



Sentinel

CT room

Acceptance Test

Document ID	SP-001-150408-001
Version	05

Reviewed	
Date	2021-12-21
By	 Johan Bostedt, R&D

Approved	
Date:	2021-12-21
By	 Thomas Matzen, QA/RA

Document History

Drafts

Version	Date	Author/Comment
03.1	2018-02-27	Åsa Kronander, ECO-1200. Adjusted site information form.
04.1	2018-03-15	Pelle Jansson, ECO-1207 Added tests for cLight and cPatient Order number added to site information.
05.1	2021-12-17	Installation checklist added. The updated version is merging SP-001-170420-001, Installation Test, Sentinel into the Acceptance test.

Released Versions

Version	Date	Comment
03	2018-02-28	Johan Bostedt, Approved version
04	2018-03-27	Åsa Kronander, Approved version
05	See front page	Approved version

Sentinel

CT Room

Acceptance Test

Document ID	SP-001-150408-001
Version	05

Performed by	Name and Title
Date	Company
	Signature

Approved by	Name and Title
Date	Company
	Signature

Site name/Hospital name

.....
.....

Address

Street
City
Postal/zip code
Country

Order number

Site room

Laser Scanner serial number

HY-002-.....

c4D version

.....

Applications available

cRespiration

Interface modules available

- | | |
|--|-----------------------------------|
| <input type="checkbox"/> cPhilips BigBore | <input type="checkbox"/> cVSIM |
| <input type="checkbox"/> cSiemens Open interface | <input type="checkbox"/> cPatient |
| <input type="checkbox"/> cToshiba | <input type="checkbox"/> cLight |
| <input type="checkbox"/> cGeneralElectric | |

Table of Content

- Sentinel.....3
- CT Room.....3
- 1. Checklist.....4
- 2. Installation Checklist5
- 3. Quality Assurance6
- 4. Volume Control.....8
- 4. 4DCT: Philips Interface9
- 5. 4DCT: Siemens/GE Interface 10
- 6. 4DCT: Toshiba Interface 11
- 8. VSIM 12
- 9. cLight 13
- 10. cPatient..... 14

1. Checklist

The following items should be noted:

1. **IP-address of the Sentinel PC:**
Subnet:
Gateway:

2. **Sentinel PC Service Tag:**

3. **Is internet access available on the PC for remote support (highly recommended)?**
 Yes
 No, but can be arranged with a VPN connection
 No
 Other:

4. **Anti-virus software installed (if any):**

5. **Has the C-RAD calibration data and settings been backed up?**
 Yes

6. **Manuals handed over to Customer**
 Yes

2. Installation Checklist

This section is only performed by the installation engineer as a part of the installation procedure.

Item Description	Item checked?	Comment (optional)
The Sentinel hardware is attached to the pipe with torque 10 Nm for PL-P-0001 or 17 Nm for 300263 applied following the instructions in the SP-001-081103-001, Installation manual section 6 Installation.	Yes <input type="checkbox"/> No <input type="checkbox"/>	

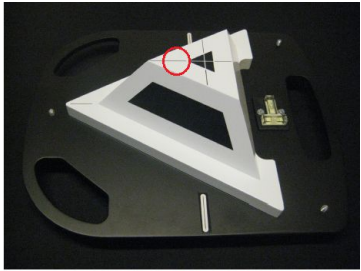
3. Quality Assurance

Purpose:

- Verify that the QA procedure passes (step 2).
- Verify that the QA calibration properly compensates for couch sag, so that there is a negligible drift in the measured breathing curve for different couch positions (step 6)
- Verify that the Sentinel laser measures on the same point during for different couch positions (step 7)
- Verify that measured values from Sentinel are accurate (step 9)

Prerequisites:

- A QA calibration has been performed.
- A cRespiration license is available.

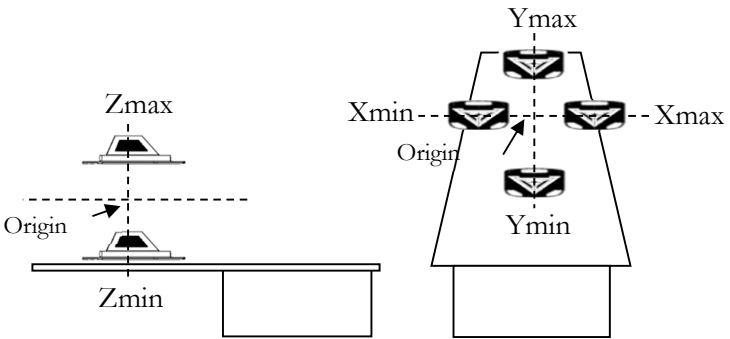
Workflow steps	Result
<p>1. Move the CT couch to the initial position according to the QA procedure. Place the daily check device in the Sentinel calibration origin (CT radiation isocenter).</p> <p>2. Switch to Clinical mode. Select “Daily Check” and complete the check-procedure. Confirm that:</p> <ul style="list-style-type: none"> ➤ The current deviation is within 1 mm. ➤ The maximum couch-profile deviation from the last check is within 1 mm. <p>3. Press “cancel”.</p> <p>4. Without moving the daily check device, place the calibration weights on the couch (same weights and position that was used for the “QA calibration”), and move the couch to the initial position according to the QA (same position as in step 1).</p> <p>5. Select the entry to perform a 4DCT. Place a white piece of tape on the position circled below. Go through the wizard and place the primary point on the region circled below, so that the three laser lines appear on the piece of tape. Mark the position of the center line with a pen.</p>  <p>6. Move the couch first to the START POSITION (about 300 mm longitudinally out of the gantry, towards Sentinel) and then to the</p>	

<p>END POSITION (about 300 mm longitudinally into the gantry past the calibration origin). Look at the measured “breathing curve” and place the lower limit of the gating window so that it corresponds to the minimum value of the curve (excluding possible noise spikes). Similarly, place the upper limit of the gating window so that it corresponds to the maximum value of the curve (excluding possible noise spikes).</p> <p>Difference between upper- and lower limit:mm</p> <p>➤ Difference shall be within 2 mm.</p> <p>7. Measure the distance from the center laser line to the drawn line in step 5.</p> <p>Difference between seen laser and marked line.....mm</p> <p>➤ Difference shall be within 4 mm.</p> <p>8. Move the couch back approximately to the Sentinel calibration origin position (CT radiation isocenter). Make sure the lines are still located on top of the daily check device.</p> <p>9. Move the couch vertically 3 mm in positive direction. The difference in the measured “breathing curve” before and after the movement shall be:</p> <p>➤ 3 mm ± (1 mm + couch accuracy)</p> <p>Couch accuracy is typically within 0.5mm</p>	<p><input type="checkbox"/> OK</p>
--	------------------------------------

4. Volume Control

Purpose:

- Measure the maximum scan volume of the system
- Verify that a point corresponding to the end of the clinical volume can be detected.

Workflow steps	Result
<p>1. Go to clinical mode and select “4DCT”. Choose any patient and go to the first step in the wizard. Place the daily check device according to the figure below and extend one volume parameter at a time to maximum (you may need to adjust the camera settings in order to detect the daily check device well). Move the device until you find a point where the limit of the detectable volume is (it may take a few attempts to find the correct position).</p>  <p>Measured distance</p> <p>1a Lat. Xmin: _____ Xmax: _____</p> <p>1b Long. Ymin: _____ Ymax: _____</p> <p>1c Vert. Zmin: _____ Zmax: _____</p> <p>Accepted values</p> <p>A point 20cm longitudinally- and 12cm vertically of the CT origin can be detected by Sentinel.</p> <p>Values listed are maximum scan volume for the given installation.</p>	<p style="text-align: right;"><input type="checkbox"/> OK</p>

4. 4DCT: Philips Interface

Shall be performed only for installations with cRespiration and cPhilips license

Purpose:

- Verify that the interface to the CT is working (step 4-5)

Prerequisites:

- Breathing phantom required

Workflow steps	Result
<ol style="list-style-type: none"> 1. Place the breathing phantom on the CT couch, with the surface above the Sentinel calibration origin and create a new 4DCT study. Perform a scan of the device and adjust the settings to suitable values to display only the phantom. 2. Choose “Prospective” and press “Next”. 3. Choose the location of the primary gating point, start the scanning and attempt to send the signal to the Philips workstation. 4. Go to the CT control computer and make sure that the signal is continuously sent to the Philips workstation. 5. Repeat step 1-4, but choose “Retrospective” in step 2. 	<div style="text-align: right;"> <input type="checkbox"/> OK </div>

5. 4DCT: Siemens/GE Interface

Shall be performed only for installations with cRespiration and cSiemens/cGeneral Electric license

Purpose:

- Verify that the interface to the CT is working (step 3-4 and 10)

Prerequisites:

- Breathing phantom required

Workflow steps	Result
<ol style="list-style-type: none"> Place the breathing phantom on the CT couch, approximately in the Sentinel calibration origin and create a new 4DCT study. Perform a scan of the device and adjust the settings to suitable values to display only the phantom. Choose “Prospective” and press “Next”. Place the primary gating point on the phantom and adjust the gating window so that the breathing curve moves in- and out of the window. Click the “trigger” button and make sure that the CT is triggered when the breathing curve is within the gating window. Change the gating window, so that the breathing curve never enters it, and make sure that the CT cannot be triggered. 	<input type="checkbox"/> OK
<ol style="list-style-type: none"> Place the breathing phantom on the CT couch, approximately in the Sentinel calibration origin and create a new 4DCT study. Perform a scan of the device and adjust the settings to suitable values to display only the phantom. Choose “Retrospective” and press “Next”. Place the primary point on the phantom and click “scan” to start measuring the breathing. Perform all the actions required on the CT-side to prepare for the CT-scan (perform scout/preview images and move the couch longitudinally to the start position of the scan). Make sure that the breathing phantom will be covered in the imaged region Make sure that the green sine curve roughly matches the red breathing curve (in period and amplitude) and click “Lock Characteristics”. Click “Record Data” and then perform the 4DCT study. Press “Finish” and import the generated vxp-file to the Siemens/GE software. Make sure that it is accepted, and that the CT data can be reconstructed. 	<input type="checkbox"/> OK

6. 4DCT: Toshiba Interface

Shall be performed only for installations with cRespiration and cToshiba license

Purpose:

- Verify that the interface to the CT is working (step 3-4 and 10)

Prerequisites:

- Breathing phantom required

Workflow steps	Result
<ol style="list-style-type: none"> 1. Place the breathing phantom on the CT couch, approximately in the Sentinel calibration origin and create a new 4DCT study. Perform a scan of the device and adjust the settings to suitable values to display only the phantom. 2. Choose “Prospective” and press “Next”. 3. Place the primary gating point on the phantom and adjust the gating window so that the breathing curve moves in- and out of the window. Click the “trigger” button and make sure that the CT is triggered when the breathing curve is entering the gating window. 4. Change the gating window, so that the breathing curve never enters it, and make sure that the CT cannot be triggered. 	<p style="text-align: right;"><input type="checkbox"/> OK</p>
<ol style="list-style-type: none"> 5. Place the breathing phantom on the CT couch, approximately in the Sentinel calibration origin and create a new 4DCT study. Perform a scan of the device and adjust the settings to suitable values to display only the phantom. 6. Choose “Retrospective” and press “Next”. 7. Place the primary point on the phantom and click “scan” to start measuring the breathing. 8. Perform all the actions required on the CT-side to prepare for the CT-scan (perform scout/preview images and move the couch longitudinally to the start position of the scan). Make sure that the breathing phantom will be covered in the imaged region 9. Make sure that the green sine curve roughly matches the red breathing curve (in period and amplitude) and click “Lock Characteristics”. Click “Send Trigger” and then perform the 4DCT study. 10. Press “Finish” and make sure that the CT data can be reconstructed. 	<p style="text-align: right;"><input type="checkbox"/> OK</p>

8. VSIM

Shall be performed only for installations with cRespiration and cVSIM license

Purpose:

- Verify that the VSIM lasers are working (step 1)

Prerequisites:

- Cyrpa HIT lasers has been installed.

Workflow steps	Result
1. Perform the acceptance test according to the instructions for Cyrpa HIT lasers.	<input type="checkbox"/> OK

9. cLight

Shall be performed only for the installations with the cLight license.

Purpose:

- Verify that the room light can change color according to the patient breathing (step 6)

Prerequisites:

- The Sentinel system is connected to the cLight system.
- The Sentinel system has a cLight license available.
- Breathing phantom required.

Workflow steps	Result
<ol style="list-style-type: none"> 1. Place the phantom on the couch. 2. Go to Clinical Mode and create a new patient. 3. Perform a scan, select Prospective and click Next. 4. Place the primary point on the breathing phantom and press scan. 5. Adjust the gating window to suitable values so that the breathing curve enters and leaves the gating window. 6. Verify that the cLight lights in the CT room changes color when the breathing curve enters and leaves the gating window. 	<div style="text-align: right;"> <input type="checkbox"/> OK </div>

10. cPatient

Shall be performed only for installations with a cPatient license.

Purpose:

- Verify that the patient synchronization to the cPatient system (step 4) is working

Prerequisites:

- The Sentinel system is connected to the cPatient system.
- The Sentinel system has a cPatient license available.

Workflow steps	Result
<ol style="list-style-type: none">1. Go to Clinical Mode and create a new patient.2. Register the patient in the cPatient system.3. Close the patient in c4D.4. Select the same patient in c4D and verify that the patient is loaded into the cPatient system.	<input type="checkbox"/> OK