

22.1.3 Tools area

The **Tools** area provides icons for planning the recon job.

Icon	Description
MPR	Switches the planning base to the MPR display. The MPR display is set by default.
MIP Thin	Switches the planning base to the MIP display.
Set FoV Segment	Sets the image orientation for the result image series.

Icon	Description
Set Ref Segment	Sets the image orientation for the reference image. The reference image is saved in a separate image series.
Manual Registration	Used for manual registration.
Automatic Registration	Used for automatic registration to match SPECT and CT images.
Reset Registration	Used for resetting scanner registration.

22.1.4 Basic recon mode

Basic recon (resconstruction) mode is selected for a specifc organ or organ type region. The selections are

- **Cardiac**
- **Skeletal**
- **Wholebody**
- **Theranostic**
- **Brain**
- **General**

Basic recon mode enables or disables different features for specific studies, making it easier to see only one reconstruction and its parameters. For example when you select **Brain**, the **SMARTNeuro AC** feature would be enabled to be selected. If your were doing **Cardiac** or one of the other basic recon modes, it would not be enabled because they would not be applicable.

There are cases where the basic recon mode is dependent on the scan mode. For example for Cardiac, Cardiac basic recon mode would only be available if there is a Cardiac scan.

From the **Recon Ranges**, select a 3D reconstruction. Right click to display a dropdown menu and select **Show Parameters**. The Recon Parameter Panel is displayed. Click the **General Recon** tab, and then click the **Basic Recon Mode** tab.

Basic Recon Mode	Features Enabled
Cardiac	- Respiratory motion correction - Gated Recon Tomo image type - FBP - Flash3D+ recon method - IQSPECT+ recon method - xSPECT-CG recon method - xSPECT-EM recon method - Decay corrected to injection time
Skeletal	- Zone preset - Flash3D+ recon method - xSPECT-CG recon method - xSPECT-EM recon method - Quant - Decay corrected to injection time
Wholebody	- FBP - Flash3D+ recon method - xSPECT-CG recon method - xSPECT-EM recon method - Quant - Decay corrected to injection time
Theranostic	- xSPECT-CG recon method - xSPECT-EM recon method - Quant - Decay corrected to start acquisition time

Basic Recon Mode	Features Enabled
Brain	- SMARTNeuro AC - Flash3D+ recon method - xSPECT-CG recon method - xSPECT-EM recon method - Quant - Decay corrected to injection time
General	- FBP - Flash3D+ recon method - xSPECT-CG recon method - xSPECT-EM recon method - Quant - Decay corrected to injection time

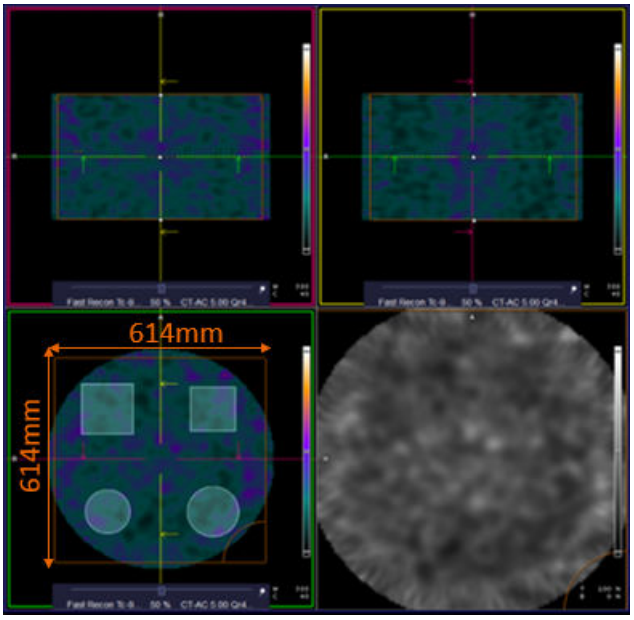
When the Basic Scan Mode is a 2D planar image type, the **Basic Recon Mode** is blank.

- WholebodyPlanar
- StaticPlanar
- PinholeStaticPlanar
- DynamicPlanar
- PinholeDynamicPlanar
- CardiacDynamicPlanar
- CardiacPlanar
- PinholecardiacPlanar

The Recon Mode Parameters for a 3D volume image type based on Basic Scan Mode.

Recon Mode Parameters	Cardiac	Skeletal	Whole-body	Theranostic	Brain	General
Cardia90Tomo	X					
Cardia76Tomo	X					
CardiacTomoFeetFirstScan	X					
Dynamice90Tomo	X					
Dynamice76Tomo	X					
SZCardiacCentricTomo	X					
180Tomo	X	X		X	X	X
180SingledetectorTomo	X	X		X	X	X
Wholebody180Tomo		X	X	X		X
Wholebody180SingledetectorTomo		X	X	X		X
Composite180Tom	X	X		X	X	X
Dynamic 180Tomo	X				X	X
SZ180Tomo					X	X
SZ180DynamicTomo					X	X
SZ180CompositeTomo					X	X

22.1.5 Voxelation, field of view, and zoom



Recon Range FoV

- For SPECT scans, you can change the recon FoV in the z-direction. The x and y-direction are fixed.
- For CT scans, you can change the recon FoV in all directions.
- For hybrid scans, SPECT range and CT for AC will have simultaneous range planning.

Reconstruction Zoom

- When the CT FoV is equal to x=614 mm and y=614 mm, the SPECT zoom is equal to 1 since 614 mm is the reconstruction diameter based on the SPECT scan's intrinsic pixel size.
- SPECT zoom can be change by:

- (AC Recon only) Modifying the CT FoV using graphical range planning.
- (NAC REcon only) Changing SPECT zoom parameter (from the Recon Parameter Panel with the **Recon Box** tab selected, select the **Zoom** parameter).

22.1.6 Motion correction

Motion correction is performed as part of the iterative reconstruction.

There are two types of data-driven motion correction.

- **Intra-Recon Motion Correction:**
  - Corrects x and y shifts for all applications
  - Also referred to Improved Tomographic Consistency (ITC)
- **Respiratory Motion Correction:**
  - Corrects movement of the heart axially (y shifts)
  - For cardiac studies only

To select motion correction from the Recon Parameter Panel, click the **General Recon** tab. Click the **Intra-Recon Motion Correction** and/or **Respiratory Motion Correction**tabs, and click **On** to enable them.

22.1.7 Attenuation correction

To create a recon (reconstruction) with attenuation correction (AC), the CT reconstruction must meet the following conditions:

- **Fix Axial** = **On**
- **Matrix** = **Square**
- No multiple reconstructions, inline results.

- Recommended Kernel = Qr40 (quantitative reference).
  - Other Qr kernels or Be05/H05 (Be = body; H = head) can also be used.

    The higher the number, the sharper the image will appear. The lower the number, the smoother an image will appear.
  - Other kernels cannot be used.
  - Qr40 can be used for Child/Adult and Head/Body.
- Recommended Height and Width: 614 mm for Zoom 1.
- Recommended HDFoV (high definition field of view). This requires that the pitch = 0.8 or less.

If there are multiple **Fix Axial** = **On**, CT recons with the same series description, a hyphenated number is added at the end of the series description (for example, **CT-AC 5.00 Qr40 S1-1**. This only appears in the dropdown list, and the number only appears for CT recons with **Fix Axial** = **On**.

To select attenuation correction from the Recon Parameter Panel, click the **General Recon** tab. Click the **Attenuation Correction** tab, and click the desired value (for example, **None**, **CT-AC 5.00 Qr40 S1-1**, **CT-AC 5.00 Qr40 S2-2**, **CT-AC 5.00 Qr40 S3-3**).

CT NM Reconstruction FOV Synchronization

When CT and NM reconstruction jobs are linked, certain spatial (volume) parameter changes to one reconstruction job are synchronized to the other reconstruction job. Some parameters can only be applied from a CT reconstruction job to an NM reconstruction job, but some parameter changes can be applied to both reconstruction jobs.

CT and NM reconstruction jobs FOVs are applied and mapped to each other using the registration matrix.

22.1.8 Retrospective gating for cardiac procedures

Retrospective gating collects data during an acquisition. When the acquisition is finished, the data is grouped into the different phases of the cardiac cycle, defined as R-R interval, based on the number of gates selected.

For a protocol, retrospective gating can be selected from the task flow control on the left side of the screen. For example, the **Tomo** task can be selected and expanded. From the **MI Gating** parameter, select **Cardiac** to enable it.

When an acquisition completes, the automatic beat selection algorithm will define the beat window based on the acquired data. The beat window can be manually modified.

Multiple gated reconstructions with different beat acceptance windows can be created.

retrospective gating is applicable for both gated tomo and gated planar.

Gated tomo projection data is no longer created. Static planar with gated planar cannot created.

Gating is set-up after the acquisition, allowing R-peak-to-R-peak framing as well as automatic beat window optimization. For patients with irregular heart rates, the system can now frame it appropriately where previously you could end up with bins containing zero counts. Because gating is now retrospective, more accurate gated images can be created because of the flexibility to change parameters after an acquisition which was not previously possible.

To modify retrospective gating from the Recon Parameter Panel, click the **Physio Recon** tab. The **Gates**, **PVC Threshold [%]**(Pre-Ventricular Contraction Thresehold [%]), and **PVC Rejection** tabs are displayed.

22.1.9 Retrospective framing for Dynamic with Static Planar

To access the **Dynamic with Static Planar [factory]** protocol scan parameters, right click in the scan timeline to display a pop-up menu. Click **Show Parameters** to display the Scan Parameter Panel. Click the **General Scan** tab. Click the **Time Per Phase [min]** and enter the number of minutes.

During the acquisition setup, the different phases are:

- Time per frame
- Time per phase

To access the **Dynamic with Static Planar** reconstruction parameters, right click a reconstruction job in the **Recon Ranges** area to display a pop-up menu. Click **Show Parameters** to display the Recon Parameter Panel. Click the **Inline Options** tab. Click the **Static Start Time [s[** and/or **Static Duration [s]** and enter the number of seconds.

During reconstruction, you can create:

- 1 dynamic planar data
- 1 or more statics
  - **Static Start Time [s]**
  - **Static Duration [s]**

22.1.10 Retrospective composite and dynamic reconstruction

To access the **Dynamic SPECT [factory]** protocol reconstruction parameters, right click reconstruction job in the **Recon Ranges** area to display a pop-up menu. Click **Show Parameters** to display the Scan Parameter Panel. Click the **General Recon** tab. Click the **Recon Phases**, **Rotations per Phase**, **Recon Images**, and/or **No. of Images** and enter the desired numbers for phases or images.

Dynamic SPECT acquisition has two different acquisition types:

- Composite SPECT
  - Creates a single reconstructed volume based on the rotations accepted in Quality Check step
- Dynamic SPECT
  - Creates a multiple reconstructed volume based on:
    - Number of phases
    - Rotations per phase
    - Recon images per phase
  - Recon image duration per phase (the total acquisition time for each reconstruction image) and the number of images are calculated by the system. Theses are read-only parameters. For the recon image duration, the calculation is Rotation Time x Rotations per Phase / Recon Images. The number of images is calculated by adding all the Recon Images for all phases.

For example, if the following were entered:

Rotation Time = 180 seconds

Number of rotations = 10

Recon Phases = 2

Rotation per phase:

- Phase 1 = 4

- Phase 2 = 6

Recon Images per phase:

- Phase 1 = 2

- Phase 2 = 1

The calculation would be Recon Image Duration [s] for phase 1 = 180 seconds x 4 / 2 = 360 seconds.

The number of images calculation would be 3, which would be the sum of all Recon Images per phase.

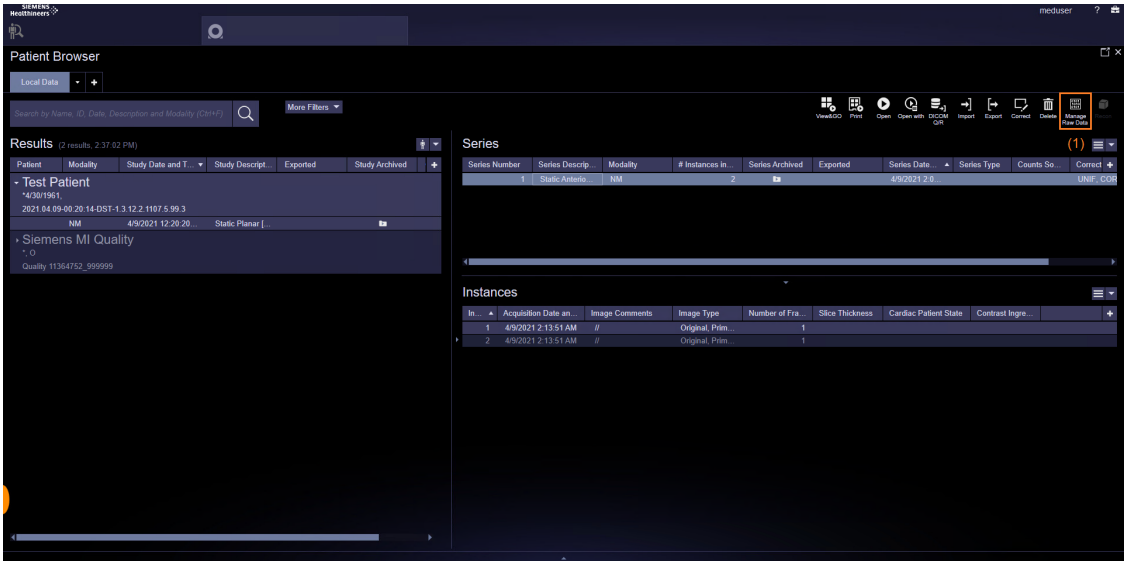
22.1.11 Managing raw data

Manage Raw Data can be used for both CT and SPECT raw data.

The maximum length of a SPECT raw data file including the data path to export is 260 characters. A raw data file with a name and path that exceeds this length cannot be exported by the system. Limit an acquisition name including data path to 260 characters.

From the top right of the **Patient Browser**, the **Manage Raw Data** icon can be selected or right click a patient in the Patient Browser to select it from a context menu.

The example screens are representational and are intended to identify areas of the screen. See your system's screen for actual language and software content.

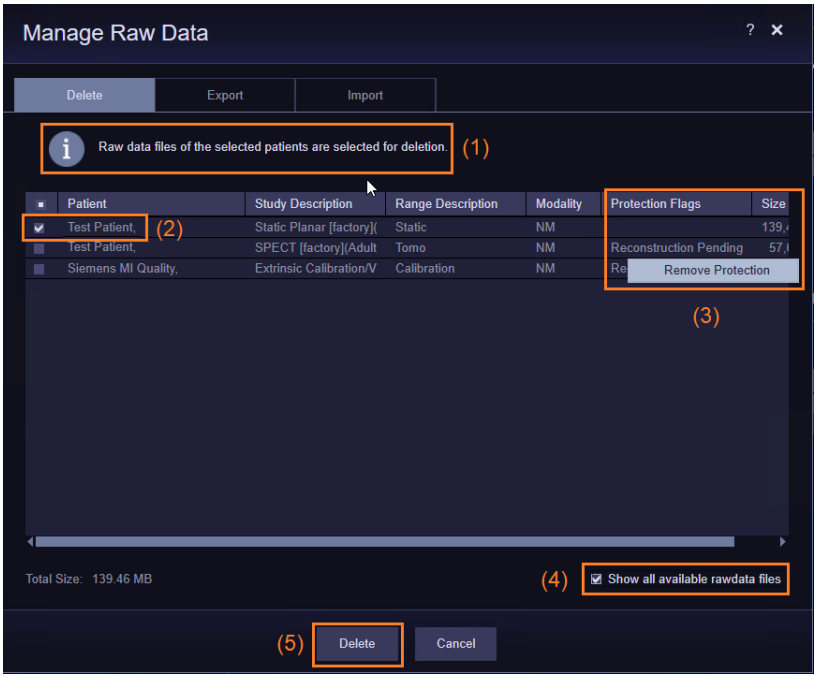


(1) Manage Raw Data Icon



Manage Raw Data Icon

When selected, the Manager Raw Data window is displayed.



(1) Raw data file messages
(2) **Patient** Checkbox for deletion
(3) **Remove Protection** Pop-up Selection
(4) **Show all available raw data files** Checkbox
(5) **Delete** Button

Raw data file messages appear at the top of the window depending on selections of window content.

No raw data files are selected for deletion. Please select the raw data files you want to delete. This message appears if no raw data files are displayed. Select the **Show all available raw data files** checkbox to display raw data files in the window.

Raw data files of the selected patients are selected for deletion. This message appears if raw data files are displayed and a file's checkbox is selected. Click the **Delete** button to remove a file. A second window will appear to confirm the deletion: **Confirm Raw Data Deletion. Are you sure you want to permanently delete all selected raw data files? Yes No**. Click the appropriate button.

Only raw data files that do not have protection may be deleted. Check the protection flag status. This message appears if you are attempting to delete a raw data file that has a status of **Reconstruction Pending**, indicating it is protected from deletion. Right click anywhere within the raw data file line and a **Remove Protection** pop-up selection will appear. Click it to remove the protection from deletion. A second window will appears to confirm the deletion: **Confirm Remove Protection. Are you sure you want to premanently remove "raw file name" protection flag from seleceted raw data files? Raw data files will not be protected from deletion anymore! Yes No**. Click the appropriate button.

22.1.12 Performing automated raw data deletion

Automatic raw data automatic deletion can be configured by a clinical administrator. Deletion can start when a trigger selection is reached. Both triggers are based on the disk space available in an Image Reconstruction System (IRS) for CT data and a Molecular Acquisition and Reconstruction System (MARS) for MI data. When the trigger is reached, any raw data that is not deletion protected, and that meets the date criteria, will be deleted.

To set up automated raw data deletion, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

  The Login page opens.

2 Login on to the Administration Portal.

3 Click the **Technical Configuration** tab.

  On the left, a navigation tree is displayed.

4 Select **DICOM Data Handing**.

5 Select **Raw Data Auto Deletion**.

  The **Raw Data Auto Deletion** page is displayed.

  For the **Trigger point for Deletion** selections, there are two checkboxes.

6 Select the **If database raw data fill-state has reached [###] %** checkbox and enter a number for the percentage limit in the **[##]** field (limit of 99%) to trigger the automatic deletion.

7 Select the **If raw data disk space only allows the data of [##] patients to be stored** checkbox and enter a number of patients (limit of 99 patients).

For the **Raw data to be deleted (only unprotected raw data)**, there are two settings.

8 Enter in the **Raw data older than** field **[xx] day(s)** (limit of 99 days) **and [##] hours** (limit of 23 hours).

9 Click the **Save** button to confirm any changes or the **Cancel** button to void any changes.

22.1.13 Performing external CT for attenuation correction

To perform an external CT for attenuation correction, perform the following steps.

1 From the **Patient Browser**, drag the CT recon job from a different protocol to the **Patient** tab or the **Recon Ranges** area of the protocol.

2 When the cursor displays a **+** sign symbol, release the button.

3 The external CT appears as an option in the **Attenuation Correction** parameter list.

Only Siemens CT can be used.

4 SPECT and CT data will not be registered because they come from different protocols, therefore, manual registration is required.

22.1.14 Performing auto tasking

To configure a protocol to perform automatic reconstruction, use the following instructions.

1 From a protocol, right click a reconstruction job in the **Recon Ranges** area.

A pop-up menu is displayed.

2 Click **Show Parameters** to display the recon parameter panel.

3 Click the **Auto Tasking** tab.

Click the desired parameters and their settings:

- **Auto Recon** - set to **On** for automatic reconstruction.
- **Transfer Nodes** - select a destination network node.
- MI **Auto View&GO** - set to **On** for automatic View&GO.
- **Auto Printing** - set to **On** for automatic printing.

22.1.15 Close task

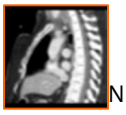
In the Close task, a list of all the reconstruction jobs is available with specific reconstruction progress. Prioritization is only supported for CT reconstructions.

22.1.16 Job view

If a reconstruction fails, a more detailed error messags can be found in the Job View. See the Job View topic for more information. (➔ Page 313 *The Job View*)

22.1.17 Planning Base area

The icons in the **Planning Base** area indicate the image types that can be used as a planning base.

Icon	Description
 CT  NM CT Recon icon after reconstruction (example)	Indicates a performed reconstruction series. Clicking the icon loads the series as planning base.

Icon	Description
 CT  NM Real-time image icon	Indicates a real-time image series. Clicking the icon loads the series as planning base.
 Topogram icon	Indicates the topogram. Clicking the icon loads the topogram as planning base.

22.1.18 Recon control area

Button	Description
Recon	Submits a reconstruction to start the resconstruction.
Cancel	Cancels the reconstruction of the selected recon job.

22.1.19 Execution control buttons after scanning

Button	Description
Recon All button	Submits all valid reconstruction jobs for reconstruction.
Next button	Opens the **Close** task.
Cancel button	Not active for the **Reconstruction** task.

22.2 Performing an automatic reconstruction

Recon jobs for which the **Auto Recon** option is set to **On** in the protocol before the scan has started are configured for automatic reconstruction.

Automatic recon jobs are indicated by the **Auto** label in the recon icon.

(CT only) If no quality check (**Check&GO**) is configured in the protocol, automatic recon jobs are started automatically once scanning the range is finished.

If a quality check is configured, proceed as appropriate.

If parameter conflicts occur, the reconstruction is not started automatically. You have to solve the conflicts and start the recon jobs manually.

22.3 Planning a reconstruction

Planning a reconstruction means adapting the reconstruction settings of the scan protocol to the needs and purpose of the current examination.

22.3.1 Loading the planning base

You can use the following image series as planning base for your reconstruction:

- Topograms (CT only)
- (CT) Real-time image series of the range, or (NM) Fast Recon image of the range
- (CT) Reconstructed image series of the range (**Fix Axial** reconstructions and Non-**Fix Axial** reconstructions)
- (NM) Reconstructed Non-CT Attenuation Correction (NAC) image series of the range (Not grouped with a CTAC job.)

Recon&GO image series cannot be used as a planning base.

1 In the **Planning Base** area, click the icon that represents the required image series.

  The image series is loaded as planning base into the image area.

2 Proceed with adapting the recon jobs.

For MI reconstruction, the planning base object must be reconstruction job that is not associated with image registration. Reconstruction jobs Field of View (FOV) cannot be interactively adjusted. They must be adjusted using zoom parameters. Also, Non-Attenuation Correction (NAC) reconstructions cannot be reconstructed off center.

22.3.2 Changing the recon volume

One step of reconstruction planning is to specify the size and position of the recon volume.

1 In the **Recon Ranges** area, select the recon job to be planned.

2 Use the coronal, the sagittal, and the axial segments to change the recon box appropriately.

  You can change the size and the position of the recon box.

  In Non-**Fix Axial** reconstructions, you can rotate the segment reference lines as a means of rotating the recon box to match the anatomical position of the patient. (CT only)

  The changes are applied to all segments. The orientation cube visualizes the orientation of the recon box in relation to the patient. (CT only)

3 In the preview segment, check if the expected reconstruction yields the required result.

4 Once the recon box fits the requirements, proceed as appropriate for your workflow.

  If necessary, check and change the other recon parameters.

  – or –

  Start the reconstruction.

Resizing the recon box

You can adapt the size of the recon box graphically in any of the segments. (→ Page 412 *Graphical recon range planning*)

Moving the segment reference lines

You can move the reference lines individually in the segments. Moving a reference line in one segment accordingly scrolls through the image in the segment that corresponds to the reference line.

1 In one of the segments, move the mouse cursor over the required segment reference line until it changes the shape into the moving pointer.

2 Drag the mouse in the direction in which you want to move the segment reference line.

The segment of the corresponding view is updated.

3 Stop dragging when the required position is reached.

The segment reference lines always stay perpendicular to each other.

4 Check the position of the recon box in the segments.

– or –

Scroll through the image stack in the preview segment.

Rotating the segment reference lines

In Non-**Fix Axial** reconstructions, you can rotate the segment reference lines as a means of rotating the recon box to match the anatomical position of the patient (CT only).

1 In one of the segments, move the mouse cursor over a reference line until it changes the shape into the rotation pointer.

2 Drag the mouse in the direction in which you want to rotate the segment reference lines.

The segment reference lines are rotated accordingly.

3 Stop dragging when the required rotation is reached.

4 Check the position of the recon box in the segments.

Changing the recon parameters in the recon parameter panel

The recon parameters are preset in the scan protocol. You can view and change the parameters for each individual recon job in the recon parameter panel.

1 In the **Recon Ranges** area, right-click the icon of the recon job whose parameters you want to change.

2 From the context menu, choose **Show Parameters**.

The recon parameter panel opens. The recon parameter panel is the recon-specific subset of the **Protocol Parameters** tab that is available in the **Protocol** task.

3 In the **Category** area, click the button of the parameter category to be checked.

The selected category button is highlighted. The parameters of the selected category are displayed in the relevant column of the parameter panel.

4 Select the required parameter.

5 Change the parameter value as appropriate.

The background color changes for the modified parameter and all dependant parameters.

The background becomes green if the new parameter value is valid.

The background becomes yellow if the new parameter value is invalid. Additionally, the corresponding category button is highlighted with an exclamation mark on a yellow circle. If a parameter value is invalid, the recon job cannot be reconstructed.

6 Change the values of all parameters that have a yellow background.

22.3.3 Copying all recon parameters

You can copy all recon parameters of a recon job to another recon job in the same range or in different ranges. Thus, you can use the settings of a recon job as a template for other recon jobs.

1 In the **Recon Ranges** area, right-click the icon of the recon job that is to be used as a template.

2 From the context menu, choose **Copy all Recon Parameters**.

3 Right-click the icon of the recon job to which the parameters are to be applied.

4 From the context menu, choose **Paste all Recon Parameters**.

All copied recon parameters are applied to the selected recon job, including the autotasking functions.

To avoid parameter conflicts, only apply the **Copy all Recon Parameters** function to recon jobs of the same anatomical region.

22.3.4 Copying the recon volume

(CT only) You can copy the recon box of a recon job to another recon job of ranges that mainly covers the same area, for example, to apply a recon box from a spiral scan with contrast medium to a recon box without contrast medium.

Copying the recon volume is useful if you need to apply a complex recon box to recon jobs from a scan step to another scan step. The properties of the recon box are applied, for example, its size and its rotation, while the image orientation of the target volume is kept.

Copy / Paste Volume Paramaters		Target		
		Group	Non-Group	
			CTAC job	Non-CTAC job
Source	CTAC job	not applicable	Source/Target with same CT job, Paste all Volume Parameters	Paste all Volume Parameters but Offset (X, Y)
	non-CTAC job	not applicable	not applicable	Paste all Volume Parameters

1. In the **Recon Ranges** area, right-click the icon of the recon job whose recon box is to be reused.
2. From the context menu, choose **Copy Recon Volume Parameters**.
3. Right-click the icon of the recon job that is to reuse the recon box.
4. From the context menu, choose **Paste Recon Volume Parameters**.

   The copied recon box is applied to the selected recon job.

To avoid parameter conflicts, only apply the **Copy Recon Volume Parameters** function to recon jobs of the same anatomical region.

22.4 Image registration

Manual rigid registration between a CT and SPECT images can be performed so that the CT can be used for attenuation correction in the SPECT reconstruction.

Multi-volume image registration can be performed with SPECT and CT data from the same Symbia Pro.specta system, or with a CT from a different Siemens scanner referred to as an external CT.

Manual image registration can be performed with each phase of dynamic SPECT data and CT data acquired on any model in the Symbia hybrid platform.

Manual image registration can be performed with SPECT data and CT data acquired on any model in the Symbia hybrid platform.

Nuclear medicine (NM) images are reconstructed in CT coordinates. The results are registered, and no 3D image registration object is created (applicable to attenuation correction (AC) and Group NAC/AC (non-attenuation correction/ attenuation correction)).

There are three different options for image registration: **Manual**, **Automatic**, and **Reset**.

The MI and CT frame of reference is checked for setting the initial registration with the following conditions:

- Same frame of reference: There is no initial registration.
- Different frame of reference: The initial registration is created as a geometric registration based upon volume centers when viewing the data in the fused display in the reconstruction task card. If no active registration is found when the frame of reference is different, the reconstruction submission is prevented and a message is displayed.

The active MI recon job is displayed with the Source CT in a fused volume display where MI is the base image and CT is the overlay image.

You can adjust the ratio of Alpha blending between base and overlay data in a fused image. The blending ratio is changeable from Coronal, Sagittal and Transversal planning views of the recon layout. The change of blending ratio is synchronized in all planning views of the recon planning layout. A slider control is provided in planning views to adjust the blending ratio.

The alpha blending ratio changes can be saved and applied when viewing any other attenuation correction (AC) reconstruction jobs of the active scan or reconstruction workflow.

A different Look Up Table (LUT) is displayed based on the ratio of alpha blending and is applied as follows.

- **0% blending ratio** - Displays only the functional images, and the change of the LUT from planning or preview is applied to all segments.
- **100% blending ratio** - Displays only anatomical images in planning segments, and no LUT is applied and the image is displayed in gray scale. Change of LUT from preview changes only the LUT for the preview segment.
- **All other blending ratios** - The fused image is displayed as per the blending ratio, and the change of the LUT from the planning segment applies to only planning segments, change of the LUT from preview changes only the LUT for the preview segment.

The following registration tool icons are displayed in the Tools Area:

- Manual Registration
- Automatic Registration
- Reset Registration

Registration tool icons are enabled when an open MI reconstruction job is selected, and the CT volume or its real time display (RTD) image is available linked as an attenuation correction CT series.

Real time display is a system generated CT volume that is created before the full resolution CT is reconstructed. It can be displayed and used for reconstruction range planning. Its like a Fast Recon for SPECT.

The setting of the registration matrices are managed between hybrid images and scan steps with the following conditions:

- When any attenuation correction (AC) SPECT reconstruction job remains open for reconstruction, an active registration matrix is created between the SPECT-CT scan pair.
- The active registration matrix is synchronized to all open AC SPECT reconstruction jobs that are linked with any CT reconstruction job from the same SPECT-CT scan pair.
- In the case of an External CT, it is treated as a different SPECT-CT scan pair.
- When no open AC SPECT reconstruction job remains within the same SPECT-CT scan pair, when you repeat a closed AC SPECT reconstruction job, the target reconstruction job inherits the active registration matrix used for the source AC SPECT reconstruction job.

Within the protocol is stored each registration matrix and the series unique identifier (UID) relationship between the series used for completed reconstruction jobs and any current registration(s) associated with open recon job(s). This applies for both identity and non-identity matrices.

22.4.1 Manual image registration

If the manual registration in-the segment tool is not selected, the manual registration tool is activated when you click the **Manual Registration** tool icon in the tools area.

When Manual Registration is selected:

- The reconstruction range planning tools are deactivated in the layout.
- Select the manual registration tool and you can manually adjust the registration between MI and the attenuation correction CT series in a hybrid scan.

When Manual Registration is selected for a hybrid scan, the keyboard arrow keys can be used to manually adjust the registration between MI and the attenuation correction CT series.

The following options are provided to turn off the Manual Registration in-the segment tool displayed in the alignment layout, and the tool icon displayed in the tools area:

- Press the **Escape** key for the selected segment.
- Switch **Manual Registration** to **Off** from the tools area.
- Switch to a different recon job.
- Submit the reconstruction job.
- Change the reconstruction task to any other task.

Once the tool is turned off, the manual registration is removed from the-segment tool in the layout, applies the registration and displays the reconstruction range graphics planning in-the segment tool in the layout. If the recon job is submitted all in-segment tools are turned off including reconstruction range graphics planning.

Note: The manual registration tool remains active when automatic registration or reset registration are selected.

22.4.2 Automatic image registration

When the Automatic Registration tool icon is clicked, an automatic registration is performed between the selected MI reconstruction job with an attenuation correction CT series selected or its real time display (RTD) image. Automatic image registration is applied iteratively. It starts from the current (or active) registration.

22.4.3 Image registration reset

When the **Reset Registration** tool icon is clicked:

- a scanner registration is applied between the selected MI reconstruction job and the reference CT volume if they have the same frame of reference,
- a geometry registration (center volumes) is applied between the selected MI reconstruction job and the reference CT volume if they have different frames of reference.

22.5 Retrospective gating reconstruction

For cardiac gated MI scans, you can review the following gating information after a scan has been completed:

- Beat histogram of acquired beats
- Beat window used for image formation

When a full beat histogram is available, automatic beat selection is performed for any open cardiac gated reconstruction job. The beat window selected applies to all open gated jobs in the scan.

You can manually adjust the beat window for cardiac gated reconstructions after the scan completes. The beat window selected applies to all open gated jobs in the scan.

You can optimize restrospective gating with pre-ventricular contraction (PVC) options.

The full beat histogram is saved with the reconstructed 2D and 3D gated data.

22.6 Group reconstruction

A group (reconstruction) recon consists of reconstructions that share multiple parameters, including a reconstruction range. Only one reconstruction range needs to be planned, and the output of one reconstruction job results in multiple reconstruction series.

- A group recon can have two or more reconstructions.
- A group recon can only be configured in Exam Designer.
- Only one open group recon per scan is supported. A group recon can only be repeated if the grouped recons are completed.
- From the Recon Parameter Panel, click the **Recon&GO** tab. Click the **Group Recon** tab, and then click **On** to enable group reconstruction.



Recon Range Tomogram Group Reconstructions

Pararameters shared:

- Match CT Slices	- Fix Axial	- Gates
- Slice Thickness	- Image Orientation	- PVC Threshold and rejection
- Increment	- Matrix Size	- Recon phases (rotations, recon images, recon image duration)
- Image Order	- Width and Height	- Body Part Examined
- Basic Recon Mode	- Center X and Y	- Requested Procedure
- Intra-recon and Respiratory Motion Correction	- Zoom	- - - - - -

More group reconstruction information can be found for the following topics:

- Group reconstruction synchronization (➔ Page 643 *Group reconstruction synchronization*)
- Group reconstruction one open group (➔ Page 645 *Group reconstruction one open group*)
- Group reconstruction configuration (➔ Page 645 *Group reconstruction configuration*)
- Group reconstruction repeat (➔ Page 645 *Group reconstruction repeat*)

  Group reconstruction delete (➔ Page 646 *Group reconstruction delete*)
- Group reconstruction configuration (➔ Page 646 *Group reconstruction configuration*)
- Group reconstruction browser (➔ Page 647 *Group reconstruction browser*)

- Group reconstruction graphical range planning (➔ Page 647 *Group reconstruction graphical range planning*)
- Group reconstruction submisssion (➔ Page 647 *Group reconstruction submisssion*)
- Group reconstruction save outputs (➔ Page 647 *Group reconstruction save outputs*)
- Group reconstruction job progress (➔ Page 648 *Group reconstruction job progress*)
- Group reconstruction attentuation correction CT Series (➔ Page 648 *Group reconstruction attentuation correction CT Series*)
- Group reconstruction identification tag (➔ Page 648 *Group reconstruction identification tag*)

22.6.1 Group reconstruction synchronization

Multiple reconstructions can be performed simultaneously in a group with the following synchronizations:

- Graphic Range Planning (GRP) result
- Job submission and progress display
- Saving
- Certain reconstruction parameters, including all Field Of View (FOV) and spatial parameters.
- Linked CT jobs

The following parameters are shared with group reconstruction.

Category	Parameter Name
General	Match CT Slices
	Slice Thickness (mm)
	Incresment (mm)
	Image Order

Category	Parameter Name
	Basic Recon Mode (BRM)
	Intr-Recon Motion Correction (MC)
	Fix Axial
	Image Orientation
	Matrix Size
	Width (mm)
	Height (mm)
	Center X (mm)
	Center Y (mm)
	Zoom
Physio	Gates
	PVC (pre-ventricular retraction) Threshold (%)
	Post PVC Rejection
	Recon Phases
	Per Phase: Rotations
	Per Phase: Recon Images
	Per Phase: Recon images Duration(s)
	Respiratory Motion Correction (MC)
Task Automation	Auto Recon
	Body Part Examined
	Requested Procedure

When 3D reconstruction jobs in the same scan step are defined as a group, the following parameters are matched within each reconstruction job specified in that group:

Phases	Image Orientation
Rotations	Matrix Size
Recon Images	Width
Recon Image Duration	Height
Match CT Slices	Center X
Slice Thickness	Center Y
Increment	Zoom
Image Order	Physio Recon Parameters - Gates, PVC Threshold, Post PVC rejection
Basic Recon Mode	Auto Recon Setting
(i) Motion Correction	Body Part Examined
(b) Motion Correction	Requested Procedure
Fix Axial	- - -

22.6.2 Group reconstruction one open group

Only one open group reconstructin is allowed per scan step.

22.6.3 Group reconstruction configuration

A group reconstruction can only be configured during protocol configuration.

22.6.4 Group reconstruction repeat

Repeat group reconstruction enables copies of jobs in the group to be made to form a new group. A group reconstruction can be repeated from a group reconstruction with the following conditions

- A group reconstruction cannot be repeated while a scan step in the exam workflow is in progress.
- A group reconstruction cannot be repeated from an open group reconstruction.
- Parameters not copied to the repeated job when they are data-driven.

When 3D reconstruction jobs in the same scan step are defined as a group, the option to repeat the entire group is provided only after the Group reconstruction has been completed.

When 3D reconstruction jobs in the same scan step are defined as a group, the option to repeat a single job from within the group is provided except when the group reconconstruction job is in a submitted or in progress state.

22.6.5 Group reconstruction delete

A group reconstruction can be deleted, except for the following:

- A group reconstruction cannot be deleted while a scan step in the exam workflow is in progress.
- A group reconstruction cannot be deleted while its reconstruction is in progress.
- A closed group reconstruction cannot be deleted.
- Jobs in group reconstruction are deleted altogether.
- A group reconstruction cannot be deleted if it is the last remaining 3D reconstruction.

22.6.6 Group reconstruction configuration

The **Group Recon** parameter is located on the **Recon&GO** tab for grouping Molecular Imaging 3D reconstruction jobs from the same volume. Right click a reconstruction job and select **Show Parameters** from the context menu to display the **Scan/Recon** parameters.

The **Group Recon** parameter is either **On** or **Off** and can be configured in Exam Designer by a system administrator. Otherwise, the parameter value displayed in read only.

When **Image Type** equals **PET**, **NM Recon Tomo**, or **NM Recon Gated Tomo**, the category Group Recon is available. Otherwise it is blank.

When a protocol is configured in the Exam Designer, any 3D reconstruction job within a single volume can be marked as **On** in the Recon Grouping category.

Reconstruction jobs within the same Group have the same Basic Recon Mode (BRM). Each Group **On** selection updates the BRM, and if any one BRM is modified within a Group, all the BRM's are updated to be synchronized.

22.6.7 Group reconstruction browser

The reconstruction browser displays a linked chain graphic as an indicator that the reconstruction jobs are part of the same group, meaning they all receive the same spatial parameters, for example, height and width.

22.6.8 Group reconstruction graphical range planning

When 3D reconstruction jobs in the same scan step (single volume) are defined as Group, the graphical reconstruction range planning results are matched across the group.

22.6.9 Group reconstruction submisssion

When 3D reconstruction jobs in the same scan step are defined as a group and the required data for the group job is available, All reconstruction jobs in that group are submitted to the Molecular Acquisition and Reconstruction System (MARS) at the same time with the submission for reconstruction of any one of the jobs in the group.

22.6.10 Group reconstruction save outputs

When 3D reconstruction jobs in the same scan step are defined as a group, the reconstruction results from the entire group are saved, including derived outputs (for example, mu-map, zone-map, synthetic planar) to the database.

When 3D reconstruction jobs in the same scan step are defined as a group, no reconstruction results are saved from the entire group, including derived outputs (for example, mu-map, zone-map, synthetic planar) to the database when any reconstruction task in that group fails.

22.6.11 Group reconstruction job progress

When 3D reconstruction jobs in the same scan step are defined as a group, the reconstruction progress is displayed for each job as a group of synchronized progress bars. Progress also includes failure. If any fail, then they all fail. If any job is cancelled, all the jobs are cancelled.

22.6.12 Group reconstruction attentuation correction CT Series

When creating multiple SPECT attenuation correction (AC) reconstruction jobs in a Group, the AC CT series selected must be syncronized across the SPECT AC reconstruction jobs in the defined Group. If you change the AC CT series in one job that is part of the group, then the system changes all the CT series in the group. The spatial parameters for the MI group output is based on the CT input. Therefore, the CT input must be the same within the group.

Attenuation Correction Calculated and **None** are not synchronized. Being in a group has no effect on the Attenuation Correction setting when the parameter is set to **Attenuation Correction Calculated** or **None**. There is no CT series dependency, so no synchronization or match is required.

22.6.13 Group reconstruction identification tag

When 3D reconstruction jobs in the same scan step are defined as a grouped reconstruction, Modality Viewer will perform the same operations; that is, short axis reorientation or masking, to the reconstructions belonging to the same grouped reconstruction.

22.7 Starting the reconstruction

Once the recon jobs are planned and no parameter conflicts exist, you can start the reconstruction.



If applicable, check the **Auto Tasking** parameters of the recon jobs before you start the reconstruction. Once a recon job is completed, the reconstructed images are distributed as specified in the **Auto Tasking** parameters.

22.7.1 Reconstructing individual recon jobs

A reconstruction can be performed multiple ways:

- From the **Patient Browser**, click a patient study, and then from the **Recon Ranges** area, click the **Recon Job** icon 

.

  – or –

  From a scan's task list, click the **Close** task, and then click the **Open Recon Tab** button.

  – or –

  From the **Patient Browser**, click a patient study, and right click and select the **Recon** button.

22.7.2 Reconstructing all recon jobs

- To reconstruct all recon jobs, click the **Recon All** button in the taskflow control.

  All recon jobs are reconstructed. Once the reconstruction is finished, the cubes in the recon icons are replaced by reconstructed CT images.

On the **Job Status** tab, you can change the process priority of recon jobs in progress. (➔ Page 649 *Checking the recon job status*)

22.8 Checking the recon job status

You can check the status and processing progress of recon jobs for the currently selected patient on the **Job Status** tab of the examination software.

- In the taskflow control, select the **Close** task.

  The **Job Status** tab opens. The status of the recon jobs is indicated by a progress bar in the **Recon Progress** column.

You can change the processing sequence of recon jobs or cancel recon jobs. (➔ Page 650 *Prioritzing a recon job*) (➔ Page 649 *Checking the recon job status*)

For an overview of all recon jobs that are currently being processed, open the **Job View** and select **Recon** in the **Job Type Control** area. (➔ Page 319 *Recon Job View*)

22.8.1 Prioritzing a recon job

✓ The **Job Status** tab is open.

1 Among the queued recon jobs, select the one that is to be processed next.

2 Click the **Prioritize** button.

The selected recon job is moved to position **1** in the processing queue. The sequence of the remaining recon jobs is not affected.

22.8.2 Canceling a recon job

✓ The **Job Status** tab is open.

1 Select the recon job to be canceled.

2 Click the **Cancel** button.

Processing the selected recon job is stopped. The recon job stays in the recon job list.

22.9 Special reconstructions with Recon&GO

The **Recon&GO** parameter category provides parameters for special reconstructions:

- **Spectral Recon**

  Spectral Recon recon jobs allow you to perform basic grey-scale reconstructions for Dual Energy images that are required to show other image types than 120 kV equivalent images. (➔ Page 576 *Dual Energy Spectral Recon reconstructions*)

- **Inline Results**

  Inline Results allow you to configure reconstructions including postprocessing that can be generated automatically. The availability of the Inline Results reconstruction types in a scan protocol depends on the scan mode.

- **Multi Recons**

  Multi Recons allow you to perform multiple reconstructions for the same anatomic coverage out of one recon job. These so-called sub recon jobs share most of the reconstruction parameters but provide different orientations or different image impressions. (→ Page 651 *Using Multi Recons*)

- **Fix Axial**

  The **Fix Axial** parameter switches on or off axial rotation in a recon job.

You can combine parameters of the **Recon&GO** category. However, some parameter combinations are not possible. If a combination is invalid, a conflict message is displayed.

For example, you cannot combine a **Spectral Recon** recon type with an **Inline Results > Multi Energy** type.

To make sure that only valid combinations are suggested in the parameter panel, select the parameters from left to right in the **Recon&GO** category.

- In Dual Energy protocols:

  Spectral Recon > Inline Results > Multi Recons > Fix Axial

- In single energy protocols:

  Inline Results > Multi Recons > Fix Axial

22.9.1 Using Multi Recons

A **Multi Recons** recon job consists of individual so-called sub recon jobs that share the same anatomic coverage and most of the reconstructions parameters.

You can select a **Multi Recons** recon job in the **Recon&GO** parameter category.

You can use a **Multi Recons** recon job to plan and perform these sub recon jobs as one combined recon job.

As the recon volume is the same in all sub recon jobs, you have to plan only one of the recon jobs. The identical volume is automatically applied to the remaining recon jobs. As a result, the time for planning and performing the reconstructions is reduced.

The following **Multi Recons** recon job types exist:

- (→ Page 652 *Orientation Multi Recons*)
- (→ Page 653 *Impression Multi Recons*)

A **Multi Recons** recon job produces a series of reconstructed images for each of its sub recon jobs. After the reconstruction, the **Multi Recons** icon is replaced by the icons that represent the reconstructed sub recon jobs (two or three icons).

The progress of a **Multi Recons** recon job displays the sum of the progress of all its sub recon jobs. Operations on **Multi Recons** recon jobs, for example, repeating, deleting, prioritizing, or canceling affects the **Multi Recons** recon job as one.

Orientation Multi Recons



You can use an **Orientation Multi Recons** recon job to reconstruct the same anatomical region in different image orientations.

Orientation Multi Recons recon jobs generate two or three standard reconstruction series using different image orientation values of the same recon volume.

The values for the following parameters are specific to every sub recon job:

- **Series Description**
- **Number of Images**
- **Image Order**
- **Comment**
- **Width [mm]**
- **Height [mm]**
- **Image Orientation**

- **Viewing Direction** (in combination with **Inline Results** recons)
- **Recon Ref. Lines**
- **Transfer Nodes**
- **Auto Transfer**
- **Auto View&GO**
- **Auto Printing**
- **syngo.via Datarole**

The remaining recon parameters are common to all sub recon jobs.

You can change the common parameters only for all sub recon jobs as one. You can change the specific parameters individually for each sub recon job.

Impression Multi Recons



You can use an **Impression Multi Recons** recon job to reconstruct the same anatomical region in different image impressions, for example, soft tissue and bone.

Impression Multi Recons recon jobs are available with two or three sub recon jobs that generate reconstruction series using the same recon volume but different values for the **Kernel** parameter and the **Window** parameter.

The values for the following parameters are specific to every sub recon job:

- **Series Description**
- **Number of Images**
- **Comment**
- **Window@120kV**
- **FAST Window**
- **Kernel**
- **iBHC** and **iBHC Material**
- **iMAR**
- **VRT Preset** (in combination with **Inline Results** recons)
- **Recon Ref. Lines**

- **Transfer Nodes**
- **Auto Transfer**
- **Auto View&GO**
- **Auto Printing**
- **syngo.via Datarole**

The remaining recon parameters are common to all sub recon jobs.

You can change the common parameters only for all sub recon jobs as one. You can change the specific parameters individually for each sub recon job.

22.9.2 Configuring reconstructions with organ-specific Parallel Ranges

Parallel Ranges reconstructions allow you to configure result series with parallel ranges for dedicated anatomical regions that can be generated automatically. You can select **Parallel Ranges** in the **Recon&GO** category or the **Inline Options** category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Parallel Ranges** reconstruction type, navigate to:

Inline Results > Parallel Ranges > Parallel Ranges

Additional parameters that are specific to **Parallel Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Parallel Ranges** parameters, as required.

5 Observe the dependency between specific **Inline Options** parameter settings and other recon parameter settings. *See Inline Options for Parallel Ranges in the Online Help*

6 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Image Type** in the **Image Impression** parameters category
- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Image Orientation** in the **Recon Box** parameters category
- **Slice Thickness** in the **General Recon** parameters category

7 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

8 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. Editing the results is only possible in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.3 Configuring reconstructions with Parallel Rib Ranges

Parallel Rib Ranges reconstructions allow you to configure result series with rib detection and parallel ranges that can be generated automatically.

You can select **Parallel Rib Ranges** in the **Recon&GO** category or the **Inline Options** category.

Parallel Rib Ranges results are read-only and cannot be edited further.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Parallel Rib Ranges** reconstruction type, navigate to:

Inline Results > Parallel Ranges > Parallel Rib Ranges

Additional parameters that are specific to **Parallel Rib Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Parallel Rib Ranges** parameters, as required.
See Inline Options for Parallel Rib Ranges in the Online Help

5 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category

6 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

7 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.4 Configuring reconstructions with Spine Ranges

Spine Ranges reconstructions allow you to configure result series with spine detection that can be generated automatically.

You can select **Spine Ranges** in the **Recon&GO** category or the **Inline Options** category.

Axial spine ranges generate parallel images perpendicular to the spinal channel.

The number of generated images depends on the length of the spine and the defined distance between the images.

Curved spine ranges create cross-sectional images along the spinal channel in the defined orientation (coronal or sagittal) and at the defined distance apart.

You can set the required image orientation (axial, sagittal, or coronal) in the **Recon Box** parameters category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Spine Ranges** reconstruction type, navigate to:

Inline Results > Parallel Ranges > Spine Ranges

Additional parameters that are specific to **Spine Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Spine Ranges** parameters, as required. *See Inline Options for Spine Ranges in the Online Help*

5 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Image Type** in the **Image Impression** parameters category
- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Image Orientation** in the **Recon Box** parameters category
- **Slice Thickness** in the **General Recon** parameters category

6 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

7 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. Editing the results is only possible in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.5 Configuring reconstructions with Parallel Vascular Ranges

Parallel Vascular Ranges reconstructions allow you to configure result series with vessel detection and parallel ranges that can be generated automatically.

Parallel vascular ranges create cross-sectional images along the centerline of the defined vessel range. Centerlines follow the course of vessels and allow you to detect lesions in the vessels.

You can select **Parallel Vascular Ranges** in the **Recon&GO** category or the **Inline Options** category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Parallel Vascular Ranges** reconstruction type, navigate to:

Inline Results > Parallel Ranges > Parallel Vascular Ranges

Additional parameters that are specific to **Parallel Vascular Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Parallel Vascular Ranges** parameters, as required.

5 Observe the dependency between specific **Inline Options** parameter settings and other recon parameter settings. *See Inline Options for Parallel Vascular Ranges in the Online Help*

6 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Image Type** in the **Image Impression** parameters category
- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Slice Thickness** in the **General Recon** parameters category

7 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

8 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. Editing the results is only possible in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.6 Reconstructing images with organ-specific Radial Ranges

Radial Ranges reconstructions allow you to configure result series with radial ranges for dedicated anatomical regions that can be generated automatically. You can select **Radial Ranges** in the **Recon&GO** or **Inline Options** category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Create a new recon job by repeating an existing one.

3 To select the **Radial Ranges** reconstruction type navigate to:

Inline Results > Radial Ranges > Radial Ranges

Additional parameters that are specific to **Radial Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Radial Ranges** parameters as appropriate.

5 Observe the dependency between specific **Inline Options** parameter settings and other recon parameter settings. *See Inline Options for Radial Ranges in the Online Help*

6 Set the required reconstruction parameters in remaining parameter categories.

For example:

- **Image Type** in the **Image Impression** parameters category
- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Image Orientation** in the **Recon Box** parameters category
- **Slice Thickness** in the **General Recon** parameters category

7 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

8 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. Editing the results is only possible in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.7 Configuring reconstructions with Radial Rib Ranges

Radial Rib Ranges reconstructions allow you to configure result series with rib detection and radial ranges that can be generated automatically. You can select **Radial Rib Ranges** in the **Recon&GO** category or the **Inline Options** category.

Radial Rib Ranges results are read-only and cannot be edited further.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Inline Results Radial Rib Ranges** reconstruction type, navigate to:

Inline Results > Radial Ranges > Radial Rib Ranges

Additional parameters that are specific to **Radial Rib Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Radial Rib Ranges** parameters, as required. *See Inline Options for Radial Rib Ranges in the Online Help*

5 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category

6 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Transfer**
- **Auto View&GO**

7 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.8 Configuring reconstructions with Radial Vascular Ranges

Radial Vascular Ranges reconstructions allow you to configure result series with vessel detection and radial ranges that can be generated automatically.

Radial vascular ranges create images displaying different viewing directions around the centerline of the defined vessel range by defined angles.

You can select **Radial Vascular Ranges** in the **Recon&GO** category or the **Inline Options** category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Inline Results Radial Vascular Ranges** reconstruction type, navigate to:

Inline Results > Radial Ranges > Radial Vascular Ranges

Additional parameters that are specific to **Radial Vascular Ranges** are available in the **Inline Options**.

4 Set the **Inline Options** for **Radial Vascular Ranges** parameters, as required.

5 Observe the dependency between specific **Inline Options** parameter settings and other recon parameter settings. *See Inline Options for Radial Vascular Ranges in the Online Help*

6 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Image Type** in the **Image Impression** parameters category
- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Slice Thickness** in the **General Recon** parameters category

7 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

8 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. Editing the results is only possible in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.9 Configuring reconstructions with Lung CAD results

Lung CAD reconstructions allow you to configure result series with included Lung CAD findings that can be generated automatically. You can select **Lung CAD** in the **Recon&GO** category or the **Inline Options** category.

Lung CAD results are read-only and cannot be edited further.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Repeat and modify an existing recon job.

3 To select the **Lung CAD** reconstruction type, navigate to:

Inline Results > Applications > Lung CAD

Additional parameters that are specific to **Lung CAD** are available in the **Inline Options**.

4 Set the **Inline Options** for **Lung CAD** parameters, as required. *See Inline Options for LungCAD in the Online Help*

5 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Slice Thickness** in the **General Recon** parameters category

6 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

7 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.10 Configuring reconstructions with CT CaScoring results

CT CaScoring reconstructions allow you to configure result series with included CT CaScoring results that can be generated automatically.

You can use CT CaScoring to evaluate calcified coronary lesions using non-contrasted cardiac CT data sets and to compare the patient results with data from heart disease studies. Using a reference database, you can compare the score of the patient with a reference group of the same age. The reference database is also used to calculate the coronary age.

Two result series are created:

- The **CaScoring Scored Volume** series contains all images with scored lesions of the patient.
- The **CT CaScoring Results** series contains the percentile chart displaying a graph of the patient score compared to a graph of the defined reference group. It also contains the scoring table, which provides the number of scored lesions in each artery.

You can select **CT CaScoring** in the **Recon&GO** category or the **Inline Options** category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Create a new recon job by repeating an existing one.

3 To select the **CT CaScoring** reconstruction type, navigate to:

Inline Results > Applications > CT CaScoring

Additional parameters that are specific to **CT CaScoring** are available in the **Inline Options**.

4 Set the **Inline Options** for **CT CaScoring** parameters, as required. *See Inline Options for CaScoring in the Online Help*

5 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Slice Thickness** in the **General Recon** parameters category

6 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

7 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. Reviewing and editing the results is only possible in the **CT CaScoring** application. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.11 Configuring reconstructions with ASPECT Score results

ASPECT Score reconstructions allow you to configure result series with a calculated aspect score that can be generated automatically. **ASPECT Score** reconstruction are available for native neurological scans.

The Alberta stroke program early CT score (ASPECTS) is a grading system for detection of early ischemic changes on non-contrast CT scans of the brain. It provides a score from 0 (most severe) to 10 (least severe). The **ASPECT Score** result is the calculated score including an overview on the 10 regions evaluated as per hemisphere. **ASPECT Score** results are read-only and cannot be edited further. If you open the results to review them, you may hide the region overlays by hiding graphical objects in your viewer.

You can select **ASPECT Score** in the **Recon&GO** category or the **Inline Options** category.

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that is to be configured.

– or –

Create a new recon job by repeating an existing one.

3 To select the **ASPECT Score** reconstruction type, navigate to:

Inline Results > Applications > ASPECT Score

4 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Slice Thickness** in the **General Recon** parameters category

5 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Recon**
- **Auto Transfer**
- **Auto View&GO**

6 Optional: Save the modified protocol.

A physician must review the results of **Inline Results** reconstructions before further evaluation or diagnosis. You can review the results in the **Reconstruction** task or in MI View&GO. For results of **Inline Results** reconstructions, **Automatic Result** is inserted as **Comment 2** by default.

22.9.12 Configuring reconstructions with RT Automatic Contouring

RT Automatic Contouring reconstructions create result series that include contouring of organs at risk. The contours are visible in **Sim&GO**, **MM RT Image Suite**, or the treatment planning system.

You can select **RT Automatic Contouring** in the **Recon&GO** category or the **Inline Options** category.

In Dual Energy protocols, **RT Automatic Contouring** can only be combined with a **Spectral Recon** parameter. If there was substantial patient motion during the scan, make sure to switch to **Spectral Recon** type **L3D** or **H3D**.

✓ Contouring structures are configured in **RT Automatic Contouring Configuration**. (➔ Page 707 *Structure Configuration*)

✓ An appropriate protocol is selected.

✓ The recon parameter panel is open.

1 Click the **Inline Options** tab.

The **Inline Options** parameters are displayed.

2 Localize the recon job that you want to configure.

– or –

Repeat and modify an existing recon job.

3 To select **RT Automatic Contouring**, navigate to:

Inline Results > RT Automatic Contouring.

Additional parameters that are specific to **RT Automatic Contouring** are available in the **Inline Options**.

4 To select the structure template according to the rules that are defined in the **RT Automatic Contouring Configuration**, set the **Structure Template Selection Mode** to **AUTO**.

– or –

To manually select the structure template or templates that you want to apply, set the **Structure Template Selection Mode** to **MANUAL**.

The **Structure Templates** parameter is displayed in the **Inline Options**. Select the relevant template or templates.

5 Observe the dependency between specific **Inline Options** parameter settings and other recon parameter settings. *See Inline Options for RT Automatic Contouring in the Online Help*

6 Set the required reconstruction parameters in the remaining parameter categories.

For example:

- **Kernel** in the **Image Impression** parameters category
- **Window@120kV** in the **Image Impression** parameters category
- **Slice Thickness** in the **General Recon** parameters category

7 Set the required parameters in the **Auto Tasking** parameters category.

For example:

- **Auto Transfer**
- **Auto View&GO**

8 Optional: Save the modified protocol.

A physician must review the contouring results before continuing the treatment planning. The contours can be reviewed or edited in **Sim&GO**, **MM RT Image Suite**, or the treatment planning system. The result series without contouring is visible in the **Reconstruction** task.

22.10 Opening a recon tab

If the required ranges are scanned and at least one reconstruction job is to be performed, you can open a recon tab for the scan patient. The scan patient is converted into a recon patient.

Converting the scan patient into a recon patient is useful, for example, if you must proceed with the next scan patient.

1 In the taskflow control, select the **Close** task.

The **Job Status** tab opens.

2 In the taskflow control, click the **Open Recon Tab** button.

The scan patient is converted into a recon patient. A new tab for the recon patient opens.

22.11 Performing an offline reconstruction

You can reconstruct recon jobs offline as long as the raw data is available.

Offline recon patients can be accessed in the **Recon Worklist** list or in the **Patient Browser** of the Patient Browser.

1 From the **Recon Worklist** list, select the patient whose recon jobs are to be finished.

– or –

In the toolbar of the **Patient Browser**, click the **Recon** icon.

The recon tab for the patient is opened.

2 Plan and perform the reconstructions as usual.

(➔ Page 632 *Planning a reconstruction*)

See *Performing a reconstruction* in the Online Help or the Instructions for Use.



Several recon tabs can be open at the same time. You can switch between the recon tabs.

23 Finalizing the examination

You can finalize an examination at any time even if some tasks are not yet completed. Finalizing an uncompleted examination may be necessary if the patient to be examined needs a rest or if an emergency patient needs to be scanned.

You can continue the examination at a later time. (➔ Page 679 *Continuing an examination*)

You can complete open recon jobs at a later time. (➔ Page 671 *Performing an offline reconstruction*)

The system provides the following possibilities to finalize the current examination:

- (➔ Page 673 *Closing the patient*)
- (➔ Page 670 *Opening a recon tab*)

23.1 Unloading the patient

Once the required scans are completed, you can unload the patient from the patient table.

1 On the CT control box, press the **Unload** key.

– or –

Press the **Unload** button on the Gantry Display while the patient protocol is still open.

The patient table is moved out of the gantry.

2 If required, assist the patient in getting off the patient table.

23.2 Closing the patient

You can finalize the current examination by closing the patient.

CAUTION

Automatically generated results are archived without being reviewed by a physician or a technician!

Wrong diagnosis

- Always review automatically generated results before sending them to other DICOM nodes.

CAUTION

Check mark for automatic archiving is configured by the system owner, for example, Auto send or Auto recon!

Wrong diagnosis

- Always check that automatically generated results are verified by a physician or technician before diagnosis.
- Make sure that the results of the currently active workflow are verified.
- Make sure that automatically stored data on the remote system is being verified in a timely manner.

1 In the taskflow control, select the **Close** task.

The **Job Status** tab opens. The **Job Status** tab provides an overview of all recon jobs and their status and auto tasking settings, for example, ongoing recon, finished recon, transfer nodes, *syngo*.via mapping.

2 If applicable, check the **Auto Tasking** parameters.

The **Job Status** tab displays the parameters that are preset in the scan protocol.

If necessary, you can adapt the parameters before reconstruction.

3 In the execution control, click the **Close** button.

The patient is closed. All pending recon jobs are processed in the background.

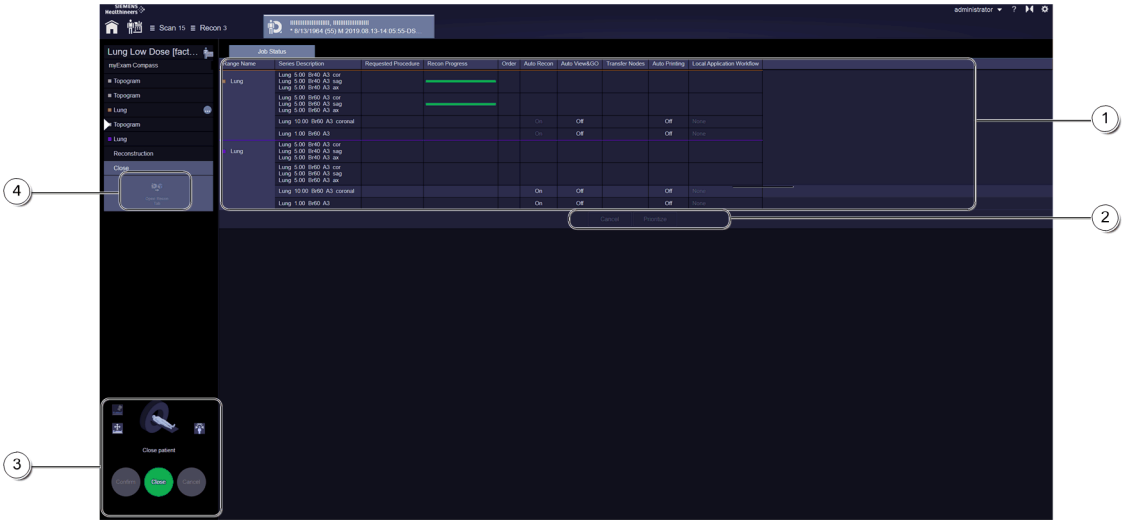
If there are uncompleted recon jobs, the patient is listed in the **Recon Worklist**. (➔ Page 671 *Performing an offline reconstruction*)

If no protocol has been loaded or if no range has been scanned, the patient is listed in the **Scan Worklist** and is available for an examination at a later time.

If at least one topogram or diagnostic range has been scanned, the assignment of the protocol to the requested procedure is saved.

23.3 Screen layout of the Job Status tab

The **Job Status** tab includes the following elements:



(1) (➔ Page 676 *Job Status parameters*)
(2) (➔ Page 676 *Job control buttons*)
(3) (➔ Page 677 *Close patient*)
(4) (➔ Page 677 *Open Recon Tab*)

23.3.1 Job Status parameters

Element	Description
Range Name	Displays the name of the range and the color indicator as specified in the scan protocol.
Series Description	Displays the name of the recon job.
Requested Procedure	Displays the name of the requested procedure that comes from the HIS/RIS or that was entered during the patient registration.
Order	Displays the position of the queued recon job in the recon job queue. (Not applicable for MI. Job priority cannot be adjusted for SPECT jobs.)
Recon Progress	Visualizes the processing progress of the reconstruction jobs: A green progress bar indicates a successful reconstruction. A red progress bar indicates a failed or a canceled reconstruction. A gray progess bar indicates a queued reconstruction. No progress bar indicates a planned reconstruction.
Auto tasking parameter columns	Auto tasking parameters for data distribution and post processing that are pre-set in the scan protocol. If necessary, you can adapt the parameters before reconstruction. Auto tasking parameters are not available for **Multi Recons**. Multi Recons are only applicable to CT jobs.

23.3.2 Job control buttons

Element	Description
Cancel	Cancels the selected recon job in progress.
Prioritize	Moves the selected queued recon job to the top position in the processing queue.

23.3.3 Close patient

Element	Description
Close button	Closes the patient.

23.3.4 Open Recon Tab

Element	Description
Open Recon Tab button	Opens a recon tab for the patient.

24 Continuing an examination

You can continue an examination in an existing study.

Continuing an examination comprises the following steps:

- Initiating the continuation in the Patient Browser or in the Scheduler. (➔ Page 679 *Initiating an examination continuation from the Patient Browser*) (➔ Page 679 *Initiating an examination continuation from the Scheduler*)
- Resuming the examination in the **Scan** tab

  (➔ Page 680 *Resuming an examination*)

24.1 Initiating an examination continuation from the Patient Browser

1 In the Patient Browser, right-click the required study of the patient and choose **Resume Examination** from the context menu.

The patient is scheduled and selected as a scan patient in the Scheduler.

2 In the Scheduler, click **Exam**.

– or –

Double-click the patient.

The patient is opened in the **Scan** tab. (➔ Page 680 *Resuming an examination*)

24.2 Initiating an examination continuation from the Scheduler

✓ The filter in the **Patient** list is set to **All**.

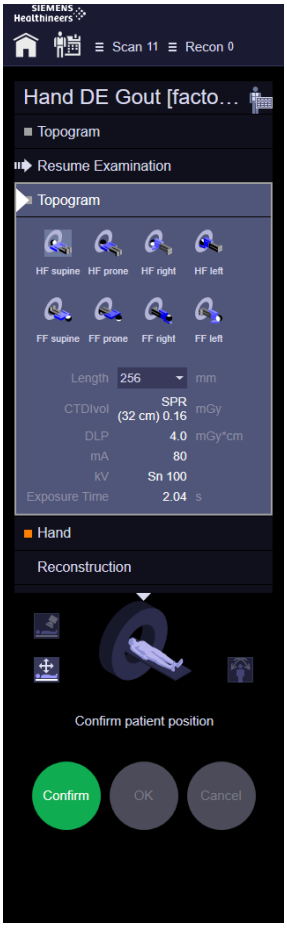
◆ In the Scheduler, right-click the required study of the patient and choose **Exam** from the context menu.

– or –

Double-click the patient.

The patient is opened in the **Scan** tab. (➔ Page 680 *Resuming an examination*)

24.3 Resuming an examination



Once the continuation of an existing study has been initiated, the examination can be resumed in the **Scan** tab. You can resume an examination multiple times.

The continuation point is indicated by the **Resume Examination** task in the taskflow control and in the timeline.

✓ The patient is positioned on the patient table and ready for examination.

1 Select and add a protocol.

2 Proceed as you would in a new examination.

After you have scanned and closed the patient, the following documentation is generated:

- Dose SR
- Patient Protocol
- Examination Report

25 About the Configuration Panel

The **Configuration Panel** is designed to adjust your workplace to your individual needs.

The **Configuration Panel** contains setting options that you can apply as a normal user or as a clinical administrator.

(→ Page 683 *Opening the Configuration Panel*)

(→ *Configuration tasks of the Configuration Panel*)

The settings are sorted in tabs according to feature categories.

Some changes only take effect after a restart of the local application.

25.1 Opening the Configuration Panel

The **Configuration Panel** offers you several options to adjust your workplace.



- On the access bar, click the **Settings** icon to open the **Configuration Panel**.

You apply your changes with **Apply** (the window remains open), or with **OK** (the window is closed).

To close the **Configuration Panel**, click this icon in the upper right corner of the **Configuration Panel**:



If you did not apply your changes, a message box is displayed.

25.2 Configuration tasks of the Configuration Panel

On the **Configuration Panel**, you can modify your workplace according to your individual needs. The following tabs contain the configuration tasks available.

On the **Client Settings** tab:

(➔ Page 684 *Enabling / disabling explicit authentication*)

(➔ Page 685 *Configuring the number of monitors*)

(➔ Page 685 *Setting the user interface language*)

(➔ Page 688 *Setting the idle session timeout*)

On the **Advanced Visualization** tab:

(➔ Page 693 *Navigating in the Advanced Visualization tab*)

(➔ Page 693 *Configuring Inline DE*)

(➔ Page 707 *Structure Configuration*)

On the **Display And Behavior** tab:

(➔ Page 688 *Adjusting the font size of annotations and handling of snapshots*)

(➔ Page 689 *Adjusting the findings behavior*)

(➔ Page 689 *Configuring the patient name format*)

(➔ Page 690 *Configuring image text*)

(➔ Page 690 *Configuring the call-up of the corner menus*)

On the **Export** tab:

(➔ Page 691 *Defining media writing profiles*)

(➔ Page 692 *Setting the displayed number of recently used nodes*)

25.2.1 Enabling / disabling explicit authentication

As an administrator, you can enable or disable explicit authentication (logon) in the **Configuration Panel**.

In case of enabled explicit authentication, the user must enter his Symbia Pro.specta X3 **User Name** and **Password** each time Symbia Pro.specta X3 is started.

1 Open the **Configuration Panel** and click the **Client Settings** tab.

2 Select the **Require authentication on startup** check box.

If this check box is selected, the user must explicitly log on when starting Symbia Pro.specta X3.

25.2.2 Configuring the number of monitors

In the **Configuration Panel**, you can select whether to display Symbia Pro.specta X3 on one or two monitors.

✓ You have administrator rights.

✓ The license for a dual monitor setup is available on your system.

1 Open the **Configuration Panel** and click the **Client Settings** tab.

2 In the **Multi Monitor Setup** section, select the **One monitor** option to display Symbia Pro.specta X3 on one monitor.

– or –

Select the **Two monitors** option to display Symbia Pro.specta X3 on two monitors.

3 Click **Apply**.

The changes take effect after a restart of the local application.

25.2.3 Setting the user interface language

In the **Configuration Panel**, you can select the language of the user interface (UI).

Tooltips and the Online Help are also displayed in the selected language.

1 Open the **Configuration Panel** and click the **Client Settings** tab.

2 In the **Select the UI Language** list, select the user interface language of your Symbia Pro.specta X3.

Symbia Pro.specta X3 supports the following UI languages:

- English
- German

- French
- Spanish
- Japanese
- Chinese

Symbia Pro.specta X3 does not support local differences in languages. For future UI language support, check the Release Information.

3 In the **Select Language for Date, Time and Number Format** list, select an entry.

Note that this setting will apply to **all** applications on your system.

If the Online Help is not available in your language:

- The Online Help as well as the tooltips are displayed in English.
- You can find PDF files of Operator Manuals and Instructions for Use for additional languages in the Online Help library.

For East Asian languages, you can use the Microsoft Input method editor to enter East Asian characters and symbols.

In case of language display problems, contact your administrator.

(➔ *See Troubleshooting language settings*).

Entering Chinese or Japanese patient names for emergency patients

✓ The UI language is set to Chinese or Japanese.

Upon entering Chinese or Japanese characters for the registration of an emergency patient, you may receive an error message and be unable to continue the registration. (➔ Page 268 *Registering an emergency patient*)

In this case, the local DICOM node may not accept the automatically generated suffix _Trauma because its language setting does not correspond with your UI language setting.

To avoid this error, follow the steps below.

1 Log on to the **Administration Portal** as a clinical administrator.

2 Select the **Technical Configuration** workspace and then choose **DICOM Nodes > Local DICOM Node** from the navigation tree.

The **Local DICOM Node** interface settings window opens.

3 Click **General Settings** to open the **General Settings** dialog box.



4 In the **SCU Settings** section, select the required language (Chinese or Japanese) from the **Select Local Language** list.

5 Select the **Use Unicode (UTF-8 / ISO IR192) for DICOM character encoding** check box.

6 Click **OK** to close the **General Settings** dialog box.

7 In the **Local DICOM Node** interface settings window, click **Save**.

8 Restart the *syngo* Acquisition Workplace to apply the changes.

25.2.4 Setting the idle session timeout

In the **Configuration Panel**, you can define the idle time after which the workplace is locked and a lock screen is activated to protect the system against unauthorized access.

This configuration task might be restricted to administrators.

1 Open the **Configuration Panel** and click the **Client Settings** tab.

2 In the **Lock screen** section, enter the time interval after which the lock screen should be activated.

– or –

To prevent the activation of a lock screen, enter **0**.

3 Click **Apply**.

Your changes take effect immediately.

25.2.5 Adjusting the font size of annotations and handling of snapshots

In the **Configuration Panel**, you can define the font size of annotation texts, and optimize the handling of snapshots.

1 Open the **Configuration Panel** and click the **Display and Behavior** tab.

2 Open the **Measurement and Snapshots Configuration** section.

3 In the **Measurements** section, choose a font size from the **Font size for annotations and measurements** list.

The **Font size preview** shows the currently selected font size.

4 From the **Optimize in Snapshots for** list, choose the quality for displaying the snapshots on different monitor types.

You can choose “Standard Monitor” or “High-Resolution Monitor”.

5 In the **Snapshot Images** section, choose the quality for saving snapshots from the **Optimize Snapshot Image for** list:

- “PACS reading”: Optimized for archiving in PACS and soft copy reading
- “Printing”: Optimized for print-outs

25.2.6 Adjusting the findings behavior

In the **Display and Behavior** tab of the **Configuration Panel**, you can predefine the findings behavior. When you select configuration options, you can skip manual steps when you create findings in the Viewer.

1 Open the **Configuration Panel** and click the **Display and Behavior** tab.

2 Open the **Measurement and Snapshots Configuration** section.

3 In the **Findings** section, select the **Automatically create findings for measurements** check box.

When you perform measurements, such as ROIs or distance lines, the values are automatically listed in the **Findings Navigator**.

4 Select the **Automatically create snapshot images for findings** check box.

When you create findings, snapshots of the images (in the resolution of the displayed segment) are automatically added to the findings in the **Findings Navigator**.

25.2.7 Configuring the patient name format

In the **Configuration Panel**, you can set the display format of the patient name used, for example, in the **Patient Browser** lists, on the **Patient** tab, and for the image text.

1 Open the **Configuration Panel** and click the **Display and Behavior** tab.

2 From the **Name Format** list, select the required option.

You have to restart the client, to take your changes effective.

25.2.8 Configuring image text

In the **Display and Behavior** tab of the **Configuration Panel**, you can set the attributes for image text customization.

If you have administrator rights, you can set the image text attributes either for a certain user (user-specific) or make them available for all users (site-specific).

1 Open the **Configuration Panel** and click the **Display and Behavior** tab.

2 Open the **Image Text Configuration** section.

3 Select a **Modality** from the list, for example, MR.

4 Select the attributes, that should be displayed as customized image text (for example, reduced image text).

– or –

Select **Show All** to display all predefined attributes for image text customization.

5 For administrators only: From the **Image Text Configuration** list, select the name of the image text configuration for which the change is requested (user-specific configuration or site-specific configuration).

Click **Apply** after each change otherwise your image text configurations will be lost when you choose the next configuration section.

25.2.9 Configuring the call-up of the corner menus

In the **Display and Behavior** tab of the **Configuration Panel**, you can configure how to open the corner menus and mini toolbars in the image segments of the reading workflows.

1 Open the **Configuration Panel** and click the **Display and Behavior** tab.

2 Open the **Corner Menu and Mini Toolbar Configuration** section.

3 Select the **On mouse over watermark** option to be able to open the segment corner menus and mini toolbars by hovering the mouse over the segment corners.

– or –

Select the **On click on watermark** option to be able to open the segment corner menus and mini toolbars only after clicking them (default system behavior).

After applying the settings they will take effect immediately.

25.2.10 Defining media writing profiles

In the **Export** tab of the **Configuration Panel**, you can manage media writing profiles for data exports from your system.

The system provides several default writing profiles for different purposes. The media writing profiles are available in the **Profiles** list of the **Export Data** dialog box when you are writing DICOM data on CD or DVD.

1 Open the **Configuration Panel**.

2 In the **Export** tab, click the **Media Burning Profiles** section to open it.

3 Click the **New** button to create a media writing profile.

– or –

Select a **Profile Name** from the list on the left and click the **Edit** button to change an existing media writing profile.

4 Enter a **Profile name**.

5 Select the **Compressed** check box if the data is to be written with lossy compression.

6 Select the **Create DICOM file system** check box if the data is to be written as DICOM file set.

7 Select the **Add Viewer** check box if a DICOM viewer shall be added to the medium (only available for the **Create DICOM file system**).

8 Choose an **Image Conversion** type:

- **Interoperability**: Exported data will be converted for best interoperability between modalities. This conversion type is preselected and cannot be modified if **Add Viewer** is selected.
- **Enhanced**: Data is not converted for export. Presentation States and enhanced MR formats, for example, are kept.

9 Select the **Anonymize as** check box and enter a name for the data, for example, if you want to use the medium for demonstration.

10 Select the type of anonymization **Full** or **Reduced** from the list.

If the **Reduced** option is selected, anonymization is only applied to certain data attributes.

11 To delete a media writing profile, select a **Profile Name** from the list and click the **Delete** button.

The changes you make in the **Export** tab will immediately take effect in the **Export Data** dialog box.

25.2.11 Setting the displayed number of recently used nodes

In the **Export** tab of the **Configuration Panel**, you can define the number of the configured remote nodes to be displayed in the **Target** list of the **Export data** dialog box.

The system keeps your defined export paths in the **Export data** dialog box. The paths or nodes are listed in the **Target** list when you export DICOM data to a network node. If you make any changes in the **Job Settings** tab, they will take effect immediately. (➔ *Exporting data in Symbia Pro.specta X3*)

1 Open the **Configuration Panel** and click the **Export** tab.

2 Open the **Recently Used Nodes** section.

3 In the **Length of recently used node list** field, enter the new number of **items** you want to display. The default value is 10 items.

Your changes take effect immediately.

25.2.12 Navigating in the Advanced Visualization tab

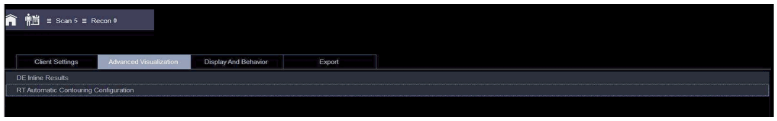
The **Advanced Visualization** tab comprises configuration sections for advanced reconstruction features that are available at the CT system, such as **DE Inline Results** or **RT Automatic Contouring**.



1 On the access bar, click the configuration icon.

The **Configuration Panel** is displayed.

2 Click the **Advanced Visualization** tab.



When you open the **Advanced Visualization** tab for the first time, the titles of the available configuration sections are displayed.

3 To open the required configuration section, click its title.

The configuration section is displayed with all available tabs.

4 To close an opened configuration section, click its title.

5 To navigate to a configuration section, use the scroll bar.

25.2.13 Configuring Inline DE

You can configure Inline DE in the **Advanced Visualization** tab of the **Configuration Panel**. All parameters are shared with the advanced *syngo*.CT Dual Energy application on the CT scanner.

You need the access privileges of a clinical administrator.

Opening the Inline DE configuration

✓ The **Configuration Panel** is open.

1 Click the **DE Inline Results** tab.

2 If the **DE Inline Results** section is not displayed, click the **DE Inline Results** headline.

The **DE Inline Results** section is displayed.

3 Click the tab that provides the task you want to perform:

- **Application Classes**

  To define the parameters and settings of the application classes.

- **Global Configuration**

  To select the archiving mode as a general setting.

- **Spectral Post Processing (SPP)**

  To define settings for the creation of SPP data sets on your Symbia Pro.specta X3.

Before changing parameters in the **DE Inline Results** configuration, close all open scan patients or recon patients, and wait until all reconstruction jobs are completed. After saving changes, the new settings apply to the next patient.

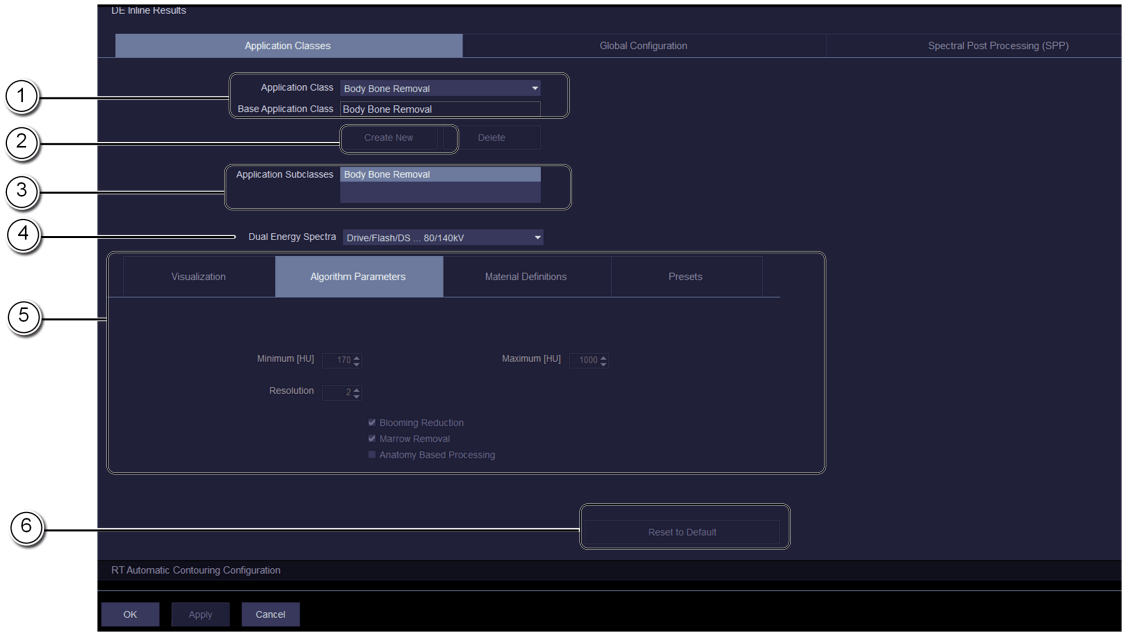
If you do not follow these steps, you cannot be sure which parameter changes become effective at which point in time.

Global Configuration tab The settings of the **Global Configuration** tab apply for the complete Inline DE functionality, including all application classes.



(1)	**Iodine Image Output**	For Interactive Spectral Imaging, you can specify which type of iodine images are calculated: • **Iodine Concentration Images** (100 µg/cm³) For example, a measured value of 15 in the image (in units of 100 µg/cm³) corresponds to an iodine concentration of 1.5 mg/ml or 1500 µg/cm³. • **Iodine Enhancement Maps** (HU) The **CT Dual Energy** workflow always calculates iodine enhancement maps.

Application Classes tab



(1)	**Application Class**	Specifies the current application class to be edited
	Base Application Class	Displays the application class the currently selected application class is derived from

(2)	**Create New**	Opens the **Create a New Application Class** dialog box to create a new application class The new user-defined application class is derived from the selected application class.
	Delete	Deletes the selected application class If the **Delete** button is dimmed, the selected base application class is a predefined application class. You cannot delete predefined application classes.
(3)	**Application Subclass**	Lists all application subclasses for the selected application class Specifies the application subclass to be edited
(4)	**Dual Energy Spectra**	Specifies the Dual Energy spectra to be edited The Dual Energy spectra dependent application class parameters are displayed accordingly.
(5)	Parameter tabs	Parameter tabs for the selected combination of **Application Class**, **Application Subclasses**, and **Dual Energy Spectra**. *Note: Adapting the parameters for the selected Dual Energy spectra affects the parameters for all other spectra of the application subclass: the values are calculated for these spectra accordingly.*
(6)	**Reset to Default**	Resets all parameters that were modified in the selected application subclass to the default parameters

Configuring application classes

You can modify the parameters of the application class that will modify the application.

✓ The **Application Classes** tab is open (**Configuration Panel** > **Advanced Visualization** tab > **DE Inline Results**).

If you want to try a new parameter set:

1 In the **Application Class** list of the **Application Classes** tab, select the application class you want to modify.

   If required, you can create a new application class. This user-defined application class is derived from the selected application class and is marked with a preceding dot.

2 From the **Application Subclasses** list, select the application subclass you want to modify.

3 From the **Dual Energy Spectra** list, select the Symbia Pro.specta X3 kV combination for which you want to modify the parameter settings.

4 Modify the parameters of the **Visualization**, **Algorithm Parameters**, **Material Definitions**, or **Presets** tab according to your needs.
(➔ Page 698 *Monoenergetic Plus parameters*)

   All edited parameters are automatically adjusted for Dual Energy spectra that were actually used for the scan.

5 Click the **Apply** button.

   – or –

   Click **OK** to apply your changes and to close the **Configuration Panel**.



At any time, you can reset the default parameters of all parameters that were modified in the selected application subclass by clicking the **Reset to Default** button.

Voltage combinations in the Dual Energy Spectra list

The **Dual Energy Spectra** list comprises the voltage combinations that are available on the Symbia Pro.specta X3 and voltage combinations that are available on other SOMATOM CT systems.

You can use a voltage combination of a non-Symbia Pro.specta X3 CT system as a frame of reference to achieve similar results on the Symbia Pro.specta X3.

1 From the **Dual Energy Spectra** list, select the required voltage combination of the non-Symbia Pro.specta X3 CT system.

2 On the **Visualization**, **Algorithm Parameters**, **Material Definitions**, or **Presets** tab, enter the parameter settings that you are currently using with that scanner.

The parameters will automatically be recalculated and adjusted for the available spectra on the Symbia Pro.specta X3.

Monoenergetic Plus parameters

In the **Configuration Panel** you can configure different parameters of the respective application class according to your needs. In the following, all tab cards, their function and the displayed UI elements are described.

Tabs in the Configuration Panel	Description and UI elements	
Presets	For this application class, the tab does not contain any parameters.	
Algorithm Parameters	On the **Algorithm Parameters** tab, you can configure the algorithm parameters for the calculation. You can change the parameters within certain limits according to your needs. Modify the parameters only in the following cases: • The image quality is not satisfactory, for example, the images are very noisy. • Different HU ranges are to be excluded.	
	Minimum [HU]	Below the minimum HU value, the mixed image is displayed instead of the Monoenergetic Plus image.
	Maximum [HU]	Above the maximum HU value, the mixed image is displayed instead of the Monoenergetic Plus image.
	Resolution	The resolution parameter is the range of the smoothing filter in units of pixel size. Spatial resolution improves with small values. Large values are better for low contrast resolution.
Material Definitions	For this application subclass, the tab does not contain any parameters.	

Gout parameters

In the **Configuration Panel** you can configure application class parameters according to your needs. All tabs, their function, and the displayed UI elements are described below.

Tabs in the Configuration Panel	Description and UI elements	
Presets	From the **VRT Preset Selection** list, you can select a VRT that controls the initial color display in a VRT image.	
Visualization	On the **Visualization** tab, you can choose between different color lookup tables for the CT and the overlay view, and define the window of the displayed data.	
	Color Lookup Table	The selection lists provide predefined color combinations that are assigned to the displayed data. The setting in the left list is for the CT data, the setting in the right list is for the overlay data.
	Window Value	The parameters **Center** and **Width** on the left define the window of the displayed CT data. The parameters **Center** and **Width** on the right define the window of the displayed overlay data.
Algorithm Parameters	On the **Algorithm Parameters** tab, you can configure the algorithm parameters for Inline DE processing. You can change the parameters within certain limits according to your needs. The parameters **Air Distance** and **Bone Distance** control the visualization of calluses as potential urate. Potential urate with negative overlay value is not visualized if the distance to air or to the skin surface is less than the **Air Distance** value and if the distance to bone is higher than the **Bone Distance** value. These values are voxels.	
	Minimum [HU]	Below the minimum HU value (mixed image), the overlay image is set to 0 HU and no calculation is performed.
	Maximum [HU]	Above the maximum HU value (mixed image), the overlay image is set to 1000 HU and the voxel is visualized as bone.
	Resolution	The resolution parameter is the range of the smoothing filter in units of pixel size. Spatial resolution improves with small values. Large values are better for larger uric acid accumulations.
	Air Distance	The value defines the size of a measurement volume between air (skin surface) and bone. It can be between 0 and 10 voxels. Within this distance to the skin surface, negative overlay values are set to 0 HU and are not visualized as potential urate, but only if the negative overlay value is not simultaneously located within the defined bone distance.

Tabs in the Configuration Panel	Description and UI elements	
	Bone Distance	The value defines the size of a measurement volume between bone and air (skin surface). It can be between 0 and 10 voxels. For bone distance, the measurement starts at the bone. The parameters **Bone Distance** and **Air Distance** have to be considered together.
Material Definitions	On the **Material Definitions** tab, you can configure the material parameters for Inline DE processing.	
	Soft Tissue	These parameters for low energy and high energy contain typical HU values of soft tissue.
	Ratio	This parameter is used for calculating the CT value of overlay images. It is set that the overlay image is positive for the majority of the contrast agent and bone voxels and negative for the majority of the urate voxels (gout).

Kidney Stones parameters

In the **Configuration Panel** you can configure application class parameters according to your needs. All tabs, their function, and the displayed UI elements are described below.

Tabs in the Configuration Panel	Description and UI elements	
Presets	From the **VRT Preset Selection** list, you can select a VRT that controls the initial color display in a VRT image.	
Visualization	On the **Visualization** tab, you can choose between different color lookup tables for the CT and the overlay view, and define the window of the displayed data.	
	Color Lookup Table	The selection lists provide predefined color combinations that are assigned to the displayed data. The setting in the left list is for the CT data, the setting in the right list is for the overlay data.
	Window Value	The parameters **Center** and **Width** on the left define the window of the displayed CT data. The parameters **Center** and **Width** on the right define the window of the displayed overlay data.
Algorithm Parameters	On the **Algorithm Parameters** tab, you can configure the algorithm parameters for Inline DE processing. You can change the parameters within certain limits according to your needs.	

Tabs in the Configuration Panel	Description and UI elements	
	Minimum [HU]	Below the minimum HU value (mixed image), the overlay image is set to 0 HU and no calculation is performed.
	Maximum [HU]	This is the maximum HU value (mixed image) of kidney stones. Voxels above this threshold are set to 0 HU in the overlay image.
	Resolution	The resolution parameter is the range of the smoothing filter in units of pixel size. Spatial resolution improves with small values. Large values are better for large homogeneous stones.
Material Definitions	On the **Material Definitions** tab, you can configure the material parameters for Inline DE processing.	
	Urine	These parameters contain typical HU values for the respective kV values of urine.
	Ratio	The value is optimized for the differentiation between uric acid and non uric acid kidney stones. You can change this value to differentiate between other kidney stone types.

Bone Marrow parameters

In the **Configuration Panel** you can configure application class parameters according to your needs. All tabs, their function, and the displayed UI elements are described below.

Tabs in the Configuration Panel	Description and UI elements	
Presets	From the **VRT Preset Selection** list, you can select a VRT that controls the initial color display in a VRT image.	
Visualization	On the **Visualization** tab, you can choose between different color lookup tables for the CT and the overlay view, and define the window of the displayed data.	
	Color Lookup Table	The selection lists provide predefined color combinations that are assigned to the displayed data. The setting in the left list is for the CT data, the setting in the right list is for the overlay data.

Tabs in the Configuration Panel	Description and UI elements	
	Window Value	The parameters **Center** and **Width** on the left define the window of the displayed CT data. The parameters **Center** and **Width** on the right define the window of the displayed overlay data.
Algorithm Parameters	On the **Algorithm Parameters** tab, you can configure the algorithm parameters for the calculation. You can change the parameters within certain limits according to your needs. Modify the parameters only in the following cases: • The image quality is not satisfactory, for example, the images are very noisy. • Different HU ranges are to be excluded.	
	Minimum [HU]	Below the minimum HU value, the HU values of all voxels are set to 0 HU.
	Maximum [HU]	Above the maximum HU value, the HU values of all voxels are set to 0 HU.
	Resolution	The resolution parameter controls the range of the smoothing filter in units of the pixel size. Spatial resolution improves with low resolution values. High resolution values are better for large bones.
	Bone Threshold [HU]	Minimum HU value for cortical bone identification. If the bone marrow segmentation does not provide proper results, you can lower the value.
Material Definitions	On the **Material Definitions** tab, you can configure the material parameters for Inline DE processing.	
	Yellow Marrow	These parameters contain typical HU values of yellow marrow for the respective kV values.
	Red Marrow	These parameters contain typical HU values of red marrow for the respective kV values.
	Calcium BHC	The **Calcium BHC** parameter is used to activate the automatic adjustment of the optimum bone mineral ratio for the scanned body region. The bone mineral ratio is calculated separately for each slice.

Tabs in the Configuration Panel	Description and UI elements	
	Rel. Ca.	The ratio of the CT value at low energy and high energy that is used for bone mineral.

Brain Hemorrhage parameters

In the **Configuration Panel** you can configure application class parameters according to your needs. All tabs, their function, and the displayed UI elements are described below.

Tabs in the Configuration Panel	Description and UI elements	
Presets	For this application class, the tab does not contain any parameters.	
Visualization	On the **Visualization** tab, you can choose between different color lookup tables for the CT and the overlay view, and define the window of the displayed data.	
	Color Lookup Table	The selection lists provide predefined color combinations that are assigned to the displayed data. The setting in the left list is for the CT data, the setting in the right list is for the overlay data.
	Window Value	The parameters **Center** and **Width** on the left define the window of the displayed CT data. The parameters **Center** and **Width** on the right define the window of the displayed overlay data.
Algorithm Parameters	On the **Algorithm Parameters** tab, you can configure the algorithm parameters for Inline DE processing. You can change the parameters within certain limits according to your needs.	
	Minimum [HU]	Below the minimum HU value (mixed image), the overlay image is set to 0 HU and the mixed image information is displayed in the virtual non-contrast (VNC) image. This value should be below the HU value of water, including some noise tolerance.
	Maximum [HU]	Voxels above this threshold are displayed in the VNC image with a better resolution. All voxels containing iodine should be below the maximum HU value.
	Resolution	The resolution parameter is the range of the smoothing filter in units of pixel size. Spatial resolution improves with small values. Large values are better for low contrast resolution.

Tabs in the Configuration Panel	Description and UI elements	
	CM Cutoff	Pixels below the specified HU value are set to zero in the overlay image.
	Resolution Enhancement	If selected, the resolution of the result images is enhanced. The calculation time is increased with this option.
	Organ Contour Enhancement	If selected, the organ contours in the overlay image are enhanced.
Material Definitions	On the **Material Definitions** tab, you can configure the material parameters for Inline DE processing.	
	Hemorrhage	These parameters contain typical HU values for the respective kV values of hemorrhage.
	CSF	These parameters contain typical HU values for the respective kV values of cerebrospinal fluid.
	Rel. CM	This parameter contains the ratio of contrast enhancement at low energy and high energy that is used for the contrast agent.
	Iodine BHC	This parameter is used to activate the beam hardening correction for iodine contrast enhancement.

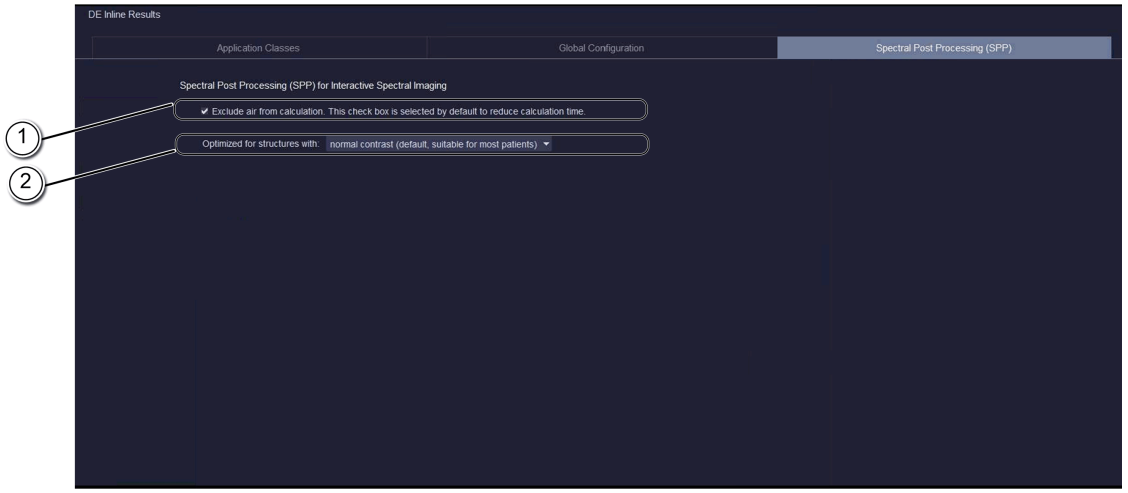
Rho/Z parameters

In the **Configuration Panel** you can configure application class parameters according to your needs. All tabs, their function, and the displayed UI elements are described below.

Tabs in the Configuration Panel	Description and UI elements	
Presets	For this application class, the tab does not contain any parameters.	
Visualization	On the **Visualization** tab, you can choose between different color lookup tables for the CT and the overlay view, and define the window of the displayed data.	
	Color Lookup Table	The selection lists provide predefined color combinations that are assigned to the displayed data. The setting in the left list is for the CT data, the setting in the right list is for the overlay data.

Tabs in the Configuration Panel	Description and UI elements	
	Window Value	The parameters **Center** and **Width** on the left define the window of the displayed CT data. The parameters **Center** and **Width** on the right define the window of the displayed overlay data.
Algorithm Parameters	On the **Algorithm Parameters** tab, you can configure the algorithm parameters for the calculation. You can change the parameters within certain limits according to your needs.	
	Minimum [HU]	Below the minimum HU value, the mixed image is displayed instead of the electron density image and the effective atomic number is set to zero. No calculation is performed.
	Maximum [HU]	Above the maximum HU value, the mixed image is displayed instead of the electron density image and the effective atomic number is set to zero. No calculation is performed.
	Resolution	The resolution parameter is the range of the smoothing filter in units of pixel size. Spatial resolution improves with small values. Large values are better for low contrast resolution.
Material Definitions	For this application class, the tab does not contain any parameters.	

Spectral Post Processing (SPP) tab



On the **Spectral Post Processing (SPP)** tab, you can define settings for the creation of SPP data sets on your Symbia Pro.specta X3.

SPP data sets contain the following:

- conventional CT images or Monoenergetic+ images (main representation)
- additional Dual Energy information for Interactive Spectral Imaging in **MM Reading** or **CT View&Go**

If you open a SPP data set with **MM Reading** or **CT View&Go**, additional images can be generated interactively.

To create SPP data sets, a corresponding license must be available on your system.

(1)	If the **Exclude air from calculation** check box is selected, only HU values above -950 HU are considered for calculating the SPP data set. This will reduce calculation time. If the **Exclude air from calculation** check box is cleared, the whole range of HU values is considered for calculation.
(2)	Select the predominant structures in the SPP data sets. The calculation of the SPP data sets is globally optimized accordingly. Changing these parameters strongly affects system performance.

25.2.14 Configuring RT Automatic Contouring

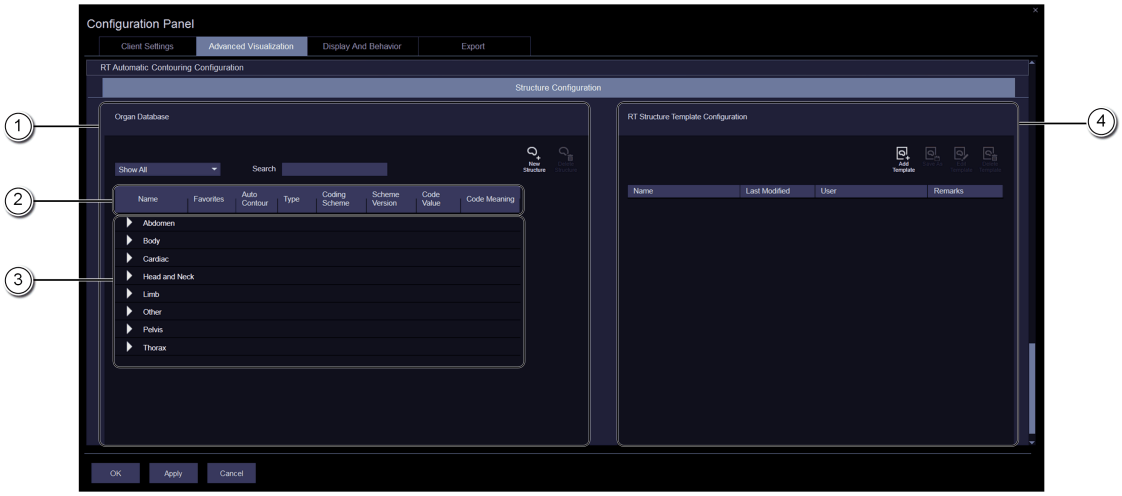
You can configure **RT Automatic Contouring** in the **Advanced Visualization** tab of the **Configuration Panel**.

You need clinical administrator rights.

Structure Configuration

In the structure organ database of the **RT Automatic Contouring Configuration** section in the **Configuration Panel**, structures with predefined attributes are stored. You can search for those structures and add them to individual structure templates in the **RT Structure Template Configuration**.

You can define attributes of the structures, such as, color, name, type, and contouring method.



(1) **Organ Database**
You can add, remove, or change structures in the structure organ database. You can search for those structures or filter the list of structures.
(➔ Page 709 *Deleting structures from the organ database*)
(➔ Page 709 *Finding structures*)
(➔ Page 710 *Defining the structure attributes*)

(2) Structure attributes
You can define the attributes of the structures, such as, color, name, and type. (➔ Page 710 *Defining the structure attributes*)

(3) Organ groups
The structures are divided into organ groups.
Click the arrow of a group to display the list of the structures that belong to an organ group.

(4) **RT Structure Template Configuration**
You can create structure templates and define the segmentation method of each structure.
(➔ Page 711 *RT Structure Template Configuration*)

Opening the RT Automatic Contouring Configuration

✓ The **Configuration Panel** is open.

1 Click the **Advanced Visualization** tab.

2 If the **RT Automatic Contouring Configuration** section is not displayed, click the **RT Automatic Contouring Configuration** title.

The **RT Automatic Contouring Configuration** section is dispalyed.

Before changing parameters in **RT Automatic Contouring Configuration**, close all open scan patients or recon patients, and wait until all reconstruction jobs are completed. After saving changes, the new settings apply to the next patient.

If you do not follow these steps, you cannot be sure which parameter changes become effective at which point in time.

Deleting structures from the organ database

You can only delete user-created structures. You cannot delete predefined structures.

✓ The **RT Automatic Contouring Configuration** section is displayed.

1 To select a structure, click in the row of a structure.



2 Click the **Delete Structure** icon to delete the selected structure from the structure organ database.

3 To apply all changes, click **Apply**.

4 To save all changes to the structure organ database and close the **Configuration Panel**, click **OK**.

Finding structures

In the **Organ Database**, you can specifically search for structures.

1 To display all structures, select the **Show All** option.

– or –

To display only the structures marked as **Favorite**, select the **Show Favorites** option.

2 In the **Search** field, enter the first letters of a structure.

Enter a minimum of three characters.

3 Press the **Enter** key.

The structures are displayed according to your search criteria.

Defining the structure attributes

In the **Organ Database**, you can define attributes of the structures, such as, color, name, and type.

Name	Favorites	Auto Contour	Type	Coding Scheme	Scheme Version	Code Value	Code Meaning
Abdomen							
Abdominopelvic cav	✓	Available	AVOIDAI	FMA	3.2	12267	Intestine
Kidneys	✓	NA	AVOIDAI	FMA	3.2	264815	Set of kidneys
Left gastric nodes	✓	NA	ORGAN	FMA	3.2	12797	Left gastric lymph noc
Liver	✓	Available	AVOIDAI	FMA	3.2	7197	Liver
Body							
Skeleton	✓	Available	AVOIDAI	FMA	3.2	303830	Skeleton
Skin	✓	Available	EXTERN	FMA	3.2	7163	Skin
Spinal Cord	✓	Available	AVOIDAI	FMA	3.2	7647	Spinal cord
Thecal Sac	✓	NA	MARKEF	FMA	3.2	83720	Lumbar cistern
Vertebra	✓	NA	CONTRA	FMA	3.2	9914	Vertebra
Vertebral Column	✓	NA	BOLUS	FMA	3.2	13478	Vertebral column

Available structures in an organ group

Structure attributes	
Color 	You can specify a color for each structure. To change the color of a structure, click the color box in front of the structure name and select a color.
Name	You can give each structure a unique name. To rename a structure, click in the **Name** field and enter a new name.
Favorites	If you select the **Favorites** check box of one or more structures and select **Show Favorites** from the list in the search area, only the selected structures are displayed in the organ database.
Auto Contour	• **N/A**: Indicates a structure that is not available for automatic contouring. • **Available**: Indicates a structure that is available for automatic contouring.

Structure attributes	
Type	Different types of structures are available in the list. To change the type, click the arrow and select a type.
Coding Scheme	Displays a unique ID and is read-only.
Scheme Version	Displays a unique ID and is read-only.
Code Value	Displays a unique ID and is read-only.
Code Meaning	A preferred label from the database and is read-only.

RT Structure Template Configuration

Organ based segmentation is performed on a contouring data set based on a structure template. This segmentation is only available for CT images. You can either manually perform the organ segmentation or enable automatic organ contouring for structures that are available for automatic contouring.

Automatic organ contouring is performed in the background based on user-defined structure templates.

If organs cannot be detected, the system displays a message. The detection may fail if the segmentation method was incorrectly selected for an organ.

In the **RT Structure Template Configuration**, the following options are available to manage structure templates:

	To create a new template, click the **Add Template** icon.
	To save an existing template under another name, select a template and click the **Save As** icon. The **Save As** icon is only available if at least one template has been created.

	To edit a template, select a template and click the **Edit Template** icon. The **Edit Template** icon is only available if at least one template has been created.
	To delete a template, select a template and click the **Delete Template** icon. The **Delete Template** icon is only available if at least one template has been created.



You can also specify auto-tasking rules for automatic template selection at the CT scanner.

Creating a structure template

✓ The **RT Structure Template Configuration** is displayed.



1 Click the **Add Template** icon.

A new empty structure template is created.

2 In the **Template Name** field, enter a name for the template.

3 Optional: In the **Remarks** field, enter a comment.

4 From the **Organ Database**, select the structures to be included in the structure template:

- Click in the structure row.
- Press the **Ctrl** key or **Shift** key for multiple selections.

The selected structures are highlighted.



5 Click the **Add Structure** icon.

The selected structures are added to the template and are displayed in the **Organ** tab.

6 From the **Method** list, select the segmentation method for each structure:

- **Atlas**: Atlas-based contouring for head and neck structures
- **Model**: Model-based contouring for cardiac structures and all other body regions
- **None**: No automatic contouring



7 Optional: Click the **Delete Row** icon to delete a selected structure from the structure template.

8 Optional: On the **Auto Tasking** tab, you can configure the structure template for automatic selection during scanning.

9 Click **Save**.

The structure template is saved with the assigned template name and the currently configured list of structures.

10 To apply all changes, click **Apply**.

11 To save all changes and close the **Configuration Panel**, click **OK**.

After closing **RT Structure Template Configuration**, the structure templates are also available as an **Inline Options** parameter for **RT Automatic Contouring**.

Defining auto-tasking rules

On the **Auto Tasking** tab, you can add auto-trigger rules to the selected structure template.

During scanning, structure templates are automatically selected according to the defined rules. The structures included in the selected structure template are automatically created and organs that are available for automatic contouring are contoured.

The auto-trigger rules are based on DICOM tags that are commonly used to store diagnosis or procedural information. The selection of DICOM tags depends on the information that is stored in the OIS/RIS and transferred to the CT scanner. If no OIS/RIS is available, the diagnosis or procedure may be entered manually within the patient registration step at the scanner.

Refer to the user manual of your scanner for information about storing diagnosis or requested procedure data during patient registration.

✓ At least one structure template is available in the **RT Structure Template Configuration**.

1 Select a structure template.



2 Click the **Edit Template** icon.

3 Click the **Auto Tasking** tab.

4 From the **Auto Tasking Trigger** list, select a DICOM tag.

5 In the **Value** field, enter a value, for example, according to the ICD-10-CM diagnosis code. You can add multiple values separated by a colon or the word 'or'.



If you select **Body Part Examined**, for example, enter an organ name in the **Value** field according to the definitions on your scanner.

---

6 From the **Operator** list, select **is**, if only the structure templates that match the entered value must be selected.

– or –

From the **Operator** list, select **contains**, if only the structure templates that contain the entered value must be selected.



7 To add another rule, click the **Add Rule** icon.



8 To delete a rule, select the rule and click the **Delete Rule** icon.

9 Click **Save**.

The structure template is saved with the defined auto-tasking rules.

10 For the auto-trigger rules to become effective, you must set the recon parameters accordingly in the scan protocol: In the **Inline Options**set the **Structure Template Selection Mode** parameter to **AUTO**.

Depending on the defined rules, the structures that are included in the selected structure template are automatically created and organs that are available for automatic contouring are contoured.

11 Optional: To send the automatically contoured structures to the configured DICOM node, for example, to a treatment planning system (TPS), you must set the recon parameters accordingly in the scan protocol: In the **Auto Tasking** parameters, set **Auto Transfer** to **On**.

26 Administration Portal

The Administration Portal is used to perform administrative tasks. It can be accessed directly from your workplace or remotely through the Microsoft Internet Explorer.

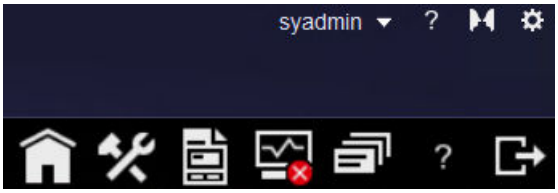
CAUTION

Security breach of network, removable media, or directly accessed system can modify or delete patient data or try to initiate system motion!

There is a potential risk for misdiagnosis, additional doses of radiation, and patient injury or system damage.

- Apply standard network security practices.

From the **Settings** (gear) icon dropdown at the top right of the console screen, there is a selection for **Administration Portal**. On its page, there are two Help icons. The first Help icon displays the first page of the online help. A second Help icon is in a row of icons beneath the first Help icon.



When selected, the second Help icon displays a link to a specific Administration Portal Help topic depending on what content is selected within the Adminstration Portal.

The Administration Portal provides access to:

- System Configuration
- Archive Configuration
- Data Management Configuration

- Software Update
- Utilities

As the content is structured in workflow-oriented workspaces, some contents are integrated in more than one workspace.

The range of functionality offered by the Administration Portal depends on the service level of the user account.

This instruction for use contains the following tasks:

- (➔ Page 736 *Configuration of the Scheduler*)
- (➔ Page 738 *Configuring job retry settings*)
- (➔ Page 739 *Software updates*)

You can find additional aspects of the Administration Portal and the tasks for higher service levels in the online help.

The screenshots shown here are only examples.

The views on your screen may differ slightly depending on your software version.

26.1 Opening the Administration Portal

The range of functionality offered by the **Administration Portal** depends on the service level of the user account.

◆ On the access bar, move the mouse pointer over the **Settings** icon and, from the menu, choose **Clinical Configuration**.

The **Clinical Configuration** workspace opens.

You are automatically logged in with single sign-on functionality.

If your account is not registered as a clinical administrator, you can view all parameters, but you cannot change them.

– or –

On the access bar, move the mouse pointer over the **Settings** icon and, from the menu, choose **Administration Portal**.

The login page opens.

– or –

From a computer with network access to the system, start the Internet Explorer and enter **`https://<server>/adminportal`**.

`<server>` is the FQDN (fully qualified domain name) or the IP address of the system.

The login page opens.

Some functions of the **Administration Portal** may not be available over network access.

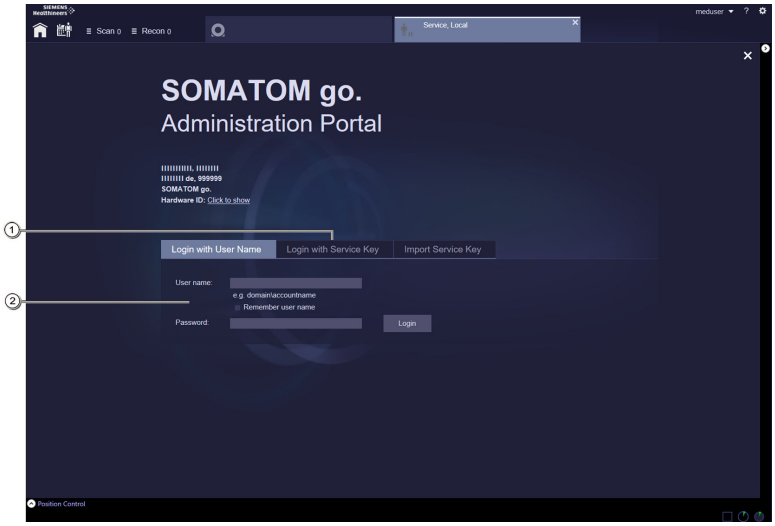
26.1.1 Logging on to the Administration Portal

You can log on to the **Administration Portal** with a Windows user account. The range of functionality offered by the **Administration Portal** depends on the service level of the user account.

Logging on with a service key is intended for Smart Remote Services.

1 Open the **Administration Portal**. (➔ Page 716 *Opening the Administration Portal*)

The login page is displayed.

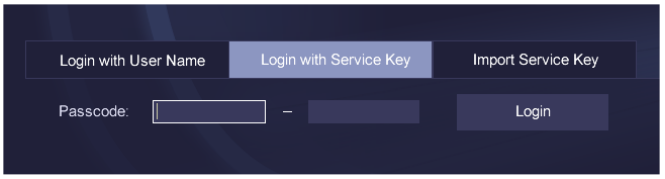


(1) Log on with service key
(2) Log on with user account

2 Click **Login with User name**, enter the user credentials of your Windows user account in the **User name** and **Password** field and click the **Login** button.

– or –

As a service user, click **Login with Service Key**, enter the last 10 digits of the service key and click the **Login** button.



The password is case-sensitive.

If available, you can click the password eye to check the typing of your password. The password is only displayed as long as the mouse button is pressed.

Before you can log on with a service key, you must import the service key once.

After a certain period of inactivity (default 30 minutes), you are automatically logged off from the **Administration Portal**.

26.2 Assigning Remote Access Rights

To provide remote access rights to your system so that a Siemens Healthineers Service Representative can remotely diagnose your system's condition, perform the following steps:

1 Right click the **Settings** (gear graphic) icon, and select **Administration Portal**.

The **Administration Portal** login screen is displayed.

2 Enter the **User name** and **Password**, and press the keyboard's **Enter** key.

The **Service Local** tab is displayed.

3 Click the **Technical Configuration** tab.

4 From the left pane, click the **Remote Service** tab to expand it

5 Click the **Access Control** tab.

The **Remote Access Configuration for Service** page appears.

6 Under the page's **Access Rights** heading, there are two settings: **Full Access** and **Restricted Access** selections.

Click the radio button for the access rights you wish to provide to the Siemens Healthineers Service Representative.

A graphic displays **Full Access** or **Restricted Access** depending on what is selected.

A Warning on the **Remote Access Configuration for Service** page states:

Do not disconnect from the network while remote service is active.

Do not change access configuration while remote service is active.

7 Click the **Save** button to apply any access right change.

26.3 Quality assurance configuration

From the **MI Clinical Configuration** task, you can select the **Quality Assurance Configuration** task to setup in advance various quality assurance collimators, system configurations, and daily and monthly schedule dates and times, Automated Collimator Changer (ACC) collimator installations after the quality control (QC) acquisition, as well as assigning Look Up Color (LUT) tables.

The **Select Source** pulldown menu allows you to indicate whether the source used will be a **Manual** setup or an **AQC** (Automated Quality Control) setup using a point or line source located within the patient table. The source selection determines the schedule setup displayed for the **Quality Assurance Configuration** task.

For a **Manual** source setup, the **Daily Extrinsic Flood** collimator selection is:

- LEAP
- SMARTZOOM
- MELP
- LEHR
- HE
- LPHR
- NONSIEMENS_LE1
- NONSIEMENS_LE2
- NONSIEMENS_ME
- NONSIEMENS_HE

- NONSIEMENS_SZ1
- NONSIEMENS_SZ2

For a **Manual** source setup, the **MI Daily Quality Schedule** is:

	Protocol
Monday	Select **Daily Intrinsic** or **Daily Extrinsic**.
Tuesday	Select **Daily Intrinsic** or **Daily Extrinsic**.
Wednesday	Select **Daily Intrinsic** or **Daily Extrinsic**.
Thursday	Select **Daily Intrinsic** or **Daily Extrinsic**.
Friday	Select **Daily Intrinsic** or **Daily Extrinsic**.
Saturday	Select **Daily Intrinsic** or **Daily Extrinsic**.
Sunday	Select **Daily Intrinsic** or **Daily Extrinsic**.

For a **AQC** source setup, the **Daily Extrinsic Flood** collimator selection is:

- LEAP
- MELP
- LEHR
- LPHR

For an **AQC** source setup, The **MI Daily Quality Schedule** is:

	Protocol	**End By End**	**End By Time**	**Automatic Collimator Install after QC completion**
Monday **Tuesday** **Wednesday** **Thursday** **Friday** **Saturday** **Sunday**	Select **Daily Intrinsic** or **Daily Extrinsic**.	Select a day: **Sunday** **Monday** **Tuesday** **Wednesday** **Thursday** **Friday** **Saturday**	An enter time in hours and seconds indicating AM or PM. Click the clock icon to select one of the following times from a table: 12:00 AM 1:00 AM 2:00 AM 3:00 AM 4:00 AM 5:00 AM 6:00 AM 7:00 AM 8:00 AM 9:00 AM 10:00 AM 11:00 AM 12:00 PM 1:00 PM 2:00 PM 3:00 PM 4:00 PM 5:00 PM 6:00 PM 7:00 PM 8:00 PM 9:00 PM	Select a collimator: MELP LEHR NONE Available collimators will be displayed for those installed in the ACC.

	Protocol	End By End	End By Time	Automatic Collimator Install after QC completion
			10:00 PM 11:00 PM	

For an **AQC** source setup, The **MI Monthly Quality Schedule** is:

	End By End	**End By Time**	**Automatic Collimator Install after QC completion**
Monthly QC Suite	Select a day: **Sunday** **Monday** **Tuesday** **Wednesday** **Thursday** **Friday** **Saturday**	An enter time in hours and seconds indicating AM or PM. Click the clock icon to select one of the following times from a table: 12:00 AM 1:00 AM 2:00 AM 3:00 AM 4:00 AM 5:00 AM 6:00 AM 7:00 AM 8:00 AM 9:00 AM 10:00 AM 11:00 AM 12:00 PM 1:00 PM 2:00 PM 3:00 PM 4:00 PM 5:00 PM 6:00 PM 7:00 PM 8:00 PM 9:00 PM 10:00 PM	Select a collimator: MELP LEHR NONE Available collimators will be displayed for those installed in the ACC.

	End By End	End By Time	Automatic Collimator Install after QC completion
		11:00 PM	

For **Quick Head Alignment** setup:

Type	Select **Calibration** or **Verification**.
Collimator Available collimators will be displayed. For example:	Select: • **LEHR** • **LPHR** • **MELP** • **LEAP**
Trending Configuration	Select: • 180 • 90 • 76

For an **Installation Setup** setup:

Gantry Left Foot To Wall Distance	Enter numeric distance in **cm** or **in**.
Gantry Right Foot To Wall Distance	Enter numeric distance in **cm** or **in**.

For a **Default Image Display Color LUT** setup:

Head Alignment	Select **Grayscale** or **Inverted Grayscale**.
Intrinsic/Extrinsic Floods	Select **Grayscale** or **Inverted Grayscale**.
NM-CT FOV Fused	Select: • **Ascending Red** • **Blue Yellow** • **BW Inv Log** • **BW Log** • **BW Log** • **BW Parabolic** • **Correction** • **Cyclic** • **Descending Red** • **Designer** • **Edges** • **French Rainbow** • **French Rainbow 2** • **Grays** • **Grayscale** • **Heart** • **Hot Body** • **Hot Iron** • **Hot Metal** • **Hot Metal New** • **Inverted Grayscale** • **Iso Count** • **Lava**

	• **Micro Delta Hot Metal** • **PBV** • **PET Rainbow** • **PM** • **Rainbow** • **Rainbow 64** • **Random** • **Red** • **Region** • **Spectrum** • **Spectrum 10 Stop** • **Stars** • **SUV 100** • **SUV 50** • **SUV 75** • **Thai** • **Throid** • **Warm Metal** • **XRay**

A message **Changes have not been saved!** is displayed until the **Save** or **Cancel** button is clicked.

26.4 Selecting dose activity unit

To select a dose activity unit:

1 Right click the **Settings** (gear graphic) icon, and select **Clinical Configuration**.

2 Click the second **Clinical Configuration** tab if not selected.

3 From the left pane, click the **MI Clinical Configuration** tab to expand it

4 Click the **Dose Activity Unit** tab.

The Dose Activity Unit Configuration page appears.

5 Click the dropdown list and select **mCi** or **MBq** to set the dose activity unit.

26.5 Energy window set management

The Energy Window Sets (EWS) page is used to view reconstruction volumes per selected Energy Window Sets (EWS) for an isotope.

Clinical Administrator or Service-level user access is required. Users with lower service-level access cannot edit higher service-level access presets.

- Logging into energy window sets (➔ Page 728 *Logging into energy window sets (EWS)*)
- Selecting an isotope (➔ Page 729 *Selecting an isotope*)
- Viewing isotope preset values (➔ Page 730 *Viewing isotope preset values*)
- Adding an energy window set (➔ Page 731 *Adding an energy window set*)
- Editing, saving, and deleting isotope preset values (➔ Page 733 *Editing, saving, and deleting isotope preset values*)
- Viewing the spectrum graphs (➔ Page 734 *Viewing spectrum graphs*)
- Deleting isotope preset or preset energy window settings (➔ Page 735 *Deleting an isotope preset or preset energy window settings*)

26.5.1 Logging into energy window sets (EWS)

To log into the Energy Window Sets page:

1 Right click the **Settings** (gear graphic) icon, and select **Clinical Configuration**.

2 Click the second **Clinical Configuration** tab if not selected.

3 From the left pane, click the **MI Clinical Configuration** tab to expand it

4 Click the **Energy Window Sets** tab.

The Energy Window Sets page appears. The **Preset**, **Created By**, and **Modified Date** fields are displayed.

For example:

Preset	Created By	Modified Date
Se75_Siemens	Siemens	01/01/2018
Se_75_3Peak_Siemens	Siemens	01/01/2018

26.5.2 Selecting an isotope

The Energy Window Sets Isotope selection enables multiple or single isotope display.

1 Click the **Isotope** dropdown list and select **Show All** to display all the isotopes.

All the energy window sets available on the system are displayed with the following fields: **Preset name**, **Created by**, and **Modification date**. The fields can be sorted by clicking on the column heading.

All factory default energy window sets for supported isotopes are displayed before clinical user created isotopes.

2 Select a single isotope from the dropdown list to display only one isotope.

For some isotopes, there may be multiple preset selections.

For information on creating a user-defined isotope, see Source Management. (→ Page 489 *Source Management*)

In the **Dose** task and **Radiopharmaceutical Dose** dialog box, the **Isotope** field selection is displayed, but cannot be changed. It can be changed from within a scan by right clicking a scan timeline to display a pop-up menu and selecting **Show Parameters**. The scan parameters are displayed. Clicking the **General Scan** tab displays the **Isotope** tab from which a different isotope can be selected.

3 To create a new isotope selection, select **New** from bottom of the list. (→ Page 730 *Creating a new isotope selection*)

26.5.3 Creating a new isotope selection

The Energy Window Sets Isotope dropdown list contains a **New** selection for creating a new isotope in the list.

1 From the Isotope dropdown list, select **New**.

A **New Isotope** window appears.

2 In the **Isotope** field, enter an isotope name. The default name is **New Isotope**.

3 In the **DICOM Code** field, enter the appropriate code.

4 In the **Half-life** field, enter the time and select the unit of time (**Days**, **Hours**, **Minutes**, or **Seconds**). The default value is **24 Hours**.

5 In the **Bremsstrahlung** field, click the check box to enable or not.

6 The ID and Type fields have values by default and cannot be changed, for example ID **1**, Type **Photopeak**.

7 For the **Width%** field, enter a range between **0** to **100**.

8 For **Center (keV)** field , enter a range between **50** and **511** keV.

If two or more photopeak windows are overlapping in energy, a message will be displayed indicating that the isotope is invalid.

26.5.4 Viewing isotope preset values

The Energy Window Sets View selection displays preset values.

1 Click the **View** button.

A window titled with the preset name appears with the **Isotope**, **Preset Name**, and then a series of information items listing the **ID**, **Type**, **Parent**, **Width%**, **Offset%**, and **Center (keV)**.

For example:

ID	Type	Parent	Width%	Offset%	Center (keV)
1	Photopeak		20.00	0.00	268.538
2	Lower Scatter	1	20.00	0.00	214.83
3	Upper Scatter	1	20.00	0.00	322.246

2 Review the preset values.

3 Click the window's close box to remove it.

26.5.5 Adding an energy window set

The Energy Window Sets Add Energy Window Set selection creates a new isotope preset.

1 Click the **Add Energy Window Set** button.

A Create Preset window appears with the same preset information as in the previous example plus an **Add Window** button, and **Save** and **Cancel** buttons.

2 Enter a preset name in the **Preset Name** field.

3 If desired, enter a value in the **Width%** field.

4 If desired, enter a value in the **Offset%** field.

5 Click the **Add Window** button.

The window updates. For example:

Isotope: Se-75, **Preset Name:** Se75_5%Offset_Siemens (The newly created preset name you just entered.)

ID	Type	Parent	Width%	Offset%	Center (keV)
1	Photopeak		15.00	5.00	281.965
2	Photopeak		20.00	0.00	134.838.83

For this example for **ID 2**, the **Type** dropdown list selections are:

- **Photopeak**
- **Lower Scatter**
- **Upper Scatter**
- **Off Peak Lower** (Service only)
- **Off Peak Upper** (Service only)
- **Co57 Marker**

For **Width**, the range is **0** to **100**.

For **Offset %**, the range is **0** to **30** percent.

For **Center (keV)**, the values vary according to the isotope.

Depending on the selection, other fields may be enabled or disabled.

For the **Center (keV)** dropdown list, example selections are 134.838 and 400.657. Select a value.

6 Click the **Save** button.

The Energy Window Sets page is updated.

For example:

Preset	Created By	Modified Date
Se75_Siemens	Siemens	01/01/2018
Se_75_3Peak_Siemens	Siemens	01/01/2018
Se-75_10^Offset	Clinical User	02/26/21

The new preset automatically has in the **Create By** field the preset creator identified as **Clinical User**.

In addition to the View button, the new preset now has **Edit** and **Delete** buttons.

26.5.6 Editing, saving, and deleting isotope preset values

The Energy Window Sets (EWS) Edit selection enables the editing of preset field values.

✓ A newly created preset displays **Clinical User** in the **Create By** field.

✓ In addition to the **View** button, the new preset now has **Edit** and **Delete** buttons for Clinical Administrator users.

✓ Only **Clinical User** presets can be edited or deleted.

✓ Deletion of EWS also deletes associated calibration data (flood and sensitivty results).

1 Click the **Edit** button.

The preset window updates. For example:

Isotope: Se-75, **Preset Name:** Se-75_10%Offset.

ID	Type	Parent	Width%	Offset%	Center (keV)
1	Photopeak		25.00	10.00	295.392
2	Photopeak		20.00	0.00	134.838.83

2 Edit the values.

For Type, the selections are:

- **Photopeak**
- **Lower Scatter**
- **Upper Scatter**
- **Off Peal Lower** (Service only)
- **Off Peak Upper**(Service only)
- **Co57 Marker**

For **Width**, the range is **0** to **100**.

For **Offset %**, the range is **0** to **30** percent.

For **Center (keV)**, the values vary according to the isotope.

Depending on the selection, other fields may be enabled or disabled.

3 Click the **Save** button to save the preset energy window settings.

4 Click the **Delete** button to remove the preset.

The **Delete** button appears to the right of the ID 2 row.

5 Click the **Delete** button.

The ID 2 row is deleted.

6 Click the **Save** button.

A dialog box **Preset will be Modified!** is displayed with the message **Do you wish to modify this preset entry? All calibratins data asociated with this preset will be modified! Yes No**

7 Click **Yes** to delete the preset or **No** to return to editing the preset.

8 Clicking the **Delete** button initially instead of the **Edit** button will remove the preset.

The first EWS created for a defined isotope will be used as the default EWS. If the first created EWS is deleted, the subsequently created EWS will be the default.

If all the created EWS belonging to a defined isotope are deleted, the isotope is also deleted from the list. Only those EWS that were created by the same Service level login can be deleted.

When creating and then deleting an EWS, all corresponding data (EWS entry) and associated data (flood corrections, sensitivities, volume sensitivity factor) will be deleted.

26.5.7 Viewing spectrum graphs

✓ When viewing or creating a new Energy Window Set (EWS) , or editing a pre-existing EWS with spectrum enabled, the spectrum graphs are displayed with the preset's windows shadowed on the spectrum curve while an acquisition is in progress or completed.

The Energy Window Sets Spectrum selection displays spectrum graphs for Detector 1 and 2.

1 Click the **Spectrum** button.

Two energy spectrum graphs appear to the right of the page for **Detector 1** and **Detector 2** with **Cnts** (counts) on the vertical axis and **keV** (kiloelectron volts) on the horizontal axis.

2 Click the **Restart** button to refresh the spectrum. Click the **Stop** button to stop the spectrum.

3 Click the **Energy Window Sets** tab to refresh the page and remove the spectrum graphs.

26.5.8 Deleting an isotope preset or preset energy window settings

The Energy Window Sets (EWS) Delete selection deletes an isotope preset.

✓ A newly created preset automatically has in the **Create By** field the preset creator identified as **Clinical User**.

✓ In addition to the View button, the new preset now has **Edit** and **Delete** buttons.

You can edit the values and click the **Save** button to save the preset energy window settings or click the **Delete** button to remove the preset.

The **Delete** button appears to the right of the ID 2 row.

1 Click the **Delete** button.

The ID 2 row is deleted.

2 Click the **Save** button.

A dialog box **Preset will be Modified!** is displayed with the message **Do you wish to modify this preset entry? All calibratins data asociated with this preset will be modified! Yes No**

3 Click **Yes** to delete the preset or **No** to return to editing the preset.

4 Clicking the **Delete** button initially instead of the **Edit** button will remove preset.

The first EWS created for a defined isotope will be used as the default EWS. If the first created EWS is deleted, the subsequently created EWS will be the default.

If all the created EWS belonging to a defined isotope are deleted, the isotope is also deleted from the list. Only those EWS that were created by the same Service level login can be deleted.

When creating and then deleting an EWS, all corresponding data (EWS entry) and associated data (flood corrections, sensitivities, volume sensitivity factor) will be deleted.

26.6 MI series description

✓ From the **Settings** (gear) icon, select **Clinical Configuration** workspace, the navigation tree **MI Clinical Configuration**, and then **MI Series Description**.

To display series information:

1 Click the individual **arrow** buttons to move series description selections between **Available items** and **Selected Items**.

The series descriptions will shift between the two categories.

2 Click the double **arrow** buttons to move all series description selections between **Available items** and **Selected Items**.

3 Click the up or down **arrow** buttons for **Selected Items** to determine the order of the series descriptions.

Top most **Selected Items** will be first in the series desciption and bottom items will be the last.

26.7 Configuration of the Scheduler

In the **Administration Portal** you can perform the following configuration tasks for the **Scheduler**:

(→ Page 737 *Configuring the displayed attributes in the Scheduler*)

(→ Page 738 *Enabling indication of prior studies in the Scheduler*)

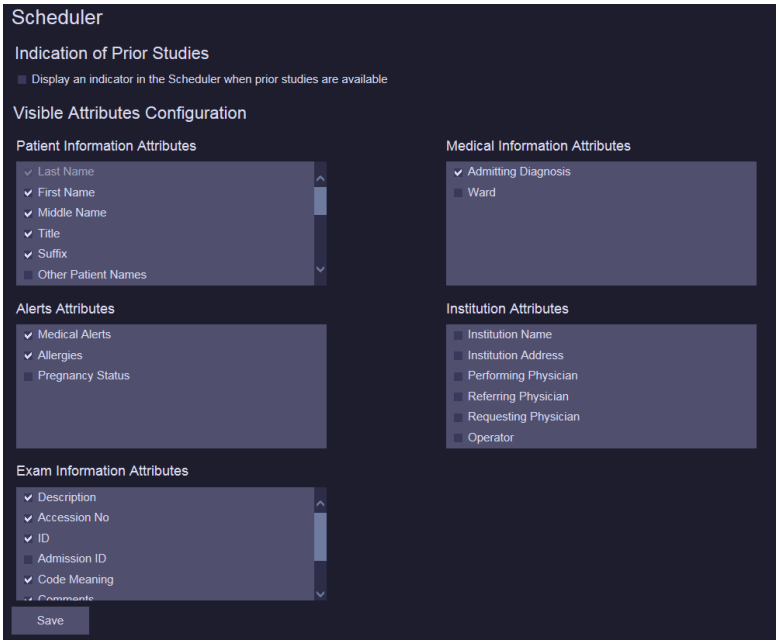
26.7.1 Configuring the displayed attributes in the Scheduler

In the **Administration Portal**, you can define which attributes are displayed in the **Patient Registration** tab of the **Scheduler**.

1 Log on to the **Administration Portal**.

2 Select the **Clinical Configuration** workspace and choose **Patient Browser > Scheduler** from the navigation tree.

The **Scheduler** window opens.



3 In the **Visible Attributes Configuration** section, select the check boxes of the attributes that should be displayed in the **Scheduler**.

– or –

Clear the check boxes of attributes that should not be displayed in the **Scheduler**.

Note that mandatory attributes, such as **Last Name**, cannot be deselected.

4 Click **Save** to confirm your settings.

(→ Page 738 *Enabling indication of prior studies in the Scheduler*)

26.7.2 Enabling indication of prior studies in the Scheduler

In the **Administration Portal**, you can enable an automatic indicator in the **Scheduler** which displays that prior studies are available.



In the **Patients** list items of the **Scheduler**, this icon indicates that prior studies are available.

1 Log on to the **Administration Portal**.

2 Select the **Clinical Configuration** workspace and choose **Patient Browser > Scheduler** from the navigation tree.

The **Scheduler** window opens.

3 Select the option **Display an indicator in the Scheduler when prior studies are available** to display an indicator when prior studies are available.

4 Click **Save** to confirm your settings.

(→ Page 737 *Configuring the displayed attributes in the Scheduler*)

26.8 Configuring job retry settings

If a transfer job fails, for example, because of network problems, the system will try to restart the job after the specified delay time.

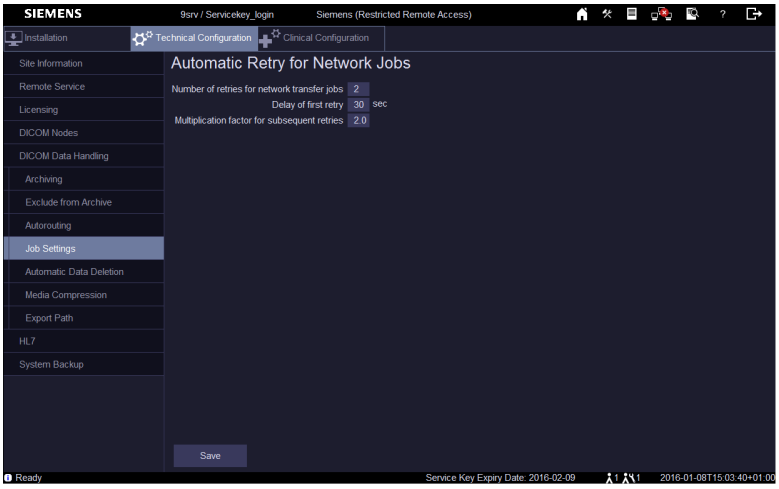
A job will be marked as “failed” after a maximum number of unsuccessful retries.

To configure the number and delay values for retries of network jobs, proceed as follows:

1 Log on to the **Administration Portal**.

2 First select the **Technical Configuration** workspace and then choose **DICOM Data Handling > Job Settings** from the navigation tree.

The **Automatic Retry for Network Jobs** window opens:



3 Enter the desired number of retries in case of errors into the **Number of retries for network transfer jobs** field. The default value is “2”.

4 Enter the desired number of seconds by which the first retry of a job shall be delayed into the **Delay of first retry** field. The default value is 30 seconds.

5 To define longer delay times for subsequent retries, enter the multiplication factor into the **Multiplication factor for subsequent retries** field. The default value is “2.0”.

6 Click **Save**.

26.9 Software updates

Siemens Healthineers regularly provides software application updates, which you must always install.

You are prompted to install software updates at the scanner during system startup.

The updates can contain feature improvements and safety-relevant patches.

26.9.1 Updating the system software

Available software updates to be installed will be displayed in the open tasks when you start your system.

If you defer an update over a longer period of time, Siemens Healthineers Service will contact you.

The installation can take up to two hours.

During the **System Check**, the **Examination**, **Calibration**, **Checkup**, and **Daily QA** are not available.

Examination will not be possbile until **System Check** is completed.

If the software update fails, a rollback is performed and the system is restored to the previous version. You can continue to work normally.

If a critical error occurs, contact Siemens Healthineers Service.

✓ Software packages to be installed are automatically detected and the name of the first package is displayed.

1 In the open dialog box of the software package, click **Start Update**.

– or –

In case of emergency, click **Defer** to postpone the installation.

Deferred updates are displayed again during the next startup.

2 In the open dialog box, click **Yes**.

3 After the installation has been successfully completed, click **Next**.

All clinical user passwords have been erased and new ones have to be issued.

4 In the **New password** field, enter a new password to be used by all users.

5 In the **Confirm new password** field, re-enter the password.

The next time a user logs on, they have to change the password.

6 Click **Next**.

7 Follow the instructions to run the software update on the tablet.

8 Click **Next**.

Follow the instructions to run the **System Check**.

9 To start **System Check**, click **OK**.

– or –

To abort **System Check** click **Cancel**.

10 If **System Checkup** fails, click **Repeat** restart **System Checkup**.

Updating the system software from SD card

If the system does not need an online connection, the software updates have to be installed from the software packages delivered on an SD card that is delivered with the instructions for use.

1 Insert the SD card into the SD card slot.

Software packages to be installed are automatically detected and the name of the first package is displayed.

2 Follow the instructions as described in *Updating the system software*. (➔ Page 740 *Updating the system software*)

Follow the instructions to verify your software update.

3 To receive your verification code, scan the QR code presented on your screen with a smart phone.

Your verification code will be displayed in a browser window.

4 Enter the six digit verification code in the respective field.

5 Click **Verify installation**.

– or –

Not now to verify the installation at a later date.

Upon verification, the software update will be completed.

What is new in the system software

After the software updates have been successfully installed, all new features and functionalities are listed in the **What is New?** dialog box.

This refers only to new software versions, not service packs.

✓ The software updates are successfully installed.

1 Restart the system.

The **What is New?** dialog box opens.

2 Click **Close** to close the dialog box.

The dialog will reopen after next system start.

– or –

Select the **Please don't show again** check box.

The dialog box will not reopen after you restart the system.

3 To open the **What is New?** dialog box, click the Help icon.

4 From the menu, select **What is New?**.

The **What is New?** dialog box reopens.

26.10 Configuring examination parameters

In the Administration Portal, you can set various examination parameters.

✓ You are logged on to the Administration Portal as a clinical administrator.

◆ Select the **Clinical Configuration** workspace and, from the navigation tree, choose **Examination Configuration**.

– or –

As a medical user, you can open the **Examination Configuration** window with limited rights.



On the access bar, move the mouse pointer over the **Settings** icon and, from the menu, choose **Clinical Configuration**.

As a clinical administrator, you can modify all parameters.

As a medical user, you can view all parameters, but you cannot modify all of them.

As a clinical administrator, you can perform the following tasks:

- (➔ Page 742 *Configuring examination parameters*)
- (➔ Page 747 *Deactivating ECG Synthetic Sync Spiral*)
- (➔ Page 748 *Setting image configurations*)
- (➔ Page 754 *Configuring the automatic patient instruction*)

26.10.1 Setting dose configurations

In the Administration Portal, you can adapt various dose settings which will help you to manage and monitor the dose and avoid using excessive radiation doses.

✓ The **Examination Configuration** window is open.

◆ From the navigation tree, choose **Dose**.

As a clininal administrator, you can perform the following tasks:

- (➔ Page 743 *Automatic adaption of the radiation dose to the patient size*)
- (➔ Page 746 *Setting the dose alert thresholds*)
- (➔ Page 747 *Disabling the dose alert*)

Automatic adaption of the radiation dose to the patient size

CARE Dose4D individually adapts the radiation dose to the patient.

In the Administration Portal, you can preset the **CARE Dose4D** modulation for different body parts and distinguish between typical patient sizes.

For more detailed information on **CARE Dose4D**, see *System Owner Manual*, chapter *Dosimetry and imaging performance report*.

✓ The **Dose Configuration** window is open. (➔ Page 743 *Setting dose configurations*)

1 Click the **Modulation** tab.

The **Dose Modulation Configuration** window opens.

2 The adaptation strength can be set individually for the various organ characteristics and various patient sizes (**Child**, **Adult Slim**, and **Adult Obese**).

Select the requested **CARE Dose4D** strength values for the **Child**, **Adult Slim**, and **Adult Obese** sections.

You can select **Very Weak**, **Weak**, **Average**, **Strong**, or **Very Strong**.

– or –

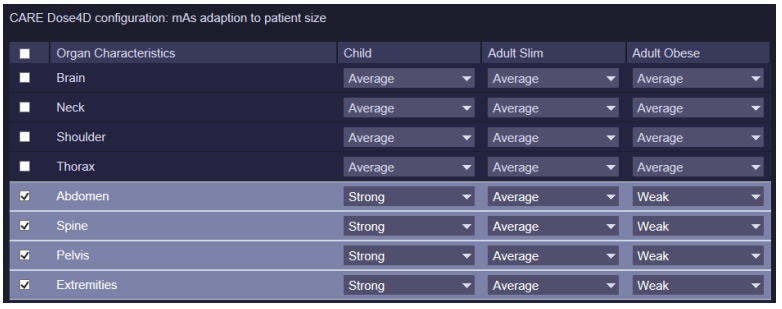
To select the same values for different organs, hold the **Ctrl** key and click all requested rows. The check boxes of the activated rows are selected.

Select the requested **CARE Dose4D** strength values for the **Child**, **Adult Slim**, and **Adult Obese** sections. All values will be applied for all activated rows.

– or –

Click **Set Default Values** to apply the default settings.

The default value for all fields is **Average**.



The selected values do not represent the intensity of the radiation, they represent the strength of the **CARE Dose4D** modulation.

Individual adjustment of the adaptation strength, which can be selected in five steps (very weak, weak, average, strong, & very strong), and which is separated for body sizes smaller or larger than the reference body size can be made.

With a **Very Weak** setting, the radiation dose for bigger-than-average patients is increased slightly, while the dose for smaller-than-average patients is decreased slightly.

With a **Very Strong** setting, the radiation dose for bigger-than-average patients is strongly increased, while the dose for smaller-than-average patients is strongly decreased.

For more detailed information on **CARE Dose4D**, see *System Owner Manual*, chapter *Dosimetry and imaging performance report*.

It is very important to remember that a change of this adaptation strength affects all protocols.

3 Click **Save**.

Disabling the creation and the transfer of the dose report

By default, your system documents all dose parameters of the radiation to which patients are exposed. All DICOM nodes that receive images of the examination automatically receive these dose reports. The system may additionally transfer the dose report to any connected DICOM node.

✓ The **Dose Configuration** window is open. (➔ Page 743 *Setting dose configurations*)

1 Click the **Report** tab.

The **Dose Configuration** window opens.

2 The **DICOM Radiation Dose Structured Report** check box is selected by default.

Clear the **DICOM Radiation Dose Structured Report** check box to disable automatic dose reports.

If the **DICOM Radiation Dose Structured Report** check box is cleared, no dose reports will be available for transfer.

3 The **Dose Report Auto Transfer** check box is selected by default.

Clear the **Dose Report Auto Transfer** check box to disable automatic dose report transfers.

4 Select or deselect the required nodes from the **Dose Report Additional Transfer** list to transfer dose reports to additional DICOM nodes.

You can select the **Dose Report Auto Transfer** check box even if the **DICOM Radiation Dose Structured Report** check box is cleared.

The patient examination documentation is also transferred to the DICOM nodes selected in this list. You can select DICOM nodes from the list even if the **Dose Report Auto Transfer** or the **DICOM Radiation Dose Structured Report** check box is cleared, if applicable.

5 Click **Save**.

Setting the dose alert thresholds

The dose alert defines the maximum radiation dose that a patient can be exposed to within one examination.

If the threshold values are exceeded, a warning message is displayed and the scan can only be started upon confirmation by an authorized user.

✓ The **Dose Configuration** window is open. (➔ Page 743 *Setting dose configurations*)

1 Click the **Alert** tab.

The **Dose Alert Configuration** window opens.

2 Enter the requested values for the **Adult** and **Child** sections.

– or –

Click **Set Default Values** to reapply the default settings.

Default values are 1000 mGy and 0 mGy*cm (= Off) for adults and 500 mGy and 0 mGy*cm (= Off) for children.

The dose alert only registers the radiation dose for one patient and one examination. It does not register long-term radiation doses for each patient! Radiation doses of previous examinations must be considered additionally.

3 Click **Save**.

Disabling the dose alert An authorized person can disable the dose alert, if applicable.

✓ The **Dose Alert Configuration** window is open. (→ Page 746 *Setting the dose alert thresholds*)

1 Enter 0 as the value for each **CTDIvol** and **DLP** in the **Adult** and **Child** section.

The value **off** is displayed for each section.

2 Click **Save**.

The dose alert is disabled.

To enable the dose alert again, raise the **CTDIvol** and **DLP** values in the **Adult** and **Child** section to the requested value.

26.10.2 Deactivating ECG Synthetic Sync Spiral

Depending on your individual license, this function may not be available.

The **ECG Synthetic Sync Spiral** function is used for examinations with ECG pulsing.

If the system detects a missing ECG signal during measurement, ECG pulsing will be switched off automatically and the scan will be proceeded with synthetic syncs.

If **ECG Synthetic Sync Spiral** is deactivated and the system detects a missing ECG signal, the scan will be interrupted.

✓ The **Examination Configuration** window is open.

1 From the navigation tree, choose **Cardiac**.

The **Cardiac Configuration** window opens.

2 **ECG Synthetic Sync Spiral** is activated by default.

Clear the **ECG Synthetic Sync Spiral** check box to disable the function.

3 Click **Save**.

26.10.3 Setting image configurations

In the Administration Portal, you can predefine window values and image comments.

✓ The **Examination Configuration** window is open.

◆ From the navigation tree, choose **Image**.

As a clininal administrator, you can perform the following tasks:

- (➔ Page 748 *Defining window values*)
- (➔ Page 749 *Predefining image comments*)

Defining window values

In the Administration Portal, you can define window values for various body parts.

With this function, the user can easily optimize the display of images to his needs. The whole range of gray scales is used to display only those gray values, that are relevant for the requested body part. As a result, the visible contrast range is better.

✓ The **Image Configuration** window is open. (➔ Page 748 *Setting image configurations*)

1 Click the **Windowing** tab.

The **Windowing Image Configuration** window opens.

The table contains predefined body parts and their window values.

You can perform one or more of the following steps:

2 Add a new organ: Click **New Entry**, enter the name of the organ and the requested window values, and click **Insert**.

3 Modify an entry: Click **Edit** in the corresponding line, edit the requested values, and click **Update**.

4 Delete an entry: Click **Delete** in the corresponding line.

Narrow window widths will cause high contrasts but also more image noise. Select wider windowing to reduce image noise.

You can edit, but not delete, default entries.

5 Up to four window values can be assigned to the **F5** to **F8** key for fast access.

Soft Tissue, **Lung**, **Bone**, and **Liver** are selected by default from the corresponding lists.

For example, select **Colon** from the **Window Value on F5** list to save the window values of colon by using the **F5** key.

6 Click **Set Default Values** to return to the default settings.

7 Click **Save**.

Predefining image comments

In the Administration Portal, you can predefine and save various image comments, for example, for images that belong to a clinical study. The saved comments can be assigned to any image in the parameter panel via selection in a dropdown menu.

✓ The **Image Configuration** window is open. (➔ Page 748 *Setting image configurations*)

1 Click the **Common** tab.

The **Common Image Configuration** window opens.

No comments are set as default.

You can perform one or more of the following steps:

2 Create a new comment: Click **New Entry**, enter the requested text in the field, and click **Insert**.

3 Modify a comment: Click **Edit** in the corresponding line, edit the comment, and click **Update**.

4 Delete a comment: Click **Delete** in the corresponding line.

5 Click **Save**.

26.10.4 Configuring the patient documentation

By default, your system creates patient protocols and examination reports, and transfers the examination data automatically to defined DICOM nodes.

As soon as a patient is examined (scan or recon), your system creates a MPPS report for each study of the patient. The MPPS report contains additional patient data and is automatically returned to the RIS.

In the Administration Portal, you can deactivate the automatic creation and transfer of patient protocols, examination reports, and MPPS reports.

✓ The **Examination Configuration** window is open.

1 From the navigation tree, choose **Patient**.

The **Patient Configuration** window opens.

All check boxes are selected by default.

2 Clear the **Patient Protocol** check box to disable the automatic creation of patient protocols.

3 Clear the **Examination Report** check box to disable the automatic creation of examination reports.

If both the **Patient Protocol** check box and the **Examination Report** check box are cleared, no patient examination documentation will be available for the transfer.

---

4 Clear the **Auto Transfer of Selected Documentation** check box to disable the automatic transfer of patient examination documentation to defined DICOM nodes.

5 Clear the **Auto Complete MPPS** check box to disable the automatic creation of MPPS reports.

You can select all check boxes again by clicking **Set Default Values**.

6 Click **Save**.

26.10.5 Setting general configurations

In the Administration Portal, you can select various general settings.

✓ The **Examination Configuration** window is open.

◆ From the navigation tree, choose **General**.

As a clininal administrator, you can perform the following tasks:

- (➔ Page 751 *Defining the maximum child age*)

Defining the maximum child age

In the Administration Portal, you can define the maximum child age.

The maximum child age influences the average age of patients (children and adults).

If you have changed the maximum child age, it may be applicable to adapt other settings. (➔ Page 743 *Automatic adaption of the radiation dose to the patient size*).

✓ The **General Configuration** window is open.

1 In the **Maximum Child Age** field, enter the requested value.

The default value is **11**.

2 Click **Save**.

Selecting the protocol parameters for series description

In the Administration Portal, you can select protocol parameters to customize the series descriptions.

✓ The **General Configuration** window is open.

All protocol parameter values, except **User Text**, are generated from the scan protocol and inserted automatically in the series description.

You can define the order in which the parameters are listed in the series description.

User Text can be added to provide customized information within the series description. Information can be entered into a designated area within the series description. If desired, entered **User Text** can be the only information for the series description.



1 Select the requested values in the **Series description** area and click the icon to move them from the **Available items** list to the **Selected items** list.

The values **Range Name**, **Slice Thickness**, **Kernel**, **Iterative Recon Strength**, **Recon Phase**, **Image Orientation**, **Recon&GO Type**, **Recon Cycle Pattern** and **User Text** are selected by default.

– or –

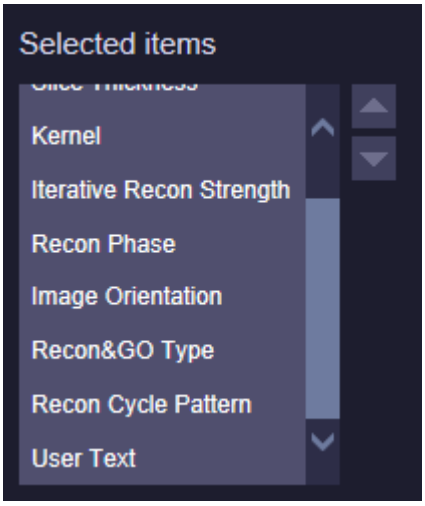


Click the icon to move all parameters from the **Available items** list to the **Selected items** list.



2 Click the requested value in the **Selected items** list and use the icons to change the order of the selected items.

The **Selected items** list reflects the values in the order in which they are listed in the series description.





You can return to the default settings by clicking **Set Default Values**.

3 Select the **Use Requested Procedure as Study Description in Single study mode** checkbox, if you want to use Single study mode. The checkbox is by default off.

4 Click **Save**.

Selecting a DICOM node as d.via

A departmental via (d.via) is a postprocessing server that provides *syngo*.via postprocessing applications. This server is connected by using a DICOM node.

This option allows your system to recognize its postprocessing server.

In the Administration Portal, you can define a *syngo*.via DICOM node as departmental via.

This function is only available for *syngo*.via customers.

✓ The **General settings** window is open.

✓ At least one remote DICOM node is configured for your system. Postprocessing servers must be configured as a **Workstation**.

1 From the **DICOM node marked as d.via** list, select the required value.

The default value is the first available *syngo*.via DICOM node.

All remote DICOM nodes with the role **Workstation** are selectable.

You can select one of the connected *syngo*.via DICOM nodes or the value **None** from the **DICOM node marked as d.via** list.

Clicking **Set Default Values** restores the factory settings.

2 Click **Save**.

Your system can now send scan data to the d.via.

When a DICOM node is defined as d.via, you can select the postprocessing applications of the d.via during the Recon jobs in the **Auto Tasking** section.

In the **Auto Tasking** section, the parameters **syngo.via Workflow** and **syngo.via Datarole** are now activated. You can select the postprocessing applications from a dropdown list.

26.10.6 Configuring the automatic patient instruction

In the Administration Portal, you can define default settings for the automatic patient instruction and add new instructions or languages.

Audio Instructions can only be modified if no scan patient is loaded into examination.

✓ The **Examination Configuration** window is open.

◆ From the navigation tree, choose **Audio**.

As a clininal administrator, you can perform the following tasks:

- (➔ Page 755 *Configuring default settings of the patient instruction*)
- (➔ Page 755 *Recording and editing additional patient instructions*)

Configuring default settings of the patient instruction

In the Administration Portal, default audio settings can be configured.

✓ The **Audio Configuration** window is open. (➔ Page 754 *Configuring the automatic patient instruction*)

1 Click the **Settings** tab.

The **Audio Configuration Settings** window opens.

2 From the **Default Instruction Language** list, select the requested language.

If your requested language is not available by default, you can enter additional languages. These languages can also be selected as default. (➔ Page 756 *Entering additional languages for patient instructions*)

3 Move the **Volume for Patient Communication** slider to the left (quiet) or to the right (loud) to adjust the volume.

4 Move the **Audio Noise Reduction** slider to the left (low) or to the right (high) to adjust the noise reduction.

5 Deselect the **Activate Audio Lighting** check box, if you do not want to support the audio patient instruction with a patient instruction light inside the gantry.

6 Click **Save**.

Recording and editing additional patient instructions

Your system provides a set of prerecorded patient instructions (**Expiration**, **Inspiration**, **Do not swallow**, **Cardiac**, **Perfusion**, **TwinSpiral Dual Energy**, and **Short Inspiration**) in various languages. You can also record additional instructions in additional languages.

In the Administration Portal, you can record additional instructions and edit prerecorded instructions.

✓ The **Audio Configuration** window is open. (➔ Page 754 *Configuring the automatic patient instruction*)

◆ Click the **Recording** tab.

The **Audio Configuration Recording** window opens.

You can perform the following tasks:

- (➔ Page 756 *Entering additional languages for patient instructions*)
- (➔ Page 757 *Recording patient instructions*)
- (➔ Page 758 *Editing patient instructions*)
- (➔ Page 759 *Deleting patient instructions and language sections*)

Entering additional languages for patient instructions

In the Administration Portal, you can enter additional languages for patient instructions.

✓ The **Audio Configuration Recording** window is open.
(➔ Page 755 *Recording and editing additional patient instructions*)

1 Click the **New Language** button and enter the requested language.

For each new language, the following instructions are created by default: **Expiration**, **Inspiration**, **Do not swallow**, **Cardiac**, **Perfusion**, **TwinSpiral Dual Energy**, and **Short Inspiration**.

Every instruction consists of two parts: One is played before, and one after the scan.

You must record all parts of these instructions. You cannot rename them.

---

2 Click **Edit**

3 Click **Record**

4 Follow the instructions to record.

5 Click **Save**.

Your language name must be unique and have less than 64 characters.

There can be up to 100 language entries.

You can now record patient instructions for your language.
(→ Page 757 *Recording patient instructions*)

You can now select your language as default instruction language.
(→ Page 755 *Configuring default settings of the patient instruction*)

Recording patient instructions

In the Administration Portal, you can record additional patient instructions.

✓ The **Audio Configuration Recording** window is open.
(→ Page 755 *Recording and editing additional patient instructions*)

1 In the **Audio Configuration Recording** window, select the requested language.

2 Click the **New Entry** button to create a new instruction.

Every instruction consists of two parts: One is played before, and one after the scan.

A new instruction is displayed.

3 Name your instruction.

4 Click the relevant **Record** button.

There is a separate **Record** button for the **Before Scan** section and the **After Scan** section.

A message window opens to guide you through the recording.

5 Press and hold the **Call Patient** key on the control box to record your instruction.

Speak slowly and clearly.

You must record both parts of your instruction.

6 Release the **Call Patient** key to stop the recording.

The length of your audio file is displayed.

You can record up to 10 instructions per language.

The maximum length for each audio file is 15 seconds.

7 Click **Save**.

You cannot save an unnamed instruction.

Editing patient instructions

In the Administration Portal, you can edit and re-record existing patient instructions.

✓ The **Audio Configuration Recording** window is open.
(➔ Page 755 *Recording and editing additional patient instructions*)

1 In the **Audio Configuration Recording** window, select the requested language.

2 In the requested instruction row, click the **Edit** button to re-record an instruction.

You can rename the instruction, if applicable.

You cannot rename pre-installed instructions.

3 Click the relevant **Record** button.

There is a separate **Record** button for the **Before Scan** section and the **After Scan** section.

A message window opens to guide you through the recording.

4 Press and hold the **Call Patient** key on the control box to re-record the requested instruction.

Speak slowly and clearly.

If there is an earlier version of the recorded instruction, this instruction is automatically overwritten.

Overwritten instructions are deleted definitively and cannot be restored!

5 Release the **Call Patient** key to stop the recording.

The length of your audio file is displayed.

The maximum length for each audio file is 15 seconds.

6 Click **Save**.

Deleting patient instructions and language sections

In the Administration Portal, you can delete patient instructions and complete language sections.

✓ The **Audio Configuration Recording** window is open.
(➔ Page 755 *Recording and editing additional patient instructions*)

◆ From the **Audio Configuration Recording** window, select the requested language.

In the requested row, click **Delete** to delete an instruction.

– or –

From the **Audio Configuration Recording** window, select the requested language.

Click **Delete** to delete the language.

You cannot delete pre-installed instructions and languages.

Deleted languages and instructions are lost definitively and cannot be restored!

26.11 Configuring the manual prior study search

In the **Administration Portal**, you can specify the default settings for manual prior study search.

These settings are used by the **Query and Retrieve** dialog box.

1 Log on to the **Administration Portal**.

2 First select the **Clinical Configuration** workspace and then choose **Prior Study Search** from the navigation tree.

3 In the **Pre-fetch nodes** list, select the default nodes that are used for prior study search.

These nodes are searched in addition to the short term storage (STS) and the configured default archive.

4 In the **Patient filter** list, select the default attributes that are used to identify prior studies that belong to the selected study.

5 In the **Modality filter** list, select the modalities that are selected by default when opening the manual prior study search.

6 Click **Save** to confirm your settings.

Your changes will apply to all users who are connected to the same server as this client.

26.12 Layout management

In the **Administration Portal**, you can manage the layout collections of users on the server.

In the **Layout Management** section, the following functions are available:

- (➔ Page 761 *Accessing the layout management configuration*)
- (➔ Page 761 *Allowing private layout collections to be saved*)
- (➔ Page 761 *Deleting layout collections*)



It is only possible to set a layout as default layout. The creation of new layouts or deletion is not possible within MI View&GO.

26.12.1 Accessing the layout management configuration

1 Log on to the **Administration Portal**.

2 First select the **Clinical Configuration** workspace and then choose **Layout Management** from the navigation tree.

The **Layout Management** window opens.

26.12.2 Allowing private layout collections to be saved

In the **Layout Management** section, you can enable the option which allows all clinical users to save private layout collections.

1 Select the check box **Allow to save user specific layouts**.

All clinical users are able to save private layout collections.

When you open the **Layout Editor** in a reading workflow, a **Private Layouts** section is displayed. The user can copy layouts from the **Public Layouts** section or create new layouts, customize and save them in the **Private Layouts** section.

2 Click **Save** to confirm your settings.

26.12.3 Deleting layout collections

In the Layout Management section, you can delete private layout collections of certain clinical users.

1 Click the **Delete Collections** button.

The **Delete Collections** dialog box opens.

In the **Workflows** area, all workflows are displayed that contain private layout collections.

2 In the **Workflows** area, select a workflow.

In the **Users with own Layout Collection** area, all clinical users are displayed who defined private layout collections for the selected workflow.

3 Select those clinical users whose private layout collections you want to delete.

4 Click **Delete** and close the dialog box.

The selected clinical users are removed from the list.

5 Click **Save** to delete the private layout collections of the selected clinical users for the corresponding reading workflow.

26.12.4 Copying layout collections

In the **Layout Management** section, you can copy private layout collections of a certain clinical user to another clinical user.

1 Click the **Copy Collections** button.

The **Copy Collections** dialog box opens.

In the **Workflows** area, all workflows are displayed that contain private layout collections.

2 In the **Workflows** area, select a workflow.

In the **Users with own Layout Collection** area, all clinical users are displayed who defined private layout collections for the selected workflow.

3 In the **Users with own Layout Collection** area, select a clinical user.

In the **Known Users** area, all registered clinical users are displayed. These are the clinical users you can copy your private layout collections to.

4 Select a known user from the list.

– or –

If the required user is not shown in the **Known User** list: Enter a **Domain User** and click **Add**.

The user is displayed in the **Known Users** list.

5 Click **Copy** and close the dialog box.

6 Click **Save** to copy the private layout collection of one clinical to another clinical user.

27 System shutdown and restart

This section provides information on how to shut down and restart the system.

27.1 Shutting down the system

You can shut down the system on the **Home** screen.

Shutting down the system will close all open workflows and save the results to the Short Term Storage (STS). The system waits until all jobs that use local resources are completed.

✓ The gantry and the acquisition console are switched on.

1 Exit all running examinations and close all applications.



2 On the access bar, click the **Home** icon.



3 On the **Home** screen, click the **Shutdown** icon.

4 Select **Shut down System**.

A **System Shutdown** dialog box opens that gives you the choice to check the active processes running.

5 Optional: click **Job View** to display all active processes.

6 Click **Shut Down** to shut down the system.

A splash screen is displayed. Open workflows are closed and results are saved when the system shuts down.

– or –

Click **Cancel** to cancel the shutdown.



On the splash screen, you can select **Force Shutdown** to force the system to shut down. The system aborts all running jobs and unsaved results of open workflows will be lost!

27.2 Shutting down the system at the gantry display

You can shut down the system by pressing the **On/Off** switch on the gantry display.

✓ The gantry and the acquisition console are running.

◆ Press the blue **On/Off** button above the gantry display's screen.

You are informed about the system shutdown with a timer dialog. After 60 seconds, the system will shut down automatically. You can cancel shutdown by pressing the **On/Off** button second time.

Performing a forced shutdown by pressing and holding the gantry display's **On/Off** button may result in a loss of unsaved data.

27.3 Restarting the system

On the **Home** screen, you can restart the system.

CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

◆ Calibrate the system as part of the CT checkup. Repeat calibration if ring artifacts occur.

1 Exit all running examinations and close all applications.

2 On the access bar, click the **Home** icon.

3 On the **Home** screen, click the **Shutdown** icon.

4 Select **Restart System**.

A **System Shutdown** dialog box opens that gives you the choice to check the active processes running.

5 Optional: click **Job View** to display all active processes.

6 Click **Restart System** to restart the system.

The system is shut down and started up again.

– or –

Click **Cancel** to cancel the restart.

To assure best system performance, it is recommended to restart the system once a day.

28 Quality control and assurance

Quality control and assurance procedures maintain and verify your system's performance on a periodic basis, ensuring that it operates within factory-defined specifications. Your meduser (medical user) or syadmin (system administrator) access level will determine which procedures you can access, perform, and change.

- We recommend having the constancy test performed by Siemens Healthineers Service as part of a service contract.
- All parameters, images, and test-procedure tables shown in these instructions are examples. Only the parameters displayed by your system are applicable.

28.1 Manual and automated quality control procedures

The quality control (QC) procedures can be performed *manually* by:

- inserting a point source in an integrated point source holder,
- using a sheet source, or
- using a phantom.

Otherwise, the QC procedures can be performed *automatically* by using the internal Automated Quality Control (AQC) device with:

- an internal point source, or
- an internal line source.

The manual QC procedures explain the system's calibration and verification steps in detail, noting the various system motions. For the AQC procedures, the system motions are not repeated since the user is not making manual selections to cause these system motions. Refer to the manual QC procedures for information on how the system will move during the automated QC procedures.

28.2 Quality Control Schedule

Quality Control procedures are performed daily, monthly, or as required. Local regulations may require additional checks.

Acquisition of a bar phantom is not required by Siemens Healthineers, but can be done at the discretion of the user. It is subject to state or federal requirements set forth in the user's radioactive materials license.

The previous Symbia system task **Coarse Tuning** has been renamed to **Tuning**. The **Tuning** task which was once a separate, standalone task can now be performed from within the **Intrinsic Flood** protocol. Tuning is performed with either **Tc-99m** or **Co-57**.

The system does not move the detectors to perform a **CT Checkup**, **CT Quality**, or **CT Calibration**. Manually retract the detectors all the way out before the start of the **CT Checkup**, **CT Quality**, or **CT Calibration** to avoid contact during motion with the patient table, its pallet, or a detector collimator. Configure the gantry to move the patient table to the predefined CT Brain Index position.

Performed	Quality Control Procedure	Source
Daily for MI	• Intrinsic Verification (manual or Automated Quality Control (AQC)) - or - • Extrinsic Verification (manual or AQC)	• 10–25 µCi (microcuries) of Tc-99m - or - • Co-57 or Tc-99m sheet source - or - • AQC source
Daily for CT	• CT Checkup • CT Quality (Daily QA) • CT Calibration - after 1 hour of checkup or if ring artifacts occur	
Weekly for MI	Tuning Note: You can perform tuning as part of intrinsic verification.	• 5–15 µCi point source of Tc-99m
Monthly for MI	• Intrinsic Calibration	• 10–25 µCi of Tc-99m - or - • AQC source
	• Quick Head Alignment Calibration	• 3 or 5 point sources, each about 1 mCi (millicuries) per source (Match sources within 20% of each other for Tc-99m only) - or - • AQC source
Monthly for CT	• CT Constancy Test	
Every 6 months or per Regulatory/License requirements (if applicable)	• Intrinsic Calibration with alternate isotopes	• 10 -25 µCi point source of applicable isotope
	• Sensitivity Calibrations (xSPECT, Broad Quantification[1], or Cross Calibration) 1) Volume sensitivity which is done with broad quantification only needs to be performed once.	• 5-10 mCi point source of applicable isotope
At installation or if collimator damage is detected:	• Extrinsic Calibration (performed at installation or if collimator damage is detected.	
Yearly for MI	• Head Alignment Calibration for all Collimators and Configurations	See source strengths above.

A reminder is displayed in **Open Tasks** for performing the MI quality-control procedure one week prior to its expiration.

28.3 System check and open tasks for NM and CT

To ensure that the MI and/or CT systems are ready for operation and all functions relevant to safety are working correctly, you must perform basic maintenance to optimize the MI and/or CT performance.

For information on:

- CT system check (➔ Page 770 *CT system check*)
- MI system check (➔ Page 771 *MI system check*)
- NM open tasks (➔ Page 774 *Open tasks*)

28.3.1 CT system check

To ensure safe operation and correct any irregularities, the system provides a checkup procedure.

The system requests this procedure automatically, and you can decide whether or not to perform it. You are informed of a checkup procedure that is due by a pop-up message which can be closed. If the checkup is not executed within a certain time frame, the pop-up message remains displayed on the *syngo* Acquisition Workplace until you perform the checkup procedure.

The system does not move the detectors to perform a **Checkup**. Manually retract the detectors all the way out before the start of the **Checkup** to avoid contact during motion with the patient table, its pallet, or a detector collimator. Configure the gantry to move the patient table to the predefined CT Brain Index position.

✓ To start the checkup procedure, verify no patient is loaded in the **Patient Browser**.

✓ Home the system.

✓ Use the hand control to move the pallet into the CT Brain position. Press the **Index** button on the hand control once, followed by the **Table Up** button, until the gantry display indicates that the pallet is in CT Brain position.

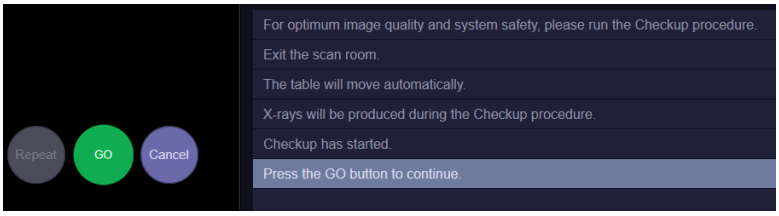
1 Click **System Check** on the **Home** screen or **Checkup** in the **Settings** menu.

The **System Check** window opens.



2 In the navigation pane on the left, select **Checkup**.

3 Click the **GO** button.



You are prompted to press the **GO** button.

4 Press the **GO** button on the control box.

Scanning is initiated. The system checkup starts.

It is recommended to perform the checkup procedure every morning as the system requests before scanning.

28.3.2 MI system check

The system provides a System Checkup to ensure all calibrations are current and the system is in optimal working condition prior to scanning a patient.This System Check will provide a listing of daily tasks that need to be performed on the system, as well as pending, expired, or failed tasks that may be needed.



The listing may include:

- Daily Floods
- Monthly Quality Control Suite
- Intrinsic calibrations
- Head Alignment
- Broad quantification
- xSPECT

Once you have started the system, the Home screen is displayed. Icons displayed on this screen are: **Examination**, **System Check**, **Lock** and depending upon the timing of calibration scheduling, **Open Tasks**. Check the **System Check** icon to see if any system calibrations should be performed.

A green checkmark (✔) displayed over the **System Check** icon indicates that all calibrations are current, and there are no tests to be performed at the present time. All calibrations have been performed, and they have been completed successfully. A yellow exclamation mark (!) indicates that one or more calibrations is overdue and is required to be performed. A red X (✖) indicates that a system calibration (or calibrations) has failed, and the system is not functioning. No acquisitions can be performed at this time, and Service must be called.

If the system **does not** have Automated Quality Control (AQC), **System Check** will only display the items:

- **NM Daily Floods** (daily QC configured in the Administration Portal)
- **Checkup** (CT daily QC)
- **Daily QA** (CT daily QC)

All other Quality Control (QC) tasks (**Head Alignment Calibration**, **Sensitivity Calibration**, **Intrinsic Calibrations**, and **Cross Calibration**) are included in the **System Check** when they become due.

If the system **does have** AQC, **System Check** will display those items listed below. Again, all other QC items are included in the **System Check** when they become due.

- **NM Daily Floods**
- **NM Monthly QC Suite** (monthly AQC of Head Alignment followed by Intrinsic Calibration)
- **Checkup**
- **Daily QA**

NM Daily Flood options include Daily Intrinsic (AQC or Manual) or Daily Extrinsic (AQC or Manual).

Daily Floods are listed as **To Do** if not performed before 5:00 AM. All other calibrations are listed as **To Do** based on the time they were acquired and the QC schedule. For example, if Intrinsic Calibration was acquired at 5:00 PM, it is listed on the **To Do** at 5:00 PM five weeks later.

Use the following to perform the **System Check**:

1 Click the **System Check** tile or hover over the **Settings** (⚙) icon and select **MI System Check**. It also includes **Checkup**, **Daily QA**, and Calibration.

  The **System Check** window is displayed, and a listing of calibrations due are displayed in the navigation pane on the left. Calibrations to be run are indicated with an exclamation mark.

2 Select the calibration to be performed.

3 Select or enter the desired settings.

4 Follow the instructions displayed at the lower left of the screen.

5 When complete, click the **Start** button.

  The calibration begins. The system calculates the time needed for the calibrations before displaying a remaining time display.

If the **System Check** tile displays a green checkmark, indicating all calibrations were current, but you wanted to be ready for the next day, you could set up an AQC daily or monthly MI test the night before by hovering over the **Settings** (☼) icon at the screen's top-right corner and selecting **MI System Check**.

28.3.3 Open tasks

✓ The **Open Tasks** tile is displayed and lists calibrations one week before they are due.



For example: **Open Tasks**

- **BraodQuant - LEAP - Tc-99m**

  Estimated time: 30 Min

  Due by: 11/02/2020

- **xSPECT -LEHR - Co-57**

  Estimated time: 30 Min

  Due: by: 11/02/2020

- **Cross-Calibration - LEAP - Tc-99m**

  Estimated time: 30 Min

  Due by: 11/02/2020

✓ An **Open** button appears across from each Open Task.

The **Open Tasks** tile displays various calibrations that are upcoming, but not immediately requiring action. It is displayed in the lower right corner of the **Home** screen. A week before a calibration needs to be performed, it is displayed as an Open Tasks item. It can be performed at any time. It is not required that you wait until a calibration moves from the **Open Tasks** tile to the **System Check** tile before performing it. When an Open Task becomes overdue, it is moved from the **Open Tasks** tile to the **System Check** tile (with the exception of Tuning) and become a **To Do** item.

Those items that can be displayed in the **Open Tasks** tile:

- Monthly Quality Control
- Installed Sources (point, line, and precision)
- Tuning
- Intrinsic calibrations
- Broad quantification
- xSPECT

To access Open Tasks:

1 From the **Home** screen, click the **Open Tasks** tile.

  A task (calibration) list is displayed.

2 Use the scroll bar to move throught the tasks in the Open Task tile if more than 7 tasks are due to be performed.

3 Click the **Open** button next to the task to be performed.

  Thie System Check page is displayed. The opened task is displayed at the left side navigation pane.

4 Click the task in the navigation pane.

5 Click the **Start** button to begin the calibration.

28.4 Accessing the Quality Assurance workspace

1 Login to the **Administration Portal**.

– or –

Move the curser over the **Settings** (gear) icon, and from the menu choose **Clinical Configuration**.

2 Select the **Quality Assurance** workspace.

These Instructions for Use always describe access through the Administration Portal.

28.5 Accessories and techniques for MI quality tests

The following section contains information on preparing a point source, and installing various quality control accessories.

28.5.1 Preparing a point source for manual quality control

Calibrations and verifications requires point sources to be created.

- Intrinsic Calibration or Verification require 1 point source.
- Head Alignment requires 3 or 5 sources.
- Broad Quant (quantification) Sensitivity calibration requires 1 point source.
- Cross Calibration requires 1 point source.
- xSPECT Sensitivity calibration requires a precision source.



The point source holder uses a specific-size vial. Use the vials supplied with the system. A quantity of point source vials with caps are initially provided.

To prepare a point source, use an amount of activity that is as close as possible to the recommended range.

1 Place a small piece of tightly-rolled cotton (< 3 mm in diameter) into the cone portion of the vial.

2 Drop the recommended amount of Tc99M on the cotton.

When preparing a point source, do not over saturate the cotton. Do not overfill the vial or splash activity on its sides. Activities are as follows:

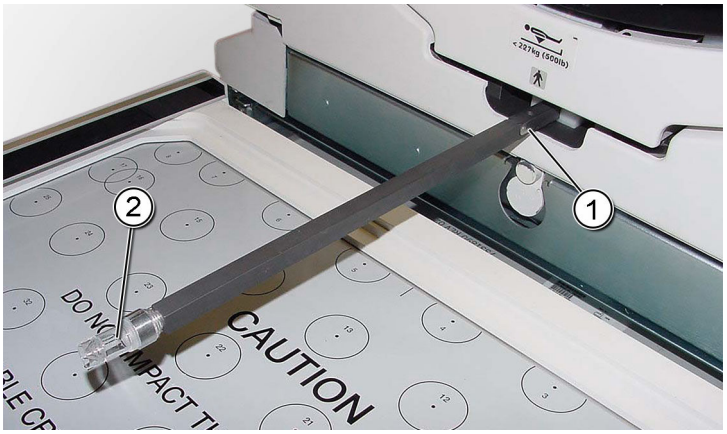
- Intrinsic Verification - 10–25 µCi
- Intrinsic Calibration - 10–25 µCi
- MHR/COR Template - 1–2 mCi per source, match sources within 20% of each other
- Sensitivity and Cross Calibration - 1–5 mCi

The point source is ready for the calibration.

28.5.2 Integrated source holder

The integrated source holder is a retractable rod built into the foot end of the patient table. It is manually pulled out of the patient table for quality control and assurance procedures. A point source vial is inserted into the end of the integrated source holder, enabling source positioning for peaking, tuning, and intrinsic verifications and calibrations. The integrated source holder can be retracted by pushing it back into the patient table.

By removing the integrated source holder's cap, a precision source can be installed for sensitivity calibration procedures..

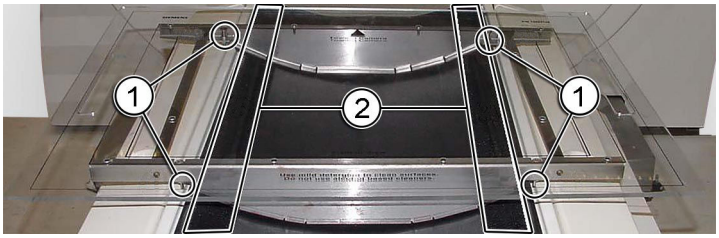


(1) Hinge enables holder to be lifted up if detector is accidentally raised.
(2) Integrated Source Holder

Do not lean or press down on the point source holder. Applying weight or pressure can bend and damage the holder. Similarly, do not allow detectors to contact the source holder.

28.5.3 Extrinsic Sheet Source Holder

The sheet source holder sits atop the patient table near the pallet handle for extrinsic flood verification and calibration. Hook and loop fasteners run the length of the patient pallet. A second short set of fasteners is used to attach the sheet source holder to the pallet. Four pins on the sheet source holder fit into tracks that run the length of the patient table and help to stabilize the sheet source holder.



(1) The circles mark the locations where the pins sit within the patient pallet track.
(2) The hook and loop fasteners run the length of the patient pallet as indicated by the white lines.

28.5.4 Extrinsic Sheet Source

The sheet source is positioned on top of the sheet source holder. The sheet source holder has screened alignment and labeling information. It attaches near the pallet handle.

28.5.5 Attaching the sheet-source holder and positioning the sheet source

A Co-57 sheet source is used with the system for calibrations. If used for verifications, replenish yearly to maintain source strength.

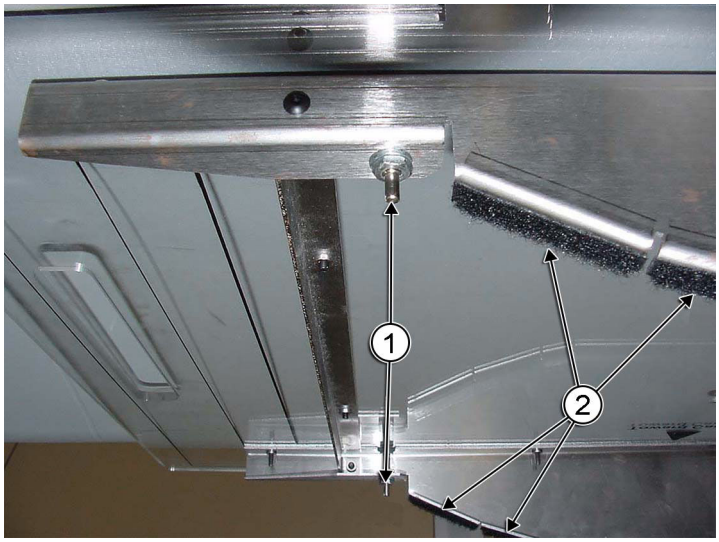
To attach the sheet source holder and position the sheet source, perform the following steps.

1 Home the system.

2 Align the sheet source holder's base with hook and loop fasteners to the pallet's shorter set of hook and loop fasteners.

Pins on the sheet source holder's base fit into tracks on both sides of the pallet to provide stability.

The system's auto configuration for extrinsic calibration depends on the proper positioning of the sheet source holder on the pallet, and the careful centering of the sheet source on the holder. Improperly positioning the holder will result in the sheet source being incorrectly positioned in the NM FOV.



(1) Pins

(2) Fasteners - Angle the sheet source holder from one side of the patient table. Align the fasteners, and lower the holder's leg pins into the track running the length of the patient pallet.

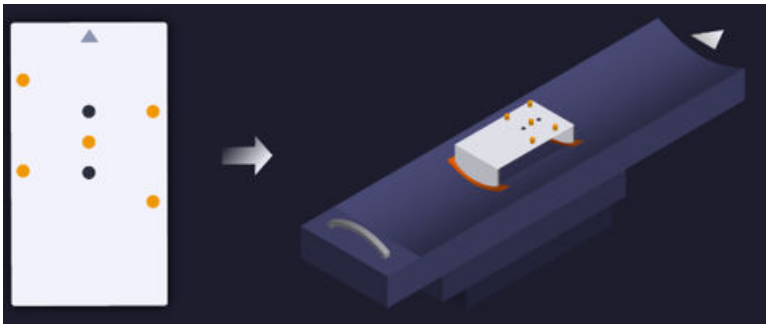
3 Center the sheet source within the sheet source holder's defined source area.

28.5.6 Head alignment source holder

The Head Alignment Source Holder comes standard with the system. Holes are cut into the Head Alignment Source Holder for holding point source vials. Hook and loop fasteners on the bottom of the Head Alignement Source Holder attach on the patient table's pallet when the pad is removed. The Head Alignment Source Holder is screened with instructions.



Head Alignment Source Holder



Head Alignment Source Holder with Five Point Source Vials

5 Source Location Collimators

- LEHR
- LEUHR
- LEAP
- LPHR

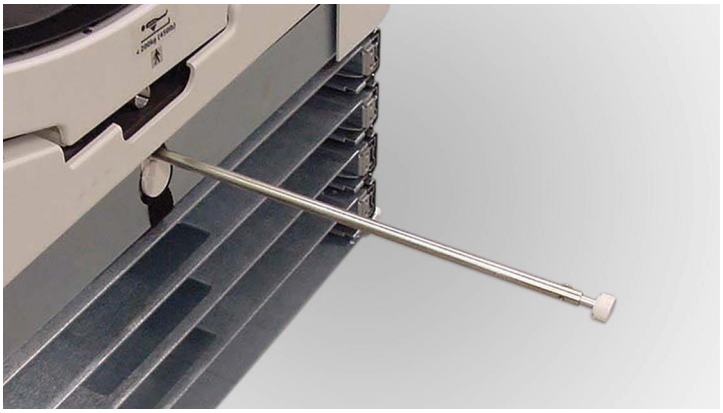
3 Source Location Collimators

- MELP
- HE

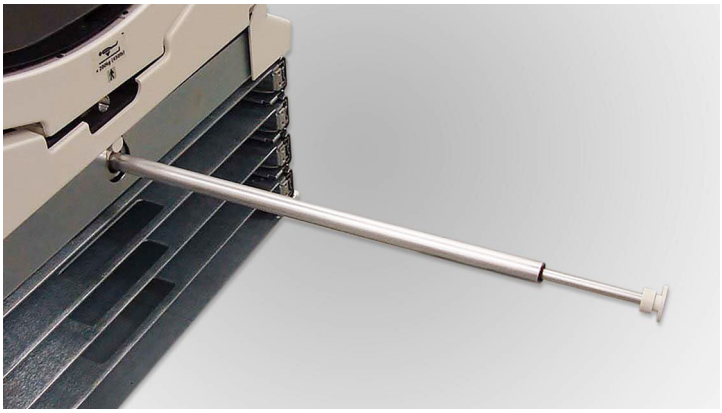
Use mild detergent to clean. Do not use alcohol-based cleaners.

28.5.7 AQC Device

Quality control can be performed manually, which involves manually positioning the source holder and source, or automatically, which requires the AQC option, enabling dates and times to be set for the Symbia system to automatically extend and retract a source during which verification and or calibration can be performed.



Point Source



Line Source with Shielding Exposed



Line Source Fully Exposed

Source Installation and Removal

The AQC device is shipped from the factory with non-radioactive, *dummy* sources installed in place of the actual radioactive sources. Initial installation and basic functionality checks are performed with the installed dummy sources. Once the device is installed, and basic functionality checks are performed, the dummy sources are removed and replaced with the radioactive sources by a Siemens Customer Service Representative.

CAUTION

When operating the system, radiation from an acquisition or calibration is present!

Radiation exposure to personnel is possible.

- When operating the system, limit personnel in the area to only those required for performing an acquisition or calibration.
- Avoid unnecessary radiation exposure to personnel.
- Observe all required radiation monitoring, safety, and reporting requirements of your site and regulatory agency.

Removing Source from AQC

✓ A lead container for source storage must also be available.

✓ A #6 drilled spanner driver must be used.



If the line or point source cannot be tapped back into the shielded storage area, the source will then need to be removed.

Do not disassemble the entire source from the lead cap.

To perform this procedure:

1 Follow the same electrical, safety, and service-related guidelines for returning the source to the shielded storage area, found in the previous section, *Returning Source to Shielded Storage*.

2 Grasp the lead end cap of the source.

Do not lean or press down on the point or line source holders. Applying weight or pressure can bend and damage the holders. System damage can result.

3 Turn the line source so that the screw which holds the source in place is in a position that it can be easily removed.

To prevent system damage, do not rotate the point source. Only the line source can be rotated 90° in either direction.

4 If removing the line source, grasp the line source by its lead cap, and using the spanner driver, completely remove the retaining screw by turning it counterclockwise.



Line source screw removal

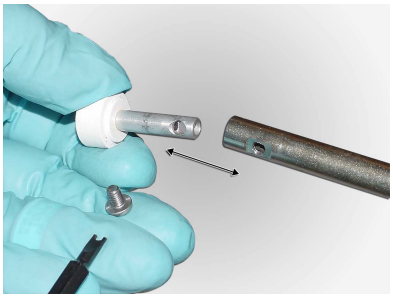
– or –

If removing the point source, grasp the point source by its lead cap, and using the spanner driver, completely remove the retaining screw by turning it counterclockwise.



Point source screw removal

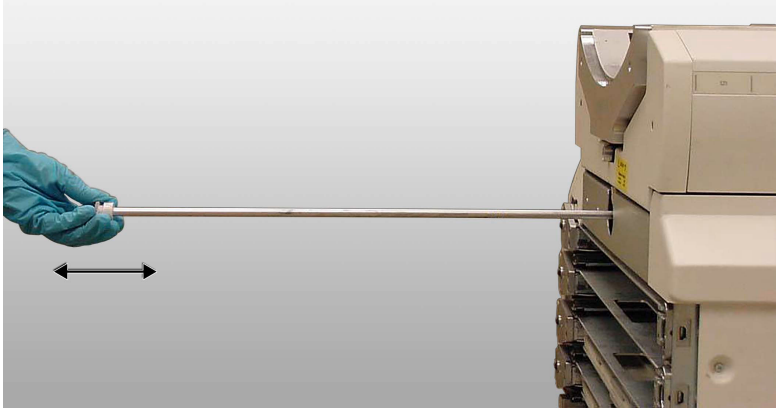
5 If removing the point source, grasp the lead cap and unscrew the point source by turning it counterclockwise once the retaining screw is removed.



Point source and lead cap detached from source rod.

– or –

If removing the line source, grasp the lead cap and unscrew the line source by turning it counterclockwise once the retaining screw is removed.



Line source resides within line source tube

6 Place the source in an appropriate lead storage container and safely store.

7 Screw the retaining screw back into the source holder.

The source holder must be retracted prior to electrical power being restored to avoid damaging the source holder when the system begins to move.

28.5.8 Automated Quality Control Source Storage or Removal

If an Automated Quality Control (AQC) source is extended and there is an unexpected electrical power loss or system malfunction, the source may need to be manually removed or pushed back into the AQC's shielded storage area.

When removing and storing sources, request help from your Siemens Customer Service Representative to prevent system damage.

CAUTION

Do not begin source installation or removal procedures before reading instructions!

Personal or system damage can result.

- Read the safety instructions in the *Safety and External Labeling* chapter, in the section titled *Radiation Protection During Source Installation*, prior to attempting source storage or removal from the AutoQC.

Returning Source to Shielded Storage

To return the source to the shielded storage area, perform the following steps:

This procedure should only be used for this specific, emergency situation. System damage can result.

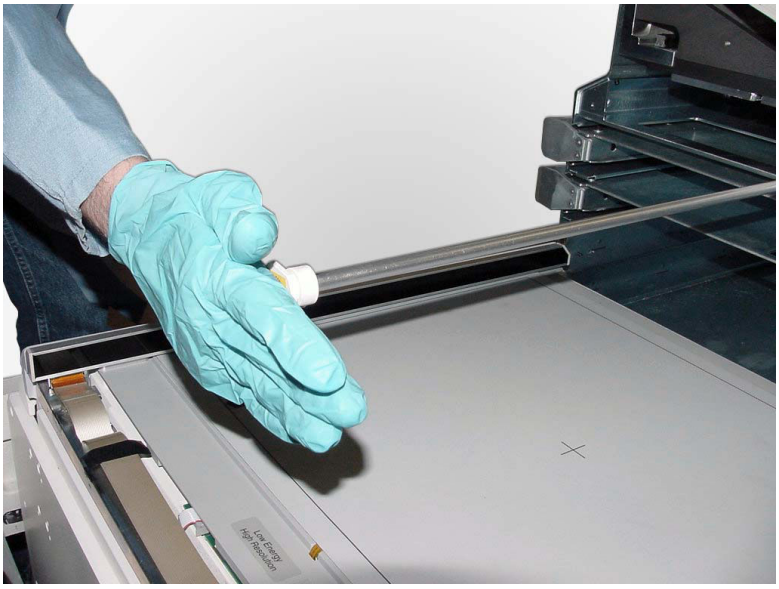
1. Try to restore electrical power to the system.
2. Contact your Siemens Customer Service Representative.
3. Read *Radiation Protection During Source Installation* in chapter 3.
4. Follow all safety precautions to limit radiation exposure.
5. Wear appropriate gloves and radiation dosimetry devices (ring, badge, etc.).

Do not lean or press down on the point or line source holders. Applying weight or pressure can bend and damage the holders. System damage can result.

6 Using moderate force with the palm of hand, repeatedly tap the point or line source's lead cap, moving the source back into the AQC's shielded storage area.

To avoid hand injury, center the palm of the hand to the source's lead cap when tapping against the source.

7 Repeat tapping of the source's lead cap until the source is gradually moved into the storage area with the lead source cap flush against the device.



Tapping the line source back into the shielded storage area.



Use the center of the palm to tap. Tap the point source back into the shielded storage area.



(1) Sources completely retracted with lead source caps flush against shielded storage area.

28.5.9 xSPECT Quant Calibration Kit

The xSPECT Quant Calibration Kit is available for three different isotopes:

- Cobalt-57 (Co57)
- Selenium-75 (Se75)
- Tin-113 (Sn113)

The calibration kits are available in two different configurations:

- xSPECT Quant Calibration Source Kit

  (Available for Co57 only)

- xSPECT Quant Calibration / Peaking Source Kit

  (Available for Co57, Se75, and Sn113)

The xSPECT Quant Calibration Source Kit contains a precision calibration source, a shield, and a source holder to aid positioning in a dose calibrator. This kit is available only for Co57, and used for customers who have AQC."

The xSPECT Quant Calibration / Peaking Source Kit additionally contains a precision calibration source, a peaking source, a shield, and a source holder to aid positioning in a dose calibrator.



xSPECT Quant Calibration / Peaking Source Kit Contents

(1) Peaking Source
(2) Precision Calibration Source and Shield
(3) Dose Calibrator Source Holder for positioning the calibration source in a dose calibrator

The calibration source is positioned in the shield as shown:



Precision Calibration Source and Shield - Exploded View

The Co57 source kit has the following activities:

- The precision source has a nominal activity of 3.15 mCi (+/- 15%).
- The peaking source has a nominal activity of 40 µCi (+/- 20%).

The Se75 source kit has the following activities:

- The precision source has a nominal activity of 4.25 mCi (+/- 15%).
- The peaking source has a nominal activity of 40 µCi (+/- 20%).

The Sn113 source kit has the following activities:

- The precision source has a nominal activity of 6.00 mCi (+/- 20%).
- The peaking source has a nominal activity of 40 µCi (+/- 20%).

Both the peaking source and the calibration source attach to the integrated source holder. To install the peaking source, first unscrew the vial holder cap from the end of the integrated source holder by turning it counterclockwise:

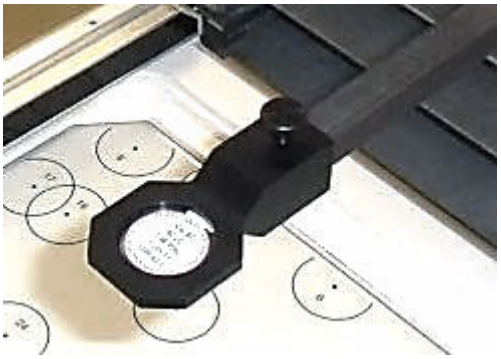


Integrated Source Holder with Vial Holder Cap



Integrated Source Holder with Vial Holder Cap Removed

Next, loosen the thumb screw on the top of the peaking source by turning it counterclockwise, slide the peaking source over the end of the integrated source holder, and then turn the thumb screw clockwise to tighten it:



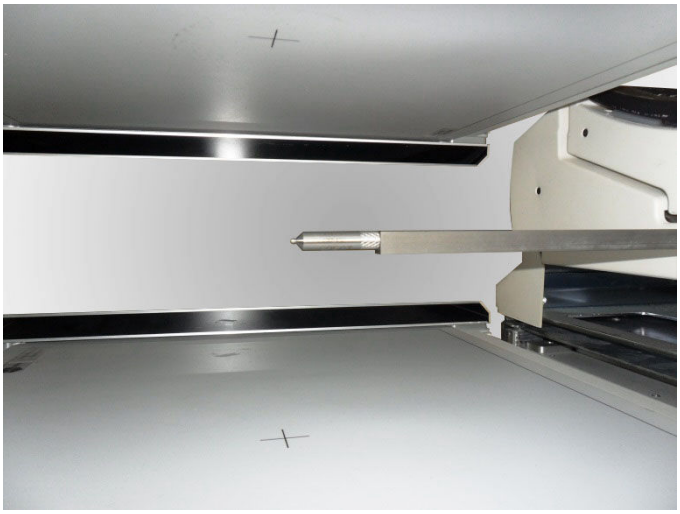
Peaking Source Installed On Integrated Source Holder

Remove the calibration source from the scan room while performing the peaking procedure to prevent calibration source scatter from interfering with the peaking process.

To remove the peaking source, loosen the thumb screw by turning it counterclockwise, and slide the peaking source off of the integrated source holder.

Install the collimators on the detectors before installing the calibration source.

To install the calibration source, screw it to the end of the integrated source holder by turning it clockwise:



Calibration Source Installed on Integrated Source Holder

The active element is contained in the sphere at the pointed end of the calibration source. Position the active element over the center of the detectors.

Follow all national, regional, and site-specific radiation safety requirements when handling the point source to limit exposure.

The calibration source shield is labeled with three separate activities:



Sample Shield Activity Label Calibration Source in Dose Calibrator Source Holder

- **System Apparent Activity** – The activity apparent to the system during an acquisition which is equal to the contained activity, but is reduced by attenuation due to the thin stainless steel sphere that houses the active element. This value should be used during the monthly sensitivity calibration.
- **Dose Calibrator Assay** - This is the activity measured by a dose calibrator with the calibration source placed in the source holder which is equal to the System Apparent Activity times the constant Geometry Factor to account for the unique geometry of the calibration source in the dose calibrator. The Dose Calibrator Assay value, decay corrected from the reference date to the current date, can be used to cross check the calibration status of the local dose calibrator. If the dose calibrator reading is significantly different from the decay-corrected Dose Calibrator Assay, the dose calibrator may need to be calibrated again.
- **Contained Activity** - This is the activity of the active element prior to encapsulation.

28.5.10 Phantom Setup for Volume Sensitivity Calibration

This sections describes a method for filling a uniform-cylinder phantom for use in volume sensitivity calibrations.

✓ Ideally, use a large, cylindrical container with an approximate diameter of 20 cm and a volume of 6000–7000 ml. Standard, cylindrical quality-control phantoms, with all inserts removed, typically meet these specifications.

✓ It is important that the volume of liquid used in the phantom is accurately known. Before injecting the radionuclide, measure the phantom's volume with standard laboratory equipment for example measuring cylinders and volumetric flasks.

To fill the phantom with an radioactive solution, you may follow these steps:

1 Fill the phantom to the top with clean water. Record the amount of water used.

2 Measure the dose of the desired radionuclide in a dose calibrator, and record the initial assay dose, date, and time.

3 Inject the radionuclide into the phantom.

4 Measure the syringe's residual dose in the dose calibrator, and record the residual assay and time.

5 Using a large syringe (<40 ml) and a large diameter needle, uniformly distribute the nuclide by repeatedly withdrawing liquid from the phantom and reinjecting it

6 Seal the phantom.

7 Within the calibration workflow, enter the dose information and the measured volume of the phantom.

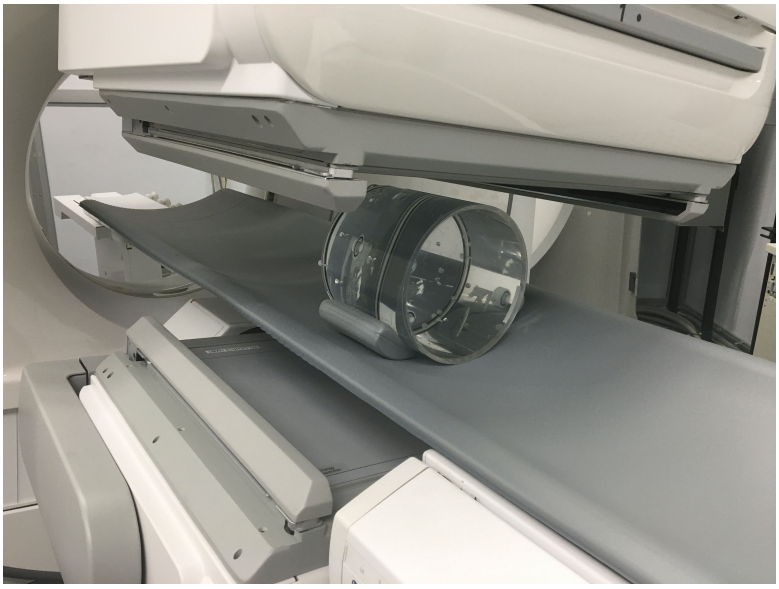
Positioning the Phantom

Perform the following steps to position the uniform cylinder phantom:

1 Position the phantom on the pallet. Insert the head holder's foam pads under each side of the phantom to prevent it from rolling off the pallet.

The long axis of the phantom should be parallel with the gantry's axis of rotation. Set the pallet height so that the phantom is centered transaxially with the gantry's opening.

2 Move the pallet into the gantry so that the phantom is within the SPECT field of view and the pallet is supported by the rear bed.



28.5.11 Accessing MI QA tasks

✓ For Quality Assurance (QA) tasks, your meduser or clinical administrator access level will determine what you see and can change.

The **Quality Assurance** workspace (which appears as a tab at the top of the console screen) can be displayed from the Settings (gear) icon by either selecting **Administration Portal** or **Clinical Configuration**.

To access QA tasks from the **Administration Portal**:

1 Move the cursor over the **Settings** (gear) icon in the top right corner and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

Select the desired MI Quality Assurance procedure.

- OR -

5 To access QA tasks from the **Clinical Configuration**:

Move the cursor over the **Settings** (gear) icon in the top right corner.

6 Click **Clinical Configuration**.

The Clinical Configuration tab is displayed. A second **Clinical Configuration** tab is displayed beneath it along with a **Quality Assurance** tab. These are also called workspaces. When selected, they change the screen content being displayed, and the navigation tree containing tasks on the left side of the screen.

7 Click the **Quality Assurance** workspace.

MI Daily QC, **MI Monthly QC**, and **MI Quality Assurance** tasks appear in the navigational tree.

Those tasks labelled as **MI** (Molecular Imaging) are labelled so to differentiate them from CT tasks. For example, there is an **MI Quality Assurance** followed by the CT task labelled **Quality Assurance** in the navigational tree.

28.5.12 MI quality control protocol overview

To help explain a protocol's screen layout, here is an example using the manual Intrinsic Verification protocol.

Prior to performing a protocol, there are prerequisites to be aware of or perform:

✓ Access the Quality Assurance (QA) tasks (➔ Page 798 *Accessing MI QA tasks*).

To begin this protocol:

1 Click the **MI Daily QC** task.

2 Click the **Intrinsic Flood** task.

3 Select the **Verification – Manual** task.

Intrinsic Verification's manual protocol and its selectable tasks and settings are displayed.

A protocol's title is displayed, for this example **Intrinsic Verification – Manual**.

There are dropdown menus for **Protocol** and **Sources** if they can be changed.

A checkmark to the left of a task indicates that the selection is to be performed for the protocol. Protocols have default tasks checked. A checkmark appearing gray indicates the task is required. A bold white checkmark indicates an optional task. Clicking the checkmark will remove the checkmark and the task will not be performed for the protocol.

A checkbox to the left of the **Tasks** heading can be clicked to select and checkmark all the tasks to be performed or clicked to remove the checkmarks (except the required tasks with gray checkmarks).

The **Save** and **Reset** buttons are only displayed in the Administration Portal with syadmin privileges or above.

Clicking the **Reset** button updates the task list selections to factory-protocol settings. A message will be displayed asking you to confirm this.

The task **System Pre-Positioning** adjusts the patient table in and out of the gantry and the table's height. For **Intrinsic Verification**, **xSPECT Sensitivity**, **Broad Quant Sensitivity**, and **Cross Calibration,** the detectors retract, and the patient table rises. For **Extrinsic Flood**, **Broad Quant VSF (Volume Sensitivity Factor) Calibration**, and **Head Alignment Calibration** the detectors retract, and patient table rises and moves into a position marked on the patient table for positioning the phantom.

For Broad Quant VSF Calibration, you must manually position phantom.

The Detectors can be set for **Both**, **Detector1** or **Detector2**.

The count rate (**MCounts**) shows the recommended default values. The values can be adjusted with tolerance limits. If you enter a value which is not allowed, the system highlights the field and displays a message and the limits.

The **Date and Time** show the last time the task was performed.

The **Status** shows **OK** if the QC is up to date, **To Do** if the QC is out of date or failed results were accepted, and **Failed (system error)** if the QC is out of tolerance. **Failed** does not appear before QC is performed.

A video or image may be available to visualize the system setup or use the system, as well as instructional steps.

4 Clicking the **Start** button starts the protocol and performs each of the selected (checked) tasks.

You will need to click the **Continue** button to confirm completion of a task and proceed to the next task as there will be system motion.

5 Clicking the **Cancel** button ends the protocol.

6 Clicking the **Spectrum** button displays the energy spectrum for the isotope for the selected detectors.

The x-axis shows the range of energy values; the y-axis displays the counts.

7 When you start the spectrum, it displays the source's photopeak and the number of counts detected from the source. Clicking the **Stop** button suspends the spectrum display. Clicking the **Restart** button restarts a stopped display. Right click on the spectrum curve to export curve data.

8 Clicking the **Save** button saves the QC protocol. A message is displayed asking you to confirm this.

These protocol changes are reflected in **Open Tasks** (➔ Page 774 *Open tasks*) and **System Check** (➔ Page 771 *MI system check*).

9 Clicking the **Reset** button returns the protocol's task list selections back to factory-recommended protocol settings.

A message is displayed asking you to confirm this.

28.5.13 Starting a protocol

After clicking the **Start** button, the protocol screen changes.

A time display appears and counts down the time remaining for the quality assurance acquisition.

The checked protocol tasks are performed. The task currently being performed is highlighted. Under the Status heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**.

The image being acquired is displayed on the right of the screen. For example for Intrinsic Verification, a curvature corrected flood is displayed.

Click the **Cancel** button to stop the acquisition from running.

28.5.14 Viewing the QC results

Once Quality Control (QC) protocol tasks are complete, the results are displayed.

The acquired images are displayed on the right side of the screen. For Intrinsic Verification, a curvature corrected flood is displayed.

The results show the uniformity numbers.

Intrinsic Verification acceptance limits are:

- - Integral uniformity Useful Field of View (IUFOV): +/- 6%
- - Integral uniformity Central Field of View (ICFOV): +/- 6%
- - Differential uniformity Useful Field of View (DUFOV): +/- 6%
- - Differential uniformity Central Field of View (DCFOV): +/- 6%

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

For example, the listed values for Intrinsic Verification may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	2.04	[0.00] – [x.xx]	OK
	Int CFOV	1.77	[0.00] – [x.xx]	OK
	Diff UFOV	1.56	[0.00] – [x.xx]	OK
	Diff CFOV	1.17	[0.00] – [x.xx]	OK
2	Int UFOV	2.23	[0.00] – [x.xx]	OK
	Int CFOV	1.75	[0.00] – [x.xx]	OK
	Diff UFOV	1.46	[0.00] – [x.xx]	OK
	Diff CFOV	1.10	[0.00] – [x.xx]	OK

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

A status indicator is displayed for each measurement. **OK** is displayed if the results are in tolerance. **Failed** is displayed if the results are out of tolerance.

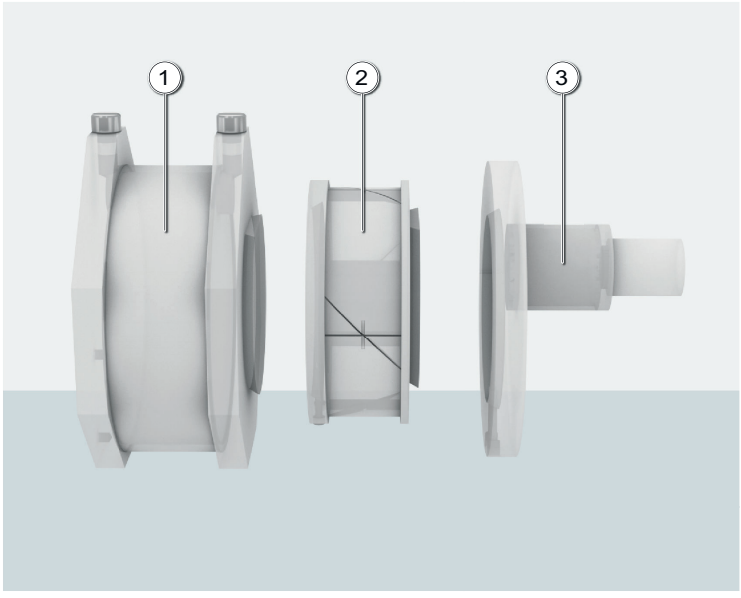
After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen. The status is displayed along with instructions:

Click **Accept** to apply results. Click **Cancel** to keep the previous results if available. It does not apply new results. If the status indicates **Failed**, additional instructions are provided.

28.6 Accessories and techniques for CT quality tests

You require the set of phantoms for the quality measurement and possibly additional accessories for the constancy test.

The set of phantoms is comprised of the following components:

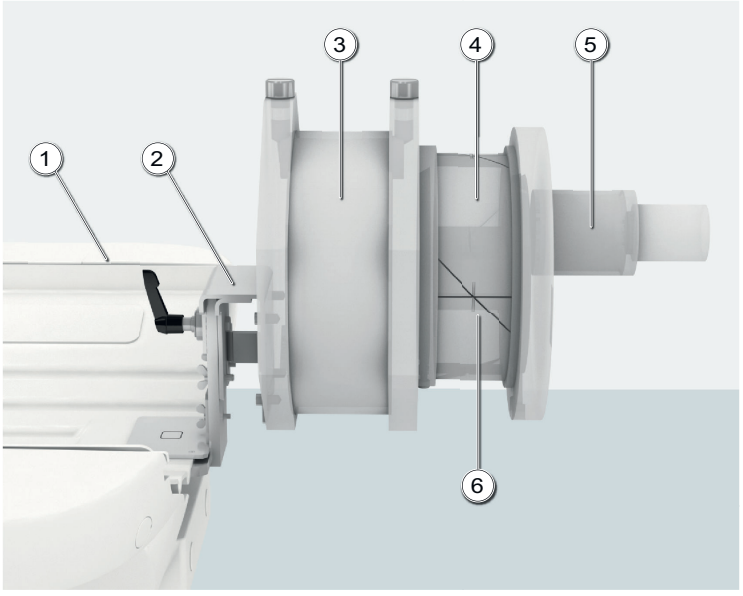


(1) Water phantom
(2) Slice thickness phantom with reference markings
(3) Wire and alignment phantom

After delivery, a Siemens Healthineers service technician assembles the phantoms into one set.

28.6.1 Mounting the phantom set

- Mount the phantom set at the head end of the patient table with the phantom holder.



(1) Patient table top
(2) Phantom holder
(3) Water phantom
(4) Slice thickness phantom
(5) Wire and alignment phantom
(6) Reference marking

The pictures of the phantoms shown here are only examples. Please refer to the phantom guide.

28.6.2 Positioning the test phantoms

To position the test phantoms:

1 Set the gantry to vertical (0°) in the **Table Position** dialog box.

2 Mount the phantom set on the patient table at normal body height.

3 Activate the light marker by pressing the **Light Marker** key on the control box.

4 Position the phantom set.

The Siemens Healthineers multi-index RTP overlay can be used with a phantom set for daily quality tests, but not for constancy tests.

28.7 Daily MI quality tests

For **MI Daily QC** (Molecular Imaging Daily Quality Control), the following procedures are available:

- **Extrinsic Flood** -> **Verification - AQC** (➔ Page 814 *Performing extrinsic flood, verification - AQC*)
- **Intrinsic Flood** -> **Intrinsic Verification - AQC** (➔ Page 809 *Performing intrinsic flood, verification - AQC*)
- **Intrinsic Flood** -> **Intrinsic Verification - Manual** (➔ Page 805 *Performing intrinsic flood, verification - manual*)

To perform the **Extrinsic Flood** -> **Verification - Manual**, link to it here: (➔ Page 811 *Performing extrinsic flood, verification - manual*)

To see all the Quality Assurance procedures, go to:

28.7.1 Performing intrinsic flood, verification - manual

Prior to performing a manual Intrinsic Verification, there are prerequisites to be aware of or perform:

✓ Intrinsic or Extrinsic Verification should be completed once daily.

✓ Intrinsic Verification Default Value: 30 Mcts (million counts - minimum 10 Mcts to maximum 200 Mcts).

✓ Remove the collimators.

✓ Prepare the point source: less than 60 kcps count rate (10 -25 µCi (microcurie)).

✓ The previous Symbia system task **Coarse Tuning** has been renamed to **Tuning**. The **Tuning** task which was once a separate, standalone task can now be performed from within the **Intrinsic Flood**, **Verification - Manual** task. Tuning is performed with either **Tc-99m** or **Co-57**.

To begin the protocol:

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Intrinsic Flood**.

6 Select **Verification - Manual**.

The **Intrinsic Verification - Manual** page is displayed.

7 Verify that the protocol, source, and task selections are complete.

8 Click the **Start** button to begin the acquisition.

If selected, the system's pre-positioning task is performed. System motion occurs as the detectors are retracted and the patient table is raised.

If the pre-positioning task is not selected, move the patient table to the maximum height so that the source is the same distance between the detectors.

---

9 When prompted during the pre-positioning step, extend the integrated source holder.

Displayed instructions will tell you to **Attach the source to the source holder**.

The hinge on the integrated source holder enables it to be lifted if the detector is accidentally raised.

10 Insert the point source vial into the end of the integrated source holder.

Displayed instructions will also tell you to **Click Continue to start the acquisition. Automatic motion may occur.**

11 Click the **Continue** button.

The next task is performed.

A time display appears and counts down the time remaining for the quality assurance acquisition. The checked protocol tasks are performed. The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**. The image being acquired is displayed on the left of the screen.

12 If required, click the **Cancel** button to stop the acquisition from running.

Once Quality Control (QC) protocol tasks are complete, the results are displayed. The acquired images are displayed on the right side of the screen. For Intrinsic Verification, a curvature corrected flood is displayed.

The results show the uniformity numbers. If issues are seen, both intrinsic and extrinsic should be checked.

Intrinsic Verification acceptance limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

For example, the listed values for Intrinsic Verification may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	2.04	[0.00] – [3.84]	OK
	Int CFOV	1.77	[0.00] – [2.84]	OK
	Diff UFOV	1.56	[0.00] – [1.84]	OK
	Diff CFOV	1.17	[0.00] – [1.84]	OK
2	Int UFOV	2.23	[0.00] – [3.85]	OK
	Int CFOV	1.75	[0.00] – [2.85]	OK
	Diff UFOV	1.46	[0.00] – [1.85]	OK
	Diff CFOV	1.10	[0.00] – [1.85]	OK

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

13 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

14 Click **Accept** to apply results.

15 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

16 If the status indicates **Failed**, additional instructions are provided.

28.7.2 Performing intrinsic flood, verification - AQC

Prior to performing an automated quality control (AQC) Intrinsic Verification, there are prerequisites to be aware of or perform:

✓ AQC is licensed and is only displayed as an option for licensed systems.

✓ Intrinsic Verification should be completed once daily unless an Extrinsic Verification has already been performed.

✓ Verify protocol is set up as expected.

✓ Intrinsic Verification Default Value: 30 Mcts (million counts - minimum 10 Mcts to maximum 200 Mcts).

✓ Prepare the point source: less than 60 kcps count rate (10 -25 µCi (microcurie)).

✓ Intrinsic Verification Acceptance Limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

✓ Select the **End by** day of the week (**Sunday**, **Monday**, -> **Saturday**, **Tomorrow**, or **As soon as possible**) from the drop-down menu.

✓ Click the **End by** time and enter a time, or click the **Clock** icon and select a time from the displayed list.

✓ Note the yellow triangle with an exclamation point symbol and the message **Click Start (Caution! System motion will occur and a radiation source will be exposed)**

✓ The Automated Collimator Changer (ACC) only removes collimators belonging to the ACC. If the collimators on the system came from a collimator cart, they must be returned to the collimator cart. If the system does not have an ACC, manually remove the collimators to their collimator carts before starting protocol.

✓ The previous Symbia system task **Coarse Tuning** has been renamed to **Tuning**. The **Tuning** task which was once a separate, standalone task can now be performed from within the **Intrinsic Flood**, **Verification - AQC** task. Tuning is performed with either **Tc-99m** or **Co-57**.

To begin the protocol:

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

  The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

  On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Intrinsic Flood**.

6 Select **Verification - AQC**.

  The **Intrinsic Verification - AQC** page is displayed.

7 Verify that the protocol, source, and task selections are complete.

8 Click the **Start** button.

  The protocol's timer countdown begins and displayed a message **Automatic scan is starting in [d:hh:mm:ss]** for example **0:10:55:10**. When zero is reached, the system removes the collimators, the AQC source extends, and the first task is started.

  A default time is configured in the Administration Portal. If needed, the protocol can be changed.

9 The first protocol task starts and the acquisition begins.

10 When the acquisition is complete, the point source holder will retract the source into the patient table storage area.

11 The protocol's results are displayed and must be accepted or cancelled as in manual Intrinsic Verification.

12 If the system has an ACC, the same collimators removed prior to the start of the Intrinsic Verification will be re-installed on the detectors at the end of the acquisition. If not, the collimators must be manually installed. To setup AQC, see (➔ Page 720 *Quality assurance configuration*).



Different collimators can be re-installed after an acquisition. This can be configured by the system administrator in **Clinical Configuration**.

28.7.3 Performing extrinsic flood, verification - manual

An extrinsic verification uses a sheet source, flooding collimated detectors to verify the detectors' corrected performance.

✓ Verify protocol is set up as expected.

✓ Install applicable collimator.

✓ Attached sheet source holder.



(1) The circles mark the locations where the pins sit within the patient table track. (2) The hook and loop fasteners run the length of the patient table as indicated by the white lines.

✓ The sheet source holder sits atop the patient table near the table handle for extrinsic flood verification and calibration.

✓ The sheet source is positioned on top of the sheet source holder and centered.

✓ Extrinsic Verification Default Value: 10 Mcts (million counts - minimum 10 Mcts to maximum 200 Mcts)

✓ Install the following collimators for million counts (Mcts):

Extrinsic Calibration Default Value: 120 Mcts (minimum 120 Mcts to maximum 1600 Mcts)

- LEHR (Low Energy High Resolution)
- LEAP (Low Energy All Purpose)
- LPHR (Low Penetration High Resolution)
- LEUHR (Low Energy Uniformity High Resolution)
- SZ **(SMART**ZOOM)

Extrinsic Calibration Default Value: 60 Mcts (minimum 60 Mcts to maximum 1600 Mcts)

- MELP (Medium Energy Low Penetration)
- HE (High Energy)

To begin the protocol:

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Extrinsic Flood**.

6 Select **Verification - Manual**.

The **Extrinsic Verification - Manual** page is displayed.

Follow setup instructions that are displayed on the screen. A graphic or video may be displayed to assist you with the instructions.

Install collimators on detectors.

Remove pad from patient table.

Click Start. Automatic motion will occur.

7 Verify that the protocol collimator, source, and task selections are complete.

8 Click the **Start** button.

System pre-positioning task is performed with the detectors retracting, the patient table rising and moving in. A **Motion in Progress** message is displayed.

There is a message to verify the source placement: **Place source within the center FOV of the detector.** (**FOV** being the Field Of View.)

Click Continue to Start the acquisition. Automatic motion will occur.

9 Check that the sheet source is center on the sheet source holder.

10 Click the **Continue** button.

The task begins and the acquisition acquires one detector at a time creating a growing image displayed on the right of the screen.

A previous verification must have been performed for there to be a comparison image. With this comparison, you no longer need to check uncorrected data. If you see issues with your previous or new verification, then there are issues with the extrinsic verification. The images should always visually match. If not, perform the calibration again, and if needed contact your service Customer Care representative.

When verification is completed, the acquired images and the uniformity numbers will be displayed. If issues are seen, both intrinsic and extrinsic should be checked.

Extrinsic Verification Acceptance Limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

For example, the listed values for Extrinsic Verification may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	4.06	[0.00] – [5.20]	OK
	Int CFOV	3.08	[0.00] – [4.20]	OK
	Diff UFOV	2.81	[0.00] – [3.20]	OK
	Diff CFOV	2.26	[0.00] – [3.20]	OK
2	Int UFOV	3.50	[0.00] – [5.20]	OK
	Int CFOV	2.83	[0.00] – [4.20]	OK
	Diff UFOV	2.38	[0.00] – [3.20]	OK
	Diff CFOV	2.37	[0.00] – [3.20]	OK

The results for the Extrinsic Verification are displayed in the same format as were the Intrinsic Verification results with the measurements in the middle and the status on the right, and then the images on the right of the screen. The acceptance limits are +/- 6%. The protocol's results must be accepted or canceled.

28.7.4 Performing extrinsic flood, verification - AQC

An extrinsic verification uses a line source, flooding collimated detectors to verify the detectors' corrected performance.

✓ Verify protocol is set up as expected.

✓ Extrinsic Verification Default Value: 160 kcts/view (10 Mcts (million counts)). The minimum is 160 kcts/view (10 Mcts) and maximum is 500 kcts/view (30 Mcts).

✓ Select the **End by** day of the week (**Sunday**, **Monday**, -> **Saturday**, **Tomorrow**, or **As soon as possible**) from the dropdown.

✓ Click the **End by** time and enter a time, or click the **Clock** icon and select a time from the displayed list.

✓ Note the yellow triangle with an exclamation point symbol and the message **Click Start (Caution! System motion will occur and a radiation source will be exposed)**

✓ If the system does not have an Automated Collimator Changer (ACC), manually install the collimators before starting protocol.

✓ Install the following collimators for million counts (Mcts):

- LEHR (Low Energy High Resolution)
- LEAP (Low Energy All Purpose)
- LPHR (Low Penetration High Resolution)
- LEUHR (Low Energy Uniformity High Resolution)
- SZ (**SMART**ZOOM)

Extrinsic Calibration Default Value: 60 Mcts (minimum 60 Mcts to maximum 1600 Mcts)

- MELP (Medium Energy Low Penetration)
- HE (High Energy)

Follow setup instructions that are displayed on the screen. A graphic or video may be displayed to assist you with the instructions.

To begin the protocol:

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Extrinsic Flood**.

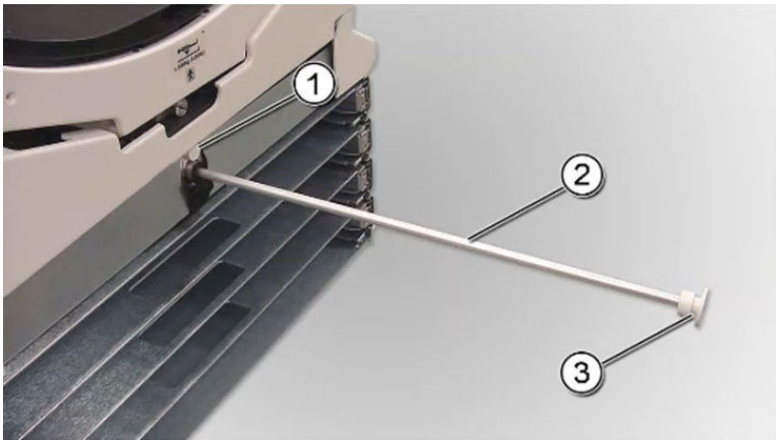
6 Select **Verification - AQC**.

The **Extrinsic Verification - AQC** page is displayed.

7 Verify that the protocol collimator, source, and task selections are complete.

8 Click the **Start** button.

The protocol's timer countdown begins and displayed a message **Automatic scan is starting in [d:hh:mm:ss]** for example **0:10:55:10**. When zero is reached, the system installs the collimators, the AQC line source extends, and the first task is started.



(1) Point Source Holder, (2) Line Source Holder, (3) Lead Cap

A default time is configured in the Administration Portal. If needed, the protocol can be changed.

9 The acquisition acquires one detector at a time creating a growing image displayed on the right of the screen.

When verification is completed, the acquired images and the uniformity numbers will be displayed. If issues are seen, both intrinsic and extrinsic should be checked.

Extrinsic Verification Acceptance Limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

For example, the listed values for Extrinsic Verification may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	4.06	[0.00] – [x.xx]	OK
	Int CFOV	3.08	[0.00] – [x.xx]	OK
	Diff UFOV	2.81	[0.00] – [x.xx]	OK

Detector	Measurement	New	Reference Mean	Status
	Diff CFOV	2.26	[0.00] – [x.xx]	OK
2	Int UFOV	3.50	[0.00] – [x.xx]	OK
	Int CFOV	2.83	[0.00] – [x.xx]	OK
	Diff UFOV	2.38	[0.00] – [x.xx]	OK
	Diff CFOV	2.37	[0.00] – [x.xx]	OK

10 When the acquisition is complete, the line source will retract into the patient table storage area.

11 The results for the Extrinsic Verification are displayed in the same format as were the manual Extrinsic Verification results with the measurements in the middle and the status on the right, and then the images on the right of the screen. The acceptance limits are +/- 6%. The protocol's results must be accepted or cancelled.

12 If the system has an ACC, collimators can be specified to be installed on the detectors at the end of the acquisition. Otherwise, they must be manually installed.

28.8 Daily CT quality tests

The daily quality test checks the following functions by means of the water phantom:

- **Homogeneity/Water**: the homogeneity of the CT values in five regions of the water phantom that are calculated in Hounsfield units (HU)
- **Noise**: the pixel noise of images that is calculated as the standard deviation

The following components are required for the daily quality test:

- Phantom holder
- Quality phantom

The system does not move the detectors to perform a **Daily QC**. Manually retract the detectors all the way out before the start of the **Daily QC** to avoid contact during motion with the patient table, its pallet, or a detector collimator. Configure the gantry to move the patient table to the predefined CT Brain Index position.

28.8.1 Performing daily quality test

The daily quality test is automated. You can perform the whole test according to the guidance on the screen.

Before you start the quality measurement, you must:

- Perform the calibration (➔ Page 961 *System calibration*)
- Position the phantom set

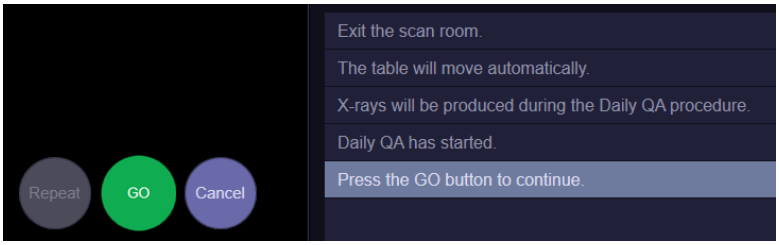
The system does not move the detectors to perform a **Daily QC**. Manually retract the detectors all the way out before the start of the **Daily QC** to avoid contact during motion with the patient table, its pallet, or a detector collimator. Configure the gantry to move the patient table to the predefined CT Brain Index position.

1 Move the mouse pointer over the **Settings** icon, and from the menu, choose **Daily QA**.

The **Daily QA** window is displayed.



2 Click **GO** to initiate the daily quality test.



The tilt of the gantry is set to 0°. The patient table is positioned such that the water phantom is in the scan plane.

3 Press **Start** on the control box when you are prompted.

The position of the phantom set is checked and displayed.

The **Homogeneity/Water** and **Noise** tests are respectively performed under each tube voltage.

Test results are displayed in the content area of the **Daily QA** window.

- All parameters and images shown here are examples. Only the parameters displayed by your system are definite.
- For incorrect positioning of the phantom set, a message is displayed. Correct the position, if necessary.
- You can cancel the quality test in any phase. Click the **Cancel** button. You have to repeat the quality test before you start the examinations.

Test results of the daily quality test are out of tolerance.

◆ Contact your Customer Care Center.

28.8.2 Daily quality test report

The daily quality test images are stored as images of the patient “Service Patient” in **Patient Browser** under Patient Browser. New images overwrite the older ones.



You can view the daily quality test reports in the Administration Portal under **Service Reports**.

(➔ Page 890 *Viewing quality test reports*)

28.9 Monthly MI quality tests

For **MI Monthly QC** (Molecular Imaging Monthly Quality Control), the following procedures are available:

- **Head Alignment** -> **Quick Calibration - AQC** (➔ Page 843 *Performing head alignment, quick calibration - AQC*)
- **Head Alignment** -> **Quick Calibration - Manual** (➔ Page 837 *Performing head alignment, quick calibration - manual*)
- **Intrinsic Flood** -> **Calibration - AQC** (➔ Page 828 *Performing intrinsic flood, calibration - AQC*)
- **Intrinsic Flood** -> **Calibration - Manual** (➔ Page 821 *Performing intrinsic flood, calibration - manual*)
- **Quantitative** -> **Broad Quant Sensitivity** (➔ Page 859 *Performing quantitative, broad quant sensitivity*)
- **Quantitative** -> **xSPECT Sensitivity** (➔ Page 850 *Performing quantitative, xSPECT sensitivity*)

28.9.1 Monthly MI quality control suite

The Quality Control Suite, enabled by AutoQC, consists of a Head Alignment calibration followed by an Intrinsic Flood calibration. For each parallel hole collimator registered to the Automated Collimator Changer (ACC) on the system, the system lists the Head Alignment calibration task to be performed, followed by the Intrinsic Flood calibration task.

Alternatively, these procedures can be run independently:

1 Perform a AutoQC Head Alignment calibration. (➔ Page 924 *Performing head alignment, calibration - AQC*)

2 Perform a AutoQC Intrinsic Flood calibration. (➔ Page 828 *Performing intrinsic flood, calibration - AQC*)

28.9.2 Performing intrinsic flood, calibration - manual

For a manual Intrinsic Calibration, you will perform certain prerequisites:

- ✓ Intrinsic Calibration should be completed monthly with a primary isotope. The primary isotopes are Tc-99m and Co-57.
- ✓ Alternative Isotopes should be completed once every 6 months This is optional in cases where you want to correct for specific isotopes. If not acquired, the primary isotope intrinsic calibration will be used for corrections.
- ✓ The previous Symbia system task **Coarse Tuning** has been renamed to **Tuning**. The **Tuning** task which was once a separate, standalone task can now be performed from within the **Intrinsic Flood**, **Calibration - Manual** task. Tuning is performed with either **Tc-99m** or **Co-57**.
- ✓ Setup is the same as a manual Intrinsic Verification.
- ✓ Task list includes Calibration and Verification which are checked as defaults.
- ✓ Intrinsic Calibration Default Value: 200 Mcts (million counts - minimum 200 Mcts to maximum 1600 Mcts)
- ✓ Remove the collimators.

Follow setup instructions that are displayed on the screen. A graphic or video may be displayed to assist you with the instructions.

1. Move the cursor over the **Settings** (⚙) icon and select **Administration Portal** from the list of menu items.

   The Login page opens.
2. Login to the Administration Portal.
3. Click the **Quality Assurance** tab.

   On the left, a navigation tree is displayed.
4. Select **MI Quality Assurance**.
5. Select **Intrinsic Flood**.
6. Select **Calibration - Manual**.

   The **Intrinsic Calibration - Manual** page is displayed.
7. Click the **Start** button to begin the acquisition.

If selected, the system's pre-positioning task is performed. System motion occurs as the detectors are retracted and the patient table is raised.

If the pre-positioning task is not selected, move the patient table to the maximum height so that the source is the same distance between the detectors.

8 When prompted during the pre-positioning step, extend the integrated source holder.

Displayed instructions will tell you to **Attach the source to the source holder**.

The hinge on the integrated source holder enables it to be lifted if the detector is accidentally raised.

9 Insert the point source vial into the end of the integrated source holder.

Displayed instructions will also tell you to **Click Continue to start the acquisition. Automatic motion may occur.**

10 Click the **Continue** button.

The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**. The image being acquired is displayed on the left of the screen.

11 The Tuning task runs in the normal range and extended range, updating results as the task is performed. Tuning can only be acquired with the primary isotopes of Co57 or Tc99m. Any other isotope selected will disable the Tuning task.

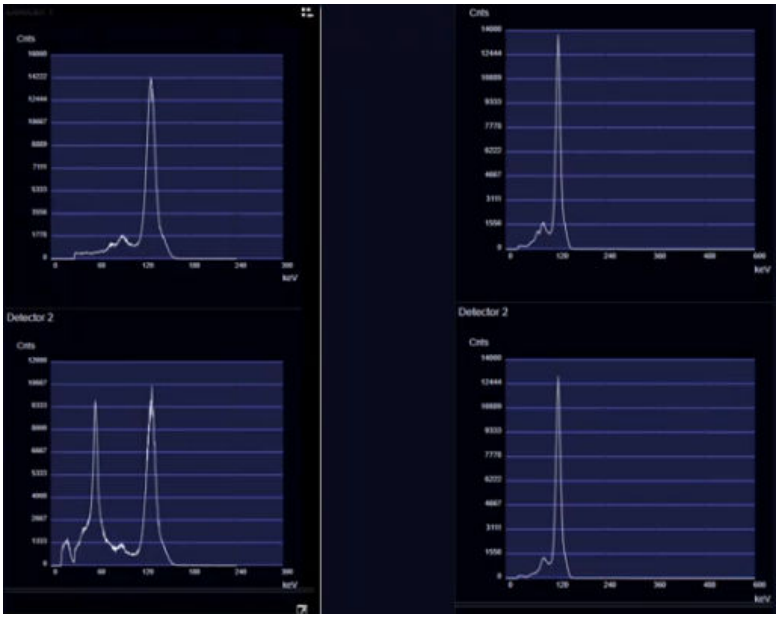
This table and those that follow are examples. Values may differ on your system.

Detector	Range	Zmap	HVDAC	Status
Detector1	Normal	0	-685	Finished 3
Detector1	Extended	-85	-634	Iteration 5

Detector	Range	Zmap	HVDAC	Status
Detector2	Normal	0	-698	Iteration 6
Detector2	Extended			Pending

12 Click the **Continue** button.

13 The Peaking task runs in the normal range and extended range, updating spectrum as task is performed.



Peaking Spectrum Normal and Extended Range

Peaking Test Verification - Energy Range Normal Results

Detector	Peak 1	Peak 2	Peak 3	Date and Time	Status
1	-0.12	N/A	N/A	10/19/2020 11:54 AM	Finished
2	0.03	N/A	N/A	10/19/2020 11:54 AM	Iteration

Peaking Test Verification - Energy Range Extended Results

Detector	Peak 1	Peak 2	Peak 3	Date and Time	Status
1	0.36	N/A	N/A	10/13/2020 3:25 PM	Finished
2	0.01	N/A	N/A	10/13/2020 3:25 PM	Iteration

14 Click the **Continue** button.

15 The Calibration task runs. System motion will occur.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5048.7 kCnts**, **Tc99m_Siemens**, **Anterior Projection**.

Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

16 The Verification task runs.

17 If required, click the **Cancel** button to stop the acquisition from running.

Once Quality Control (QC) protocol tasks are complete, the results are displayed. The acquired images are displayed on the right side of the screen. For Intrinsic Verification, a curvature corrected flood is displayed.

The Intrinsic Calibration results show the uniformity numbers. If issues are seen, both intrinsic and extrinsic should be checked.

Intrinsic Calibration acceptance limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 8%
- Integral uniformity Central Field of View (ICFOV): +/- 8%
- Differential uniformity Useful Field of View (DUFOV): +/- 8%
- Differential uniformity Central Field of View (DCFOV): +/- 8%

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

For example, the listed values for Intrinsic Calibration may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	3.88	[3.05] – [4.06]	OK
	Int CFOV	2.76	[1.67] – [2.69]	OK
	Diff UFOV	2.18	[1.32] – [2.33]	OK
	Diff CFOV	1.39	[0.55] – [1.56]	OK
2	Int UFOV	3.73	[1.68] – [2.70]	OK
	Int CFOV	1.61	[0.92] – [1.94]	OK
	Diff UFOV	1.89	[0.37] – [1.39]	OK
	Diff CFOV	0.81	[0.26] – [1.28]	OK

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

18 When the verification is completed, the Intrinsic Verification results (acquired images and the uniformity numbers) will be displayed. If issues are seen, both intrinsic and extrinsic should be checked.

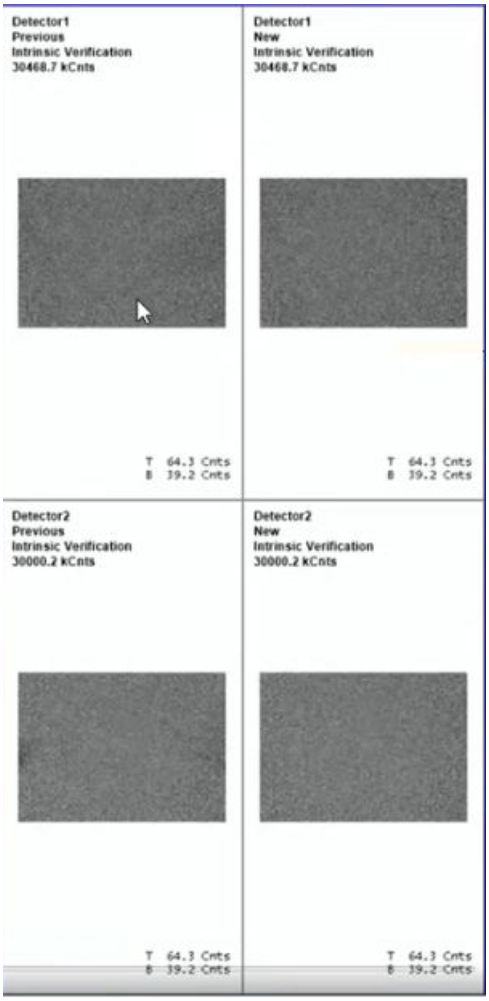
Intrinsic Verification acceptance limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

A previous calibration must have been performed for there to be a comparison image. With this comparison, you no longer need to check uncorrected data. If you see issues with your previous or new verification, then there are issues with the intrinsic calibration. The previous image is created using the newly acquired data with the previous intrinsic calibration, and the new image is created using the newly acquired data with newly acquired intrinsic calibration. The images should always visually match. If not, perform the calibration again, and if needed contact your service Customer Care representative.

For example, the listed values for verification may include:

Detector	Measurement	Previous	New	Reference Mean	Status
1	Int UFOV	2.47	2.05	[0.00] – [3.83]	OK
	Int CFOV	1.81	1.64	[0.00] – [2.83]	OK
	Diff UFOV	1.55	1.46	[0.00] – [1.83]	OK
	Diff CFOV	1.19	1.06	[0.00] – [1.83]	OK
2	Int UFOV	2.65	1.94	[0.00] – [3.85]	OK
	Int CFOV	1.64	1.65	[0.00] – [2.85]	OK
	Diff UFOV	1.75	1.24	[0.00] – [1.85]	OK
	Diff CFOV	1.33	1.02	[0.00] – [1.85]	OK



Top left Detector 1 previous calibration and top right Detector 1 new calibration with Detector 2 previous calibration and new calibration below.

Each image is labelled with:

- **Detector1** or **Detector2**
- **Previous** or **New**
- **Intrinsic Verification**

- **kCnts** (thousands of counts)
- **T** (top) **00.0 Cnts** (number of counts)
- **B** (bottom) **00.0 Cnts** (number of counts)

19 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

20 Click **Accept** to apply results.

21 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

22 If the status indicates **Failed (system error)**, additional instructions are provided.

28.9.3 Performing intrinsic flood, calibration - AQC

For an automated quality control (AQC) Intrinsic Calibration, you will perform certain prerequisites:

✓ Verify protocol is set up as expected.

✓ Setup is the same as a manual Intrinsic Verification.

✓ The previous Symbia system task **Coarse Tuning** has been renamed to **Tuning**. The **Tuning** task which was once a separate, standalone task can now be performed from within the **Intrinsic Flood**, **Calibration - AQC** task. Tuning is performed with either **Tc-99m** or **Co-57**.

✓ Intrinsic Calibration should be completed monthly with a primary isotope. The primary isotopes are Tc-99m and Co-57.

✓ Alternative Isotopes should be completed once every 6 months This is optional in cases where you want to correct for specific isotopes. If not acquired, the primary isotope intrinsic calibration will be used for corrections.

✓ Tasks lists includes Calibration and Verification which are checked as defaults.

✓ Intrinsic Calibration Default Value: 200 Mcts (million counts - minimum 200 Mcts to maximum 1600 Mcts)

✓ Select the **End by** day of the week (**Sunday**, **Monday**, -> **Saturday**, **Tomorrow**, or **As soon as possible**) from the dropdown.

✓ Click the **End by** time and enter a time, or click the **Clock** icon and select a time from the displayed list.

✓ Note the yellow triangle with an exclamation point symbol and the message **Click Start (Caution! System motion will occur and a radiation source will be exposed)**

✓ If the system does not have an Automated Collimator Changer (ACC), manually remove the collimators before starting protocol.

Follow setup instructions that are displayed on the screen. A graphic or video may be displayed to assist you with the instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Intrinsic Flood**.

6 Select **Calibration - AQC**.

The **Intrinsic Calibration - AQC** page is displayed.

7 Click the **Start** button.

The protocol's timer countdown begins and displayed a message **Automatic scan is starting in [d:hh:mm:ss]** for example **0:10:55:10**. When zero is reached, the system removes the collimators, the AQC source extends, and the first task is started.

A default time is configured in the Administration Portal. If needed, the protocol can be changed.

8 If selected, the system's pre-positioning task is performed. System motion occurs as the detectors are retracted and the patient table is raised.

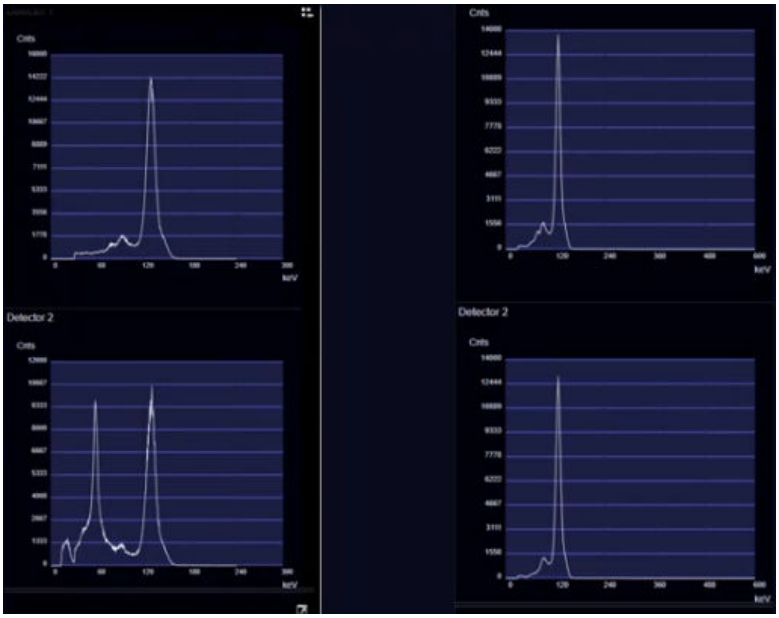
9 The AQC source is extend from the patient table source storage area.

10 A time display appears and counts down the time remaining for the quality assurance acquisition. The checked protocol tasks are performed. The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**. The image being acquired is displayed on the left of the screen.

11 The Tuning task runs in the normal range and extended range, updating results as the task is performed.

Detector	Range	Zmap	HVDAC	Status
Detector1	Normal	0	-685	Finished 3
Detector1	Extended	-85	-634	Iteration 5
Detector2	Normal	0	-698	Iteration 6
Detector2	Extended			Pending

12 The Peaking task runs in the normal range and extended range, updating spectrum as task is performed.



Peaking Spectrum Normal and Extended Range

Peaking Test Verification - Energy Range Normal Results

Detector	Peak 1	Peak 2	Peak 3	Date and Time	Status
1	-0.12	N/A	N/A	10/19/2020 11:54 AM	Finished
2	0.03	N/A	N/A	10/19/2020 11:54 AM	Iteration

Peaking Test Verification - Energy Range Extended Results

Detector	Peak 1	Peak 2	Peak 3	Date and Time	Status
1	0.36	N/A	N/A	10/13/2020 3:25 PM	Finished
2	0.01	N/A	N/A	10/13/2020 3:25 PM	Iteration

13 The Calibration task runs.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5048.7 kCnts**, **Tc99m_Siemens**, **Anterior Projection**.

Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

14 If required, click the **Cancel** button to stop the acquisition from running.

Once Quality Control (QC) protocol tasks are complete, the results are displayed. The acquired images are displayed on the right side of the screen. For Intrinsic Verification, a curvature corrected flood is displayed.

The Intrinsic Calibration results show the uniformity numbers. If issues are seen, both intrinsic and extrinsic should be checked.

Intrinsic Calibration acceptance limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 8%
- Integral uniformity Central Field of View (ICFOV): +/- 8%
- Differential uniformity Useful Field of View (DUFOV): +/- 8%
- Differential uniformity Central Field of View (DCFOV): +/- 8%

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

For example, the listed values for Intrinsic Calibration may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	3.88	[3.05] – [4.06]	OK
	Int CFOV	2.76	[1.67] – [2.69]	OK
	Diff UFOV	2.18	[1.32] – [2.33]	OK
	Diff CFOV	1.39	[0.55] – [1.56]	OK

Detector	Measurement	New	Reference Mean	Status
2	Int UFOV	3.73	[1.68] – [2.70]	OK
	Int CFOV	1.61	[0.92] – [1.94]	OK
	Diff UFOV	1.89	[0.37] – [1.39]	OK
	Diff CFOV	0.81	[0.26] – [1.28]	OK

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

15 The Verification task runs.

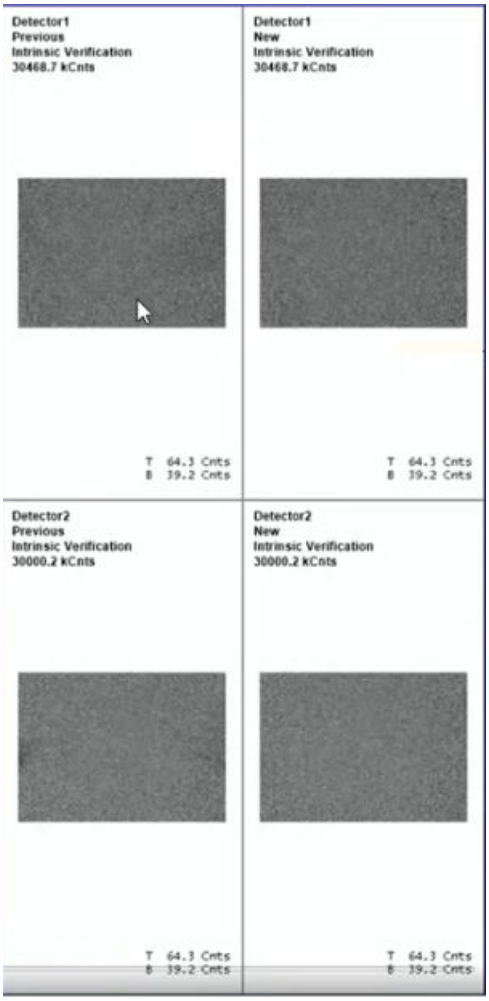
16 When the verification is completed, the acquired images and the uniformity numbers will be displayed. If issues are seen, both intrinsic and extrinsic should be checked.

A previous verification must have been performed for there to be a comparison image. With this comparison, you no longer need to check uncorrected data. If you see issues with your previous or new verification, then there are issues with the extrinsic calibration. The images should always visually match. If not, perform the calibration again, and if needed contact your service Customer Care representative.

For example, the listed values for verification may include:

Detector	Measurement	Previous	New	Reference Mean	Status
1	Int UFOV	2.47	2.05	[0.00] – [3.83]	OK
	Int CFOV	1.81	1.64	[0.00] – [2.83]	OK
	Diff UFOV	1.55	1.46	[0.00] – [1.83]	OK

Detector	Measurement	Previous	New	Reference Mean	Status
	Diff CFOV	1.19	1.06	[0.00] – [1.83]	OK
2	Int UFOV	2.65	1.94	[0.00] – [3.85]	OK
	Int CFOV	1.64	1.65	[0.00] – [2.85]	OK
	Diff UFOV	1.75	1.24	[0.00] – [1.85]	OK
	Diff CFOV	1.33	1.02	[0.00] – [1.85]	OK



Top left Detector 1 previous calibration and top right Detector 1 new calibration with Detector 2 previous calibration and new calibration below.

Each image is labelled with:

- **Detector1** or **Detector2**
- **Previous** or **New**
- **Intrinsic Verification**

- **kCnts** (thousands of counts)
- **T** (top) **00.0 Cnts** (number of counts)
- **B** (bottom) **00.0 Cnts** (number of counts)

17 The Intrinsic Verification results show the uniformity numbers. If issues are seen, both intrinsic and extrinsic should be checked.

Intrinsic Verification acceptance limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

18 When the acquisition is complete, the AQC source will retract into the patient table storage area.

19 The protocol's results are displayed and must be accepted or cancelled as in manual Intrinsic Calibration.

20 If the system has an ACC, the same collimators removed prior to the start of the Intrinsic Calibration will be re-installed on the detectors at the end of the acquisition. If not, the collimators must be manually installed. To setup AQC, see (➔ Page 720 *Quality assurance configuration*).

After a System Check, different collimators can be re-installed after an acquisition.

21 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

22 Click **Accept** to apply results.

23 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

24 If the status indicates **Failed**, additional instructions are provided.

25 Specified collimators are installed on the system at the end of acquisition if the system has an ACC.

28.9.4 Performing head alignment, quick calibration - manual

Head Alignment Quick Calibration eliminates the need to recalibrate head alignment for all collimators and configurations every month.

For a manual Head Alignment Quick Calibration, you will perform certain prerequisites:

- ✓ Perform calibration once a month. Alternates, or collimators not set as the trending, are due every 53 weeks, requiring one of the other Head Alignment Calibration options.
- ✓ If the results of the trending collimator or configuration are out of tolerance, perform a Head Alignment Calibration for all collimators and configurations used.
- ✓ The trending collimator or configuration is specified in the Adminstration Portal.

To setup the Quick Head Alignment, hover over the **Settings** (⚙) icon and select the **Adminstration Portal**. Click **MI Clinical Configuration**, and then **Quality Assurance Configuration**. On the right is displayed **Quick Head Alignment**. System administrator access level rights are required to change the **Type** (**Calibration**), the **Collimator** (**LEHR**, **LPHR**, **MELP**, **LEAP**), and **Trending Configuration** (**180**, **90**, **76**).

- ✓ Install LEHR (Low Energy High Resolution) collimator if configured as the trending collimator.
- ✓ Default: LEHR at 180 degrees.
- ✓ Remove the patient table pallet pad.
- ✓ Prepare 3 or 5, 1–2 mCi Tc-99m, Tl-201, or Co-57 point sources depending on the collimator. Match sources within 20% of each other.
- ✓ Install Head Alignment Source Holder, and then the point sources. Each point source holder is labelled **5|3** or **5** to indicate the number of sources needed and point source vial location for calibration. Quick calibration will use 3 or 5 point sources depending on what the trend collimator is set to.



A symbol of a gantry opening with detectors at the top of the Head Alignment Source Holder indicates this end should be placed towards the detectors.

✓ A cleaning instruction is screened on the MHR phantom stating: **Use mild detergent to clean. Do not use alcohol based cleaners.**

SMARTZOOM collimators are not used with Head Alignment calibration.

To perform the Head Alignment Quick Calibration manually, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

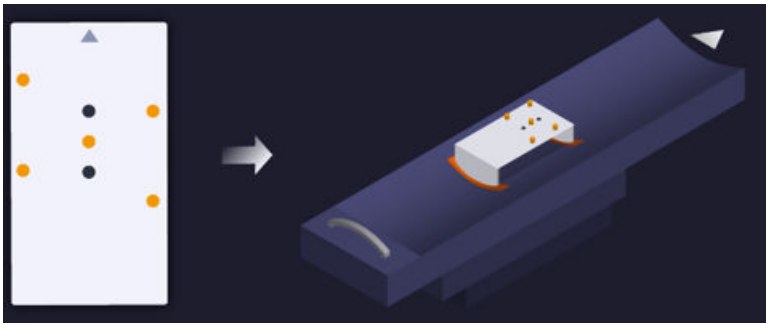
6 Select **Quick Calibration - Manual**.

The **Quick Head Alignment Calibration - Manual** page is displayed.

7 Install the collimators as instructed in the prerequisites. Instructions will also appear on the screen.

For example:

- **Ensure LEHR collimators are installed and detector path of motion is clear.**
- **Home the motion system.**
- **Verify that the background count in FOV is less than 0.4 kcts/sec.**
- **Place 5 Tc-99m sources in the source holder as shown.**
- **Start Calibration (system motion will occur).**



Head Alignment Source Holder location on the patient table and source locations.

8 From the Gantry display, click the **Home** button.

System motion will occur.

9 Per the collimator, insert the point sources in the appropriate configuration for the collimator in the Head Alignment Source Holder.

Source insertion locations are screened on the Head Alignment Source Holder.

10 Verify the **Protocol** settings for the collimator selection and source.

11 Click the **Start** button.

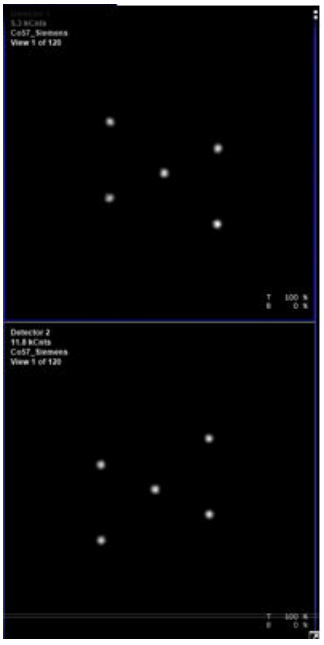
The Calibration task runs. System motion will occur. The system assumes that the Head Alignment Source Holder with sources is on the patient table. The system automatically configures the system, positions the detectors, and moves the sources into position. There is no prompting for source placement or clicking the **Continue** button.

Collimator	Configuration	Date and Time	Status
LEHR	180	06/10/2020 1:13 PM	OK

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

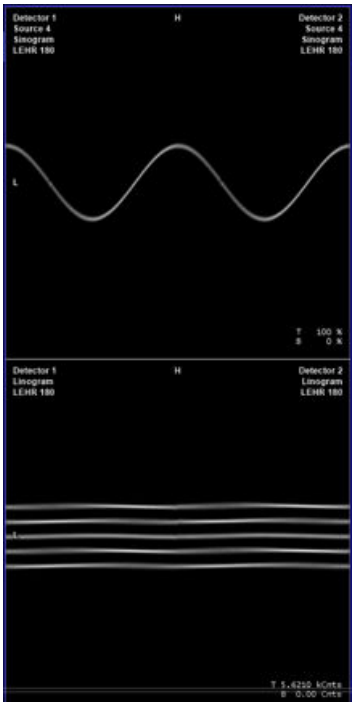
Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **37.9 kCnts**, **Tc99m_Siemens**, **View 18 of 120**.



Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

The acquisition can be stopped by clicking the **Cancel** button. If one task is completed and acquisition is cancelled, the completed task results will be saved.

12 Once the Calibration is complete, the results are displayed in the center of the screen. A sinogram and linogram are displayed on the right side of the screen. On the sinogram, text information appears. The **Source** number indicates the sinogram and linogram of each point source. The linogram displays the projection data for all sources.



For example for the sinogram text:

- **Detector 1, Detector 2**
- **Source 4**
- **Sinogram**
- **LEHR 180**
- **T** (top) **100 %** and **B** (bottom) **0 %**

For example for the linogram text:

- **Detector 1, Detector 2**
- **Linogram**
- **LEHR 180**

For example, the listed values for Head Alignment Calibration may include:

Detector	Measurement	New	Reference Mean	Status
1	Resolution [mm]	14.84	N/A	OK
	Axial Shift [mm]	-0.652	[-2.127] – [0.873]	OK
	BPA [deg]	0.053	[-0.068] – [0.232]	OK
	COR [mm]	1.051	[-0.497] – [2.503]	OK
2	Resolution [mm]	14.913	N/A	OK
	Axial Shift [mm]	0.652	[-0.873] – [2.127]	OK
	BPA [deg]	-0.053	[-0.232] – [0.068]	OK
	COR [mm]	0.582	[-0.880] – [2.120]	OK

The system considers the lowest results as the overall **Results**. Head Alignment does not need to be run for every configuration.

Head alignment acceptance limits are:

- Center Of Rotation (COR): +/- 10 mm
- Axial Shift: +/- 5 mm
- (BPA): +/- 0.8

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

13 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

14 Click **Accept** to apply results.

15 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

16 If the status indicates **Failed**, additional instructions are provided.

28.9.5 Performing head alignment, quick calibration - AQC

Head Alignment Quick Calibration eliminates the need to recalibrate head alignment for all collimators and configurations every month as a specified collimator and configuration is trended to verify within tolerance. The Head Alignment Quick Calibration is a once a month calibration in which a Head Alignment calibration is performed for the specified collimator and configuration. If this is in tolerance, no other Head Alignment Calibrations need to be performed. If this is out of tolerance, it is recommended to perform Head Alignment Calibrations for all configurations and collimators.

For an automated quality control (AQC) Head Alignment Quick Calibration, the following prerequisites apply:

✓ The trending collimator or configuration is specified in the Adminstration Portal. Default: LEHR at 180 degrees.



To setup the Quick Head Alignment, hover over the **Settings** (gear) icon and select the **Adminstration Portal**. Click **MI Clinical Configuration**, and then **Quality Assurance Configuration**. On the right is displayed **Quick Head Alignment**. System administrator (syadmin) access level rights are required to change the **Type** (**Calibration**, **Verification**), the **Collimator** (**LEHR**, **LPHR**, **MELP**, **LEAP**), and **Trending Configuration** (**180**, **90**, **76**).

✓ Verify protocol is set up as expected including the time the calibration should be completed by.

✓ If the system does not have an Automated Collimator Changer (ACC), collimators specified for the protocol are installed on the system. If the system does have an ACC which contain the specified collators, these will be automatically installed on the system.

SMARTZOOM collimators are not used with Head Alignment calibration.

✓ Verify that the protocol collimator, source, and task selections are complete.

To perform the AQC Head Alignment Quick Calibration, use the following instructions.

This calibration can either be accessed through the System Check or Adminstration Portal. It can be accessed through System Check when this calibration is due. The steps that follow are through the Adminstration Portal.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

   The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

   On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

6 Select **Quick Calibration - AQC**.

   The **Quick Head Alignment Calibration - AQC** page is displayed.

7 Click the **Start** button.

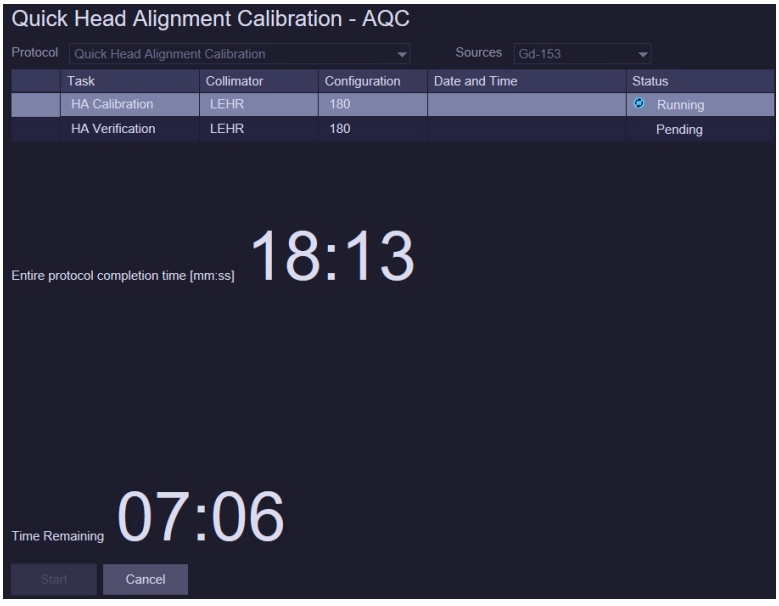
The system determines the amount of time until the automatic scanning starts in order to end by the specified time within the protocol. A countdown then begins and is displayed as **Automatic scan is starting in [d:hh:mm:ss]**. When zero is reached, the first task is started.

System motion will occur. The system automatically configures the system including putting on specified collimators for systems with ACC), and extending the AQC source into position.

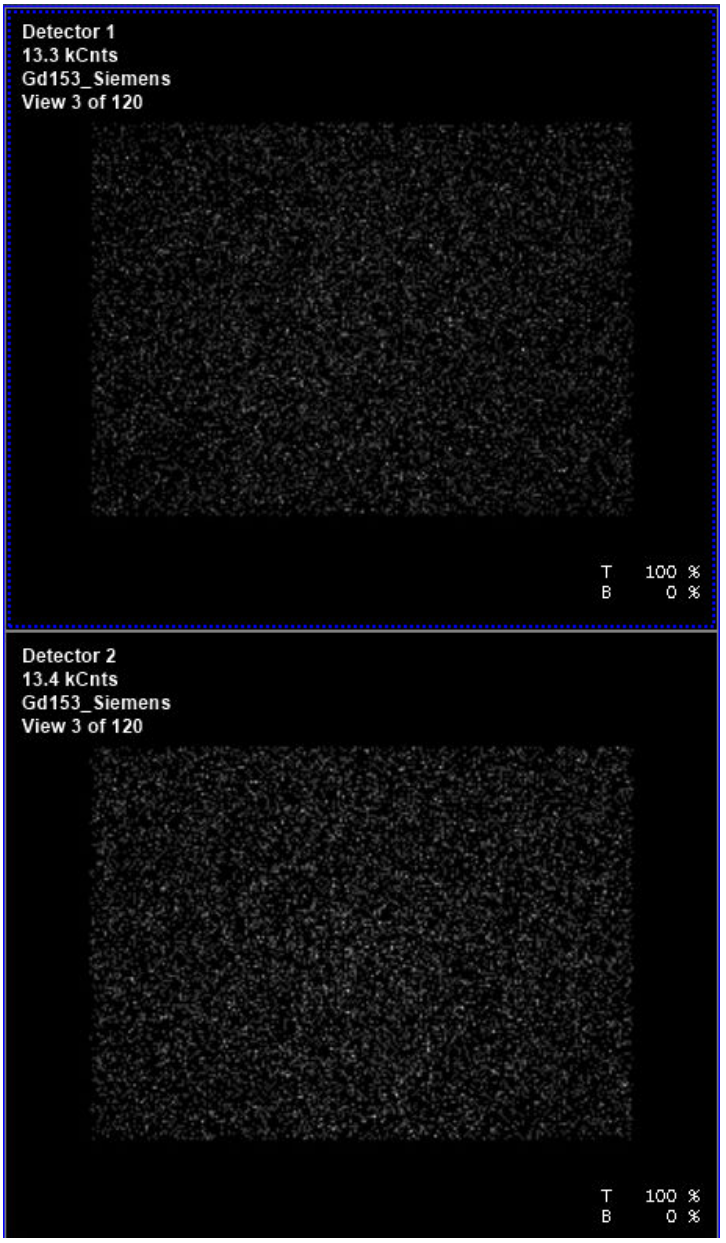
Task	Collimator	Configuration	Date and Time	Status
HA Calibration	LEHR	180	06/10/2020 1:13 PM	OK
HA Verifcation	LEHR	180		

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.



Detector1 and **Detector2** growing images are displayed on the screen's right side.

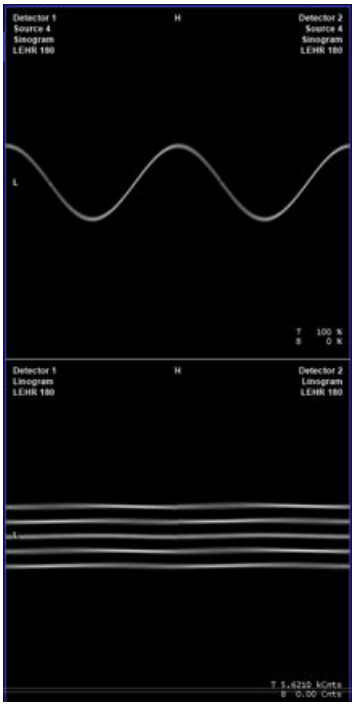

Detector 1
13.3 kCnts
Gd153_Siemens
View 3 of 120
T 100 %
B 0 %
Detector 2
13.4 kCnts
Gd153_Siemens
View 3 of 120
T 100 %
B 0 %

A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **13.3 kCnts**, **Gd153_Siemens**, **View 3 of 120**.

Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

The acquisition can be stopped by clicking the **Cancel** button. If one task is completed and acquisition is cancelled, the completed task results will be saved.

8 Once Calibrations are complete, the results are displayed. For each configuration, the results are displayed in the center of the screen. A sinogram and linogram are displayed on the right side of the screen.



Sinogram and Linogram

An example of sinogram text:

- **Detector 1, Detector 2** (detector number)
- **Source 4** (source number)
- **Sinogram**
- **LEHR 180** (collimator and configuration)
- **T** (top) **100 %** and **B** (bottom) **0 %** (window level)

An example of linogram text:

- **Detector 1, Detector 2**(detector number)
- **Linogram**
- **LEHR 180** (collimator and configuration)

The Head Alignment Calibration includes the measurements of Resolution [mm], Axial Shift [mm], BPA [deg], and COR [mm]. An example of the measurements:

Detector	Measurement	New	Reference Mean	Status
1	Resolution [mm]	14.84	N/A	OK
	Axial Shift [mm]	-0.652	[-2.127] – [0.873]	OK
	BPA [deg]	0.053	[-0.068] – [0.232]	OK
	COR [mm]	1.051	[-0.497] – [2.503]	OK
2	Resolution [mm]	14.913	N/A	OK
	Axial Shift [mm]	0.652	[-0.873] – [2.127]	OK
	BPA [deg]	-0.053	[-0.232] – [0.068]	OK
	COR [mm]	0.582	[-0.880] – [2.120]	OK

The overall **Results** are determined based on the calibration with the lowest results. Head Alignment does not need to be run for every configuration.

Head alignment acceptance limits are:

- Axial Shift: +/- 5 mm
- (BPA): +/- 0.8
- Center Of Rotation (COR): +/- 10 mm

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

9 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

10 Click **Accept** to apply results.

11 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

12 If the status indicates **Failed**, additional instructions are provided.

28.9.6 Performing quantitative, xSPECT sensitivity

For xSPECT Sensitivity calibration, you will perform certain prerequisites:

✓ Install the applicable collimators.

✓ Extend integrated source holder.

✓ Install precision source.

✓ If a precision source is not registered for a collimator, a message is displayed: **Precision source not registered! Precision source must be registered through Source Management.**

✓ The xSPECT Sensitivity screen lists the following information:

- **Protocol: LEHR**
- **Source: Co-57**
- **M12345 (registration number)**

✓ Sources are registered in the Administration Portal. Move the cursor over the **Settings** (gear) icon, and click **Administration Portal**. Click the **Quality Assurance** tab. Click the **MI Quality Assurance** task, and then**Source Management**. For information on source management, go to (➔ Page 489 *Source Management*).

To perform xSPECT Sensitivity, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Quantitative**.

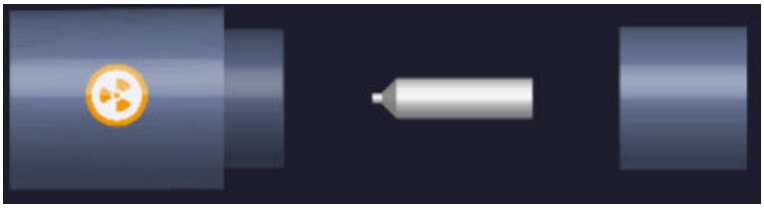
6 Select **xSPECT Sensitivity**.

The **xSPECT Sensitivity** page is displayed.

7 Install the collimators and prepare the precision source to be attached as instructed in the prerequisites. Instructions will also appear on the screen.

For example:

- **Install collimators on both detectors.**
- **Prepare the precision point source to be attached to the manual holder.**
- **Click Start (system motion will occur).**



Precisions source and container.

8 Click the **Start** button to begin the calibration.

The system's pre-positioning task is performed. System motion occurs as the detectors are retracted and the patient table is raised.

9 When prompted during the pre-positioning step, extend the integrated source holder.

Displayed instructions will tell you to **Attach the point source to the source holder**. A video also demonstrates the installation procedure.

10 Install the precision source into the end of the integrated source holder.



Installing precision source into integrated point source holder.

11 From the end of the integrated point source holder, unscrew the source holder cap counterclockwise.

Screw the precision source clockwise.

12 Displayed instructions will also tell you to **Click Continue (system motion will occur).**

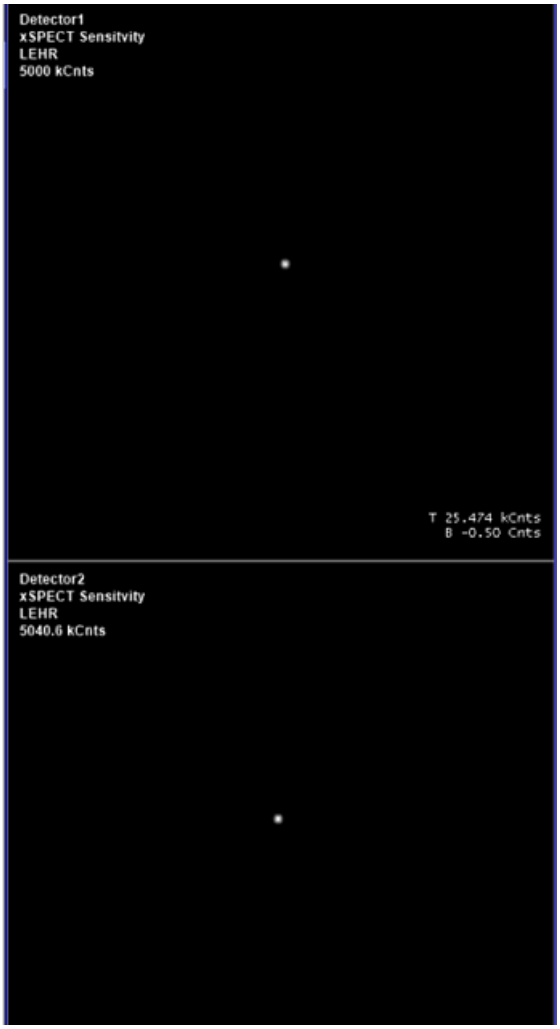
Click the **Continue** button.

The next task is performed.

A time display appears and counts down the time remaining for the quality assurance calibration. The checked protocol tasks are performed. The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**.

13 If required, click the **Cancel** button to stop the calibration from running.

Detector1 and **Detector2** growing images are displayed on the screen's right side.



Detector 1 and Detector 2 Calibration Images with Co-57 Precision Source.

A continually updating counts per thousand (**kCnts**) total is displayed, as well as other calibration information (for example, **Detector1**, **xSPECT Sensitivity**, **LEHR**, **5000 kCnts**).

Windowing information is also displayed: **T** (top) **25.474 kCnts** and **B** (bottom) **-0.50 Cnts**.

The QC results list the **Detector**, **Measurement**, **Photopeak**, **Results cps/ Mbq)**, **Deviaton from Expected (%)**, **Reference range (cps/Mbq)** and **Status**.

For example, the **Sensitivity (Details)** values may include:

Detector	Measure-ment	Photopeak	Results cps/ Mbq)	Deviation from Expected (%)	Reference range (cps/ Mbq)	Status
1	Co-57	1	-5.118255	-5.105063	[77.661] - [94.91901]	OK
2	Co-57	1	81.87346	-5.118255	[77.661] - [94.91901]	OK

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

14 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

15 Click **Accept** to apply results.

16 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

17 If the status indicates **Failed**, additional instructions are provided.

28.9.7 Performing quantitative, cross calibration

For Cross Calibration, you will perform certain prerequisites:

✓ Install the applicable collimators.

✓ Prepare point source 5-10 mCi (millicuries) point source of applicable isotope.

✓ Dose Calibrators are registered in the Administration Portal. Move the cursor over the **Settings** (gear) icon, and click **Administration Portal**. Click the **Quality Assurance** tab. Click the **MI Quality Assurance** task, and then **Source Management**.

To perform Cross Calibration, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Quantitative**.

6 Select **Cross Calibration**.

The **Cross Calibration** page is displayed.

Protocol: LEHR, **Sources: Tc-99m**

Tasks	Detector	Collimator	MCounts	Date and Time	Status
Position Point Source			N/A		
Calibration	Both	LEHR	5		

7 Install the collimators and source as instructed in the prerequisites. Instructions will also appear on the screen.

For example:

- **Install collimators on both detectors.**
- **Prepare a 5- 10 mCi point source of the selected isotope. Attach it to the sources holder when prompted.**
- **Click Start (system motion will occur).**

8 Enter the assay **Dose** and **Time** for the dose calibrator.

If correcting for multiple Dose Calibrators that are registered, enter data using the dropdown for each Dose Calibrator. The correction can be performed in a single calibration.

For example:

- **Dose Calibrator**, **DC1**

  Dose mCi (or **MBq**) **10.00**

  Time 04/02/2021 8:00.00 AM

9 Click the **Start** button to begin the calibration.

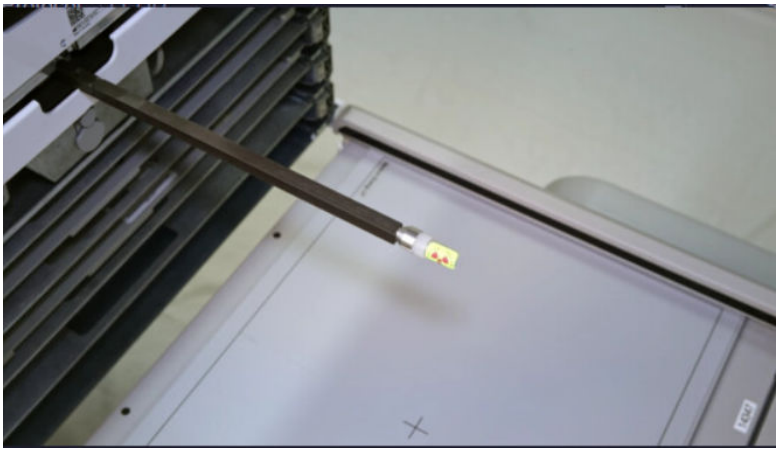
The system's pre-positioning task is performed. System motion occurs as the detectors are retracted and the patient table is raised.

The hinge on the integrated source holder enables it to be lifted if the detector is accidentally raised.

10 When prompted during the pre-positioning step, extend the integrated source holder.

Displayed instructions will tell you to **Attach the point source to the source holder**. A video also demonstrates the installation procedure.

11 Install the prepared point source into the end of the integrated source holder.



Point source installed in integrated point source holder.

12 Displayed instructions will also tell you to **Click Continue (system motion will occur).**

Click the **Continue** button.

The next task is performed.

A time display appears and counts down the time remaining for the quality assurance calibration. The checked protocol tasks are performed. The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**.

13 If required, click the **Cancel** button to stop the calibration from running.

Detector1 and **Detector2** growing images are displayed on the screen's right side.



Detector 1 and Detector 2 Calibration Images with Point Source.

A continually updating counts per thousand (**kCnts**) total is displayed, as well as other calibration information (for example, **Detector1**, **3489.1 kCnts**, **Tc99m_Siemens**, **Anterior Projection** or Detector2, **Posterior Projection**).

Windowing information is also displayed: **T** (top) **100% kCnts** and **B** (bottom) **0 %**. Upon completion, the text may change. For example: **Dectector1**, **Sensitivity Cross Calibration**, **LEHR**, **5000 kCnts**.

The QC results list the **Detector**, **Measurement**, **Photopeak**, **Results cps/Mbq)**, **Deviaton from Expected (%)**, **Reference range (cps/Mbq)** and **Status**.

For example, the **Cross Calibration (Details)** values may include:

Source ID	Detector	Measurement	Photopeak	Results cps/ Mbq)	Status
DC1	1	Tc-99m	1	68.46715	OK
DC1	2	Tc-99m	1	68.08286	OK

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

14 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

15 Click **Accept** to apply results.

16 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

17 If the status indicates **Failed**, additional instructions are provided.

28.9.8 Performing quantitative, broad quant sensitivity

For Broad Quant (quantification) Sensitivity calibration, you will perform certain prerequisites:

✓ Install the applicable collimators.

✓ Prepare point source 5-10 mCi (millicuries) point source of applicable isotope.

✓ Dose Calibrators are registered in the Administration Portal. Move the cursor over the **Settings** (gear) icon, and click **Administration Portal**. Click the **Quality Assurance** tab. Click the **MI Quality Assurance** task, and then **Source Management**. For information on source management, go to (➔ Page 489 *Source Management*).

If the xSPECT Quant option has not been purchased, Dose Calibrator will not be available.

If Cross Calibration has been performed, enter the assay dose information for dose calibrator.

To perform Broad Quant Sensitivity, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login on to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Quantitative**.

6 Select **Broad Quant Sensitivity**.

The **Broad Quant Sensitivity** page is displayed.

Protocol: LEHR, **Sources: Tc-99m**

Tasks	Detector	Collimator	MCounts	Date and Time	Status
Position Point Source			N/A		
Calibration	Both	LEHR	5		

7 Install the collimators and source as instructed in the prerequisites. Instructions will also appear on the screen.

For example:

- **Install collimators on both detectors.**
- **Prepare a 5- 10 mCi point source of the selected isotope. Attach it to the sources holder when prompted.**
- **Click Start (system motion will occur).**

8 If applicable, enter the assay **Dose** and **Time** for the dose calibrator.

If correcting a registered Dose Calibrator, enter the data using the drop-down menu. The correction can be performed in a single calibration.

For example:

- **Dose Calibrator**, **DC1**

  Dose mCi (or **MBq**) **10.00**

  Time 04/02/2021 8:00.00 AM

If a dose calibrator is registered and selected for Broad Quant calibrations, results without a dose calibrator are overwritten. Likewise for a deletion, if a dose calibrator is deleted, all the Broad Quant calibration data with dose calibrator data is deleted, as well as the Broad Quant calibration data not referencing a dose calibrator. If a dose calibrator is registered, always select a dose calibrator during Broad Quant calibrations to prevent data loss.

9 Click the **Start** button to begin the calibration.

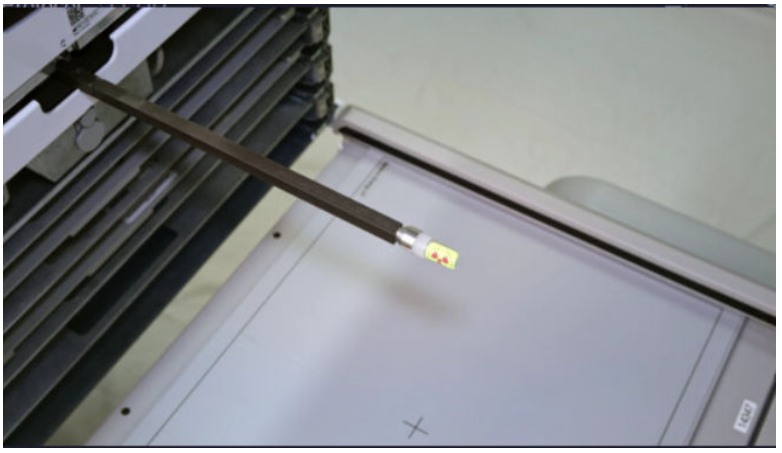
The system's pre-positioning task is performed. System motion occurs as the detectors are retracted and the patient table is raised.

The hinge on the integrated source holder enables it to be lifted if the detector is accidentally raised.

10 When prompted during the pre-positioning step, extend the integrated source holder.

Displayed instructions will tell you to **Attach the point source to the source holder**. A video also demonstrates the installation procedure.

11 Install the prepared point source into the end of the integrated source holder.



Point source installed in integrated point source holder.

12 Displayed instructions will also tell you to **Click Continue (system motion will occur).**

Click the **Continue** button.

The next task is performed.

A time display appears and counts down the time remaining for the quality assurance calibration. The checked protocol tasks are performed. The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**.

13 If required, click the **Cancel** button to stop the calibration from running.

Detector1 and **Detector2** growing images are displayed on the screen's right side.



Detector 1 and Detector 2 Calibration Images with Point Source.

A continually updating counts per thousand (**kCnts**) total is displayed, as well as other calibration information (for example, **Detector1**, **3489.1 kCnts**, **Tc99m_Siemens**, **Anterior Projection** or Detector2, **Posterior Projection**).

Windowing information is also displayed: **T** (top) **100% kCnts** and **B** (bottom) **0 %**. Upon completion, the text may change. For example, **Dectector1**, **Sensitivity Cross Calibration**, **LEHR**, **5000 kCnts**.

The QC results list the **Detector**, **Measurement**, **Photopeak**, **Results cps/ Mbq)**, **Deviaton from Expected (%)**, **Reference range (cps/Mbq)** and **Status**.

For example, the **Sensitivity (Details)** values may include:

Source ID	Detector	Measurement	Photopeak	Results cps/ Mbq)	Status
DC1	1	Tc-99m	1	68.46715	OK
DC1	2	Tc-99m	1	68.08286	OK

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

14 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

15 Click **Accept** to apply results.

16 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

17 If the status indicates **Failed**, additional instructions are provided.

28.9.9 Performing quantitative, broad quant VSF sensitivity

For Broad Quant (quantification) VSF (Volume Sensitivity Factor) calibration, you will perform certain prerequisites:

Broad Quant (quantification) VSF (Volume Sensitivity Factor) calibration is only performed once at systerm installation, and the system will only prompt for it during initial system installation.

✓ Prepare the phantom.

✓ Recommended volume of 6000 – 7000 ml (milliliters) with an approximate diameter of 20 cm (centimeters). A standard cylinder quality control phantom without inserts typically meets these specifications.

✓ Install applicable collimators.

✓ Position the phantom on the patient table in the same area for Head Alignment Source Holder.

✓ The long axis of the phantom should be parallel with the gantry's axis of rotation. Set the patient table height so that the phantom is centered transaxially with the gantry's opening.

✓ Other preconditions including having NMCTFOV (nuclear medicine computed tomography field of view) calibration for the selected collimator, Head Alignment calibration for the selected collimator, and Broad Quant Sensitivity for the selected collimator and isotope configuration.

To perform Broad Quant VSF calibration, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Quantitative**.

6 Select **Broad Quant VSF Calibration**.

The **Broad Quant VSF calibration** page is displayed.

Protocol: LEHR, Sources: Tc-99m

Function	Configuration	Date and Time	Status
Position Phantom	N/A		
LEHR	N/A		
CT	N/A		
Select VOI	N/A		

For Symbia Pro.specta X3 and X7 systems, if a dose calibrator is registered and selected for Broad Quant calibrations, results without a dose calibrator are overwritten. Likewise for a deletion, if a dose calibrator is deleted, all the Broad Quant calibration data with dose calibrator data is deleted, as well as the Broad Quant calibration data not referencing a dose calibrator. If a dose calibrator is registered, always select a dose calibrator during Broad Quant calibrations to prevent data loss.

7 Install the collimators as instructed in the prerequisites. Instructions will also appear on the screen.

If a required calibration has not been performed, additional instructions may appear before those instrucitons for the Broad Quant VSF Calibration. For example:

- **No Flood calibration has been performed for the selected isotope.**

  Please perform the Flood calibration for this isotope or select other sources.

- **No Head Alignment calibration has been performed for the selected Collimator.**

  Please perform the Head Alignment calibration for this Collimator or select another Collimator.

- **No NMCTFOV calibration has been performed for the selected Collimator.**

  Please perform the NMCTFOV calibration for this Collimator or select another Collimator.

If there are no preconditions to performing the Broad Quant VSF Calibration, instructions may appear as in this example:

- **Prepare a uniform cylinder phantom with a known activity concentration as measured by an onsite dose calibrator.**
- **Select the dose calibrator.**

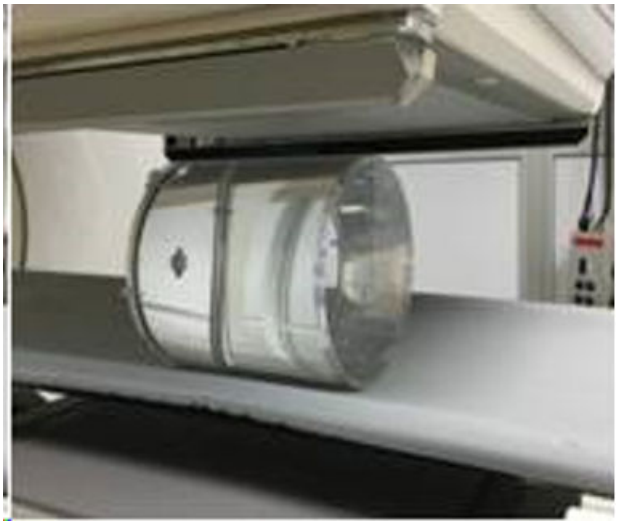
  DC1 (drop-down selection)

- **Enter the Activity and Volume to calculate the activity concentration.**(Information entered is based on the phantom.)
- **Dose mCi** (or **MBq**) **10.00**

  Time 04/02/2021 8:00.00 AM

  Volume ml (volume in millileters)

- **Place the phantom on the patient table and position between the detectors as shown.**
- **Go (system motion will occur).**



If time limit for a calibration has been exceeded, a message is displayed: **Last Broad Quant Sensitivity calibration has been performed more that 10 Days ago.**

8 Select applicable collimator and source to perform Broad Quant VSF Calibration

9 Enter the **Dose Calibrator** information: **Dose**, **Time**, and **Volume**.

10 Place the phantom on the patient table.

11 Click the **Go** button.

System motion occurs, retracting detectors and moving patient table to the start position.

12 Verify phantom's position, and then click the **Continue** button.

The SPECT calibration starts, followed by a CT calibration. Instructions for performing the CT calibration will be displayed.

A time display appears and counts down the time remaining for the calibration. The checked protocol tasks are performed. The task currently being performed is highlighted. Under the **Status** heading, the progress of the task is displayed, for example, **Running**. Upon completion, a green light indicator with a checkmark will appear with the status message **OK**.

13 If required, click the **Cancel** button to stop the calibration from running.

14 When calibration is completed, the acquired results are displayed.

The results list the **Function**, **Configuration**, **Date and Time**, and **Status**.

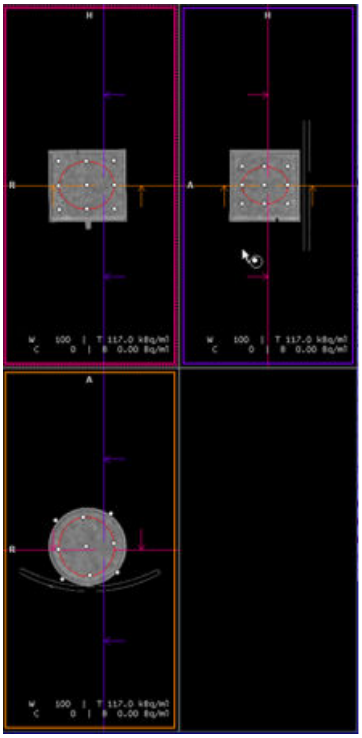
For example:

Detector	Function	Configuration	Date and Time	Status
1	Position Phantom	N/A	09/02/2020 1:13 PM	OK
	LEHR	N/A	09/02/2020 1:16 PM	OK
2	CT	N/A		OK
	Select VOI	N/A		Running

For example, the **VSF Result** values may include:

Detector	Parameter	Value	Status
1	Volume Sensitivity Factor	0.7310895	OK
2	True Activity Concentration [kBq/ml]	72.24349	OK

15 The acquired images are displayed on the screen's right side.



Calibration Images of Phantom.

An example of image text: **W 100 | T 117.0 kBq/m]** (W for Window, T for Top, kBq/m for kilo Bequerel per million)

C 0 | B 0.00 Bq/m] (C for Center, B for Bottom, Bq/m for Bequerel per million)

16 Verify that VOI (Volume Of Interest) placement is avoiding edge boundaries. If necessary, reposition VOI by dragging its circular crosshair and center it within the phantom's square or circle gray range on the image.

17 The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs the VOI verified.

18 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

19 Click **Accept** to apply results.

20 Click **Cancel** to keep the previous results if available.

Clicking does not apply new results.

21 If the status indicates **Failed**, additional instructions are provided.

28.10 Monthly CT quality tests

Together with other characteristic values, the daily test values are checked for constancy monthly. These tests comply with IEC 61223-2-6, and are performed on the complete set of phantoms. You can perform the monthly quality test in the **Quality Assurance** workspace of the Administration Portal.

In addition, the CT dose index (CTDI) must be measured at least once every six months. The CTDI must also be measured after any maintenance work that might have altered the test results.

For the monthly constancy test, you require the following phantoms and accessories:

- Phantom holder
- Quality phantom
- A person-equivalent load not exceeding 135 kg
- Ruler, 100 cm

- The test shall be performed with a person-equivalent load not exceeding 135 kg on the PATIENT SUPPORT.
- We recommend having the constancy test and the CTDI measurement performed by proper personnel. If you want to conduct the constancy test and the CTDI measurement yourself, you must perform all steps of the constancy test or the CTDI measurement under your own responsibility.

28.10.1 Performing reference constancy tests

Evaluation of the constancy test results are based on a comparison with reference data that are stored in your system. These are determined by Siemens Healthineers Service.

If you have any of the system parts replaced (for example, tubes), the reference data must be determined again. You can do this with a reference measurement.

1 On the access bar, move the mouse pointer over the Settings icon and, from the menu, choose Administration Portal.

The login page opens.

2 Log on to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.



4 Choose **Constancy Reference**.

The test results of the reference constancy test will be used as reference data in the future.

A reference constancy test follows the same sequence as a normal constancy test.

(➔ Page 872 *Calling up the constancy tests*)

(➔ Page 874 *Starting the constancy tests*)

We recommend that Siemens Healthineers Service always performs your reference constancy test.

28.10.2 Calling up the constancy tests

1 On the access bar, move the mouse pointer over the **Settings** icon and, from the menu, choose Administration Portal.

The login page opens.

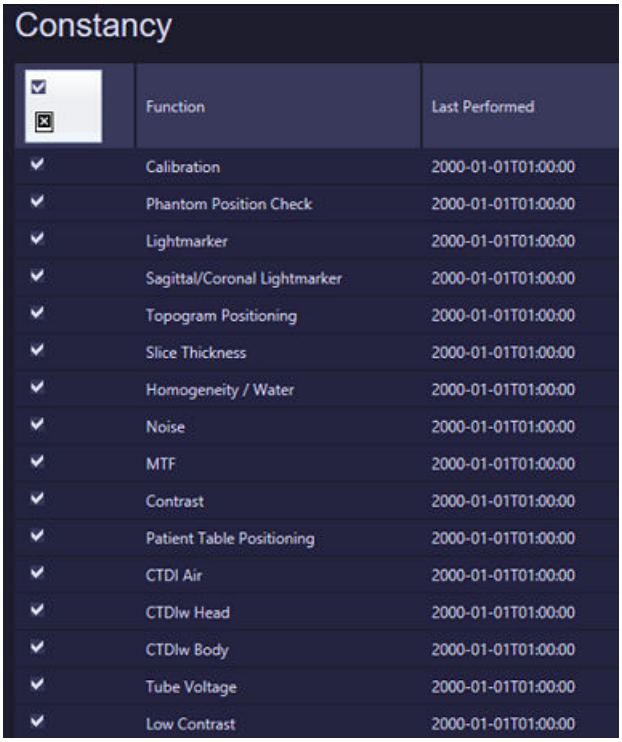
2 Log on to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.



4 Choose **Constancy** to open the **Constancy** dialog box.



5 Select the tests that you want to include in this constancy test.

The system calibration and phantom position check are typically required and run before any other individual constancy test.

– or –

Clear the tests that you do not require by selecting them again.

6 Click the **GO** button to confirm the constancy test selections.

A dialog box opens asking you to enter the tester's name and the phantoms' serial numbers.

- After you open the constancy test, follow the instructions given on the screen. The system starts the first quality test. After successful completion of the first test, the next test is started.
- You can interrupt each test within the procedure with the **Cancel** button in any phase.

28.10.3 Starting the constancy tests

A reference measurement follows the same sequence as a normal constancy test.

1 Click the **GO** button to start the constancy tests when you have completed your preparations.



2 Press **Start** on the control box when you are prompted.

3 **Base Calibration** is performed.

On completion of the **Base Calibration** test, the **Phantom Position Check** test initiates.

4 Select the phantom that is used for the current test.

5 Click **OK** to confirm the settings.

The phantom position is checked. The result of the scan will be displayed in the status and error message area.

The system alerts you if the phantom is positioned incorrectly. Correct the position, if necessary.

The system starts the first quality test. This is usually checking the light marker position (z-position).

The selected functions start.

- You can interrupt each test within a constancy test by clicking **Cancel**.
- Successfully saved results of completed quality measurements within the procedure are not deleted.

Test is out of tolerance.

◆ Contact your Customer Care Center.

28.10.4 Performing the light marker test (z-position)

With this quality test, you determine the deviation of the light marker from the current slice plane.

✓ The quality phantom is positioned in such a way that the inner light marker points on the reference marking on the slice thickness phantom.

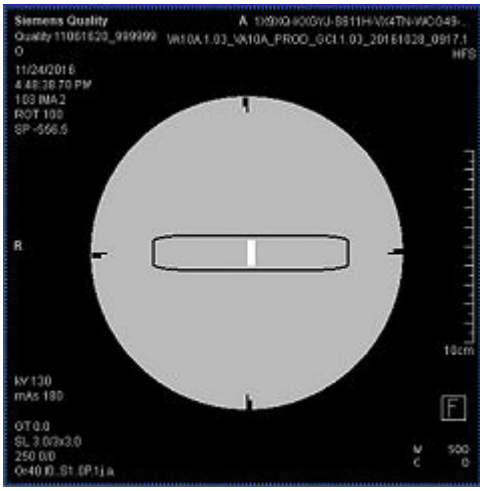
✓ The **Lightmarker** test mode is loaded.



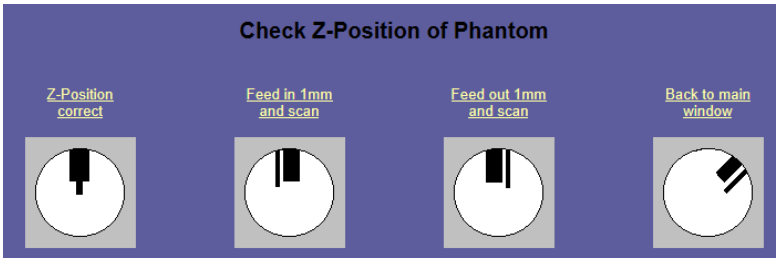
1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

In the image area, the phantom is displayed as a circle in the image. For the light marker test, both the short and the long strip in the 12 o'clock position are important.



3 Compare the image with the pictures displayed in the content area of the **Constancy** dialog box.



4 Correct the table position by clicking **Feed In** or **Feed Out**. With **Feed In** or **Feed Out**, you can move the table by 1 mm.

A new image is acquired.

5 Repeat step 2 to step 3 until you have set the correct z-position.

6 Click **Continue**.

The internal z-position is set to 0, and the display of the table position shows 0. The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.5 Performing the sagittal and coronal light marker test

With this quality test, you determine the position of the sagittal and the coronal light marker.

✓ The slice thickness phantom is positioned in such a way that the sagittal and horizontal light markers mark the horizontal and vertical center.

✓ The **Sagittal/Coronal Lightmarker** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

In the image, the middle of the phantom is determined. The result is the deviation from the horizontal and vertical middle of the image to the middle of the phantom. The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.6 Performing the topogram positioning test

With this quality test, you determine the position of the tomographic plane using a preview image.

✓ The set of phantoms is in front of the scan plane. The internal light marker must not hit the set of phantoms.

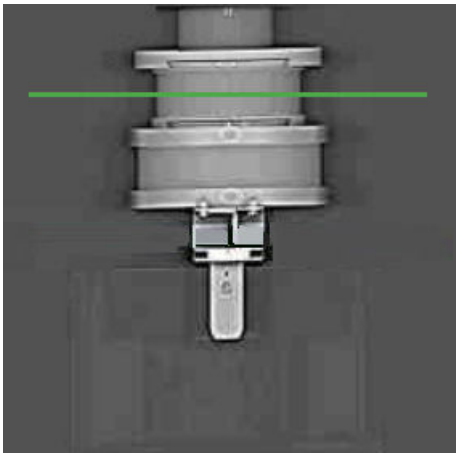
✓ The **Topogram Positioning** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

In the image area, you can see an image with a horizontal line, and the corresponding table position to the line position.

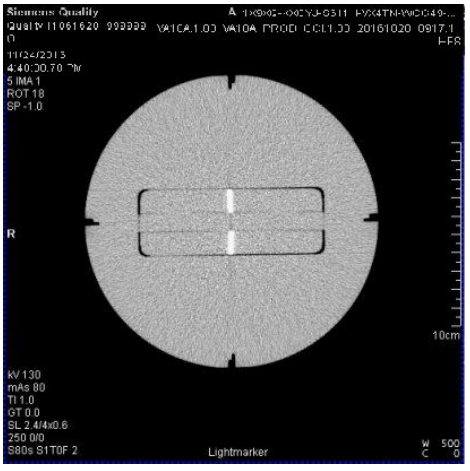


3 Move the horizontal line and mark the position of the middle of the slice thickness phantom.

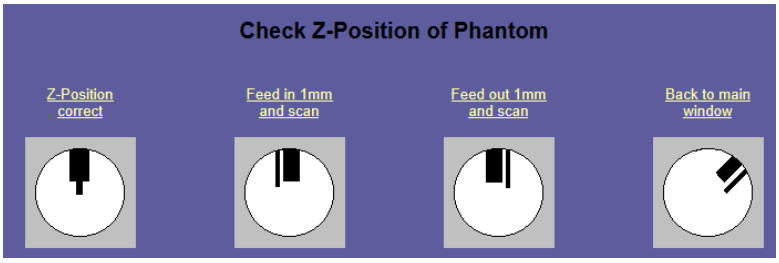
4 Click **GO**.

The patient table moves to the marked position. Scanning starts.

In the image area, the phantom is displayed as a circle in the image. For the preview image test, both the short and the long strip in the 12 o'clock position are important.



5 Compare the image with the pictures displayed in the content area of the **Constancy** dialog box.



6 Correct the table position by clicking **Feed In** or **Feed Out**. With **Feed In** or **Feed Out**, you can move the table by 1 mm.

A new image is acquired.

7 Repeat image recording and correction of the table position until you have set the correct z-position.

8 Click **Continue**.

The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.7 Performing the slice test

The slice thickness is determined with the slice thickness phantom. For each slice thickness, a tomogram of the phantom is recorded and the real slice thickness is calculated from this.

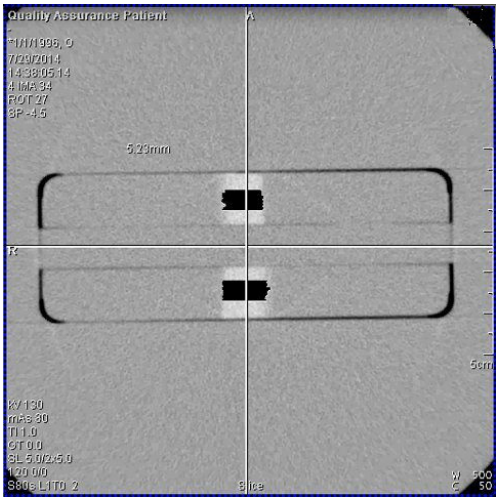
✓ The **Slice** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

An image of the slice thickness phantom is displayed in the image area. The slice thickness is calculated. The procedure is repeated.



The test results are located in the content area of the **Constancy** dialog box once all slice thicknesses have been evaluated.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.8 Performing the homogeneity test

With this test, you measure the homogeneity of the CT values in five regions of the water phantom.

✓ The **Homogeneity/Water** test mode is loaded.

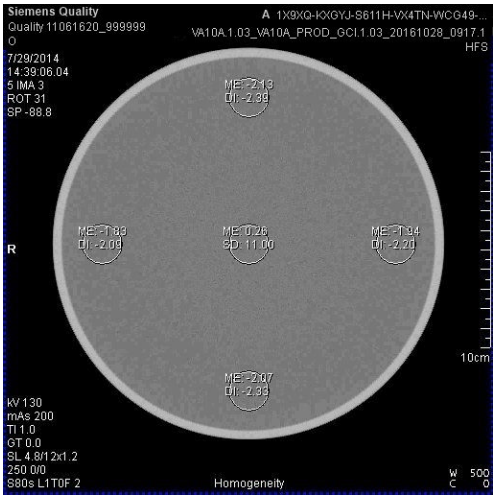


1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

An image of the water phantom is recorded. 5 ROIs are marked in the image, one central and four peripheral.

In addition to the ROIs, the mean values and standard deviations of the CT values are displayed. The difference between the mean values of the central ROI and the peripheral ROIs is displayed.



The measurement is repeated automatically for other tube voltages. The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.9 Performing the noise test

The pixel noise is determined from two tomograms of the water phantom using the same method the daily quality measurement uses.

✓ The **Noise** test mode is loaded.



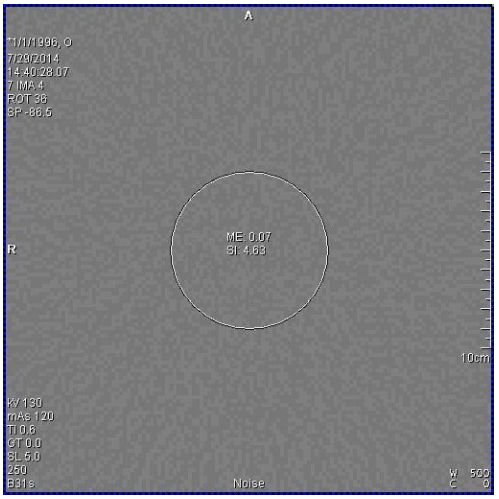
1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

Two images of the water phantom are recorded with identical parameters. The difference between the first and the second measurement is shown.

The following evaluations are displayed:

- ROI
- Mean value of the CT value
- Sigma value (pixel noise)



The measurement is repeated automatically for other tube voltages. The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.10 Performing the MTF test

The spatial resolution is characterized through the modulation transfer function (MTF). It describes the contrast amplitude with different local frequencies shown in the image relative to an ideal transmission.

In practice, the MTF values are determined using a single thin wire in the air.

✓ The **MTF** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

The MTF is represented graphically as a function of the local frequency (LP/cm). In addition, two characteristic values, 50% MTF, and 10% MTF are displayed.

The scan is displayed in the image area. The result image is calculated and stored in the local database.

The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.11 Performing the contrast test

With this test, you measure the contrast scale by a measurement in the air and the water.

✓ The **Contrast** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

A central ROI is evaluated, the corresponding mean value (ME) and standard deviation (SD) are displayed, see the following image.



The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.12 Performing the table positioning test

With this quality measurement, you test whether the actual table position matches the table position displayed.

The **Table Positioning** test is performed without triggering radiation.

✓ The **Table Positioning** test mode is loaded.

1 Mount a ruler or tape at the mobile part of the patient table so that the 0 mm mark of the ruler is aligned with the stationary part of the table.

2 Place a person-equivalent table load.

The test shall be performed with a person-equivalent load not exceeding 135 kg on the PATIENT SUPPORT.

3 Start measurement by following the instructions on the screen.

The horizontal table position is set to 0. The table top moves 300 mm in the direction of the gantry.

4 Read the 300 mm position on the ruler.

5 Enter the value in the entry field of the content area.



The value sign is automatically corrected.

6 Click **Continue**.

The table top now moves stepwise into the gantry (300 mm) and back.

7 Enter the actual values at the 300 mm and the 0 mm position in the entry field again.

The deviations of the actual positions from the displayed positions are calculated. The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.13 Performing the CTDI Air test

With this test, you measure the dose in the system axis.

✓ The ionization chamber is centered in the axial direction in the system axis. The slice plane must run through the center of the chamber. An appropriate dosimeter is connected to the ionization chamber.

✓ The **CTDI Air** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

3 Read off the value on the dosimeter and enter it in the entry field of the **Constancy** dialog box.



4 The measurement is repeated for other tube voltages.

The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.14 Performing the CTDIw head and the CTDIw body test

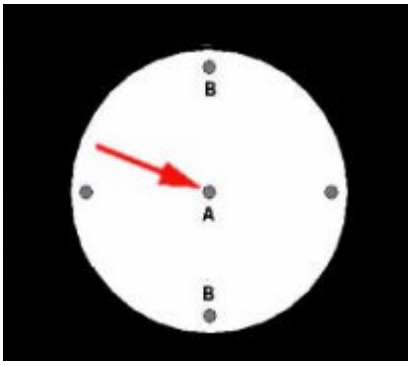
The process for **CTDIw Head** test and **CTDIw Body** test are identical, only with different phantoms and evaluation methods. The test described herein focuses on the **CTDIw Head** test.

The **CTDIw Head** test requires the CTDI head phantom with 16 cm diameter. The **CTDIw Body** test requires the CTDI body phantom with 32 cm diameter.

✓ The CTDI head phantom is positioned in the center of the scan field so that the inner light markers match the engraved markings. An appropriate dosimeter is connected to the ionization chamber.

✓ The **CTDIw Head** test mode is loaded.

1 Insert the ionization chamber into drilling A and fill all other drillings with PMMA sticks.





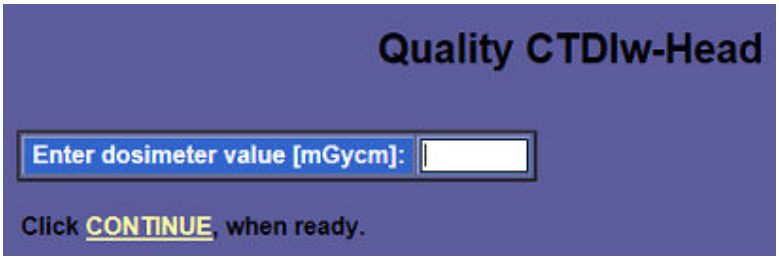
2 Press **Start** on the control box when you are prompted.

3 Scanning starts.

The reconstructed image of the CTDI phantom is displayed. A centric ROI with the configured diameter is displayed in the image. With this image, you can decide whether the phantom is positioned correctly. Drilling A must be within the circle.

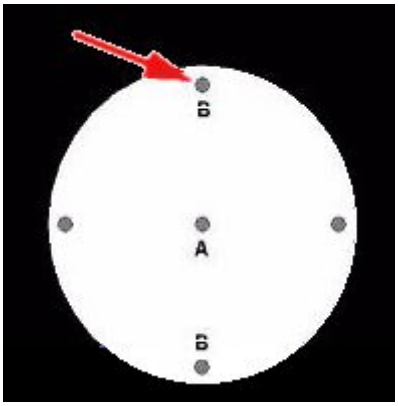
4 When the phantom position is correct, click **Continue**.

5 Read off the value on the dosimeter and enter it in the entry field in the content area of the **Constancy** dialog box.



6 The measurement is repeated for other tube voltages.

7 Insert the ionization chamber into drilling B and fill all other drillings with PMMA sticks.



8 Repeat step 2 to step 6 above.

The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

The **CTDIw Head** test and **CTDIw Body** test can be performed either according to IEC 61223-2-6 or alternatively to CTDIair, and as a consequence, they are not compulsory.

28.10.15 Performing the tube voltage test

With this quality test, you can compare the actual voltage in the tube to the expected voltage for each available tube voltage.

✓ The **Tube Voltage** test mode is loaded.

1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

The measurement is repeated for other tube voltages. The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

28.10.16 Performing the low contrast test

The low contrast test has to be performed during system installation and after the replacement of image quality related components.

The availability of the low contrast test is country-specific. It needs to be activated by Siemens Healthineers Service.

Acquiring low contrast image

The Low Contrast test is performed in the Administration Portal under **Quality Assurance** > **Constancy**.

✓ The low-contrast phantom is positioned in such a way that the inner light marker points on the reference markings that are on the slice thickness phantom.

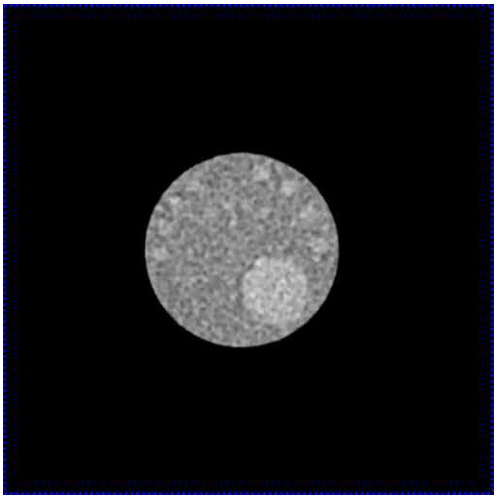
✓ The **Low Contrast** test mode is loaded.



1 Press **Start** on the control box when you are prompted.

2 Scanning starts.

The phantom position and the gantry inclination are checked. The image of the low contrast phantom is displayed in the image area.



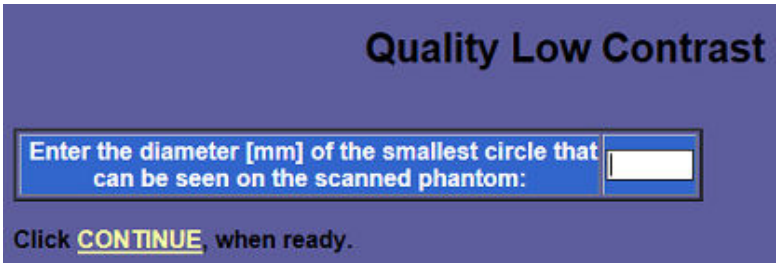
Evaluating low contrast image

Normally one scan is sufficient to discern the pins in the row with the smallest diameter (3 mm). However, the procedure may be repeated if desired. Low contrast measurements are directly affected by the level of noise ("sigma") in the system, which may vary from scan to scan within a specified range. Low contrast estimations involve visual verification methods that are somewhat subjective. It is normal to expect some variations in assessing low contrast of the smallest (3 mm) pins.

1 Adjust the window width and center to improve visualization (adequate starting values: 40 width/90 center).

2 Observe the region where the small pins are located just below the two 20 mm measurement areas.

3 Enter the resolution in the corresponding entry field of the content area.



The low contrast test is in tolerance if the resolution is at least 5.0 mm.

4 Click **Continue**.

The test results are located in the content area of the **Constancy** dialog box.

In the status and error message area, you can see the details of this test, for example, if this test is in tolerance or out of tolerance.

It may help to observe the image in a semi-darkened room and from distance of up to 5 feet (1.5 meters).

28.10.17 Quality test results

A defined number of results are stored. Older values are overwritten by new values.

The images recorded during measurement are stored as images of the patient "Service Patient" in **Patient Browser** under Patient Browser.

Viewing quality test reports

You can view the results of the daily and monthly quality test with the **Service Reports** function.

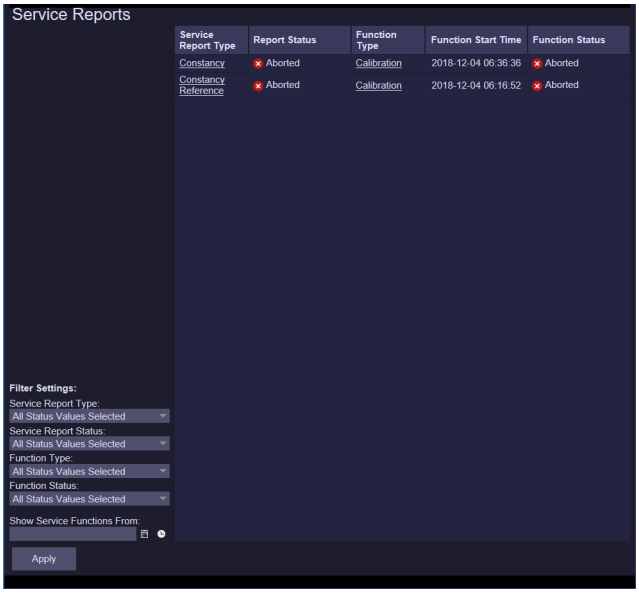
1 On the access bar, move the mouse pointer over the **Settings** icon and, from the menu, choose Administration Portal.

The login page opens.

2 Log on to the Administration Portal.

3 On the toolbar, move the mouse pointer over the **Service Reports** icon, and click the tooltip.

The **Service Reports** page is displayed.



4 In the **Filter Settings** list, select the type, status, and date of the service report, and function type and status, and click **Apply**.

   A list of matching service reports is displayed.

5 To create a PDF document, select a report from the list.

6 Click the **Show PDF** button.

   The PDF settings are displayed.

7 Select the **Service level** to be considered and the paper format.

8 To include items specified as wordy, select the **Verbose** check box.

9 To include downloadable content, such as raw image data, select the **Attach Raw Data** check box.

10 Click the **Show** button.

   A PDF file is created and displayed.

- The report can be generated in the local language.
- You can enter the test results in the forms supplied in the System Owner Manual.
- Test films and test forms must be stored for at least two years.

Viewing quality test images

You can view the result images of the quality tests in the MI View&GO.

1 Open the **Patient Browser**.

2 Click Patient Browser.

The series of the patient “Service Patient” are displayed. Each series contains the images of one application.

3 Select the series you want to view.

4 You can choose, for example, to view the result images in MI View&GO or by selecting an icon from the toolbar.

28.11 Additional MI quality tests

28.11.1 Pedestals

Clearing of pedestals should only be necessary following a major camera servicing such as detector or PMT replacement. This would only need to be performed if requested by your local Customer Care Center representative.

Pedestal capabilities for the system detectors are used to adjust the baseline of the camera's A/D converters for each photomultiplier tube. The result allows a more uniform response in the absence of radiation.

For information on generating pedestals, go to: (➔ Page 892 *Generating pedestals*)

Generating pedestals

✓ Remove any sources from the room.

✓ Install collimators on detectors.

To run the pedestals protocol, perform the following instructions.

1 From the Home page, hover over the **Settings** icon (gear) in the top right corner of the screen. Review the detector and PMT data.

2 Using the left side navigation pane, click **MI Quality Assurance**, **Detector Calibrations**, and then **Pedestals**.

The Pedestals display page is shown.

The **Clear Pedestals** checkbox can be selected if the current pedestal values need to be cleared prior to running the protocol again.

---

3 Select Detector 1 or Detector 2. This specifies the detector for which the Pedestals protocol should be run on.

4 Check to make sure the desired collimators are installed on the detectors.

5 Ensure the background count rate is less than 600 cps.

6 Click **Start** to initate the Pedestals protocol.

The generating process automatically stops when the generating of pedestals is complete.

7 Click **Accept** to apply results.

8 Click **Cancel** to keep the previous results if available.

Clicking does not apply new results.

9 If the status indicates **Failed**, additional instructions are provided.

28.11.2 Performing extrinsic flood, calibration - manual

An extrinsic calibration uses a sheet source, flooding collimated detectors to verify the detectors' corrected performance.

✓ Extrinsic calibration can only be performed manually; there is no Automated Quality Control (AQC).

✓ If an Intrinsic flood (Calibration) for the selected detector(s) is more that 10 days old, the collimator correction matrix for the detector(s) will not be calculated or saved.

✓ Attached sheet source holder.



(1) The circles mark the locations where the pins sit within the patient table track. (2) The hook and loop fasteners run the length of the patient table as indicated by the white lines.

✓ The sheet source holder sits atop the patient table near the table handle for extrinsic flood verification and calibration.

✓ The sheet source is positioned on top of the sheet source holder and centered.

✓ Install the following collimators for million counts (Mcts):

Extrinsic Calibration Default Value: 120 Mcts (minimum 120 Mcts to maximum 1600 Mcts)

- LEHR (Low Energy High Resolution)
- LEAP (Low Energy All Purpose)
- LPHR (Low Penetration High Resolution)
- LEUHR (Low Energy Uniformity High Resolution)
- SZ (**SMART**ZOOM)

Extrinsic Calibration Default Value: 60 Mcts (minimum 60 Mcts to maximum 1600 Mcts)

- MELP (Medium Energy Low Penetration)
- HE (High Energy)

Follow setup instructions that are displayed on the screen. A graphic or video may be displayed to assist you with the instructions.

Install collimators on detectors.

Remove pad from patient table.

Click Start. Automatic motion will occur.

If the pre-positioning task is not selected (checked) so that there is no motion, you can manually position the sheet source between both detectors.

To begin the protocol:

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Extrinsic Flood**.

6 Select **Calibration - Manual**.

The **Extrinsic Calibration - Manual** page is displayed.

7 Click the **Start** button.

System pre-positioning task is performed with the detectors retracting, the patient table rising and moving in. A **Motion in Progress** message is displayed.

There is a message to verify the source placement: **Place source within the center FOV of the detector.** (**FOV** being the Field Of View.)

Click Continue to Start the acquisition. Automatic motion will occur.

8 Check that the sheet source is center on the sheet source holder.

9 Click the **Continue** button.

The task begins and the acquisition acquires one detector at a time creating a growing image displayed on the right of the screen.

When calibration is completed, the acquired images and the uniformity numbers will be displayed. If issues are seen, both intrinsic and extrinsic should be checked.

Extrinsic Calibration Acceptance Limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 12%
- Integral uniformity Central Field of View (ICFOV): +/- 12%
- Differential uniformity Useful Field of View (DUFOV): +/- 12%
- Differential uniformity Central Field of View (DCFOV): +/- 12%

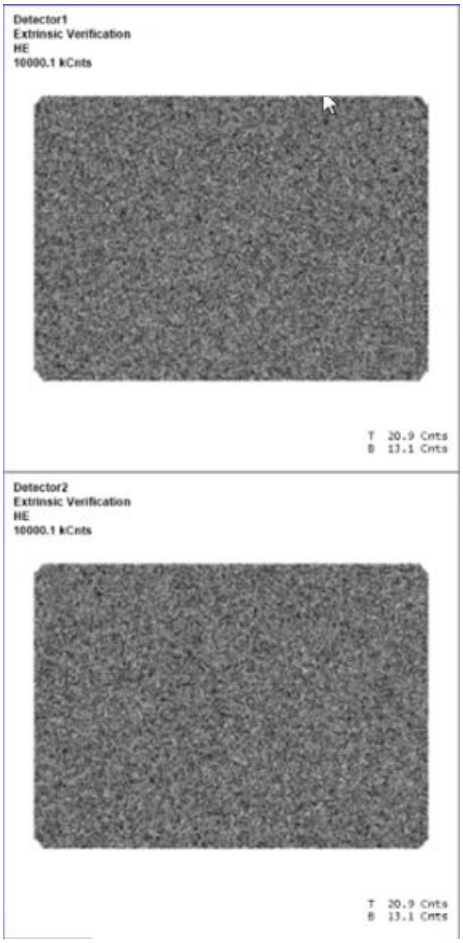
For example, the listed values for Extrinsic Calibration may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	2.86	[0.00] – [12.00]	OK
	Int CFOV	1.68	[0.00] – [12.00]	OK
	Diff UFOV	1.53	[0.00] – [12.00]	OK
	Diff CFOV	1.20	[0.00] – [12.00]	OK
2	Int UFOV	3.29	[0.00] – [12.00]	OK
	Int CFOV	1.89	[0.00] – [12.00]	OK
	Diff UFOV	1.79	[0.00] – [12.00]	OK
	Diff CFOV	1.57	[0.00] – [12.00]	OK

The results for the Extrinsic Calibration are displayed in the same format as were the Extrinsic Verification results with the measurements in the middle and the status on the right, and then the images on the right of the screen. The acceptance limits are +/- 12%. The protocol's results must be accepted or cancelled.

10 A previous verification must have been performed for there to be a comparison image. With this comparison, you no longer need to check uncorrected data. If you see issues with your previous or new verification, then there are issues with the extrinsic calibration. The images should always visually match. If not, perform the calibration again, and if needed contact your service Customer Care representative.

When verification is completed, the acquired images and the uniformity numbers will be displayed. If issues are seen, both intrinsic and extrinsic should be checked.



Previous and New Curvature Corrected Flood with only new displayed if no previous flood exists.

Each image is labelled with:

- **Detector1** or **Detector2**
- **Extrinsic Verification**

- Collimator (for example, **HE** (High Energy)
- **kCnts** (thousands of counts)
- **T** (top) **00.0 Cnts** (number of counts)
- **B** (bottom) **00.0 Cnts** (number of counts)

Extrinsic Verification Acceptance Limits are:

- Integral uniformity Useful Field of View (IUFOV): +/- 6%
- Integral uniformity Central Field of View (ICFOV): +/- 6%
- Differential uniformity Useful Field of View (DUFOV): +/- 6%
- Differential uniformity Central Field of View (DCFOV): +/- 6%

For example, the listed values for Extrinsic Verification may include:

Detector	Measurement	New	Reference Mean	Status
1	Int UFOV	2.94	[0.00] – [5.20]	OK
	Int CFOV	2.48	[0.00] – [4.20]	OK
	Diff UFOV	2.24	[0.00] – [3.20]	OK
	Diff CFOV	1.85	[0.00] – [3.20]	OK
2	Int UFOV	2.92	[0.00] – [5.20]	OK
	Int CFOV	2.39	[0.00] – [4.20]	OK
	Diff UFOV	1.91	[0.00] – [3.20]	OK
	Diff CFOV	1.79	[0.00] – [3.20]	OK

The results for the Extrinsic Verification are displayed in the same format as were the Intrinsic Verification results with the measurements in the middle and the status on the right, and then the images on the right of the screen. The acceptance limits are +/- 6%. The protocol's results must be accepted or cancelled.

11 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

12 Click **Accept** to apply results.

13 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

14 If the status indicates **Failed**, additional instructions are provided.

28.11.3 Performing head alignment, quick verification - manual

For a Head Alignment Quick Verification - Manual, you will perform certain prerequisites:

✓ Remove the patient table pallet pad.

✓ Prepare 3 or 5, 1–2 mCi Tc-99m, Tl-201, or Co-57 point sources depending on the collimator. Match sources within 20% of each other.

✓ Verify that the protocol collimator, source, and task selections are complete.

To perform the Quick Head Alignment Verfication manually, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

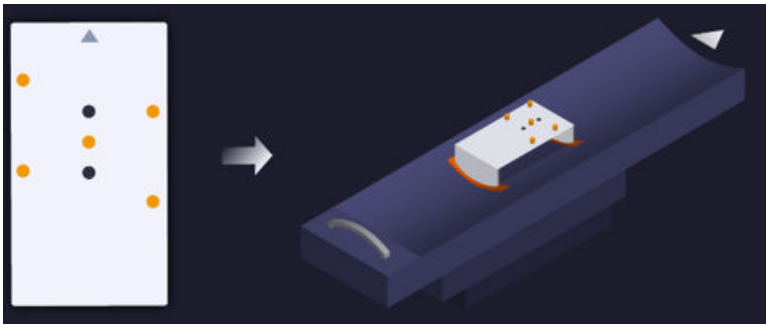
4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

6 Select **Quick Verification - Manual**.

The **Quick Head Alignment Verification - Manual** page is displayed.

7 Install the trending collimators. The default collimators are the LEHR (Low Energy High Resolution) collimators. Instructions will appear on the console screen. Check that the detector path of motion is clear of obstructions.



Head Alignment Source Holder location on patient table and source locations.

8 From the Gantry display, click the **Settings** button.

9 From the **Motion Home** area, click the **Start** button.

System motion will occur. When complete, perform the Touch Pad Test.

10 From the **Touch Pad Test** area, click the **Start** button.

11 Go to the system's four touch pads and press them.

An audible click will be heard, and the Gantry Display will indicate that the touch pads have been tested.

12 Per the collimator, insert the point sources in the appropriate configuration for the collimator in the Head Alignment Source Holder.



A symbol of a gantry opening with detectors at the top of the Head Alignment Source Holder indicates this end should be placed towards the detectors.

Each point source holder is labelled **5|3** or **5** to indicate the number of sources needed and point source vial location for calibration. Use the instructions on the Head Alignment Source Holder to determine the number of sources that should be used for the verification based on the detector type.

13 Verify the **Protocol** setttings for the collimator selection and source.

14 Verify that the background count in FOV is less than 0.4 kcts/sec.

15 Click the **Start** button.

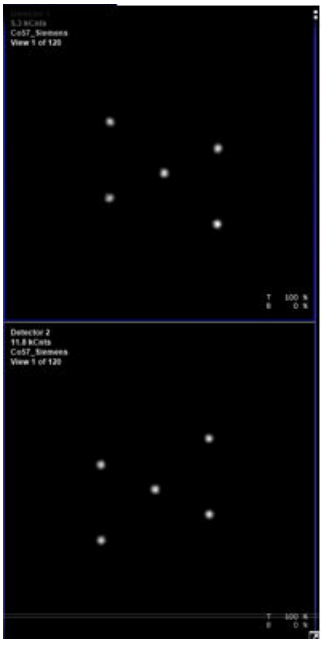
The Verification task runs. System motion will occur. The system assumes that the Head Alignment Source Holder with sources is on the patient table. The system automatically configures the system, positions the detectors, and moves the sources into position. There is no prompting for source placement or clicking the **Continue** button.

Collimator	Configuration	Date and Time	Status
LEHR	180		Running
LEHR	90		Pending
LEHR	76		Pending

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

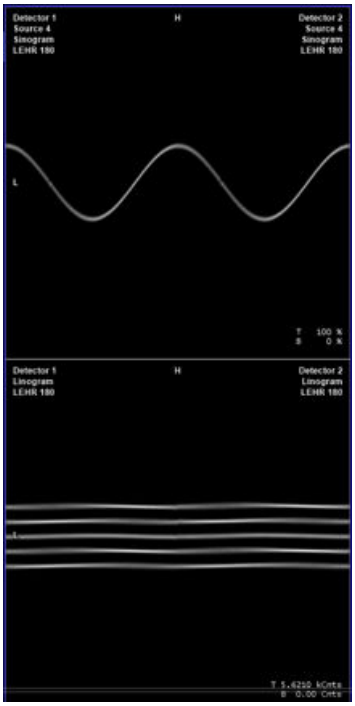
Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Tc-99m_Siemens**, **View 1 of 120**.



Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

The calibration can be stopped by clicking the **Cancel** button. If one task is completed and calibration is cancelled, the completed task results will be saved.

16 Once Calibrations are complete, the results are displayed. For each configuration, the results are displayed in the center of the screen. A sinogram and linogram are displayed on the right side of the screen. On the sinogram, text information appears. The **Source** number indicates the sinogram and linogram of each point source. The linogram displays the projection data for all sources.



Sinogram and Linogram

For example for the sinogram text:

- **Detector 1, Detector 2**
- **Source 4**
- **Sinogram**
- **LEHR 180**
- **T** (top) **100 %** and **B** (bottom) **0 %**

For example for the linogram text:

- **Detector 1, Detector 2**
- **Linogram**
- **LEHR 180**

For example, the listed values for Head Alignment Verification may include:

Detector	Measurement	New	Reference Mean	Status
1	Resolution [mm]	14.84	N/A	OK
	Axial Shift [mm]	-0.652	[-2.127] – [0.873]	OK
	BPA [deg]	0.053	[-0.068] – [0.232]	OK
	COR [mm]	1.051	[-0.497] – [2.503]	OK
2	Resolution [mm]	14.913	N/A	OK
	Axial Shift [mm]	0.652	[-0.873] – [2.127]	OK
	BPA [deg]	-0.053	[-0.232] – [0.068]	OK
	COR [mm]	0.582	[-0.880] – [2.120]	OK

The system considers the lowest results as the overall **Results**. For example, if a calibration failed, and the other calibrations were passed, the overall **Results** would be **Failed (system error)**. As another example, if the calibrations with the LEHR collimator and 180 and 90 degree configurations were **OK**, but the calibration with the LEHR collimator and the **76** degree configuration was not performed, the overall **Status** for the calibrations would be **To Do**.

Head alignment acceptance limits are:

- Center Of Rotation (COR): +/- 2.5 mm
- Axial Shift: +/- 1,25 mm
- (BPA): +/- 0258

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

17 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

18 Click **Accept** to apply results.

19 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

20 If the status indicates **Failed**, additional instructions are provided.

28.11.4 Performing head alignment, quick verification - AQC

For an automated quality control (AQC) Head Alignment Verification, you will perform certain prerequisites:

✓ If the results of the trending collimator or configuration are out of tolerance, perform a Head Alignment Calibration for all collimators and configurations used.

✓ The trending collimator or configuration is specified in the Adminstration Portal.

✓ Install LEHR (Low Energy High Resolution) collimator.

✓ Default: LEHR at 180 degrees.

✓ A Gd-153 source is in the intergrated source holder.

✓ Select the **End by** day of the week (**Sunday**, **Monday**, -> **Saturday**, **Tomorrow**, or **As soon as possible**) from the dropdown.

✓ Click the **End by** time and enter a time, or click the **Clock** icon and select a time from the displayed list.

✓ Note the yellow triangle with an exclamation point symbol and the message **Click Start (Caution! System motion will occur and a radiation source will be exposed)**

✓ If the system does not have an Automated Collimator Changer (ACC), manually remove the collimators before starting protocol.

✓ Verify that the protocol collimator, source, and task selections are complete.

To perform the Quick Head Alignment Verification - AQC, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

6 Select **Quick Verification - AQC**.

The **Quick Head Alignment Verification - AQC** page is displayed.

7 Click the **Start** button.

The protocol's timer countdown begins and displayed a message **Automatic scan is starting in [d:hh:mm:ss]** for example **0:10:55:10**. When zero is reached, the system removes the collimators, the AQC source extends, and the first task is started.

A default time is configured in the Administration Portal. If needed, the protocol can be changed.

8 The first protocol task starts and the verification begins.

9 When the verification is complete, the source will retract the source into the patient table storage area.

10 The protocol's results are displayed and must be accepted or cancelled as in manual Head Alignment Verification.

Collimator	Configuration	Date and Time	Status
LEHR	180		
LEHR	90		
LEHR	76		

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Verification.

Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Tc-99m_Siemens**, **View 1 of 120**.

11 If the system has an ACC, collimators can be specified to be installed on the detectors at the end of the verification. Otherwise, they must be manually installed.

28.11.5 Performing head alignment, verification - manual

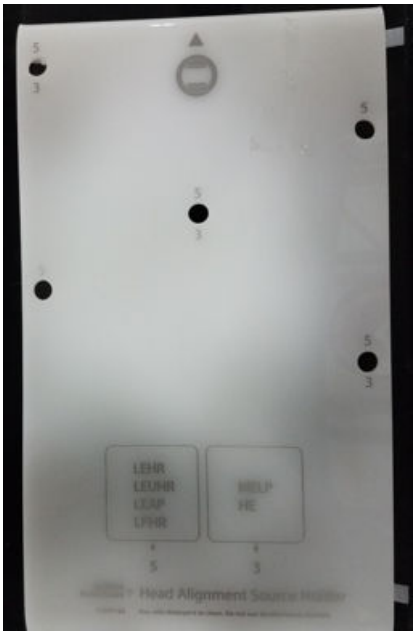
For a manual Head Alignment Verification, the following prerequisites apply:

✓ Remove the patient table pallet pad.

✓ Install the collimator for the verification.

✓ Prepare 1–2 mCi Tc99m point source. (Match sources within 20% of each other for Tc99m only.)

✓ Install Head Alignment Source Holder, and then the point sources. Each point source holder is labelled **5|3** or **5** to indicate the number of sources needed and point source vial location for calibration.



A symbol of a gantry opening with detectors at the top of the Head Alignment Source Holder indicates this end should be placed towards the detectors.

Five point sources should be used for the following collimators:

- Low Energy High Resolution (LEHR)
- Low Energy Ultra High Resolution (UHR)
- Low Energy All Purpose (LEAP)
- Low Penetration High Resolution (LPHR)

Three point sources should be used for the following collimators:

- Medium Energy Low Penetration (MELP)
- High Energy (HE)

✓ Verify that the protocol collimator, source, and task selections are complete.

To perform the Head Alignment Verification manually, use the following instructions.

1 Move the cursor over the **Settings** (⚙) icon and select **Administration Portal** from the list of menu items.

   The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

   On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

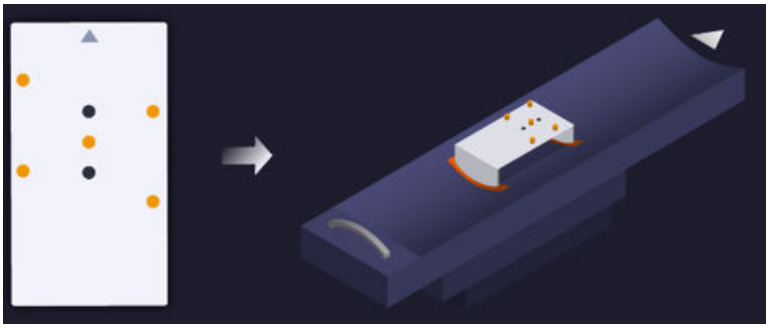
6 Select **Verification - Manual**.

   The **Verification - Manual** page is displayed.

7 Install the collimators as instructed in the prerequisites. Instructions will also appear on the screen.

   For example:

   - **Ensure LEHR collimators are installed and detector path of motion is clear.**
   - **Home the motion system.**
   - **Verify that the background count in FOV is less than 0.4 kcts/sec.**
   - **Place 5 Tc-99m sources in the source holder as shown.**
   - **Start Calibration (system motion will occur).**



Head Alignment Source Holder location on patient table and source locations.

8 From the Gantry display, click the **Home** button.

System motion will occur.

9 Per the collimator, insert the point sources in the appropriate configuration for the collimator in the Head Alignment Source Holder.

Source insertion locations are screened on the Head Alignment Source Holder.

10 Verify the **Protocol** setttings for the collimator selection and source.

11 Click the **Start** button.

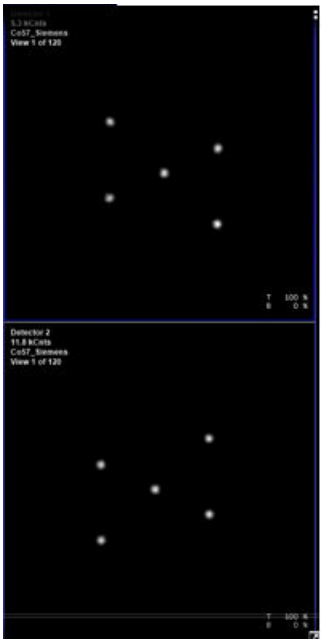
The Verification task runs. System motion will occur. The system assumes that the Head Alignment Source Holder with sources is on the patient table. The system automatically configures the system, positions the detectors, and moves the sources into position. There is no prompting for source placement or clicking the **Continue** button.

Collimator	Configuration	Date and Time	Status
LEHR	180		Running
LEHR	90		Pending
LEHR	76		Pending

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

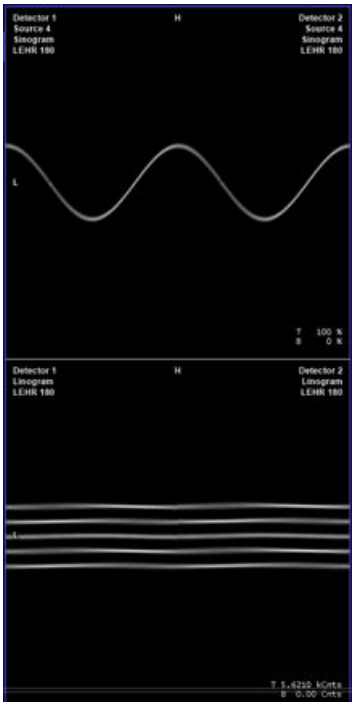
Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Tc-99m_Siemens**, **View 1 of 120**.



Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

The calibration can be stopped by clicking the **Cancel** button. If one task is completed and calibration is cancelled, the completed task results will be saved.

12 Once Calibrations are complete, the results are displayed. For each configuration, the results are displayed in the center of the screen. A sinogram and linogram are displayed on the right side of the screen. On the sinogram, text information appears, including the **Source** number for the individual point sources. The linogram displays the data for all sources.



Sinogram and Linogram

An example of sinogram text:

- **Detector 1, Detector 2** (detector number)
- **Source 4** (source number)
- **Sinogram**
- **LEHR 180** (collimator and configuration)
- **T** (top) **100 %** and **B** (bottom) **0 %** (window level)

An example of linogram text:

- **Detector 1, Detector 2** (detector number)
- **Linogram**
- **LEHR 180** (collimator and configuration)

The Head Alignment Calibration includes the measurements of Resolution [mm], Axial Shift [mm], BPA [deg], and COR [mm]. An example of the measurements:

Detector	Measurement	New	Reference Mean	Status
1	Resolution [mm]	14.84	N/A	OK
	Axial Shift [mm]	-0.652	[-2.127] – [0.873]	OK
	BPA [deg]	0.053	[-0.068] – [0.232]	OK
	COR [mm]	1.051	[-0.497] – [2.503]	OK
2	Resolution [mm]	14.913	N/A	OK
	Axial Shift [mm]	0.652	[-0.873] – [2.127]	OK
	BPA [deg]	-0.053	[-0.232] – [0.068]	OK
	COR [mm]	0.582	[-0.880] – [2.120]	OK

The overall **Results** are determined based on the calibration with the lowest results. For example, if a calibration failed, and the other calibrations were passed, the overall **Results** would be **Failed (system error**). As another example, if the calibrations with the LEHR collimator and 180 and 90 degree configurations were **OK**, but the calibration with the LEHR collimator and the **76** degree configuration was not performed, the overall **Status** for the calibrations would be **To Do**.

Head alignment acceptance limits are:

- Axial Shift: +/- 1,25 mm
- (BPA): +/- 0258
- Center Of Rotation (COR): +/- 2.5 mm

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

13 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

14 Click **Accept** to apply results.

15 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

16 If the status indicates **Failed**, additional instructions are provided.

28.11.6 Performing head alignment, verification - AQC

For an automated quality control (AQC) Head Alignment Verification, you will perform certain prerequisites:

✓ Perform calibration once a month.

✓ Verify protocol is set up as expected including the time the calibration should be completed by.

✓ If the system does not have an Automated Collimator Changer (ACC), collimators specified for the protocol are installed on the system. If the system does have an ACC which contain the specified collators, these will be automatically installed on the system.

✓ Verify that the protocol collimator, source, and task selections are complete.

To perform the AQC Head Alignment Verification, use the following instructions.

1 Move the cursor over the **Settings** (⚙) icon and select **Administration Portal** from the list of menu items.

   The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

   On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

6 Select **Verification - AQC**.

   The **Head Alignment Verification - AQC** page is displayed.

7 Click the **Start** button.

   The system determines the amount of time until the automatic scanning starts in order to end by the specified time within the protocol. A countdown then begins and is displayed as **Automatic scan is starting in [d:hh:mm:ss]**. When zero is reached, the first task is started.

   System motion will occur. The system automatically configures the system including putting on specified collimators for systems with ACC), and extending the AQC source into position.

8 The first protocol task starts and the verification begins.

9 The protocol's results are displayed and must be accepted or cancelled as in manual Head Alignment Verification.

Collimator	Configuration	Date and Time	Status
LEHR	180		
LEHR	90		
LEHR	76		

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Verification.

Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Tc-99m_Siemens**, **View 1 of 120**.

10 When the calibration is complete, the source will retract the source into the patient table storage area.

11 If the system has an ACC, collimators can be specified to be installed on the detectors at the end of the calibration. Otherwise, they must be manually installed.

28.11.7 Performing head alignment, calibration - manual

✓ Install applicable collimator.

✓ Remove the patient table pallet pad.

✓ Recommended source strength is 1-2 mCi (millicuries) per source within ~20% of each other.

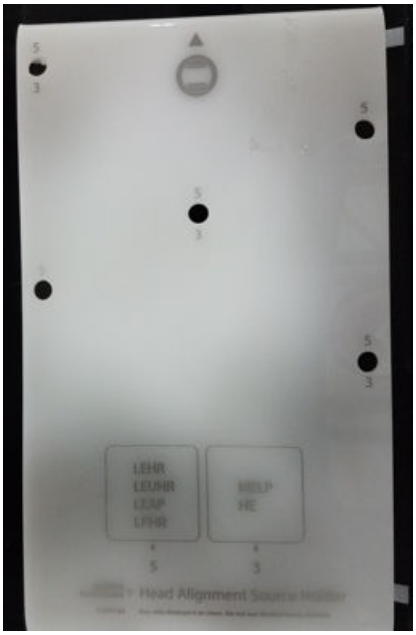
✓ Install the Head Alignment Source Holder and its point sources. Each point source holder is labelled **5|3** or **5** to indicate the number of sources needed and point source vial location for calibration.

The following collimators are calibrated with 5 point sources:

- LEHR (Low Energy High Resolution)
- LEUHR (Low Energy Uniformity High Resolution)
- LEAP (Low Energy All Purpose)
- LPHR (Low Penetration High Resolution)

The following collimators are calibrated with 3 point sources:

- MELP (Medium Energy Low Penetration)
- HE (High Energy)



A symbol of a gantry opening with detectors at the top of the Head Alignment Source Holder indicates this end should be placed towards the detectors.

✓ A cleaning instruction is screened on the Head Alignment Source Holder stating: **Use mild detergent to clean. Do not use alcohol based cleaners.**

SMARTZOOM collimators are not used with Head Alignment calibration.

✓ Verify the protocol collimator, source, and task selections are complete.

To begin the protocol:

1 Move the cursor over the **Settings** (☼) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

6 Select **Calibration - Manual**.

The **Head Alignment Calibration - Manual** page is displayed.

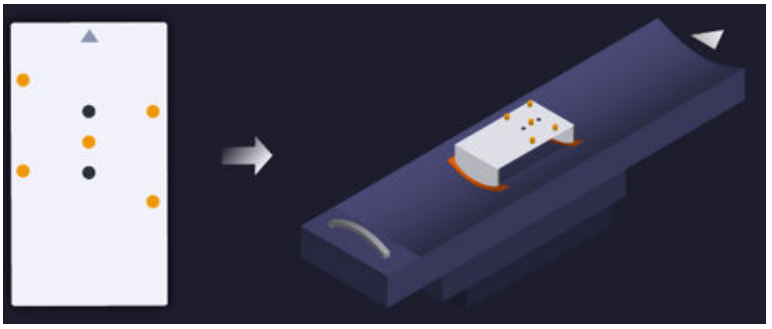
Head Alignment Calibration - Manual can also be selected from **MI Monthly QC**.

7 Install the collimators as instructed in the prerequisites. Instructions will also appear on the screen.

For example:

- **Ensure LEHR collimators are installed and detector path of motion is clear.**
- **Home the motion system.**
- **Verify that the background count in FOV is less than 0.4 kcts/sec.**
- **Place 5 Tc-99m sources in the source holder as shown.**

  (3 Tc-99m sources if using ME or HE collimators.)
- **Start Calibration (system motion will occur).**



Head Alignment Source Holder location on patient table and its source locations.

Co-57 and Tl-201 point sources can also be used.

8 From the Gantry display, click the **Home** button.

System motion will occur.

9 Per the collimator, insert the point sources in the appropriate configuration for the collimator in the Head Alignment Source Holder.

Source insertion locations are screened on the Head Alignment Source Holder.

10 Click the **Start** button.

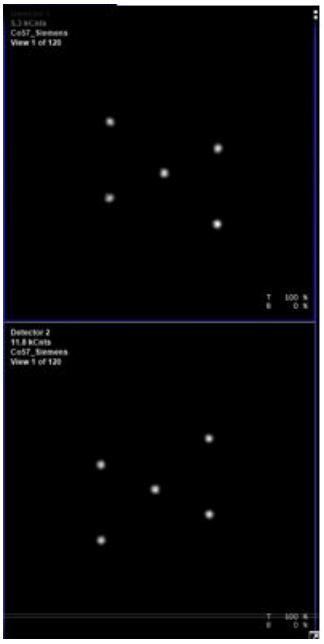
The Calibration task runs. System motion will occur. The system assumes that the Head Alignment Source Holder with sources is on the patient table. The system automatically configures the system, positions the detectors, and moves the sources into position. There is no prompting for source placement or clicking the **Continue** button.

Collimator	Configuration	Date and Time	Status
LEHR	180		Running
LEHR	90		Pending
LEHR	76		Pending

System performs the tasks in the list, indicating their Running or Pending status.

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

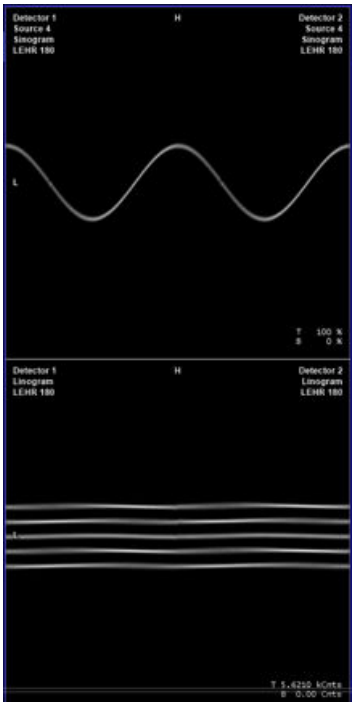
Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Co57_Siemens**, **View 1 of 120**.



Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

The acquisition can be stopped by clicking the **Cancel** button. If one task is completed and acquisition is cancelled, the completed task results will be saved.

11 Once Calibrations are complete, the results are displayed. For each configuration, the results are displayed in the center of the screen. A sinogram and linogram are displayed on the right side of the screen. On the sinogram, text information appears. The **Source** number indicates the sinogram and linogram of each point source. The linogram displays the projection data for all sources.



Sinogram and Linogram

For example for the sinogram text:

- **Detector 1, Detector 2**
- **Source 4**
- **Sinogram**
- **LEHR 180**
- **T** (top) **100 %** and **B** (bottom) **0 %**

For example for the linogram text:

- **Detector 1, Detector 2**
- **Linogram**
- **LEHR 180**

The Calibration results show the uniformity numbers. If issues are seen, both intrinsic and extrinsic should be checked.

For example, the listed values for Head Alignment Calibration may include:

Detector	Measurement	New	Reference Mean	Status
1	Resolution [mm]	14.84	N/A	OK
	Axial Shift [mm]	-0.652	[-2.127] – [0.873]	OK
	BPA [deg]	0.053	[-0.068] – [0.232]	OK
	COR [mm]	1.051	[-0.497] – [2.503]	OK
2	Resolution [mm]	14.913	N/A	OK
	Axial Shift [mm]	0.652	[-0.873] – [2.127]	OK
	BPA [deg]	-0.053	[-0.232] – [0.068]	OK
	COR [mm]	0.582	[-0.880] – [2.120]	OK

The system considers the lowest results as the overall **Results**. Head Alignment does not need to be run for every configuration. Some examples follow:

If a 76 degee detector configuration for a LEHR collimator is never performed because it is not required, clinical acquisitions would be blocked. There would be no reminders to perform it, and the overall results would be based on the 90/180 configurations.

If a 180 degree configuration is OK, but the 90 degree configuration Fails, and the 76 degree configuration has been performed previously, but not not been selected to be perfomed:

- 180 degree configuration is set as the proxy, and the results are accepted.

Collimator	Configuration	Date and Time	Status
LEHR	180	03/31/2021 10:28 AM	OK
LEHR	90	03/21/2021 10:34 AM	Failed

- 90 degree configuration is set as the proxy, and the results are accepted.

Collimator	Configuration	Date and Time	Status
LEHR	180	03/31/2021 11:21 AM	To Do
LEHR	90	03/31/2021 11:27 AM	Failed
LEHR	76	02/03/2021 3:46 PM	To Do

Head alignment acceptance limits are:

- Center Of Rotation (COR): +/- 10 mm
- Axial Shift: +/- 5 mm
- (BPA): +/- 0.8

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

12 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

13 Click **Accept** to apply results.

14 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

15 If the status indicates **Failed**, additional instructions are provided. For example:

- 180 degree configuration is set as the proxy, but the results are rejected.

Collimator	Configuration	Date and Time	Status
LEHR	180	02/03/2021 3:46 PM	OK
LEHR	90	02/03/2021 3:46 PM	To Do
LEHR	76	02/03/2021 3:46 PM	OK

- 90 degree configuration is set as the proxy, but the results are rejected.

Collimator	Configuration	Date and Time	Status
LEHR	180	02/03/2021 3:46 PM	OK
LEHR	90	02/03/2021 3:46 PM	To Do
LEHR	76	02/03/2021 3:46 PM	OK

28.11.8 Performing head alignment, calibration - AQC

For an automated quality control (AQC) Head Alignment Calibration, you will perform certain prerequisites:

✓ Verify the protocol collimator, source, and task selections are complete.

✓ Select the **End by** day of the week (**Sunday**, **Monday**, -> **Saturday**, **Tomorrow**, or **As soon as possible**) from the dropdown.

✓ Click the **End by** time and enter a time, or click the **Clock** icon and select a time from the displayed list.

✓ Note the yellow triangle with an exclamation point symbol and the message **Click Start (Caution! System motion will occur and a radiation source will be exposed)**

✓ If the system does not have an Automated Collimator Changer (ACC), manually remove the collimators before starting protocol.

SMARTZOOM collimators are not used with Head Alignment calibration.

To automatically perform the Head Alignment calibration , use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Head Alignment**.

6 Select **Calibration - AQC**.

The **Head Alignment Calibration - AQC** page is displayed.

7 Click the **Start** button.

The protocol's timer countdown begins and displayed a message **Automatic scan is starting in [d:hh:mm:ss]** for example **0:10:55:10**. When zero is reached, the first task is started.

A default time is configured in the Administration Portal. If needed, the protocol can be changed.

System motion will occur. The system automatically installs the specified collimators, sets up the initial configuration, extends the AQC source into position, and runs the first Calibration task.

Task	Collimator	Configuration	Date and Time	Status
HA Calibration	MELP	180		Running
HA Calibration	MELP	90		Pending
HA Calibration	MELP	76		Pending

Task	Collimator	Configuration	Date and Time	Status
HA Verification	MELP	180		Pending

System performs the tasks in the list, indicating their Running or Pending status.

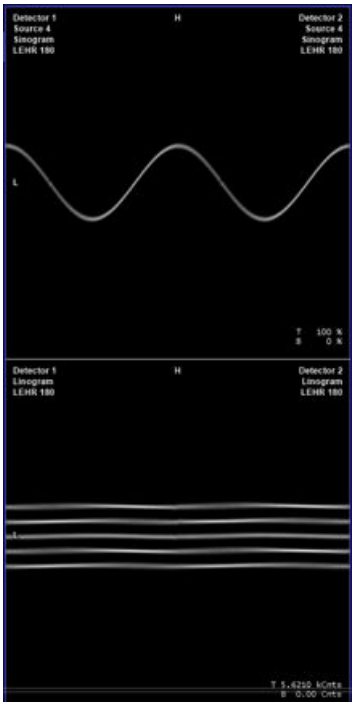
A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the Calibration.

Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Co57_Siemens**, **View 1 of 120**.

Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

The acquisition can be stopped by clicking the **Cancel** button. If one task is completed and acquisition is cancelled, the completed task results will be saved if the results are accepted.

8 Once Calibrations are complete, the results are displayed. For each configuration, the results are displayed in the center of the screen. A sinogram and linogram are displayed on the right side of the screen. On the sinogram, text information appears. The linogram displays the projection data.



Sinogram and Linogram

For example for the sinogram text:

- **Detector 1, Detector 2**
- **Source 4**
- **Sinogram**
- **LEHR 180**
- **T** (top) **100 %** and **B** (bottom) **0 %**

For example for the linogram text:

- **Detector 1, Detector 2**
- **Linogram**
- **LEHR 180**

For example, the listed values for Head Alignment Calibration may include:

Detector	Measurement	New	Reference Mean	Status
1	Resolution [mm]	14.84	N/A	OK
	Axial Shift [mm]	-0.652	[-2.127] – [0.873]	OK
	BPA [deg]	0.053	[-0.068] – [0.232]	OK
	COR [mm]	1.051	[-0.497] – [2.503]	OK
2	Resolution [mm]	14.913	N/A	OK
	Axial Shift [mm]	0.652	[-0.873] – [2.127]	OK
	BPA [deg]	-0.053	[-0.232] – [0.068]	OK
	COR [mm]	0.582	[-0.880] – [2.120]	OK

The system considers the lowest results as the overall **Results**. Head Alignment does not need to be run for every configuration. Some examples follow:

If a 76 degee detector configuration for a LEHR collimator is never performed because it is not required, clinical acquisitions would be blocked. There would be no reminders to perform it, and the overall results would be based on the 90/180 configurations.

If a 180 degree configuration is OK, but the 90 degree configuration Fails, and the 76 degree configuration has been performed previously, but not not been selected to be perfomed:

- 180 degree configuration is set as the proxy, and the results are accepted.

Collimator	Configuration	Date and Time	Status
LEHR	180	03/31/2021 10:28 AM	OK
LEHR	90	03/21/2021 10:34 AM	Failed

- 90 degree configuration is set as the proxy, and the results are accepted.

Collimator	Configuration	Date and Time	Status
LEHR	180	03/31/2021 11:21 AM	To Do
LEHR	90	03/31/2021 11:27 AM	Failed
LEHR	76	02/03/2021 3:46 PM	To Do

Head alignment acceptance limits are:

- Center Of Rotation (COR): +/- 10 mm
- Axial Shift: +/- 5 mm
- (BPA): +/- 0.8

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference mean values will match the set acceptance limits. When performed again, the reference mean value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

9 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

10 Click **Accept** to apply results.

11 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

12 If the status indicates **Failed**, additional instructions are provided.

- 180 degree configuration is set as the proxy, but the results are rejected.

Collimator	Configuration	Date and Time	Status
LEHR	180	02/03/2021 3:46 PM	OK
LEHR	90	02/03/2021 3:46 PM	To Do
LEHR	76	02/03/2021 3:46 PM	OK

- 90 degree configuration is set as the proxy, but the results are rejected.

Collimator	Configuration	Date and Time	Status
LEHR	180	02/03/2021 3:46 PM	OK
LEHR	90	02/03/2021 3:46 PM	To Do
LEHR	76	02/03/2021 3:46 PM	OK

13 Specified collimators are installed on the system at the end of acquisition if the system has ACC.

28.11.9 Performing NMCTFOV, verification

For a NMCT FOV (Nuclear Medicine Computed Tomography Field of View) Verification, you will perform certain prerequisites:

✓ Verify that NM and CT subsystems are calibrated.

✓ Remove the patient table pallet pad.

✓ Install collimators.

✓ Prepare 10 Tc-99m point sources. Mix 1 ml of Tc-99m (10 - 30 mCi) plus 0.3 ml of contrast agent plus 0.2 ml of dearerated water. Match sources within 20% of each other (for Tc-99m only). Evenly distribute the solution into each of the ten vials and place the cap on each vial.

To perform the NMCTFOV verification, use the following instructions.

1 Move the cursor over the **Settings** (⚙) icon and select **Administration Portal** from the list of menu items.

   The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

   On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **NMCTFOV**.

6 Select **Verification**.

   The **NM-CT FOV Verification** page is displayed. Instructions will appear at the bottom of the console screen.

   The **Protocol** pull-down menu should display the collimator, for example **LEHR**, and the **Sources** pull-down menu should display the isotope, for example **Tc-99m**. Table below shows an example of information displayed on the console screen.

☑	Function	Configuration	Date and Time	Status
☑	CT without sources	N/A	-	-
	Add sources	N/A	-	-
☑	CT with sources	N/A	-	-
☑	LEHR	180	-	-
☑	LEHR	90	-	-
☑	LEHR	76	-	-

7 Per the prequisites, the collimators should be installed.

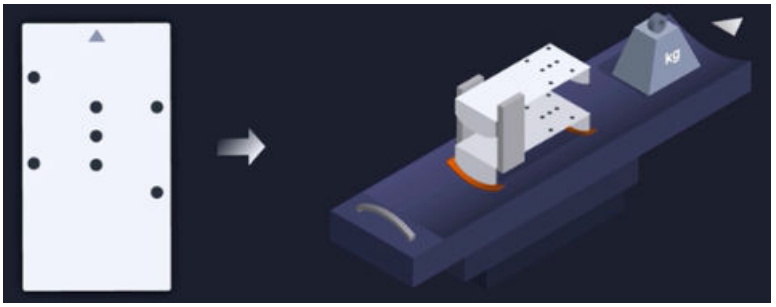
8 From the Gantry display, click the **Settings** button.

9 From the **Motion Home** area, click the **Start** button.

   System motion will occur.

10 Position the Head Alignment Source Holders without the vials on the patient table as shown.

Stack the 2 Head Alignment Source Holders on the patient table using the foam supports on both sides of the holders. Weight the front end of patient table with >20 pounds (9.07 kilograms) of weight as shown on the console screen video.



Two Head Alignment Source Holders on the patient table for NMCTFOV Verification



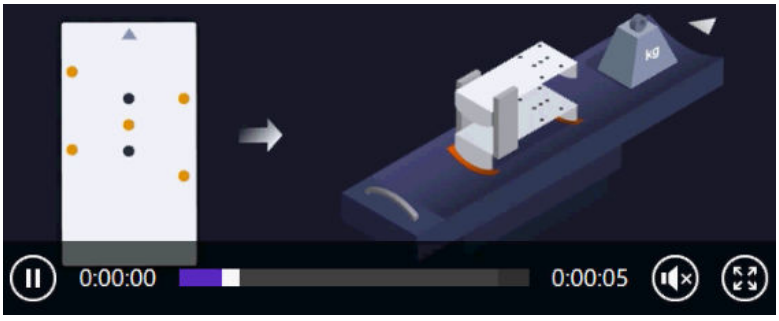
A gantry opening with detectors symbol at the top of the Head Alignment Source Holder indicates this end should be placed towards the detectors.

NMCTFOV verification uses the 5 point sources configuration. Each holder is labeled **5|3** or **5** to indicate the number of sources needed and point source vial location for calibration. **For the first CT scan, the holder is empty.**

11 Press the **Start** button on the control box.

12 Click the **GO** button.

The **CT without sources** task runs. System motion will occur. The staus field for the task displays **Running**. A status message **CT scan in progress** is displayed at the bottom of the screen along with a continually updating status bar. Once the **CT without sources** task is complete, the Status field is updated with a checkmark in a green circle and the word **OK**. The **Date and Time** for the completion are displayed. The **Add sources** task will display instructions and a video indicating where the point source vials are to be inserted in the Head Alignment Source Holders.



The screen instructions indicate to **1. Insert the previously prepared vials as shown**, and **2. Click Continue (system motion will occur)**.

13 When the 10 point source vials are inserted in the Head Alignment Source Holders, click the **Continue** button.

The next task **CT with sources** begins. An image of the Head Alignment Source Holders appears on the right of the console screen.

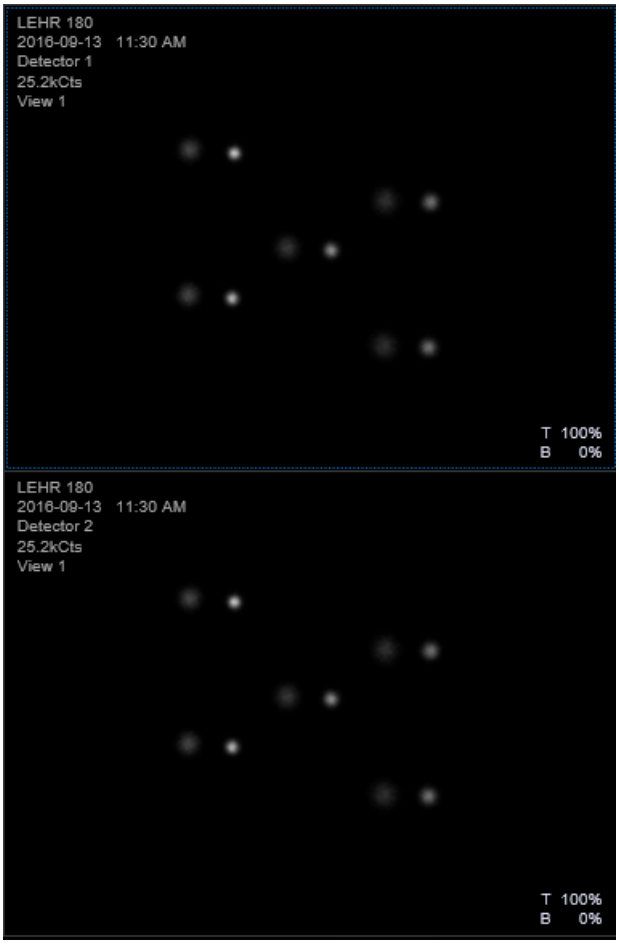


CT Image of Head Alignment Source Holders

The verification can be stopped by clicking the **Cancel** button. If one task is completed and verification is cancelled, the completed task results will be saved.

Once the **CT with sources** task is complete, the **Date and Time** and **Status** are updated. The NM verification begins.

Detector1 and **Detector2** growing images are displayed on the screen's right side. A continually updating counts per thousand (**kCnts**) total is displayed, as well as the source name and projection (for example, **Detector1**, **5.3 kCnts**, **Tc-99m_Siemens**, **View 1 of 120**.

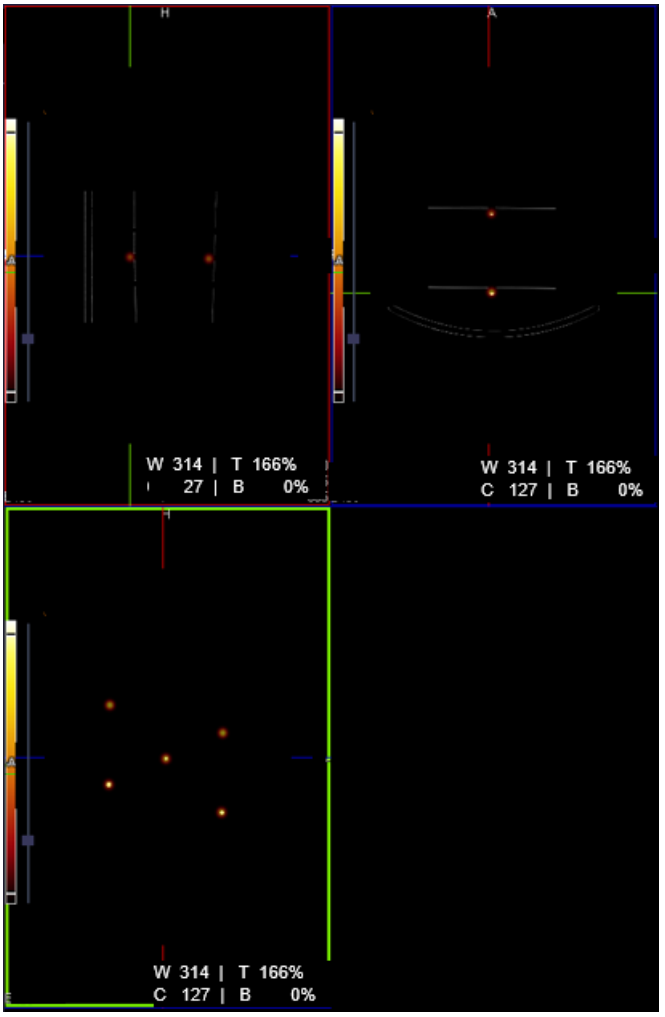


NMCTFOV images

A **Time Remaining** digital clock is displayed with a time remaining countdown until the completion of the verification.

Windowing information is also displayed: **T** (top) **100%** and **B** (bottom) **0%**.

14 Once the verifications are complete, the results are displayed. For each configuration, the results are displayed in the center of the screen. Fused images are displayed on the right side of the screen with image text information.



For example, the listed values for NMCTFOV Verification may include:

Results LEHR 76		Landmarks	
Measurement	**Result**	**Reference**	**Status**
Rotation about X	[x.xxx%]	<1*	OK
Rotation about Y	[x.xxx%]	<1*	OK
Rotation about Z	[x.xxx%]	<1*	OK
Translation in X	[x.xxx%]	<5mm	OK
Translation in Y	[x.xxx%]	<5mm	OK
Translation in Z	[x.xxx%]	<5mm	OK

Results LEHR 76				Landmarks			
Point	**X(NM)**	**X(CT)**	**Y(NM)**	**Y(CT)**	**Z(NM)**	**Z(CT)**	**Deviation (mm)**
1	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
2	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
3	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
4	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
5	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
6	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
7	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX
8	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX	X.XX

The system considers the lowest results as the overall **Results**. For example, if a calibration failed, and the other calibrations were passed, the overall **Results** would be **Failed (system error**). As another example, if the calibrations with the LEHR collimator and 180 and 90 degree configurations were **OK**, but the verification with the LEHR collimator and the **76** degree configuration was not performed, the overall **Status** for the verifications would be **To Do**.

Acceptance limits are:

- Net Translation (mm): +/- 0.25 mm
- Net Rotation: +/- 1,25 mm

The QC results list the **Detector**, **Measurement**, **New**, **Reference Mean**, and **Status**.

The first time the QC protocol is performed, the reference values will match the set acceptance limits. When performed again, the reference value is a calculated range based on the additional data points.

The status is shown per measurement and overall. **OK** is displayed if the results are in tolerance. **Failed (system error)** is displayed if the results are out of tolerance. **Pending** is displayed if an action must take place before proceeding, for example, the system needs to be homed.

15 After reviewing the results, click the **Close Details** button to close the results screen and display the acceptance screen.

The status is displayed along with instructions.

16 Click **Accept** to apply results.

17 Click **Cancel** to keep the previous results if available.

Canceling does not apply new results.

18 If the status indicates **Failed**, additional instructions are provided.

28.12 Additional CT quality tests

28.12.1 Monitor constancy test

Monitors are subjected to a constancy test to ensure that the image quality and measured values lie within a defined range.

Constancy test requirements for monitors may vary according to different national regulations.

The monitor constancy test must be performed in intervals according to different national regulations.

CAUTION

Missing constancy test of the monitor!

Wrong basis for diagnosis.

- Perform the monitor test regularly at the recommended intervals.

Image quality of the monitor

The acceptance test performed during initial startup commissioning ensures optimum image quality of the device. The results of these measurements are documented in an acceptance test report and serve as reference values for the follow up constancy test.

Test images

In the **Patient Browser** window, you can select the test images stored in the database under Patient Browser. Load a test image to the MI View&GO to display it on the monitor or to a connected printer for printing.

Individual tests

According to DIN 6868-157, the following tests must be performed:

- Daily constancy test of the monitor
- Biannual visual tests of the monitor
- Biannual metrological tests

According to IEC 61223-2-5, the following tests must be performed:

- Daily visual constancy test of the monitor
- Quarterly luminance measurement
- Quarterly spatial and contrast resolution
- Quarterly homogeneity of the image brightness

Monitor constancy test report

You will find a form for the test report in the System Owner Manual.

We recommend that the constancy test and collection of the reference values be performed and documented by authorized personnel.

Individual tests according to DIN 6868-157

According to DIN 6868-157, the following tests must be performed:

- Daily constancy test of the monitor
- Biannual visual tests of the monitor
- Biannual metrological tests

- It is highly recommended that the biannual constancy tests of the monitor are performed by Siemens Healthineers Service.
- If any alterations are made to the device that affect the image quality, for example, repairs, replacement of parts, or readjustments, the acceptance test according to the German X-ray regulations must be repeated.

Preparing the constancy tests of the monitor

The room class is defined in accordance with DIN 6868-157: 2014 by the radiation protection officer of the organization or the hospital.

1 Clean the monitor according to the cleaning instructions in the SOMATOM Instructions for Use.

2 Switch on the monitor and keep it connected to power for at least 30 minutes.

3 Make sure that the requirements for the room lighting are met or restored according to the acceptance test performed during initial start up.

4 In the Patient Browser window, select the test images stored in Patient Browser.

To view the images, from **Settings** menu, select **File Browser** > **SiteData** > **UserData** > **ReferenceImages**.

Before performing the constancy test, you need to import the reference images.

(➔ Page 299 *Importing images*)

5 Load the required test image into MI View&GO.

6 Double-click the image to expand the display.

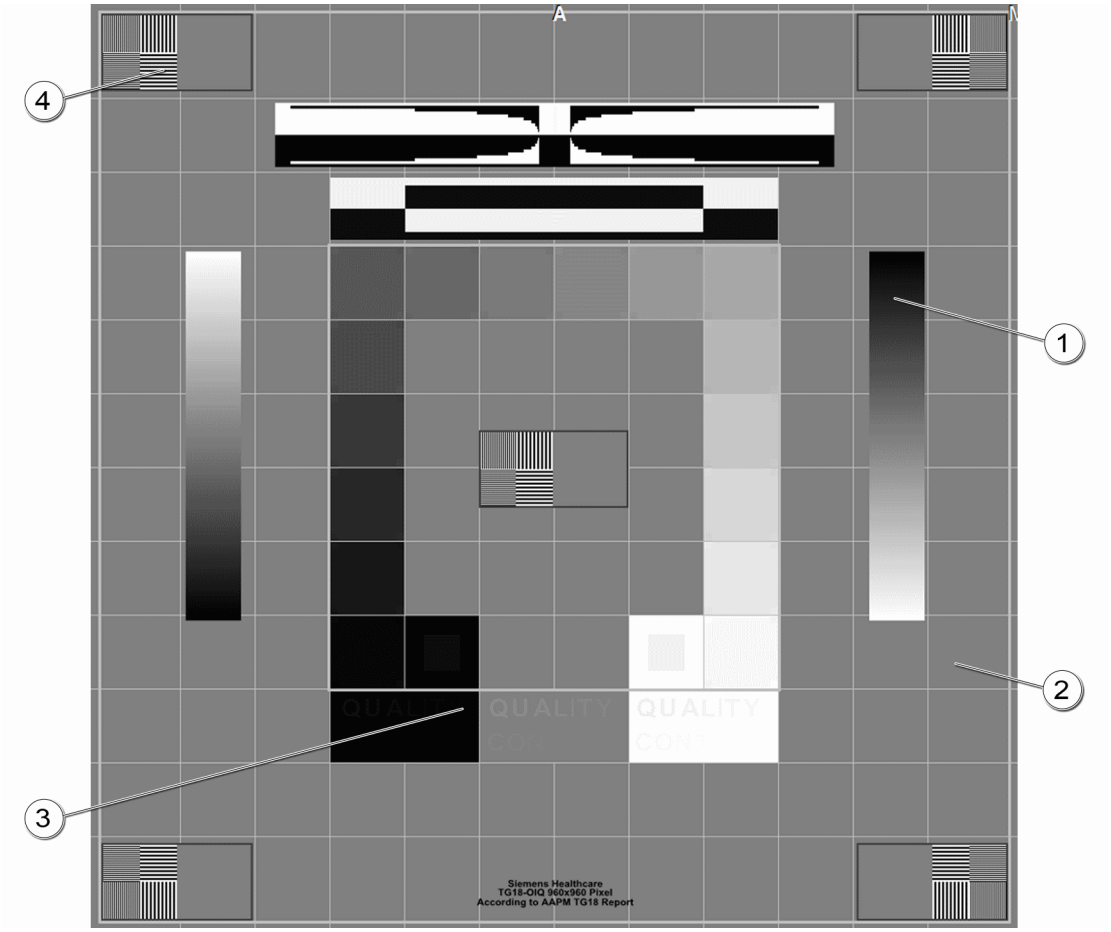
7 Choose **Fit to Acquisition Size** from the menu in the upper left corner.

The image is adjusted to its original size.

Performing the daily constancy test of the monitor

You must perform the following test of the overall image quality daily.

1 Load test image TG18-OIQ into MI View&GO.



(1) Process bar
(2) Line grid
(3) Low contrast letters
(4) Linepair grid

2 Check image element 1 for the continuity of the process bar:

The appearance of the process bar must be sustainable.

3 Check image element 2 for the visibility of lines and grids:

The frontiers, lines, and the centering of the grid must be visible in the active area of the monitor.

4 Check image element 3 for the visibility with low contrast:

QUALITY CONTROL

The following letters must be visible in the white and grey field:

QUALITY CONTROL

For room class 1 (≤ 50 lx), the following letters must be visible in the black field:

QUALITY CONTRO

For room class 2 (≤ 100 lx), the following letters must be visible in the black field:

QUALITY CONT

5 Check image element 4 for the general visibility:

The line pair grid has to be straight visible, without slidings, blurs, or deletions.

A linepair grid, width two pixel, with low contrast must be visible in the middle and in the four corners of the test image.

6 Document your test results and confirm them with date and initials.

The test result shows deviations.

- Contact your Customer Care Center to set information.

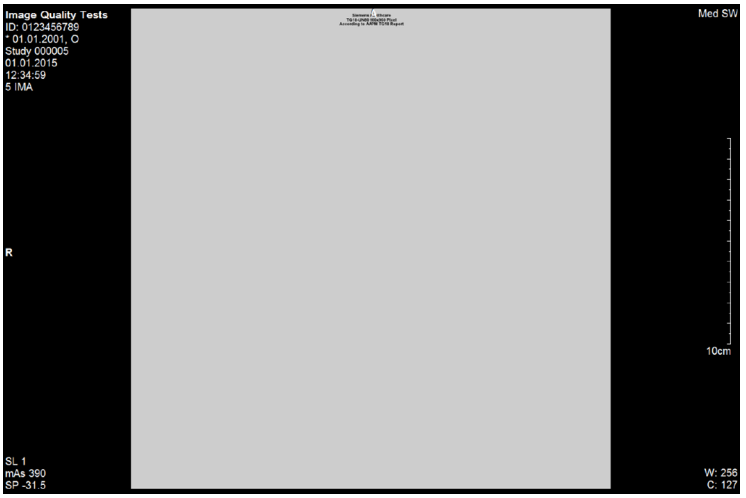
Biannual visual tests of the monitor

The following visual tests must be performed biannually to ensure the image quality of the monitor.

It is highly recommended that the biannual tests are performed by Siemens Healthineers Service.

Performing the biannual luminance homogeneity test

1 Load test image TG18-UN80 into MI View&GO.



2 Check the test image for interferences from the middle to the edges.

Typical LCDs contain asymmetric inequalities. As the human eye in general has a small sensibility for differences at low local frequencies, the inequalities are negligible, as long as the differences are not too distinct.

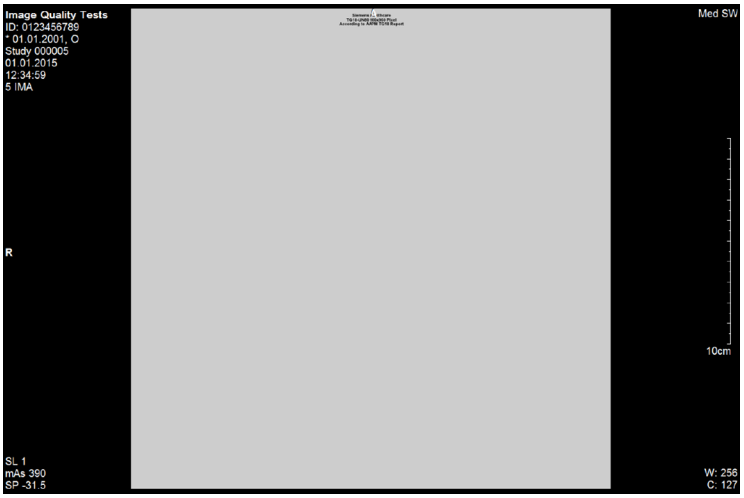
3 Document your test results and confirm them with date and initials.

The test result shows deviations.

- Contact your Customer Care Center to set information.

Performing the biannual color effect and equality test

1 Load test image TG18-UN80 into MI View&GO.



2 Visually check the color effect of the test image for color equality.

3 Document your test results and confirm them with date and initials.

The test result shows deviations.

◆ Contact your Customer Care Center to set information.

Performing the biannual metrological test

It is highly recommended that the biannual tests are performed by Siemens Healthineers Service.

If you prefer to perform the tests by yourself, make sure that the tests and the documentation of the test results are compliant to DIN 6868-157: 2014.

1 In the Patient Browser window, select the test images stored in the database under Patient Browser /**Image Quality Tests** /**TG18 3D**.

2 Load the required test image into MI View&GO.

3 Perform the following tests.

- Minimum luminance
- Maximum luminance
- Veiling glare
- Illuminance
- Homogeneity of multiple monitors
- Luminance response

4 Document your test results and confirm them with date and initials.

The test result shows deviations up to 20%.

◆ You can contact your Customer Care Center to set information.

The test result shows deviations of 30% or more.

◆ You must contact your Customer Care Center that the monitor must be newly adjusted.

Individual tests according to IEC 61223-2-5

According to IEC 61223-2-5, the following tests must be performed:

- Daily visual constancy test of the monitor

  (➔ Page 941 *Performing the daily constancy test of the monitor*)
- Quarterly luminance measurement
- Quarterly spatial and contrast resolution
- Quarterly homogeneity of the image brightness

Monitor test equipment

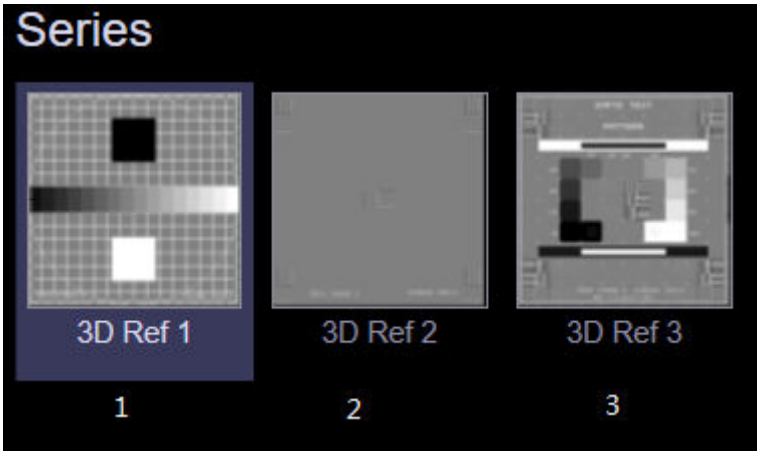
The constancy test is performed using the following test equipment:

- Luminance meter for LCD monitors

  Specification: Class B (DIN 5032-7) with valid calibration, range 0.05 cd/m^2 – 1000cd/m^2 (recommended device: Spotmeter SMfit Act for LCD monitors)
- Test image source (imaging device)

- Test images

  In the Patient Browser window, you can select the test images stored in the database under Patient Browser /**Image Quality Tests** /**3D Test**.



Performing the quarterly luminance measurement

In this test the veiling luminance (environmental lighting) and the maximum contrast are tested.

1. Switch the monitor off and wait at least 30 seconds.
2. Adjust then the room lighting to the operating conditions using the dimmer switch.
3. Measure veiling luminance Ls at the center of the screen with the luminance meter.
4. Switch on the monitor.
5. Select test image 1 to measure the minimum and maximum luminance, with the luminance meter.

   In test image 1, the squares for the maximum grayscale value (L_{max}, bright field) and the minimum grayscale value (L_{min}, black field) are used.

   The ratio L_{max}/L_{min} is calculated as maximum contrast MK (≥ 40:1).

- When taking measurements with the luminance meter, observe the distance recommended by the manufacturer (40 – 60 cm).
- You can simply increase the contrast ratio by reducing the environmental lighting intensity. However, make sure that enough light is available for reading and writing.

Test is out of tolerance.

◆ Contact your Customer Care Center.

Performing the quarterly spatial resolution test

The visual resolution is checked in this test.

1 Select test image 2 or test image 3.

2 Check the lines of the grid with a modulation of 100% high contrast (HC) at the center and in the four corners.

The lines of the grid must be recognizable.

Performing the quarterly homogeneity test

This test ascertains any deviations in the luminance (L) within the image.

1 Select test image 3.

2 With the luminance meter measure a point close to the center (L_{center}) and four measuring points in the corners (L_{corner}).

3 Calculate the deviation in % = 100 × (L_{center} − L_{corner})/L_{center}.

Maximum deviation of the corner points: Flatscreen ± 20% (max.)

Visual interference such as ghosting, artifacts, overshoots, light or dark spots, flickering, and so on, encountered.

◆ Please consult your Siemens Healthineers service technician.

Test is out of tolerance.

- Contact your Customer Care Center.

28.12.2 Camera Test

With the camera test, the image quality and the camera settings are checked. You can also film test images of the quality measurement in order to meet requirements for documentation.

CAUTION

Missing camera test!

Wrong basis for diagnosis.

- Perform the camera test regularly at the recommended intervals.

Image quality of the camera

The camera was set for optimum image quality during installation and should not be changed.

Please note the following points:

- Use the correct film type (emulsion number)
- Keep the developer bath at a constant temperature
- Use the correct chemicals
- Follow the development instructions supplied by the film manufacturer

Test film

After installation, a test film is recorded and evaluated. The results are summarized in a table. These values are used as reference values for the daily quality check of the camera.

If the equipment or the emulsion number of the film is changed, the camera must be readjusted by a service technician who is authorized to do so. After this, another camera test is required.

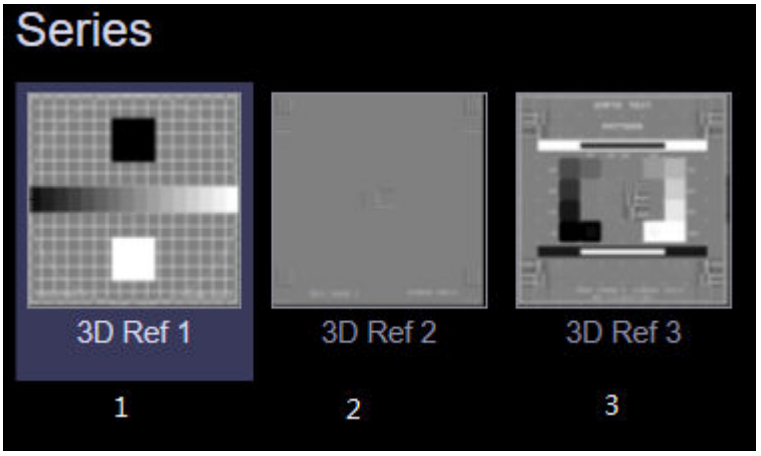
Camera test report

You will find a form for the test report in the System Owner Manual.

Performing the camera test

With the camera test (Film Demo), you can check the camera settings by filming the images of the "Image Quality Tests" patient. You can also film the images of a previous constancy test to check the camera settings.

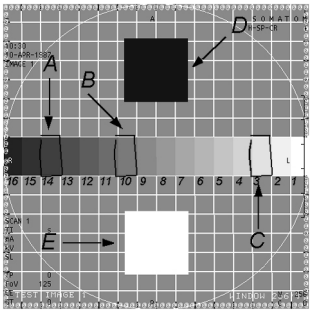
1 In the **Patient Browser**, load the test images stored in the database under Patient Browser /**Image Quality Tests** /**3D Test** into MI View&GO.



Examples of test images

2 In MI View&GO, film the test images.

3 Measure the fields marked in the first test image with the densitometer X-RITE 331.



Example of measurement fields marked by technologist

4 Enter the measured values in the constancy test report.

5 Compare the test results with the reference values.

Test is out of tolerance.

◆ Contact your Customer Care Center.

28.13 Sensitivity dashboard

The Sensitivity Dashboard allows users to view the overall results for sensitivity calibrations as shown below.

- xSPECT Quant Precision Source System Sensitivity
- Cross Calibration Sensitivity
- Broad Quant Dose Calibrator Source System Sensitivity

To access the Sensitivity Dashboard, use the following instructions.

1 Move the cursor over the **Settings** icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login on to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Quantitative**.

6 Select **Sensitivity Dashboard**.

The Sensitivity Dashboard page is displayed.

The results shown on the Sensitivity Dashboard are based on the collimator selected. Use the drop-down menu to change the collimator selected and the results that are displayed.

28.14 Source management

For more topics on source management, go to (➔ Page 489 *Source Management*).

✓ A license is required for **Integrated Sources**, **Precision Source**, and **Dose Calibrator**.

To register an integrated source, precision source, or a dose calibrator on the system, perform the following steps:

1 Move the cursor over the **Settings** icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Quality Assurance** tab.

On the left, a navigation tree is displayed.

4 Select **MI Quality Assurance**.

5 Select **Source Management**.

The **Source Management** display page appears for Integrated Sources, Precision Source, and Dose Calibrator.

6 Setup the line source and point source for the **Integrated Sources** field.

7 To add a Precision Source, click the **Add Source** button.

The **Register xSPECT Quant Precision Source** window is displayed. Complete the fields as mentioned below.

8 For the **Source ID** field, enter a unique name for the new entry, for example, the precision source serial number.

This field allows free text entries with certain restrictions on special characters. The text entry cannot contain any spaces or the following characters: \ / : * ? " < > |.

9 From the Isotope drop-down menu, select Co57, Se75 or Sn113. From the **Isotope** pull-down menu, select either **Co57** for a Co-57 precision source, **Se75** for a Se-75 precision source, or **Sn113** for a Sn113 precision source.

10 Enter the **Reference** date by clicking the calendar popup. This is the date the system apparent activity was measured.

11 Go to the **System Apparent Activity** field and enter the assay dose amount.

12 From the unit of measure pull-down menu, select **mCi** (millicuries), or **MBq** (megabecquerels).

13 Use the **Reminder** drop-down menu to select a time period for when the source should be replaced.

14 Select **Save** to add the source to the listing of Precision Sources and save the entry. Click **Cancel** to void the entries made.

15 To add and register a Dose Calibrator on the system, click the **Add Calibrator** button.

The **Register Dose Calibrator** window is displayed. Complete the fields as mentioned below.

16 From the **Enter ID** field, enter a unique name for the new entry, for example, **DC_Hotlab**.

This field allows free text entries with certain restrictions on special characters. The text entry cannot contain any spaces or the following characters: \ / : * ? " < > |

17 Select **Save** to add the dose calibrator to the listing of dose calibrators and save the entry. Click **Cancel** to void the entries made.

Use the System apparent activity as written on the precision source label for assay dose.

To ensure that all values are accurately corrected for radioactive decay, enter all times accurately and maintain department-wide time synchronization.

18 Click the **Save** button to save the entry.

28.14.1 To Delete an Existing Entry for Precision Source or Dose Calibrator

✓ Perform the following steps to Delete a Precision Source or Dose Calibrator entry.

1 From the Registered Labels pull-down menu, select the entry to be deleted from the system.

2 Click the **Delete** button.

When deleting an entry through Source Management, all associated sensitivity measurements for the particular precision source or dose calibrator will be deleted from the system.

28.14.2 To Edit an Existing Entry for Precision Source or Dose Calibrator

✓ Perform the following steps to Edit a Precision Source or Dose Calibrator entry.

1 Select the entry to be edited from the system.

2 Click the **Edit** button.

28.15 Performing CT checkup calibration

✓ Move patient table to CT Brain Index.

Once you have started the system, the Home screen is displayed. Tiles displayed on this screen are: **Examination**, **System Check**, **Lock** and depending upon the timing of calibration scheduling, **Open Tasks**. Check the **System Check** tile to see if any system calibrations should be performed.

A green checkmark (√) displayed over the **System Check** tile indicates that all calibrations are current, and there are no tests to be performed at the present time. All calibrations have been performed, and they have been completed successfully. A yellow circle with an exclamation mark (**!**) indicates that one or more calibrations is overdue and is required to be performed. A red circle with an **X** indicates that a system calibration (or calibrations) has failed, and the system is not functioning. No acquisitions can be performed at this time and Service must be called.

The System Check tile does not have a red circle with an **X** displayed if CT Daily QA is not performed when due. There is no status indicator. CT Checkup does have a status indicator displayed.

If the system **does not** have Automated Quality Control (AQC), **System Check** will only display the items listed below. All other quality control items are included in the **System Check** when they become due.

- NM Daily Floods (daily QC configured in the Administration Portal)
- Checkup (CT daily QC)
- Daily QA (CT daily QC)

If the system **does have** AQC, **System Check** will display those items listed below. Again, all other quality control items are included in the **System Check** when they become due.

- NM Daily Floods (daily QC configured in the Administration Portal)
- NM Monthly QC Suite (monthly AQC of Head Alignment followed by Intrinsic Calibration)
- Checkup (CT daily QC)
- Daily QA (CT daily QC)

Use the following to perform the **System Check**:

1 Click the **System Check** icon or hover over the **Settings** (gear) icon and select **Check up**.

  The **System Check** window is displayed, and a listing of calibrations due are displayed in the navigation pane on the left. Calibrations to be run are indicated with a yellow exclamation mark.

2 Click the **Checkup** task.

3 Click the **GO** button.

Follow the instructions displayed at the lower left of the screen.

- **For optimum image quality and system safety, please run the Checkup procedure.**
- **Exit the scan room.**
- **The table will move automatically.**
- **X-rays will be produced during the Checkup procedure.**
- **Checkup has started.**
- **Press the Go button to continue.**

4 Press the system's CT control box **Start** button.



The calibration begins.

28.16 Creating quality control service reports

Quality Control (QC) reports can be created by clicking the **Service Reports** icon located at the top right of hte Adminstration Portal screen.



To create QC reports, use the following instructions.

1 Move the cursor over the **Settings** (gear) icon and select **Administration Portal** from the list of menu items.

The Login page opens.

2 Login to the Administration Portal.

3 Click the **Service Reports** icon.

A **Service Reports** page is displayed with the following information:

- **Service Report Type** (for example, **Extrinsic Verification**)
- **Report Status** (for example, **OK**)
- **Function Type** (for example **Extrinsic Verification**)
- **Function Start Time** (for example, **2020-10-19 11:45:31**)
- **Function Status** (for example, **OK**)

4 Click the **Service Report Type**, for example **Extrinsic Verification**, and a service report for the verification will be displayed.

The service report will contain the various information, for example for an Extrinsic Verification:

- **Demographical Data** information
- **Summary** information
- **Extrinsic Verification** information, includeing parameters, measurements, and images.

5 Click the **Show PDF** button at the screen's bottom left.

A PDF is created.

6 Click the **Save** button.

Save the PDF to **H:\SiteData** to access it through the File Browser.

29 System maintenance

Regular maintenance and service are important for the safety of patients, personnel, people accompanying the patient, and for the functional integrity of the system.

For that reason, all maintenance work with the exception of the cleaning of the equipment and accessories should be performed by Siemens Healthineers Service. Please contact your Customer Care Center to agree on a maintenance contract for your system.

On request, technical documents can be obtained from Siemens Healthineers.

If the system does not function perfectly, it must be checked immediately. Please notify your Customer Care Center to perform the maintenance work.

CAUTION

Missing maintenance of the scanning system!

Scan abortion or reduced image quality due to malfunction of the scanner.

- Make sure that maintenance is performed at the recommended intervals.
- Check the imaging performance with the monthly constancy test.

- For further information on maintenance and maintenance intervals, please consult System Owner Manual.
- Please contact your Customer Care Center to exchange the consumable components of the CT system that must be exchanged by trained and authorized technologists.

29.1 Basic maintenance

To ensure that the system is ready for operation and all functions relevant to safety are working correctly, you must perform basic maintenance to optimize the CT performance.

29.1.1 System check

To ensure safe operation and correct any irregularities, the system provides a checkup procedure.

The system requests this procedure automatically, and you can decide whether or not to execute it. You are informed of due checkup with a pop-up message which can be closed. But if the checkup is not executed within a certain time slot, the pop-up message remains visible on the *syngo* Acquisition Workplace continuously until you execute the checkup.

✓ To start the checkup procedure, make sure no patient is loaded in the **Patient Browser**.

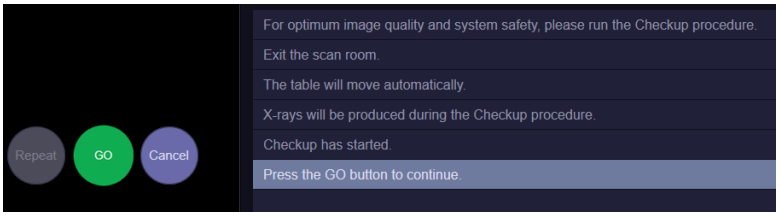
1 Click **System Check** on the **Home** screen or **Checkup** in the **Settings** menu.

The **System Check** window opens.



2 In the navigation pane on the left, select **Checkup**.

3 Click **GO**.



You are prompted to press **Start**.

4 Press **Start** on the control box.

Scanning is initiated. The system checkup starts.

You are recommended to do the checkup every morning, as the system requests, before you start scanning.

29.1.2 System calibration

To ensure a constantly high quality of images, the CT scanner must be calibrated at least once a day.

✓ To start the calibration procedure, make sure all objects are removed from the scan field and no patient is loaded in the **Patient Browser**.

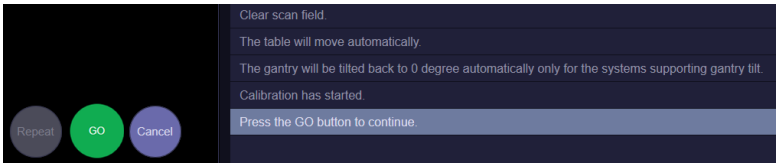


1 Move the mouse pointer over the **Settings** icon, and from the menu, choose **Calibration**.

The **Calibration** window opens.



2 Click **GO** to initiate the calibration procedure.

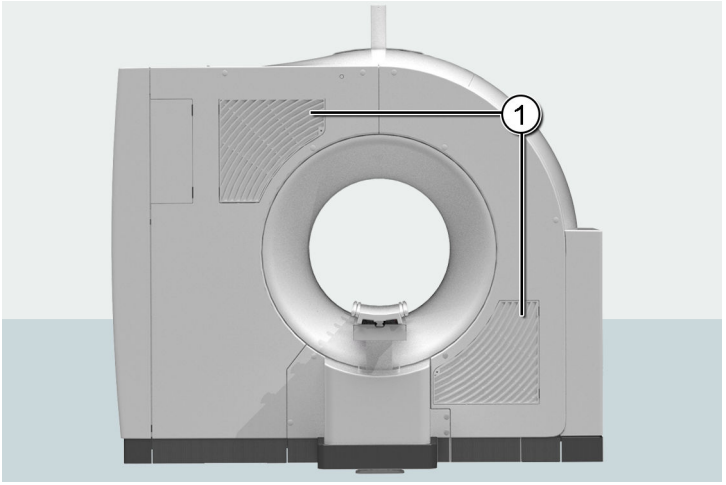


3 Press **Start** on the control box when you are prompted.

The calibration procedure starts.

29.1.3 Air filter exchange

There are two air filters at the top left and bottom right of the gantry back.

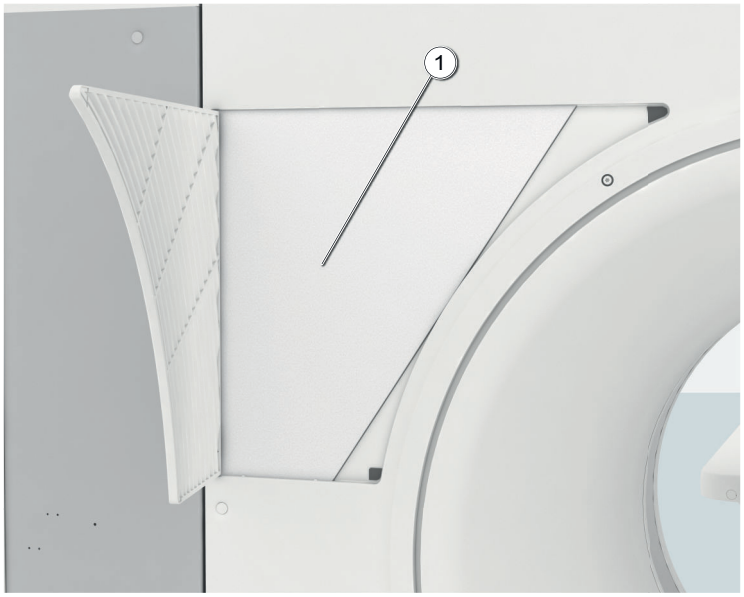


(1) Air filter

If the air filter is dirty, it might lead to the system overheating. The door of the filter is closed with magnets, so you can exchange the filter pads on your own quickly and easily without tools.

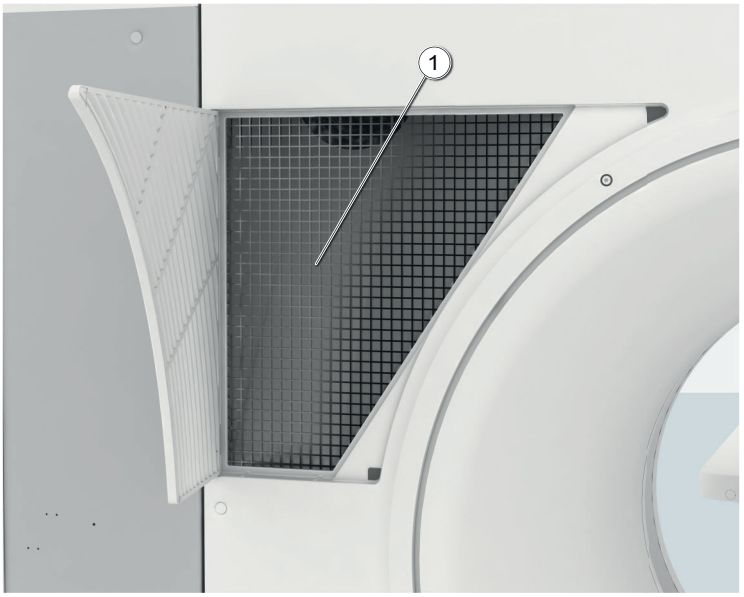
1 Open the filter door.

2 Remove the old filter pad.



(1) Filter pad

3 Clean the grid, for example with a vacuum cleaner.



(1) The grid

4 Place a new filter pad on the grid.

5 Close the door.

- It is forbidden to use the gantry without replacing the filter.
- You will receive a notification when it is time to change the air filter. For information regarding the purchase of the filter pads, please contact your Customer Care Center.
- If the filter pad is not very dirty, cleaning it with a vacuum cleaner is sufficient.

29.2 Environment monitoring

The CT scanner and its components shall be operated within corresponding specified operation condition. Therefore, for system maintenance, environmental condition related parameters must be monitored.

Environmental monitoring is able to:

- Protect the system/components from damage (could result in a system downtime for the customer)
- Inform the customer about possible, imminent problems
- Analyze system problems
- Control the gantry cooling system

29.3 Cleaning and disinfecting

The following sections describe how to clean and disinfect your Symbia system and accessories. Read all precautions and safety information within your system's Operator Manual before cleaning or disinfecting your system and accessories.

29.3.1 Cleaning

You can use the following commercially available cleaning agents with the given restrictions to clean these system components:

- system gantry and detector covers
- patient bed and pallet (also referred to as the table and pad)
- foam pads and system accessories

Cleaning Agents	Restrictions
Green soap	No restrictions
Dish washing detergent	No restrictions
Isopropyl alcohol	Will fade and damage the system's foam accessories, restraint straps, and any acrylic surfaces.
Surgical spirit	Will fade and damage the system's foam accessories, restraint straps, and any acrylic surfaces.

Cleaning the gantry display

The monitor is extremely sensitive to mechanical damage. Avoid all scratches and other physical damage. Remove any water drops immediately; extended contact with water can discolor screen surface.

To clean the case or screen of the display, first wipe the surface with a clean, soft, lint-free dry cloth to remove dust and other particles. If the screen is still not clean, apply a small amount of glass cleaner, containing **no** ammonia or alcohol, onto a clean, soft, lint-free cloth and wipe the screen. If the case is still not clean, apply a small amount of mild, non-abrasive detergent, containing **no** ammonia or alcohol, onto a clean, soft, lint-free cloth and wipe the surface.

Cleaning computer monitor screens

The monitor screens have a sensitive anti-reflective coating which have to be treated with care.

- Use a microfiber cloth and an antistatic cleaner to clean the screen surface. Never use corrosive agents as it will cause damage to the screen's surface coating.
- Clean the housing with a damp, soft cloth. Always dry the surface once you have finished cleaning. Do not use cleaning solutions.
- Remove water drops immediately; extended contact with water discolors the surface.

29.3.2 Disinfecting

Commercially available decontamination or germicidal solutions may be used sparingly on the gantry, patient bed, pad, and head holder surfaces. Please use cleaning agents and disinfectants in the concentration recommended by their manufacturer. For more information on the disinfectant effectiveness and application process, please refer to the manufacturer's label.

Disinfectants based on the following active substances will not damage the patient table or accessory surfaces, but they may affect them cosmetically.

- Aldehyde decompositors
- Quaternary compounds
- Peroxide compounds
- Organic acids (do not use on straps)

Most disinfectants are effective against known pathogens. Check the list of disinfectants that meet the EPA's criteria for use against SARS-CoV-2 on their website:

29.3.3 Cleaning and disinfecting precautions

Follow these precautions when cleaning the system:

- Never spray or pour liquids directly onto any part of the Symbia system. Excessive liquid on cloth or cleaning wipes can flow into sensitive system components.
- When possible, switch the system's power off, at the main power switch, before cleaning or disinfecting. Completely dry surfaces with a dry, soft cloth before turning the system's power on.
- To clean or disinfect the system without turning off electrical power, spray a cleaning solution, away from the system, onto a cloth, and wipe the area that needs to be cleaned. Disinfectant wipes can also be used. Completely dry surfaces with a dry, soft cloth.
- Do not clean or disinfect any areas inside the system. Contact your Siemens Customer Service Representative for assistance with these areas.

- Avoid scrubbing, rubbing, or applying excessive pressure to detector and touchpad surfaces. Detectors and touchpads can be damaged if improperly handled.
- To disinfect the system after an infectious patient, lightly wipe the system with permissible cleaning agents, such as bleach and other standard germicides.

Please note that some cleaning agents can cause damage to the system components and accessories. Do not use the following cleaning agents:

- Organic solvents such as acetone, stain remover, cleaner's naphtha, and benzine.
- Agents that release ammonia when they are dissolved or decomposed and have a corrosive effect.
- Agents containing silicone as it decays over time and can form sticky deposits that interfere with electrical contacts.
- Disinfectants based on substituted phenols or disinfectants that release chlorine.

Please note products containing alcohols, quaternary compounds, aldehyde, or aldehyde decompositors can discolor and damage the system's foam accessories and restraint straps.

Do not use ethyl or isopropyl alcohol (rubbing alcohol) to clean the system's foam pads and restraint straps, as it can fade and damage them.

Do not use alcohol based cleaners on acrylic surfaces, like phantoms and the sheet source holder.

30 Technical Specifications

30.1 Conformance to Standards

This equipment conforms to the safety standards listed in the table which follows.

Standard	Edition and/or Date
EN 60601-1	:2006/A12:2014
IEC 60601-1	:2005/AMD1:2012/COR1:2014
CAN/CSA-C22.2 NO. 60601-1	:14
ANSI/AAMI ES60601-1	:2005/A2:2010/(R)2012 :2005/C1:2009/(R)2012 :2005/A1:2012
EN 60601-1-2	:2015
IEC 60601-1-2	:2007 :2014
CAN/CSA-C22.2 No. 60601-1-2	:08
ANSI/AAMI/IEC 60601-1-2	:2007/(R)2012
EN 60601-1-3	:2008
IEC 60601-1-3	:2008 :2008+AMD1:2013 CSV
IEC 60601-1-6	:2006
EN 60601-1-6	:2010/A1:2015
IEC 60601-1-6:	:2010/AMD1:2013
IEC 60601-2-28	:2010
EN 60601-2-44	:2009/A2:2016
IEC 60601-2-44	:2009+AMD1:2012
EN 62366	:2008
IEC 62366	:2007+AMD1:2014
EN 62304	:2006/A1:2015
IEC 62304	:2006+AMD1:2015 CSV

Standard	Edition and/or Date
ISO 14971	:2019
EN ISO 14971-1	:2012
IEC 60601-1-1	:2000
IEC 60601-1	:1988 :1998/A1:1992 :1998/A2:1995
CSA-C22.2 No. 601.1	:M90 :S1-94
CSA-C22.2 No. 01.1	:1998+A2
IEC 60601-1-3	:1994
IEC 60601-1-4	2000
IEC 60601-1-6	:2004
IEC 60601-2-28	:1993
IEC 60601-2-32	:1994
IEC 60601-2-44	:2001
IEC 60601-2- 4	:2001:/A1:2002
IEC 61223-2-6	:1994
EN ISO 14971-1	:2009 :2007

30.2 Accompanying EMC Documents

This medical electrical equipment needs special precautions regarding EMC, and needs to be installed and put into service according to the EMC information provided in this manual.

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

WARNING

The system when used with adjacent equipment or with additional equipment stacked on the system can lead to electromagnetic interference!

Inconsistent operation of system and nearby equipment is possible.

- If the system is used while positioned adjacent to other equipment or with additional equipment stacked on the system, it should be observed to verify normal operation in the configuration in which it will be used.

WARNING

Accessories, transducers and cables other than those specified or provided by Siemens are used.

Increased electromagnetic emissions or decreased electromagnetic immunity could result in improper operation!

- Only connect approved electrical devices. See the System Owner's Manual for more information.

30.3 Declaration of Conformity

The following declarations of conformity apply to the Symbia system.

30.3.1 Electromagnetic Emissions

This system is intended for use in the electromagnetic environment specified below. The customer or the user of the system should assure that it is used in such an environment.

Guidance and Manufacturer's Declaration: Electromagnetic Emissions

Emission Test	Compliance	Electromagnetic Environment - Guidance
RF Emissions CISPR 11	Group 1	The system generates RF energy only for its internal functions. Therefore, its RF emission is very low and is not likely to cause any interference in nearby electronic equipment.
RF Emissions and Conductive CISPR 11	Class A	The system is suitable for use in all establishments other than domestic and those directly connected to the public low- voltage power supply network supplying buildings used for domestic purposes.
Harmonic Distortion IEC 61000-3-2	Not Applicable	
Voltage Fluctuations and Flicker IEC 61000-3-3	Not Applicable	

30.3.2 Electromagnetic Immunity

This system is intended for use in the electromagnetic environment specified below. The customer or the user of the system should assure that it is used in such an environment.

Guidance and Manufacturer's Declaration: Electromagnetic Immunity

Immunity Test	IEC 60601-1-2 Test Levels[1)]	Compliance Levels	Electromagnetic Environment - Guidance
Electrostatic discharge IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	Floor should be wood, concrete, or ceramic tiles. If floor is covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transients/bursts IEC 61000-4-4	± 2 kV for power supply lines at 100 kHz frequency ± 1 kV for input/output lines at 100 kHz frequency	± 2 kV for power supply lines at 100 kHz frequency ± 1 kV for input/output lines at 100 kHz frequency	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 0.5 kV, ± 1.0 kV for line-to-line ± 0.5 kV, ± 1.0 kV, ± 2.0 kV for line-to-ground	± 0.5 kV, ± 1.0 kV for line-to-line ± 0.5 kV, ± 1.0 kV, ± 2.0 kV for line-to-ground	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips IEC 61000-4-11	0 % U_T ; 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°.	0 % U_T ; 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°.	Mains power quality should be that of a typical commercial or hospital environment. Tests only applicable for products rated <16 A.
	0 % U_T ; 1 cycle and 70 % U_T ; 25/30 cycles Single phase: at 0°	0 % U_T ; 1 cycle and 70 % U_T ; 25/30 cycles Single phase: at 0°	
Voltage interruptions IEC 61000-4-11	0 % U_T ; 250/300 cycles	0 % U_T ; 250/300 cycles	
Power frequency (50/60 Hz magnetic fields) IEC 61000-4-8	30 A/m	30 A/m	If image distortion occurs, it may be necessary to position the monitor further from sources of power frequency magnetic fields or to install magnetic shielding. The power frequency magnetic field should be measured in the installation location to assure that it is sufficiently low.

1) U_T is the AC mains voltage prior to application of the test voltage.

Guidance and Manufacturer's Declaration: Electromagnetic Immunity

Immunity Test	IEC 60601-1-2 Test Levels	Compliance Levels	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 V (150 kHz to 80 MHz) 6 V in ISM bands between 150 kHz and 80 MHz [2)] 80 % AM at 1 kHz	3 V (150 kHz to 80 MHz) 6 V in ISM bands between 150 kHz and 80 MHz 80 % AM at 1 kHz	Portable and mobile RF communications equipment should not be used closer to any part of the system including cables than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance: $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ for 80–800 MHz $d = 2.3\sqrt{P}$ for 800 MHz to 2.7 GHz Where *P* is the maximum output power rating of the transmitter in watt (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[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: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz 80 % AM at 1 kHz	3 V/m 80 MHz to 2.7 GHz 80 % AM at 1 kHz	
Proximity fields from wireless transmitters IEC 61000-4-3	9 V/m at 710 MHz; 745 MHz; 780 MHz; 5.24 GHz; 5.50 GHz; 5.785 GHz 27 V/m at 385 MHz 28 V/m at 450 MHz; 810 MHz; 870 MHz; 930 MHz; 1.72 GHz; 1.845 GHz; 1.97 GHz; 2.45 GHz	9 V/m at 710 MHz; 745 MHz; 780 MHz; 5.24 GHz; 5.50 GHz; 5.785 GHz 27 V/m at 385 MHz 28 V/m at 450 MHz; 810 MHz; 870 MHz; 930 MHz; 1.72 GHz; 1.845 GHz; 1.97 GHz; 2.45 GHz	

Note: At 80 MHz and 800 MHz, the higher frequency range applies.

Note: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflections from structures, objects, and people.

[a] Field strength from fixed transmitters, such as base stations for radio telephones and land mobile radios, amateur radio, AM or FM 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 system is used exceeds the applicable RF compliance levels above, the 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 system.

[b] Over the frequency range 150 kHz to 80 MHz , field strengths should be less than 3 V/m.

2) The ISM (industrial, scientific and medical) bands between 0.15–80 MHz are 6.765–6.795 MHz, 13.553–13.567 MHz, 26.957–27.283 MHz, and 40.66–40.70 MHz. The amateur radio bands between 0.15–80 MHz are 1.8–2.0 MHz, 3.5–4.0 MHz, 5.3–5.4 MHz, 7–7.3 MHz, 10.1–10.15 MHz, 14–14.2 MHz, 18.07–18.17 MHz, 21.0–21.4 MHz, 24.89–24.99 MHz, 28.0–29.7 MHz, and 50.0–54.0 MHz.

30.3.3 Recommended Separation Distances

This system is intended for use in the electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of the system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and the system as recommended below, according to the maximum output power of the communication equipment.

WARNING

Accessories, transducers and cables other than those specified or provided by Siemens are used.

Increased electromagnetic emissions or decreased electromagnetic immunity could result in improper operation!

- Only connect approved electrical devices. See the System Owner's Manual for more information.

Recommended Separation Distances for Portable/Mobile RF Communications and the System

Rated Maximum Output Power of Transmitter [W]	Separation Distance According to Frequency of Transmitter (m)		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
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 meters (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: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

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

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Material No. 11520967.05
Published by Siemens Healthcare GmbH / Print No. MI-SPECT-X3.621.01.01.02 / © Siemens Healthcare GmbH, 2020 - 2021
Date of first issue: 2020-08 / Revision date: 2021-11