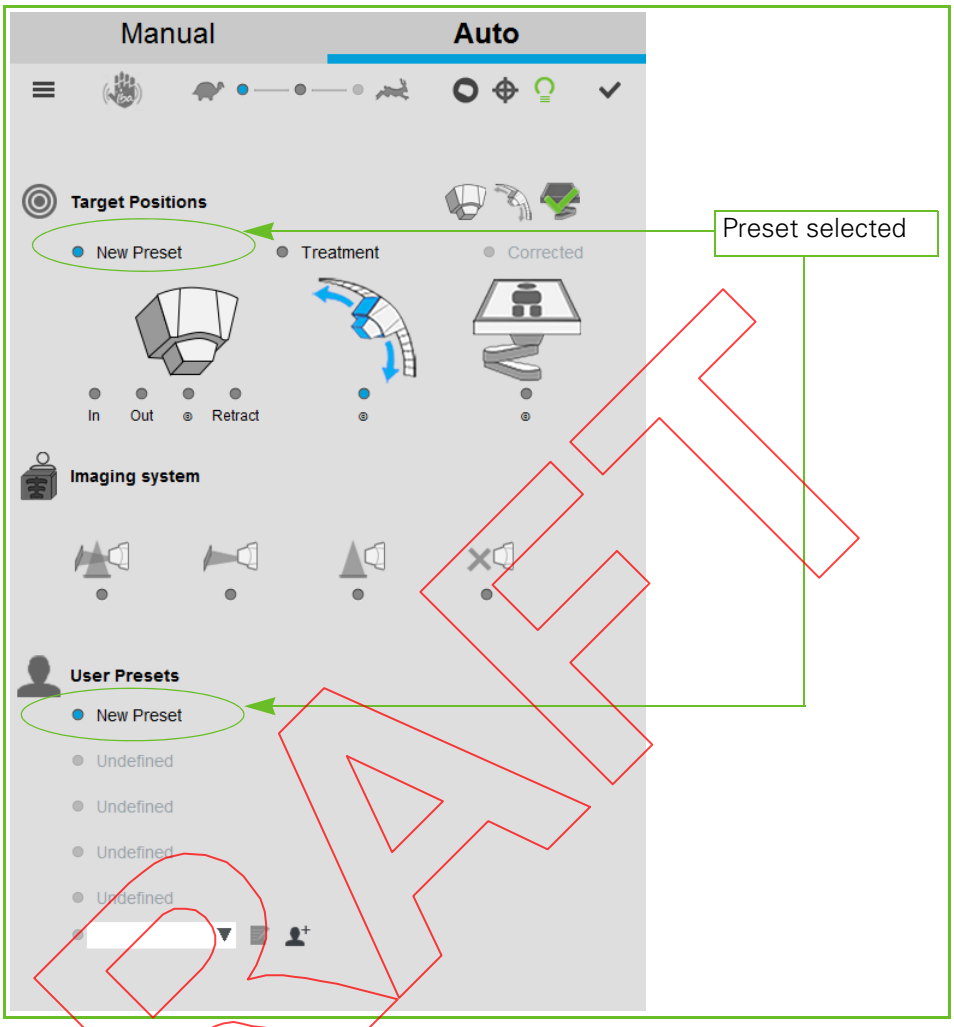


Figure 11-8. Preset Selected as Target Position (typical)

Target Position Device Feedback

Next to the 'Target Positions' title in the remote positioning controls panel, three icons represent the three patient positioning devices that may need to be moved in order to reach the target position.

These three icons provide you with feedback on:

- Whether or not the device is included in the selected target position:
  - Included: the device icon appears in dark gray.
  - Not included: the device icon appears in light gray.
- Whether or not the device has reached the target position.

- Reached: a green ‘check’ appears on top of the device icon.
- Not reached: no green ‘check’ on top of the device icon.

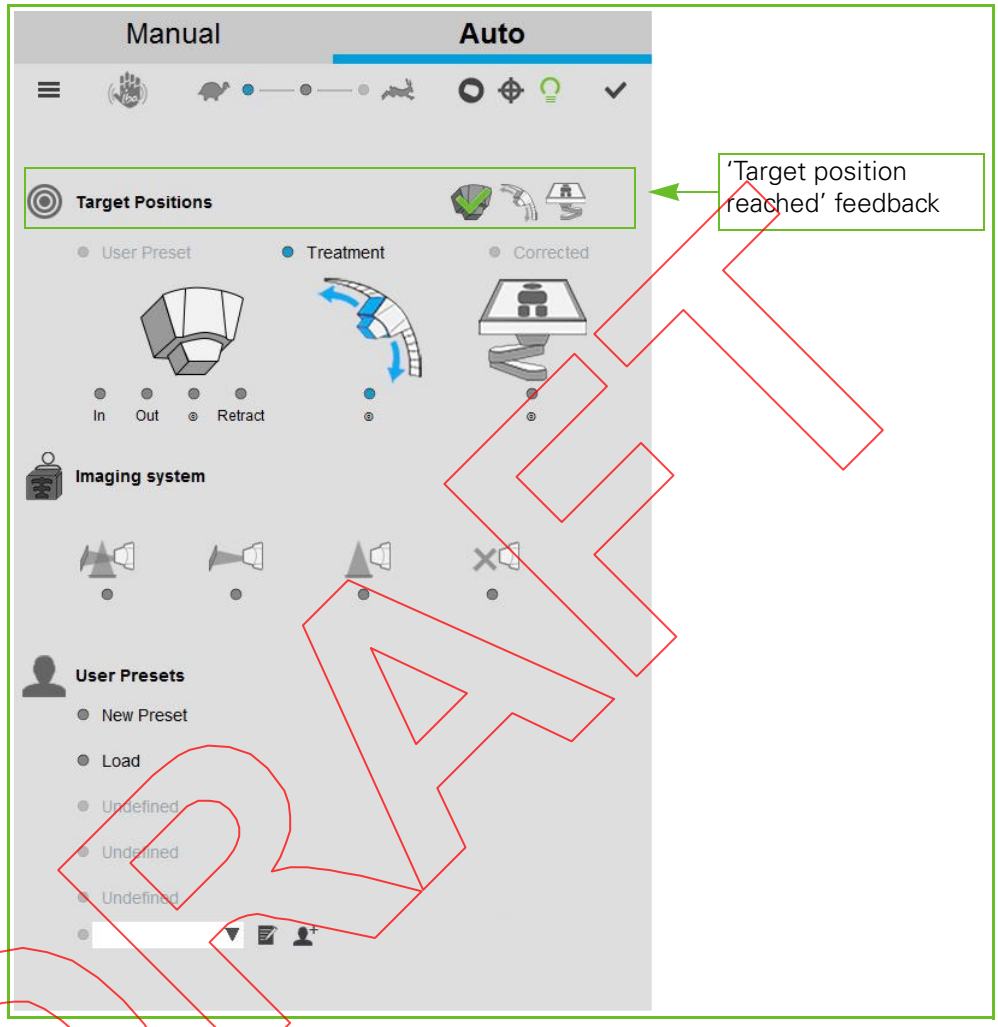


Figure 11-9. Target Position Device Feedback (typical)

Moving Devices to a Target Position

Once a target position is selected, you are able to move the devices that need to be moved in order to reach it.

The default selection for every device is always the target position (as prescribed in the Plan or the user preset, represented by the symbol ‘◎’). The other options correspond to position modifiers for quick access to additional motions.

In order to move the different patient positioning devices to the target position, proceed as follows:

Note: *It is your responsibility as a Radiation Therapy Technologist (RTT) to decide in which order you move the different devices that need to be moved in order to reach a target position. This procedure describes a 'typical' procedure in which it may be necessary to move the snout, gantry and PPS.*

Moving the Snout holder

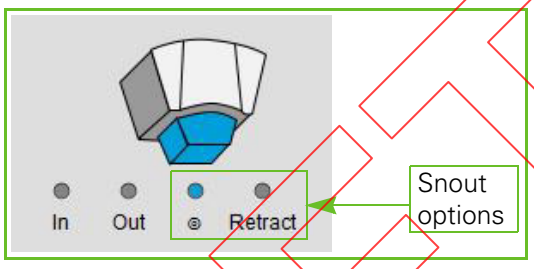


Figure 11-10. Snout Options (typical)

The '◎' and 'Retract' options refer to snout positions.

The Inserted/Retracted position of the snout may be part of the prescribed position.

In order to move the snout, proceed as follows:

1. Click on the snout icon and the '◎' option is automatically selected.
2. To move the snout to the prescribed position, keep the '◎' option selected.
3. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Alternatively, you may completely retract the snout if you deem it necessary, as follows:

1. Select the 'Retract' option.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Moving the Accessory Drawer

Note: *The system only enables you to move the accessory drawer when the snout is at a completely retracted position (the furthest possible from the isocenter).*

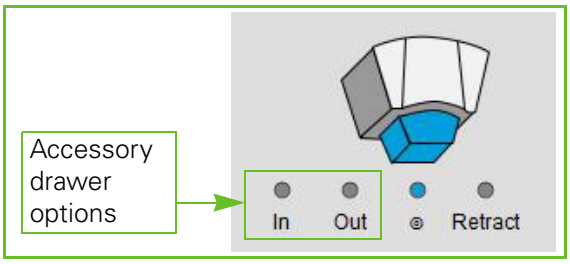


Figure 11-11. Accessory Drawer Options (typical)

The 'In' and 'Out' options refer to accessory drawer positions.

The position of the accessory drawer (In/Out of the beam path) may be part of the prescribed position. Make sure you select the 'In' option to put the accessory drawer in the beam path or the 'Out' option to put the accessory drawer out of the beam path, as prescribed.

Note: *A feedback on the status panel reflects whether the accessory drawer is at prescribed position.*

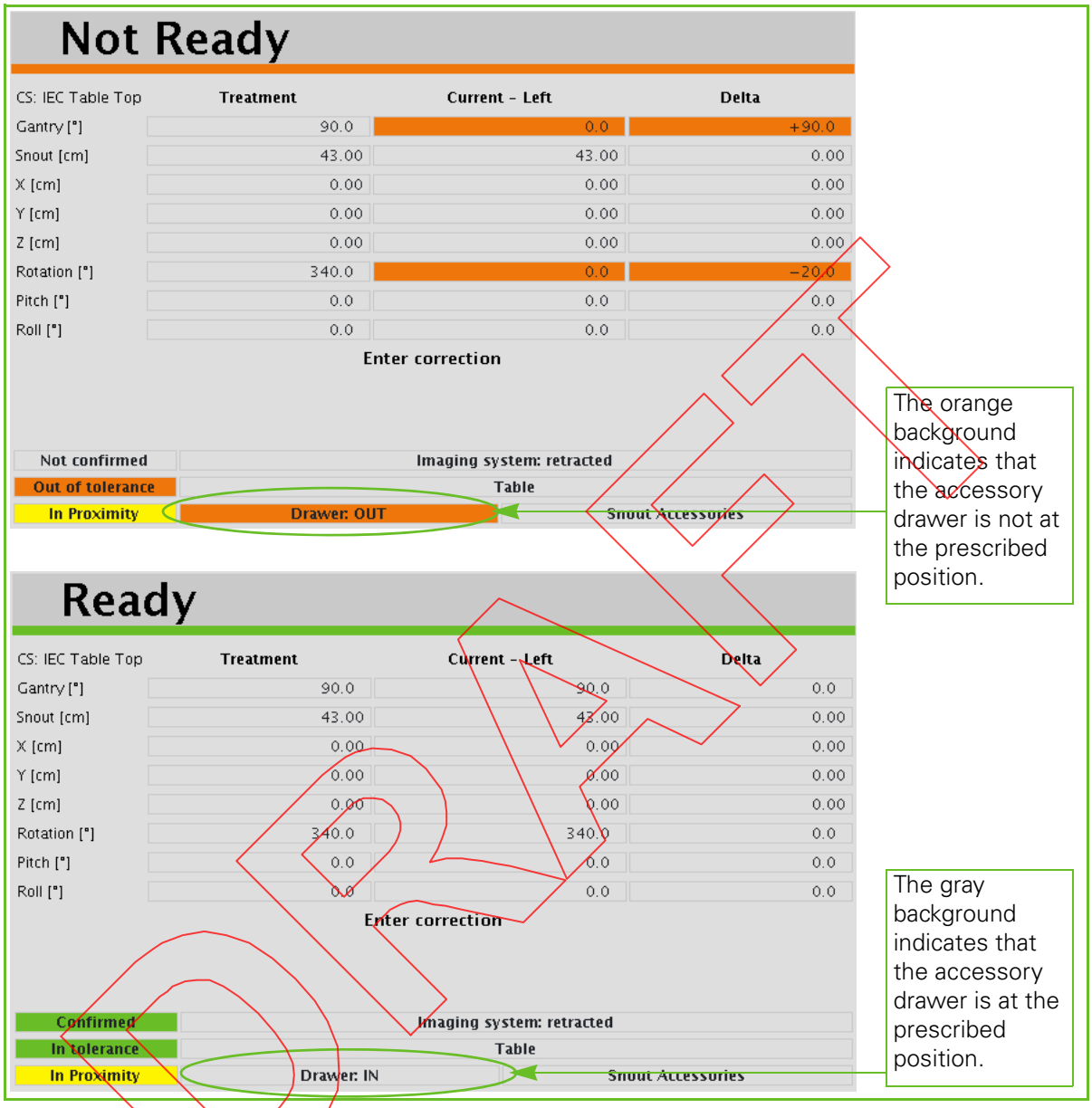


Figure 11-12. Status Panel - Accessory Drawer Position Feedback

In order to move the accessories holder, proceed as follows:

1. To move the accessory drawer in the beam path, select the 'In' option.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Alternatively,

1. To move the accessory drawer out of the beam path, select the 'Out' option.

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Moving the Gantry

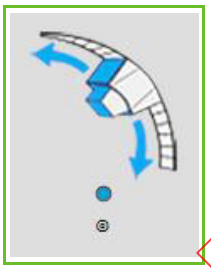


Figure 11-13. Gantry Options (typical)

In order to move the gantry, proceed as follows:

1. Click on the gantry icon and the '◎' option is automatically selected.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Moving the PPS

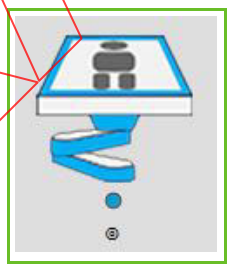


Figure 11-14. Gantry Options (typical)

In order to move the PPS, proceed as follows:

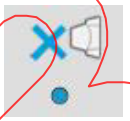
1. Click on the PPS icon and the '◎' option is automatically selected.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Using Auto Mode to Move the Imaging Devices

In order to move the imaging devices, proceed as follows:

1. Click on the desired option, as follows:

Table 11-2. Imaging Devices Movement Options

Icon	Meaning
	Put both imagers in position for image acquisition.
	Put the portal imager in position for image acquisition.
	Put the orthogonal imager in position for image acquisition.
	Retract all imagers.

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Preparing Equipment for a CBCT Acquisition

When a CBCT preparation is requested using adaPT*insight*, the CBCT PREPARATION PANEL (EQUIPMENT NOT READY) of the remote positioning controls appears automatically.

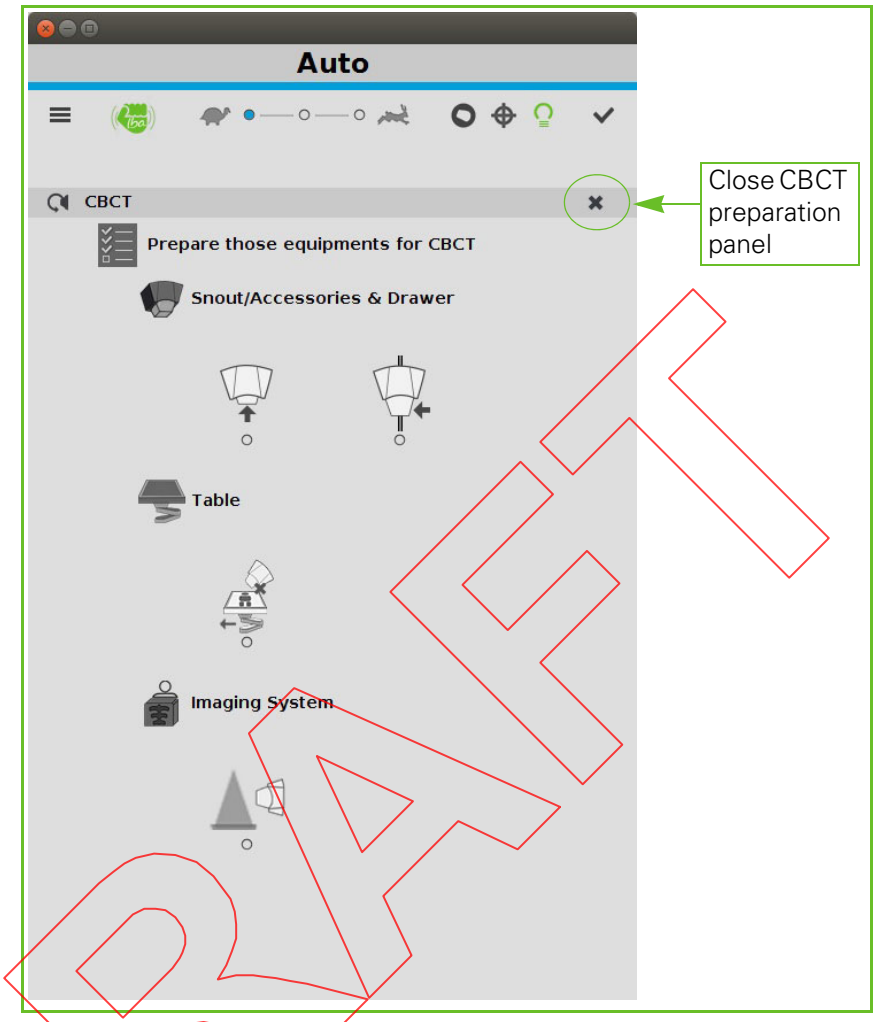


Figure 11-15. CBCT Preparation Panel (equipment not ready) (typical)

This panel enables you to move the patient positioning and imaging devices to the position required for adaPT*insight* to be able to perform a CBCT scan.

Note: *Only the devices available in the treatment room are shown in the* CBCT PREPARATION PANEL (EQUIPMENT NOT READY).

You may close the CBCT PREPARATION PANEL (EQUIPMENT NOT READY) by clicking the cross on the top right of the panel (see Figure 11-15).

To access the CBCT PREPARATION PANEL (EQUIPMENT NOT READY) again, click the CBCT preparation icon in the Imaging System options of the remote positioning controls panel.

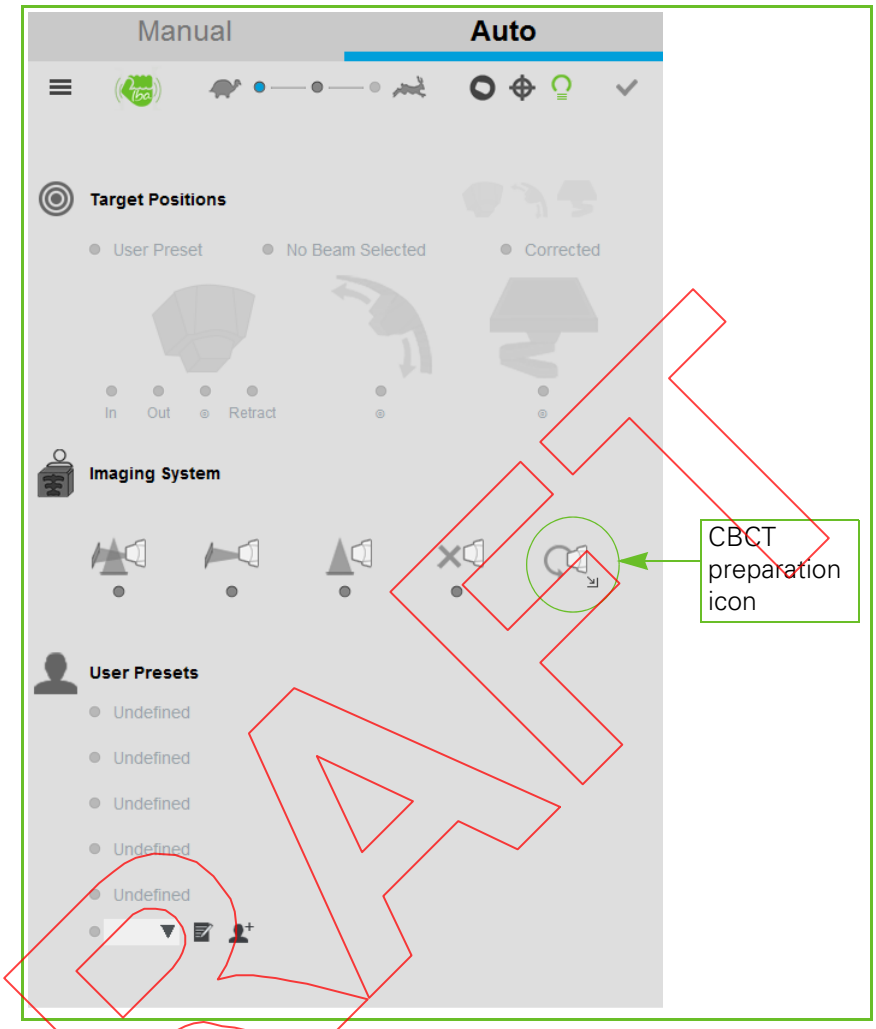


Figure 11-16. Remote Positioning Controls Panel - CBCT Preparation Icon (typical)

Once in the CBCT PREPARATION PANEL (EQUIPMENT NOT READY), proceed as follows in order to move the devices to the required position:

1. Click on the icon corresponding to the device and the movement that you want to request.

Table 11-3. CBCT Preparation - Devices Movement Options

Icon	Meaning
	Retract the snout.
	Move accessory drawer into the beam path.
	PPS move to Safe position.
	Put the orthogonal imager in position for image acquisition (only available in Gantry Treatment Rooms).

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.
3. Repeat Step 1 and Step 2 for all the required devices until all of the equipment is ready for CBCT acquisition. All of the icons need to be overlaid by a green check mark before you are able to proceed to CBCT acquisition.

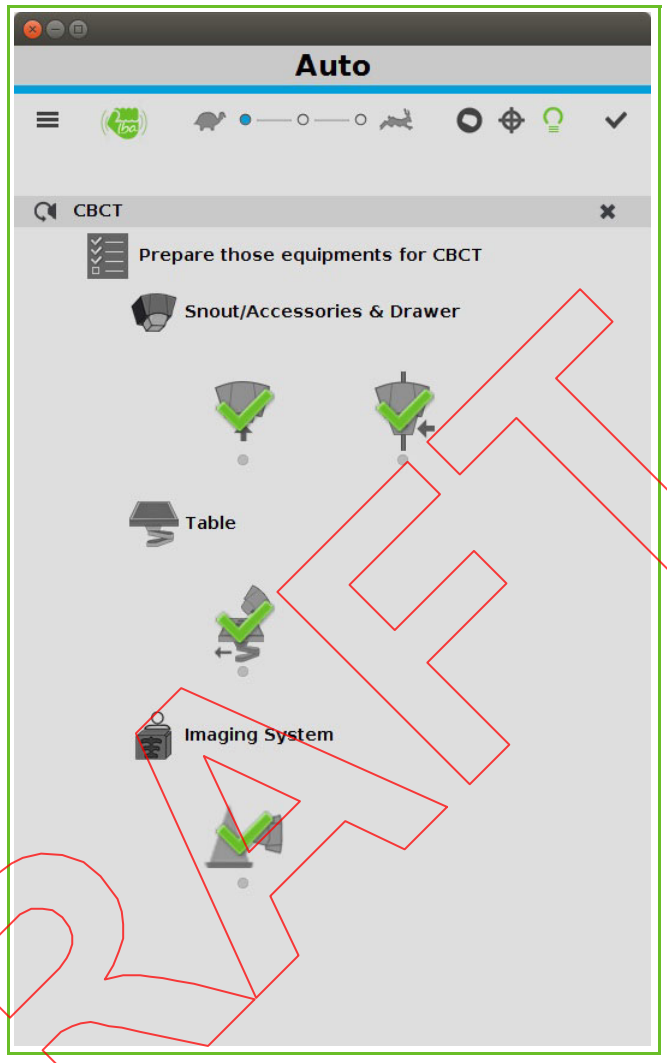


Figure 11-17. CBCT Preparation Panel - Equipment Ready (typical)

4. You may now continue the CBCT acquisition procedure using adaPT*insight*.

Note: *For further details on CBCT acquisition, refer to the adaPTinsight user documentation listed in the Delivery Note.*

Using Auto Mode to Move to a User Preset

In order to move the patient positioning devices to a user preset, proceed as follows:

1. Select the required preset from the 'User Presets' part of the Remote Positioning Controls panel.

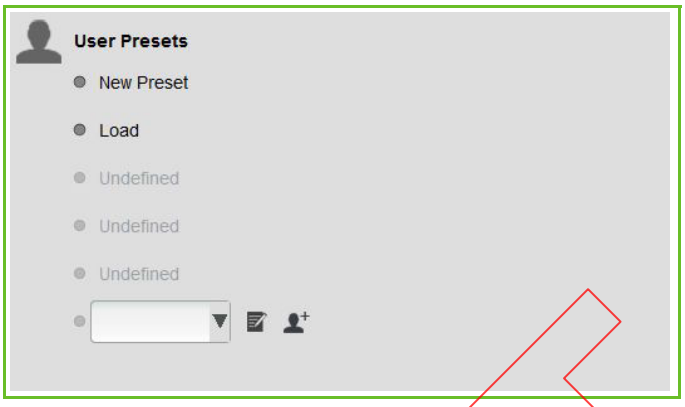


Figure 11-18. Remote Positioning Controls Panel - User Presets (typical)

2. Proceed as described in section *Moving Devices to a Target Position*.

Using Auto Mode to Create and Edit User Presets

Creating a User Preset

In order to create a new user preset, proceed as follows:

1. In order to access the USER PRESET EDITION MENU, click the **New User Preset** icon in the 'User Presets' part of the Remote Positioning Controls panel.

Figure 11-19. New User Preset Icon
Remote Positioning Controls Panel - User Presets (typical)

2. Fill in the fields in the USER PRESET EDITION MENU as necessary.

   Note: *The fields in the* USER PRESET EDITION MENU *are automatically filled with the current position of the equipment. You may modify this information, as necessary.*

3. In order to select the devices that need to be included in the new user preset, tick the boxes next to the gantry, snout and table icons as necessary.

   Note: *Only the settings corresponding to the selected devices are saved in the user preset.*

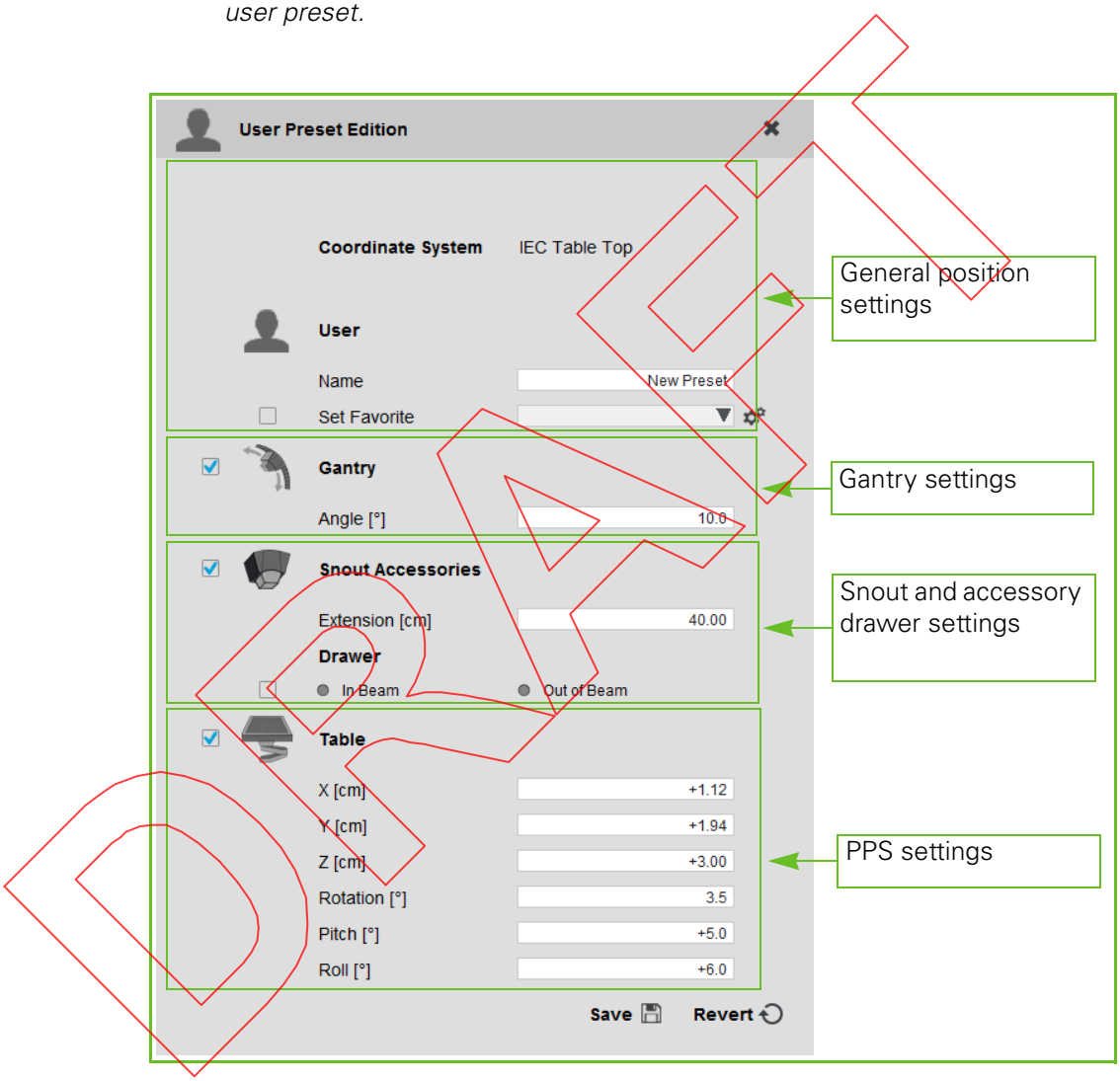


Figure 11-20. User Preset Edition Menu (typical)

4. In order to save the new user position, click the **Save** button at the bottom right of the USER PRESET EDITION MENU.

Alternatively, to cancel the modifications done to the values of the new user preset click the **Revert** button at the bottom left of the USER PRESET EDITION MENU.

Note: *When the value input in a field is not valid (e.g., gantry angle 500°), a red cross is displayed next to the field in question. Hover over the red cross and a tooltip explaining the reason of the error appears. It is not possible to save the user position if one or more fields are in error.*

Editing a User Preset

In order to edit an existing user preset, proceed as follows:

1. Select the user preset that you want to modify from the drop down menu at the bottom of the 'User Presets' part of the Remote Positioning Controls panel.

Figure 11-21. List of User Presets
Remote Positioning Controls Panel - User Presets (typical)

2. In order to access the USER PRESET EDITION MENU, click the **Edit User Preset** icon in the 'User Presets' part of the Remote Positioning Controls panel.

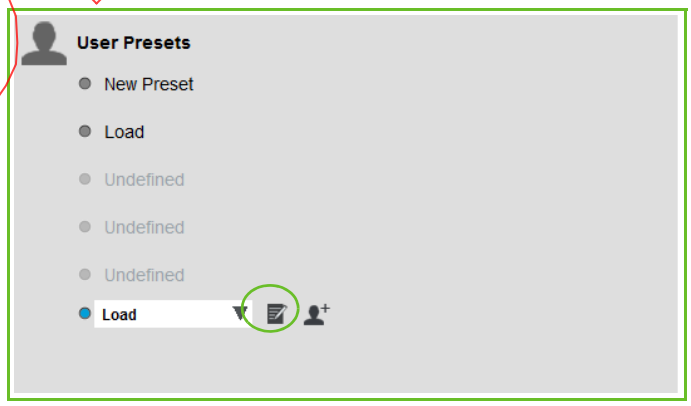


Figure 11-22. Edit User Preset Icon
Remote Positioning Controls Panel - User Presets (typical)

3. Modify the fields in the USER PRESET EDITION MENU as necessary.

   Note: *The 'name' field of the* USER PRESET EDITION MENU *is not editable when you are modifying an existing user preset.*

4. In order to save the changes, click the **Save** button at the bottom right of the USER PRESET EDITION MENU.

   Alternatively, to cancel the modifications done to the values of the user preset click the **Revert** button at the bottom left of the USER PRESET EDITION MENU.

Managing User Presets

Using the MANAGE PRESETS MENU, it is possible to:

- Organize the order of the existing user presets. Only the first 5 user presets in the list (a.k.a. favorite user presets) appear in the list in the Remote Positioning Controls Auto mode panel. All other presets are available via the drop down menu that appears below the list of favorite presets (see Figure 11-21).
- Edit, clone or delete any of the existing user presets.

You can access the MANAGE PRESETS MENU from the USER PRESET EDITION MENU. In order to access the MANAGE PRESETS MENU, proceed as follows:

1. Click the **Manage Presets** icon that appears in the 'User' part of the USER PRESET EDITION MENU.

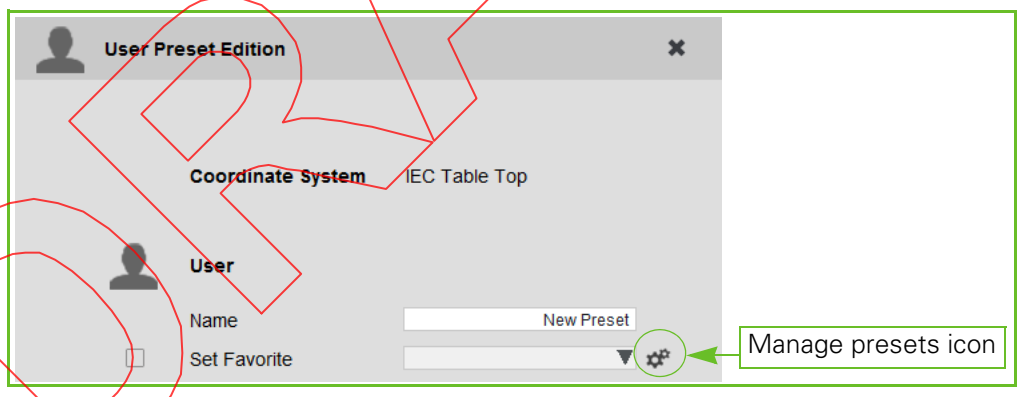


Figure 11-23. Manage Presets Icon

The MANAGE PRESETS MENU appears:

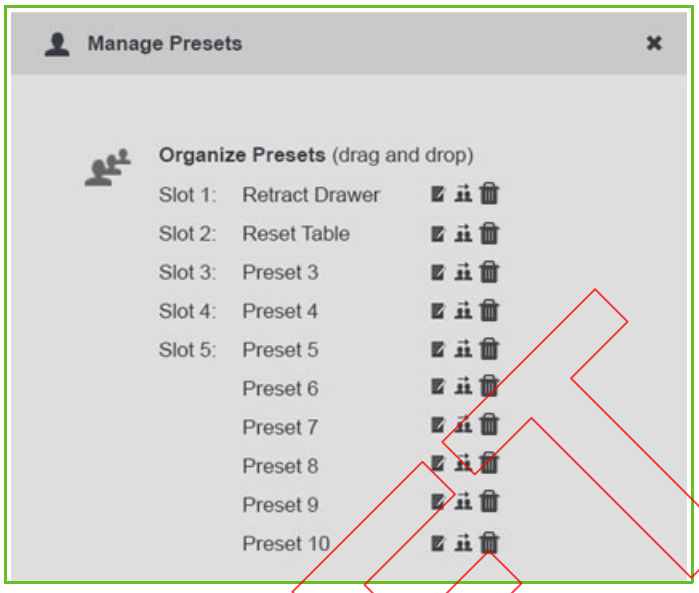


Figure 11-24. Manage Presets Menu (typical)

In order to arrange the list of user presets, proceed as follows:

1. Drag and drop each user preset to the chosen position in the list.

   Note: *The first 5 user presets in the list (a.k.a. favorite user presets, which appear in the* MANAGE PRESETS MENU *next to slots 1 to 5) appear in the list in the Remote Positioning Controls panel. All other presets are available via the drop down menu that appears below the list of favorite presets (see Figure 11-21).*

In order to edit an existing user preset, proceed as follows:

1. Click the **Edit Preset** icon next to the user preset that you want to edit.

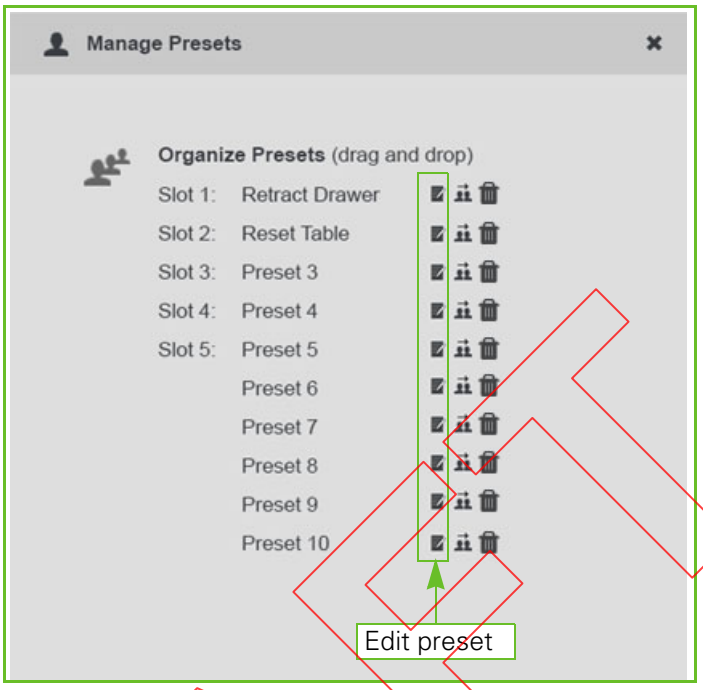


Figure 11-25. Edit Preset Icon

2. You are now able to modify the user preset using the USER PRESET EDITION MENU. Proceed as described in section *Editing a User Preset*.

In order to clone an existing user preset, proceed as follows:

1. Click the **Clone Preset** icon next to the user preset that you want to clone.

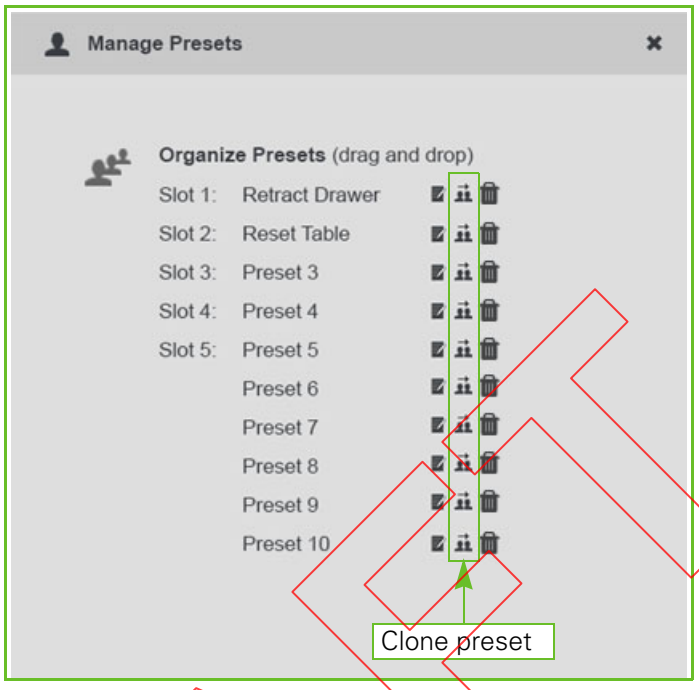


Figure 11-26. Clone Preset Icon

In order to delete an existing user preset, proceed as follows:

1. Click the **Delete Preset** icon next to the user preset that you want to delete.

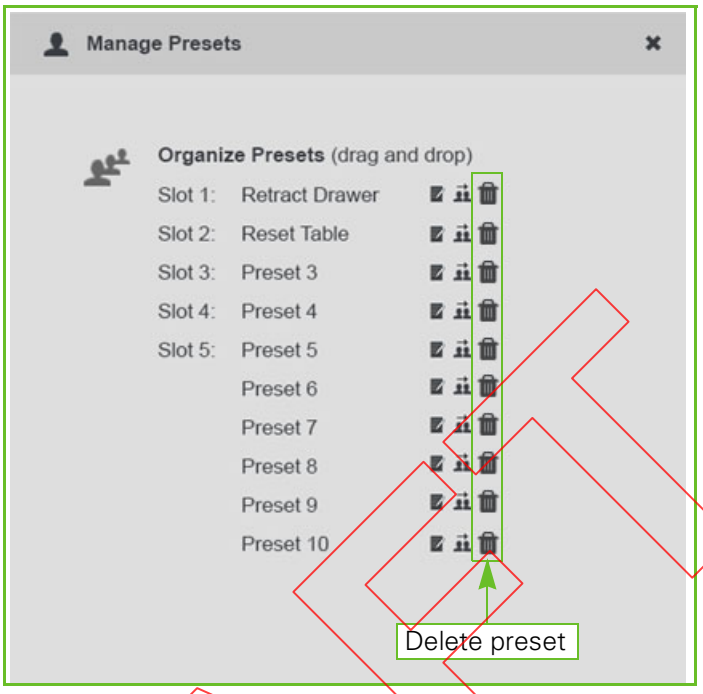


Figure 11-27. Delete Preset Icon

Using the Remote Positioning Controls in Manual Mode

Note: *For the purpose of this manual, the Manual mode of the remote positioning controls is fully explained and illustrated. This operating mode may or may not be available at your site.*

Manual mode enables you to perform equipment movements that do not require any particular patient information or user presets. This covers Manual motions as well as certain Auto motions (the insertion/retraction of various pieces of equipment, gantry angle motions, etc.).

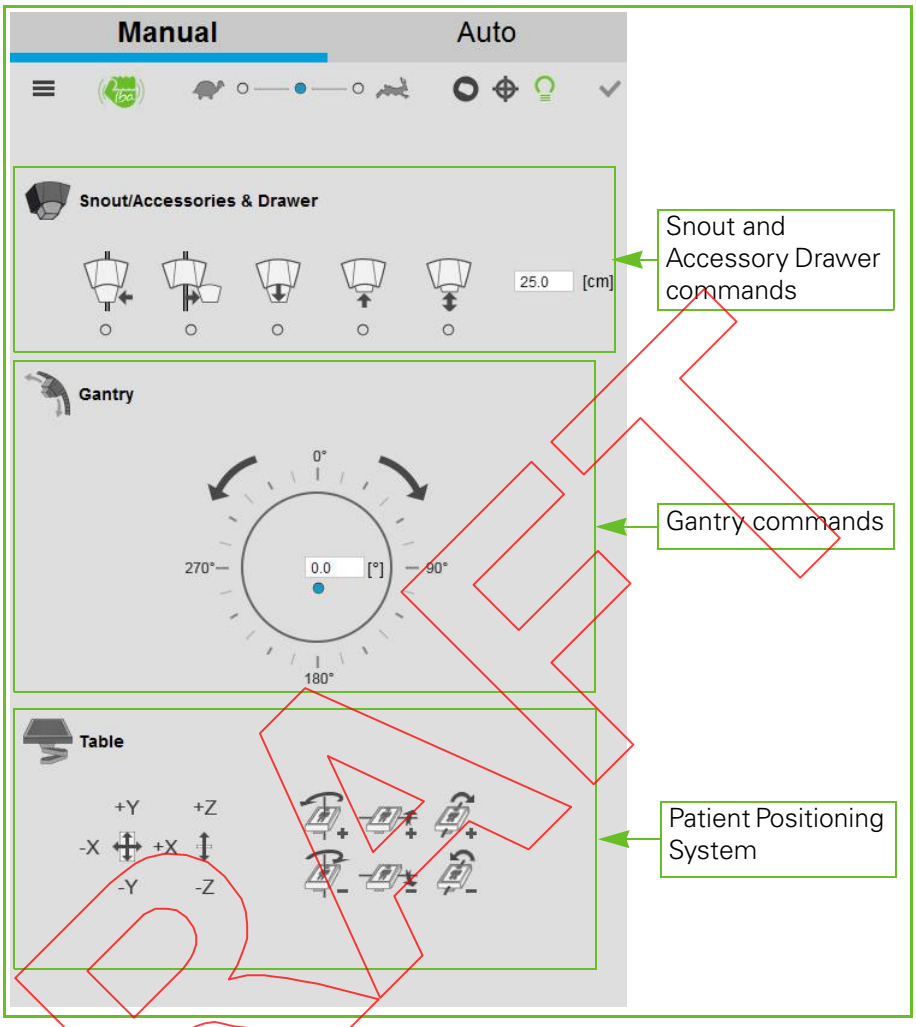


Figure 11-28. Remote Positioning Controls - Manual Mode (typical)

Using Manual Mode to Move the Accessory Drawer and the Snout

The commands to move the accessory drawer and the snout are grouped at the top of the Remote Positioning Controls panel.

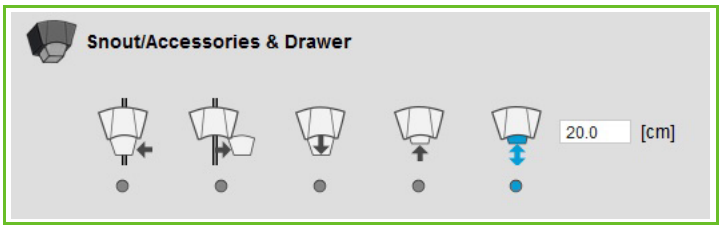


Figure 11-29. Accessory Drawer and Snout Commands (typical)

Moving the Accessory Drawer

Note: *The system only enables you to move the accessory drawer when the snout is at a completely retracted position (the furthest possible from the isocenter).*

To move the accessory drawer into the beam path, proceed as follows:

1. Click on the **Move Accessory Drawer Into the Beam Path** icon.

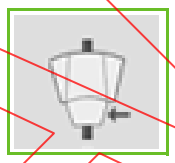


Figure 11-30. Move Accessory Drawer Into the Beam Path Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

To move the accessory drawer out of the beam path, proceed as follows:

1. Click on the **Move Accessory Drawer Out of the Beam Path** icon.

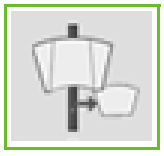


Figure 11-31. Move Accessory Drawer Out of the Beam Path Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

Moving the Snout

To insert the snout, proceed as follows:

1. Click on the **Insert Snout** icon.

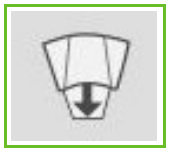


Figure 11-32. Insert Snout Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

To retract the snout, proceed as follows:

1. Click on the **Retract Snout** icon.

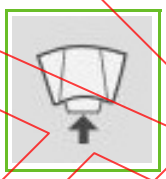


Figure 11-33. Retract Snout Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

   Note: *This command enables you to perform a continuous snout motion, without a precise target position. As such, it differs from the snout 'Retract' option available in Auto mode, which moves the snout to the 'retracted' target position (i.e., it completely retracts the snout).*

To move the snout to a particular extension, proceed as follows:

Note: *This command may entail an insertion or a retraction of the snout, depending on the location of the target position relative to the current snout position.*

1. Click on the field next to the **Insert or Retract Snout** icon, enter a target snout extension and press the **Enter** key on your keyboard.

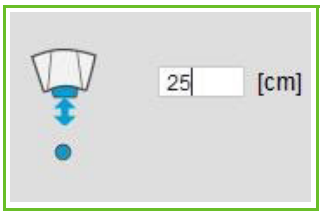


Figure 11-34. Insert or Retract Snout Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

Using Manual Mode to Move the Gantry

The commands to move the gantry appear in the middle of the Remote Positioning Controls panel.

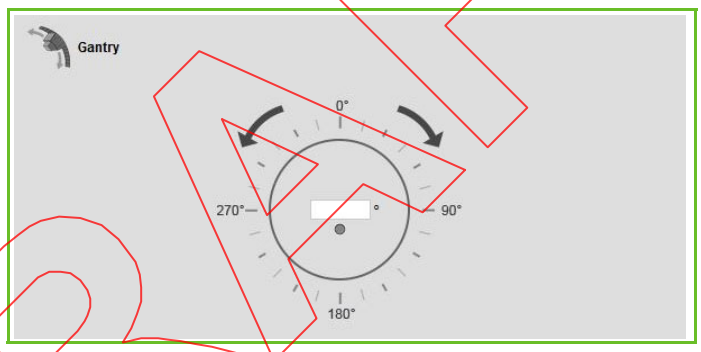


Figure 11-35. Gantry Commands (typical)

These commands enable you to move the gantry in several ways.

To move the gantry to a particular angle, proceed as follows:

1. Click on the angle field in the center of the gantry dial, enter a target gantry angle and press the **Enter** key on your keyboard or click the dot below the field. The dot becomes blue.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

To move the gantry to one of the angles available in the gantry widget, proceed as follows:

Note: *The gantry widget enables you to move the gantry to points every 15° between 0° and 345°.*

1. Click on the line corresponding to the angle to which you want to move the gantry.

   Alternatively, click any point of the circle of the gantry dial.

   The angle corresponding to the line that you clicked or to the line that is closest to the point of the circle that you clicked appears in the angle field in the center of the gantry dial. The dot below the angle field becomes blue.

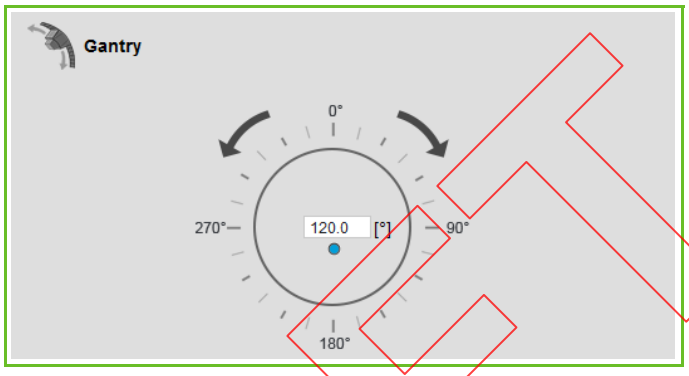


Figure 11-36. Gantry Commands - Target Angle Selected (typical)

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target angle.

To move the gantry clockwise, proceed as follows:

1. Click on the arrow pointing clockwise. The arrow becomes blue.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

To move the gantry counterclockwise, proceed as follows:

1. Click on the arrow pointing counterclockwise. The arrow becomes blue.
2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

Using Manual Mode to Move the PPS (Patient Positioning System)

Note: *Manual PPS motions are executed along the Horizontal Table Top Coordinate System (HTTCS) axes.*

The commands to move the PPS appear at the bottom of the Remote Positioning Controls panel.

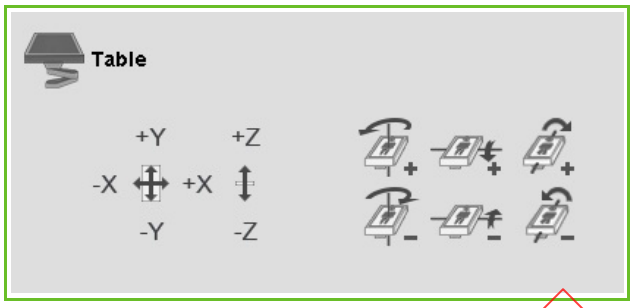


Figure 11-37. PPS Commands (typical)

Moving the PPS Along the X Axis

Proceed as follows:

1. To move the PPS in the + direction along the X axis, click on the **+X** on the right of the **X and Y PPS Axes** icon.

   Alternatively, to move the PPS in the - direction along the X axis, click on the **-X** on the left of the **X and Y PPS Axes** icon.

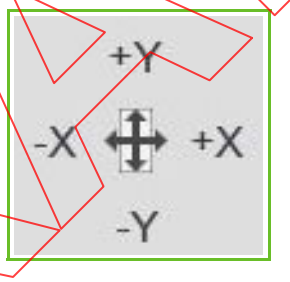


Figure 11-38. X and Y PPS Axes Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Moving the PPS Along the Y Axis

Proceed as follows:

1. To move the PPS in the + direction along the Y axis, click on the **+Y** on top of the **X and Y PPS Axes** icon.

   Alternatively, to move the PPS in the - direction along the Y axis, click on the **-Y** below the **X and Y PPS Axes** icon.

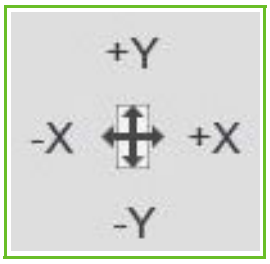


Figure 11-39. X and Y PPS Axes Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Moving the PPS Along the Z Axis

Proceed as follows:

1. To move the PPS in the + direction along the Z axis, click on the **+Z** on top of the **Z PPS Axis** icon.

   Alternatively, to move the PPS in the - direction along the Z axis, click on the **-Z** below the **Z PPS Axis** icon.

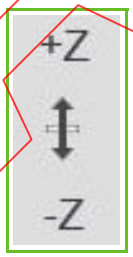


Figure 11-40. Z PPS Axis Icon

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Rotating the PPS Around the Isocenter

Proceed as follows:

1. Click the **PPS + Horizontal Rotation** icon to rotate the PPS in the positive direction.

   Alternatively, click the **PPS - Horizontal Rotation** icon to rotate the PPS in the negative direction.

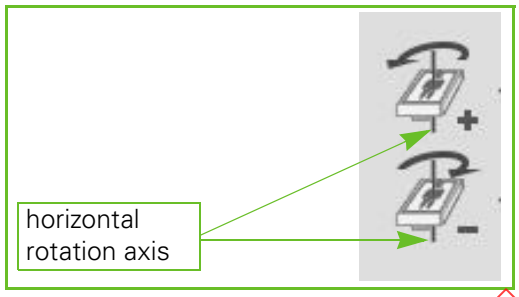


Figure 11-41. PPS + Rot Arrow (above) and PPS - Rot Arrow (below)

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the target position.

Pitching the PPS

Proceed as follows:

1. Click the **PPS + Pitch** icon to pitch the PPS in the positive direction.

   Alternatively, click the **PPS - Pitch** icon to pitch the PPS in the negative direction.

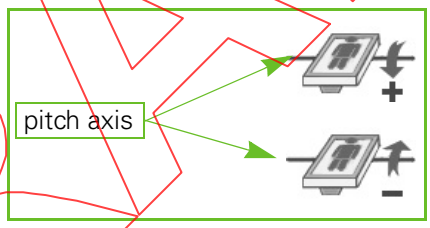


Figure 11-42. PPS +Pitch Icon (above) and PPS - Pitch Icon (below)

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

Rolling the PPS

Proceed as follows:

1. Click the **PPS + Roll** icon to roll the PPS in the positive direction.

   Alternatively, click the **PPS - Roll** icon to roll the PPS in the negative direction.

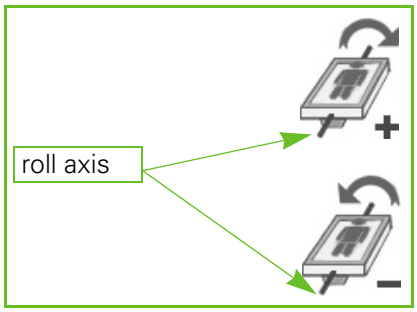


Figure 11-43. PPS + Roll Icon (above) and PPS - Roll Icon (below)

2. Press and hold the **MEB** and **Move** buttons on the remote positioning hardware console until the device reaches the required position.

Using Advanced Settings

1. To access the ADVANCED SETTINGS MENU while working in Auto or Manual mode, click on the **Options Menu** icon in the remote positioning controls bar.

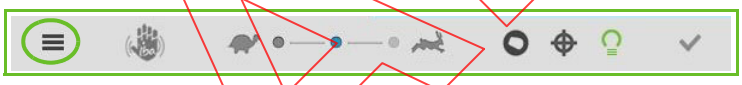


Figure 11-44. Options Menu Icon
Remote Positioning Controls Bar (typical)

Figure 11-45 shows the options present in the ADVANCED SETTINGS MENU:

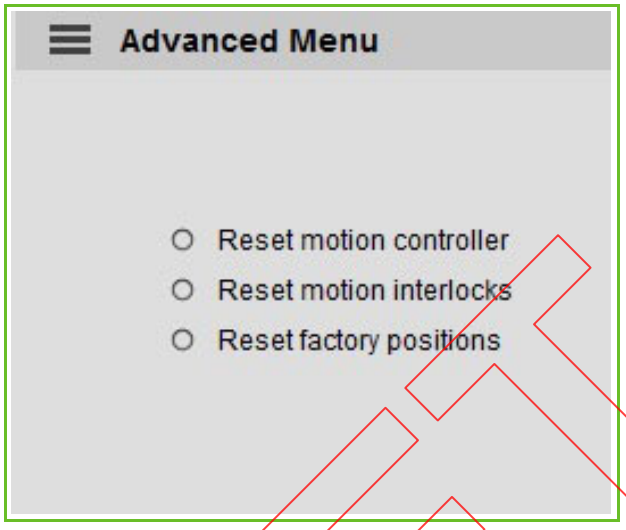


Figure 11-45. Advanced Settings Menu (typical)

- **Reset motion controller:** this function resets internal Positioning Management System communications. You may need to reset the motion controller after a particular error occurs. This is recommended in the relevant error messages.
- **Reset motion interlocks**: this function enables you select all positioning devices so that they are all reset in a single push of the SRCU **Restart** button. This action is necessary after an emergency stop has occurred.
- **Reset factory positions:** this function resets all positions to their factory settings.

Note: *For further details on how to recover the system after an emergency stop refer to the Safety and Emergency Recommendations document.*

2. Click on the desired option, as follows:

   a. If you wish to reset the check manager, click the 'Reset Check Manager' option.

      The `Check manager has been reset` message appears at the top of the ADVANCED SETTINGS MENU.

   Alternatively,

   a. If you wish to reset the SRCU, click the 'Reset SRCU' option.

      The following pop-up message appears:

Figure 11-46. Reset SRCU Warning

b. Click the **OK** button and reset the SRCU within the following 60 seconds.

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Chapter 12
Alignment Tools and Devices

Proper alignment requires the following:

- **Precise alignment devices to record the actual alignment using adaPT*insight***: in case adaPT*insight* is used for computing the initial corrections, the initial position of the tumor is indicated on the CT scan in the TPS. Next the treatment plan and the CT scan are transferred to adaPT*insight*. The adaPT*insight* software computes the correction vector from the treatment plan, the CT scan, and two orthogonal radiographic images acquired in the TR.

  The adaPT*insight* software communicates the correction vector automatically to the TCS, which supplies the correction data to the positioning devices, until the optimal alignment is reached. For detailed information on alignment tools, refer to section "*Patient Alignment Devices*" on page 12-7.

- **Precise alignment data**: you can obtain such data for all non-eye treatments using the PPVS application (e.g., adaPT*insight*).

For an overview on how to use the PPVS data, refer to the following:

- For adaPT*insight* data, refer to section "*Alignment Correction Calculation Tool: adaPT*insight" on page 12-3.

For a detailed description on how to compute positioning corrections using any of the PPVS systems, refer to the following:

- adaPT*insight*: refer to Chapter 50, "Calculating Corrections Using adaPT*insight*".

WARNING	Make sure that a procedure is run regularly to check the correct alignment of the Patient Position Verification System (PPVS).

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*Alignment Correction Calculation Tool: adaPT*insight

The adaPT*insight* software enables you to calculate the alignment corrections that must be applied to the PPS to ensure a correct alignment of the patient in respect to the isocenter. The adaPT*insight* application calculates corrections for the GTR.

Note: *The gantry based system is isocentric and shares the same geometric reference as the X-ray Image Guided Radiation Therapy (IGRT) equipment.*

In the Treatment Planning Room (TPR) all data that is useful for treatment preparation is centralized, e.g., CT scans, RT Ion Plan information, etc. This is typically and most efficiently done in the weeks or days before treatment.

In each TR where adaPT*insight* is used, an adaPT*insight* workstation with a monitor is available from which the Digital Radiographs (DRs) are acquired at the time of treatment.

Depending on the TR hardware configuration, 2D stereoscopic images are acquired at the time of treatment using one or multiple imaging devices. Equally, and optionally, 3D images can be acquired using a single 2D imaging device which rotates around the volume to be imaged.

AdaPT*insight* computes the correction vector using image registration techniques and automatically transfers them into the TCS. Alternatively, the Radiation Therapy Technologist (RTT) can introduce these corrections manually from the TCS screen in the TR. The RTT finally implements these corrections using the hand pendant.

This correction calculation can be iterated a number of times until a satisfactory alignment is reached.

WARNING

As a Radiation Therapy Technologist (RTT) it is your responsibility to verify the appropriateness of the corrections generated by the Patient Position Verification System (PPVS).

WARNING

After applying and implementing the corrections calculated by the Patient Position Verification System (PPVS) software (e.g., adaPT*insight*), it is recommended to take a new set of X-ray images to verify proper positioning of the patient.

Important	If the administration of your center has established any such procedure, make sure that a regular backup is taken of the adaPT*insight* log files containing the information on the dose delivered to each patient by means of X-rays or fluoroscopy.

The GTR imaging geometry consists of the following:

- 1 portal axis
- 1 ortho axis

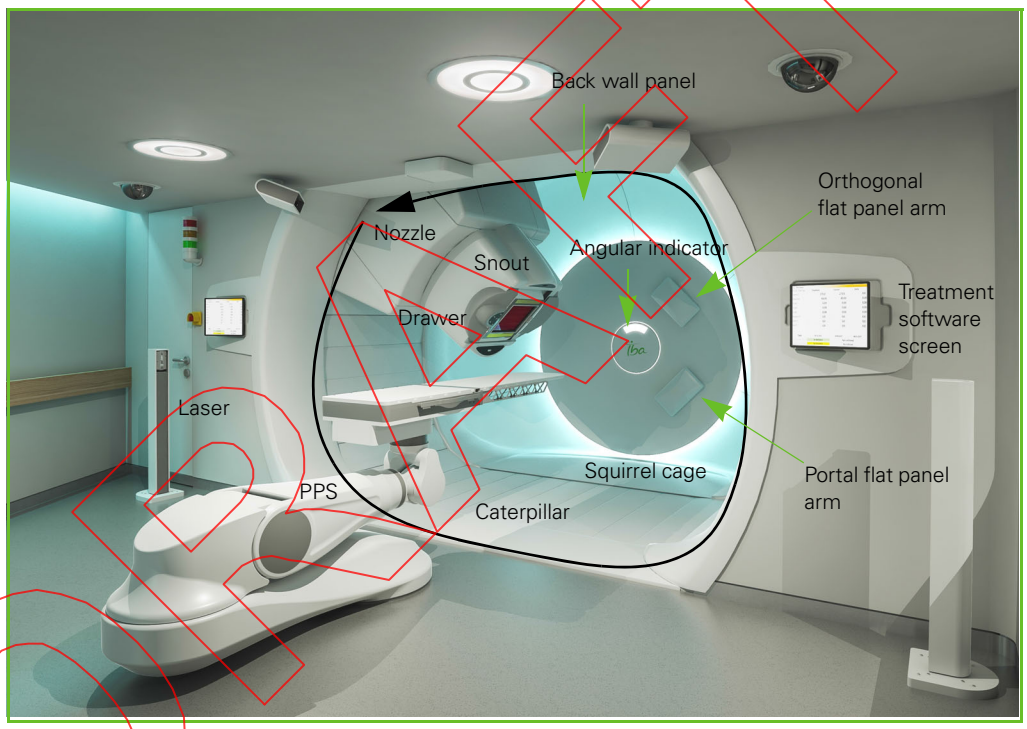

Figure 12-1. GTR Imaging Geometry

The isocenter which is used to align the patient in the TR changes position during gantry rotation due to gantry deformation and nozzle deformation. These two effects need to be compensated in order to have the proton beam delivered at the intended location.

To compensate for gantry deformation a geometrical calibration is computed thus defining the X-ray isocenter. The proton LUT is not required in systems equipped with PBS dedicated nozzle as in this case the direction of the proton beam is tuned to match the X-ray isocenter. To compensate for nozzle deformations in universal nozzle

systems a look-up-table is computed containing the deviations of the proton position relative to the X-ray isocenter for different gantry angles and snout extensions. Such deviations – whose typical values are of the order of 1mm and never exceed 5mm – are obtained by positioning an ionization chamber detector or a radiographic film at X-ray isocenter and measuring the relative distance to the center of the proton field.

The use of Proton Offset LUT ensures the patient is aligned with the isocenter where the proton beam is delivered.

Relationship between Imaging equipment and treatment geometries

A geometrical calibration of the X-ray imaging system is required to compensate for gantry deformations and lack of isocentricity. To this purpose, a correction is applied at each gantry angle consisting of a flexmap with X-ray tube displacements, and imager displacements and rotations. The geometrical calibration method uses a phantom with radio-opaque markers which is positioned in the TR such that its projection model is known if no geometrical deformations exist. The method then computes the deviation of the measured X-ray projection with that of the model and computes a geometrical correction which minimizes such deviation.

Typical values for tube and flat panel displacements are in the range of 2 to 20mm while rotation components are as small as 0.3°. The same range of deformation is observed in GTR configuration. However, values can differ quite significantly among different sites and different rooms.

Alignment

When an acceptable alignment is reached:

1. Select the Treatment beam.
2. Look at the X-ray image again from the adaPT*insight* workstation: the outline is on the image.

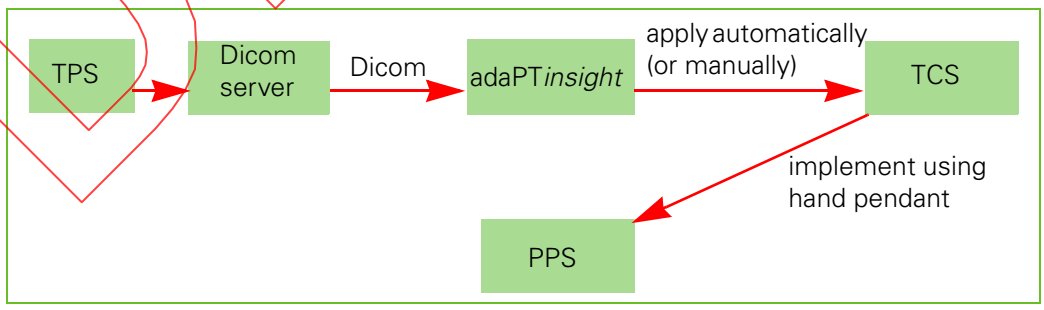

*Figure 12-2. adaPT*insight *Integration With the* TCS

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Patient Alignment Devices

The Patient Alignment Devices are used to verify the correct position of the patient prior to an irradiation. These devices are:

- **Lasers**
- **X-ray tubes and associated Digital Imaging Devices (DID)**: each X-ray tube works in combination with a DID flat panel to record an X-ray image.

Note: *Use the lasers for initial positioning of the patient, use the X-ray tubes next. Lasers have a precision of ~3 mm; the precision of the X-ray based method is <1 mm.*

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Working With Laser Devices

Laser devices may be used to align the patient on the couch.

CAUTION	The nozzle lasers have been calibrated at 270° only. Lasers therefore should be used for rough alignment only.

Important	As radiation therapy technologist (RTT), pre-position the patient using the lasers. During this process, pay attention to the potential large difference between the position of the isocenter as indicated by the lasers and the position of the isocenter as indicated by the X-ray image guidance system. A large difference would indicate that one of these systems needs to be re-aligned.

Note: *Use the lasers for initial positioning of the patient, use the X-ray tubes next. Lasers have a precision of ~3 mm; the precision of the X-ray based method: is <1 mm.*

Location of Lasers in a GTR

Laser Locations for PBS Dedicated Nozzle

Nine lasers are located in the Gantry Treatment Room (GTR):

- **Laser 1** (mounted on the nozzle edge) emits a vertical laser beam.
- **Laser 2** (mounted on the nozzle edge) emits a vertical laser beam.
- **Laser 3** (mounted on the patient enclosure, opposite the nozzle) emits a crosshair laser beam.
- **Laser 4** (mounted on the ceiling, above the PPS) emits a vertical laser plane containing the gantry rotation axis.
- **Laser 5** (mounted against the wall opposite the gantry) emits a horizontal laser plane containing the gantry rotation axis.
- **Laser 6** (mounted on a column or wall bracket, to the left of the PPS when facing the gantry) emits a crosshair laser beam.
- **Laser 7** (mounted on a column or wall bracket, to the right of the PPS when facing the gantry) emits a crosshair laser beam.

- **Laser 8** (mounted on the ceiling, above the PPS) emits a vertical laser beam.
- **Laser 9** (on the nozzle edge) emits a horizontal laser beam.

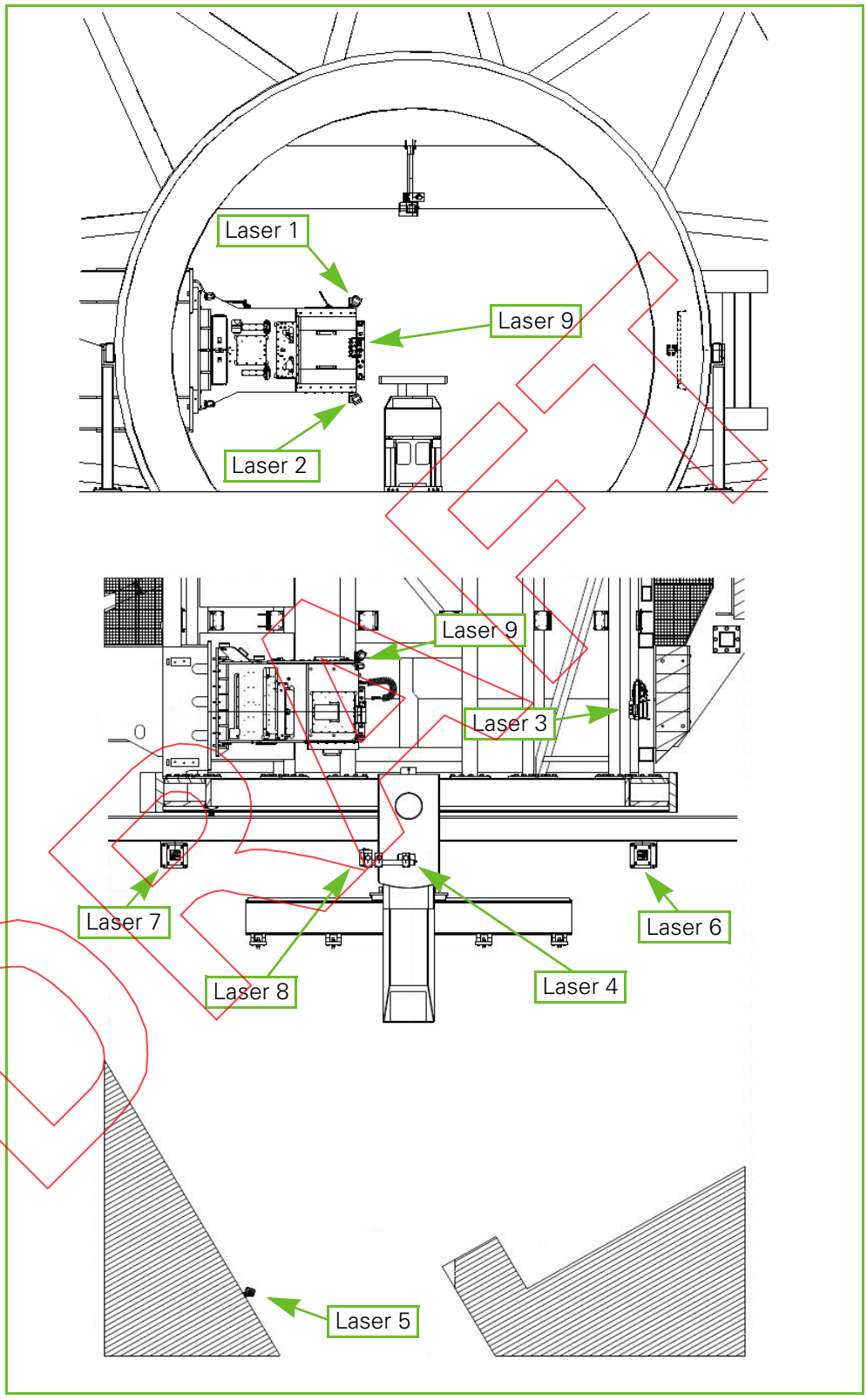

Figure 12-3. Laser Locations for PBS Dedicated Nozzle in GTR

Turning Lasers On and Off

To turn the lasers on using the wireless hand-pendant or the remote positioning controls, proceed as follows:

1. Touch or click the **Lasers ON/OFF** icon located in the App bar (wireless hand-pendant) or in the Remote Positioning Controls bar.

   The **Lasers ON/OFF** icon becomes green and the lasers are turned on.

To turn the lasers off using the wireless hand-pendant or the remote positioning controls, proceed as follows:

1. Touch or click the **Lasers ON/OFF** icon located in the App bar (wireless hand-pendant) or in the Remote Positioning Controls bar.

   The **Lasers ON/OFF** icon becomes gray and the lasers are turned off.

Table 12-1. Wireless Hand-Pendant App Bar and Remote Positioning Controls Bar: Lasers ON/OFF Icon

Icon	Meaning
	Lasers ON/OFF

All lasers are turned on and off at the same time.

Note: *It is recommended to turn the lasers off when treatment is completed. This will help to extend the life of the lasers.*

Depending on the configuration at your treatment center, the TR lights automatically dim when the lasers are turned on.

Working with X-ray Images in a GTR, for Use With adaPTinsight

Images can be taken either 2D (one image) or 2D stereoscopic (two images that will be combined).

The adaPT*insight* application supports the acquisition of the following kinds of X-ray images depending on the TR hardware configuration:

- **Orthogonal X-ray images** are taken in the direction orthogonal to the proton treatment beam.
- **Portal View X-ray images** are taken in the direction of the proton beam.
- **CBCT X-ray images (3D) using the Rad-B X-ray tube**

  The Rad-B X-ray tube, which is mounted on the rotating gantry, makes a 180° or 360° rotation around the patient to record a sequence of multiple X-ray images. A 3D image is then reconstructed by adaPT*insight*.

The paragraphs below explain what needs to be done in the GTR prior to acquiring such X-ray images using adaPT*insight*.

Images can be taken in the following mode:

- Dual Source mode: both X-ray images can be taken at the same time (i.e., in an automatic sequence) using two X-ray tubes and two DID panels, and one or two X-ray generators.

There is one fixed X-ray tube (X-ray tube B) and one retractable X-ray tube (X-ray tube A), each with an associated flat panel holder system that supports and positions an appropriate Digital Imaging Device (DID) used to aid in patient positioning. The **fixed X-ray tube** is located in the gantry frame 90° counterclockwise from the nozzle. The **retractable X-ray tube** is inside the nozzle. The Rad-A X-ray tube is used for portal view X-ray images and the Rad-B X-ray tube is used for orthogonal X-ray images.

The maximum value of the attenuation equivalent of the couch does not exceed 2 cm in water (WET).

The flat panel holder systems are mounted on the rotating gantry catwalk behind the back wall of the patient enclosure.

CAUTION	In case of collision of the flat panel with a tough surface or in case of rough shock, a visual inspection is required to detect any mechanical deformation. In such case, the use of the detector must be considered as hazardous and the clinical user shall immediately contact the service provider.

Setting up for Orthogonal X-ray Images in a GTR

This procedure is for the retractable X-ray tube inside the nozzle and both associated flat panel holder systems.

To set up the equipment for the acquisition of orthogonal X-ray images, proceed as follows using the wireless hand-pendant or the remote positioning controls:

Note: *For further information on how to use the wireless hand-pendant, refer to Chapter 9. For further information on how to use the remote positioning controls, refer to Chapter 11.*

1. Retract the snout (if present) into the nozzle.
2. Move the patient positioning devices to the *Setup* target position.

   Note: *For further information on how to use the wireless hand-pendant to move devices to the Setup target position, refer to section Using the GUI in Auto Mode on page 9-13. For further information on how to use the remote positioning controls to move devices to the Setup target position, refer to section Using the Remote Positioning Controls in Auto Mode on page 11-8.*

WARNING 	Make sure that the DID flat panel arms are fully retracted before attempting to move Patient Positioning Devices (PPDs) that can collide with the flat panels.

3. Choose the adequate imaging devices setup and move them to the chosen position.

   Note: *For further information on how to use the wireless hand-pendant to move the digital imaging devices, refer to section Moving the Digital Imaging Devices on page 9-31. For further information on how to use the remote positioning controls to move the digital imaging devices, refer to section Using Auto Mode to Move the Imaging Devices on page 11-18.*

   The **IN** (or **OUT**) status of the DID panels and X-ray tube A appears on the flat panel monitors when the selected device(s) reach(es) the desired position; depending on the device, these positions are:

   - X-ray tube: in the beam path
   - DID A: its inserted (extended) position
   - DID B: its inserted (extended) position

The background becomes highlighted if the setting is not compatible with the irradiation.

Note: *The desired DID flat panel* **must be in place** *before attempting to acquire an X-ray image.*

4. The system is now ready for X-ray images to be taken.

CAUTION	
	No Digital Imaging Device (DID) flat panel must be plugged or unplugged from the associated power supply while the power supply is powered on. If there is a need to connect or disconnect a DID panel, the associated power supply must be switched off first. Else the DID panel may suffer severe damage.

WARNING	
	Over time, the quality of digital radiographs may become degraded, suffer from an offset or a deterioration of the gain of the flat panels or from defective pixels. Periodic tests must be performed to ensure sufficient X-ray image quality. The frequency shall take into account the foreseeable flat panel deterioration by neutrons. In case of recalibration and corrective maintenance, contact immediately the assigned responsible team. For detailed information about these procedures, refer to the Original Equipment Manufacturer (OEM) documentation.

Setting up for Portal View X-ray Images in a GTR

This procedure is for the retractable X-ray tube inside the nozzle and the associated flat panel holder system.

To set up the equipment for the acquisition of portal view X-ray images, proceed as follows using the wireless hand-pendant or the remote positioning controls:

Note: *For further information on how to use the wireless hand-pendant, refer to Chapter 9. For further information on how to use the remote positioning controls, refer to Chapter 11.*

1. Move the patient positioning devices to the *Treatment* target position.

WARNING

Make sure that the DID flat panel arms are fully retracted before attempting to move Patient Positioning Devices (PPDs) that can collide with the flat panels.

2. Choose the adequate imaging devices setup and move them to the chosen position.

   The **IN** (or **OUT**) status of the DID panels and X-ray tube A appears on the flat panel monitors when the selected device(s) reach(es) the desired position; depending on the device, these positions are:

   - X-ray tube: in the beam path
   - DID A: its inserted (extended) position

   The background becomes highlighted if the setting is not compatible with the irradiation.

Note: *The desired DID flat panel* ***must be in place*** *before attempting to acquire an X-ray image.*

3. The system is now ready for X-ray images to be taken.

CAUTION

No Digital Imaging Device (DID) flat panel must be plugged or unplugged from the associated power supply while the power supply is powered on. If there is a need to connect or disconnect a DID panel, the associated power supply must be switched off first. Else the DID panel may suffer severe damage.

WARNING

Over time, the quality of digital radiographs may become degraded, suffer from an offset or a deterioration of the gain of the flat panels or from defective pixels.

Periodic tests must be performed to ensure sufficient X-ray image quality. The frequency shall take into account the foreseeable flat panel deterioration by neutrons.

In case of recalibration and corrective maintenance, contact immediately the assigned responsible team. For detailed information about these procedures, refer to the Original Equipment Manufacturer (OEM) documentation.

Setting up for Single-source (Rad-A) Stereoscopic X-ray Image Acquisition in the GTR

This procedure is for the retractable X-ray tube inside the nozzle and the associated flat panel holder system.

To set up the equipment for the acquisition of single-source (Rad-A) stereoscopic X-ray images, proceed as follows using the wireless hand-pendant or the remote positioning controls:

Note: *For further information on how to use the wireless hand-pendant, refer to Chapter 9. For further information on how to use the remote positioning controls, refer to Chapter 11.*

1. Move the PPS to the *Setup* or *Treatment* target position and use Manual motions to pre-align the patient using the lasers.

WARNING

Make sure that the DID flat panel arms are fully retracted before attempting to move Patient Positioning Devices (PPDs) that can collide with the flat panels.

2. Move the gantry to the *Nozzle Imager Start* target position.
3. Retract the snout holder into the nozzle.
4. Choose the adequate imaging devices setup and move them to the chosen position.

The **IN** (or **OUT**) status of the DID panels and X-ray tube A appears on the flat panel monitors when the selected device(s) reach(es) the desired position; depending on the device, these positions are:

- X-ray tube: in the beam path
- DID A: its inserted (extended) position

The background becomes highlighted if the setting is not compatible with the irradiation.

Note: *The desired DID flat panel* **must be in place** *before attempting to acquire an X-ray image.*

5. The system is now ready for X-ray images to be taken.

CAUTION	
	No Digital Imaging Device (DID) flat panel must be plugged or unplugged from the associated power supply while the power supply is powered on. If there is a need to connect or disconnect a DID panel, the associated power supply must be switched off first. Else the DID panel may suffer severe damage.

WARNING	
	Over time, the quality of digital radiographs may become degraded, suffer from an offset or a deterioration of the gain of the flat panels or from defective pixels. Periodic tests must be performed to ensure sufficient X-ray image quality. The frequency shall take into account the foreseeable flat panel deterioration by neutrons. In case of recalibration and corrective maintenance, contact immediately the assigned responsible team. For detailed information about these procedures, refer to the Original Equipment Manufacturer (OEM) documentation.

Setting up for Acquiring Stereo X-ray Images Using Rad-A

CAUTION	No Digital Imaging Device (DID) flat panel must be plugged or unplugged from the associated power supply while the power supply is powered on. If there is a need to connect or disconnect a DID panel, the associated power supply must be switched off first. Else the DID panel may suffer severe damage.

1. Acquire an X-ray image.
2. Move the gantry to the second angle by selecting Setup-90° or Treat-90° on the hand-pendant.
3. Acquire the second X-ray image.

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Setting up for Acquiring CBCT Images

CBCT images are acquired using X-Ray Tube Rad-B.

The CBCT acquisition controls provided by the X-ray image guidance system on the CBCT console (i.e., the CBCT buttons on the left hand side of the X-ray console) control the gantry rotation and enable you to acquire CBCT images, as follows:

1. Select one of the preset options (e.g., Head, Thorax, Pelvis, etc.) from the drop-down menu in adaPT*insight* .
2. Select a trajectory and a start angle.
3. Click **Load** to upload the parameters of the X-ray generator. On the adaPT*insight* screen, the status bar turns green (i.e., Ready).
4. Click **Start** from the adaPT*insight* screen. The green LED on the X-ray console starts blinking.
5. Press the green button on the X-ray console. The green LED on the X-ray console stops blinking after a few seconds.
6. The gantry starts rotating automatically to position the gantry at the pre-start angle, if not already at that angle. From this moment, the system forbids motion from the hand-pendant(s).

   The yellow LED on the X-ray console starts blinking when the gantry has reached the pre-start position. The gantry is now ready to start CBCT acquisition.
7. While the yellow LED is blinking, press the yellow button on the X-ray console. The X-ray tube starts taking images while the gantry rotates around the patient.
8. If desired, you can pause the acquisition, in any of the following ways:
   - Click **Pause** from the adaPT*insight* screen. The gantry will be halted gently.
   - Press the red button on the X-ray console to stop the rotation. Gantry motion is stopped abruptly. This should be used in emergency situations only.

   Note: *During the rotation, you can press the red button any time to stop the rotation.*
9. The hand-pendant(s) is (are) automatically released by adaPT*insight* at the end of acquisition.
10. Optionally, you can stop acquisition and release the hand-pendant during the CBCT scan. To do so, press **Pause** from the adaPT*insight* screen.

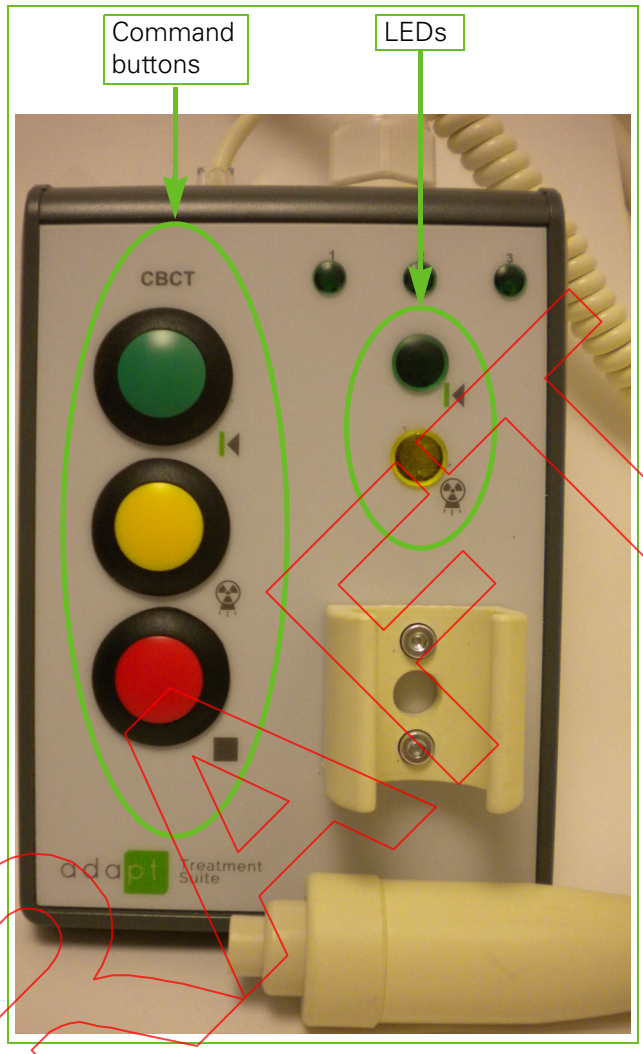

Figure 12-4. CBCT Commands on the X-ray Console

Check the absence of collision before initiating the CBCT acquisition by performing a dry-run. To perform the dry-run:

1. Select the CBCT acquisition parameter from the drop-down menu in adaPT*insight* (i.e., Clockwise or Counter ClockWise and define start angle). This automatically defines the **Prestart** and **Postend** position on the hand-pendant.
2. Proceed as detailed in section "*Preparing Equipment for a CBCT Acquisition*" on page 9-32.
3. During the dry-run gantry rotation, check that there is no collision and that the clearance is sufficient with the patient and/or equipment, such as anesthesia or respiratory equipment.

WARNING	As a Radiation Therapy Technologist (RTT), it is your responsibility to verify the absence of collision with the patient or any equipment before initiating a CBCT image acquisition by performing a dry-run. If the patient position or the position of immobilization devices changes between two different fractions, a new verification shall be performed.

WARNING	As a Radiation Therapy Technologist (RTT), always monitor the patient during motion in the CBCT X-ray image acquisition. In case the patient moves, the RTT shall interrupt the acquisition.

Note: *For detailed information on how to perform CBCT acquisition, refer to the adaPT*insight *documentation listed in chapter "About this Manual".*

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Chapter 13
Attaching/Removing a Patient Support Device to/from the PPS

Preliminary: Gantry Rolling Floor Precautions

When you are performing functions in the vicinity of the PPS, bear in mind the Gantry Rolling Floor (GTR) precautions as specified in section "*Gantry Rolling Floor Precautions*" on page 4-3.

Couch Identification

When using multiple accessories, it is possible to use the Tool ID system.

The system identifies each accessory with a different number. It also gives the opportunity to check if the correct accessory has been coupled.

The system consists of a module mounted on the side of a tool plate. This module has two thumbwheels to set an ID (Figure 13-1).

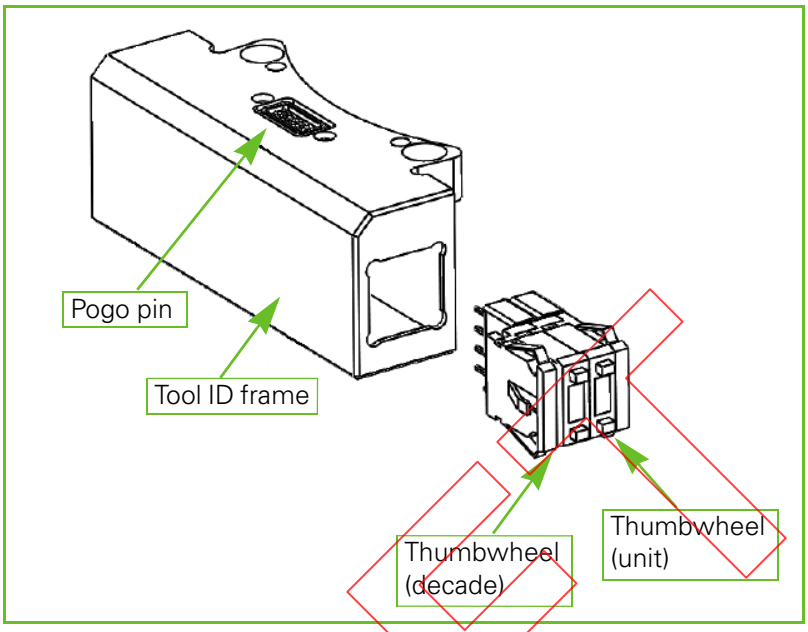

Figure 13-1. Tool ID system for couch identification

The Docking Principle

Prior to treatment, the patient is placed on a docking device (also called patient support device) such as a bed that is capable of being attached (also called *docked*) to the PPS.

CAUTION	Using the long couch extension with the Patient Positioning System (PPS) for vertex fields in a Gantry Treatment Room (GTR) is not possible because of a mechanical interference between the couch and the nozzle. In order to avoid the risk of collisions, a short table-top must be used.

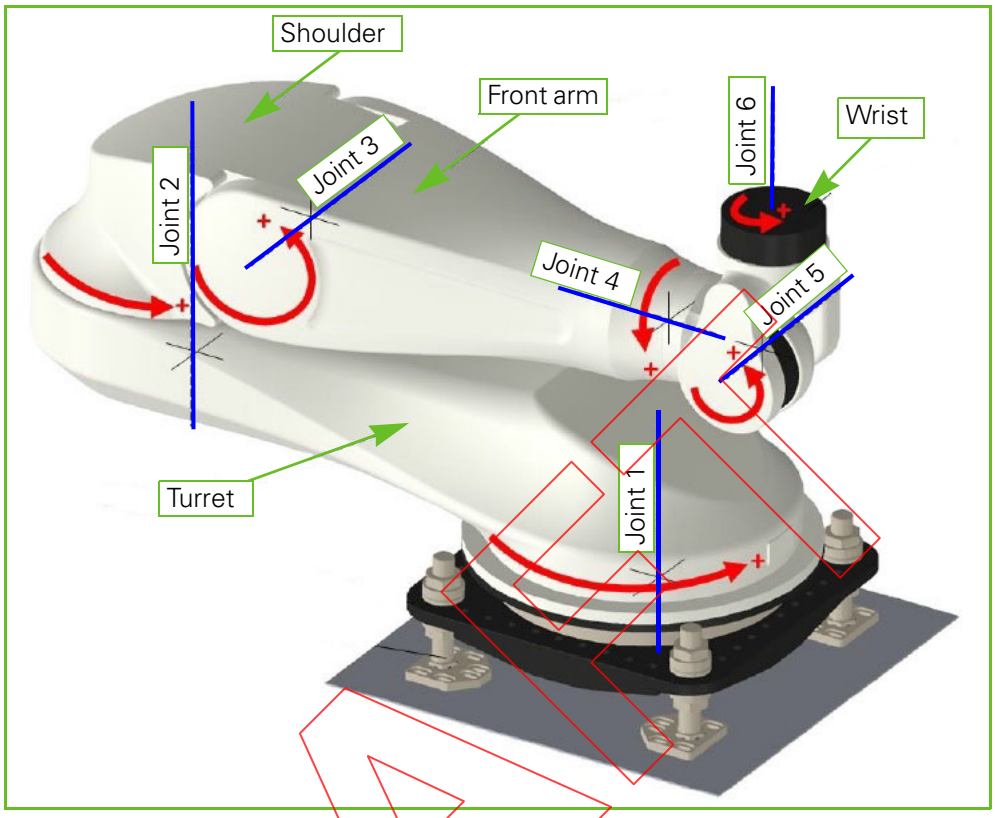

Figure 13-2. PPS - Major Moving Parts

The Patient Positioning System has one air locking coupler installed on the coupling system (Figure 13-3), facing up.

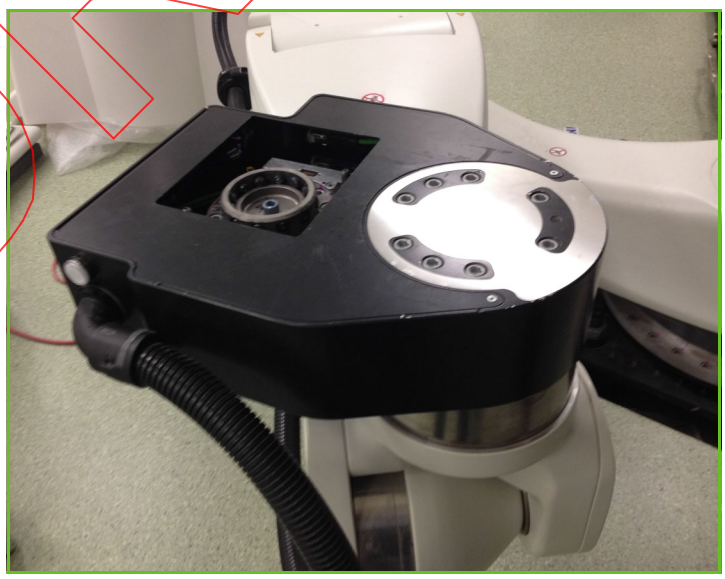

Figure 13-3. Coupling System

Each docking device also has one air locking coupler installed, facing down. Joining the docking device coupler with the corresponding PPS coupler firmly latches the docking device to the PPS.

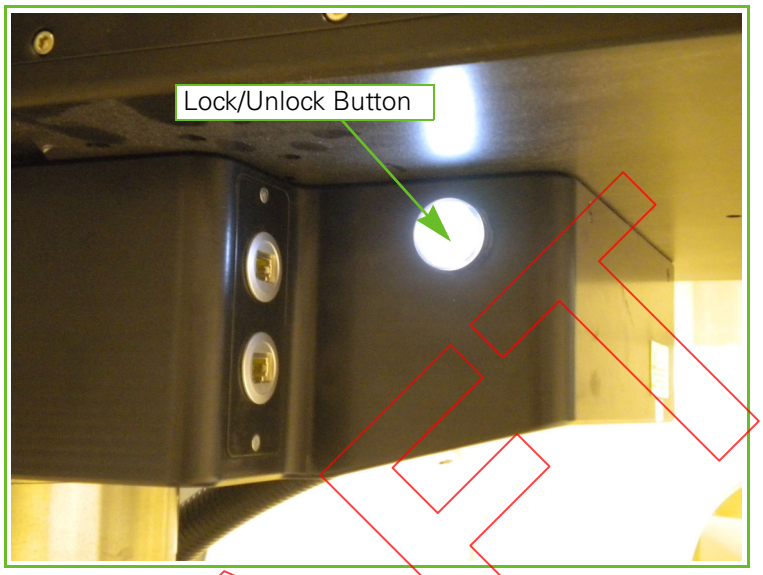

Figure 13-4. Lock/Unlock Button

Once the docking device is firmly latched to the PPS, pressurized air is required to maintain the couch firmly locked with the robot and to ensure the repeatability of the positioning of the couch on the PPS. However, the couch locking is failsafe. In case of power failure, the couch will remain attached to the robot. It may, however, slightly move with respect to the robot. In such a case, the accuracy of the patient positioning cannot be guarantied, and no treatment shall be performed. Power must be established to be able to disengage the couplers.

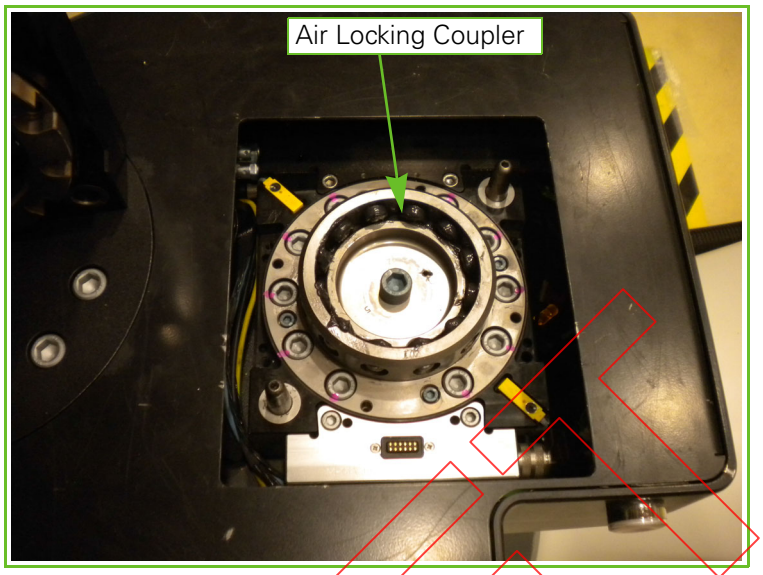

Figure 13-5. Air Locking Coupler on the Wrist

Docking Modes

The docking device can be docked onto the PPS in the following mode:

- **Manually**: you manually position the docking device over the wrist of the PPS and you manually line up the docking device coupler with the PPS coupler.

  For detailed information, refer to section "*Manual Docking and Undocking*" on page 13-7.

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Manual Docking and Undocking

WARNING	No patient must be present on the docking device while performing a manual docking or undocking procedure.

Manually Docking a PPS Support Device

To manually attach a docking device to the PPS:

1. Manually move the docking device over the coupling system of the PPS.

CAUTION	The Patient Positioning System (PPS) coupler and the docking device coupler can only lock when they are properly aligned. Make sure that both couplers are properly aligned before pressing the lock/unlock button on the wrist.

2. Lower the docking device slowly onto the coupler housing.
3. Long touch the PPS icon on the WIRELESS HAND-PENDANT GUI SCREEN (see Figure 8-2). The POSITIONER MENU appears (see Figure 13-6).

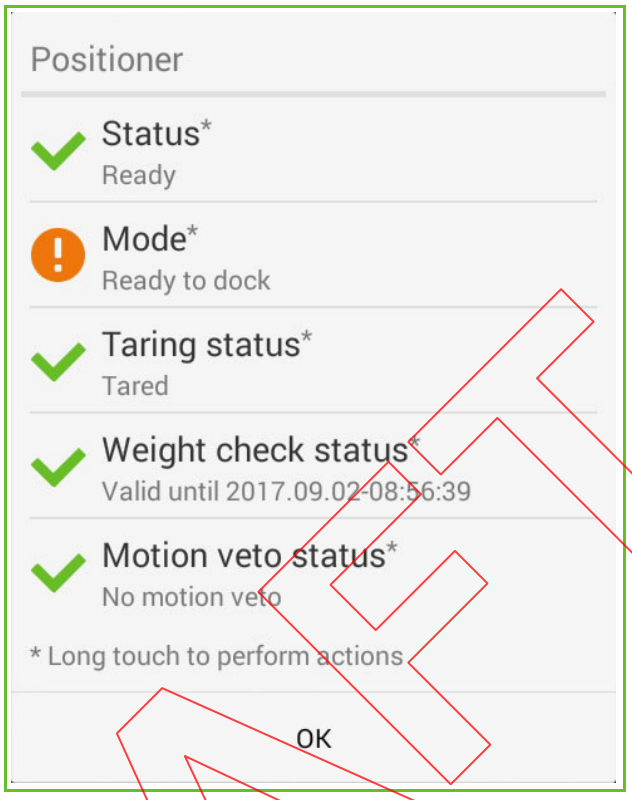

Figure 13-6: Positioner Menu Ready to Dock

4. Long touch **Mode**. **Ready to Dock** appears.
5. Press the lock/unlock button on the coupling system. The docking device is now pneumatically locked onto the coupling system.

   Note: *There is a lock/unlock button on either side of the coupling system. You can use any of these two buttons.*

   Note: *The lock/unlock buttons on the coupling system are lit before and after the docking/undocking procedure; the buttons are blinking during that process.*
6. Visually verify that the lock/unlock button on the coupling system is lit and not blinking.

CAUTION	Movement of the Patient Positioning System (PPS) is only possible if the coupler is properly engaged and if the docking device is locked, i.e., the lock/unlock button on the coupling system has been pressed.

7. Long touch the PPS icon on the WIRELESS HAND-PENDANT GUI SCREEN (see Figure 8-2). The POSITIONER MENU appears (see Figure 13-6).
8. Press and hold the **Motion Enable Button** on the hand-pendant.
9. Long touch **Mode**. **Ready to Move** appears (Figure 13-7).

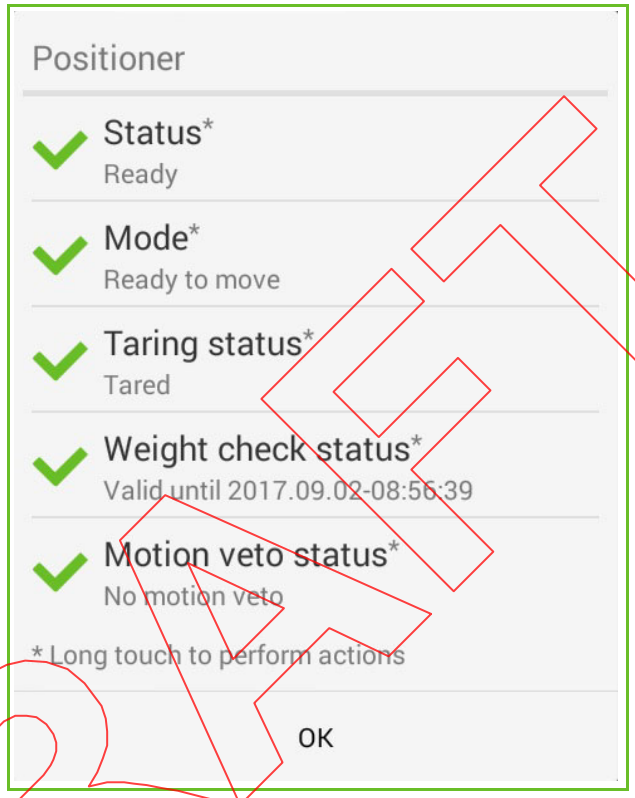

Figure 13-7. Positioner Menu Ready to Move

Manually Undocking a PPS Support Device

To manually release a docking device from the PPS:

1. Move the PPS in a position that enables the docking device to be easily removed from the treatment room.

2. Long touch the PPS icon on the WIRELESS HAND-PENDANT GUI SCREEN (see Figure 8-2). The POSITIONER MENU appears (see Figure 13-6).
3. Long touch **Mode**. **Ready to Undock** appears.

CAUTION	Make sure to sufficiently support the docking device before pressing the lock/unlock button on the wrist to unlock the couplers. Failure to do so may result in bodily harm or equipment damage.

4. Keep the lock/unlock button on the coupling system pressed until it starts blinking.
5. Release the button, then press it again. The docking device is now pneumatically unlocked from the wrist.
6. Visually verify that the lock/unlock button on the wrist is not lit anymore.
7. Raise the docking device slowly over the coupler housing.

8. Long touch the PPS icon on the WIRELESS HAND-PENDANT GUI SCREEN (see Figure 8-2). The POSITIONER MENU appears (see Figure 13-6).
9. Press and hold the **Motion Enable Button** on the hand-pendant.
10. Long touch **Mode**. **Ready to Move** appears.
11. Manually move the docking device away from the coupling system of the PPS.

Automatic Docking and Undocking

Overview: Automatic Docking

A docking device such as a couch can be automatically docked onto the PPS. The **typical automatic docking process** is as follows:

1. The trolley (also called 'gurney'), with the docking device mounted on it, is positioned in a dedicated docking position in the treatment room.
2. The PPS knows this docking position and therefore can line up its air locking coupler with the coupler of the docking device.

CAUTION	It is recommended not to jog in the docking area.

3. Both couplers get engaged; you then must manually lock the docking device coupler and the PPS coupler by pressing the button on the wrist (see Figure 13-4).
4. When locked, you can lift the docking device from the trolley and move it to the treatment position.

Overview: Automatic Undocking

Conversely, a docking device can be automatically undocked from the PPS. The **typical automatic undocking process** is as follows:

1. The PPS moves the docking device away from the treatment position to the dedicated docking position where a trolley is waiting to receive the docking device.
2. After the PPS automatically lowers the docking device onto the trolley, you must manually unlock the docking device coupler from the PPS coupler by pressing the button on the wrist (see Figure 13-4).
3. You can then instruct he PPS to move away from the docking location, enabling you to remove the trolley from the treatment room.

Positions and Areas

Automatic docking functions can be performed in well defined areas and in specific positions.

The **docking area** is a space that covers those locations where the PPS coupler is capable of attaching to the docking device coupler. The collision avoidance and collision detection systems of the PPS can detect a collision throughout the **docking area**, with the exception of the coupling area.

The **coupling area** inside the docking area is a small area close to the **docking position** where collision detection is disabled.

The **docking position** is the dedicated location where the trolley with the docking device must be precisely positioned; the **docking position** is known to the PPS, which enables the PPS coupler to line up with the docking device coupler.

Any docking operation can start from inside or outside the docking area but will always pass by the **docking reference position**. This is a uniquely defined position on the edge of the docking area.

Furthermore, a **reference workspace** is defined; fetch and put back operations (refer to section "*Docking Instructions*" on page 13-13) can only be performed when the PPS coupler is positioned inside the reference workspace.

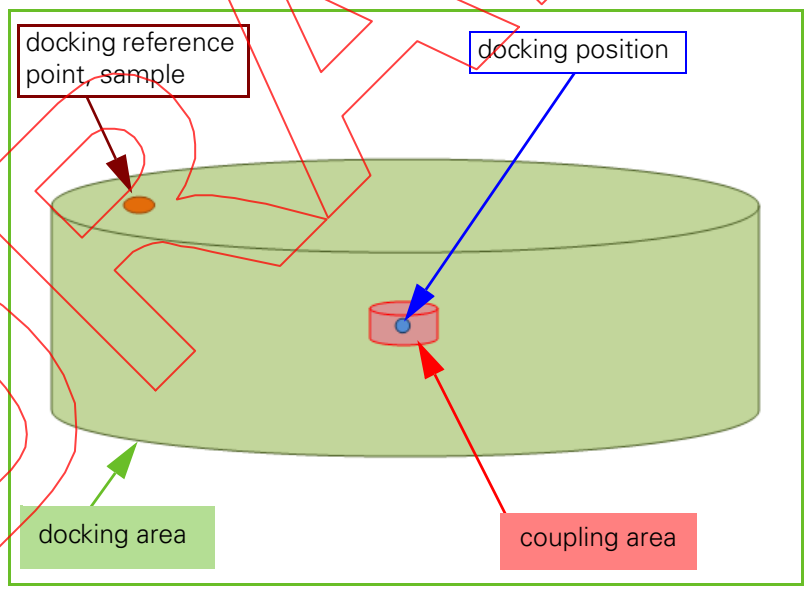

Figure 13-8. Automatic Docking Areas and Positions (Side view)

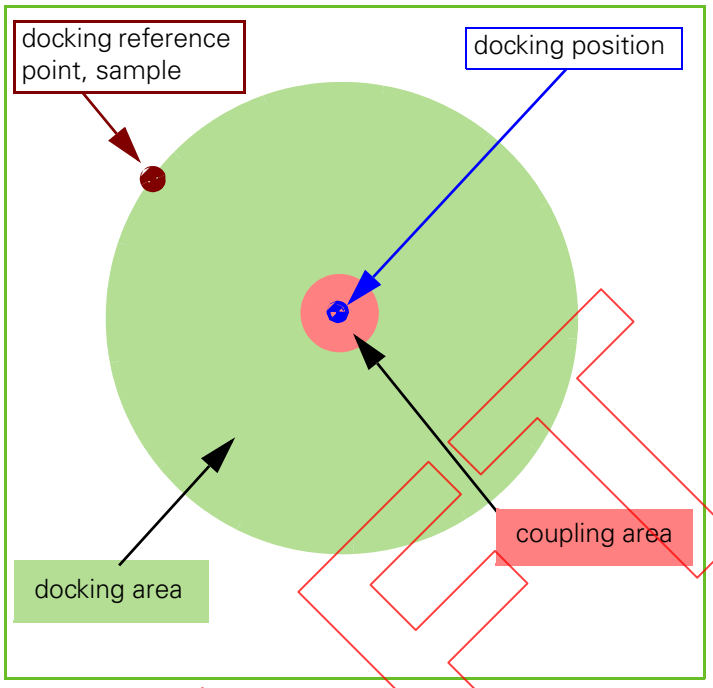

Figure 13-9. Automatic Docking Areas and Positions (Top down view)

Docking Instructions

The following automatic docking instructions are available from the hand pendant menu:

- **Fetch**: to move the vacant PPS horizontally towards the docking position and vertically up until the PPS coupler touches the coupler of the docking device supported by the trolley. Any fetch movement passes by the docking reference point (see Figure 13-9).
- **Lift**: to raise the loaded docking device from the trolley, after the lock/unlock button on the wrist has been pressed, and to move the docking device away towards the treatment position.
- **Put back**: to move the PPS, loaded with a loaded docking device, horizontally towards the docking position and vertically down to deposit the docking device on a vacant trolley that is waiting there. Any put back movement passes by the docking reference point (see Figure 13-9).
- **Release**: to lower the PPS under the docking device, after the lock/unlock button on the wrist has been pressed, and to move the vacant PPS horizontally away from the docking position to a safe position.
- **Manual**: to perform a manual docking operation.

- **Cancel**: to cancel the selected docking operation.

Note: *Be aware that neither Manual nor Auto motions are possible before termination of an automatic docking or undocking operation when the PPS is in the docking area. If you cannot allow an ongoing docking or undocking operation to terminate orderly, you must select the* **Cancel** *option if you want to perform a Manual or Auto motion with the PPS.*

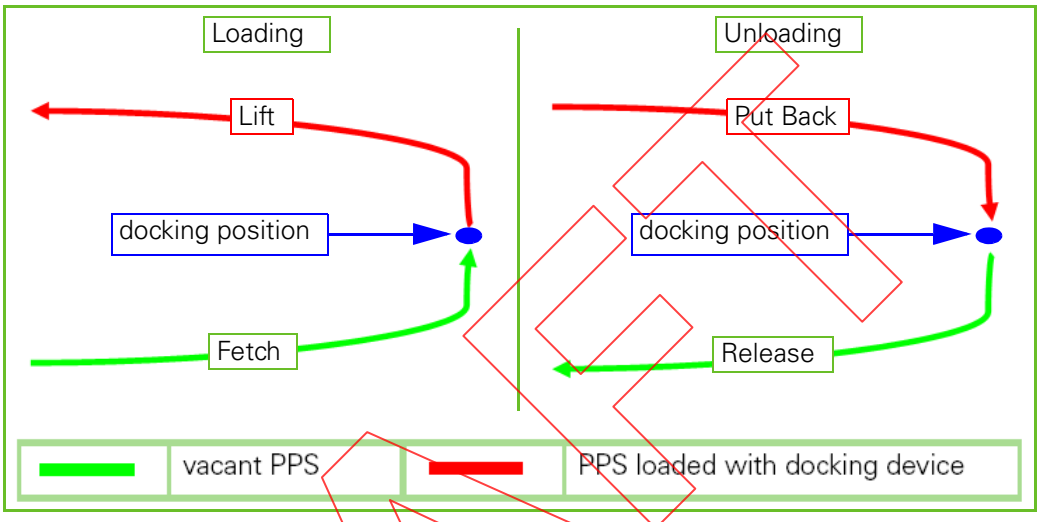

Figure 13-10. Automatic Docking - Sequence of Operations sideview

Automatically Docking a Docking Device

CAUTION	A total load on the docking device exceeding 180 kg (397 lbs) will generate a prompt on the hand pendant requesting the Radiation Therapy Technologist (RTT) for an acknowledgment to proceed. Any load on the docking device exceeding 250 kg (551 lbs) will prevent the PPS from moving.

To automatically attach a docking device to the PPS:

1. Move the trolley with the docking device mounted on it to the docking position.
2. Lock the trolley in that position.

CAUTION	The Patient Positioning System (PPS) coupler and the docking device coupler can only lock when they are properly aligned. Make sure that both couplers are properly aligned before pressing the lock/unlock button on the wrist.

3. Make sure that the lock/unlock button on the wrist is pressed.

   Note: *If the lock/unlock button on the wrist is not pressed at this stage, the docking procedure will fail.*

4. Select the Automatic Docking option from the ADVANCED MENU (see Figure 13-11). The AUTOMATIC DOCKING SCREEN appears (see Figure 13-12).

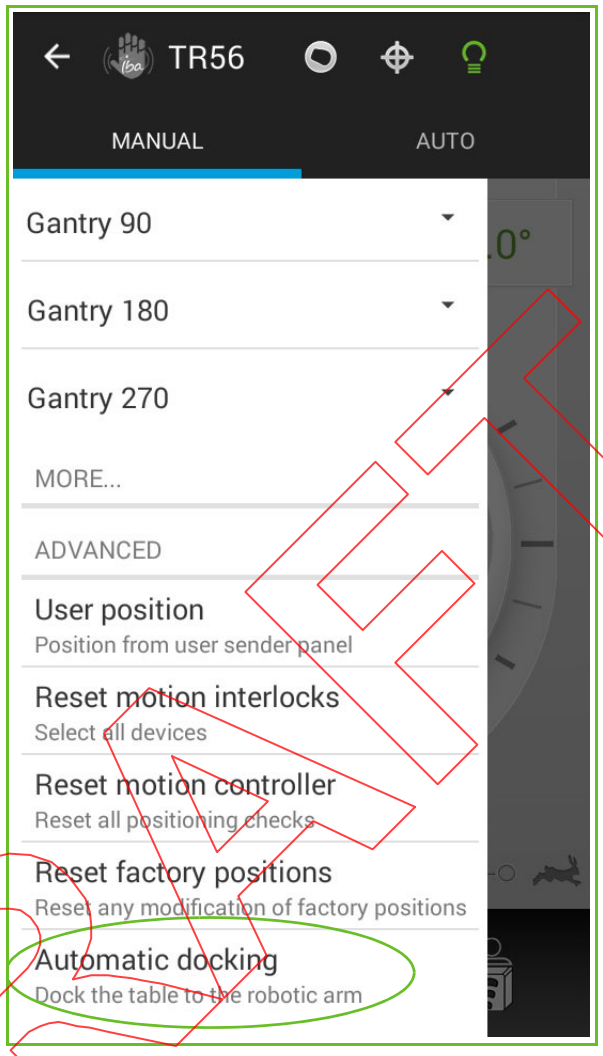

Figure 13-11. Advanced Menu

5. Press and hold the **Motion Enable Button** on the hand pendant.
6. Click the **Fetch** icon from the AUTOMATIC DOCKING SCREEN (see Figure 13-12).
7. Touch and hold the relevant **Move** button till completion of the Fetch sequence.
8. Click **OK** to acknowledge the message that appears.
9. Press the lock/unlock button on the wrist to manually lock the docking device coupler and the PPS coupler.

   Note: *If the docking device coupler fails to engage with the PPS coupler, check to see that the lock/unlock button on the wrist is lit.*

CAUTION	Movement of the Patient Positioning System (PPS) is only possible if the coupler is properly engaged and if the docking device is locked, i.e., the lock/unlock button on the coupling system has been pressed.

10. Visually verify that the lock/unlock button on the wrist is lit.
11. Press and hold the **Motion Enable Button** on the hand pendant.
12. Click the **Lift** icon from the AUTOMATIC DOCKING SCREEN (see Figure 13-12).
13. Touch and hold the relevant **Move** button till completion of the Lift sequence.

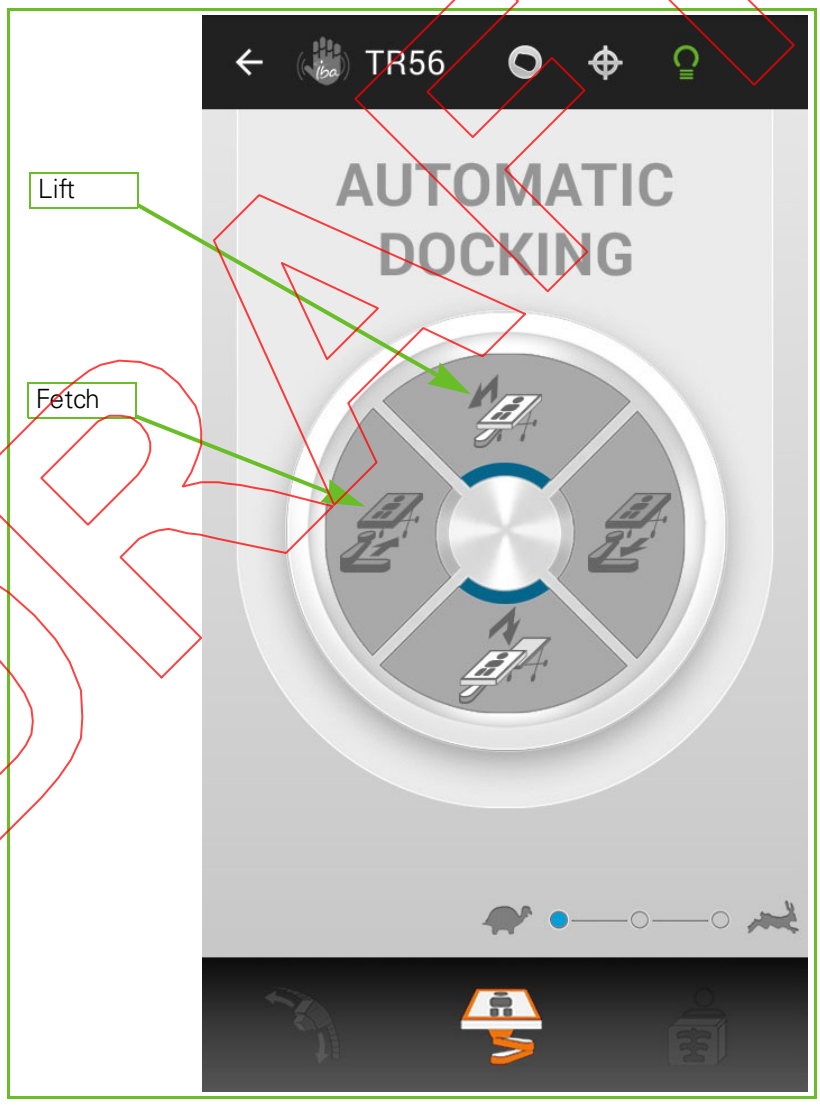

Figure 13-12. Automatic Docking Screen

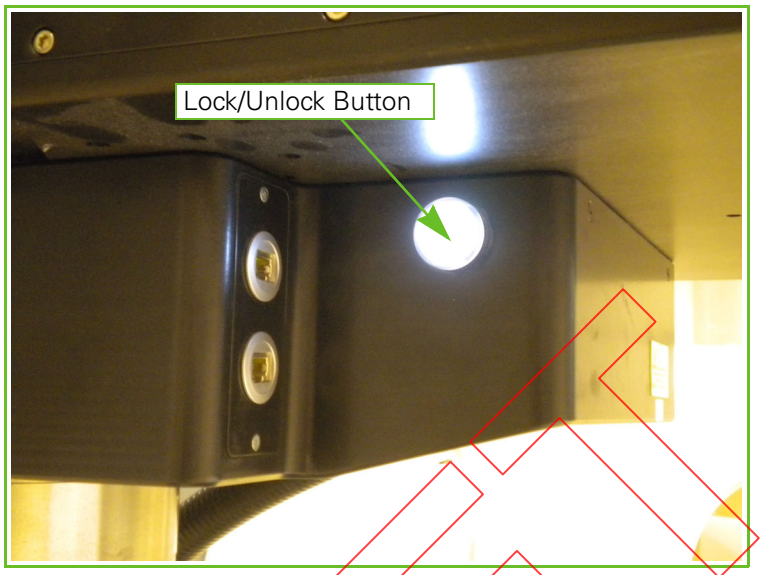

Figure 13-13. Lock/Unlock Button

Automatically Undocking a Docking Device

To automatically release a docking device from the PPS:

1. Press and hold the **Motion Enable Button** on the hand pendant.
2. Select the Automatic Docking option from the ADVANCED MENU (see Figure 13-11). The AUTOMATIC DOCKING SCREEN appears (see Figure 13-12).
3. Click the **Put Back** icon from the AUTOMATIC DOCKING SCREEN (see Figure 13-14).

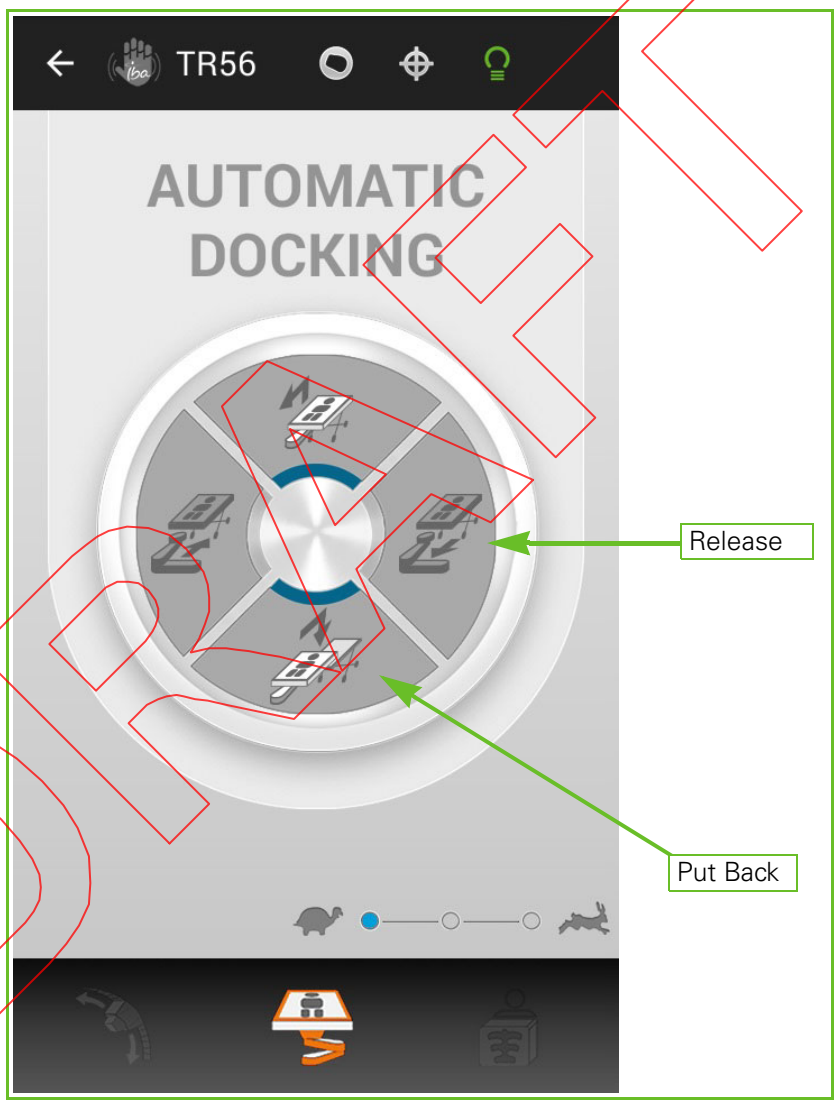

Figure 13-14. Automatic Docking Screen

4. Touch and hold the relevant **Move** button till completion of the Put Back sequence.
5. Click **OK** to acknowledge the message that appears.

6. Disengage the docking device coupler fails to disengage from the PPS coupler:
   a. Long press (approximately 3 seconds) the lock/unlock button on the wrist. The button starts blinking.
   b. Release the lock/unlock button on the wrist.
   c. Within two seconds, press the lock/unlock button on the wrist until the button goes dark (approximately 1 second).
   d. Visually verify that the lock/unlock button on the wrist is dark.

   Note: *If the docking device coupler fails to disengage from the PPS coupler, check to see that the lock/unlock button on the wrist is dark.*
7. Press and hold the **Motion Enable Button** on the hand pendant.
8. Click the **Release** icon from the AUTOMATIC DOCKING SCREEN (see Figure 13-12).
9. Touch and hold the relevant **Move** button till completion of the Release sequence.

Interrupting, Resuming, or Cancelling an Automatic Docking or Undocking Operation

Interrupting an Automatic Docking or Undocking Operation

To interrupt an ongoing automatic docking or undocking operation, release the relevant **Move** button on the hand pendant.

Resuming an Automatic Docking or Undocking Operation

To resume an interrupted operation:

1. Click **OK** to acknowledge the message that appears.
2. From the AUTOMATIC DOCKING SCREEN (see Figure 13-12), select the docking or undocking function that was interrupted.
3. Touch and hold the relevant **Move** button till completion of the selected function.
4. Press **OK** to acknowledge the message that appears.

Canceling an Automatic Docking or Undocking Operation

If you do not want a docking or undocking operation to complete orderly, perform as follows:

1. Release the **M** (Move) button on the hand pendant to interrupt the ongoing operation.
2. Click **OK** to acknowledge the message that appears.
3. Tap the **Back** button.

   Note: *The **Back** button is the rightmost button at the bottom of the hand pendant, below the screen (see Figure 13-15).*

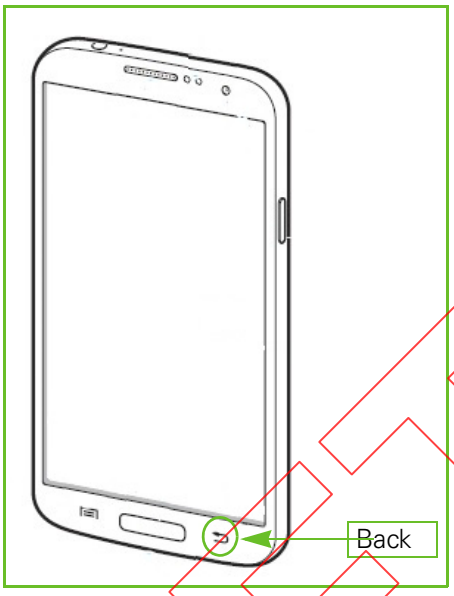

Figure 13-15. Back Button

4. Click **OK** to acknowledge that you want to cancel docking.

Chapter 14
Installing and Removing Accessories into/from the Accessory Drawer or PBS Dedicated Snout

In the irradiation preparation phase using adaPT*deliver*, it may be required to install one or two accessories onto the accessory holder or the PBS dedicated snout, as outlined in the prescription.

Accessories

Possible accessories are:

- Range shifter (tray mounted)
- Ridge filter (tray mounted)
- Block
- Range compensator

In addition, a tray mounted snout can be installed in the accessory drawer; the snout itself has two accessory slots.

Important	The range shifter, ridge filter, or snout forms one assembly with its tray. Throughout this chapter, whenever the terms 'range shifter', 'ridge filter', or 'snout' are used this means the assembly together with its tray. The range shifter, ridge filter, or snout must NOT be disassembled from its tray.

Accessories can be inserted into the accessory drawer or into a snout that may be mounted onto the accessory drawer. Table 14-1 details which accessories or combination of accessories can be used.

Table 14-1. PBS Accessories

PBS Dedicated Snout	Range Shifter	Ridge Filter	Empty	Block	Range Compensator
Snout	**Range Shifter**	**Ridge Filter**	**Empty**		
Snout Holder + Drawer + Tray (1 accessory)	✓	✓	✓		
Snout Holder + Drawer + Tray **+ Snout** (max 2 types of accessories)	✓			✓	
				✓	✓
				✓	
					✓
	✓				

Note: *Note that there are two kinds of range shifters and ridge filters. The hardware design of these accessories is different depending on whether they are meant to be installed on the accessory drawer (rectangular surface) or on the snout (circular surface).*

For detailed information on the different accessories or the PBS dedicated snout, refer to *PTS System Description*.

The accessory drawer is mounted onto the snout holder, which in itself is mounted at the exit of the PBS Dedicated Nozzle (see Figure 14-1). The snout holder is able to move the accessory drawer towards or away from the isocenter.

All required accessories, if any, must be installed when the therapist is ready to start irradiation. When the irradiation has finished, the accessories must be removed to enable treatment of a next patient.

Note: *It is up to the Radiation Therapy Technologist (RTT) to identify and install the proper block and range compensator. .*

If the block and range compensator does not fit the snout, it may mean that the snout is the wrong type. Blocks are keyed to a specific snout and range compensators contain one or more orientation pins to prevent incorrect installation of patient specific devices.

Preliminary Precautions

Preliminary: Gantry Rolling Floor Precautions

When you are performing functions in the vicinity of the PPS, bear in mind the Gantry Rolling Floor (GTR) precautions as specified in section "*Gantry Rolling Floor Precautions*" on page 4-3.

Accessory Precautions

WARNING

In a GTR, be aware of the risks associated with the installation of removable accessories in a gantry position where the accessory is suspended above the patient (i.e., gantry angles between 0° and 90° and between 270° and 360°), particularly when the accessory has a mass higher than 5 kg.

Use the lower quadrant positions of the gantry to install removable accessories when the patient is installed on the patient support.

Those removable accessories are:

- blocks and range compensators
- range shifters and ridge filters
- the Dedicated Nozzle snouts XL, M, and S

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Accessory Holder Operations

The accessory holder need not be in any particular position to enable an accessory or the snout to be inserted or removed. On the other hand, for safety reasons, moving the accessory drawer using the hand pendant is only possible when the snout holder is retracted.

Note: *With regard to ease of handling, the range shifter, snout type XL, and the ridge filter can ideally be mounted onto and dismounted from the accessory drawer with the gantry rotated to the 270° (9:00 o'clock) or 90° (3:00 o'clock) position.*

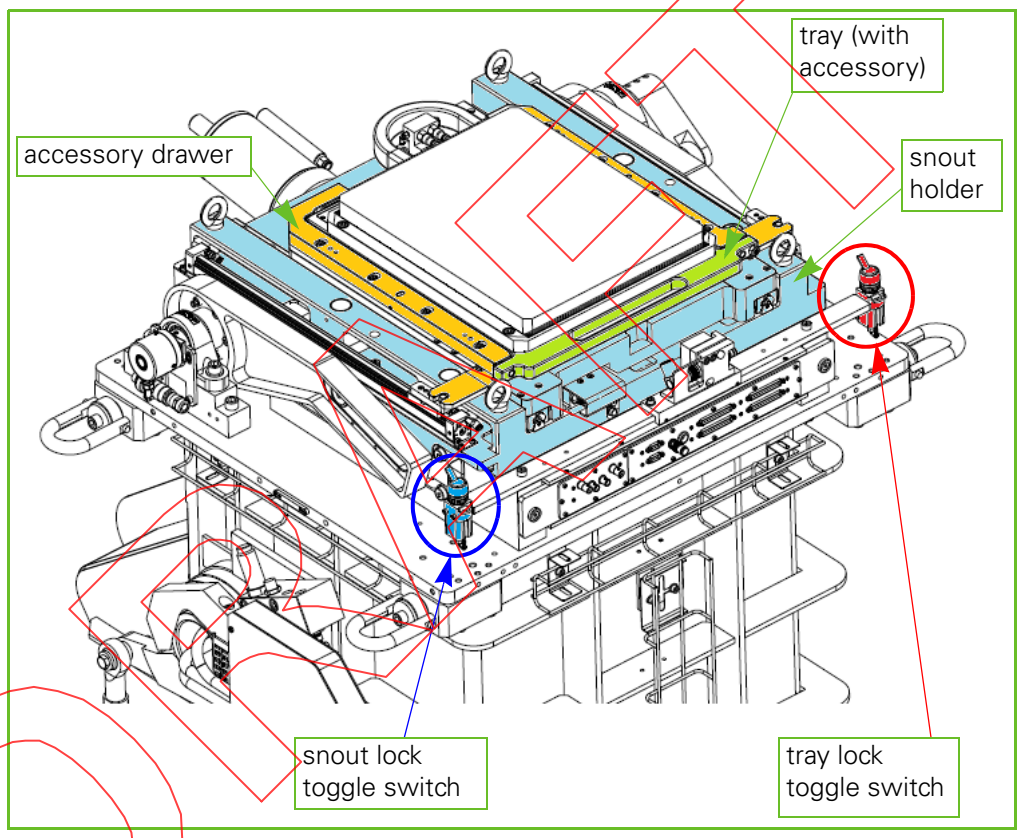

Figure 14-1. PBS Dedicated Snout Holder

Installing an Accessory or Snout onto the Accessory Drawer

The procedure to install an accessory or snout onto the drawer is as follows:

1. Make sure that the tray toggle switch is in the **Unlocked** position (see Figure 14-1), i.e., up.
2. Insert the tray mounted accessory or snout into the drawer. Make sure that it is completely introduced.

3. Depress the tray toggle switch to the **Locked** position.

Removing an Accessory or Snout from the Accessory Drawer

The procedure to remove an accessory or snout from the drawer is as follows:

1. Pull the tray lock toggle switch up to the **Unlocked** position (see Figure 14-1).
2. Remove the tray mounted accessory or snout from the drawer.
3. Depress the tray lock toggle switch to the **Locked** position.
4. Store the tray mounted accessory or snout in its dedicated location.

Snout Types

The following snout(s) is (are) available at your center:

The following section(s) explain(s) how to install and remove accessories on the snout(s) that is (are) available at your center:

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Type DN_S (Dedicated Nozzle - Small) Snout Operations

The type DN_S snout is a round snout with two slots:

- one block holder (slot 1)
- one range compensator, range shifter or ridge filter holder (slot 2)

One hinged retainer, including a spring-loaded retaining pin, secures the accessories once installed onto the snout. Two safety locks retain the accessories in place even when the hinged retainer is open.

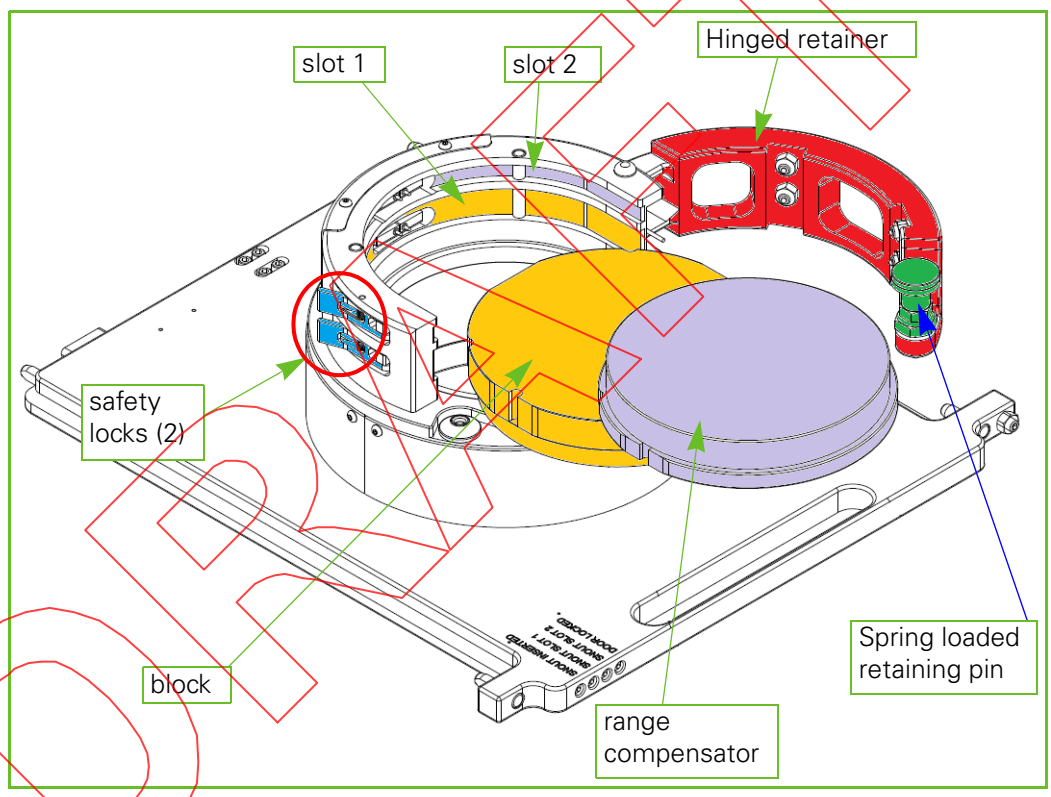

Figure 14-2. Type DN_S Snout Components

Four LEDs are installed on the snout's tray:

- SNOUT INSERTED
- SNOUT SLOT 1
- SNOUT SLOT 2
- DOOR LOCKED

The LEDs turn ON (green light) when the respective presence switches or pressure pins send a signal indicating that (each item corresponding to a LED in the same order as the list above):

- The snout has been inserted
- The block has been installed into slot 1
- The second accessory has been installed into slot 2
- The hinged retainer is closed

Two presence switches installed at the back of the snout detect the correct installation of the accessories. A pressure pin on the hinged retainer detects whether or not the retainer has been closed.

Otherwise, the LEDs are OFF.

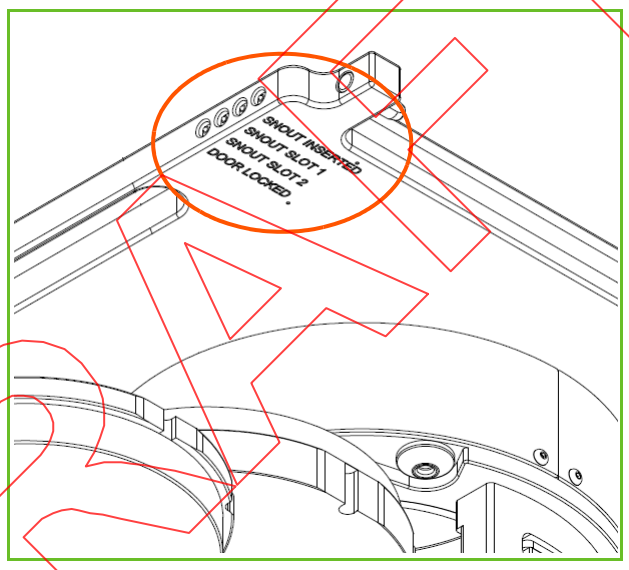

Figure 14-3. LEDs on the Snout's Tray

Installing Accessories onto a DN_S Type Snout

Note: *The maximum combined weight of all accessories installed in the DN_S type snout must not exceed 10 kg.*

The procedure to install a block and accessory onto a DN_S type snout is as follows:

1. Pull the spring-loaded retaining pin to release the hinged retainer.
2. Open the hinged retainer.
3. Align the two key-ways on the edge of the block with the two keys inside the groove of the fixed block holder.
4. Insert the block; the safety lock falls into place and the LED on the snout's tray indicating 'Snout Slot 1' turns green.
5. Repeat Step 3 with the range compensator, range shifter or ridge filter to be installed on the second slot.
6. Insert the range compensator, range shifter or ridge filter; the safety lock falls into place and the LED on the snout's tray indicating 'Snout Slot 2' turns green.
7. Push the surface of the hinged retainer to close it; the spring-loaded retaining pin automatically falls into its locked position.

CAUTION	Do not use the spring-loaded retaining pin to close the hinged retainer. When you try to use the spring-loaded retaining pin, you may crush your fingers.

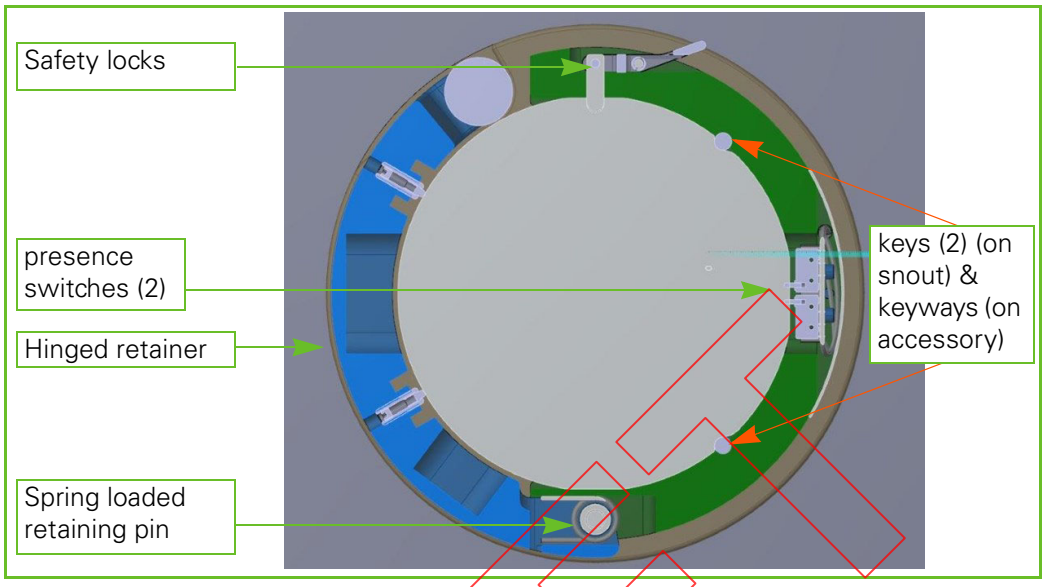

Figure 14-4. Type DN_S Snout (lateral cut)

Removing Accessories from a DN_S Type Snout

The procedure to remove a block and accessory from a DN_S type snout is as follows:

1. Pull the spring-loaded retaining pin to release the hinged retainer.
2. Open the hinged retainer.
3. Unlock the safety lock retaining the accessory installed on slot 2.
4. Remove the accessory from slot 2.
5. Unlock the safety lock retaining the block installed on slot 1.
6. Remove the block from slot 1.
7. Push the surface of the hinged retainer to close it; the spring-loaded retaining pin automatically falls into its locked position.

CAUTION	Do not use the spring-loaded retaining pin to close the hinged retainer. When you try to use the spring-loaded retaining pin, you may crush your fingers.

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Type DN_M (Dedicated Nozzle - Medium) Snout Operations

The type DN_M snout is a round snout with three slots:

- two block holders (slots 1.1 and 1.2)
- one range compensator, range shifter or ridge filter holder (slot 2)

One hinged retainer, including a spring-loaded retaining pin, secures the accessories once installed onto the snout. Three safety locks retain the accessories in place even when the hinged retainer is open.

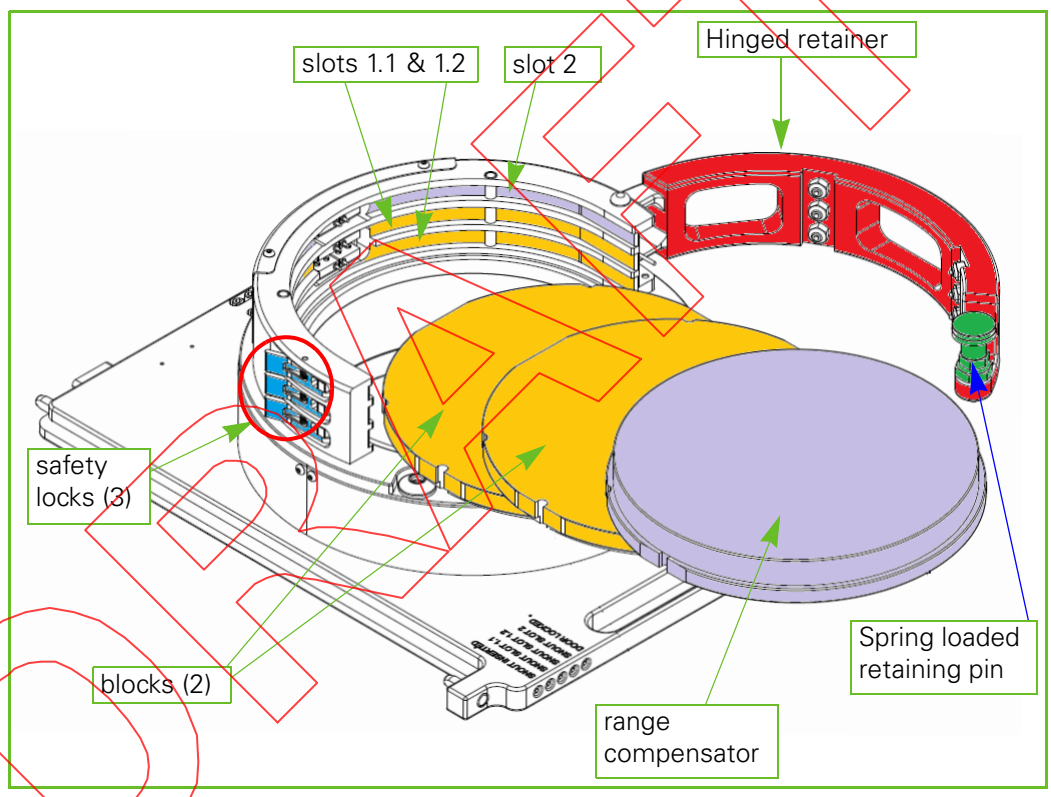

Figure 14-5. Type DN_M Snout Components

Five LEDs are installed on the snout's tray:

- SNOUT INSERTED
- SNOUT SLOT 1.1
- SNOUT SLOT 1.2
- SNOUT SLOT 2
- DOOR LOCKED

The LEDs turn ON (green light) when the respective presence switches or pressure pins send a signal indicating that (each item corresponding to a LED in the same order as the list above):

- The snout has been inserted
- The first block slice has been installed into slot 1.1
- The second block slice has been installed into slot 1.2
- The second accessory has been installed into slot 2
- The hinged retainer is closed

Three presence switches are installed at the back of the snout detect the correct installation of the accessories. A pressure pin on the hinged retainer detects whether or not the retainer has been closed.

Otherwise, the LEDs are OFF.

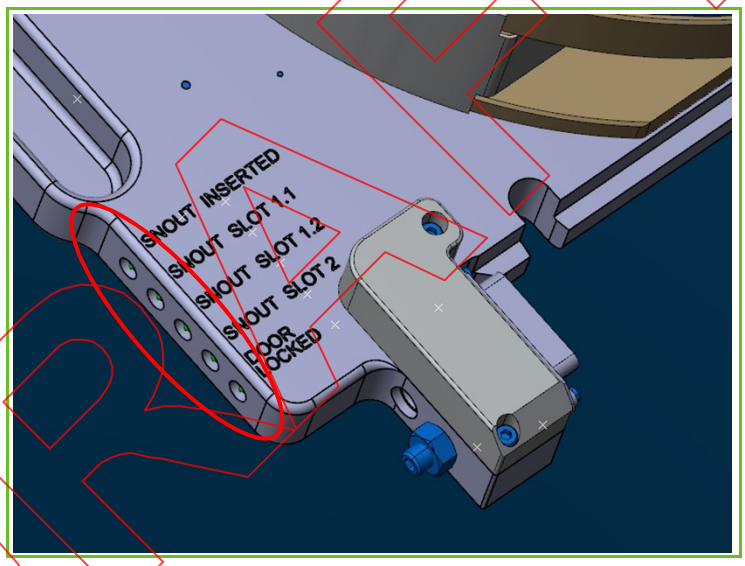

Figure 14-6. LEDs on the Snout's Tray

Installing Accessories onto a DN_M Type Snout

Note: *The maximum combined weight of all accessories installed in the DN_M type snout must not exceed 20 kg.*

The procedure to install a block and accessory onto a DN_M type snout is as follows:

1. Pull the spring-loaded retaining pin to release the hinged retainer.
2. Open the hinged retainer.
3. Align the two key-ways on the edge of the first block slice with the two keys inside the groove of the fixed block holder.
4. Insert the first block slice; the safety lock falls into place and the LED on the snout's tray indicating 'Snout Slot 1.1' turns green.
5. Repeat Step 3 with the second block slice.
6. Insert the second block slice; the safety lock falls into place and the LED on the snout's tray indicating 'Snout Slot 1.2' turns green.
7. Repeat Step 5 with the range compensator, range shifter or ridge filter to be installed on the third slot.
8. Insert the range compensator, range shifter or ridge filter; the safety lock falls into place and the LED on the snout's tray indicating 'Snout Slot 2' turns green.
9. Push the surface of the hinged retainer to close it; the spring-loaded retaining pin automatically falls into its locked position.

CAUTION	Do not use the spring-loaded retaining pin to close the hinged retainer. When you try to use the spring-loaded retaining pin, you may crush your fingers.

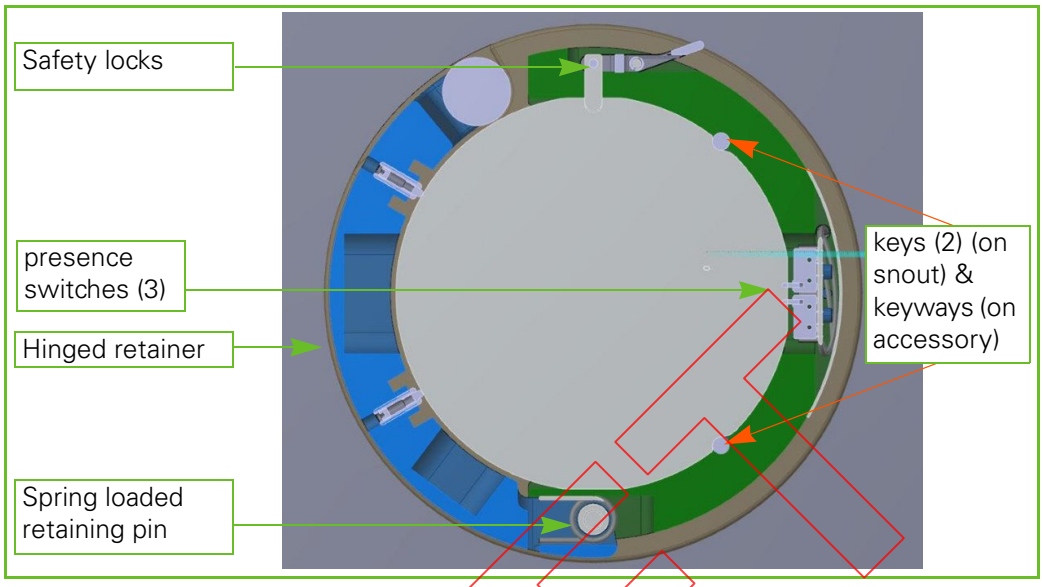

Figure 14-7. Type DN_M Snout (lateral cut)

Removing Accessories from a DN_M Type Snout

The procedure to remove a block and accessory from a DN_M type snout is as follows:

1. Pull the spring-loaded retaining pin to release the hinged retainer.
2. Open the hinged retainer.
3. Unlock the safety lock retaining the accessory installed on slot 2.
4. Remove the accessory from slot 2.
5. Unlock the safety lock retaining the block slice installed on slot 1.2.
6. Remove the block slice from slot 1.2.
7. Unlock the safety lock retaining the block slice installed on slot 1.1.
8. Remove the block slice from slot 1.1.
9. Push the surface of the hinged retainer to close it; the spring-loaded retaining pin automatically falls into its locked position.

CAUTION	Do not use the spring-loaded retaining pin to close the hinged retainer. When you try to use the spring-loaded retaining pin, you may crush your fingers.

Type DN_XL (Dedicated Nozzle - Extra Large) Snout Operations

The type DN_XL snout is a rectangular snout with five slots that cater to two different accessories:

- four **block** holders (slots 1.1, 1.2, 1.3, and 1.4)
- one **range compensator**, **range shifter** or **ridge filter** holder (slot 2)

Once installed onto the snout, each of the four blocks is retained by a safety lock; the snout itself is secured by a pneumatically actuated safety pin.

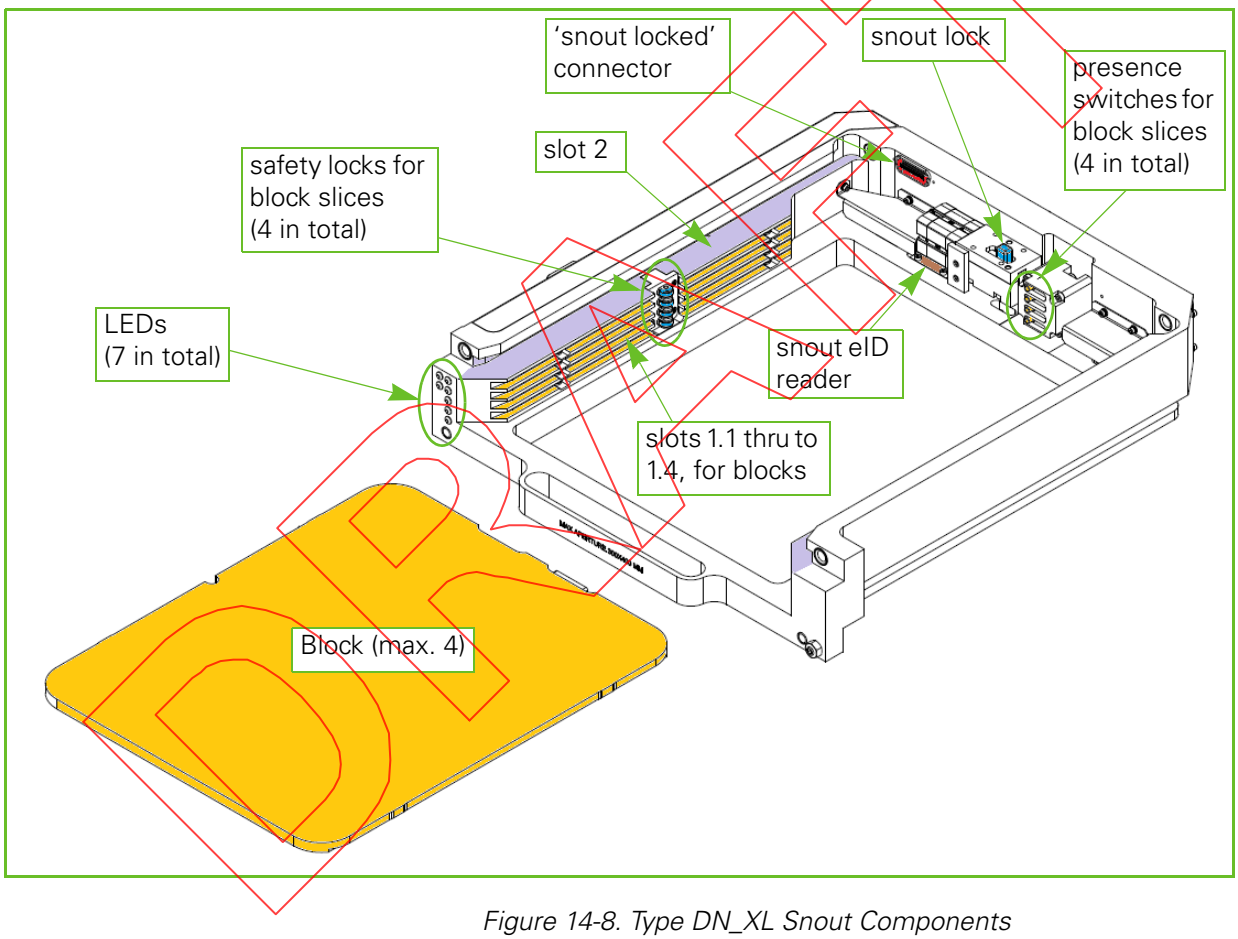

Figure 14-8. Type DN_XL Snout Components

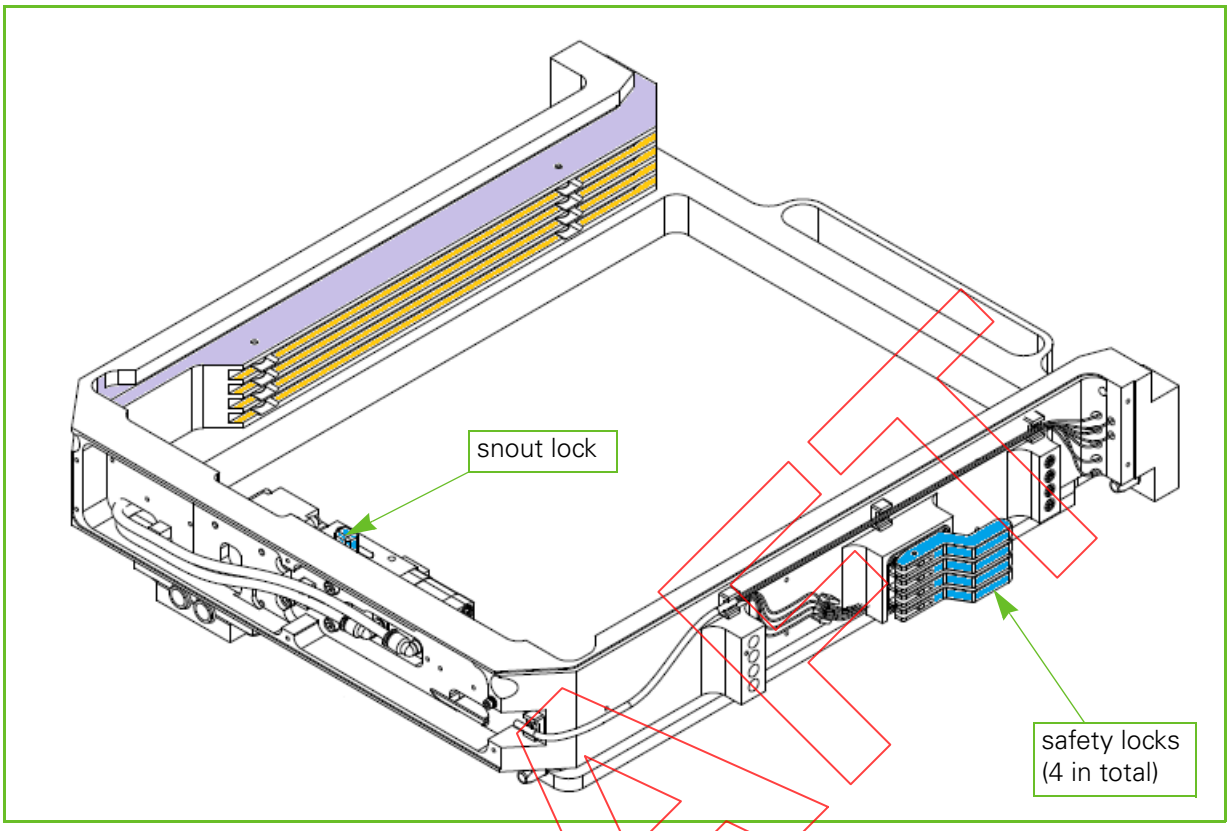

Figure 14-9. Type DN_XL Snout Components - continued

Seven LEDs are installed on the snout's tray (from bottom to top), in two rows:

- Rightmost row:
  - SNOUT SLOT 1.1
  - SNOUT SLOT 1.2
  - SNOUT SLOT 1.3
  - SNOUT SLOT 1.4
  - SNOUT SLOT 2
- Leftmost row:
  - SNOUT INSERTED
  - SNOUT LOCKED

The LEDs turn ON (green light) when the respective switch detectors or the slot position detector send a signal indicating that (each item corresponding to a LED in the same order as the list above):

- Rightmost row:

- The first block slice has been installed into slot 1.1
- The second block slice has been installed into slot 1.2
- The third block slice has been installed into slot 1.3
- The fourth block slice has been installed into slot 1.4
- The second accessory has been installed into slot 2

- Leftmost row:
  - The snout has been retracted
  - The snout is locked in place

Four switch detectors installed at the back of the snout detect the correct installation of the blocks. A lock at the back of the snout (see Figure 14-8) keeps the slot 2 accessory (if any) in place and activates the snout lock.

Otherwise, the LEDs are OFF.

Important	The gantry will not rotate unless an accessory is inserted in slot 1.4 (closest to the patient). Irradiation and snout holder motion will also be prevented. An empty frame (dummy aperture) is available in case the treatment plan does not require any accessory in slot 1.4 of the snout.

Figure 14-10. LEDs on the Snout

Installing Accessories onto a DN_XL Type Snout

The procedure to install a block and accessory onto a DN_XL type snout is as follows:

1. Insert the first block slice; the safety lock falls into place and the LED on the snout's tray indicating 'Snout Slot 1.1' turns green.
2. Repeat Step 1 with each block slice. Check to see that the corresponding LED turns green.
3. Check to see that the snout lock switch is in the **Unlocked** position (see Figure 14-10), i.e., pointing in the direction of the drawer movement.
4. Insert the desired accessory (if any) in slot 2. The LED on the tray indicating 'Snout Slot 2' turns green.
5. Rotate the snout lock switch by 90° to the **Locked** position. The LED on the tray indicating 'Snout Locked' turns green.

   Note: *Always rotate the snout lock switch to the Locked position, even if no accessory is installed in slot 2.*

Removing Accessories from a DN_XL Type Snout

The procedure to remove a block and accessory from a DN_XL type snout is as follows:

1. Rotate the snout lock switch by 90° to the **Unlocked** position. The LED on the snout's tray indicating 'Snout Unlocked' turns green.
2. Remove the accessory installed on slot 2 (if any).
3. Unlock the safety lock retaining the block slice installed on slot 1.4.
4. Remove the block slice installed on slot 1.4.
5. Repeat Step 3 and Step 4 with each remaining block slice.

Chapter 15
Resetting a Dose Counter Electronic Unit

The Dose Counter Electronic Unit (DCEU) is a redundant dose counter. It is used to:

- Provide a redundant reading of the dose monitor units received by the patient.
- Provide a redundant way of stopping the irradiation when the target dose entered on the Therapy Control System (TCS) is reached.
- Record the counter value in case of computer failure or power failure, thus allowing the therapist to note the dose delivered at the time of failure.

WARNING	
	As a Radiation Therapy Technologist (RTT), when the treatment is interrupted (e.g., the treatment is stopped after a pause, the software crashes, etc.), you have to manually record the value reported by the hardware Monitor Unit (MU) counter, which is located on the front panel of the Dose Counter Electronic Unit (DCEU). If applicable, i.e., in the Single Scattering, Double Scattering, and Uniform Scanning treatment modes ONLY, a correction shall manually be applied to this value to take into account the dose correction parameters encoded in the Dosimetry Manager (ambient temperature, atmospheric pressure, and dose correction factor). Check that the value reported by the hardware MU counter (after correction) matches the delivered MU value recorded in the Oncology Information System (OIS) for this irradiation. When the irradiation is resumed, if the system (Oncology Information System or Proton Therapy System) proposes a MU value for the delivered dose (MUd), you shall verify that this value matches the value reported by the hardware MU counter (after correction), within the foreseen precision. If the values are not in agreement, you shall use the value reported by the hardware MU counter (after correction).

The Proteus PLUS has one measuring function: the measurement of the Monitor Units (MU). The accuracy of the measurement of the MU is 1%.

The proton radiation dose delivered to the patient is measured in Ionization Chambers. The Ion Chamber Electronic Unit (ICEU) and/or scanning controller communicate(s) dose information to the DCEU.

The DCEU allows the irradiation as long as the radiation dose delivered to the patient is less than the upper preset limit entered on the DCEU by the RTT. The dose count is displayed on the front panel of the DCEU.

The DCEU is a backup in case of an IC software communication failure. You typically set the value to 105% of the required dose.

Important

Enter the maximum preset Monitor Units (MU) value on the Dosimetry Counter Electronic Unit (DCEU) front panel before irradiation.

The maximum preset MU value depends on the treatment mode, as follows:

Pencil Beam Scanning:

- a MU value equal to 105% of the prescribed MU

The DCEU also emits beeps while the dose is being delivered. A number of audible pulses are emitted with a frequency proportional to the momentary dose rate. The DCEU contains a volume adjustment control and a nominal dose rate selector.

The normal end to an irradiation is determined by the Therapy Control System(TCS), which also receives input from the ionization chambers to monitor the dose. Because the DCEU serves as a redundant device, the target dose entered on the DCEU is normally slightly higher than the required dose entered on the TCS.

X-ray images taken with the retractable X-ray tube located inside the nozzle, accumulate counts on the DCEU. Therefore, the DCEU must be reset following all irradiations in order to avoid reaching the required dose during the patient setup procedure. If the required dose is reached during the patient setup procedure, the nozzle preparation procedure will be canceled.

In addition to entering a target dose on the DCEU, the counters shall be reset before an irradiation can begin. The TCS provides the enabling signal for resetting and will not allow the beam to enter a TR until the DCEU counters have been reset.

To reset the DCEU:

1. When the led next to red **Reset** button is lit (green), press the **Reset** button.
2. Use the buttons of the **Preset** display to set the counter to a value that is slightly higher (e.g., 105%) than the required dose. There is a button to count up (above the display) and a button to count down (below the display).

WARNING

Be aware that two types of DCEU exist: one where you set the actual MU value, indicated by the **Preset [MU]** label below the Preset display (see Figure 15-1), and one where you set the MU value divided by 10, indicated by the **Preset [x10MU]** label below the Preset display (see Figure 15-1).
Take a close look at the DCEU in your TCR to ascertain that you have to enter either the actual MU value, or the MU value divided by 10.

3. Use the volume knob to set the volume of the audible signal produced by the DCEU.
4. Use the Beeper Rate knob to match the prescribed dose to the gray/minute[1]. For example, when set at two gray/min, the audible signal should be heard once per second.

DCEU Types

Two different types of DCEU exist:

- one where you set the actual MU value: see section '*DCEU With Actual Preset MU Value*' on page 15-4.
- one where you set the MU value divided by 10: see section '*DCEU With Preset MU Value to be Multiplied by 10*' on page 15-4

Take a close look at the DCEU in your TCR to ascertain that you have to enter either the actual preset MU value, or the preset MU value divided by 10.

DCEU With Actual Preset MU Value

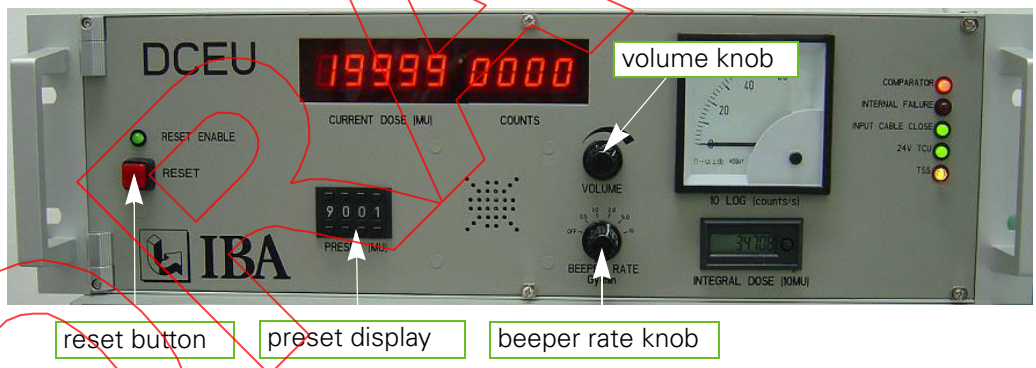

Figure 15-1. Dose Counter Electronic Unit (DCEU) Actual Preset Value

DCEU With Preset MU Value to be Multiplied by 10

On this DCEU type, a preset value of 9999 means an actual preset MU value of 99990.

1. Gray [J/Kg]. 1Gy = 100 cGy = 100 rad

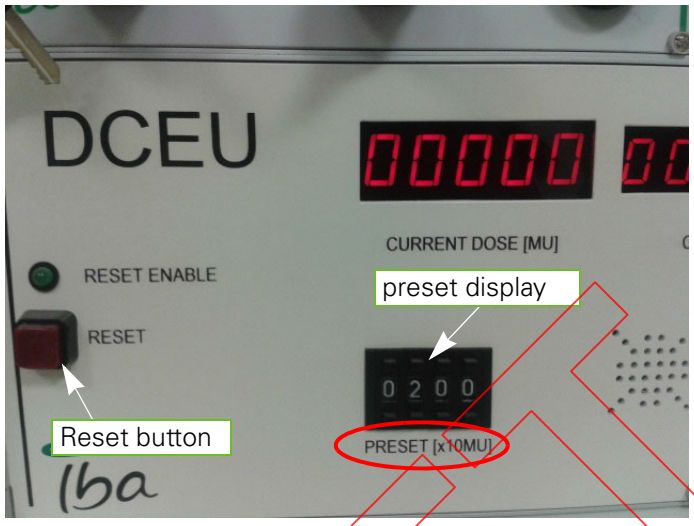

Figure 15-2. Dose Counter Electronic Unit (DCEU) - detail x10 Preset Value

Effects of Temperature and/or Pressure Changes in the Treatment Room

Fluctuations in temperature and/or pressure have an impact on beam measurement performed by Ionization Chamber 2/3 (IC2/3), which are located in the nozzle. The impact is irrespective of the type of ionization chamber, be it sealed or open air[1].

To ensure correct IC2/3 measurement, the ambient treatment room temperature and pressure are measured and recorded every morning.

If, in the course of the day, temperature and/or pressure is observed to be deviating from the values measured in the morning, these new values must be recorded using the Dosimetry Manager. For detailed information on the Dosimetry Manager, refer to **Appendix A**, Using the Dosimetry Manager.

1. IC measurement is proportional to ambient temperature and pressure. A variation in temperature of 1 °C or a variation in atmospheric pressure of 3 hPa from the values registered in the Dosimetry Manager implies approximatively an error of 0.3%.

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Chapter 16
Operating the Patient Positioning System Manually (Emergency Release Mode)

The Patient Positioning System (PPS) is the mechanical arm that serves to position the patient laying on the couch. It has six axes of movement that can be controlled using the hand-pendant or the remote positioning controls. In such a case, all movements are electrically executed.

For more information on the PPS, see Chapter 7, "Moving the Patient Positioning Devices".

In case of a power failure or of a Therapy Control System (TCS) failure, you can still move the Patient Positioning System (PPS) or unlock the PPS axis using the Leoni Orion emergency hand-pendant.

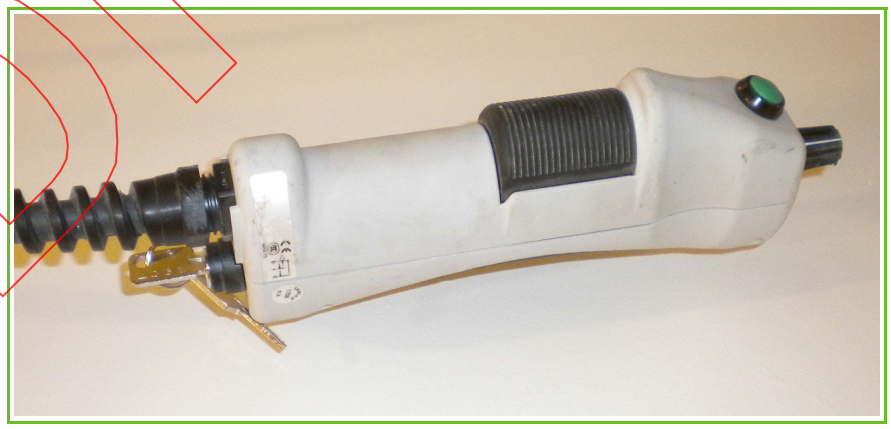

Figure 16-1. Emergency Hand-Pendant

WARNING

The Radiation Therapy Technologist (RTT) shall be trained and exercised to perform efficiently and safely the emergency release mode operations.

WARNING

The emergency release mode shall be used only if the Patient Positioning System (PPS) or the patient positioning devices do not respond to control or are likely to be unsafe for operation.

The emergency release mode can be used in the following situations:

- complete power failure, loss of patient positioning device control.

- critical positioning devices failure, severe collision.

- serious patient condition requiring specific way of release (ex.: patient stucked, incident,...).

Any other use of the emergency release mode is forbidden.

WARNING

In emergency release mode:

- The PPS Robot requires a lot of force to be moved by hand, even with the brakes released, ensure that you are assisted to move the robot safely and efficiently.

When you lower the robot (by joint 3 release), the couch will tilt by gravity. The patient must be held during this operation at all times to avoid falling or severe injuries due to accessories.

- When releasing joint 3 brake: it is released by pulse that can induce jerks. These jerks and bumps might cause injury.

WARNING

If the emergency hand pendant/emergency release mode is used, the references of the robotic patient positioner is lost. Call IBA personnel to reset the system.

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Using the Emergency Hand-Pendant

Performing a Coplanar Movement, Joints 1-2

To perform a combined coplanar (lateral and longitudinal) motion, it is necessary to release the joints 1 and 2 as described below:

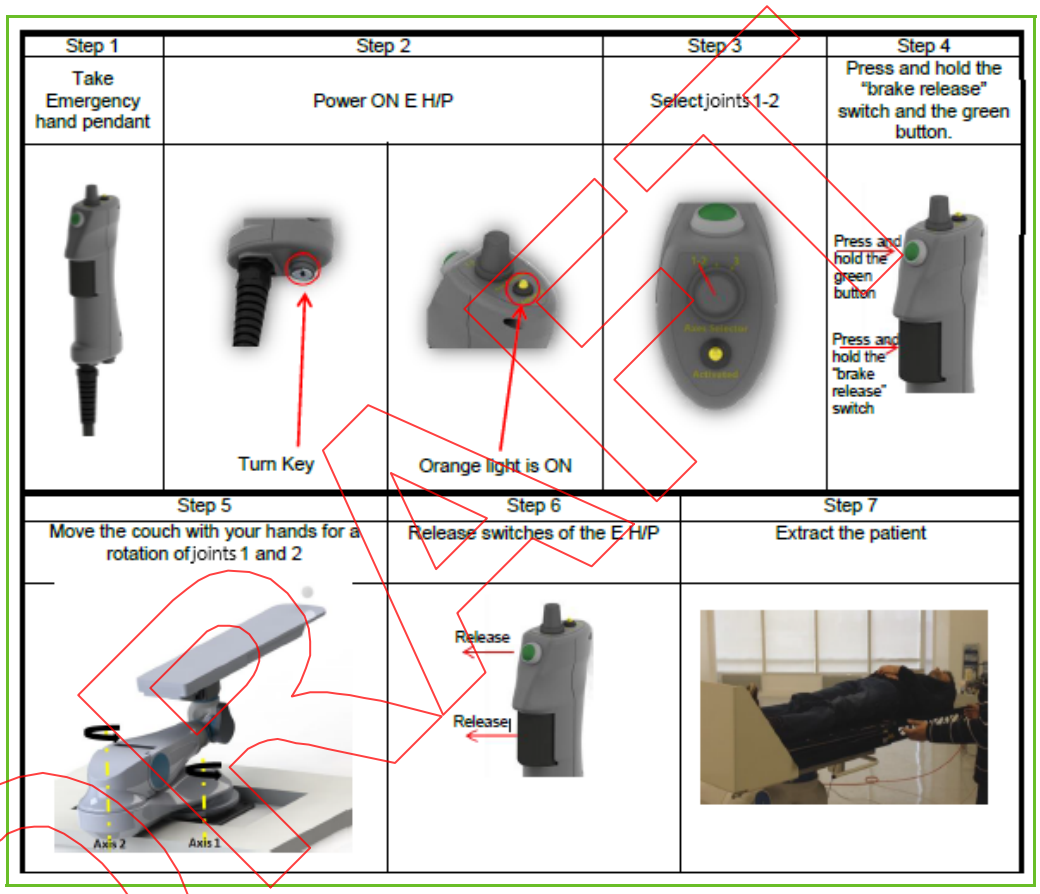

Figure 16-2. Joints 1 and 2 Motions

Refer to the "Leoni Orion System" User manual for additional information.

Performing a Vertical Motion, Joint 3

To perform a vertical motion, it is necessary to release the joint 3 as described below:

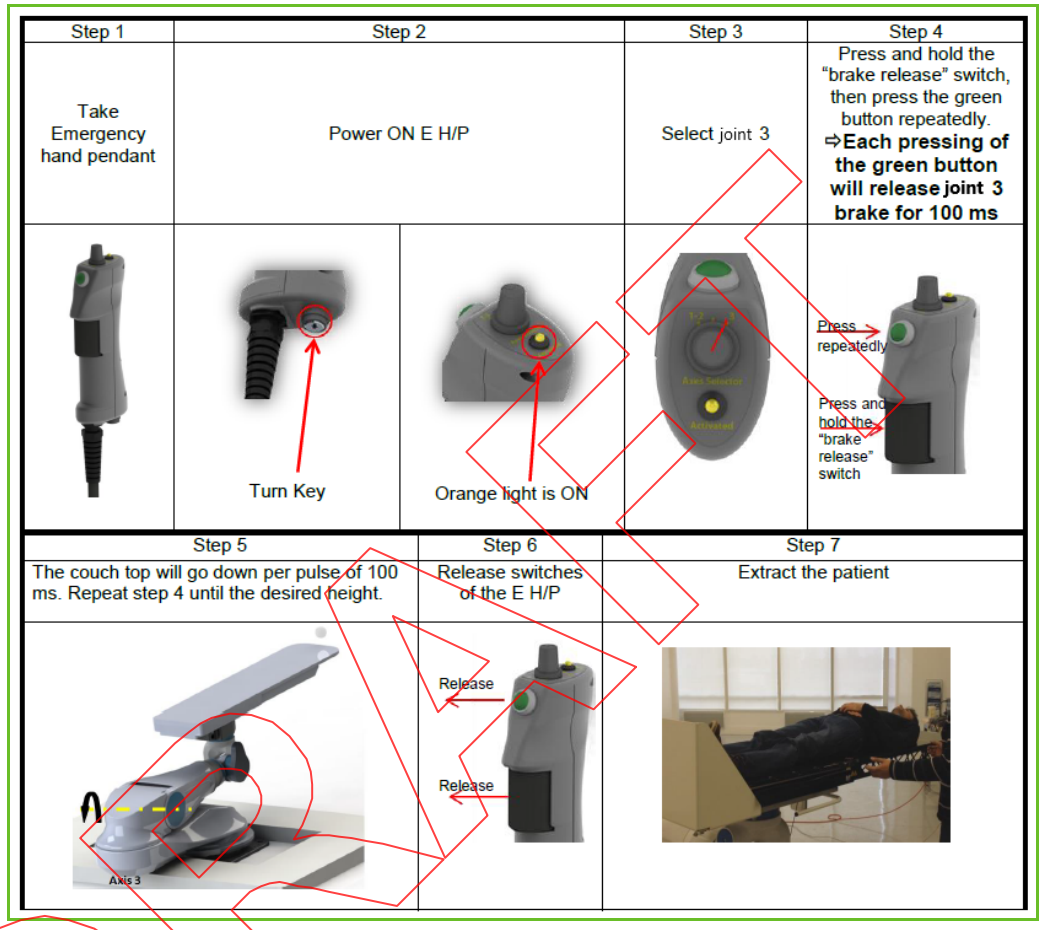

Figure 16-3. Joint 3 Motion

Refer to the "Leoni Orion System" User manual for additional information.

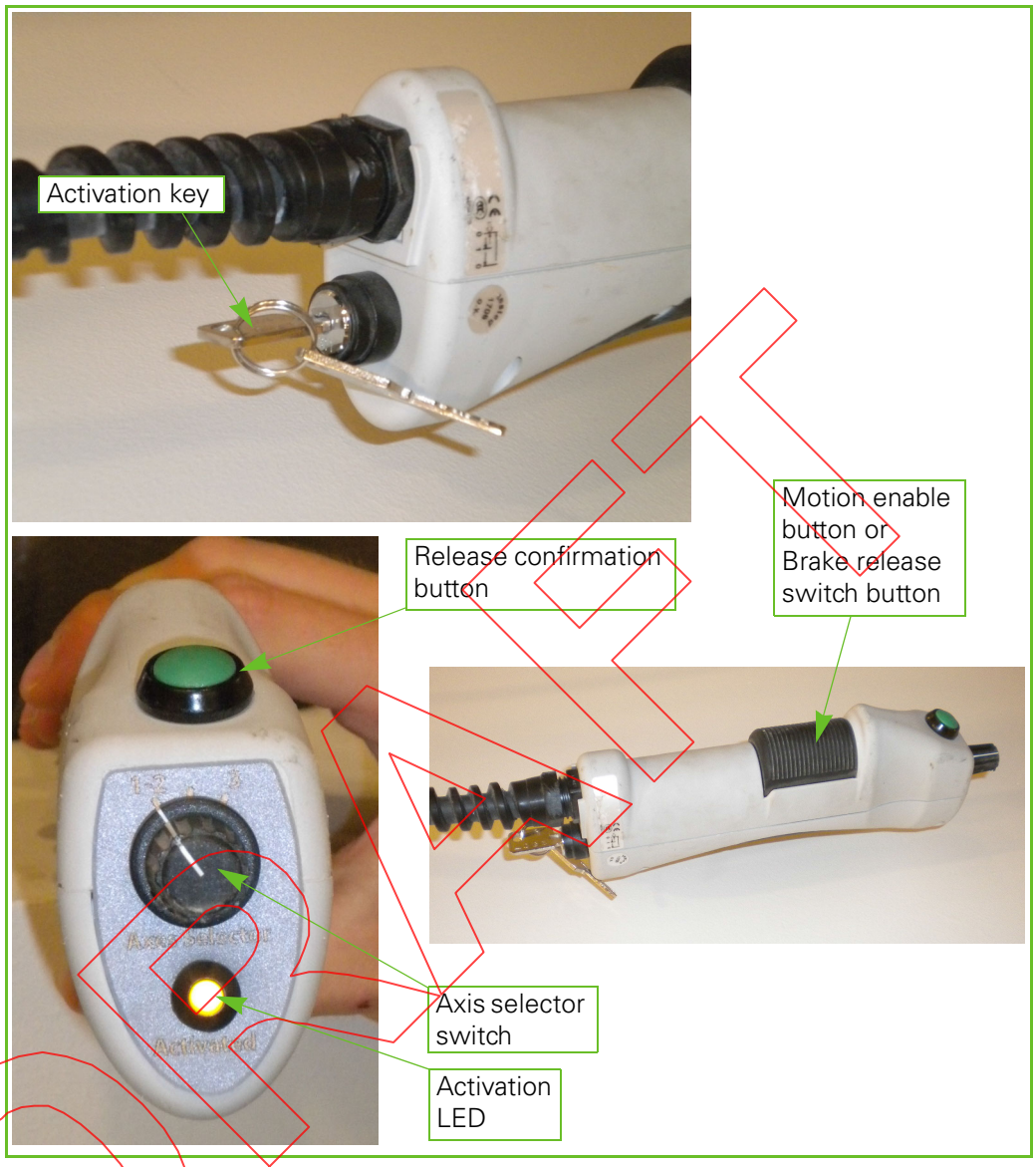

Figure 16-4. Emergency Hand-Pendant Details

Chapter 17
Performing QA Checks and Verifying Beams With a Water Phantom

WARNING	
	Periodic system recalibration to maintain operational compatibility with clinical needs of the treatment center is not part of the equipment manufacturer's responsibility. As a physicist you are responsible for the equipment and must perform verifications of the machine output at an established frequency. These verifications, as well as any procedures and parameters needed to proceed with these verifications, are not the responsibility of the equipment manufacturer.

Note: *All these verifications of the equipment output beams are necessary to confirm that the equipment operates to specifications and standards.*

CAUTION	
	When working with the water phantom, do respect the maximum weight allowed by the Patient Positioning System (PPS). Exceeding the allowed values will jeopardize the precision of the results. For details on the allowed weights, refer to section *Allowed Maximum Weight on the Couch* in Chapter 7.

CAUTION	Be aware that the lifetime of Ionization Chambers may be reduced if exposed to over 10E6 Gray, which corresponds to approximately 450 hours of beam exposure at 5 nA. Ionization Chamber 1 (IC1) can sustain 450 hours of beam exposure at 5 nA. Ionization Chamber 2/3 (IC 2/3) can sustain 450 hours of unscanned beam exposure at 5 nA.

Locating the Water Phantom on the PPS

The water phantom has to be positioned above the rotation axis (joint 6) of the PPS to ensure precise measurements and to prevent potential damage to the PPS.

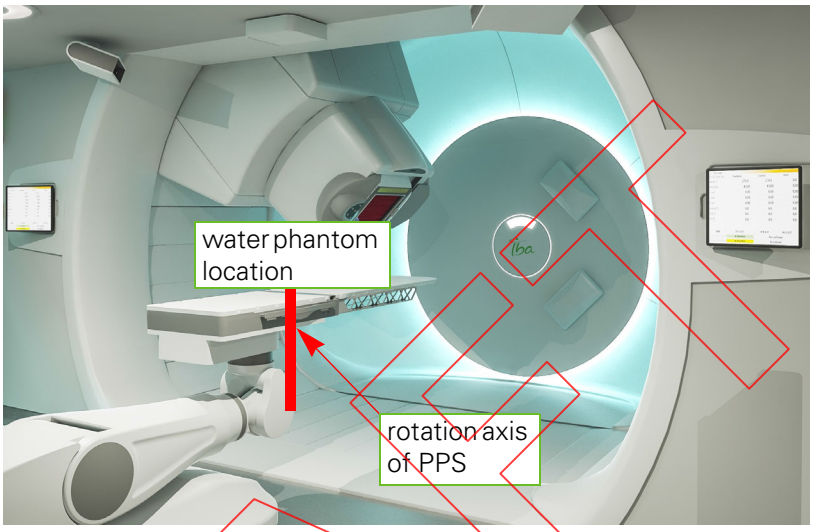

Figure 17-1. Position of Water Phantom on PPS (typical)

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Verifying Beams

Some beam parameters are validated by making measurements with a water phantom before using a new beam. This validation ensures consistency of the settings between the Treatment Planning System (TPS) and the PTS equipment.

WARNING	As a physicist using the systems (Treatment Planning System and Proton Therapy System) it is your responsibility to validate some parameters to check the consistency of the settings between the Treatment Planning System and the Proton Therapy System equipment.

The list of recommended parameters to be checked for each new beam is as follows:

- Range verification of the planning beam. The range needs to be verified for each new beam and the required range needs to be modified in the prescription if the discrepancy with the measured range is too large.
- Measurement of the absolute dose for each beam.

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Chapter 18
Troubleshooting Treatment Room Equipment

The following table describes the error/warning messages displayed on the wireless hand-pendant screen.

Message	Description
DEVICE[a] must be homed first.	Home the device DEVICE before performing this action.
Gantry position too far from prescription. Position cannot be confirmed.	Move the gantry closer to the treatment position before confirming the current position.
Lock the couch before moving.	The couch is not properly locked. Lock it before moving the PPS.
Positioner must be tared first.	Remove everything from the couch and perform a taring procedure in order to be able to move the PPS.
Before taring, add a couch.	There is no couch installed on the PPS. You have to install a couch before taring.
Before taring, add a known couch.	The couch installed on the PPS is not a valid couch to tare. You have to install a valid couch before taring. The validity of the couch is assessed by the couchId value.
Selected device DEVICE is unhealthy!	The device DEVICE has an internal error preventing it from moving. Contact an operator.
Selected device DEVICE is faulty!	The device DEVICE is outside valid motion range. You have to perform a recover sequence before being able to move it again.

Message	Description
Selected device DEVICE is in unknown state. Probably it has not been configured properly.	The software controlling the device DEVICE has not configured it properly. Contact an operator to check its configuration.
Selected device DEVICE is off!	The software controlling the device DEVICE has performed a shutdown. Contact an operator to restart it.
Selected device DEVICE is initializing!	The software controlling the device DEVICE has not configured it properly. Contact an operator to check its configuration.
Latest corrected position has not been reached. Press OK to confirm	The latest computed correction vector has not been completely applied to the PPS position. Make sure the current PPS position is correct.
The positioner was overloaded and may require maintenance. Contact IBA Support.	The load on the loadcell exceeded the maximum allowed by the manufacturer specification. This may have damaged the PPS. Contact an operator.
Emergency stop button pressed.	An emergency button has been pressed. Locate the pressed button and release it if the emergency situation is over. Perform a 'clear emergency' sequence to be able to move devices again.
Lock accessory before any gantry motion.	The accessory installed on the snout holder is not properly locked. Lock it to be able to move the gantry.
Lock accessory before any drawer motion.	The accessory installed on the snout holder is not properly locked. Lock it to be able to move the drawer.
Lock accessory before any snout motion.	The accessory installed on the snout holder is not properly locked. Lock it to be able to move the snout.
DEVICE is in maintenance mode.	Device DEVICE is in maintenance mode. You have to set it back to default mode to be able to move it again.
DEVICE is in Error. Contact operator.	An internal error occurred on device DEVICE. Contact an operator.
Positioner motion is forbidden due to docking mode. Please disable this mode before motion.	The PPS is still in docking mode. Switch to move mode.

Message	Description
Snout cannot move.	The room configuration prevents the snout holder from moving. Contact an operator to enable snout motion in the room configuration.
DEVICE must be tared first.	You need to tare the device DEVICE in order to be able to move it.
Weight check must be performed first on DEVICE.	Perform a weight check sequence on the device DEVICE.
Jog request is not valid for this device.	You pressed a jog button which is invalid for the selected device (e.g. you pressed the 'jog X' button with the gantry selected). Press a jog button that is valid for the selected device.
Motion Enable Button is not pressed!	Press the Motion Enable Button of the hand-pendant before moving.
Motion not allowed.	The safety system (SRCU) prevents motion. Contact an operator.
Device not enabled.	Select a device before moving it.
Motor status NOK.	The gantry motor status is in error. Contact an operator.
Motion veto: ORIGIN[b].	The element ORIGIN prevents motion. This element can either be a device, a check or the check manager. Reset the check manager and if the problem is still present, then contact an operator.
Lock compensator before any snout motion.	The compensator is not properly locked. Lock it before moving the snout holder.
Lock block before any snout motion.	The block is not properly locked. Lock it before moving the snout holder.
Cancel docking activity.	Cancel the docking activity currently selected in order to be able to move the PPS.
Gantry must be horizontal to proceed to snout homing.	Snout holder can only be homed with the gantry in an horizontal position. Move the gantry to 90.0° or 270.0° position before homing the snout holder.
DID-B must be inserted before moving the imager.	The imager can only be offset when DID-B is fully inserted. Insert Did-B before offsetting the imager.

a. During normal equipment operation, the word 'DEVICE' present in several of the messages in this table is replaced by the name of the relevant device, according to the circumstances.

b. During normal equipment operation, the word 'ORIGIN' present in several of the messages in this table is replaced by the name of the relevant device, check or check manager according to the circumstances.

Part III

The Pencil Beam Scanning (PBS) Suite

Chapter 19
Guiding You Through the Pencil Beam Scanning Documentation

The purpose of this part is to describe the major PBS principles and to provide an overview of the equipment that is used to deliver PBS treatments.

The chapters in this part describe:

- Pencil Beam Scanning principles
- PBS beam delivery equipment

Part III, "*The Pencil Beam Scanning (PBS) Suite*", is to be used together with the following parts:

- **Part IV**, "*Using adaPTprescribe*"; the chapters in that part provide operational information on how to use adaPT*prescribe*. The chapters in that part describe:
  - An overview of adaPT*prescribe* features
  - Instructions on how to manage patients, study, plans, and beams
- **Part V**, "*Using adaPTdeliver*"; the chapters in that part provide operational information on how to use adaPT*deliver*. The chapters in that part provide:
  - An overview of adaPT*deliver* features
  - A description on how to use adaPT*deliver* in Treatment mode
  - Instructions on how to generate reports using adaPT*deliver*
- In addition, **Appendix B**, "*Managing PTS Users*", contains information on how to configure and manage adaPT*prescribe* users.

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Chapter 20
Pencil Beam Scanning Principles

Introduction

Pencil Beam Scanning (PBS) is the beam delivery technique that delivers the dose by scanning a narrow proton beam over the target by adjusting the transverse trajectory of a mono-energetic pencil beam. The scanning operation is performed by two scanning magnets that are located in the nozzle.

The incoming narrow beam is moved by magnetic scanning in the Xg and Yg directions (where Xg and Yg are the X and Y axes of the IEC 61217 Gantry Coordinate System), so as to deflect the beam to the correct position in the tumor. The settings of the scanning magnets are such that the beam will be positioned at the desired position and then the beam will be ON up to the moment when the fluence delivered matches the fluence prescribed for that precise spot in the target in the current painting or repainting action (this is the 'spot scanning' technique, characteristic of the PBS delivery mode and described in section *Spot Scanning*.

Hence, during a PBS irradiation, the lateral spot position, the beam energy, and the dose are precisely controlled and adjusted in order for the pencil beam Bragg peak to cover the patient target volume laterally and in depth and to deliver at each point of the target the required amount of dose.

WARNING Only a physicist shall be allowed to attach a fluence file to a patient's beam.

The amount of dose delivered at each point of the trajectory is computed by the Treatment Planning System (TPS) during the dose optimization and calculation process.

Beam delivery in the treatment volume is achieved:

- Longitudinally, by varying the proton beam energy
- Transversally, by magnetic scanning

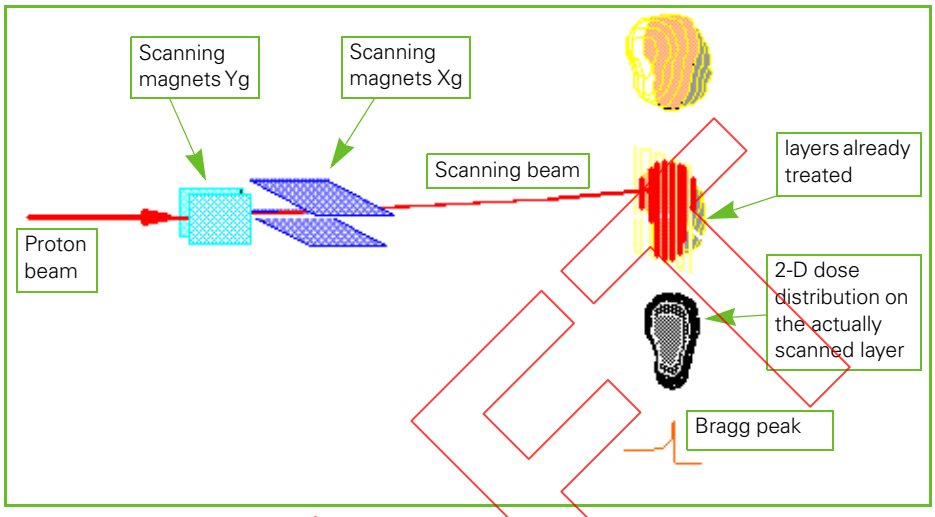

Figure 20-1. Pencil Beam Scanning (PBS) Delivery Technique

Clinical Advantages

Clinical advantages of PBS over other techniques are:

- Better dose conformity
  - Better sparing of organs at risk and healthy tissues
  - Allow dose escalation for better local tumor control
- No need for patient specific devices (i.e., no block nor range compensator)
  - Reduce costs
  - Increase patient throughput
  - Easier operation
  - Allow more flexibility in plan evolution
- Less neutron dose

Longitudinal and Transversal Dose Distribution in PBS

A very precise dose distribution can be obtained both longitudinally (in depth) and transversally (on the plane perpendicular to the beam direction) using PBS.

Longitudinal Distribution

In order to spread the dose delivery along the longitudinal axis (that is to say, in depth), the dose is delivered in successive single energy layers. A layer is therefore defined as the set of spots for which the same beam energy is required.

In PBS, the energy is adjusted in the Energy Selection System (ESS) for each one of the layers.

Layers

In the Pencil Beam Scanning (PBS) treatment mode, layers are defined: the tumor is divided in a stack of layers, whereby each layer corresponds to one specific energy.

The division in layers takes the patient body outline, the target shape, and the presence of heterogeneities into account. This means that the dose deposited in a given layer is not necessarily maximal (Bragg peak) in the same transversal plane.

Every layer can be painted several times and the range modulation is done layer per layer at the energy selection level. This is different from the scattering delivery techniques, where the beam shape is passively broadened before entering the target volume.

The spacing of the different layers and the weight of the beam at each position is computed by the TPS in order to fulfill the required dose conformity.

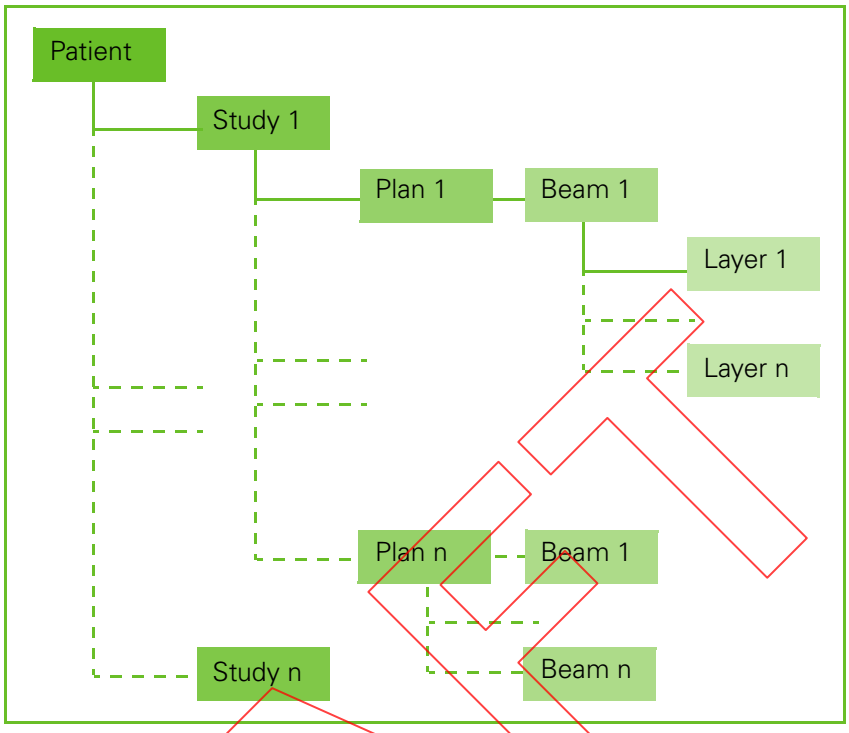

Figure 20-2. Organization of the Prescription Data

Transversal Distribution

In order to spread the dose delivery along the axes perpendicular to the beam direction (that is to say, transversal to the beam axis), the beam is scanned in the plane perpendicular to the beam direction for each defined layer using the two scanning magnets in the nozzle.

Beam Delivery Characteristics in PBS

Spot Scanning

Spot scanning is the PBS technique by which the target volume is not only divided in layers, but also divided in discrete spots, both longitudinally and transversally. Each one of these spots will receive its prescribed dose in one or more 'shots' of the proton beam, which will scan the target volume spot by spot. The proton beam is interrupted while the beam is moved between spots.

This means that in order to deliver PBS with Spot Scanning, the scanning magnets will modify the beam's transversal position for each spot and the ESS will select a different beam energy for each spot at a different layer (longitudinal dose distribution).

This combination of longitudinal and transversal dose distribution lies at the core of the PBS delivery technique.

Repainting Modes

When a given layer is scanned by the proton beam more than once (or repainted), the total dose to be delivered at each layer in the target is divided by the number of scans or paintings that is to be achieved. This delivery process is repeated a number of times, as specified in the treatment plan, and results in the delivery of the entire prescribed dose within the layer.

As a result of this process, the weight of the spots in each layer is scaled in function of the total dose to be delivered at that layer and the number of paintings to be performed.

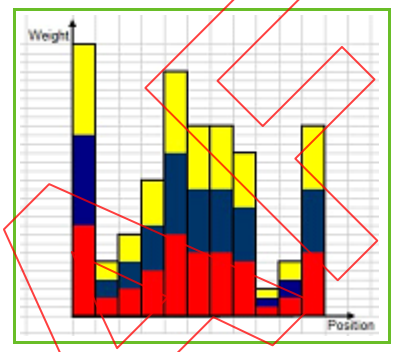

Figure 20-3. Scaling Sample: 3 Paintings

The order in which the layers are scanned or painted and hence the way in which the prescribed dose is delivered to each of the layers in the target volume defines several possible types of repainting techniques.

Note: *Some of these repainting techniques may not be available at your center.*

The repainting types are as follows:

- None (no layer repainting)
- In-Layers Repainting
- Decrease in Energy
- Back and Forward
- Mixed Repainting

In addition to the repainting type principles that are described in the sections below, Chapter 22, "*PBS Multiple Repainting*", contains detailed information on how the different repainting types are identified and represented.

In-Layers Repainting

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) as many times as prescribed until the total dose prescribed for that layer is delivered. Only when a given layer has received its full dose, the scanning process progresses on to the next layer.

Decrease in Energy

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) once. When the proton beam finishes the scan of the layer that ends at the proximal edge of the target volume, the repainting process restarts at the distal edge of the tumor. This process is repeated as many times as necessary until the prescribed dose is delivered for every spot in every layer of the target volume.

Back and Forward

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) once. When the proton beam finishes the scan of the layer that ends at the proximal edge of the target volume, the repainting process restarts at that same layer. The beam scanning process now advances from the proximal layer to the distal one. This process is repeated as many times as necessary until the prescribed dose is delivered for every spot in every layer of the target volume.

None (no layer repainting)

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) once. The prescribed dose is delivered completely for each spot in the target in just one scanning operation.

Mixed Repainting

In this mode, different types of repainting are mixed for the same beam.

Chapter 21
Introducing PBS Beam Delivery System Equipment

The PBS Treatment Mode

Following is a schematic representation of how Beam Delivery System (BDS) equipment is used in the PBS treatment mode.

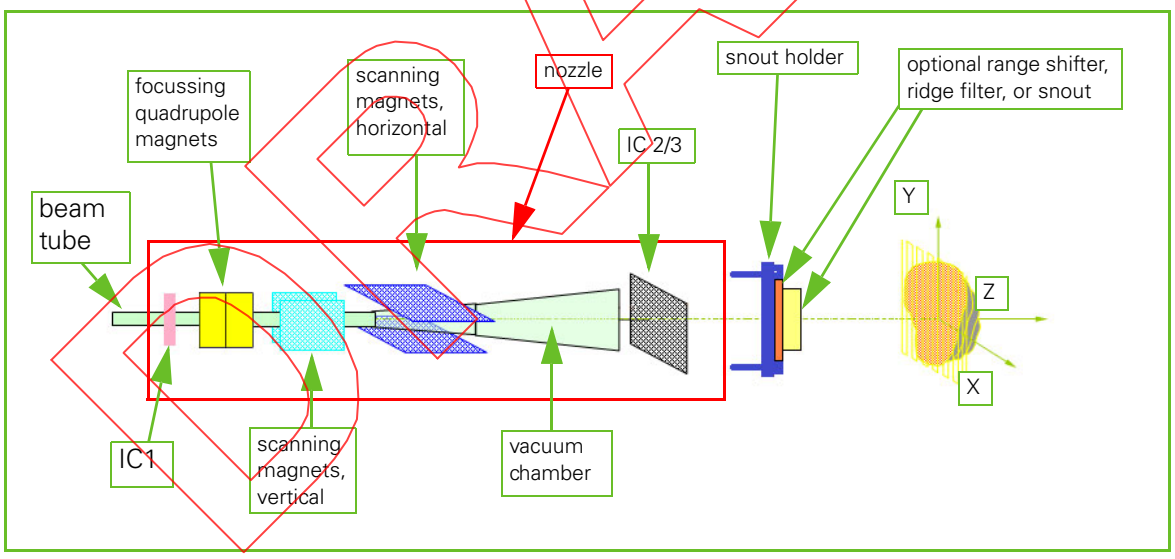

Figure 21-1. BDS Equipment Usage in PBS Treatment Mode - Schematic

PBS Capable Nozzle Types

At your center, PBS can be delivered using the following:

- **PBS Dedicated Nozzle**: for detailed information, refer to section "*Nozzle Types and Components PBS Dedicated Nozzle Structure*" on page A-3.

Role of the Scanning Magnets

The two scanning magnets located in the nozzle deflect the beam and continually paint the treatment field with a small beam area. The upstream magnet scans the beam in the Y direction. The downstream scanning magnet scans in the X direction.

The beam position is changed using magnetic field(s), to direct the beam to a particular location on a target. Other properties are modified using other equipment. When a beam penetrates the target, it delivers dose to that location along the beam trajectory. The goal of the beam delivery is to deliver the appropriate proton fluence according to a prescription. This prescription provides a map of the fluence that is necessary to deliver at each location on the target. Thus the beam is moved to each location on the target and the appropriate fluence is deposited at each location.

During a PBS irradiation, the lateral position (transverse position), the beam energy (longitudinal position), and the dose are precisely controlled and adjusted in order for the pencil beam Bragg peak to cover the patient target volume laterally and in depth and to deliver at each point of the target the required amount of dose.

Low Ranges

To be able to treat very shallow targets and have full modulation to the skin, the nozzle includes range shifters and/or a ridge filter. This enables the modulation of range up to the skin and maintain a pristine peak of sufficient width so that the number of delivered layers remains reasonable.

The range shifter is installed at the end of the nozzle to minimize its impact on the beam size. The range shifter reduces the range and the ridge filter reduces the number of layers required for small ranges by increasing the width of the very thin low energy Bragg peaks.

Note: *Range shifter characteristics must be part of the user commissioning and Quality Assurance System.*

The Scanning Controller

In the PBS beam delivery technique, a narrow particle beam is deflected in two perpendicular directions, both orthogonal to the beam axis, in order to scan the beam. These deflections are obtained using both scanning magnets; each of these magnets is driven by a power amplifier, the so-called Scanning Magnet Power Supply (SMPS). The SMPS is controlled by the Scanning Controller.

The Scanning Controller handles most of the functionality required for the pencil beam scanning treatment delivery. The Scanning Controller (SC) is largely responsible for the controls and feedbacks of some elements that affect the beam trajectory and intensity as well as some other aspects of the beam.

The Scanning Controller is a distributed system and includes shared parts in the Power Supply Room, and TR specific parts, located near the nozzle.

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Chapter 22
PBS Multiple Repainting

The PBS delivery mode is capable of delivering beam using the multiple repainting technique. This technique has been introduced in section "*Beam Delivery Characteristics in PBS*" on page 20-4.

Multiple Repainting Types

PBS multiple repainting can be performed using different types of repainting, as follows:

- **None** (no layer repainting): see section "*None*" on page 22-2.
- **In-Layers repainting**: see section "*In-Layers Repainting*" on page 22-3.
- **Decrease in Energy**: see section "*Decrease in Energy*" on page 22-4.
- **Back and Forward**: see section "*Back and Forward*" on page 22-5.
- **Mixed Repainting**: see section "*Mixed Repainting*" on page 22-7.

Each of these repainting techniques has its specific identification and representation throughout the adaPT*prescribe* and adaPT*deliver* screens.

Note: *Some repainting techniques may not be available at your center.*

None

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) once. The prescribed dose is delivered completely for each spot in the target in just one scanning operation.

This type means that PBS is delivered without any repainting.

Identification

This repainting type is labelled **PBS** in the (Delivery) Technique fields on the adaPT*prescribe* and adaPT*deliver* screens.

Representation

This repainting type is represented by an icon on adaPT*deliver* screens.

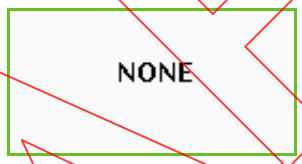

Figure 22-1. None (No Multiple Repainting) Icon

Graph

Figure 22-2 illustrates the energy that is delivered in each layer. A graph similar to this one appears on adaPT*deliver* screens.

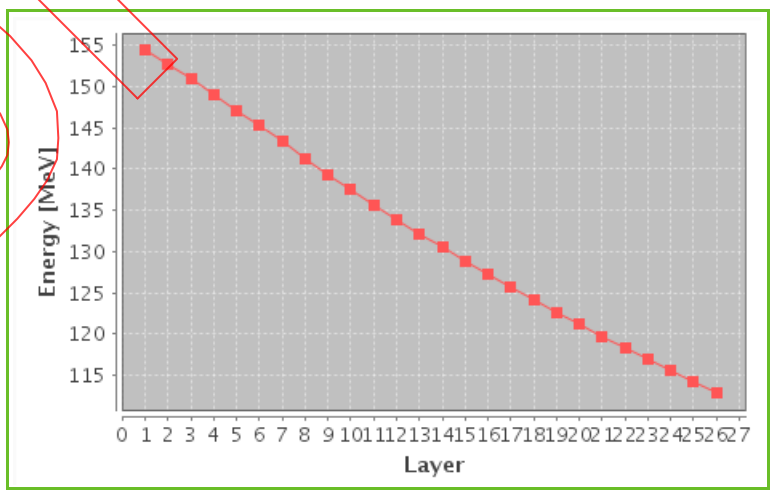

Figure 22-2. None (No Multiple Repainting) Energy/Layer Graph (typical)

In-Layers Repainting

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) as many times as prescribed until the total dose prescribed for that layer is delivered. A different number of re-paintings may be prescribed for each layer in the plan.

The PTS software divides the total dose to be delivered to each spot within a given layer by the number of re-paintings requested for that layer. If the dose to be delivered to a given spot in one re-painting falls below a threshold (close to 0.05MU), the number of re-paintings for that spot decreases to the greatest number such that the dose for each re-painting is above the threshold. As such, different spots within the same layer may be re-painted a different number of times.

Only when all the spots within a given layer have received their full dose, the scanning process progresses on to the next layer.

Identification

This repainting type is labelled **PBS-IL** in the (Delivery) Technique fields on the adaPT*prescribe* and adaPT*deliver* screens.

Representation

This repainting type is represented by an icon on adaPT*deliver* screens.

Figure 22-3. In-Layers Icon

Graph

Figure 22-4 illustrates the energy that is delivered in each layer. A graph similar to this one appears on adaPT*deliver* screens.

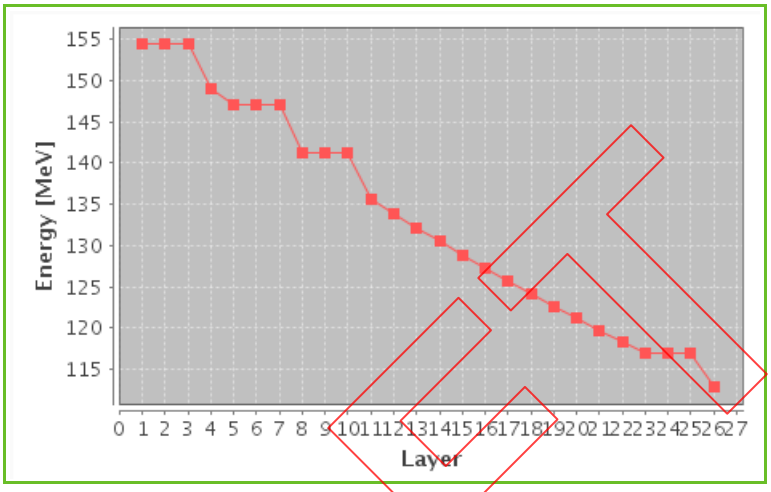

Figure 22-4. In-Layers Energy/Layer Graph (typical)

Decrease in Energy

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) once. When the proton beam finishes scanning the layer that ends at the proximal edge of the target volume, the repainting process restarts at the distal edge of the tumor. This process is repeated as many times as necessary until the prescribed dose is delivered for every spot in every layer of the target volume.

In this re-painting mode, the dose computation for each layer re-painting and the order of delivery by layers are fully handled by the TPS.

Identification

This repainting type is labelled **PBS-DE** in the (Delivery) Technique fields on the adaPT*prescribe* and adaPT*deliver* screens.

Representation

This repainting type is represented by an icon on adaPT*deliver* screens.

Figure 22-5. Decrease in Energy Icon

Graph

Figure 22-6 illustrates the energy that is delivered in each layer. A graph similar to this one appears on adaPT*deliver* screens.

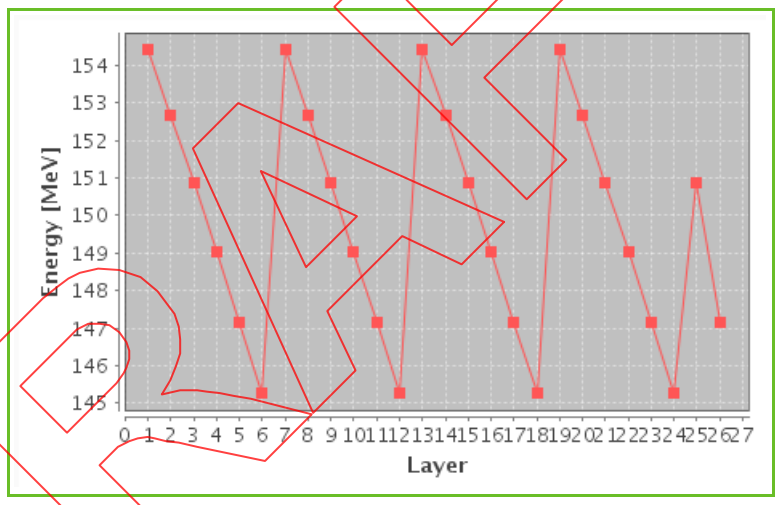

Figure 22-6. Decrease in Energy Energy/Layer Graph (typical)

Back and Forward

From the distal to the proximal edge of the target volume, each defined layer is scanned by the proton beam (or painted) once. When the proton beam finishes the scan of the layer that ends at the proximal edge of the target volume, the repainting process restarts at that same layer. The beam scanning process now advances from the proximal layer to the distal one. This process is repeated as many times as necessary until the prescribed dose is delivered for every spot in every layer of the target volume.

Identification

This repainting type is labelled **PBS-B&F** in the (Delivery) Technique fields on the adaPT*prescribe* and adaPT*deliver* screens.

Representation

This repainting type is represented by an icon on adaPT*deliver* screens.

Figure 22-7. Back and Forward Icon

Graph

Figure 22-8 illustrates the energy that is delivered in each layer. A graph similar to this one appears on adaPT*deliver* screens.

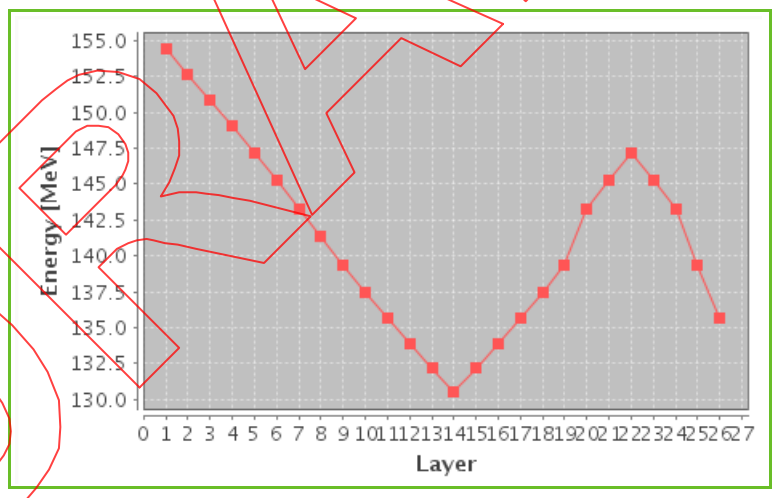

Figure 22-8. Back and Forward Energy/Layer Graph (typical)

Mixed Repainting

In this mode, different types of repainting are mixed for the same beam.

Identification

This repainting type is labelled **PBS-MIX** in the (Delivery) Technique fields on the adaPT*prescribe* and adaPT*deliver* screens.

Representation

This repainting type is represented by an icon on adaPT*deliver* screens.

Figure 22-9. PBS Mixed Icon

Graph

Figure 22-10 illustrates the energy that is delivered in each layer. A graph similar to this one appears on adaPT*deliver* screens.

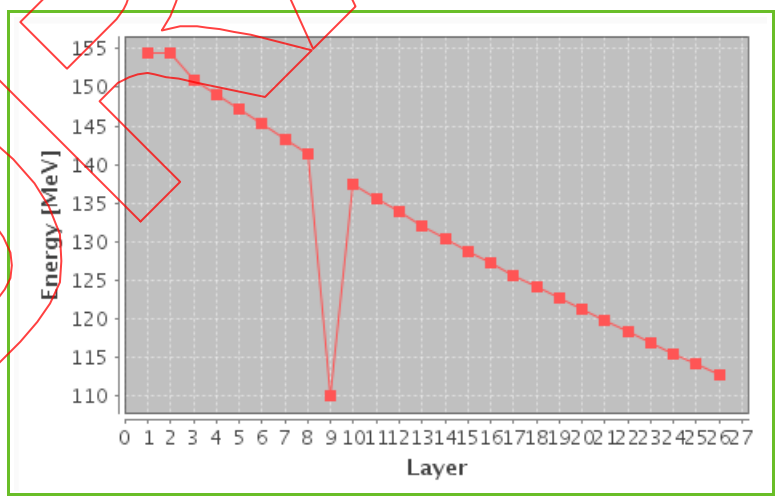

Figure 22-10. PBS Mixed Energy/Layer Graph (typical)

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Part IV

Using adaPT*prescribe*

Chapter 23
TPS-PTS Communication in Standalone Mode

The standalone mode option can be used when you opt not to use the OIS, or if the OIS is not available.

For each patient that will be treated by the PTS, patient data is stored in the PTS database. To enable proton therapy treatment, specific study and treatment plan data are also stored. These patient and treatment plan data are typically created using a Treatment Planning System (TPS) and once created, need to be imported into the PTS.

WARNING	In the absence of an OIS, it is required that the clinical operator of the Proton Therapy Center uses a paper-based Patient Chart and keeps paper records of the delivered fractions.

The adaPT*prescribe* application is used to manage patient, study, plan, and beam data stored in the PTS database and to baseline beams and plans during beam review. '*Baselining*' means the approval for treatment and prohibition of further modification.

Different options exist for entering treatment plan data into the PTS database. However, the workflow that follows each one of these different options is identical. Once all the required data is available in the PTS database, baselining is performed using adaPT*prescribe*. All subsequent activities, i.e., patient and plan selection, selection of the beam, preparation and treatment of the patient, creation of the irradiation record, and local storage of that record in the PTS database are performed using adaPT*deliver* in 'Stand Alone' mode.

These are the different ways to import deliverable plans into the PTS database:

- Entering data manually: this possibility only exists for treatment plans to be delivered using the double scattering, uniform scanning or single scattering delivery techniques. Pencil Beam Scanning plans cannot be created manually in adaPT*prescribe* due to the big amount of data they contain. The data entered manually are automatically stored in the PTS database. This way of entering patient data into the PTS is usually executed offline (i.e. before patient treatment/irradiation).
- Using the batch importer: the batch importer is a process which continuously runs in the PTS background. It waits for DICOM communications from other machines, such as the TPS. Once it receives a plan from a given machine, it performs a series of checks to verify that the received data corresponds to a deliverable plan. Once the plan is successfully checked and accepted, the data are stored in the PTS database. This way of entering patient data into the PTS is usually executed offline (i.e. before patient treatment/irradiation).
- Manual data import using the adaPT*prescribe* **Import Patient** command: the user may browse and import a plan (in dcm format) from the local disk by using the **Import Patient** button in adaPT*prescribe*. AdaPT*prescribe* performs a series of checks similar to those executed by the batch importer to verify that the imported data corresponds to a deliverable plan. Once the plan is successfully checked and accepted, the data are stored in the PTS database.

Using the Batch Importer

This is workflow option A mentioned in Figure 23-1.

Using the batch importer (BI) implies that the TPS is connected to the PTS (BI) without the use of an OIS. The definition of the prescription inside the PTS is done by exporting the DICOM plan from the TPS to the PTS (BI). The BI stores the plan from the TPS in the PTS database and then the plan can be baselined (using adaPT*prescribe*) and the patient can be treated (using adaPT*deliver*).

WARNING	
	Beam algorithms and parameters can be modified both on the TPS and the PTS side. A similar algorithm and a parameter database to compute equipment settings out of clinical parameters exists both on the PTS and the TPS, which means there is a risk of inconsistent results. As a treatment center, it is your responsibility to perform a set of quality assurance measurements to verify the coherence between both algorithms and parameter databases.

Note: *Please consult the Release Note to see whether or not clinical use of the batch importer is allowed.*

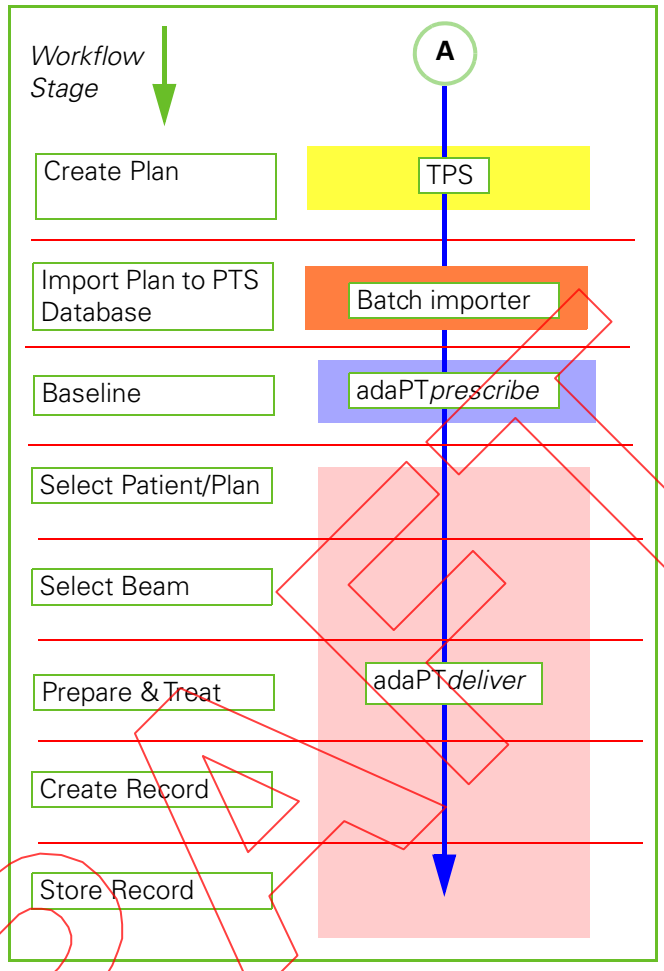

Figure 23-1. Communication Mode: Using the Batch Importer

The treatment plan is imported using the batch importer, which implies that the treatment plan data is imported into the PTS database, where it is available to be used for future treatment.

Once imported, all this data becomes accessible using adaPT*prescribe* and subsequently adaPT*deliver* (in stand alone mode).

The adaPT*prescribe* application is used to manage patient, study, plan, and beam data and to baseline beams and plans during beam review. 'Baselining' means the approval for treatment and prohibition of further modification.

The adaPT*deliver* application is used to select the patient, plan, and beam, to prepare and treat the patient, and to create and store the irradiation record.

When you want to use the batch importer to import a treatment plan from TPS into the PTS, select the desired plan in the TPS and export it.

The batch importer, i.e., the process that manages batch imports, is continually running in the background and waits for incoming DICOM connection requests. For detailed information, refer to the TPS OEM documentation for instructions on how to connect and send a Plan from TPS to the batch importer.

To display the exported treatment plan in adaPT*prescribe*, refresh the screen and select the desired patient and study.

You can then review and baseline the beams, and subsequently baseline the plan.

Using the adaPTprescribe 'Import' Feature

Alternatively to using the batch importer, a plan can also be imported from the TPS into the PTS database using adaPT*prescribe*.

The user may browse and import a plan (in .dcm format) from the local disk by using the **Import Patient** button in adaPT*prescribe*. AdaPT*prescribe* performs a series of checks similar to those executed by the batch importer to verify that the imported data corresponds to a deliverable plan. Once the plan is successfully checked and accepted, the data are stored in the PTS database.

You can then use adaPT*prescribe to* review and baseline the beam, and subsequently baseline the plan, which will become accessible on adaPT*deliver*.

Chapter 24
Getting Started With adaPTprescribe

WARNING	Beam algorithms and parameters can be modified both on the TPS and the PTS side. A similar algorithm and a parameter database to compute equipment settings out of clinical parameters exists both on the PTS and the TPS, which means there is a risk of inconsistent results. As a treatment center, it is your responsibility to perform a set of quality assurance measurements to verify the coherence between both algorithms and parameter databases.

The adaPT*prescribe* application is used to manage patient, study, plan, and beam data stored in the PTS database and to baseline beams and plans during beam review. '*Baselining*' means the approval for treatment and prohibition of further modification.

Only those plans that have been baselined and set as active in adaPT*prescribe* become accessible using adaPT*deliver*.

Also those plans that have been received via the OIS and that have already been irradiated at least once using adaPT*deliver* become visible in adaPT*prescribe*. This allows these plans to be irradiated again using standalone mode, if necessary.

Starting an adaPTprescribe Session

Click the adaPT*prescribe* icon on the desktop in the TCR or in the TR to start up adaPT*prescribe*.

Figure 24-1. Start adaPTprescribe Icon

When you start an adaPT*prescribe* session, the ADAPT*prescribe* LOGIN SCREEN appears (see Figure 24-2).

Exiting an adaPTprescribe Session

Whenever you want to exit the adaPT*prescribe* session:

1. Logout from adaPT*prescribe*, as described in Section "*Logging out From adaPTprescribe*" on page 24-4.
2. Click **Exit** from the ADAPT*prescribe* LOGIN SCREEN.

Logging into adaPTprescribe

Double-click the adaPT*prescribe* icon and the ADAPT*prescribe* LOGIN SCREEN appears.

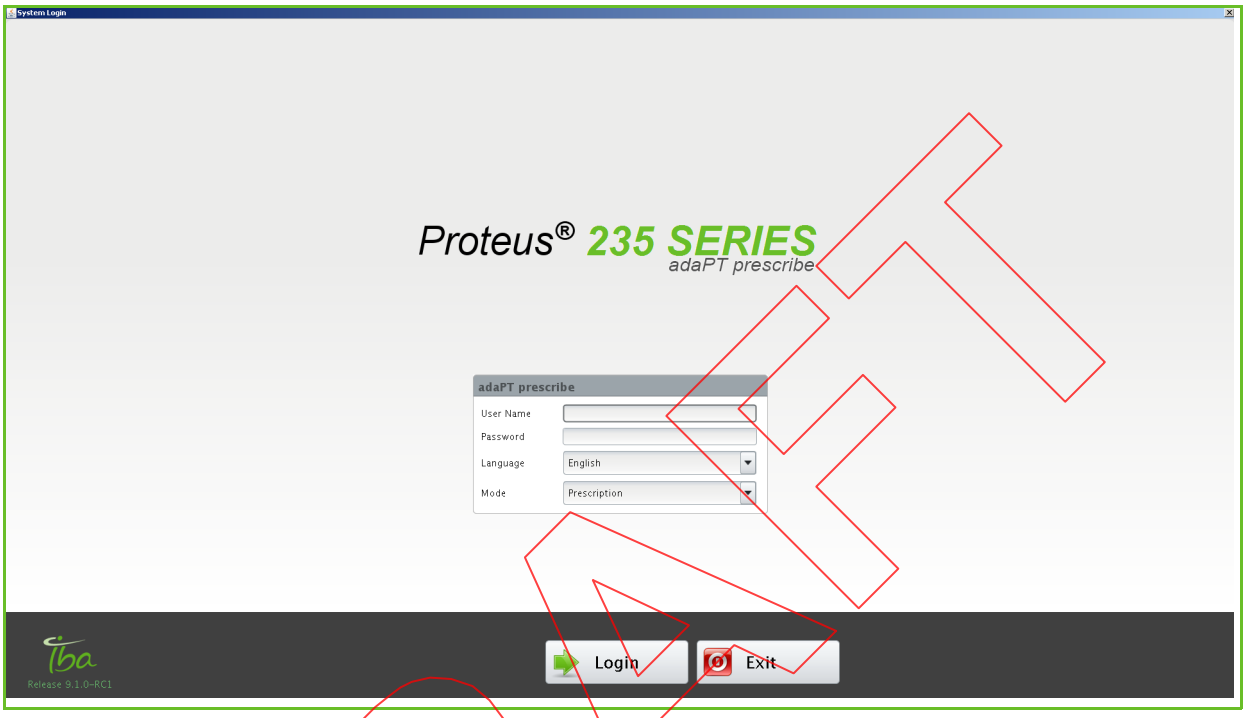

Figure 24-2. adaPTprescribe Login Screen

Enter your user name and password, as obtained from your administrator, and select your language and operating mode. User name and password are case sensitive. Should you want to change your password, please contact your administrator.

Note: *For detailed information on how user names and passwords are managed, refer to* **Appendix B**, *"Managing PTS Users".*

Two operating modes exist:

- **Prescription**: for clinical operations. For detailed information refer to Chapter 25, *"How adaPTprescribe* is Organized".
- **Administration**: to define and manage tolerances and MU clinical ranges. In addition, you can manage accessories.

  For detailed information refer to **Appendix C**, *"Managing adaPTprescribe* Settings".

Click **Login** and the ADAPT*prescribe* SCREEN appears (see Figure 24-3).

Note: *By default at login, adaPTprescribe displays active patients only.*