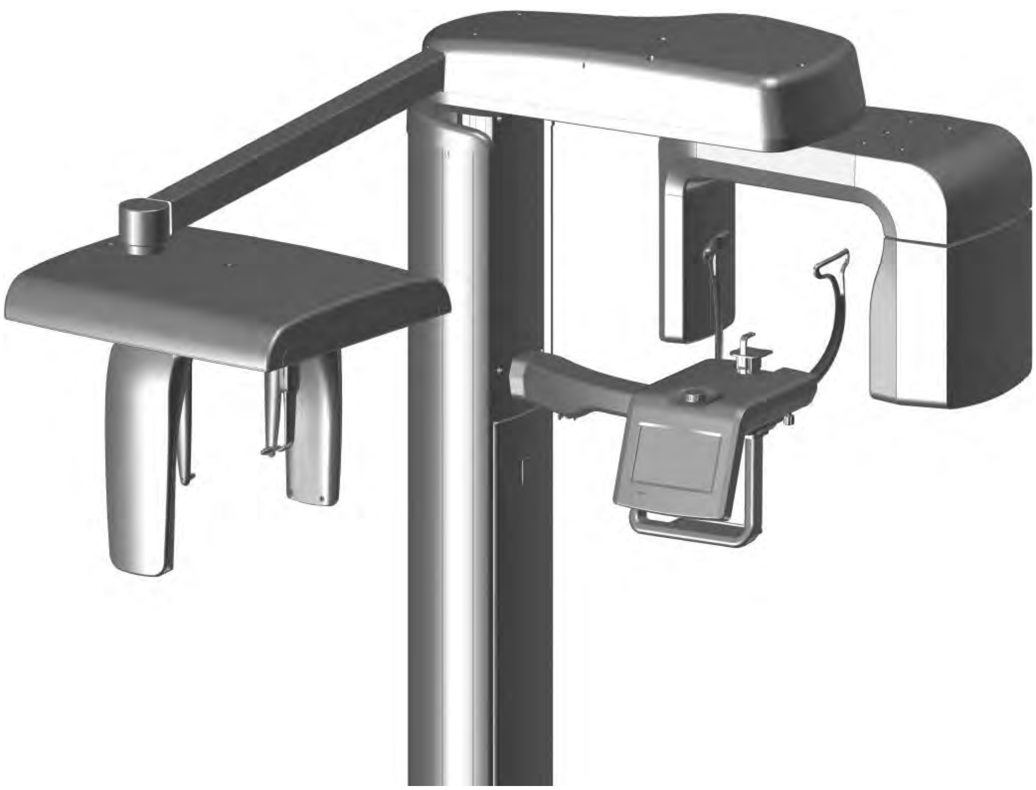
ProVecta S-Pan,
ProVecta S-Pan Ceph



Service Manual

A7566 Revision A
Air Techniques, Inc.

Contents

1 Background

1.1 About this manual

This manual describes the procedures for calibrating the units ProVecta S-Pan and ProVecta S-Pan Ceph. In addition, it also contains background information and instructions for optimising, troubleshooting and repairing the systems.

This manual has been written solely for technical personnel who have been trained on installation, maintenance and repairs for ProVecta S-Pan and ProVecta S-Pan Ceph.

In addition, the text refers to "ProVecta S-Pan" in all cases where the stated content applies equally to ProVecta S-Pan and ProVecta S-Pan Ceph, as ProVecta S-Pan Ceph has the same range of basic functions as ProVecta S-Pan.

1.1.1 Symbols

ⓘ The described information is part of the initial installation.

1.2 Further documentation

The following documents are available via www.airtechniques.com

ProVecta S-Pan Ceph Operating Manual	Part Number: A7515
ProVecta S-Pan Operating Manual	Part Number: A7370
ProVecta S-Pan Installation Manual	Part Number: A7380
ProVecta S-Pan Ceph Installation Manual	Part Number: A7516
ProVecta S-Pan & S-Pan Ceph Software Installation & Configuration	Part Number: A7371

1.3 Technical data and additional information about installation of the unit

1.3.1 Device dimensions

1.3.1.1 ProVecta S-Pan

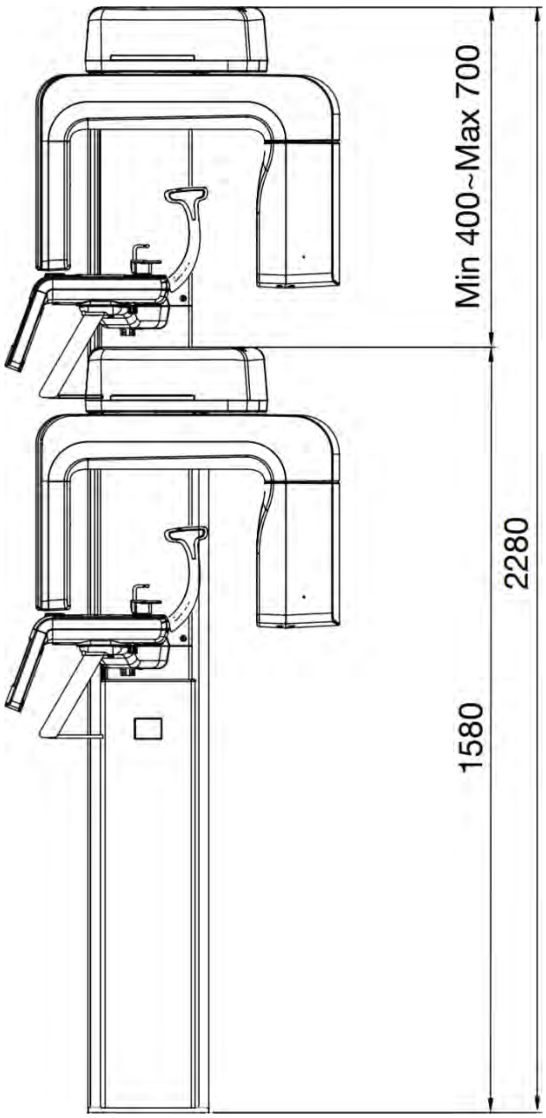


Fig. 1 Height information for ProVecta S-Pan

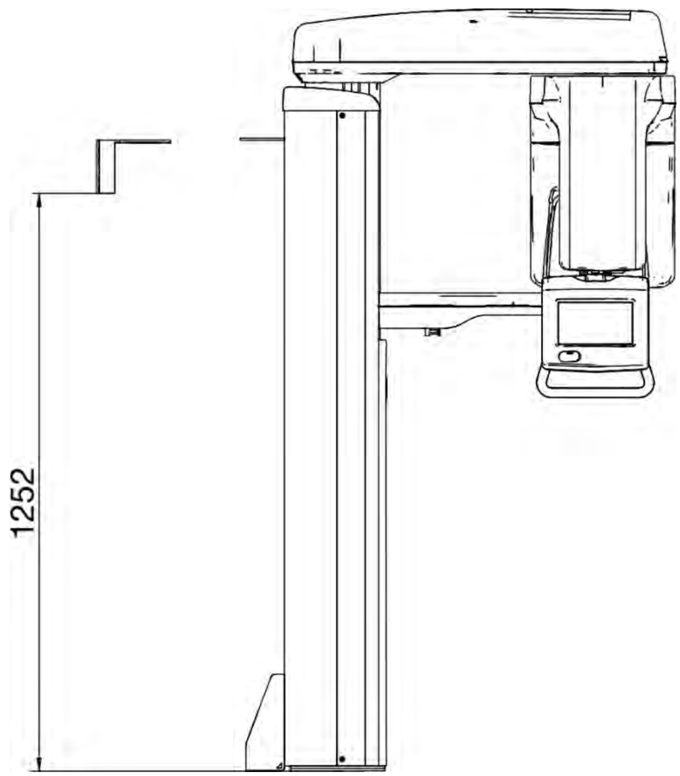


Fig. 2 Height information for wall mounting the ProVecta S-Pan

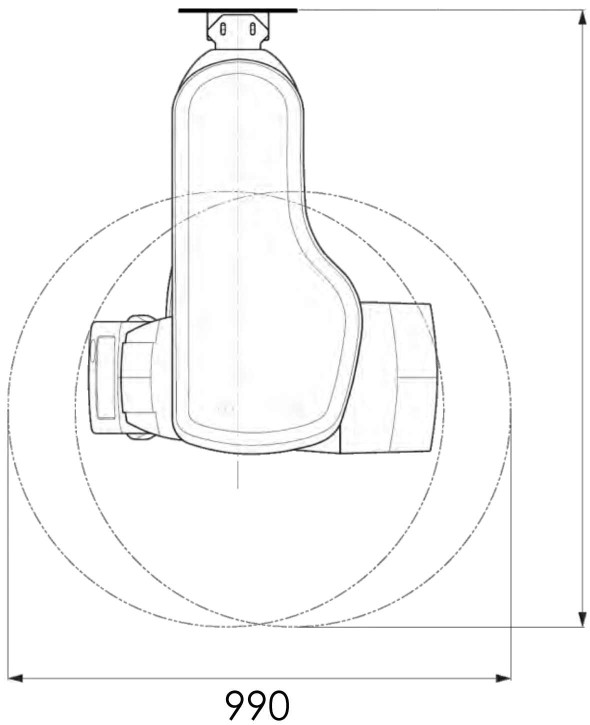


Fig. 3 Width and depth information for ProVecta S-Pan

1.3.1.2 ProVecta S-Pan Ceph

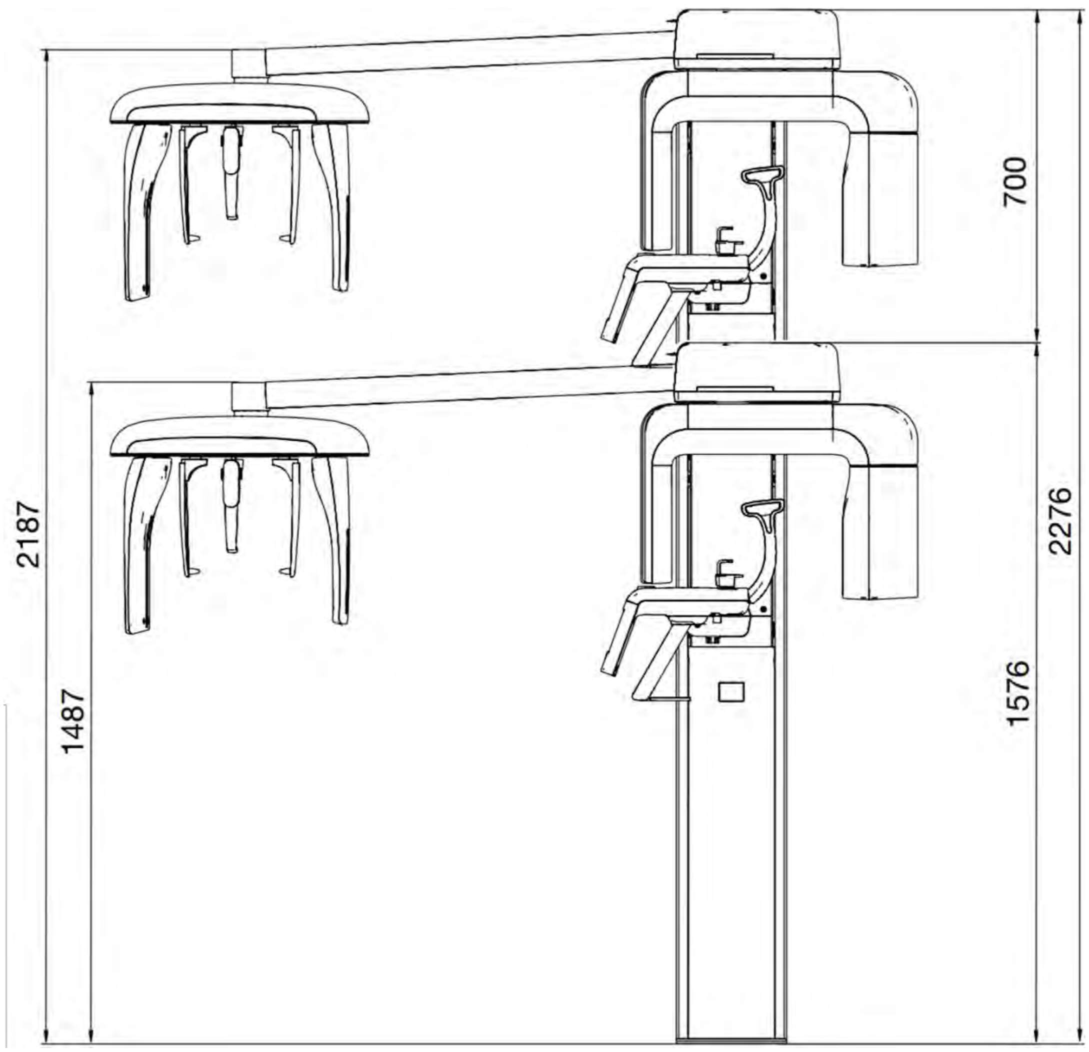


Fig. 4 Height information for ProVecta S-Pan Ceph

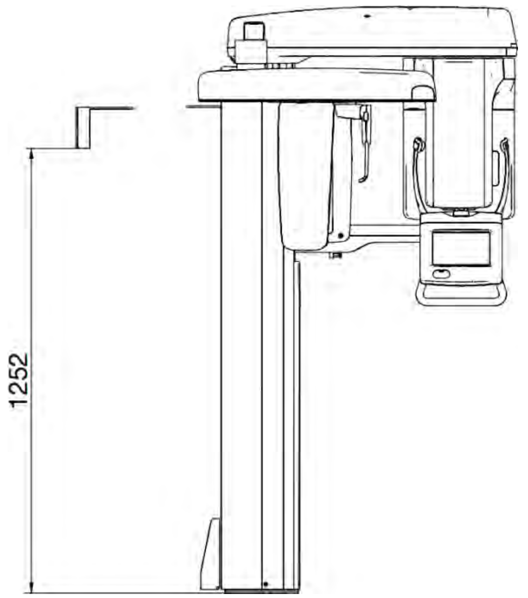


Fig. 5 Height information for wall mounting the ProVecta S-Pan Ceph

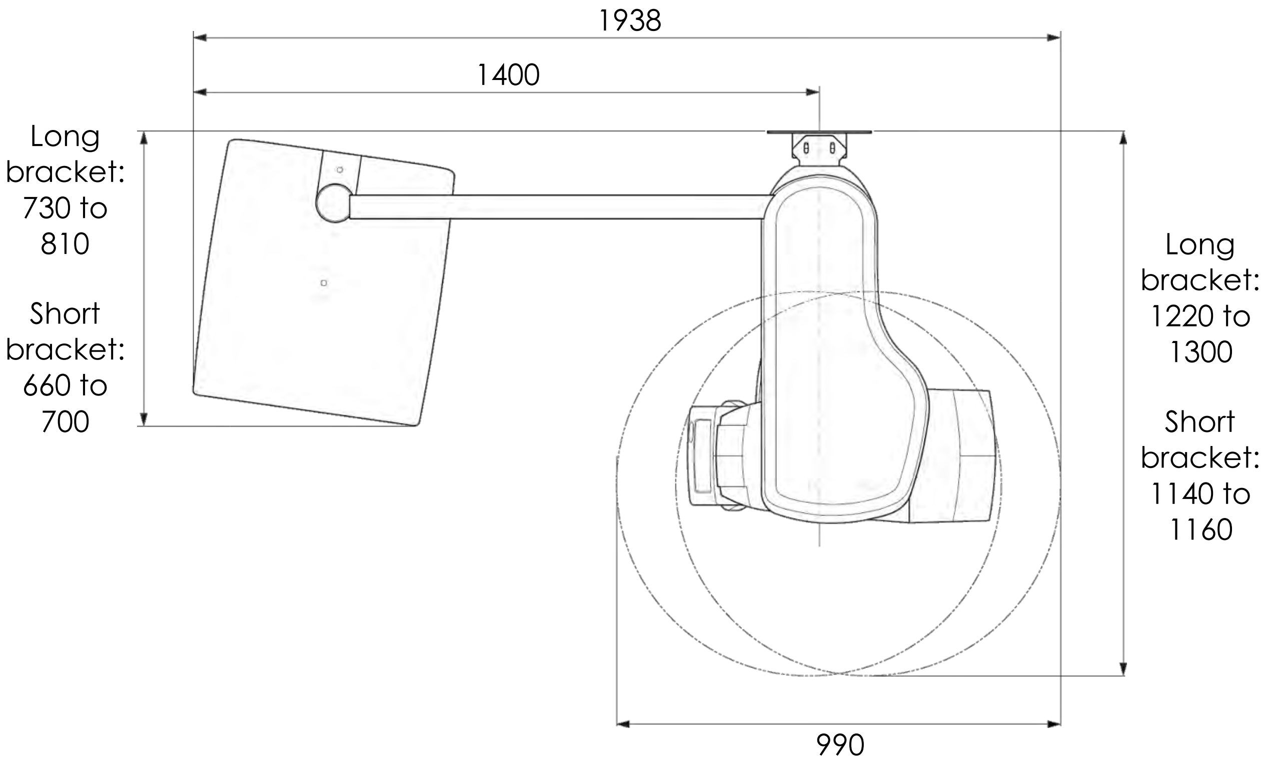


Fig. 6 Width and depth information for ProVecta S-Pan Ceph

1.3.2 Technical data for ProVecta S-Pan (Ceph)

Further data can be found in the installation guide and in the operating instructions.

General data for ProVecta S-Pan

Height	mm	1580 – 2280
Dimensions (W x D)	mm	990 x <= 1300
Vertical adjustment travel of telescopic	mm	700
Weight	kg	100
Weight with foot (optional)	kg	148

General data for ProVecta S-Pan Ceph

Height	mm	1576 – 2276
Dimensions (W x D)	mm	1938 x <= 1300
Vertical adjustment travel of telescopic	mm	700
Weight	kg	129
Weight with foot (optional)	kg	179

Electrical data

Nominal voltage	V AC	200 – 240
Max. voltage fluctuation	%	± 10
Frequency	Hz	50 / 60
Rated power	W	170
Maximum power	kVA	2.2

X-ray emitter

Model		DG-07C11T2 (H)
Rated power	kW	1.6 (at 1 sec)
Type: high-voltage generator		Inverter
Nominal voltage: high voltage generator	kV	50 – 99 (± 10 %)
Nominal current, high voltage generator	mA	4 – 16 (at 1 kVp)
Cooling, high voltage generator		Automatic monitoring Shut-off at ≥ 60 °C
Additional filtering at 50 kV	mm Al	2.0
Integrated filtering at 50 kV	mm Al	0.8
Total filtering at 50 kV	mm Al	2.8
X-ray tube model		Toshiba D-052SB
Focal spot size as per IEC 60336 X-ray tube	mm	0.5
Anode angle	°	5
Pulse/pause ratio		1:60 or more
Duration of radiation exposure	Sec	1.9 – 13.5

Detector

		Panoramic	Ceph
Brand		Xmaru 1501CF-HS	Xmaru 2301CF-HS
Type		CMOS photodiode array	
Pixel size	µm	100	
Active surface	mm	6 x 150.4	5.9 x 230.4
Frame rate	fps	300	200
Greyscale	bit	14	

Image capture scale (magnification)

Acquisition mode	FDD mm	FOD mm	ODD mm	Image capture scale
Panoramic	490.2	375.0	115.2	1.3
Ceph	1745	1525	220	1.14

Distances: FDD = focal spot – detector; FOD = focal spot – object; ODD = object – detector

Locale acquisition speed in spine area

Acquisition mode	Value
Panoramic SD (7 sec.)	2,9 cm / s
Panoramic HD (13,5 sec.)	1,5 cm / s

1.3.3 Assembly instructions

Assembly instructions can be found in the installation guides.

1.3.3.1 (Remote) trigger

The manual trigger included in the scope of delivery has a cable length of around 10 m. In addition to the push button function, it also has two status LEDs (green and yellow) and is actuated via a 5-wire cable.

Polarity of the 5 wires:

- White/black wire -> push button
- Blue/red wire -> 15V DC LED green
- Red/green wire -> 15V DC LED yellow

If an existing (two-pole) remote trigger is to be connected to the ProVecta S-Pan, it is possible to do this using an optional adapter cable with pre-assembled crimp connectors.

This can be ordered under the item number 2207-070-51.

1.3.3.2 Replacement of the network cable

The pre-installed network cable (10 m) can be replaced with any network cable in category 5e, 6 or 7. This might be useful e.g. if the computer is located right next to the X-ray unit or if (due to space constraints) it is further than 10 m away.

It is relatively easy to replace the network cable. In the lower part of the unit column there is a network coupling that provides the connection between the internal network cable and the external one.

Both connectors are pushed into the coupling but not screwed in. The connector of the external cable can be pulled to the rear and then disconnected. In addition, the entire coupling can be detached (two screws) to gain better access to the plug connection. The situation can be seen more clearly in the picture below.

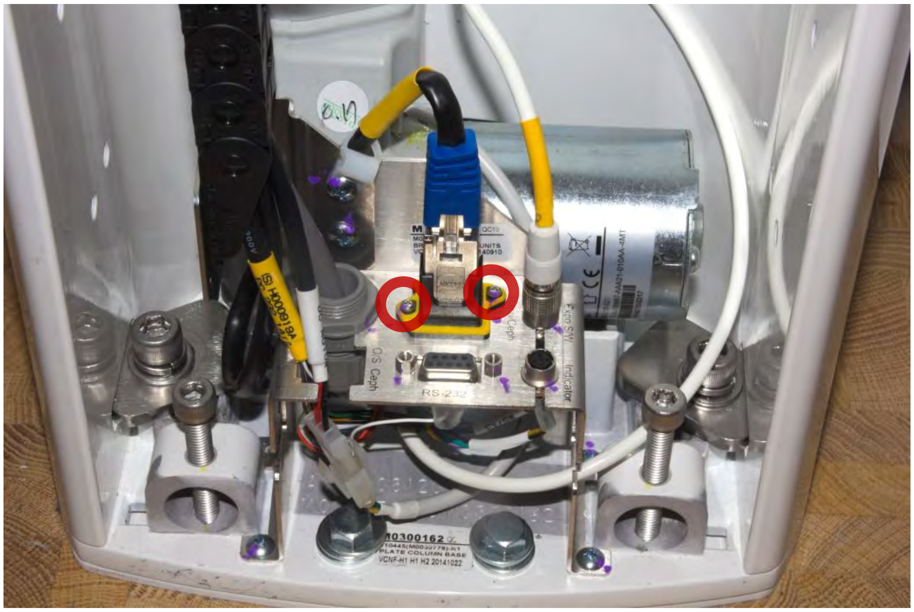


Fig. 7 Cable connection options in the lower part of the column

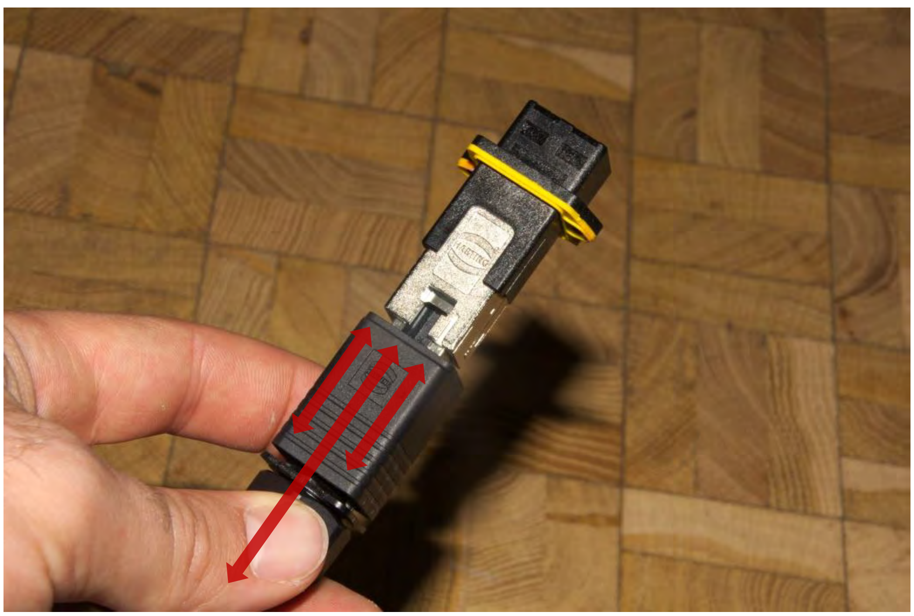


Fig. 8 External cable at the detached coupling

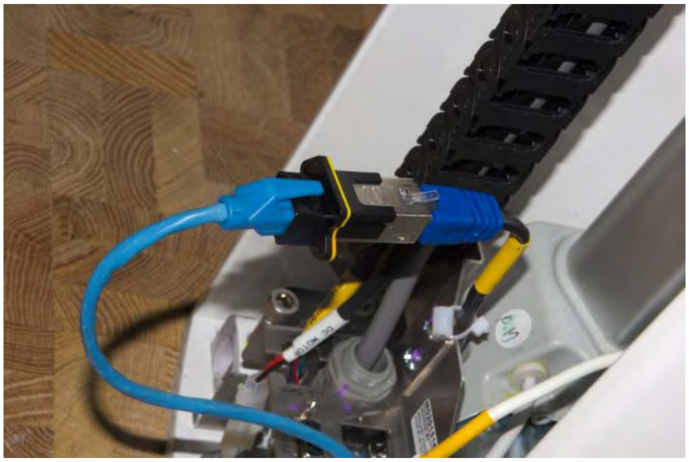


Fig. 9 Alternative external cable at the coupling

1.4 Initial calibration procedure after installation of the unit ⓘ

Section **16 Checklists** on page 198 contains various checklists to help with the different processes that need to be performed for the initial installation.

1.4.1 ProVecta S-Pan

The following procedure applies to ProVecta S-Pan:
An image is acquired to retrieve the calibration data from the ProVecta S-Pan unit.
Afterwards the adult and child collimators are calibrated. In most cases the calibration of the unit is then complete.

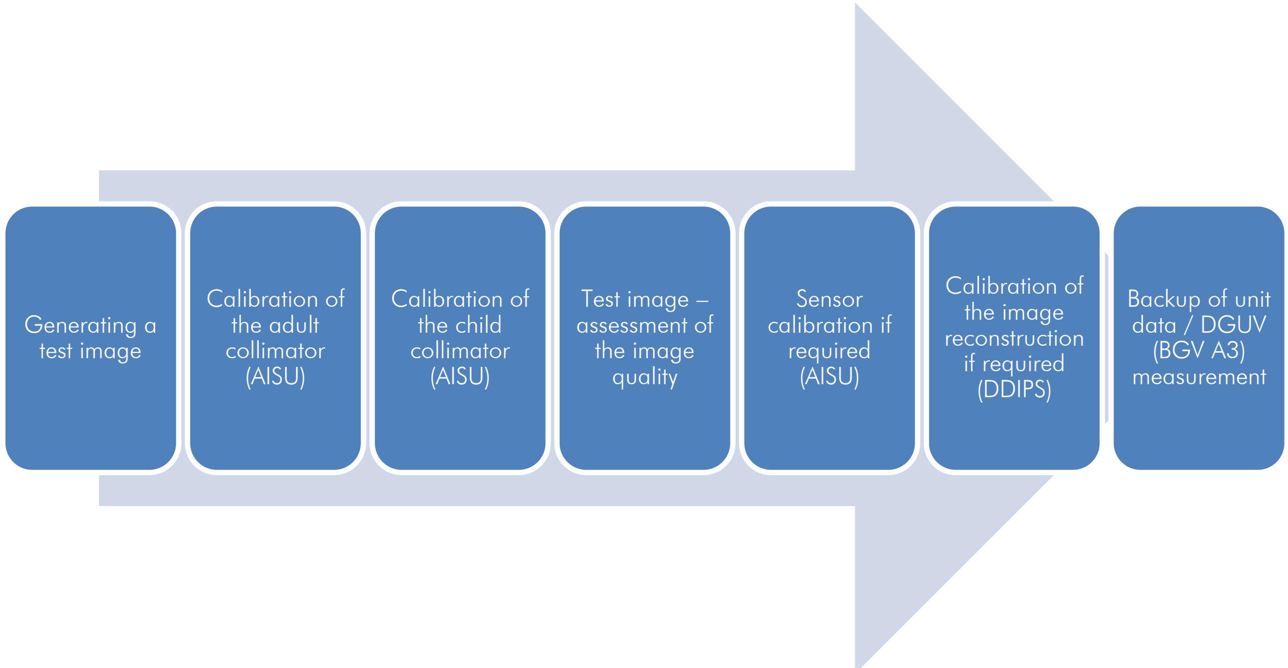


Fig. 10 Calibration procedure for panoramic unit

1.4.2 ProVecta S-Pan Ceph

The procedure for the ProVecta S-Pan Ceph is the same as for the ProVecta S-Pan.

In addition, the following steps also need to be performed for the Ceph unit:

Here again, the first test image is also used to ensure that all of the calibration data is downloaded to the computer. Afterwards the primary collimator (tube side) and the secondary collimator (in front of the patient) are aligned on the ceph sensor.

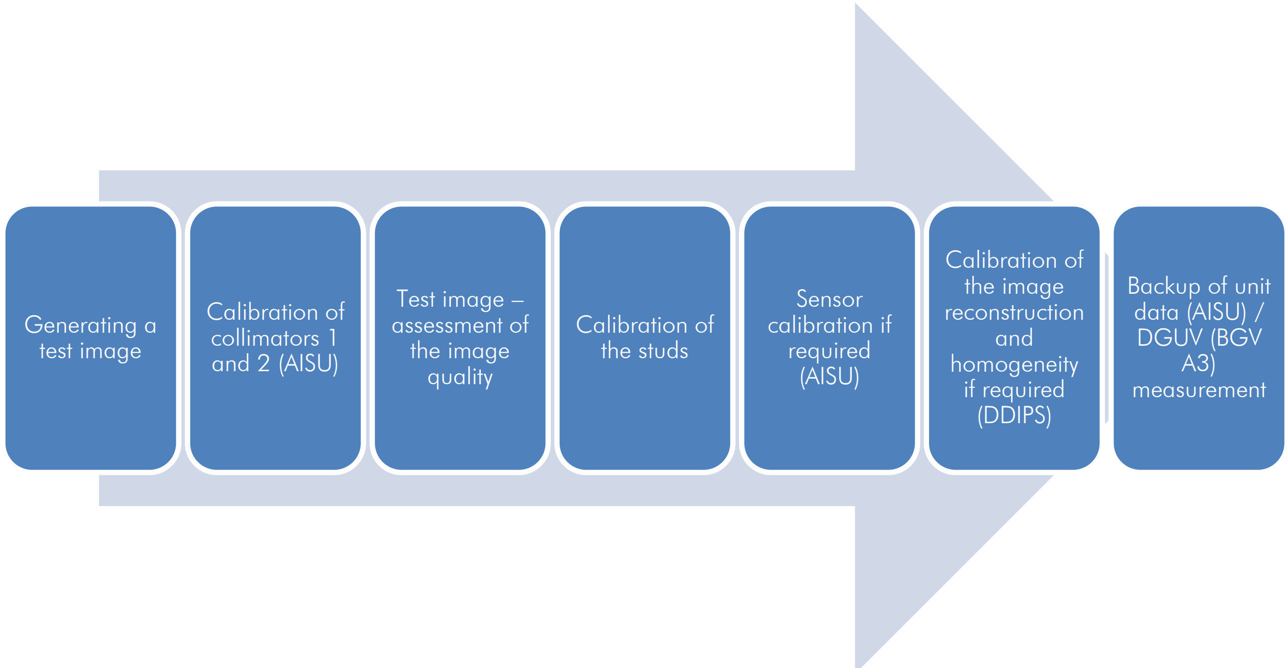


Fig. 11 Calibration procedure for ceph unit

2 Software installation and Configuration

2.1 ProVecta S-Pan Installation Software

ProVecta S-Pan Software and Utilities Disk contains several components that relate to ProVecta S-Pan. These are:

- Software element for actuation of ProVecta S-Pan
- Admin tools (AISU, Calibration Downloader and Uploader, DDIPS, RawViewer)
- Individual configuration files for ProVecta S-Pan (e.g. Environment.ini)
- Software Installation and Configuration Instructions

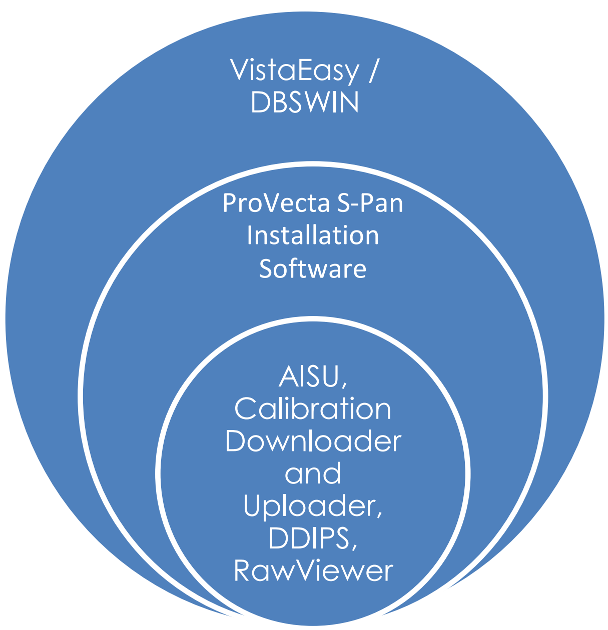


Fig. 12 Software dependencies

2.1.1 Configuration and preconditions

2.1.1.1 Hardware requirements

The requirements for ProVecta S-Pan Installation Software are no higher than those for VistaEasy or DBSWIN.

2.1.1.2 Network communication

Communication with ProVecta S-Pan takes place exclusively via the network connection. The requirement for this is cabling that at least satisfies the requirements for cat. 5e.

The network card included in the scope of delivery is approved for communications with ProVecta S-Pan. Although we have found that alternative gigabit-capable network cards can work, we do not recommend their use.

ProVecta S-Pan is only approved for use with a direct network connection between computer and ProVecta S-Pan. Use of a switch or router between the computer and ProVecta S-Pan is therefore not an approved solution.

The pre-installed network cable can be replaced (see section

2.1.1.3 Configure network adapter

Note: Before proceeding, make sure that the ProVecta is turned on and connected to the new network adapter.
3a. From the start menu, select the CrongIPC item from the
Air Techniques > Provecta S-Pan submenu

3b. With the Gigabit Ethernet card installed only for ProVecta S-Pan operation selected, Click the Set to CRONG client IP button and perform steps 3.c thru 3.g to configure the client IP.

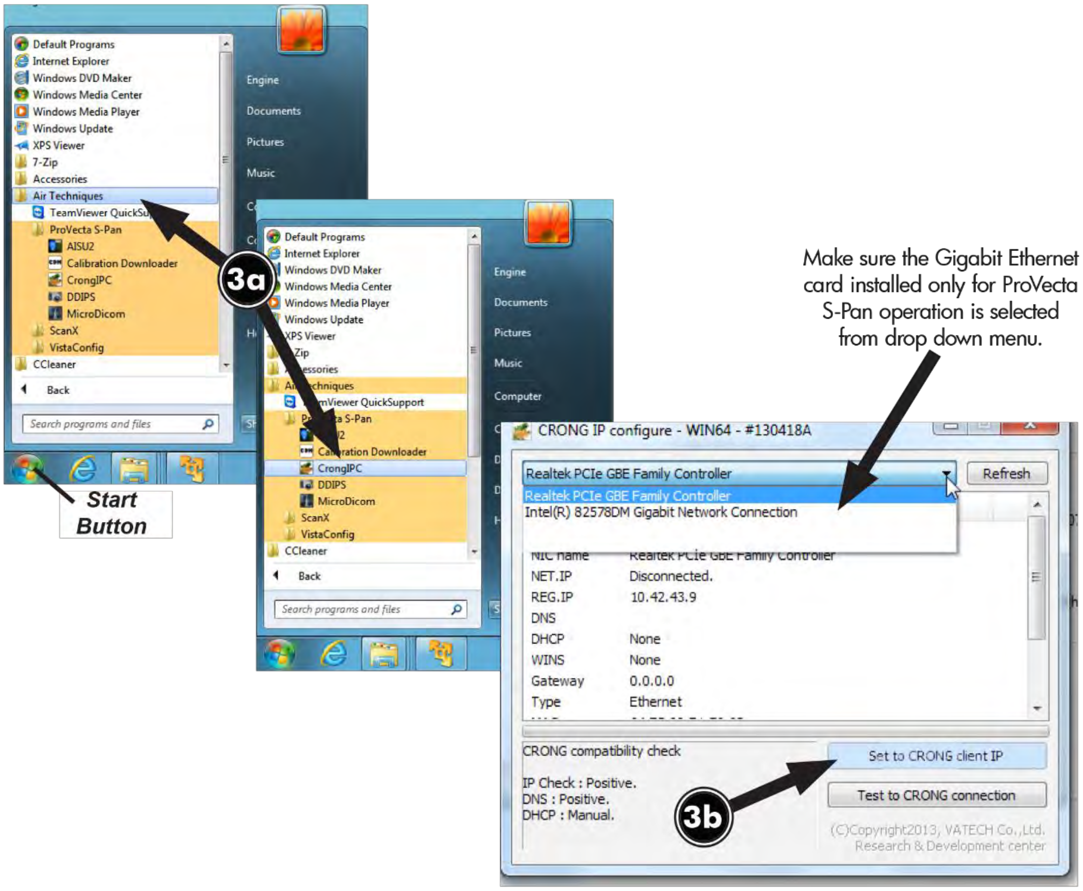


Fig. 13 Network adapter configuration

3.c. One of two windows will pop up: the Warning window or the Confirm message window.

If the Warning message displays, click OK, close the CRONGIPC application, make sure the network adapter is properly seated and drivers loaded. Also make sure that S-Pan is turned on and physically connected to the network adapter. Restart CRONGIPC. Otherwise, click Yes when the Confirm message appears.

Fig. 14 Warning or confirm message

3.d. Observe that a new IP and NIC setting process starts in the open the **CRONG IP configure** window. Note the sequence of information in the lower left window area.
3.e. When the program finishes the setting check, click the **Test to CRONG connection** button.

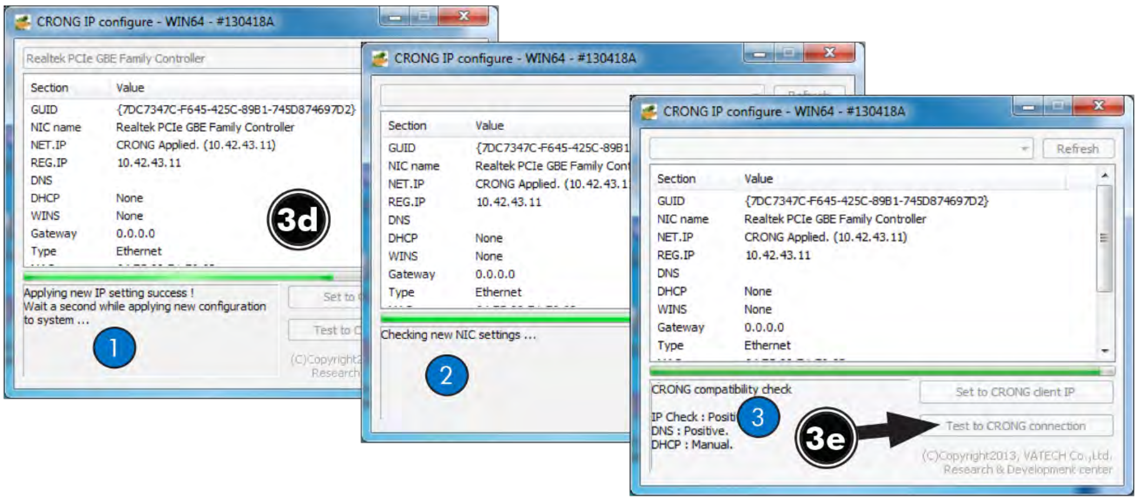


Fig. 15 Crong configuration

3.f. Click **OK** in the Test passed window and note the successful status.
3.g. Repeat steps 3.b, 3.c and 3.d above to ensure that the CRONG client IP is correctly reset after the test.

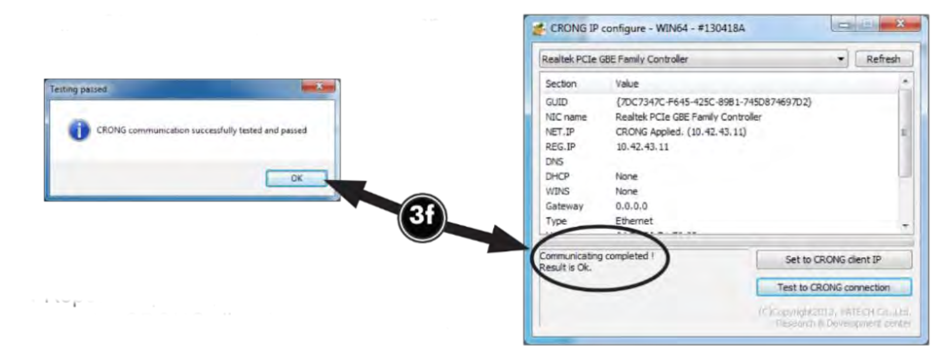


Fig. 16 Crong configuration Ok

2.1.1.4 Deactivating the energy saving option for the network card

Perform the following procedure to keep power to the device on to ensure constant operation.

1. From the start menu, select **Control Panel**.
2. Observe that the All Control Panel Items Window opens.
3. Select **Device Manager** (may be located under Hardware and Sound or under Devices).
4. Device Manager Window opens.
5. From the **Network Adapter** group, double click the Gigabit network connection for ProVecta. Observe that the properties window for the network adapter opens.
6. Select **Power Management** tab.
7. Un-check the check box: ***Allow the computer to turn off this device to save power***. Click the OK button to exit. Power savings mode for the network adapter has been disabled.

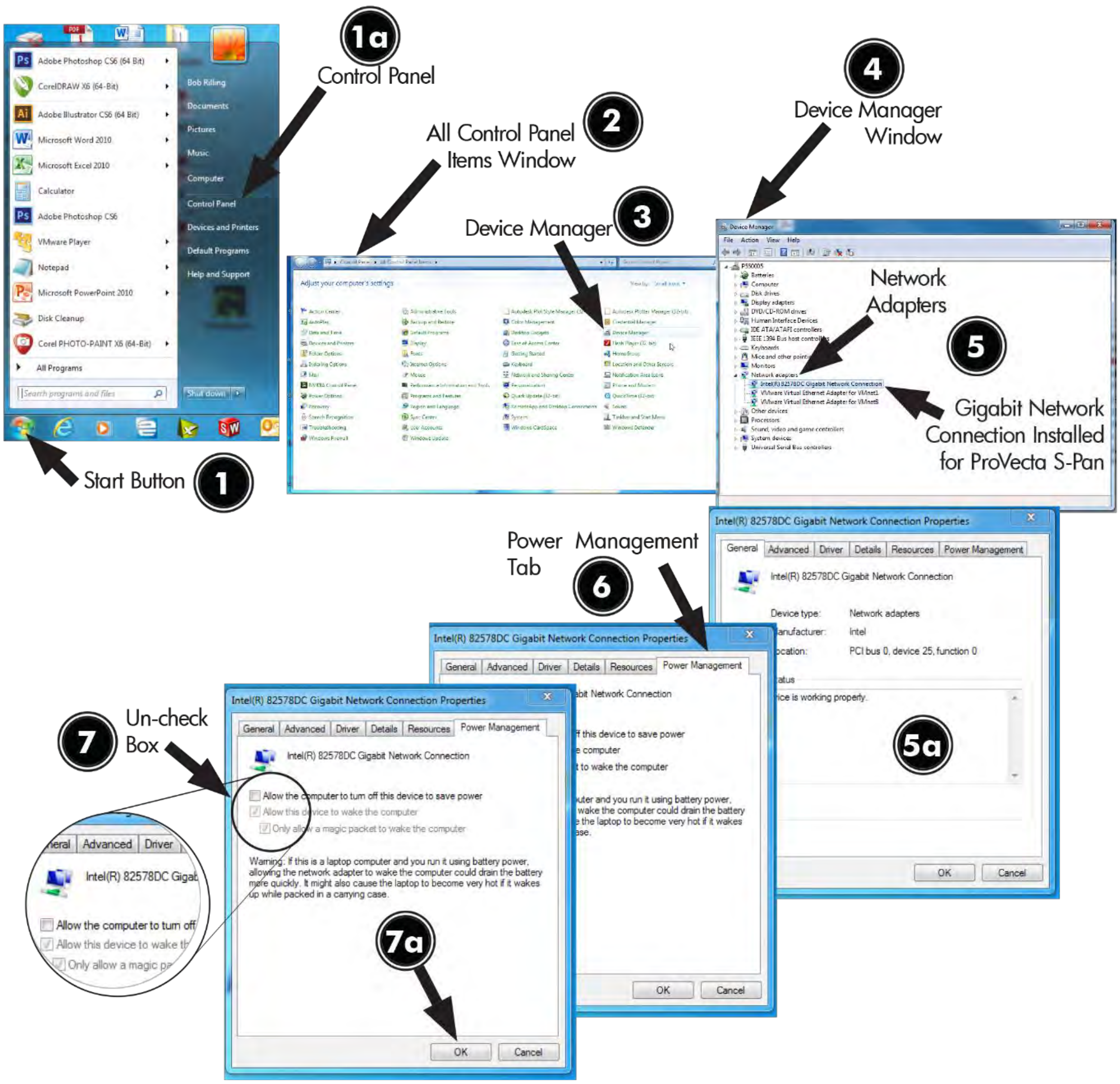


Fig. 17 Deactivating energy savings

2.1.1.5 Software Installation

Before operating the ProVecta, run the Setup program on the Software Disk included with ProVecta. Normally, this program runs automatically when the CD is inserted into the drive for the first time. If not, run the Setup program located in the root directory of the CD (typically D:\AutoRun.exe) and select Install Software from the menu.

a. Follow the on-screen instructions to complete the software installation, clicking Next or Install to advance the installation.

b. Make sure that the ProVecta S-Pan check box is checked and use all default settings.

c. From the Installation completed window, click Finish to complete the installation.

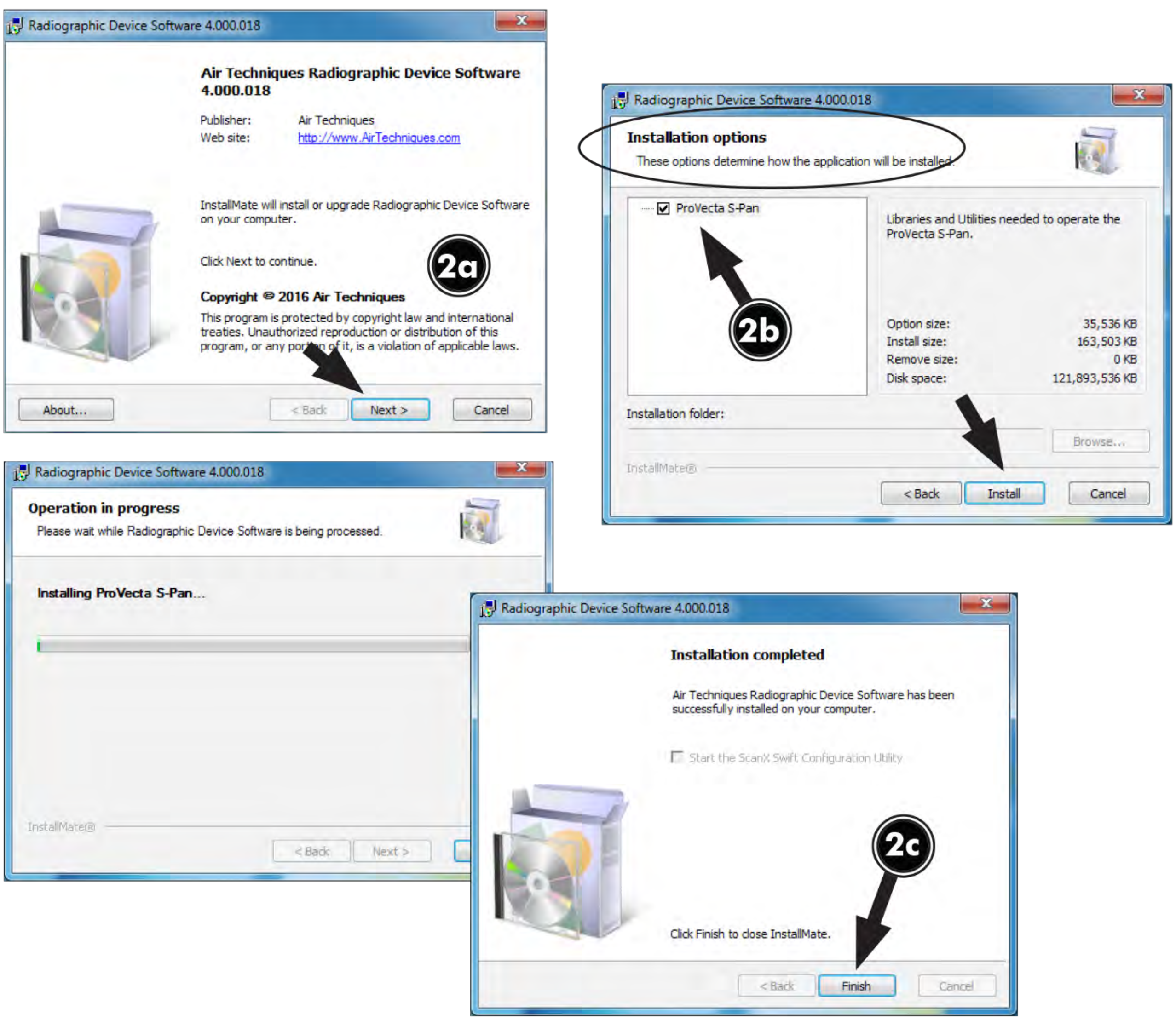


Fig. 18 Software installation

2.1.1.6 Download prerequisite files.

Prerequisite files include the calibration files that provide required information to operate the ProVecta S-Pan and the ProVecta S-Pan Ceph units.

4.a. From the ***start menu***, select the **Calibration Downloader** item from the **Air Techniques–>ProVecta S-Pan** submenu.

4.b. Observe that the **Calibration Downloader** window opens listing six files selected as shown below.
Perform the steps of 4.c. to download prerequisite files when setting up a ProVecta S-Pan with Ceph. Otherwise proceed to step 4.d. to download prerequisite files needed just for the ProVecta S-Pan without Ceph.

4.c. ProVecta S-Pan with Ceph file download.

1. Keep all six file check boxes selected.
2. Click **Download.**
3. Observe the successful download progress of all six selected files shown by the lower left Log View.

4.d. ProVecta S-Pan without Ceph file download.

1. De-select all six file check boxes and select only the ***Calibration*** and ***Versioninfo*** file check boxes.
2. Click **Download.**
3. Observe the download progress and verify the successful status notation in the lower left Log View.

4.e. Make sure that each selected file for ProVecta S-Pan with Ceph or without Ceph was successfully downloaded and close the **Calibration Downloader** window.

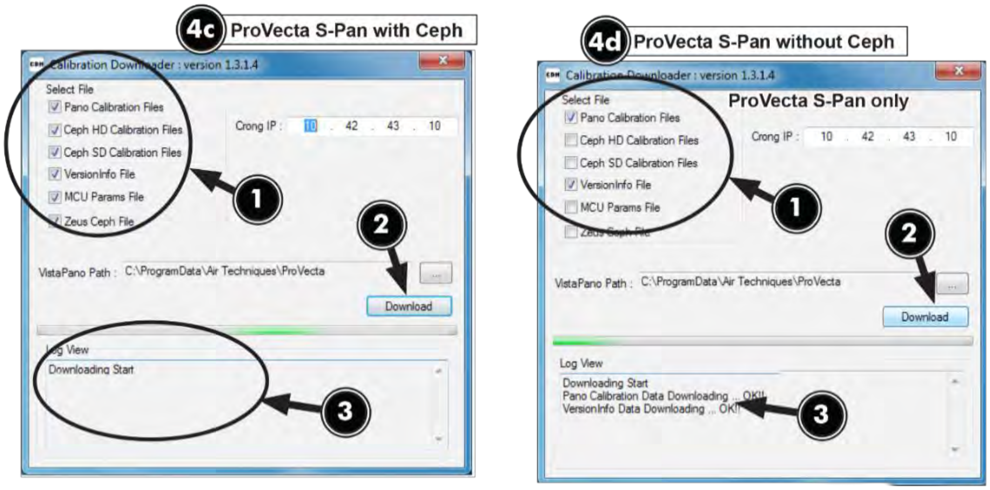


Fig. 19 Download prerequisite files

2.2 Integration into VistaEasy and DBSWIN

Integration into VistaEasy and DBSWIN is performed using the software VistaConfig. Once VistaEasy or DBSWIN has been installed, this can be found under:

Start > All Programs > Air Techniques > VistaEasy > VistaConfig

Alternatively, the software can also be found under:

C:\Program Files (x86)\Air Techniques\VistaScan\VistaScanConfig.exe

When the program starts to load, VistaConfig will attempt to detect all available units from Dürr Dental in the network and outputs them in a list.

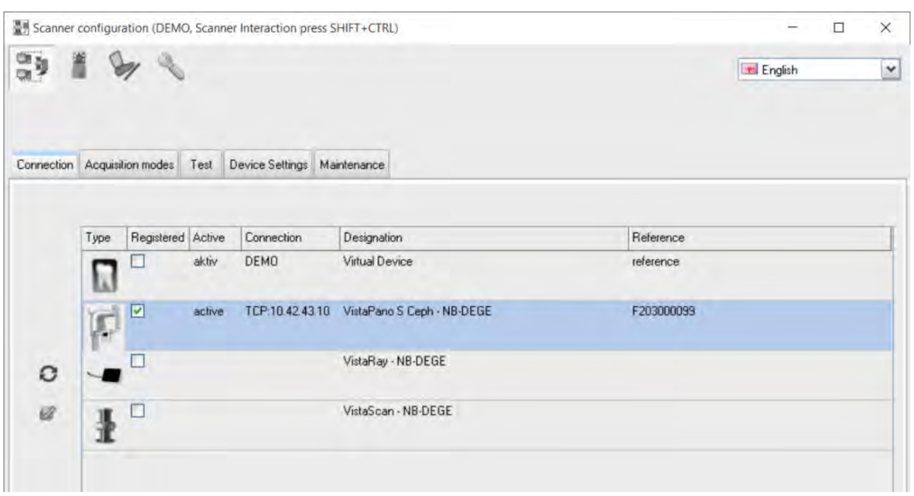


FIg. 12 VistaConfig sample screen

2.2.1 ProVecta S-Pan registration

By ticking the box under *Registered* you can set it so that the selected unit is permitted to be used on this computer.

The *Active* column can display *active* or *inactive* to indicate whether or not the unit can currently be addressed.

The *Connection* column always displays the fixed IP address 10.42.43.10 for ProVecta S-Pan.

The *Reference* column shows the serial number of the ProVecta S-Pan unit as soon as it has been successfully connected to the computer at least once.

Click the refresh button on the left next to the list of units to run the search again.

2.2.2 Configuring the unit

Double-click the unit to open the configuration screen. This provides an overview of the components that are integrated in ProVecta S-Pan (see also section **11.6 Replacing components with a registered serial number** on page 190 and section **10.2 VersionInfo.txt** on 145).

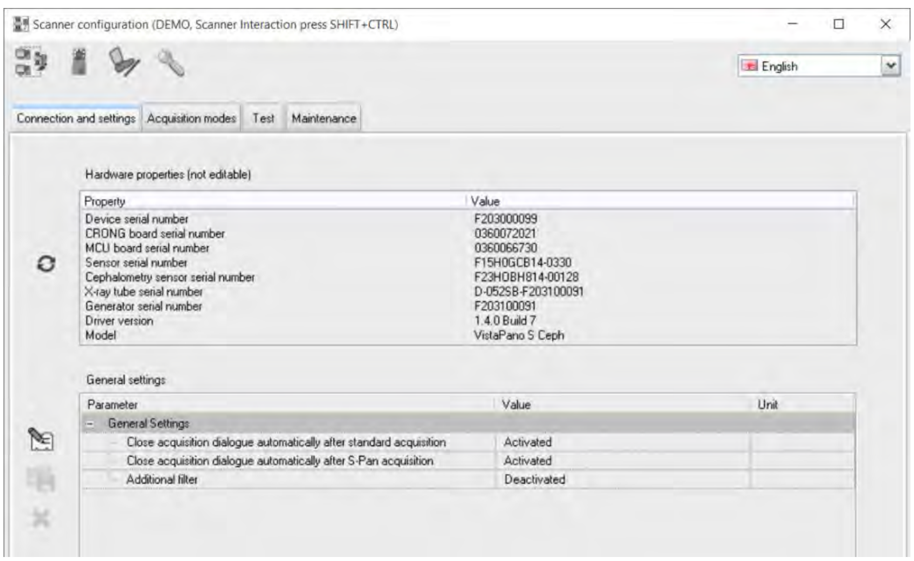


Fig. 21 Connection and settings in VistaConfig

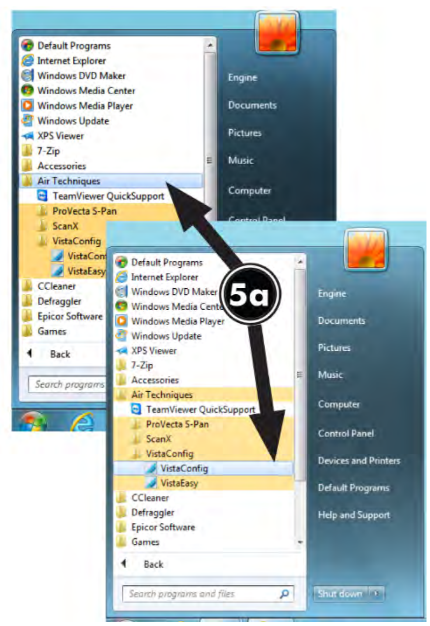
Three points are defined in the area below *General Settings*:

- Automatically close image acquisition window after standard image acquisitions
- Automatically close image acquisition window after S-Pan image acquisitions
- Additional filter

The entries *Automatically close image acquisition window after standard image acquisition* and *Automatically close image acquisition window after S-Pan image acquisition* are enabled by default. This means that the panoramic image is immediately transferred to the X-ray software after image acquisition. If the automatic transmission is deactivated then the image acquisition window is not closed after each image is acquired, but instead remains open so that the operator has the opportunity to view both images (once as an image acquired with the S-Pan technology and once as a standard image). Ultimately the operator will need to choose one of the two images. This is then transmitted to the X-ray software.

The *Additional filter* relates to the ceph unit. If the operator would like to be able to see fine structures in the soft area outside the skull (e.g. hairs) on the image, then this option can be enabled.

2.2.3 Test image Testing Provecta setup



Standalone operation allows the ProVecta to operate without using TWAIN. Perform the following steps.

5.a. From the start menu, select the VistaConfig item from the Air Techniques–>VistaConfig submenu.

5.b. Observe the VistaConfig window opens.

5.c. Click the Configuration VistaEasy icon to switch to available configuration options for the program.

5.d. Make sure the Activate VistaEasyView check box is unchecked as shown.

5.e. Click the Configuration ScanX/ Ray icon.

5.f. If any device is checked, uncheck it and click the indicated Refresh symbol. Then check only the ProVecta S-Pan check box.

5.g. Click the Test tab

5.h. Click the drop down arrow and select ProVecta S-Pan from the list.

5.j. Click the Read Image button to start the ProVecta image capture software.

5.k. Observe that the ProVecta S-Pan window opens. Check the ProVecta front panel to ensure the device is ready. Proceed with image capture.

Fig. 22 Test image testing

2.2.4 Acquisition modes and maintenance

The two hidden tabs *Acquisition modes* and *Maintenance* can be displayed by pressing *F2*. The *Acquisition modes* area contains the following adjustment options:

Area of use	Name	Role
Image acquisition	PanoType	Choice between: S-Pan or Pan This defines the pre-defined image acquisition window. We recommend always keeping S-Pan as the selected default option. If the operator has reservations about using the S-Pan technology then we recommend suppressing the automatic transfer of the images (for more information see section **2.2.2 Configuring the unit** on page 23).
	Image quality	Choice between: Standard or HD Defines the pre-defined exposure time for the image acquisition. We recommend keeping the standard quality.

Operations	Filter	This provides the option of automatically applying a filter to the image after every image acquisition. We do not recommend enabling this function. If the operator is unhappy with the resulting image then we recommend adjusting the reconstruction parameters based on the DDIPS software (for more information about this refer to section **8 DDIPS software** on 135).
	Histogram greyscale improvement LL	This enables percentage trimming of grey scales. We do not recommend enabling this function. If the operator is unhappy with the resulting image then we recommend adjusting the reconstruction parameters based on the DDIPS software (for more information about this refer to section **8 DDIPS software** on 1350).
	Histogram greyscale improvement UL	This enables percentage trimming of grey scales. We do not recommend enabling this function. If the operator is unhappy with the resulting image then we recommend adjusting the reconstruction parameters based on the DDIPS software (for more information about this refer to section **8 DDIPS software** on page 120135).
	Histogram greyscale improvement evaluation characteristic	This indicates which scheme is to be used as the basis for trimming the grey scales.

Table 1 Acquisition modes in VistaConfig

The *Maintenance* tab allows both admin tools AISU and DDIPS to be called up (for more information refer to section **3 AISU software** on page 28 and section **8 DDIPS software** on page 135).

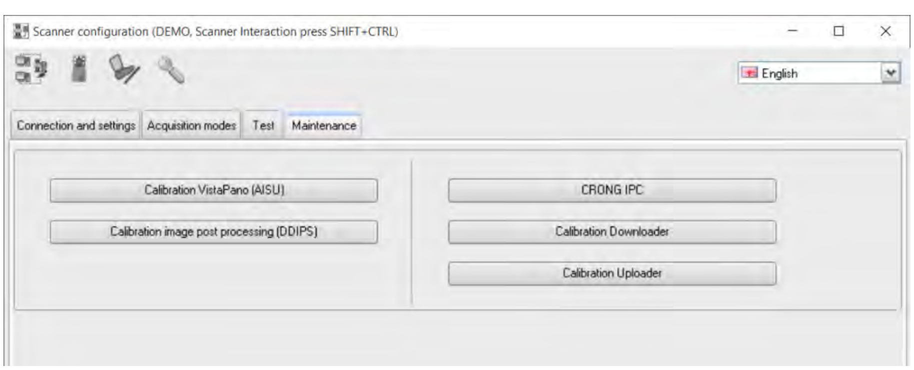


Fig. 13 Maintenance tab in VistaConfig

3 AISU software

The AISU software configures the following X-ray units:

- ProVecta S-Pan
- ProVecta S-Pan Ceph

As an admin tool it is largely used for:

- Calibration of the collimators (on the tube side)
- Calibration of the sensors (if necessary)
- Management of sensor calibration data
- Backup and restoring of unit parameters
- Symmetry calibration of the panoramic unit
- Configuration of the unit parameters (volume, positioning beam speed)
- Alignment of the ceph unit (lateral, posterior-anterior)

3.1 Installation

The AISU software is included in the installation software (see section **2.1 ProVecta S-Pan Installation** Software

Software on page 18).

It is not possible to manually install the AISU software.

3.2 Operation

The AISU software guides you step-by-step through the calibration processes.
Here, not only will the AISU software tell you about the individual steps that need to be performed, but in most cases it also takes care of communications between the computer and ProVecta S-Pan. Typical examples of this include the activation and setting of collimator positions, kV and mA settings, activation of the One-Shot Mode etc.
Two Print Screen functions are available as long as the AISU software is open. They offer a quick and easy way to save individual images as a JPG file. This can be a very useful feature particularly for collimator images that are to be saved in a record later on.

Note: It is no doubt possible to export a collimator image shown in the Raw Viewer directly in BMP format. However, this export will only generate a greyscale image. If the area shown in red of the active surface of the detector is required then we recommend using the Print Screen function from the AISU software..

Keyboard shortcuts:

- *Ctrl + F11* – Creates a printscreen of the currently active Windows window
- *Ctrl + F12* – Creates a printscreen of the entire screen

3.2.1 Tools

The following tools may be required (depending on the type of calibration):

- Ball phantom for symmetry calibration (item number : 2207-021-50)
- 1 mm copper for ceph sensor calibration
- Standard tools (for manual adjustment of the collimator or symmetry)
- RAW viewer (this is generally installed on the computer as soon as the AISU software is available)

3.2.2 Launching the AISU software

The AISU software cannot be accessed via the Windows interface as administration software. There are three different ways to launch the software:

- You can run it directly from the installation path: C:\Program Files **(x86)\Air Techniques\ProVecta S-Pan\Util**
- You can run it via VistaConfig (when using VistaEasy or DBSWIN).
- You can run it via the VistaSoft configuration.

3.2.2.1 Callup via VistaConfig

The detailed process for calling up the software can be found in section **2.2 Integration into VistaEasy and DBSWIN**

on page 23. Brief summary:

Launch VistaConfig > Double-click ProVecta S-Pan > Press F2 button > Open Maintenance tab > Click VistaPano calibration (AISU)

3.2.3 ProVecta S-Pan connection

Once you have launched the AISU software, use the *Connect* button to to attempt to establish a connection between the software and ProVecta S-Pan.

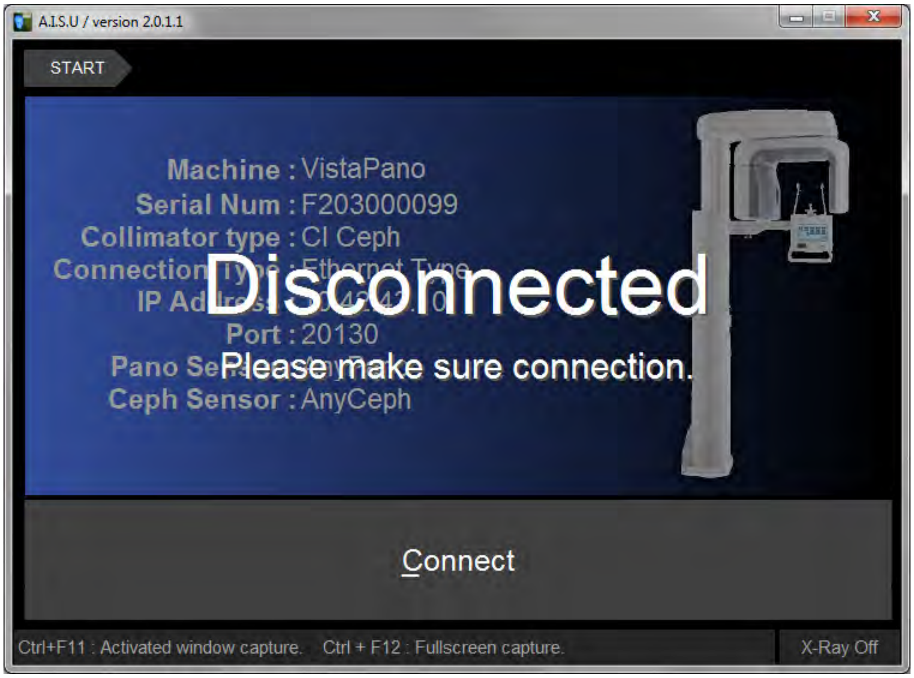


Fig. 24 Establishing a connection to ProVecta S-Pan

If it is not possible to establish a successful connection to the X-ray unit, then the requirements in section **2.1.1 Configuration and preconditions** on page 17 should be checked.

Once a connection has been successfully established the following software overview is displayed. It essentially offers the following information about ProVecta S-Pan:

- Serial number
- IP-Address
- Port number
- Available sensors

Fig. 25 AISU software overview

3.2.4 Program structure

The core functions can be found in the two areas *Image Calibration* and *Service*.

The *Image Calibration* area contains the processes for effective unit calibration. The *Service* area contains tools and functions that enable e.g. a backup of ProVecta S-Pan after the calibration.

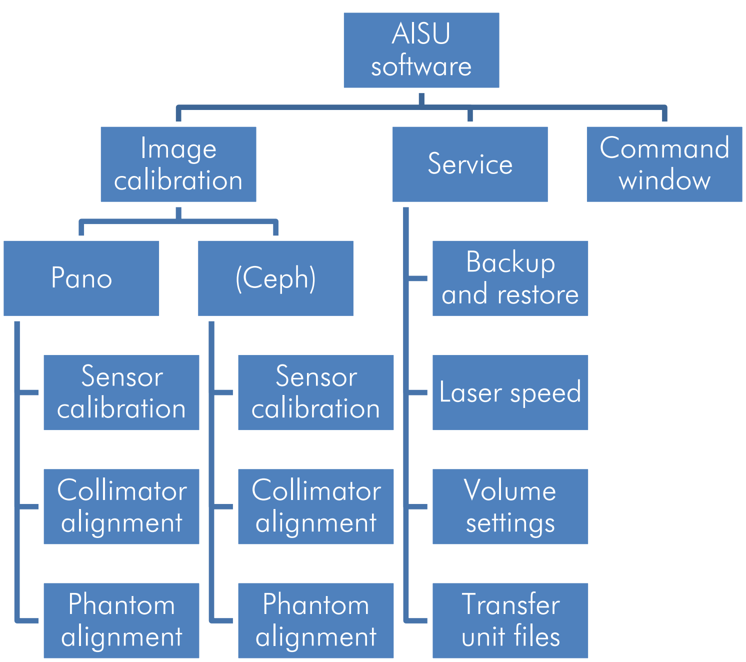


Fig. 26 Program layout of the AISU software

4 Collimator and sensor calibration in the AISU software (Image Calibration)

Depending on the unit type, the Image Calibration area contains both the *Pano* section and the *Ceph* section for ProVecta S-Pan Ceph. Both sections contain the same group elements:

- Sensor Calibration (calibration of the sensor under X-ray radiation)
- Collimator Alignment (calibration of the collimators)
- Phantom Alignment (symmetry alignment)

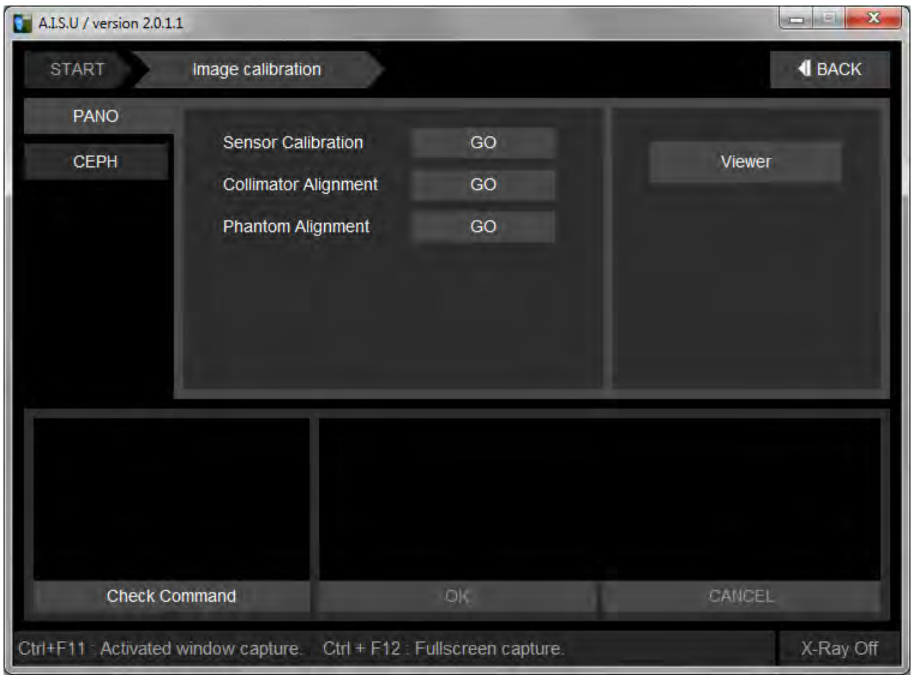


Fig. 27 Image calibration

4.1 Sensor calibration

4.1.1 Background

Sensor calibration is required in order to successfully take X-ray images. For ProVecta S-Pan Ceph this applies to the panorama sensor and the Ceph sensor.

For each sensor, the sensor calibration comprises 7 raw files. These are made up of:

- Dark Image (dark image with no exposure)
- 5 individual exposures (under increasing kV and mA values)
- Bad Pixel Matrix file (error correction for defective pixels)

Every ProVecta S-Pan unit is pre-calibrated in the factory (this applies to both sensors for the ProVecta S-Pan Ceph). This calibration data is located on the CRONG board of the unit and is automatically called up by the computer before every image acquisition.

To do this, from VistaEasy 5.7.0 and VistaPano InstallPackage 1.3.0.5 the system checks at the start of the image acquisition whether the 7 raw files are present on the computer. If this is not the case then the 7 raw files for the selected sensor are automatically downloaded and applied for the image acquisition. Any existing sensor calibration data is overwritten in the process.

4.1.2 When should a sensor calibration be performed?

A sensor calibration only needs to be performed if the image quality is inadequate even though the collimators have been correctly calibrated first.

The image quality is inadequate if for example:

- the resulting image has lots of noise despite the dose being appropriate
- horizontal stripes can be seen across the entire image (this does not apply to test body images)

The calibration of the sensor is easy to carry out via the AISU software and should be performed if you are in any doubt about the image quality. Care must be taken after successful calibration to ensure that the calibration data is uploaded via the *Calibration Uploader* to the ProVecta S-Pan (see also section **5.4.2 Upload (Calibration Uploader)** on page 97).

4.1.3 Panorama sensor

No further tools are required for the calibration of the panorama sensor. Go to the *Image Calibration* area and select the point *Sensor Calibration*, then click *GO* to launch.

Fig. 28 Sensor calibration

Note: Section **16.6 Sensor calibration – panorama** on page 204 contains a checklist for performing the calibration.

4.1.3.1 Initialization of ProVecta S-Pan

Afterwards ProVecta S-Pan needs to be initialized via the *Initialize* button. The displayed *min Kvp* value is a recommendation that should not be adjusted. The AISU software automatically corrects the kV and mA values during the calibration process.

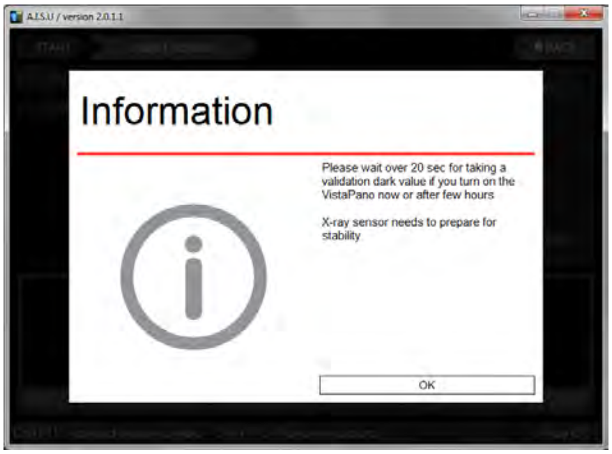


Fig. 29 Wait 20 seconds prior to exposure

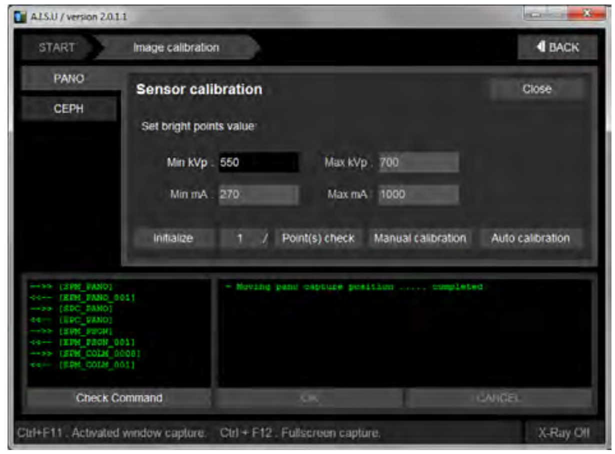


Fig. 30 Panorama sensor calibration initialized

4.1.3.2 Starting the calibration

The calibration is started via the button *Auto calibration*. The AISU software will remind you that all components that are in the X-ray path need to be removed from the unit for this process.

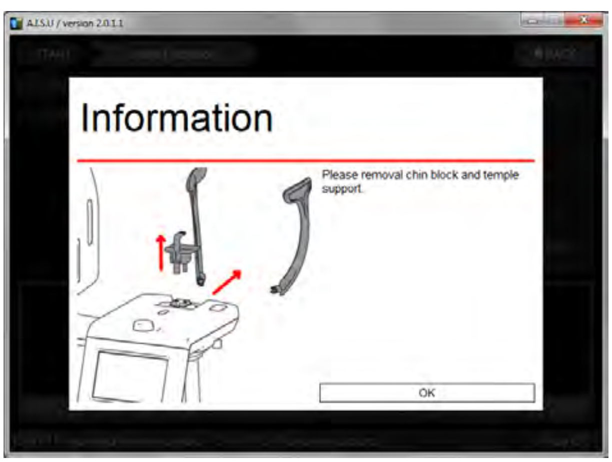


Fig. 31 Removal of all elements

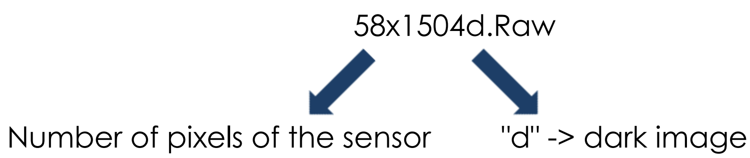
Then the AISU software will activate the 1 mm copper collimator on the tube. This means that no additional copper filter is required. Afterwards the unit is set to the motionless One-Shot Mode, and the kV and mA values are transmitted.

The AISU software generates (where this is not already present) a directory with the name BACKUP in the following directory:

C:\ProgramData\Duerr\VistaPano\Acquisition\Pano\CAL

Previous calibration data is moved here.

Afterwards the dark image calibration file is generated without irradiation. The file name for this is *58x1504d.Raw*.



4.1.3.3 Generating an image

The operator is then prompted to *Hold the Button,* i.e. to press the exposure button.

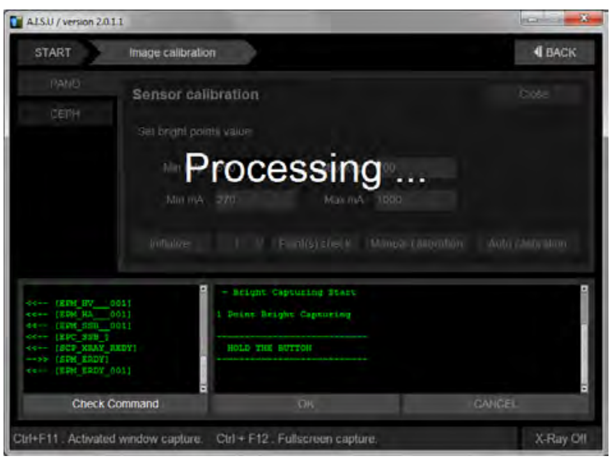
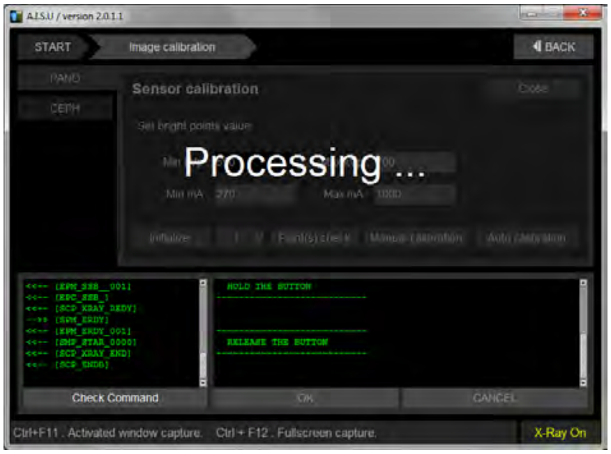


Fig. 32 Pressing the exposure button



Release the exposure button as soon as the screen shows *Release the Button*.

Fig. 33 Releasing the exposure button

4.1.3.4 Evaluation of the first image

The AISU software automatically assesses the first image and then increases or reduces the kV values as required.

Soon afterwards the prompt to press the exposure button appears again (see section **4.1.3.3 Generating an image**).

The first image acquisition is repeated until an average exposure value of 25 – 40 is attained. As soon as this is the case the actual calibration process starts with the determined kV and mA values.

4.1.3.5 Generating bright images

Here, 5 RAW images are generated one after the other, whereby the AISU software increases the dose step-by-step from one image to the next.

As is described in section **4.1.3.3 Generating an image**, the AISU software lets the operator know when to press the exposure button.

4.1.3.6 Creating a Bad Pixel Matrix file

Afterwards AISU automatically creates a Bad Pixel Matrix file (58x1504bpm.Raw).

If you look at the CAL directory you will see something like the screenshot below (the numerical values in the file names vary from one calibration to the next).

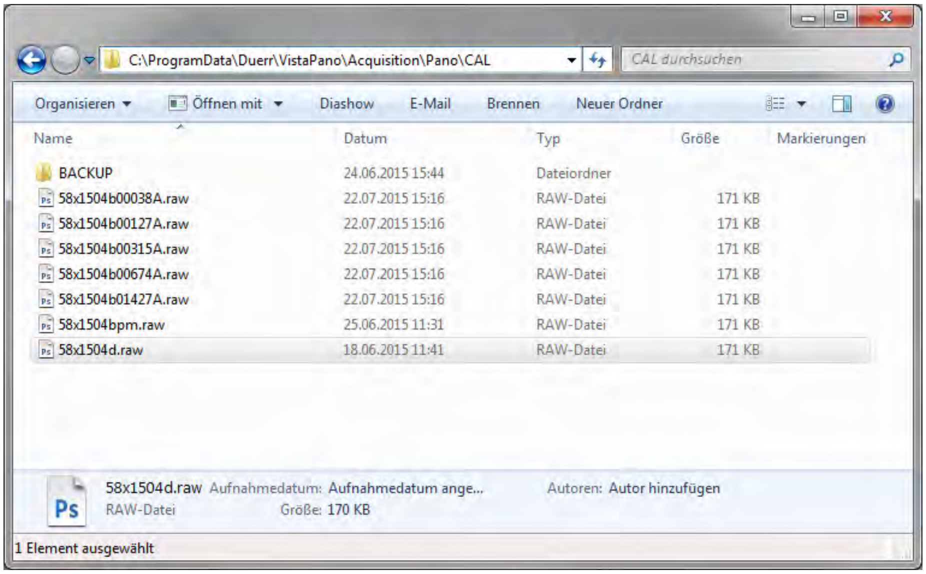


Fig. 34 Raw files after panorama sensor calibration

A message will appear to tell you that the calibration has been successful; this will also remind you that the calibration data then needs to be uploaded to the ProVecta S-Pan.

Fig. 35 Calibration completed

Note: If you do not see a message saying that the calibration has been successful, the AISU software will restart the calibration automatically.

If the second complete run-through also fails to deliver a successful calibration, the reason for this may be that the copper filter is not correctly positioned. This can be checked by removing the housing covers (see section **Fig. 58 Opening the housing for the tube collimator** on page 61).

4.1.3.7 Uploading the calibration data

Once the calibration has been completed it is important to upload the calibration data to the ProVecta S-Pan. This is described in section **5.4.2 Upload (Calibration Uploader)** on 97.

4.1.4 Ceph sensor

The ceph sensor calibration requires 1 mm copper, which needs to be manually attached to the tube for certain image acquisitions.

Within the *Image Calibration* area click on *Ceph* on the left. Then activate the calibration via *Sensor Calibration* by clicking *GO*.

Fig. 36 Ceph sensor calibration

Note: Section **16.7 Sensor calibration – ceph** on page 205 contains a checklist for performing the calibration.

4.1.4.1 Initialization of ProVecta S-Pan

Afterwards ProVecta S-Pan needs to be initialized via the *Initialize* button. The displayed *Min Kvp* value is a recommendation that should not be adjusted. The AISU software automatically corrects the kV and mA values during the calibration process.

Afterwards the AISU software activates the Ceph Mode and moves all collimators out of the image acquisition area. The sensor is significantly over-irradiated throughout the entire calibration process. Afterwards the unit is set to the motionless One-Shot Mode, and the kV and mA values are transmitted.

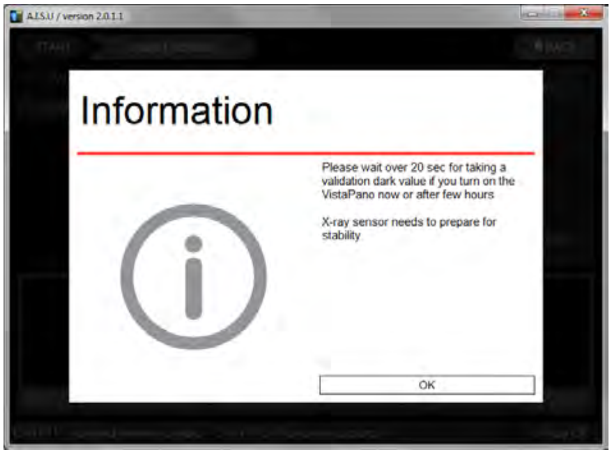


Fig. 37 Wait 20 seconds prior to exposure

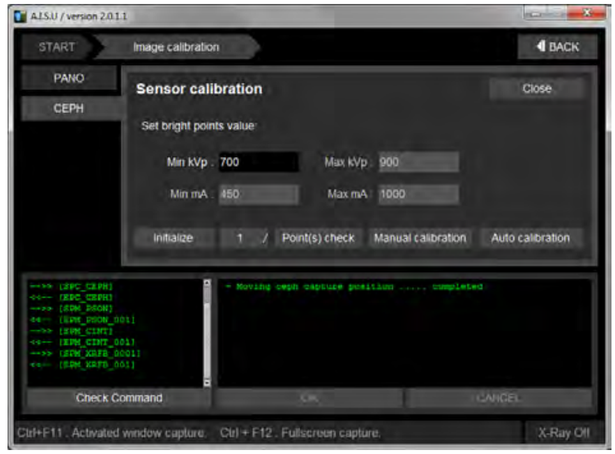


Fig. 38 Ceph sensor calibration initialized

4.1.4.2 Starting the calibration

The calibration is started via the button *Auto calibration*. The AISU software will remind you that all components that are in the X-ray path need to be removed from the unit for this process. The software will then instruct you to position 1 mm of copper on the tube.

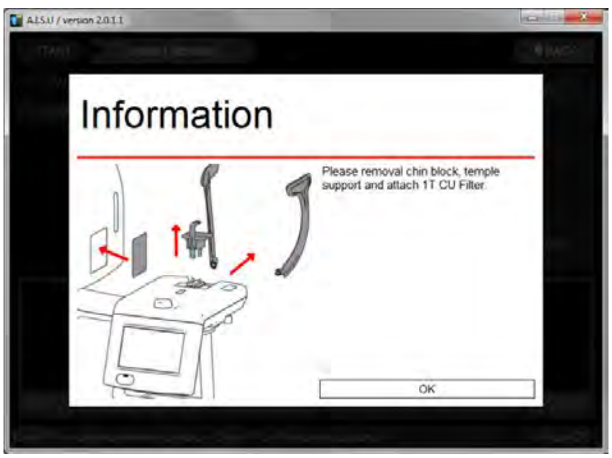


Fig. 39 Removal of the components and placement of 1 mm copper

The AISU software generates (where this is not already present) a directory with the name BACKUP in the following directory:

C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Norm\Cal

and moves the previous calibration files to this location.

Note: In addition to the directory Ceph_Norm there is also the directory Ceph_Fast, which also contains a Cal folder and therefore calibration data. However, this data is identical to the Cal files from the folder Ceph_Norm. The AISU software creates sensor calibration data once for the Ceph_Norm Mode and then automatically copies the newly generated calibration data to directory folder Ceph_Fast. When the sensor data is then uploaded to the ProVecta S-Pan with the Calibration Uploader, make sure that both areas *Ceph HD Calibration Files* and *Ceph SD Calibration Files* are selected here.

Afterwards the dark image calibration file is generated without irradiation. The file name for this is *57x2304d.Raw*.

57x2304d.Raw

Number of pixels of the sensor "d" -> dark image

4.1.4.3 Generating an image

The operator is then prompted to *Hold the Button,* i.e. to press the exposure button.

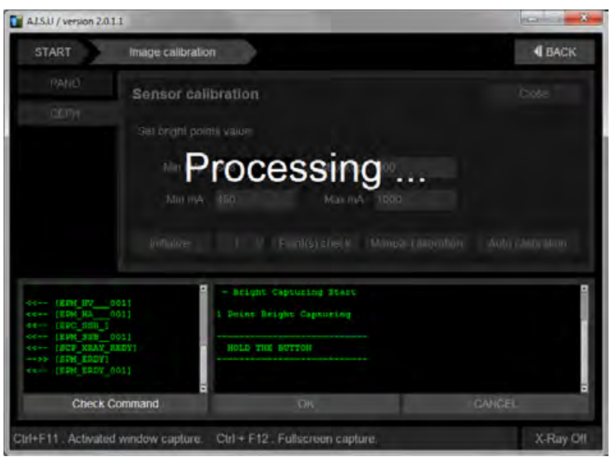


Fig. 40 Pressing the exposure button

Release the exposure button as soon as the screen shows *Release the Button*.

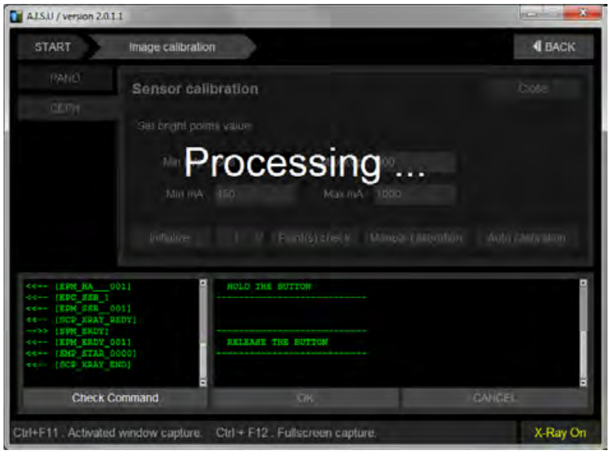


Fig. 41 Releasing the exposure button

4.1.4.4 Evaluation of the first image

The AISU software automatically assesses the first image and then increases or reduces the kV values as required.

Soon afterwards the prompt to press the exposure button appears again (see section **4.1.4.3 Generating an image** on page 42).

The AISU software repeats the first image acquisition until an average exposure value of 30 – 50 is attained. As soon as this is the case the actual calibration process starts with the determined kV and mA values.

4.1.4.5 Generating bright images

Here, 5 Raw images are generated one after the other, whereby the AISU software increases the dose step-by-step from one image to the next.

As is described in section **4.1.4.3 Generating an image** on page 42, the AISU software lets the operator know when to press the exposure button.

The additional copper filter needs to be removed for the 5th image acquisition. The AISU software will remind you to do this.

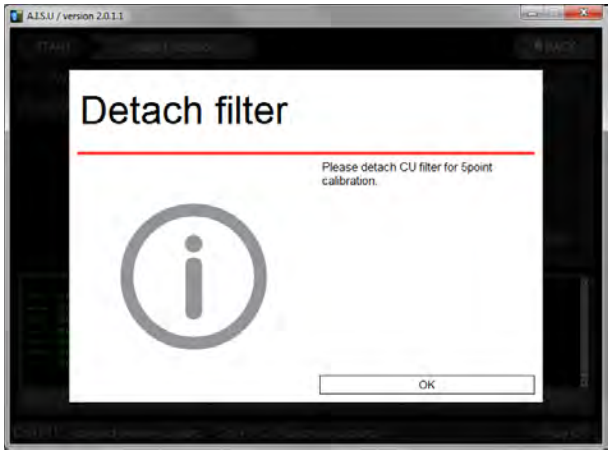


Fig. 42 Removing the filter from the collimator

4.1.4.6 Creating a Bad Pixel Matrix file

Afterwards AISU automatically creates a Bad Pixel Matrix file (57x2304bpm.Raw).

If you look at the CAL directory you will see something like the screenshot below (the numerical values in the file names vary from one calibration to the next).

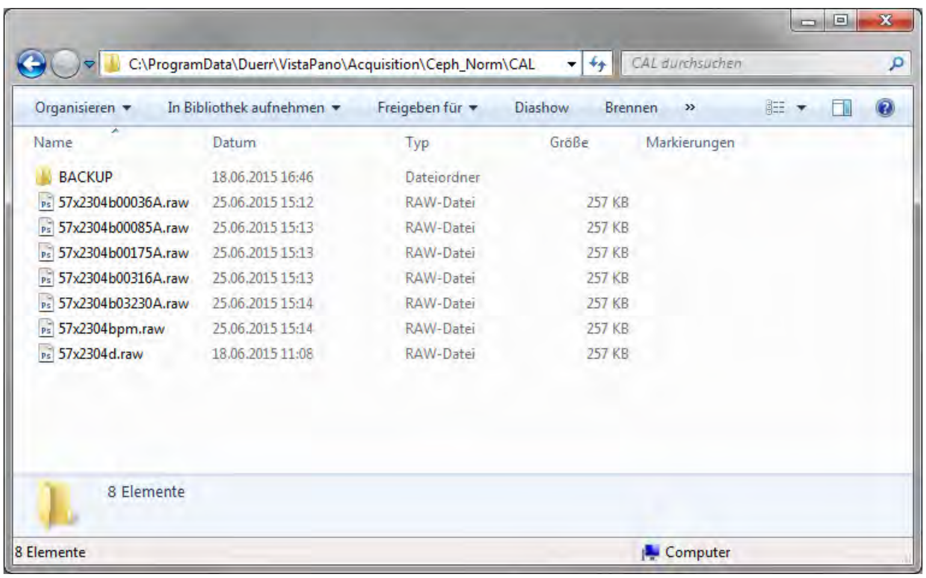


Fig. 43 Raw files after calibration of the ceph sensor

Once all 5 images have been acquired, a message appears to say that the calibration was successful. You will also be reminded that the calibration data then needs to be uploaded to the ProVecta S-Pan.

Fig. 44 Ceph sensor calibration successfully completed

4.1.4.7 Uploading the calibration data

Once the calibration has been successfully completed, it is important to upload the calibration data to both areas *Ceph HD Calibration Files* and *Ceph SD Calibration Files*. This is described in section **5.4.2 Upload (Calibration Uploader)** on page 97.

4.2 Collimator calibration (Collimator Alignment)

4.2.1 Background

The calibration of the collimators is an important step in the calibration of the overall unit and must be performed after every installation of the ProVecta S-Pan and any time it is moved. In the process, it is ensured that the radiation field (emanating from the tube) is reduced far enough so that the active surface on the sensor is not over-irradiated. The collimator and the sensor are both calibrated for each unit prior to delivery. However, it is quite normal for the radiation field to become slightly misaligned as a result of vibrations or knocks during transport and setup.

4.2.2 Panorama unit ⓘ

No further tools are required for the calibration of the collimator. Go to the *Image Calibration* area and select the point *Collimator Alignment*, then click *GO* to launch.

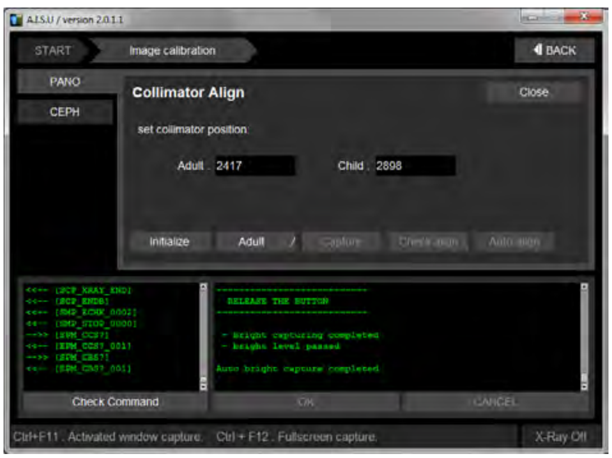


Fig. 45 Pano Collimator Alignment

Note: Section **16.1 Collimator calibration – panorama** ⓘ on page 198 contains a checklist for performing the calibration.

4.2.2.1 Initialization of ProVecta S-Pan

Afterwards ProVecta S-Pan needs to be initialized via the *Initialize* button.

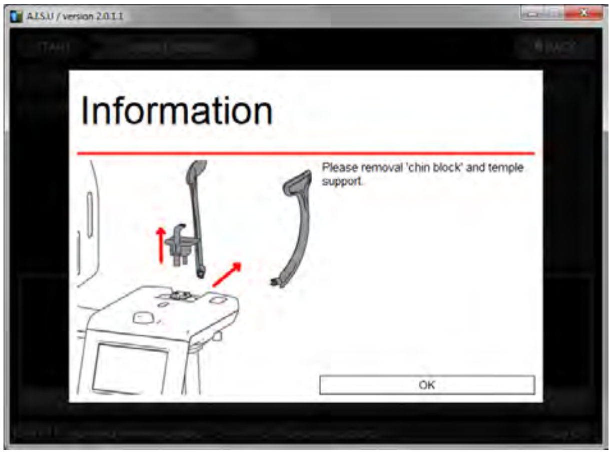


Fig. 46 Removal of elements from ProVecta S-Pan

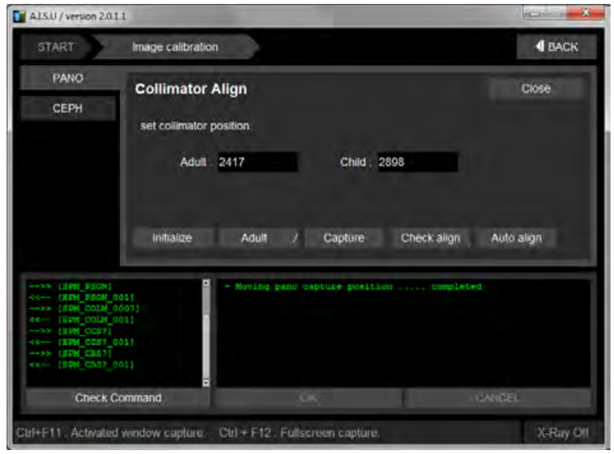


Fig. 47 Collimator Align overview

The values displayed for *Adult* and *Child* indicate the collimator positions currently being used by the unit. This information is taken directly from the MCU board and is not saved locally on the computer.
Finally, the two numerical values tell the stepper motor on the collimator how far forwards it needs to move to align the X-ray beam accurately on the sensor.

4.2.2.2 Starting the calibration

The button to the right of *Initialize* defines which collimator is to be calibrated. You can choose between *Adult* and *Child*. Both collimators need to be calibrated. The order in which this is done does not matter.

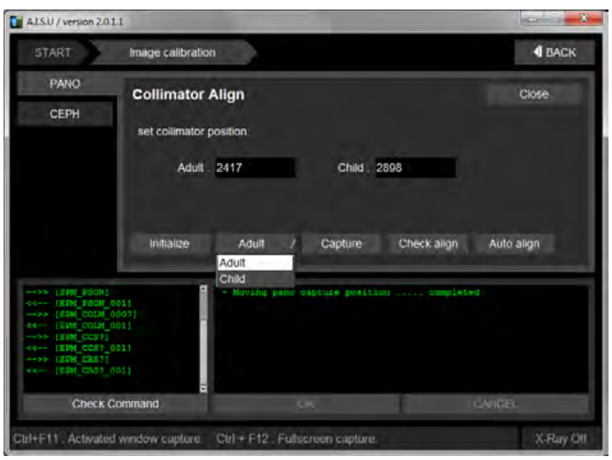


Fig. 48 Selection of the collimator

The actual image is acquired via the *Capture* button. To do this, the AISU software switches the ProVecta S-Pan into the motionless One-Shot Mode and transmits suitable kV and mA values for the image acquisition.

As is described in section **4.1.3.3 Generating an image** on page 41, the AISU software lets the operator know when to press the exposure button.

Note: We do not recommend using the function *Auto align*.

4.2.2.3 Evaluation of the image

The evaluation is started by clicking the *Check align* button. As the first step, AISU checks itself whether the image meets the criteria for the unexposed edge.

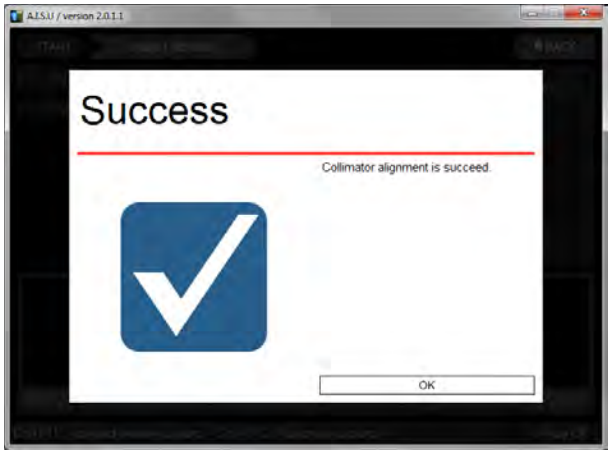


Fig. 49 Outcome A: calibration successful

Fig. 50 Outcome B: calibration unsuccessful

Regardless of the outcome, the image is then displayed with the Raw Viewer.

Here, the Raw Viewer displays the active tube in red and the effective exposure in grey/white. Normally the exposed area is merely not central in the image, but instead shown too far to the left or right.

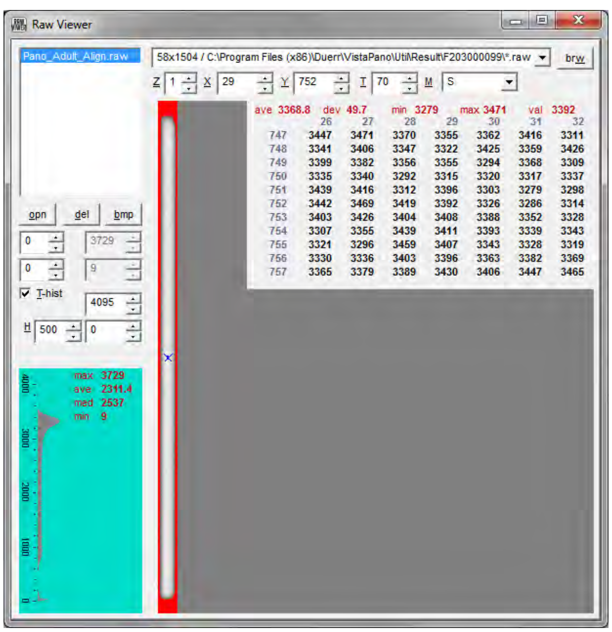


Fig. 51 Outcome A: calibration successful

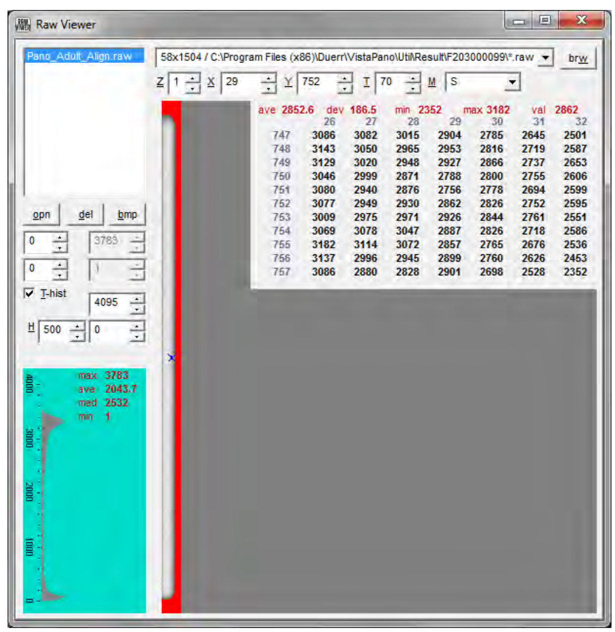


Fig. 52 Outcome B: calibration unsuccessful

An adjustment can be made easily by increasing or reducing the value for *Adult* or *Child*. The following applies here: if the exposed area is shown too far on the left, then the value needs to be reduced. Here, one pixel also corresponds to approximately one unit of value.

After the value has been adjusted, repeat the procedure (see section **4.2.2.2 Starting the calibration**) until you are certain that no part of the sensor is being over-irradiated. The image can be enlarged via the Z-value in the Raw Viewer if required.

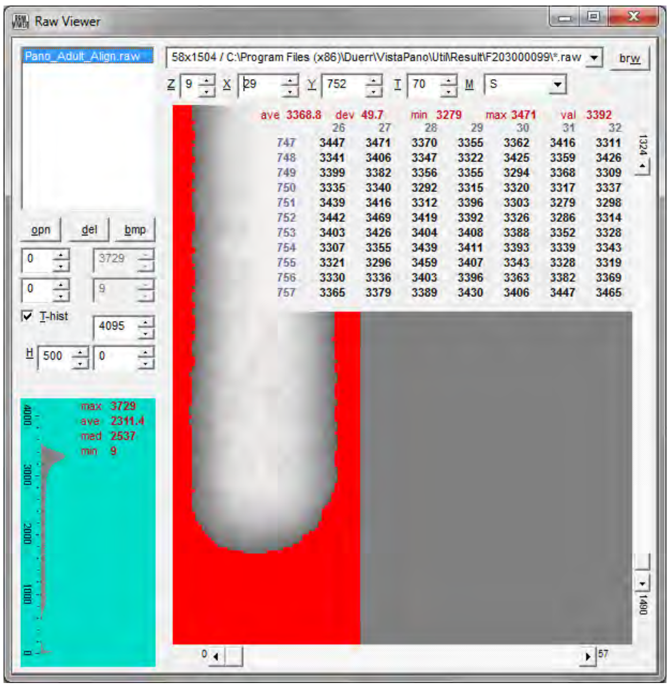


Fig. 53 Enlargement via the Z-value

If required, you can export the image as a bitmap file by clicking the *bmp* button (for example in order to incorporate it subsequently in the acceptance test record).

Note: Further details about the Raw Viewer software can be found in **4.3.4 Raw Viewer software** on page 71.

Typically, the collimator values are normally within the following limits:

ProVecta S-Pan		ProVecta S-Pan Ceph	
Adult	Child	Adult	Child
400 - 550	900 - 1100	2300 - 2500	2800 - 3000

Table 2 Empirical values for the panorama collimator

Either of the following two problems can prevent successful calibration via the AISU software:

- The exposed area is not vertical. The area is at such an angle that it cannot be fully positioned within the active area.

- The exposed area over-irradiates the active sensor area at the top or bottom.

Case studies are shown below, together with solutions for performing the calibration of the collimator.

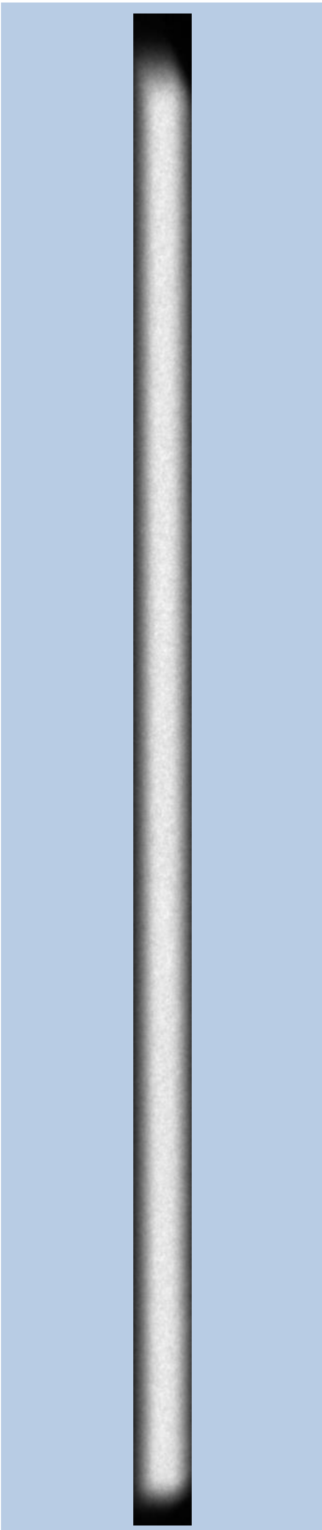


Fig. 54 Good

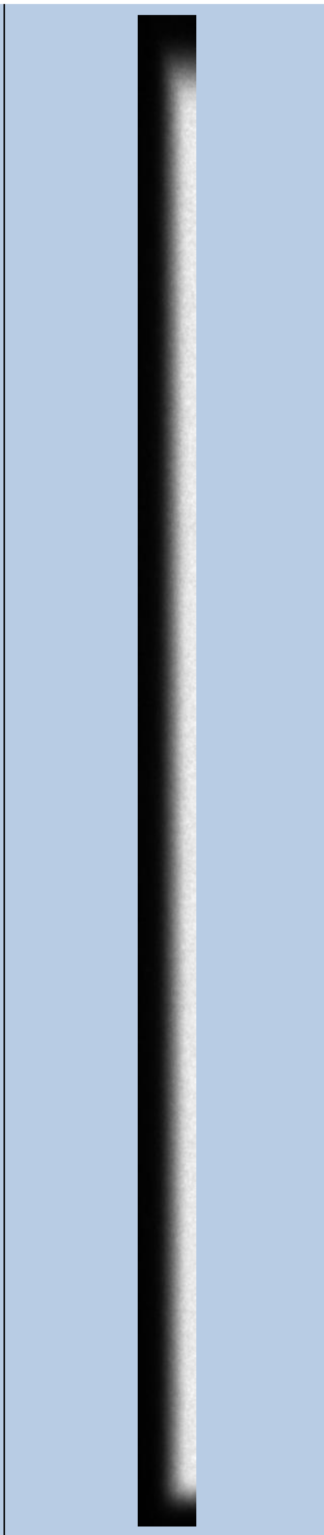


Fig. 55 Collimator too far to the right

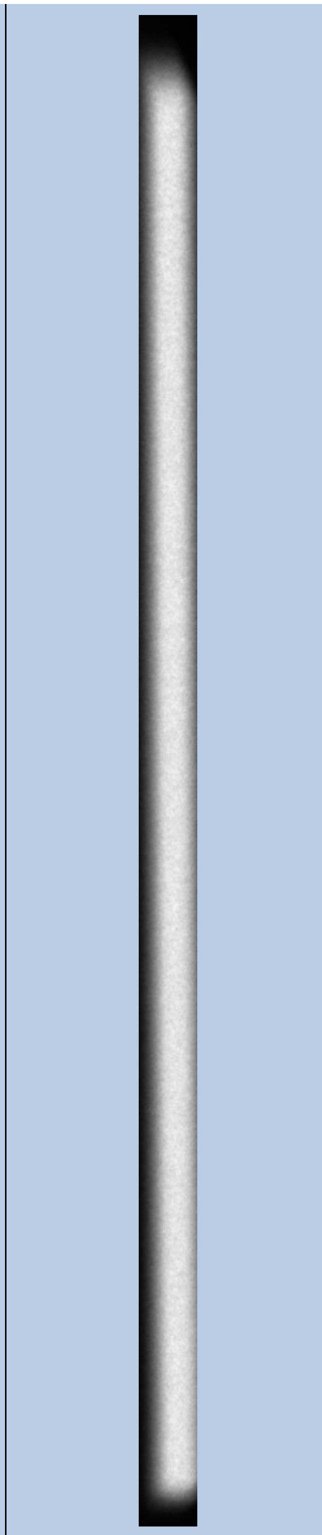


Fig. 56 Collimator not straight

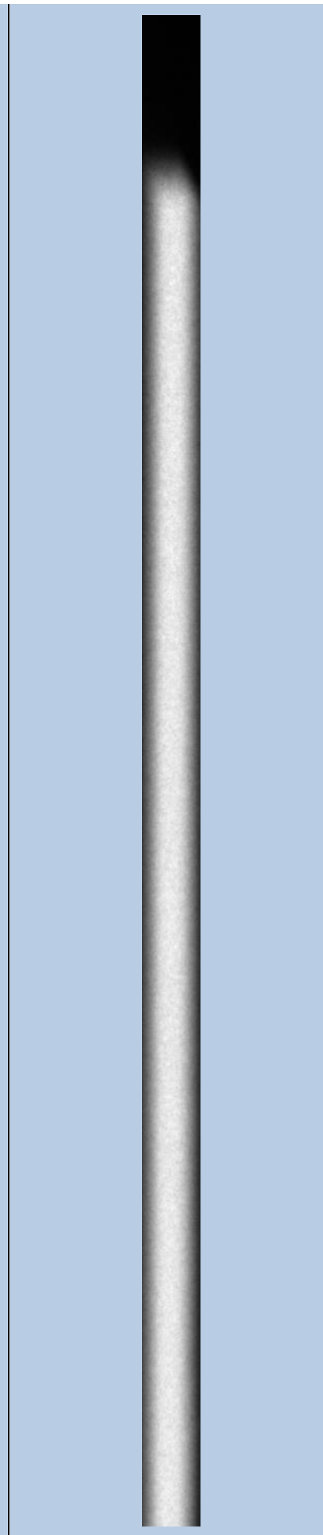


Fig. 57 Collimator too low

Ideal outcome.	The sensor is over-irradiated on its left-hand side.	The collimator is at an angle, which is causing over-irradiation of the sensor at its bottom left.	The collimator is too low, which is causing over-irradiation of the sensor at the bottom.

Table 3 Possible panorama collimator positions

4.2.2.4 Sensor over-irradiated on the left or right

As shown in **Fig. 55 Collimator too far to the right** on page 58, the sensor is over-irradiated on the left or right.

This can be corrected as described in section **4.2.2.3 Evaluation of the image** on page 52.

4.2.2.5 Collimator is not straight

As can be seen in **Fig. 56 Collimator not straight** on page 58, the beam path is not vertical.

In this case the collimator needs to be manually adjusted. To do this, remove the front cover (4 screws) of the tube. The two upper screws are covered by the white covers on the C-shaped curved section above the tube. This cover needs to be removed first (2 screws).

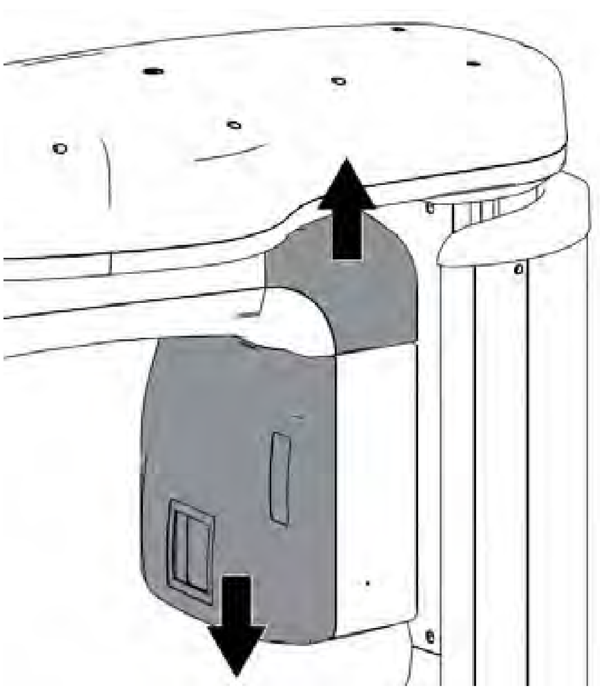


Fig. 58 Opening the housing for the tube collimator

Afterwards the angle or height of the collimator can be adjusted (4 screws).

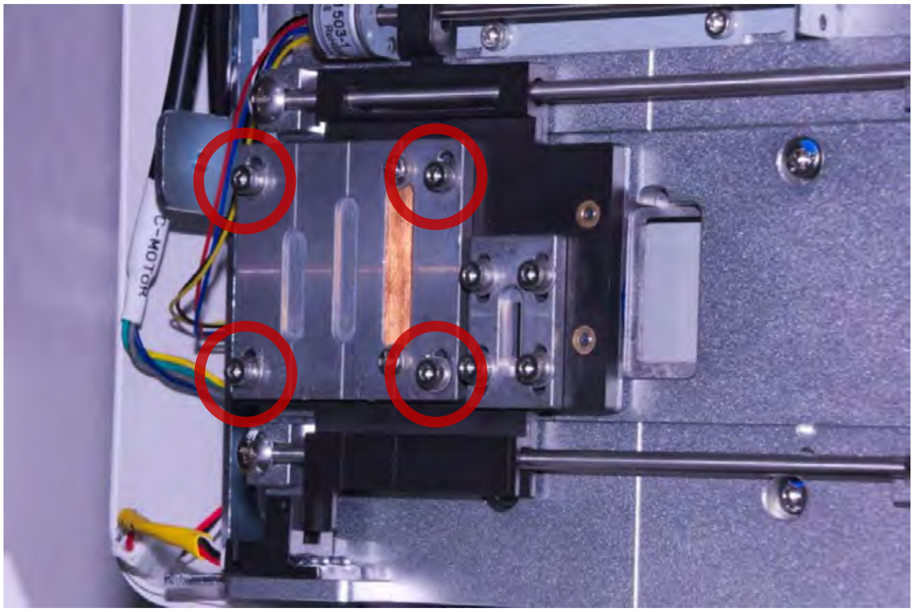


Fig. 59 Adjustment of the panorama collimator

Repeat the processes for image acquisition (see section **4.2.2.2 Starting the calibration** on page 51) and evaluation (see section **4.2.2.3 Evaluation of the image** on page 48) until over-irradiation of the sensor is ruled out.

4.2.2.6 Collimator is too low or too high

As can be seen in **Fig. 57 Collimator too low** on page 58, the radiation field is below (or above) the active sensor area.

The method for correcting this follows the same procedure as the one described in section **4.2.2.5 Collimator is not straight** on page 562.

4.2.3 Ceph unit ⏻

No further tools are required for the calibration of the collimator. Within the *Image Calibration* area click on *Ceph*. The calibration is called up via the point *Collimator Alignment* by clicking *GO*.

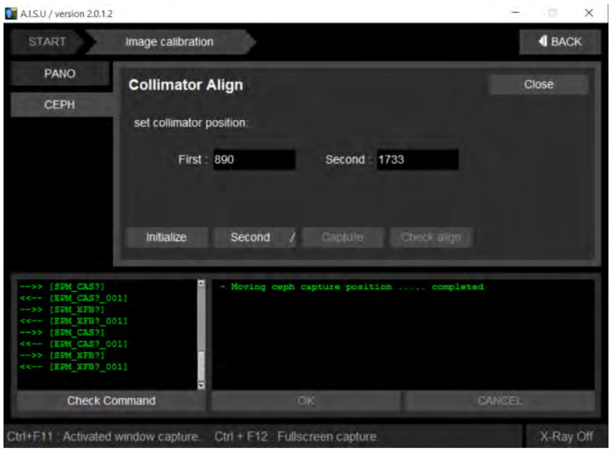


Fig. 60 Ceph Collimator Alignment

Note: Section **16.2 Collimator calibration – ceph** ⏻ on page 198 contains a checklist for performing the calibration.

4.2.3.1 Initialization of ProVecta S-Pan

Afterwards ProVecta S-Pan needs to be initialized via the *Initialize* button. Here, there are reminders about correct positioning of the studs and nasion.

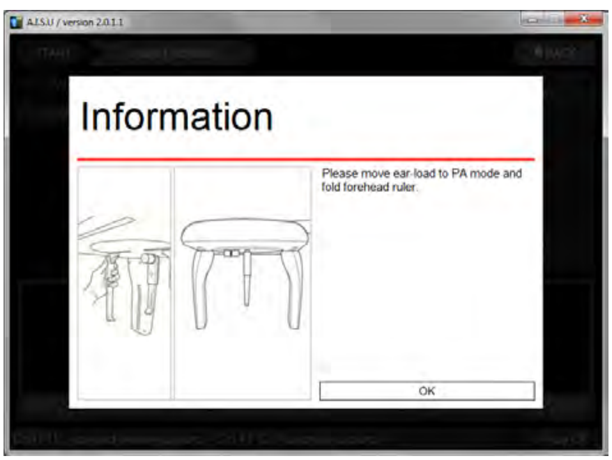


Fig. 61 Correct positioning of the supports

The values displayed for *First* and *Second* indicate the collimator positions currently being used by the unit. This information is taken directly from the MCU board and is not saved locally on the computer.

Finally, the two numerical values tell the stepper motor what distance the carriages need to be moved to align the X-ray beam accurately on the sensor. Here, the first collimator (primary collimator) is located on the tube (next to the panorama collimator). The second collimator (secondary collimator) represents the moveable carriage immediately in front of the patient.

The task of the primary collimator is to effectively limit the radiation beam to the top and bottom. Lateral limitation of the radiation field is provided by the secondary collimator.

The ceph sensor is almost fully irradiated. Exact alignment of the collimators is correspondingly important. The following illustration shows the positions of the collimators.

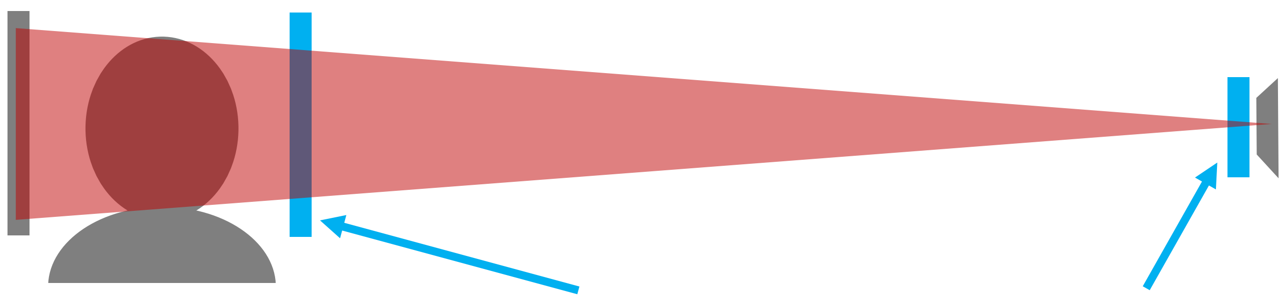


Fig. 62 Ceph collimator assignment

4.2.3.2 Starting the calibration

The button to the right of *Initialize* defines which collimator is to be calibrated. You can choose between *First* and *Second*. The *First* mode only activates the first collimator and moves the second collimator out of the radiation field in the process. The *Second* mode activates both collimators.

Finally a calibration needs to be performed in *Second* mode. However, it may be helpful to use the *First* mode to check the lateral full irradiation, and the first collimator only to check the upper and lower limitation.

Note: If there is any uncertainty about whether or not the position of the first collimator is suitable and delivers full irradiation to the width of the secondary collimator, there is a simple procedure for centrally aligning the first collimator

- Reduce the *First* parameter step-by-step and keep generating images under *First* settings until the edge of the collimator can be seen in the image.
- Increase the *First* parameter by 35 value units and then take an image again under *First* settings. It is then ensured that the first collimator delivers the beam centrally to the sensor and to the secondary collimator.

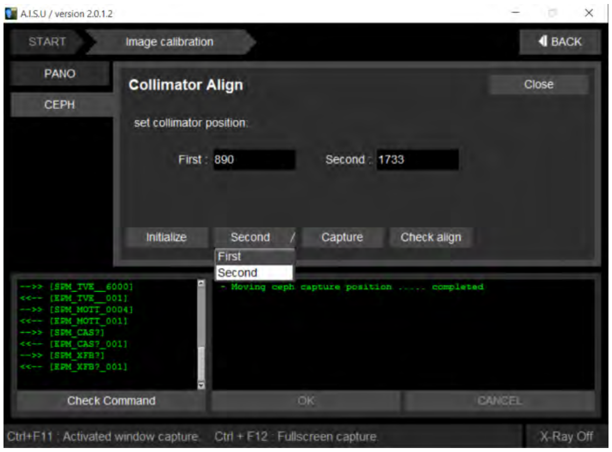


Fig. 63 Selecting the ceph collimators

The actual image is acquired via the *Capture* button. Here, any changes to the collimator value are automatically transmitted to the unit. For the image acquisition, the AISU software sets the activated collimator to the central position and activates the motionless One-Shot Mode. Suitable kV and mA values are also determined for the image acquisition. Separate filtering is not required.

As is described in section **4.1.4.3 Generating an image** on page 46, the AISU software lets the operator know when to press the exposure button.

4.2.3.3 Evaluation of the image

The evaluation is started by clicking the *Check align* button. As the first step, AISU checks itself whether the image meets the criteria for the unexposed edge.

Fig. 64 Image satisfies the requirements

Afterwards the Raw Viewer opens and displays the generated image.

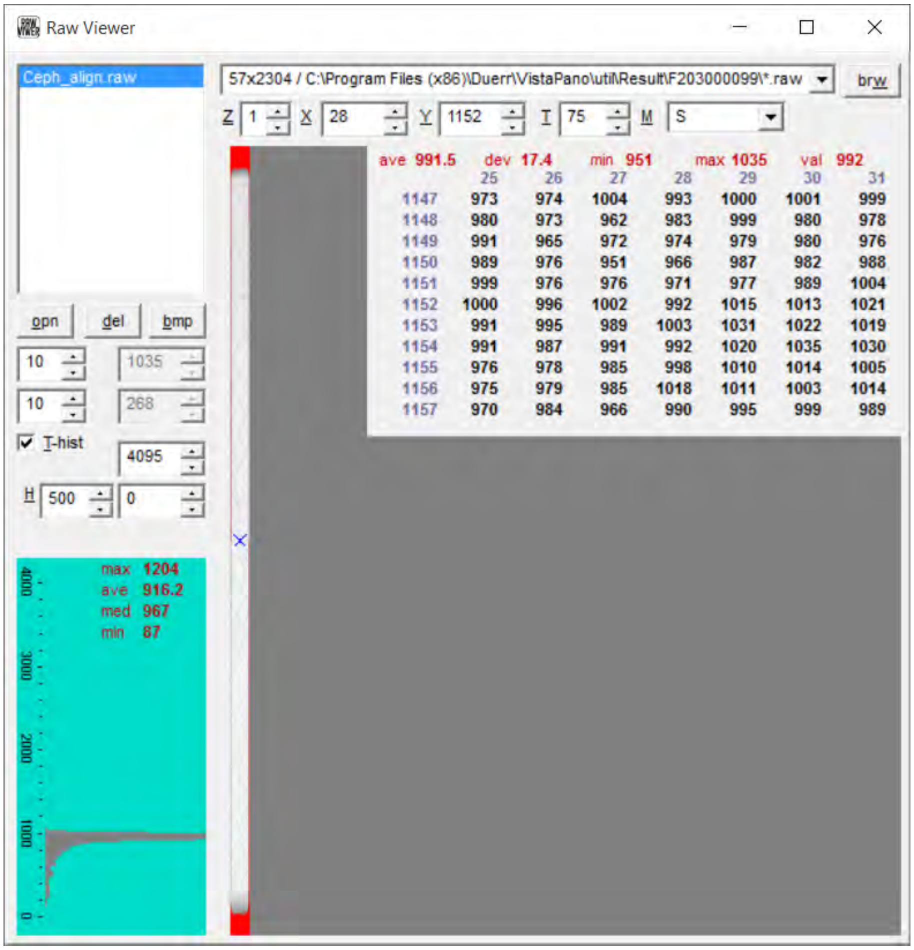


Fig. 65 Image under the *Second* mode (first and second collimator)

As the detector is almost fully irradiated left and right, the following things are useful in order to rule out over-irradiation:

- Increase the contrast (by adjusting the value *T* to 95)
- Check and correct the collimator angle of the secondary collimator
- Check and correct the collimator height of the primary collimator

In general it is possible to enlarge the image via the *Z*-value of the Raw Viewer.

Note: Further details about the Raw Viewer software (e.g. information about exporting the control image) can be found in section **4.3.4 Raw Viewer software** on page 71.

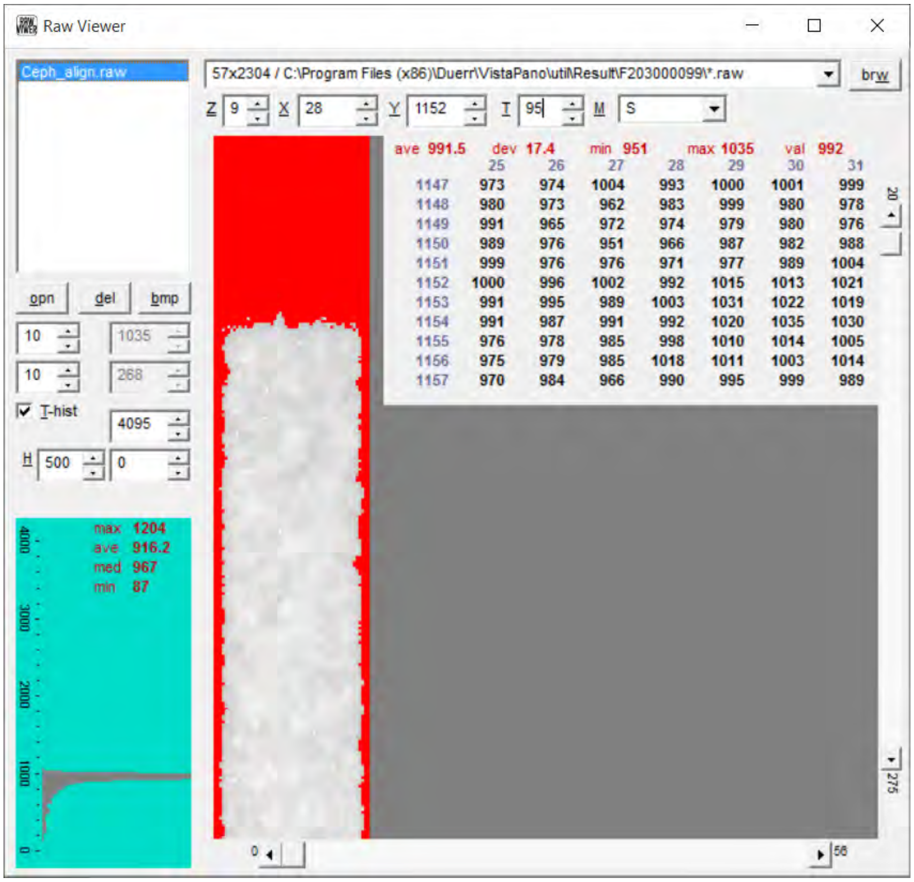


Fig. 66 Enlarged ceph second image with adjusted *T*-value

Case studies are shown below, together with solutions for performing the calibration of the collimator.

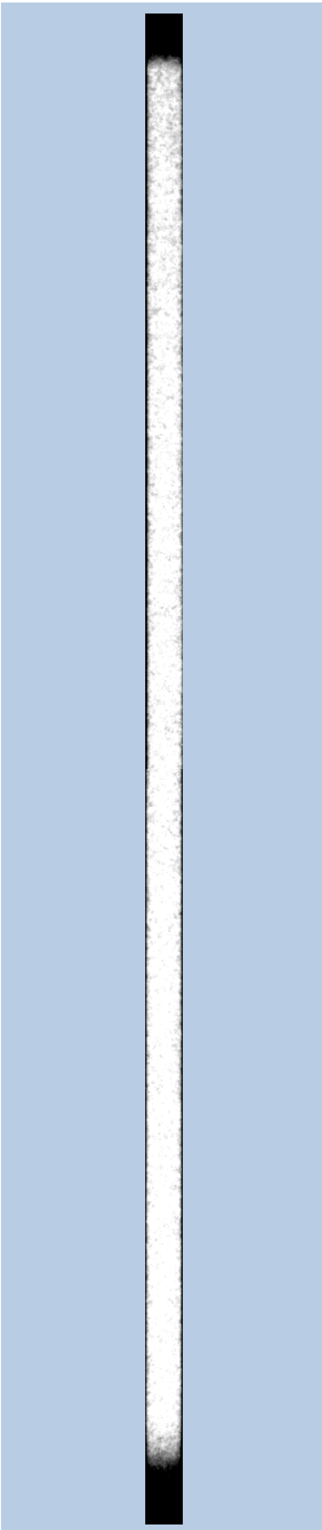


Fig. 67 Good

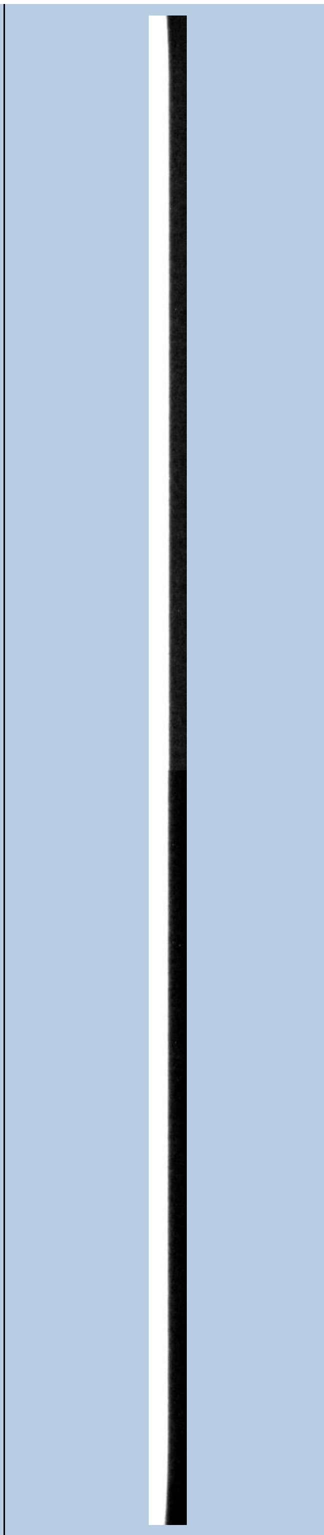


Fig. 68 Collimator too far to the left

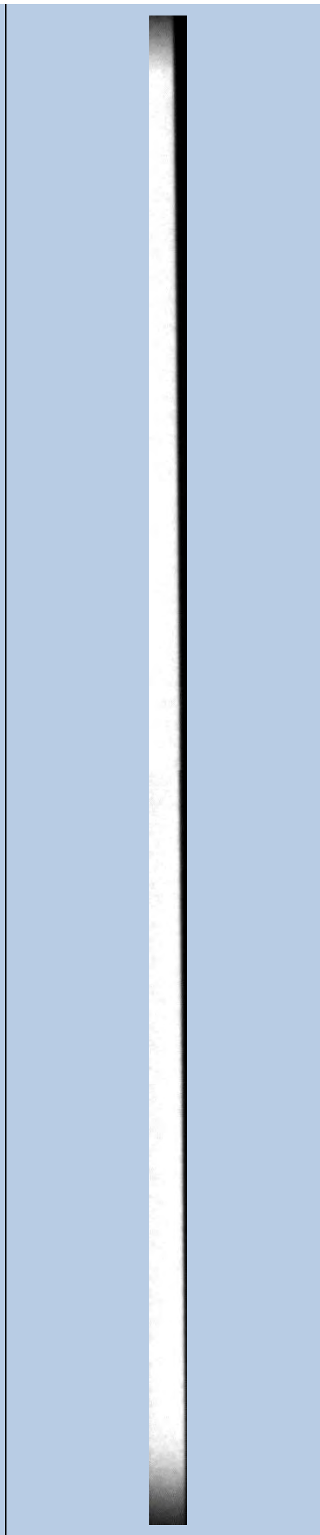


Fig. 69 Collimator not straight

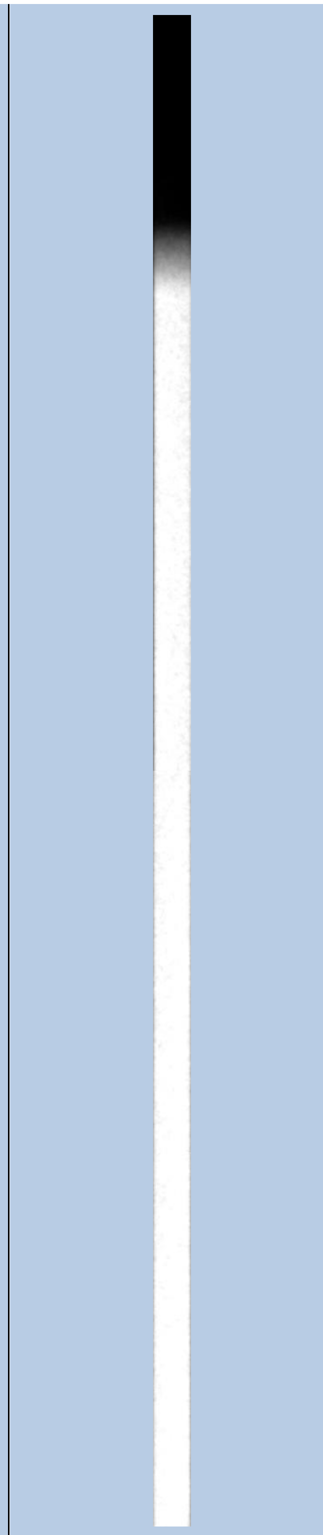


Fig. 70 Collimator too low

Ideal outcome.	The sensor is over-irradiated on its right-hand side.	The collimator is at an angle, which is causing over-irradiation at the top right of the sensor.	The collimator is too low, which is causing over-irradiation of the sensor at the bottom.

Table 4 Possible ceph collimator positions

4.2.3.4 Sensor over-irradiated on the left or right

As can be seen in **Fig. 68 Collimator too far to the left** on page 58, the active area of the detector is over-irradiated either on the left or right.

The collimator correction can be performed via the AISU software. The secondary collimator is responsible for the left/right-hand irradiation of the sensor. This means that the *Second* value needs to be adjusted.

The following applies here: increase the value to move the shown irradiated area to the right. Here again, one pixel corresponds to approximately one unit of value.

Typically, the collimator values are normally within the following limits:

ProVecta S-Pan Ceph

First	Second
850 - 950	1600 - 1850

Table 5 Empirical values for the ceph collimator

Repeat the processes for image acquisition (see section **4.2.3 Ceph unit** ⓘ on page 53) and evaluation (see section **4.2.3.3 Evaluation of the image** on page 55 until over-irradiation of the sensor is ruled out.

4.2.3.5 Collimator is not straight

As can be seen in **Fig. 69 Collimator not straight** on page 58, the collimator is at an angle. The sensor is being over-irradiated in the upper and lower areas.

In this case the secondary collimator needs to be manually adjusted. To do this, detach the cover on the collimator (4 screws). By loosening the three upper screws on the effective collimator it is loosened. Then the collimator angle can be adjusted by lightly turning the large slotted screw.

Fig. 71 Removing the cover from the secondary collimator

Fig. 72 Loosening the three fixing screws

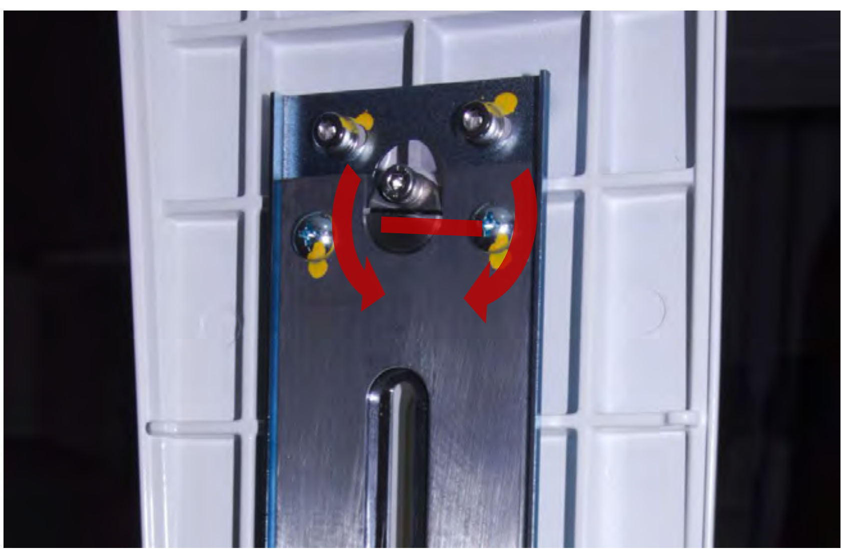


Fig. 73 Adjusting the angle of the secondary collimator via the slotted screw

4.2.3.6 Collimator is too low or too high

As can be seen in **Fig. 70 Collimator too low** on page 58 the collimator is either too low or too high. The sensor is being over-irradiated at the top or bottom

In this case the collimator needs to be manually adjusted. To do this, remove the front cover (4 screws) of the tube. The two upper screws are covered by the white covers on the C-shaped curved section above the tube. This cover needs to be removed first (2 screws).

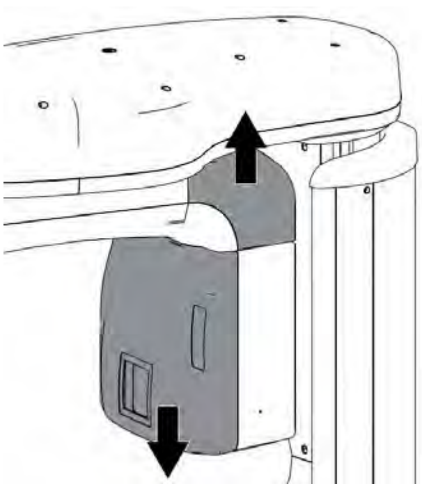


Fig. 74 Opening the housing for the tube collimator

Afterwards the height of the collimator can be adjusted (4 screws).

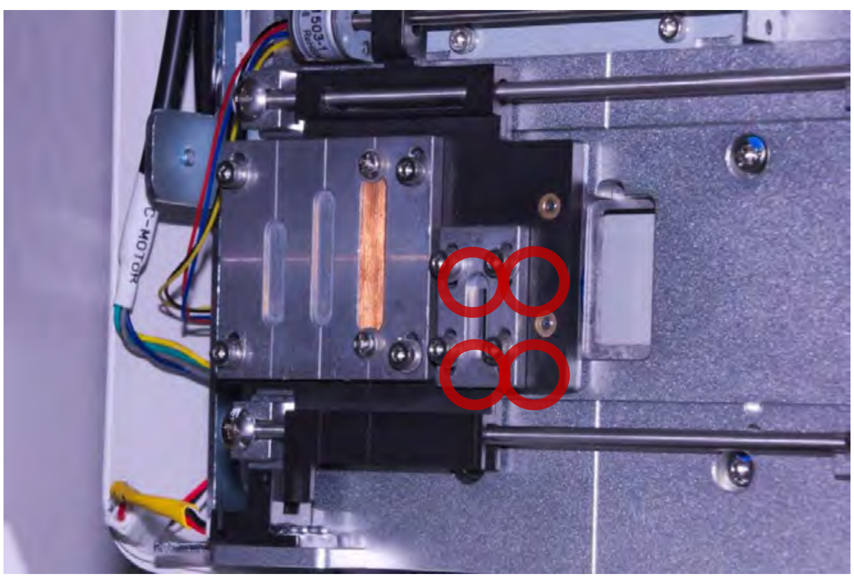


Fig. 75 Adjustment of the ceph collimator

Repeat the processes for image acquisition (see section **4.2.3 Ceph unit** ⓘ on page 5358) and evaluation (see section **4.2.3.3 Evaluation of the image** on page 55) until over-irradiation of the sensor is ruled out.

4.3 Symmetry calibration for the panorama unit (Phantom Alignment)

The symmetry calibration (Phantom Alignment) is not part of the initial installation. It normally only becomes necessary when components are replaced or changed that influence the symmetry of the ProVecta S-Pan.

These are:

- Positioning unit
- MCU board
- Light barriers for the rotation unit
- Upper canine X-ray positioning beam
- Rotation unit

4.3.1 Calibration process

The calibration process comprises several steps. We recommend following the steps in the order shown here, as some results are dependent upon others. However, these dependencies cannot be avoided even if the correct sequence is followed. Particularly if a unit is badly misaligned it may therefore be necessary to perform the symmetry calibration several times.

Note: The alignment of the X-ray positioning beams for the mid-saggital plane and for the Frankfort horizontal plane can be performed at any time.

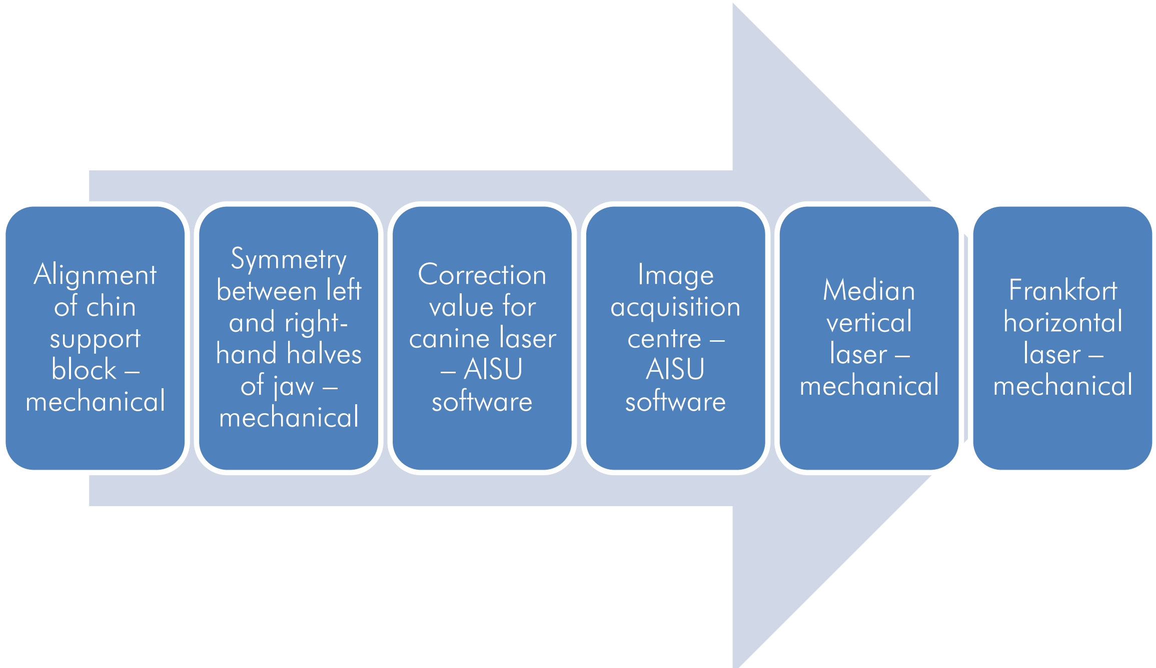


Fig. 76 Symmetry calibration procedure

4.3.2 Tools

In addition to the AISU software (and the Raw Viewer) you will also always need the ball phantom (order number 2207-021-50) as well as 1.8 mm copper.

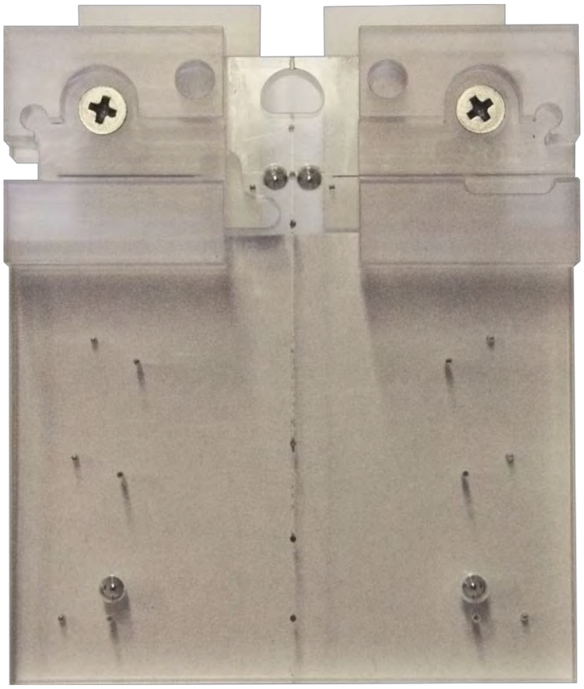


Fig. 77 Ball phantom

4.3.3 Positioning of the ball phantom

The phantom is positioned in the location where the patient support is attached.

In the alignment, particular attention must be paid to making sure that the X-ray positioning beam for the upper canine is in the correct position. The test body has a side indentation in the white plastic for this purpose. We recommend marking this with a pen to make it easier to see the laser position.

The X-ray positioning beams for the mid-sagittal plane and for the Frankfort horizontal plane are unimportant during positioning.

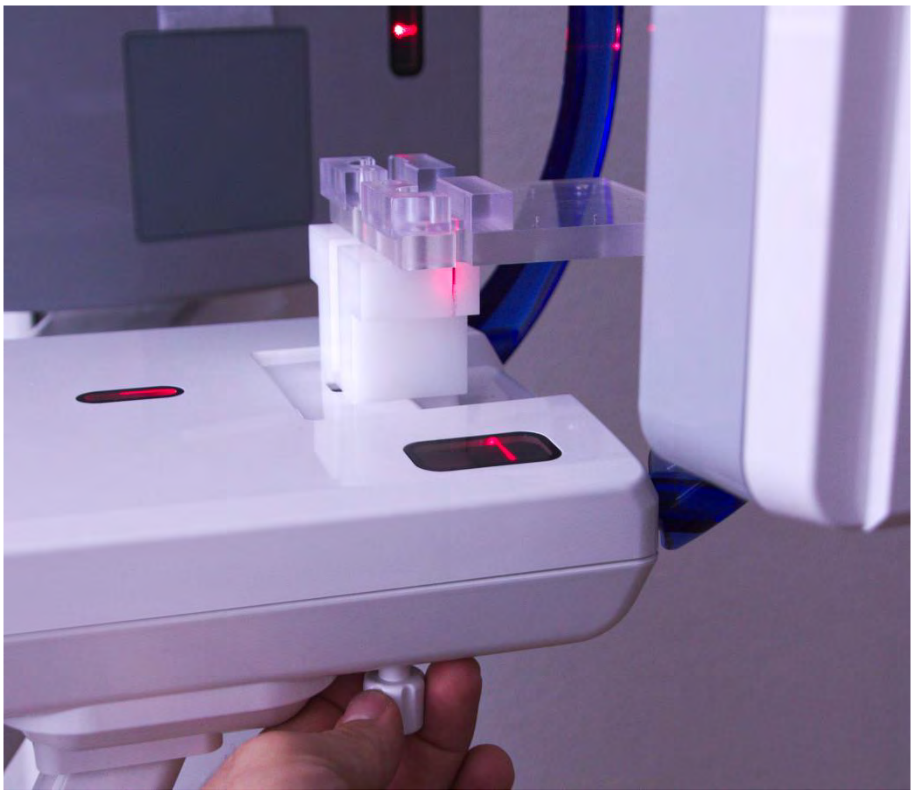


Fig. 78 Position of the ball phantom

4.3.4 Raw Viewer software

The Raw Viewer is a helpful tool for assessing raw images. These are generated during the calibration of the sensor or collimator and during symmetry calibration (as well as, ultimately, in the background during the the acquisition of every image taken by the ProVecta S-Pan).

4.3.4.1 Program structure

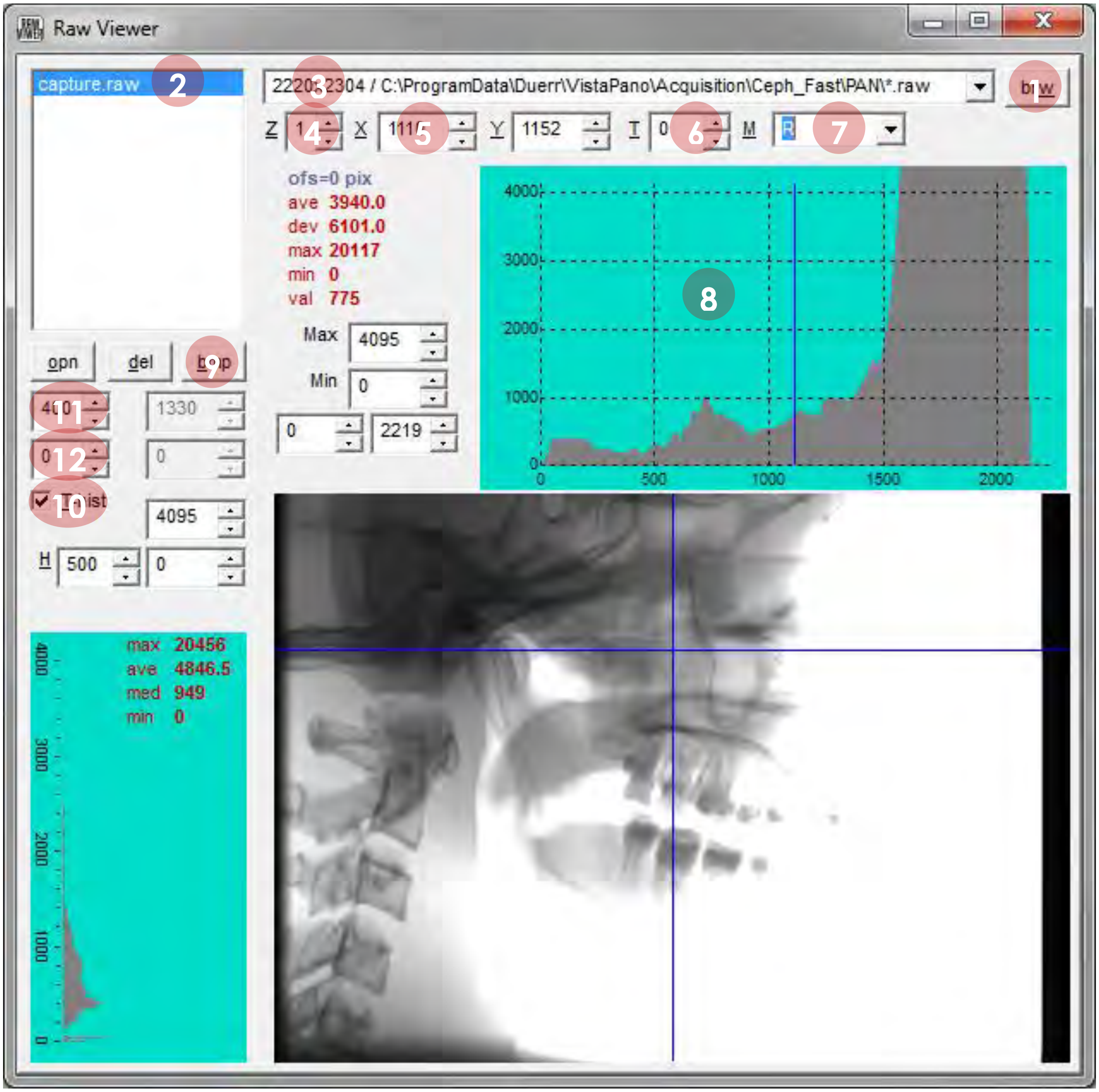


Fig. 79 Raw Viewer

Explanation of the key functions in **Fig. 79 Raw Viewer**

1	Here you can change the path from which the *.Raw files are loaded.
2	This area shows all of the *.Raw files that are contained in the previously selected directory. Single-click the relevant file to load it.
3	The pixel size is stated here. Raw images have different image widths. The Raw Viewer is often not able to determine them and is reliant upon the information entered by the operator. To do this, it is only necessary to enter the first pixel value (image width), and the Raw Viewer will then automatically add the image height. Matching values for the relevant images can be found in **Table 7 Typical pixel values for image widths** on page 73.
4	Enlargement factor. The image can be displayed larger by increasing the Z-value.
5	X-position (horizontal) based on the selected mouse position within the image. The Y-position (vertical) can be seen to the right of this.
6	Red coloration of individual grey scales.
7 + 8	Selection and display of different modes. The selected mode (7) is displayed underneath the selection (8) and provides information as a histogram on the X-axis, or via grey scales for individual pixel values or areas.
9	Export of the current image as a BMP file (in 8-bit grey scales). **Note:** For an export that includes the colour representations refer to the printscreen function of the AISU software in section **3.2 Operation** on page 28.
10	Activates or deactivates the display of the images in the histogram (recommended).
11	Trimming of the dark grey scales (in steps of 0.1%; possible values are 0 – 999) in order to increase the contrast. A value of 200 is recommended for symmetry calibration.
12	Trimming of the light grey scales (in steps of 0.1%; possible values are 0 – 999) in order to increase the contrast. A value of 10 is recommended for symmetry calibration.

Table 6 Explanation of key functions in the Raw Viewer

4.3.4.2 Typical pixel values for image widths

Panorama sensor	Ceph sensor	Panorama image – adult	Panorama image – child	Ceph		
58	57	2830	2451	2220	2197	2223

Table 7 Typical pixel values for image widths

4.3.5 Default parameters for symmetry calibration

All images for symmetry calibration are acquired under 1.8 mm copper. For the calibration of the correction value for the X-ray positioning beam for the upper canine a t-hist value of 200 / 10 is the default for the correction value. This value is also recommended as the standard value for the entire calibration.

4.3.6 Starting the symmetry calibration

Go to the *Image Calibration* area and select the point *Phantom Alignment*, then click *GO* to launch.

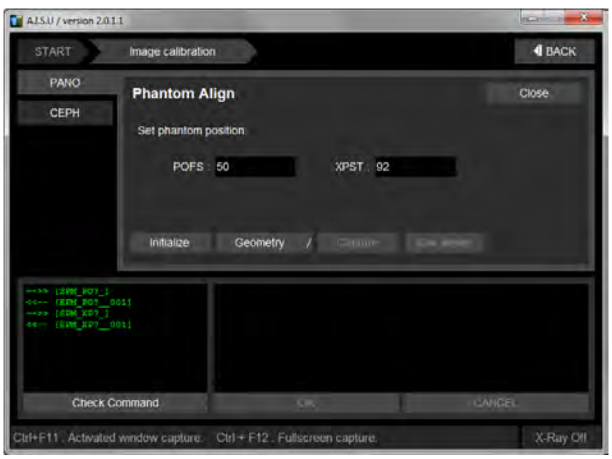


Fig. 80 Starting Phantom Alignment

Afterwards select *Initialize* to prepare the unit for the image acquisition form. The system will remind you to make sure that the MCU parameters should be backed up before running the calibration function. For more information see section **5.1 Machine information (unit backup and restore)** on page 89.

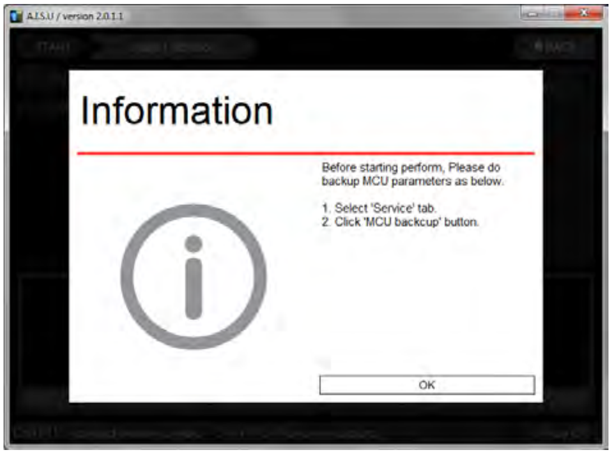


Fig. 81 Reminder about backing up the MCU parameters

4.3.7 Starting image acquisition for symmetry calibration

The selection *Geometry* remains unchanged for the symmetry calibration.

The image is acquired via the *Capture* button.

All of the positioning aids must be removed for the calibration. In addition, 1.8 mm copper must be attached to the tube. The ball phantom should be positioned in the way shown in section **4.3.3 Positioning of the ball phantom** on page 64.

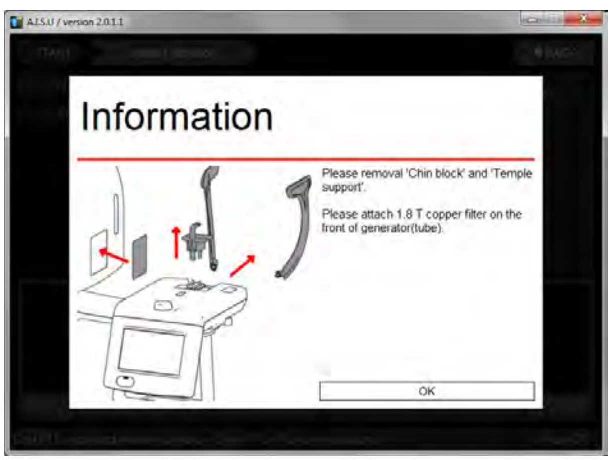


Fig. 82 Removal of the components and placement of 1.8 mm copper

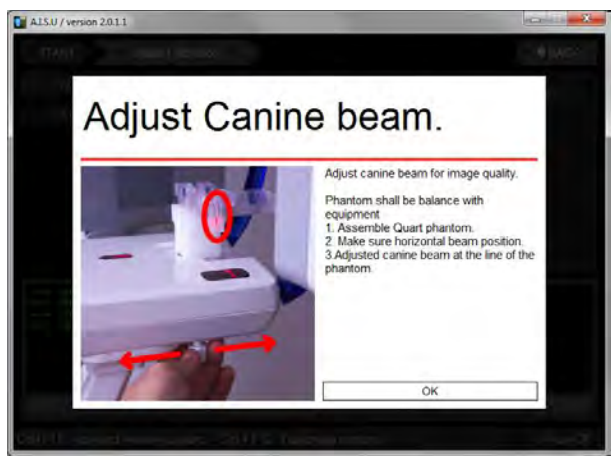


Fig. 83 Positioning the ball phantom

A message then pops up asking whether the current position of the X-ray positioning beam for the upper canine should be saved in the Log file of the AISU software. This value does not play a central role in further proceedings. Nonetheless, we recommend clicking *OK* here.

Fig. 84 Saving the X-ray positioning beam for the upper canine in the Log file

Once the image has been acquired a selection is made via the *Raw Viewer* button.

4.3.8 Alignment of the chin support block

The system checks here whether the support block is at an angle of 90° to the unit.

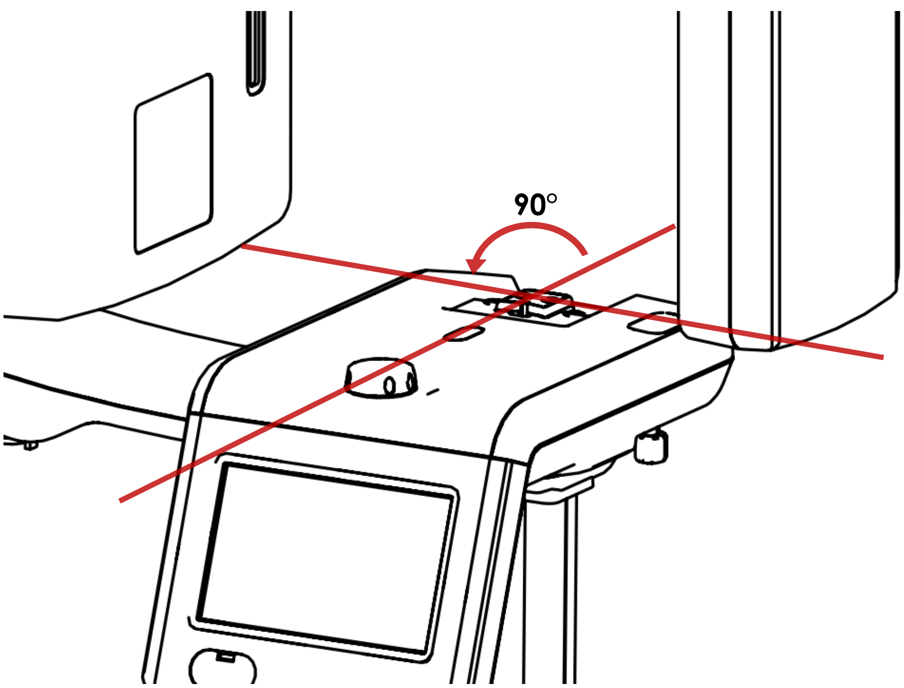


Fig. 85 Alignment of the chin support block

As is described in section **4.3.7 Starting image acquisition for symmetry calibration** on page 74, an acquisition is generated with the ball phantom; this can then be used to check the position. The phantom has 3 metal pins for this purpose that are arranged one above the other in the middle at the rear.

If these metal pins that are shown (always out of focus) form a vertical line with the in-focus metal pin from the tomographic plane then the setup is perfect.

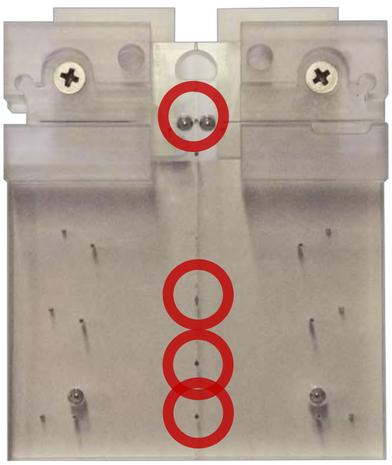


Fig. 86 Ball phantom

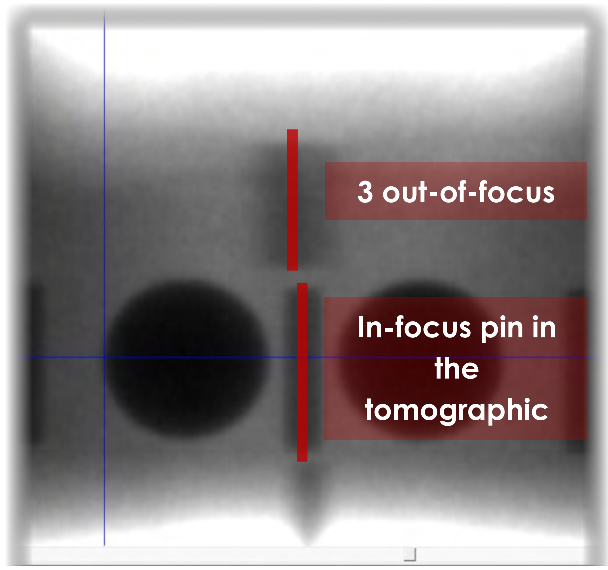


Fig. 87 Image of the ball phantom centre

If there is a clear offset here then the locking screw of the mounting needs to be loosened so that the angle of the support block can be turned to the left or right.

The position of the screw is on the underside of the overall positioning unit. Once the white rubber cap has been removed it can be loosened (with a small Phillips screwdriver).

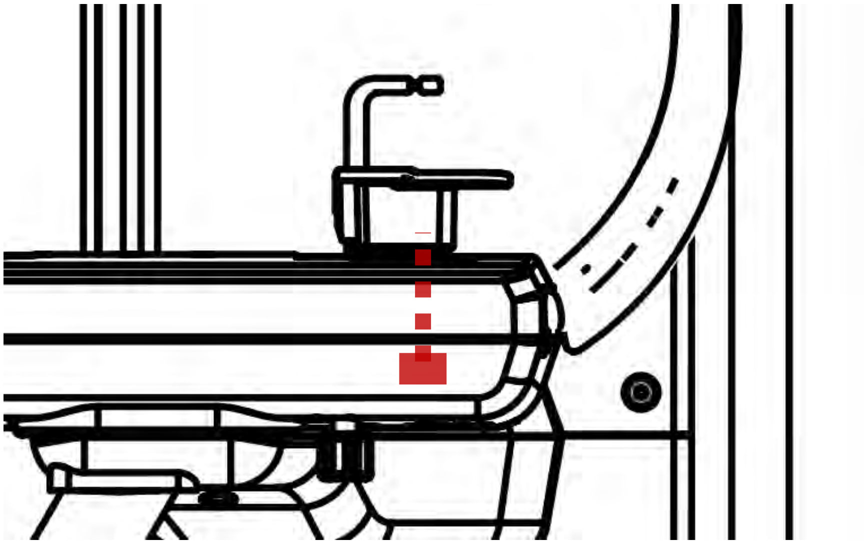


Fig. 88 Position of the locking screw for the chin support block

4.3.9 Symmetry between the left and right-hand halves of the jaw

The question whether or not the halves of the patient's jaw are depicted symmetrically is answered by taking an image with the ball phantom (see section **4.3.7 Starting image acquisition for symmetry calibration** on page 74). Here, the pixel values of the X-coordinate of the two outer metal pins are checked against the middle metal pin.

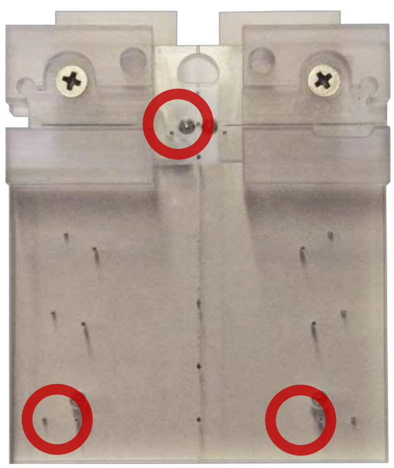


Fig. 89 Ball phantom

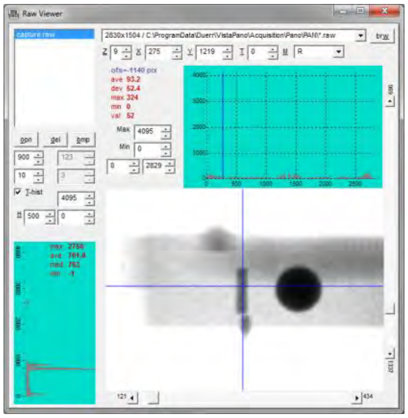


Fig. 90 Right-hand metal pin

Example – metal pin X-position = 275

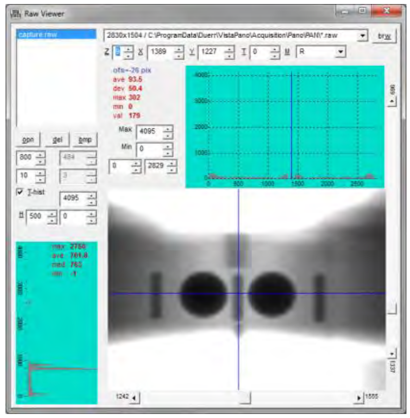


Fig. 91 Central metal pin

Example – metal pin X-position = 1389

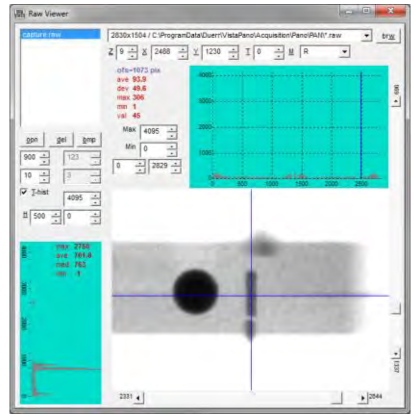


Fig. 92 Left-hand metal pin

Example – metal pin X-position = 2488

The distances are calculated as follows:

- Distance to the right-hand metal pin: central metal pin – right-hand metal pin
- Distance to the left-hand metal pin: left-hand metal pin – central metal pin
- The permissible difference between both values must not exceed 10 pixels.

Example:

- 1389 – 275 = 1114
- 2488 – 1389 = 1099
- Difference: 1114 – 1099 = 15 => outside the tolerance

If the result exceeds 10 pixels then the positioning unit must be repositioned. To do this, the support blocks and the rotary button (this is pulled off to the top) need to be removed.

Fig. 93 Removal of the support blocks and rotary knob

The upper cover is screwed from underneath to the unit with 5 screws. All of the screw holes have a rubber cap that needs to be removed first.

Fig. 94 Removing the screws for the positioning unit housing part

Under the cover there are 4 socket head screws that connect the positioning unit to the ProVecta S-Pan.

By undoing the four screws it is possible to move the positioning unit freely to the left or right. One stop screw helps with the fine adjustment here.

The following applies to the alignment:

- Opening (unscrewing) the stop screw causes the distance of the right-hand metal pin to reduce / the distance of the left-hand metal pin to increase.
- One rotation of the stop screw causes a change in the pixel value by around 30 pixels.

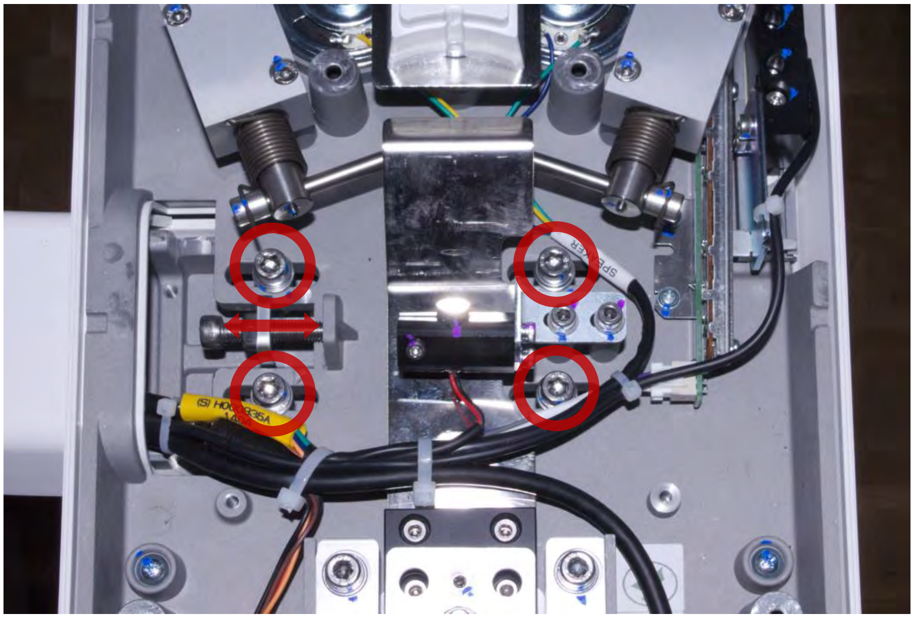


Fig. 95 Adjusting the position of the positioning unit

Note: The right-hand metal pin of the phantom is shown on the left of the support block. This handbook describes the positioning from the point of view of the phantoms.

Note: if the jaw symmetry is badly misaligned then we recommend correcting the symmetry of the halves of the jaw in interim steps and performing the calibration of the centre of the image acquisition at the same time (see section **4.3.11 Calibration of the centre of the image** on page 77). Both of these calibrations influence each other.

Note: Once the positioning unit has been successfully adjusted check section **4.3.8 Alignment of the chin support block** on page 75 again.

4.3.10 Correcting the upper canine X-ray positioning beam

The height of the curve shape of the rotation unit depends on the position of the upper canine X-ray positioning beam. A potentiometer on the X-ray positioning beam measures the displacement of the lasers and passes this information on to the MCU board. A correction value is used to ensure that the information is perfectly coordinated with the tomographic plane. This correction value can be adjusted in this step.

Beforehand it is necessary to generate an image with the ball phantom (see section **4.3.7 Starting image acquisition for symmetry calibration** on page 74). Two spheres are displayed in the centre of the image. The diameter of both spheres in pixels needs to be determined.

It is important here that the image is acquired with 1.8 mm copper and that the X-ray positioning beam has been accurately positioned on the phantom. Similarly, a t-hist setting of 200 / 10 is also important. A high Z-value > 7 is recommended so that the spheres and their edges are easy to identify.

Click with the mouse buttons on both side edges of the sphere to determine the pixel value of the X-axis.

The difference between the two pixel values is the diameter of the sphere. It must be 53, 54 or 55.

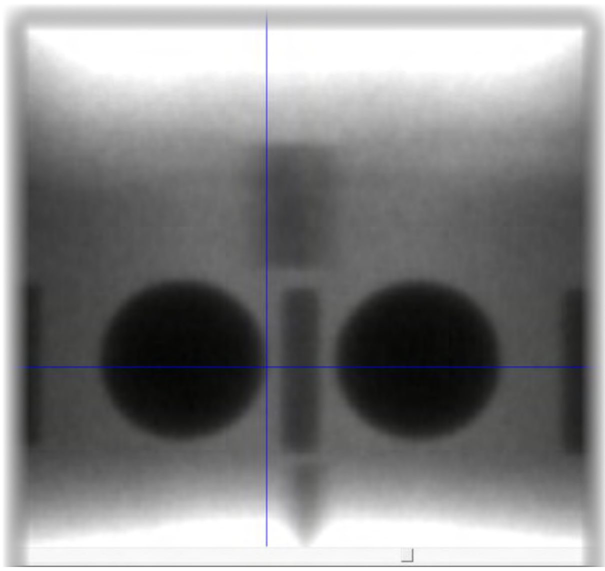


Fig. 96 Image of the ball phantom centre

Example: left edge of the sphere, position X: 1369

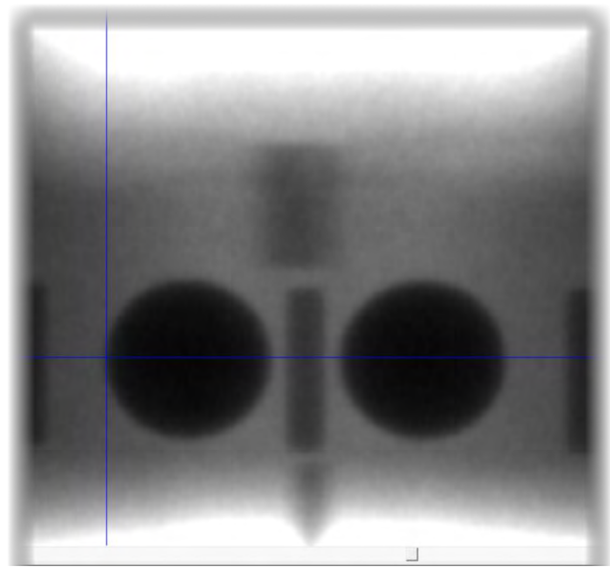


Fig. 97 Image of the ball phantom centre

Example: right edge of the sphere, position X: 1315

Example: 1369 – 1315 = 54 => OK

The AISU software has the input field *XPST* for correcting a deviation in the value.

The following applies when adjusting the sphere size: if the display width of the sphere is to be increased by one pixel then the XPST value should be reduced by around 5.

Note: The described process should also be applied if the canine laser has been replaced or readjusted (for example if it is not vertical).

The laser is held in the moveable device via a hexagon socket screw. Once this screw has been loosened the laser can be freely rotated (and therefore adjusted in its angle).

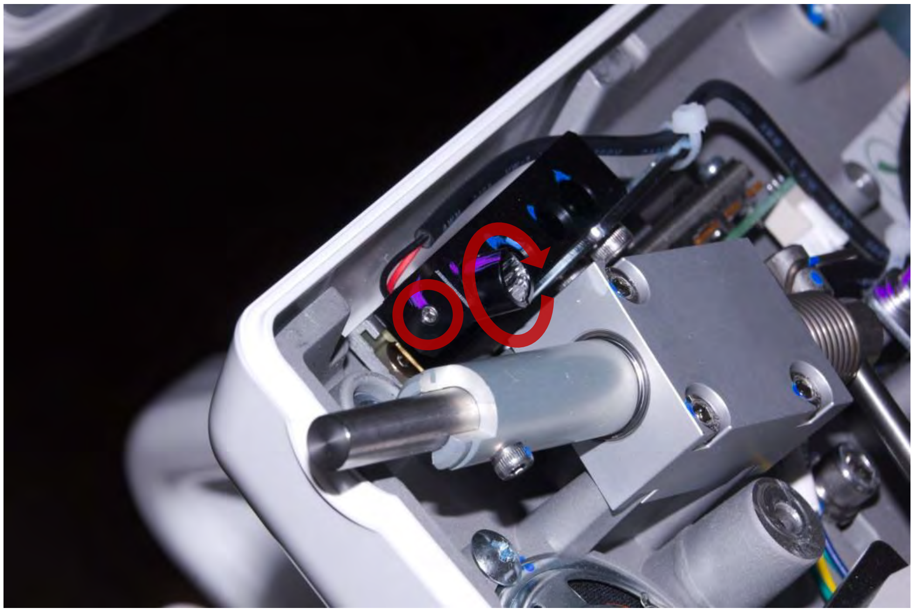


Fig. 98 Adjustment of the position of the upper canine X-ray positioning beam

4.3.11 Calibration of the centre of the image

To ensure that the centre of the phantom is positioned in the centre of the image, there is a correction value that influences the position of the rotation unit for every image acquisition.

Once the image has been acquired with the ball phantom (see section **4.3.7 Starting image acquisition for symmetry calibration** on page 74), only the position of the central metal pin on the X-axis needs to be determined here.

This value has the default setting 1386 pixels +/- 10 pixels.

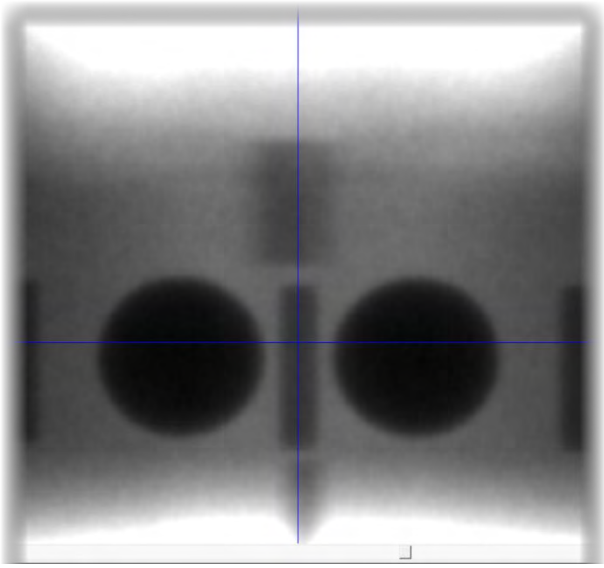


Fig. 99 Ball phantom image centre

Example – position of centre of pin: 1389 => Ok

The AISU software has the input field *POFS* for correcting a deviation in the value.

4.3.12 Final assessment of the image

Once the symmetry calibration is complete a final overall assessment of the image is performed.

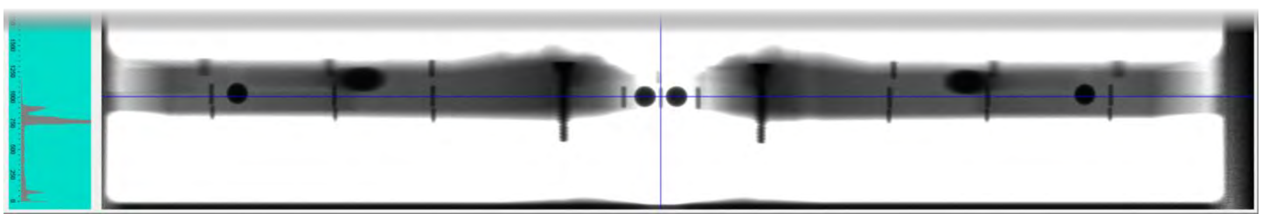


Fig. 100 Successful ball phantom image acquisition

In addition to the characteristics described in the previous steps, the following additional points also demonstrate that the calibration was successful:

- The 4 spheres are all displayed as round objects
- The 9 metal pins that are at the same height as the 4 spheres are shown in focus.
- The two shadows of the outer two spheres are located in similar positions within the image and have approximately the same length of tail.

4.3.13 Adjustment of the X-ray positioning beam for the mid-sagittal plane

Since the X-ray positioning beam for the mid-sagittal plane is part of the positioning unit (which is then moved as a whole unit) and the laser cannot be moved by the operator, it can be adjusted at any time without affecting the symmetry of the image. Ultimately, the X-ray positioning beam for the mid-sagittal plane serves merely as an important positioning aid.

If the X-ray positioning beam for the mid-sagittal plane is offset or at an angle then read through the points in section **4.3.9 Symmetry between the left and right-hand halves of the jaw** on page 71 for instructions on removing the cover.

The unit can be freely adjusted as required with the aid of the different hexagon socket screws. We recommend attaching a positioning aid next to the ball phantom on the chin support, which can then be used for alignment (for example a test body).

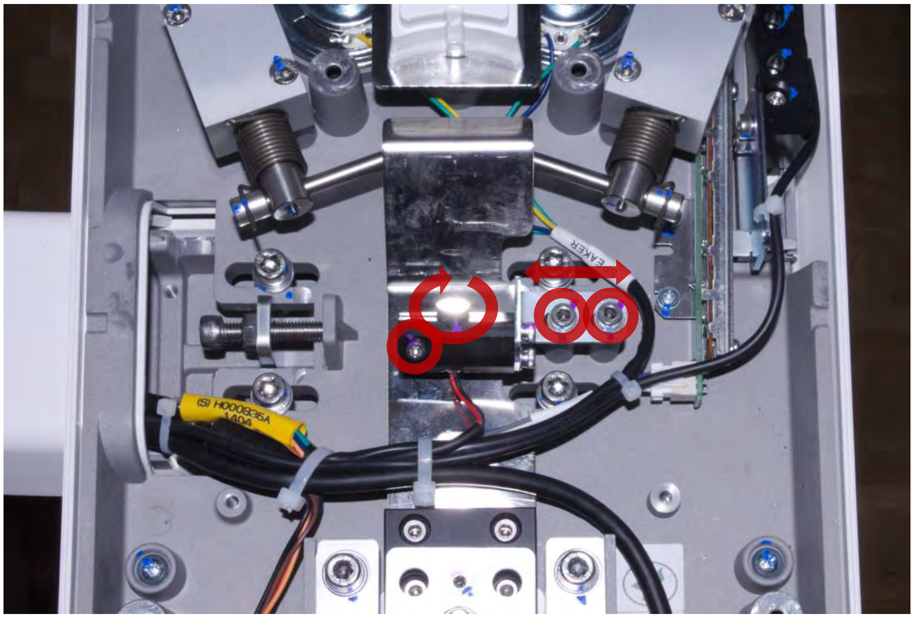


Fig. 101 Adjusting the position of the positioning unit

4.3.14 Adjustment of the X-ray positioning beam for the Frankfort horizontal plane

The X-ray positioning beam for the Frankfort horizontal plane also has no impact on the image layout, but instead merely helps with correct positioning of the patient.

As described in section **4.2.2.5 Collimator is not straight** on page 52, the two housing parts on the tube side also need to be removed in order to adjust the angle of the X-ray positioning beam for the Frankfort horizontal.

The X-ray positioning beam itself is held in the moveable device via a hexagon socket screw. Once this screw has been loosened the X-ray positioning beam itself can be freely rotated (and therefore adjusted in its angle).

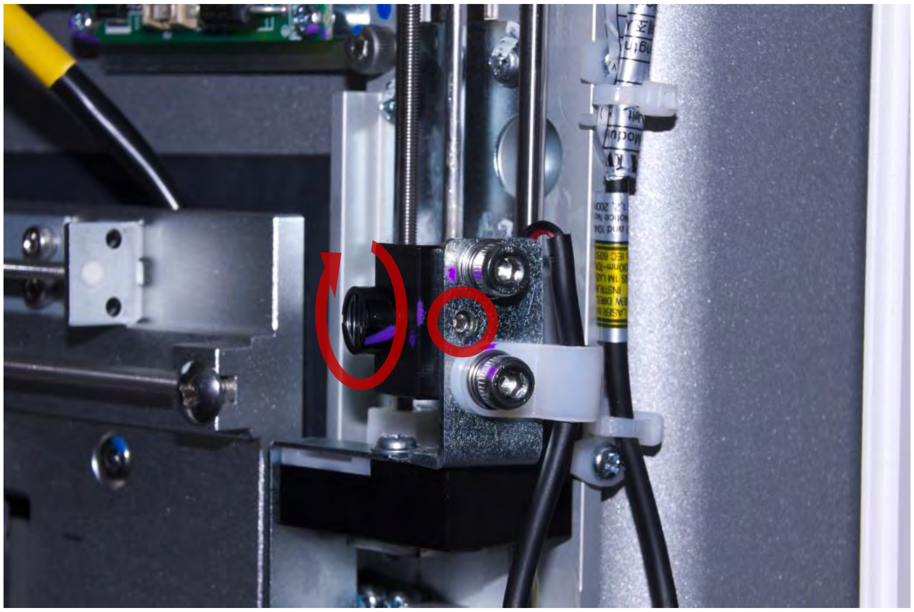


Fig. 102 Adjusting the angle of the X-ray positioning beam for the Frankfort horizontal

4.4 Phantom Alignment Ceph

With the aid of the Phantom Alignment function in the AISU software it is possible to:

- Calibrate the position of the studs.
- Calibrate the start and end positions of the sensor and the secondary collimator.

4.4.1 Calibrating the position of the studs

This calibration process ensures that both studs are positioned above each other and that therefore the patient is positioned at an ideal angle to the X-ray source and sensor.

Note: Section **16.3 Adjustment of the ceph unit** on page 199 contains a checklist for performing the calibration.

A simple X-ray image in lateral mode needs to be taken in order to calibrate the studs. This does not necessarily need to be done within the AISU software (although we do recommend this).

As a preparatory step, the ceph unit needs to be aligned in lateral mode. Here, the studs should be approximately central. In addition, in order to improve the image we recommend removing the protective silicone caps.

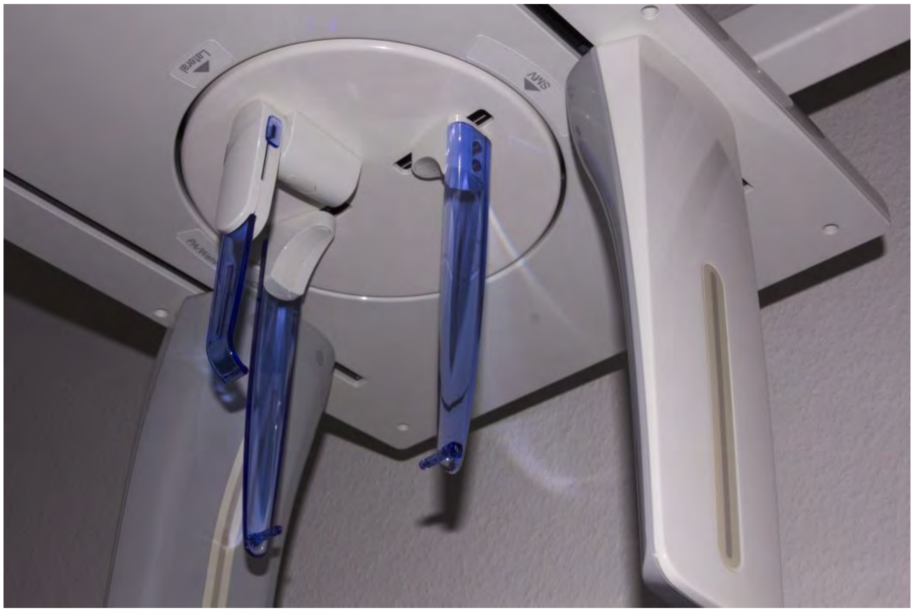


Fig. 103 Alignment of the ceph unit

This can be done via the AISU software within the area *Phantom Alignment* in *Lateral* mode. There is no need for a copper filter.

Both studs can be seen on the image. Here, the one that is closer to the tube is shown larger than the one on the sensor side. Each ear stud contains a metal pin that can be easily seen in the X-ray image and makes it easier to understand the image. If required, a washer or similar can be placed over one of the studs to help tell them apart.

The aim is to have both of the studs shown as round objects as cleanly as possible one above the other in the image.

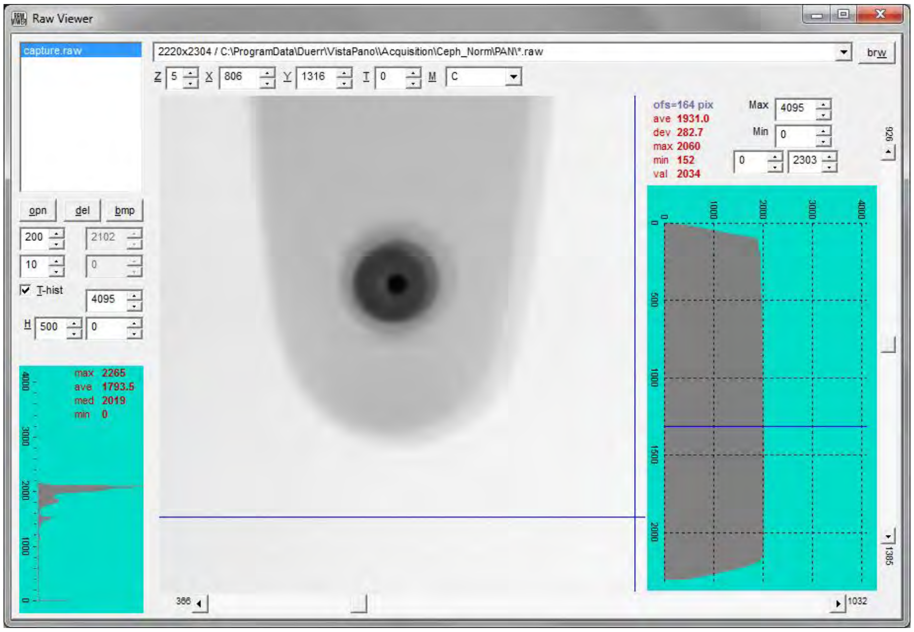


Fig. 104 Image for alignment of the studs

The adjustment is performed mechanically in two ways:

- Adjustment of the height of the studs if they are not above each other in the horizontal alignment.
- Adjustment of the angle of the studs if they are not above each other in the vertical alignment.

4.4.1.1 Adjustment of the height of the studs

If the height of the ear studs is incorrect then one of the two studs needs to be moved higher or lower. For this purpose the ear stud is screwed to the holder via two screws, whereby the ear stud has freedom to move upwards or downwards. The two screws are covered by a wide rubber comb on the inside of the fixture. This needs to be removed first.

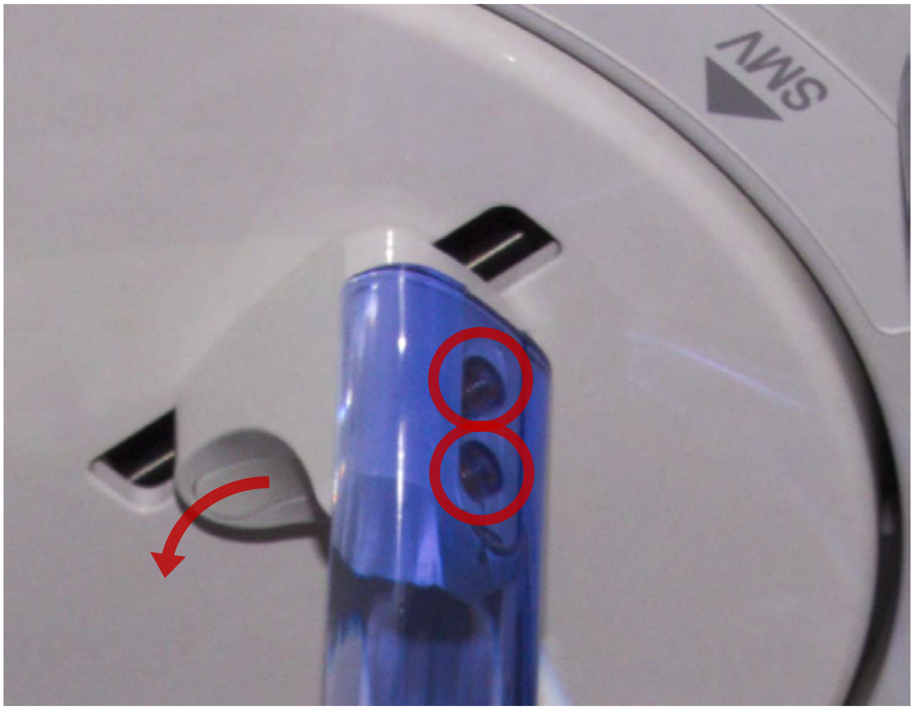


Fig. 105 Adjustment of the height of the studs

4.4.1.2 Adjustment of the angle of the studs

If the studs are shown side-by-side with an offset (vertically offset) then the position in which the moveable studs and nasion unit engage should be adjusted. To do this the cover of the ceph unit needs to be removed.

In the centre there is a rotation unit that is painted white and can be moved in a circular fashion. Here, a ball bearing wheel engages in the possible positions in one of the recesses in the rotation unit. This ball bearing wheel is fixed with two screws. By undoing these screws you can move the entire ball bearing wheel assembly to the left or right. As a result, the position of the angle between both studs and the tube and sensor is adjusted.

Fig. 106 Ceph unit without cover

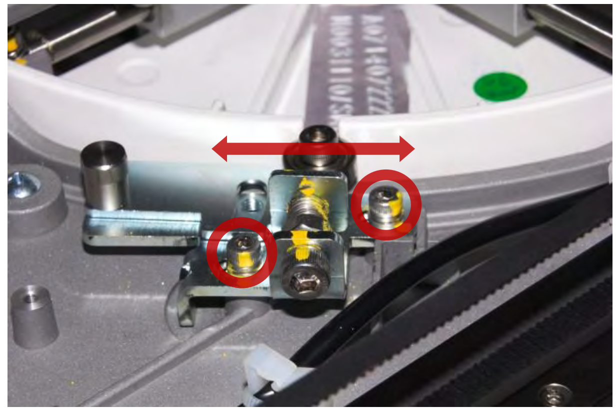


Fig. 107 Adjustment of the angle of the studs

4.4.2 Calibrating the start and end positions of the mounting

4.4.2.1 Tools

The CEPH Universal test body holder (order number 2130-996-00) is required as a tool.

This is clamped between the two studs. Here, care must be taken to ensure that the studs are aligned for a lateral image, with the nasion positioned towards the tube. The cut away opening on the test body holder must face towards the detector. Exact positioning is important to prevent measuring errors during the calibration process.

Fig. 108 Positioning of the test body holder

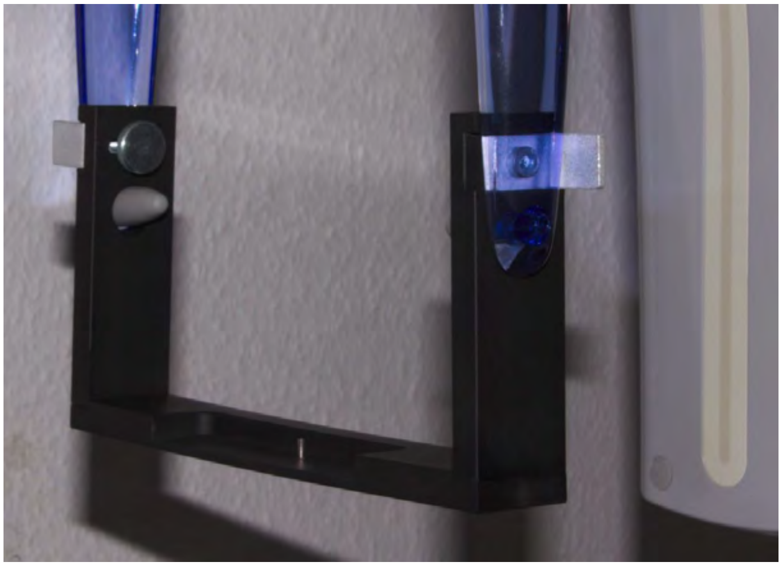


Fig. 109 Positioning of the test body holder

4.4.2.2 Starting the calibration

No further tools are required for the calibration of the collimator. Within the *Image Calibration* area click on *Ceph*. The calibration is called up via the point *Phantom Alignment* by clicking GO.

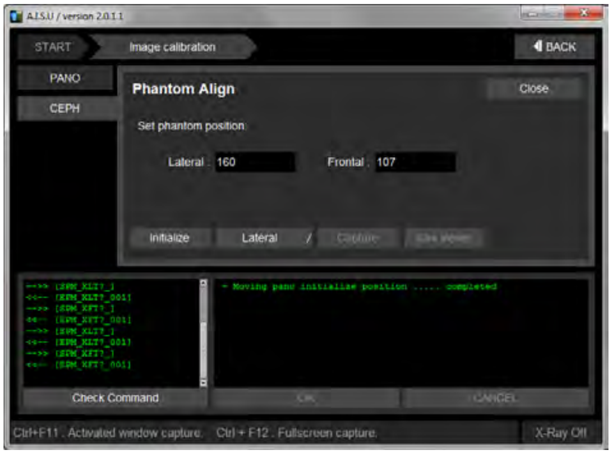


Fig. 110 Phantom Alignment Ceph

Click *Initialize* to align the unit to the ceph unit.

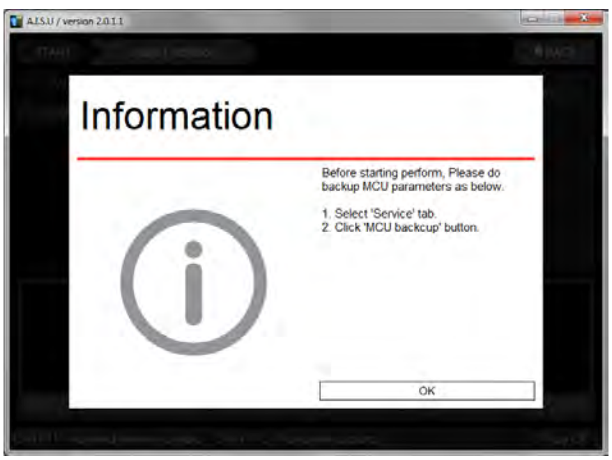


Fig. 111 Reminder about backing up the MCU parameters

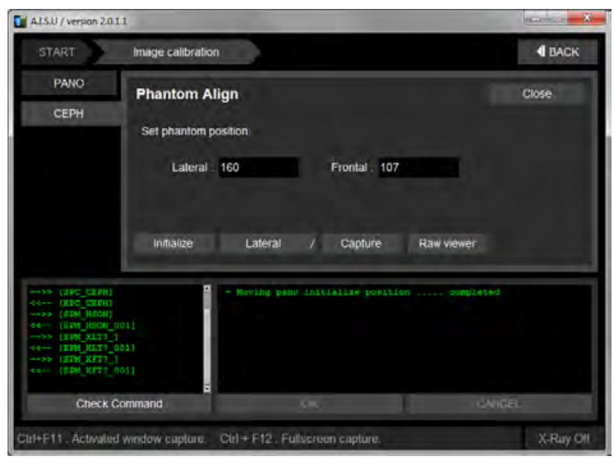


Fig. 112 Ceph Phantom Align overview

The calibration of the start position is available for both image acquisition types.

- Lateral
- Frontal

The order in which the calibration is done does not matter. The positioning of the test body holder is identical for both image acquisition types (see section **4.4.2 Calibrating the start and end positions of the mounting** on page 84).

4.4.2.3 Performing the lateral calibration

The image is acquired via the *Capture* button, taking into account the current lateral value. Afterwards this is viewed via the *Raw Viewer*. For measurement of the X-axis we recommend switching to the mode *M = C*. A t-hist value of *200 / 10* is recommended for good contrast settings.

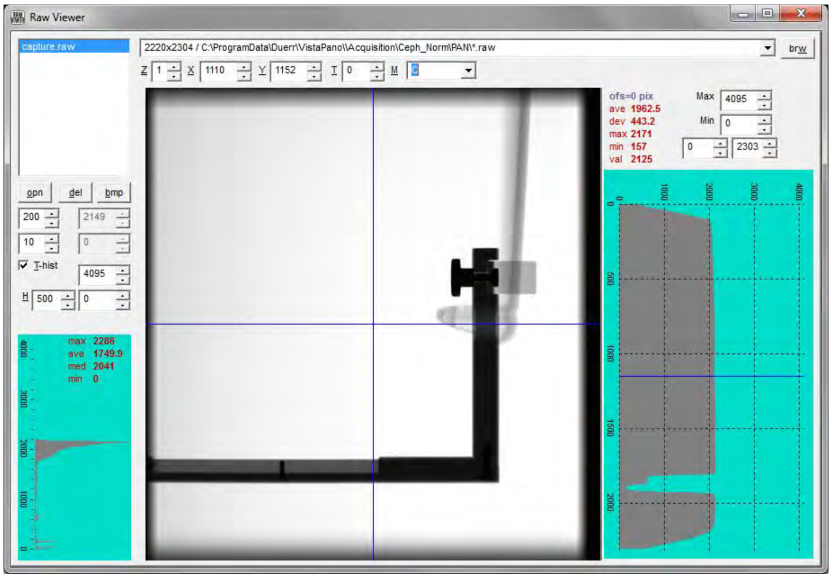


Fig. 113 Lateral image

We recommend significantly enlarging the image via *Z* so that the metal pin in the test body holder can be seen more easily.

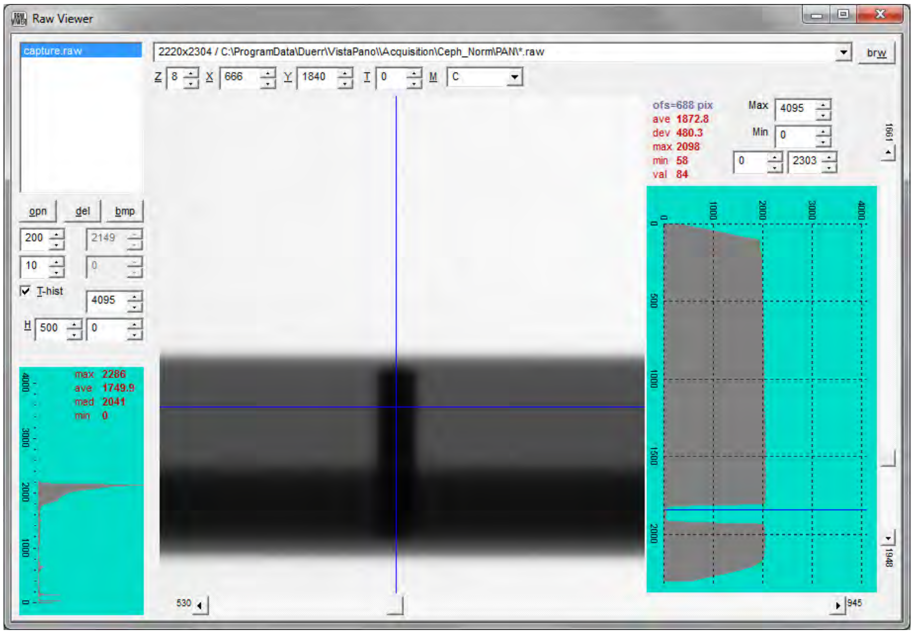


Fig. 114 X-axis position for lateral images

The limit values for the X-axis for the calibration can be found in **Table 8 Limit values for ceph lateral and frontal** on page 88. If the pixel value of the X-axis is outside the limits then the following applies: to increase the value by around 10 pixels the relevant entry in the AISU software needs to be reduced by 1.

4.4.2.4 Performing the frontal calibration

The image is acquired via the *Capture* button, taking into account the current frontal value. Afterwards this is viewed via the *Raw Viewer*. For measurement of the X-axis we recommend switching to the mode *M = C*. A t-hist value of *200 / 10* is recommended for good contrast settings.

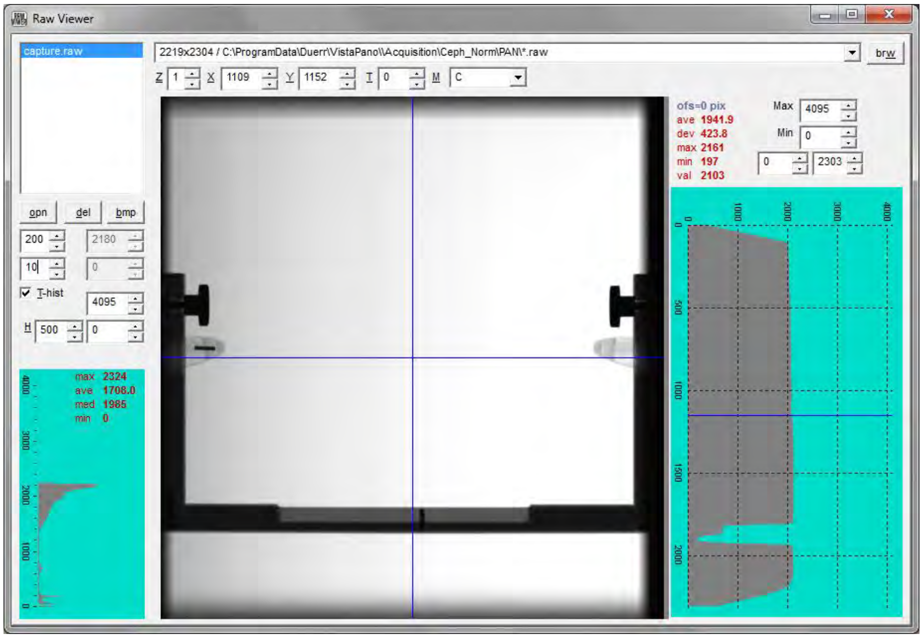


Fig. 115 Frontal image

We recommend significantly enlarging the image via Z so that the metal pin in the test body holder can be seen more easily.

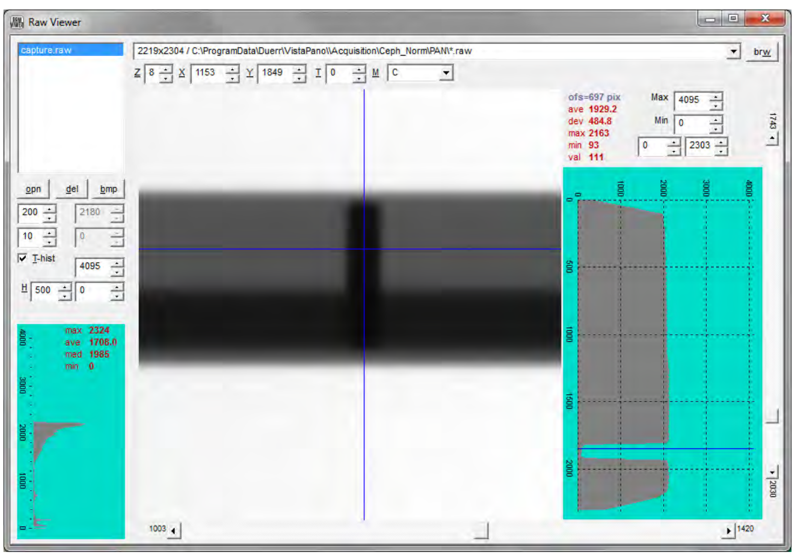


Fig. 116 X-axis position for a frontal image

The limit values for the X-axis for the calibration can be found in **Table 8 Limit values for ceph lateral and frontal** on pag88. If the pixel value of the X-axis is outside the limits then the following applies: to increase the value by around 10 pixels the relevant entry in the AISU software needs to be reduced by 1.

4.4.2.5 Limit values for lateral and frontal calibration

Lateral	Frontal
600 - 620	1140 - 1160

Table 8 Limit values for ceph lateral and frontal

5 The *Service* area in the AISU software

The *Service* area of the AISU software offers additional functions beyond basic unit calibration.

These include:

- Downloading and uploading calibration data
- Option for backing up MCU parameters
- Changing the volume and speed of the X-ray positioning beams (lasers)

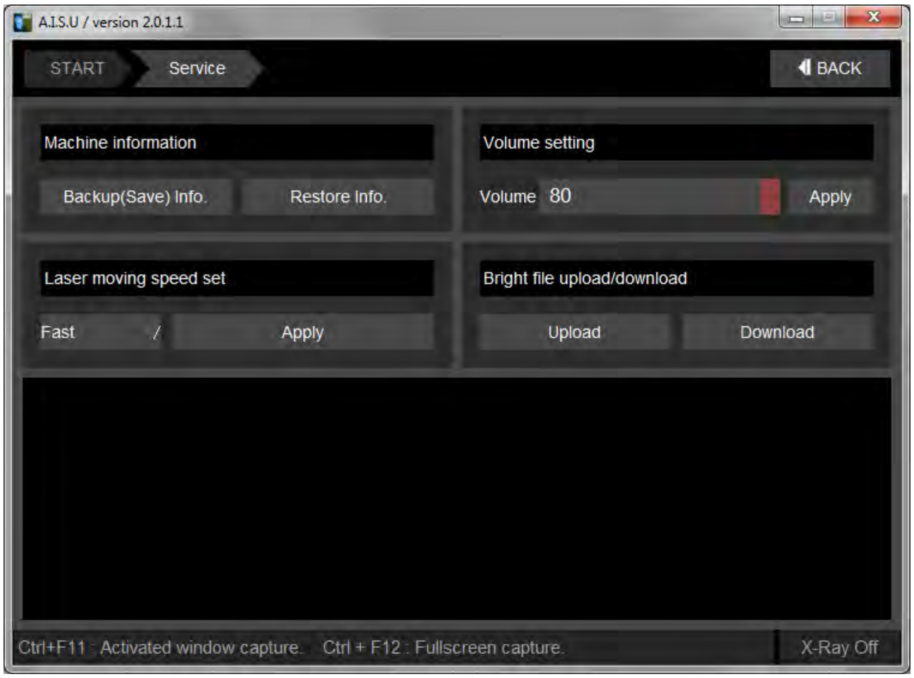


Fig. 117 *Service* area in the AISU software

5.1 Machine information (unit backup and restore)

This area offers the following two functions:

- *Backup(Save) info.*
- *Restore Info.*

5.1.1 Backing up the MCU parameters ⓘ

Via *Backup(Save) Info.* all parameters that are known by the MCU board (for more information about the MCU board see section **6.3 MCU board** on page 104) are written to an INI file. Since this information is not available on the microSD card of the MCU board, but only in its firmware, we urgently recommend backing up the functions in the following cases:

- After successful completion of the initial calibration
- Before performing the symmetry calibration (or any other type of recalibration)
- Before replacing the MCU board
- Before performing a firmware update

After clicking on *Backup(Save) Info.* you will need to enter a file name and a path to which the information is to be saved.

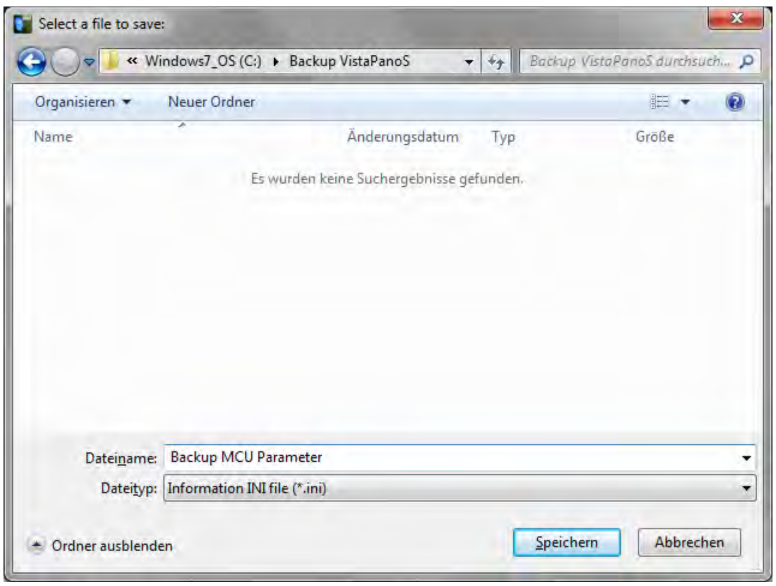


Fig. 118 Stating the path and file name for backing up the MCU parameters

After a short delay, a message will pop up to tell you that the backup has been successfully completed.

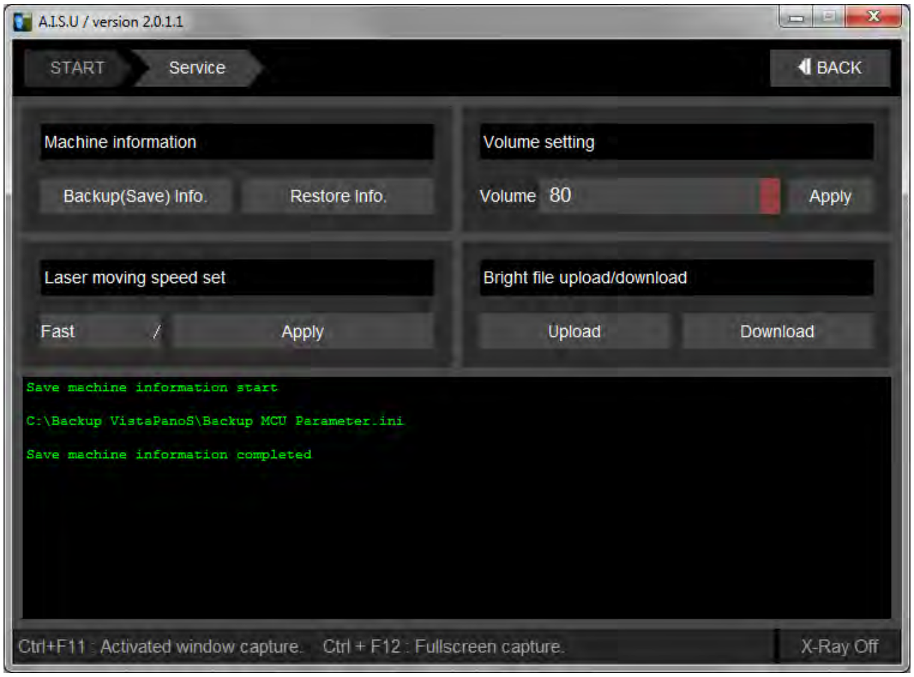


Fig. 119 Message showing that the backup was successful

Depending on the unit type and parameter the INI file will contain (approximately) the following elements.

Backup MCU Parameter.ini - Editor

Datei Bearbeiten Format Ansicht ?

```
SPM_XPST=0092
SPM_CXST=1160
SPM_HFST=1555
SPM_CPHF=1555
SPM_POFS=00050
SPM_CSCN=02130
SPM_TTCS=17450
SPM_TTTC=12990
SPM_TFCA=00865
SPM_CFRQ=0160
SPM_LFRQ=0163
SPM_FFRQ=0163
SPM_CCTM=1350
SPM_XFTA=0107
SPM_XLTA=0145
SPM_XRFA=1730
SPM_XRFB=1734
SPM_GCNT=00378
SPM_GCNT=00355
SPM_CAST=00890
SPM_CBST=02898
SPM_CCST=02417
SPM_CDST=01950
SPM_CHST=0375
SPM_MPOP=0002
SPM_MUTE=00000
SPM_LSPT=00000
SPM_DROP=0000
SPM_TITY=0001
SPM_CISC=0001
SPM_RTOP=0001
SPM_CLTY=0001
SPM_FANT=0400
SPM_SNUM=F203000099
SPM_L=de
```

Fig. 120 Possible MCU parameters

Note: Section **16.4 Backup after installation** on page 199 contains a checklist for performing a full backup of ProVecta S-Pan.

5.1.2 Restoring the MCU parameters

The *Restore Info.* function is used to copy the information from an INI file and overwrite the existing data on the MCU board. To do this the AISU will ask you to specify the relevant INI file.

Note: This function will overwrite the existing data on the MCU board without further notice! We strongly recommend that you always back up before performing a restore.

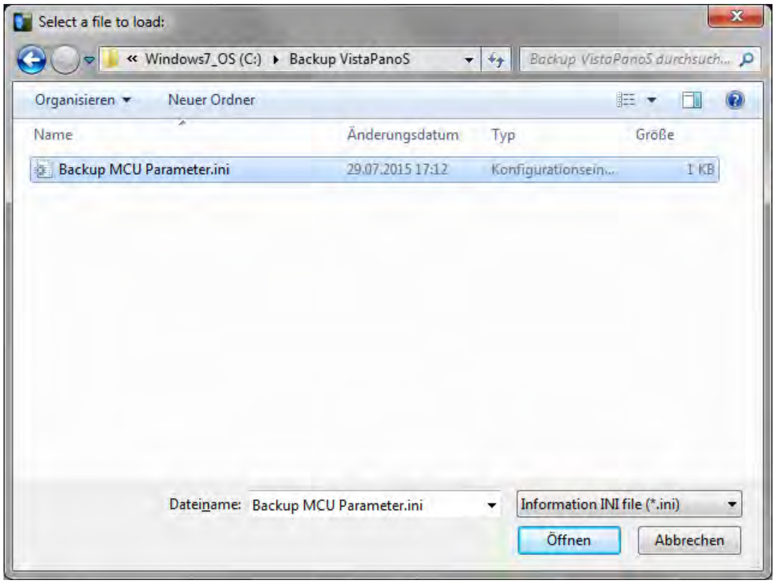


Fig. 121 Specifying the required INI file for the MCU restore

Afterwards the ProVecta S-Pan will copy each individual parameter from the INI file and start up its function.

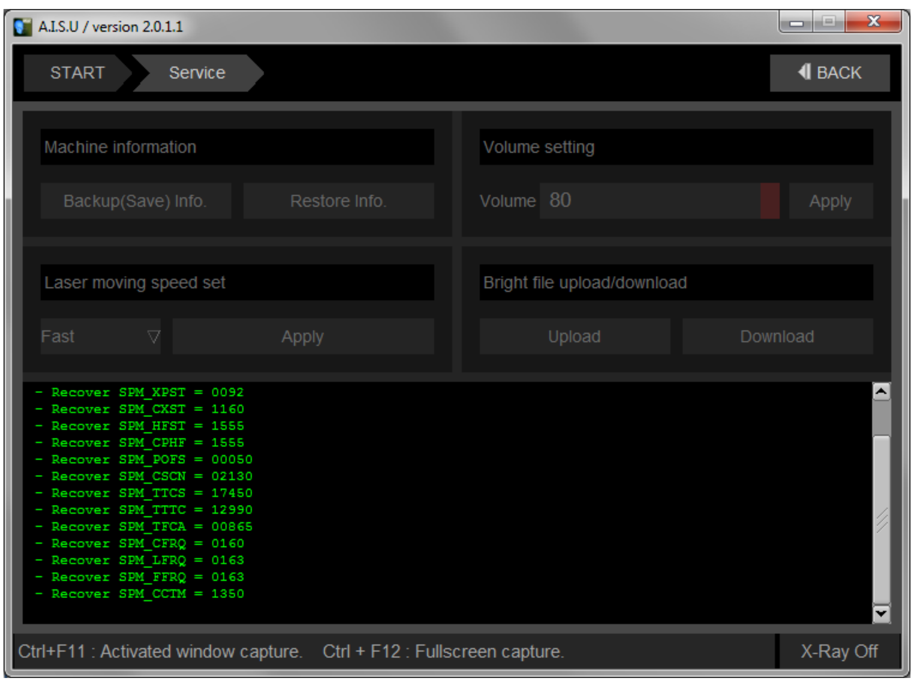


Fig. 122 Checking all parameters that are to be restored

The restore process will take around 2 minutes. Afterwards a message appears to tell you that the restore was successful.

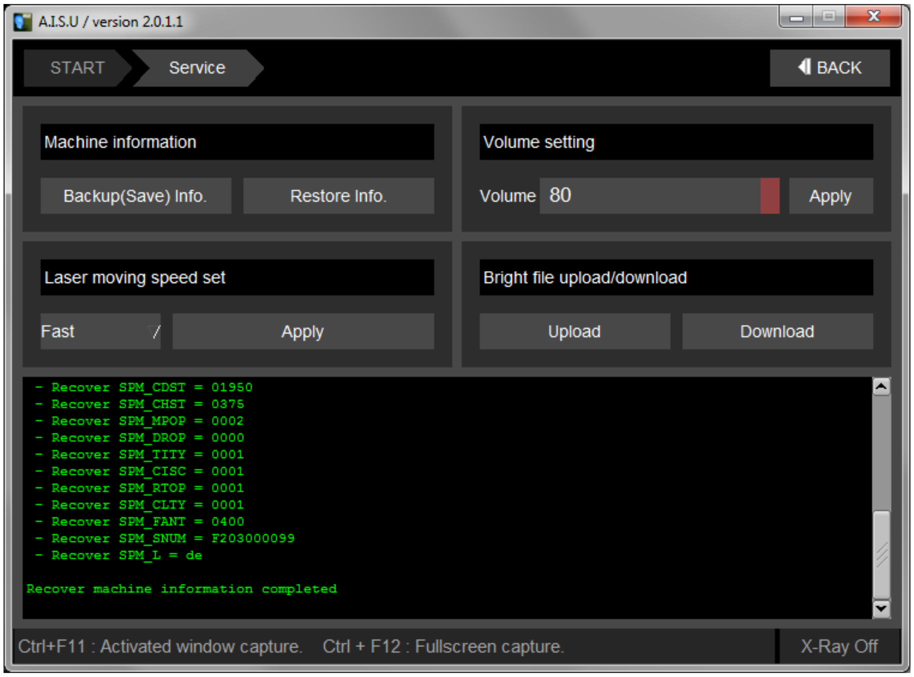


Fig. 123 Restore confirmation

5.2 Volume setting

This function allows you to change the voice output volume on the ProVecta S-Pan. Here, the value of *80* shown when the program is called up does not reflect the current value used on the unit. The red bar can be changed to freely change the value between *0* and *80*. *Apply* is then used to transmit the selected volume to the ProVecta S-Pan.

5.3 Laser moving speed set

This function enables you to define the speed of the motor of the controlled X-ray positioning beam for the Frankfort horizontal. The following speeds can be selected:

- *Fast*
- *Normal*
- *Low*

Here, the value *Fast* shown when the program is called up does not reflect the current value used on the ProVecta S-Pan.

Apply is then used to transmit the selected speed to the unit.

5.4 Bright file upload/download

This module links to the two independent programs.

- *Upload* > Calibration Uploader
- *Download* > Calibration Downloader

Both programs communicate with the data of the microSD card on the CRONG board. An upload to ProVecta S-Pan is necessary particularly after creating a new sensor calibration.

5.4.1 Download (Calibration Downloader)

The Calibration Downloader has the task of downloading various files from ProVecta S-Pan to the computer.

The Calibration Downloader represents an independent piece of software that can be manually started if required. There are two ways to call up the software:

- C:\Program Files (x86)\Duerr\VistaPano\Util\Calibration Downloader.exe
- Via the AISU software > *Service* > *Download*

Call-up via the AISU software will be the standard method since the download of the calibration data may become necessary in conjunction with the unit calibration.

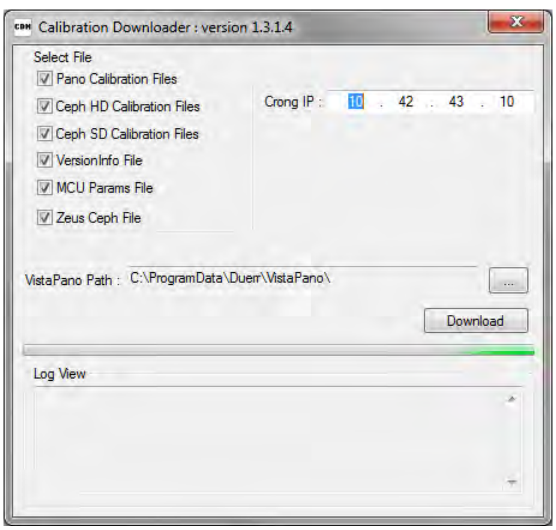


Fig. 124 Calibration Downloader

Depending on the unit type and program version of the Calibration Downloader, various elements are offered for download when you select the section *Select File*. You can check or uncheck individual options to define the scope of the download.

Selection	Definition	Save location on the computer
Pano calibration files	Sensor calibration files for panorama sensor (7 Raw files)	C:\ProgramData\Duerr\VistaPano\Acquisition\Pano\CAL*
Ceph HD calibration files	Sensor calibration files for ceph sensor (7 Raw files)	C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Norm\CAL*
Ceph SD calibration files	Sensor calibration files for ceph sensor (7 Raw files)	C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Fast\CAL*
VersionInfo.txt file	Text file containing not only the version information for the unit firmware and the software version, but also the serial numbers of the ProVecta S-Pan and its components	C:\ProgramData\Duerr\VistaPano\VersionInfo.txt
MCU Params file	Backup file for the MCU parameters	C:\ProgramData\Duerr\VistaPano\mcu_params.ini
Zeus Ceph file	Backup file for the Zeus ceph file (image reconstruction parameters for ceph reconstructions)	C:\ProgramData\Duerr\VistaPano\SettingFiles\ZeusCeph.ini

Table 9 Overview of elements that are handled by the Calibration Downloader / Uploader

To download the selected components, then simply click *Download*.

Caution: Any existing data will be overwritten by the software without further notice.

Note: Section **16.4 Backup after installation** on page 199 contains a checklist for performing a full backup of ProVecta S-Pan.

5.4.2 Upload (Calibration Uploader)

The Calibration Uploader has the task of uploading various files from the computer to ProVecta S-Pan.

The Calibration Uploader is an independent piece of software that can be called up in two ways.

- C:\Program Files (x86)\Duerr\VistaPano\Util\Calibration Uploader.exe
- Via the AISU software > *Service* > *Upload*

Call-up via the AISU software will be the usual method since it may be necessary to upload data when calibrating the unit. One example is a newly created sensor calibration, which needs to be uploaded directly to the unit.

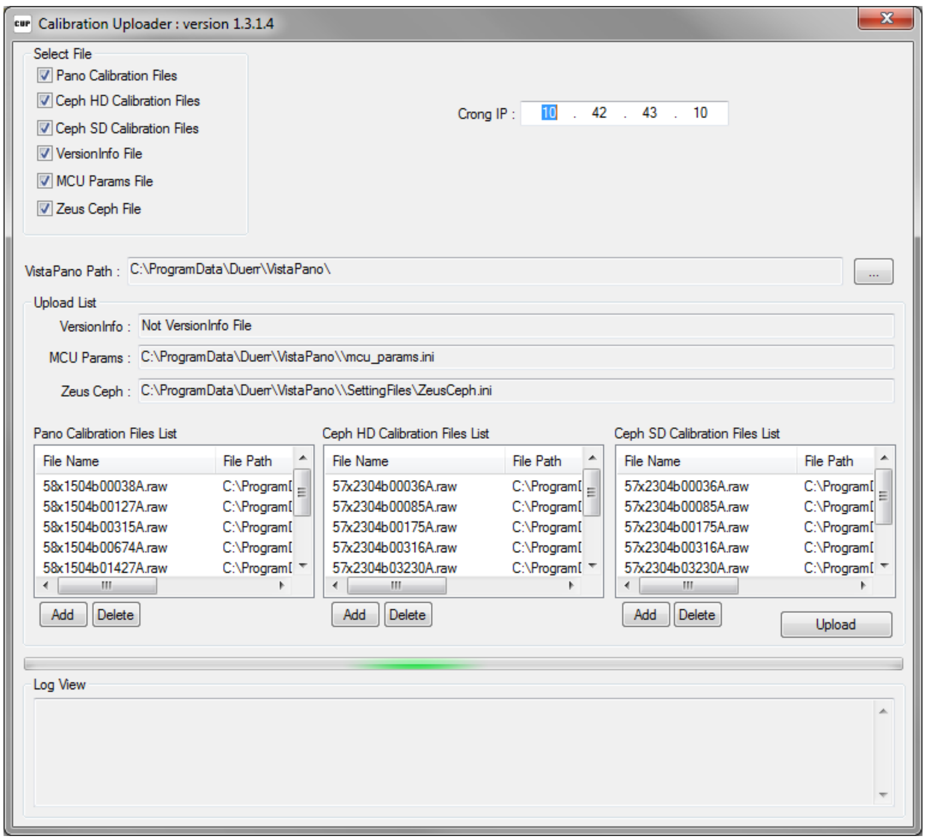


Fig. 125 Calibration Uploader

An overview and an explanation of the points listed under *Select File* can be found in **Table 9 Overview of elements that are handled by the Calibration Downloader / Uploader** on page 96.

Compared to the Downloader, the Uploader shows the individual sensor calibration files that can be uploaded to the ProVecta S-Pan as well as the paths for the individual files.

To upload the selected components, then simply click *Upload*.

Caution: Any existing data will be overwritten by the software without further notice.

5.5 Packing Mode

The ProVecta S-Pan has a transportation mode (packing mode). The transportation mode can enabled with *Set mode* and disabled with *Release mode*.

At activation of the transport mode, the following actions will be processed:

- The c-arm (panoramic) move to transport position (then is it possible to mount the two screws to fix c-arm and head unit)
- The MCU board will recognise that the device is in transport mode

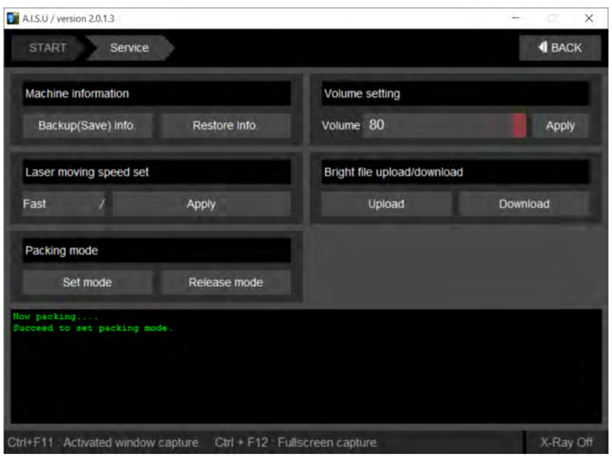


Fig. 126 Enable transport mode

The transportation mode has an influence on the curved progression of the ProVecta S-Pan (panoramic unit). If the packing mode is accidentally left on during regular operation, distorted images can result.

Attention: To avoid any malfunctions, it is important that the transportation mode is disabled!

From VistaPano InstallPackage version 1.4.0.10 page and onwards, the software will disable the transportation mode automatically when connecting to the device (by acquiring an image).

This step can be done manually with the AISU software, by clicking on *Release mode* (an activation in this way will be automatically disabled with the first regular connection to the ProVecta S-Pan by VistaEasy, DBSWIN or VistaSoft).

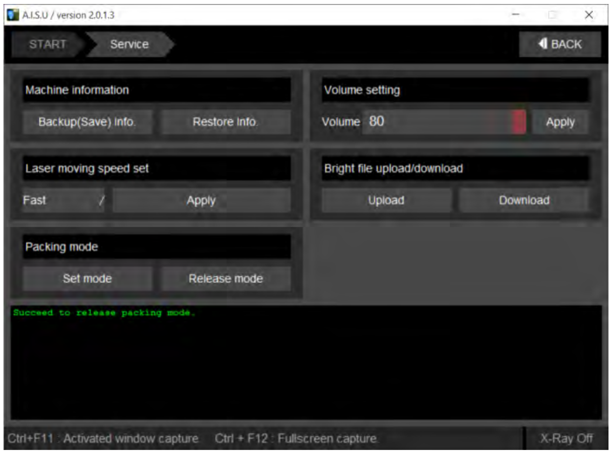


Fig. 127 Disable transport mode

Note: The function to set the transport mode manually with the AISU software is available from the VistaPano InstallPackage version 1.4.0.10 (see chapter **2.1 ProVecta S-Pan** Installation Software

18).

The enabling and disabling for older versions of VistaPano InstallPackage is also possible by sending the manual command *[SPM_PKEN_0000]* or *[SPM_PKEN_0001]* to the device (see chapter **7 Command window in the AISU software** on page 115).

At delivery, the transportation mode is disabled for ProVecta S-Pan by default. For ProVecta S-Pan Ceph is enabled by default.

6 Tasks and background of the unit boards

6.1 Overview

Fig. 128 Overview of boards on the ProVecta S-Pan Ceph

1. **6.4 Power** board on page 122
2. **6.3 MCU** board on page 104
3. **6.2 CRONG** board on page 101
4. **6.5 Inverter** board on page 110
5. **6.10 X-ray tube (incl.** board) on page 114
6. **6.11 Board for control of the X-ray alignment (ProVecta S-Pan** Ceph only) on page 114
7. **6.6 Board for controlling the X-ray positioning beam** for the Frankfort horizontal on page 112
8. **6.7 Board for controlling the height** of the unit on page 112

9. **6.8 Touchscreen (incl. board)** on page 113
10. **6.9 Sensor (incl. board)** on page 113

6.2 CRONG board

The CRONG board can be considered as the I.T. board of the ProVecta S-Pan. It largely performs the following duties:

- Loading the integrated operating system
- Connecting to the computer via the network interface
- Receiving the sensor data from the pano and ceph sensor (if applicable)
- Actuating the touchscreen

The CRONG board has a microSD card (2 or 4 GB). This can be removed from the slot and always contains:

- The firmware of the touchscreen (CRONG LCD Image) – for information about updating the software refer to section **12 Firmware updates** on page 177.
- The calibration files of the sensor(s)
- The file VersionInfo.txt

Depending on the particular version, the following may also be included:

- Backup of the MCU parameters (mcu_params.ini)
- Zeus ceph parameters (ZeusCeph.ini)

It is not possible to directly access the data by removing the microSD card from the board. To transfer the individual files between the computer and the microSD card you need the two programs Calibration Downloader (see section **5.4.1 Download (Calibration Downloader)** on page 95) and Calibration Uploader (see section **5.4.2 Upload (Calibration Uploader)** on page 96).

The CRONG board can normally be replaced without any interactions with other components. Please note that the existing microSD card can be transferred from the previous CRONG board to the replaced CRONG board.

If both the CRONG board and the microSD card have been replaced then the latter will need to be configured. The following points need to be taken into account here:

- The new microSD card must be written to, starting with the CRONG image (see section **12.6 Performing an update of the CRONG image on the CRONG board** on page 185).
- The unit-specific data must be restored via the Calibration Uploader (for more information see section **5.4.2 Upload (Calibration Uploader)** on page 97).

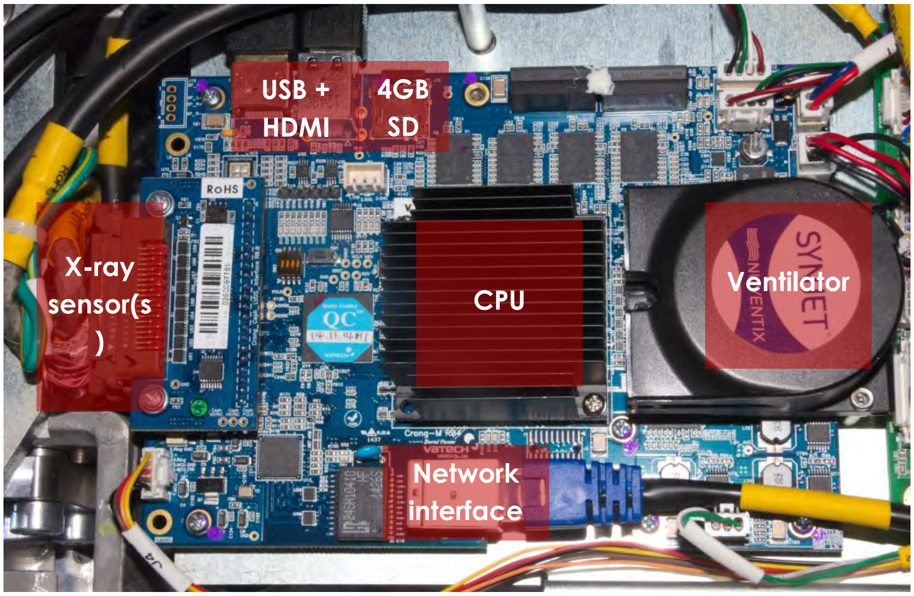


Fig. 129 CRONG board

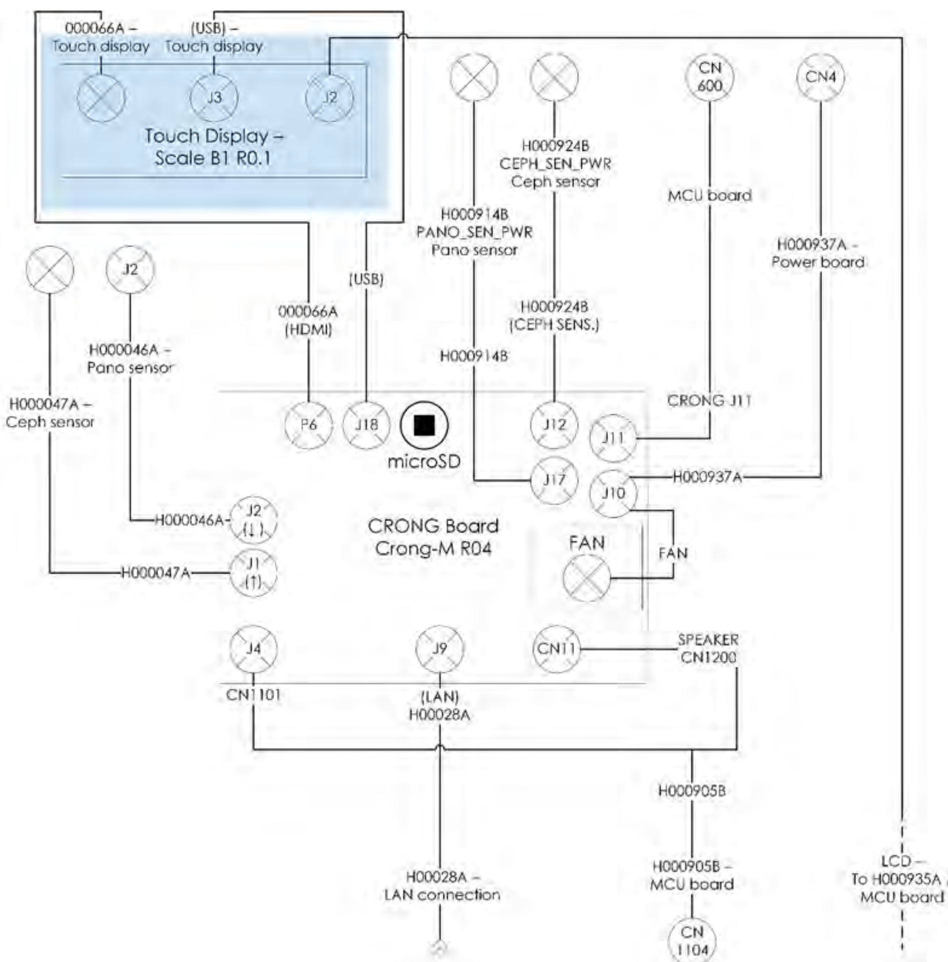


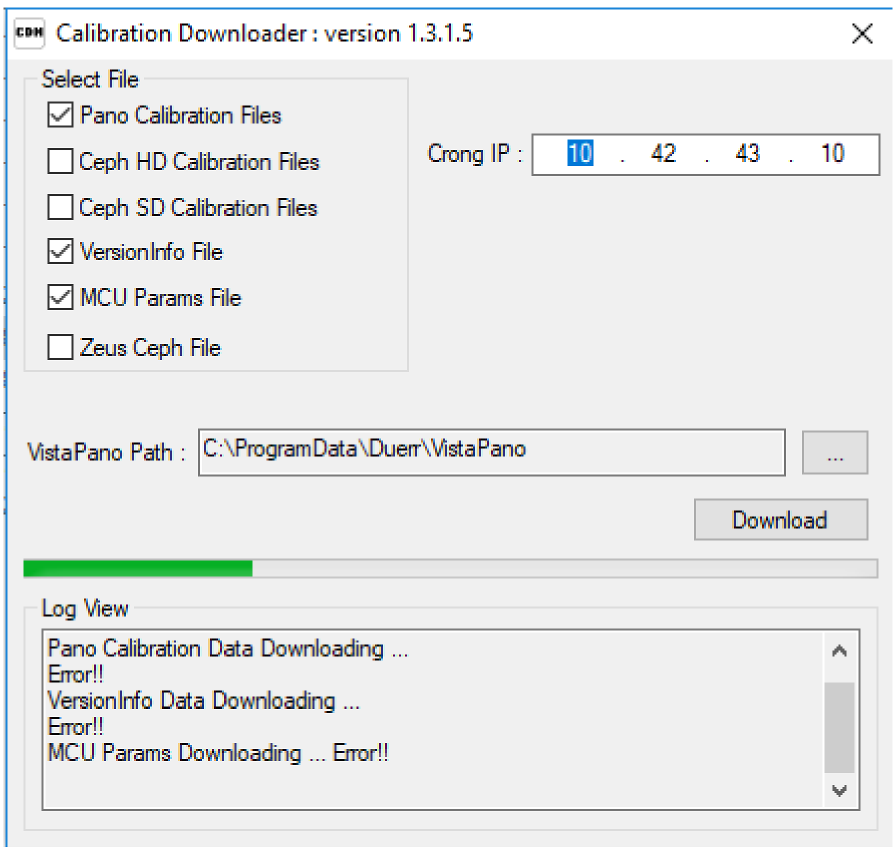
Fig. 130 CRONG board wiring diagram

MCU Params Error During Calibration Downloader

Problem: Error Received downloading MCU params file after CRONG replacement.

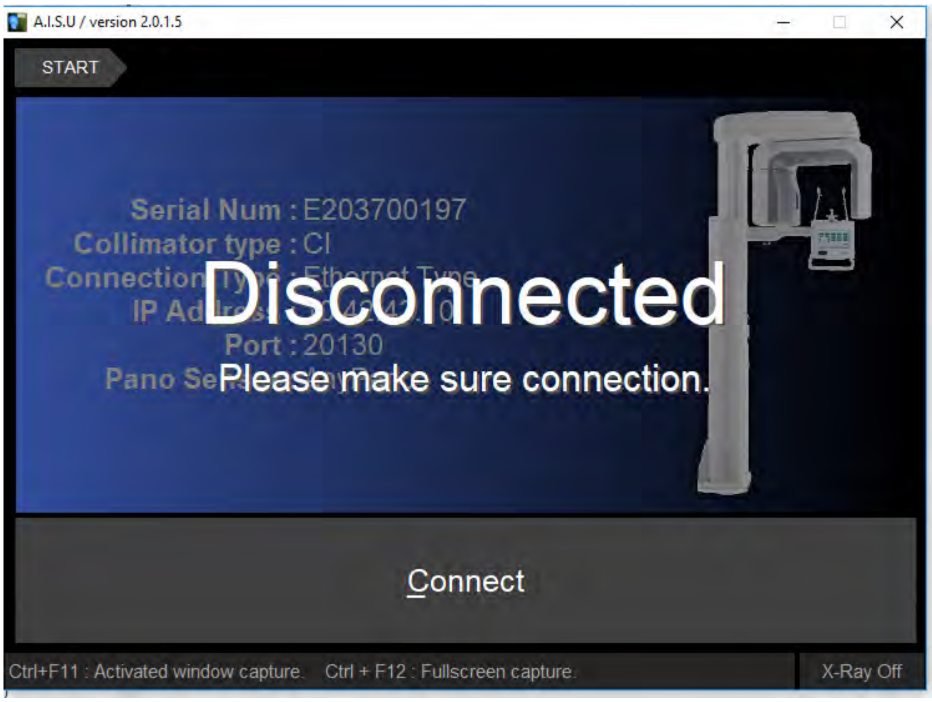
Situation: Replacing CRONG board and transferring SD Card without a previous full unit backup. In the event that the unit could not be turned on or board failure does not allow a full backup to be done before replacing CRONG board.

Refer to Service Manual - **6.2 CRONG Board** (page 102) The SD Card that is transferred from the old CRONG board should contain the units Calibration Files, the **VersionInfo.txt** as well as the touchscreen firmware. Depending on the version of the CRONG, it may or may not contain **mcu_params.ini** or **ZeusCeph.ini**. If it does not, the **mcu_params.ini** error will appear during the initial Calibration Downloader procedure because it will not find those settings.



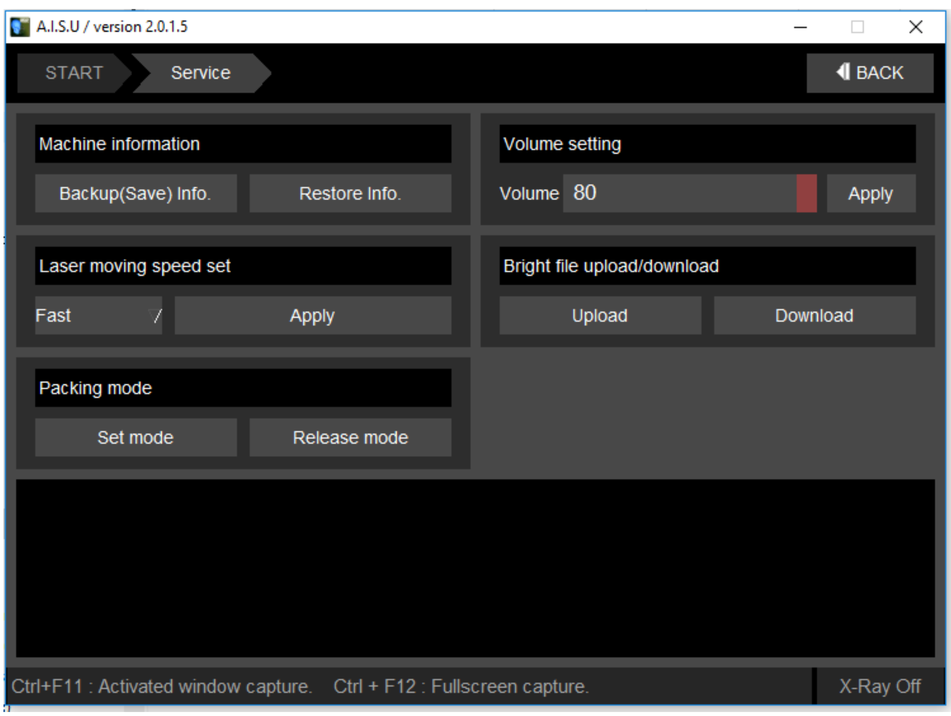
Recover the MCU Parameters directly from the MCU board by performing the following steps. This assumes the MCU board was not replaced.
Recover the MCU Parameters directly from the MCU board by performing the following steps. This assumes the MCU board was not replaced.

1. Open AISU.

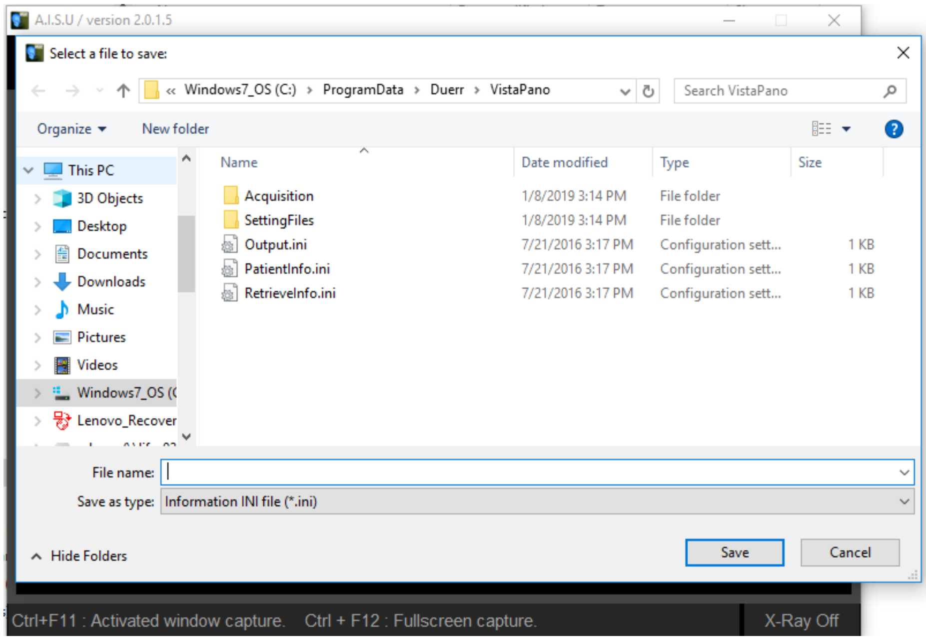


2. Connect to unit

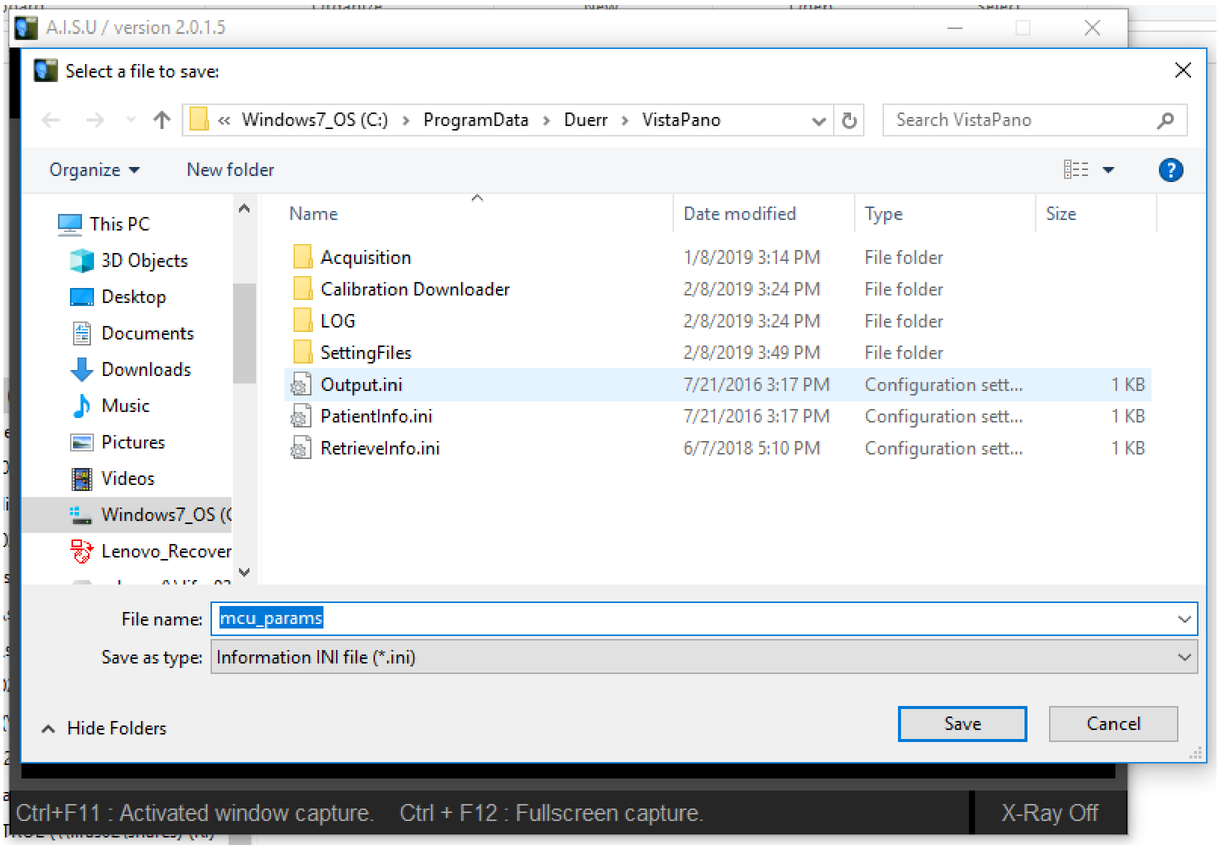
3. Click Service



4. Click Backup (Save) Info.



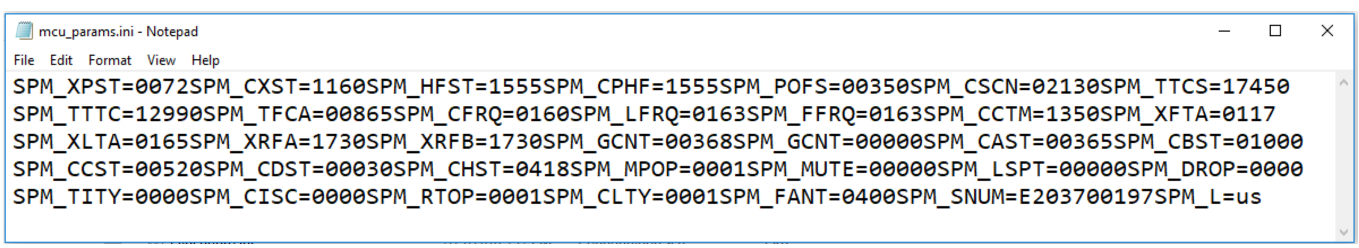
5. Give filename mcu_params



6. Click Save to default location - C:\ProgramData\Duerr\VistaPano\

7. Navigate to save location - C:\ProgramData\Duerr\VistaPano\

8. Open mcu_params.ini



- NOTE – File Syntax is formatted incorrectly.

9. Make sure each parameter is on a separate line by using enter before every **"SPM_"**. Each line should begin with **"SPM_"** followed by parameter.

mcu_params.ini - Notepad

File Edit Format View Help

```
SPM_XPST=0072
SPM_CXST=1160
SPM_HFST=1555
SPM_CPHF=1555
SPM_POFS=00350
SPM_CSCN=02130
SPM_TTCS=17450
SPM_TTTC=12990
SPM_TFCA=00865
SPM_CFRQ=0160
SPM_LFRQ=0163
SPM_FFRQ=0163
SPM_CCTM=1350
SPM_XFTA=0117
SPM_XLTA=0165
SPM_XRFA=1730
SPM_XRFB=1730
SPM_GCNT=00262
SPM_GCNT=00000
SPM_CAST=00365
SPM_CBST=00999
SPM_CCST=00519
SPM_CDST=00030
SPM_CHST=0418
SPM_MPOP=0002
SPM_MUTE=00001
SPM_LSPT=00000
SPM_DROP=0000
SPM_TITY=0000
SPM_CISC=0000
SPM_RTOP=0001
SPM_CLTY=0001
SPM_FANT=0400
SPM_SNUM=E203700197
```

To Upload MCU Params File:

10. Run Calibration Uploader from Util Folder

11. Choose MCU Params File from Checklist

12. Click Upload

To Verify That They Are On the Unit:

13. Run Calibration Downloader

14. Choose MCU Params File from Checklist

15. Click Download.

16. Confirm that no error is present.

6.3 MCU board

The MCU board can be considered as the electronic mainboard. It maintains a connection to most of the electronic components of the ProVecta S-Pan in order to control and monitor them. In addition, it is responsible for outputting the audio signals (voice output).

It has a microSD card for storing the audio files, which contains the different audio files for the individual languages.

The MCU board contains the unit firmware. This controls motor behaviour during the image acquisition, e.g. the collimator movement, X-ray positioning beams, correction values etc.

The firmware includes a large number of parameters that are adjusted during alignment of the collimators. During some of the calibration steps the AISU software has direct access to the unit firmware and adjusts it live.

Note: The MCU parameters are not contained on this microSD card. They are located directly on the MCU board as part of the firmware.

For more information about performing a firmware update refer to section **12 Firmware updates** on page 177.

The MCU board can normally be replaced without any interactions with other components.

Please note:

- The microSD card must be present and contain the required audio files.

- The firmware version must match the software version of the CRONG board and the installed version of the VistaPano InstallPackage on the computer.
- The MCU parameters must be restored (for more information see section **5.1 Machine information (unit backup and restore)** on page 89).

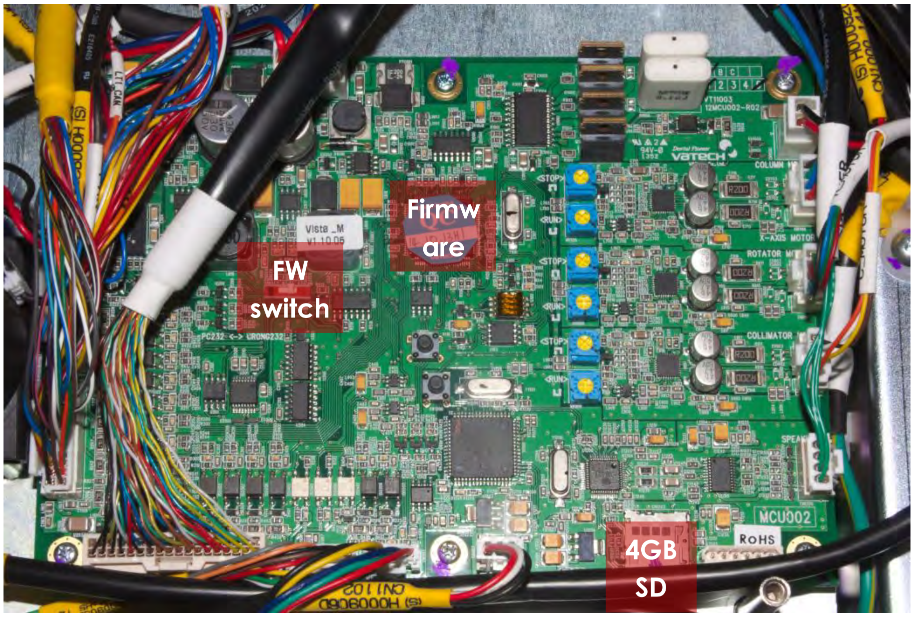


Fig. 131 MCU board

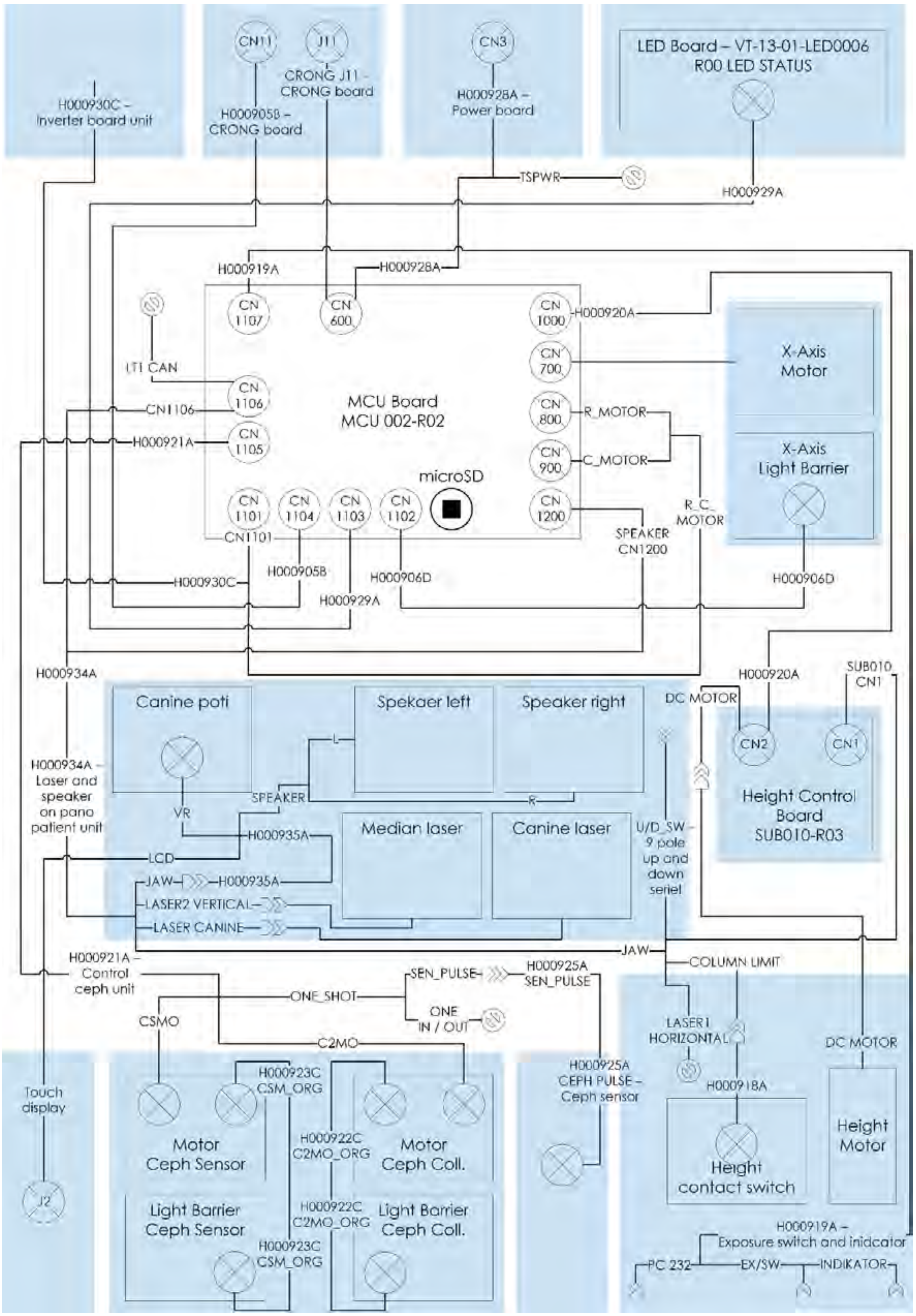

H000930C – Inverter board unit
CN11
J11
CRONG J11 – CRONG board
H000905B – CRONG board
CN3
H000928A – Power board
LED Board – VT-13-01-LED0006 R00 LED STATUS
TSPWR
H000929A
H000919A
H000928A
CN 1107
CN 600
CN 1000
H000920A
LT1 CAN
CN 700
X-Axis Motor
CN 1106
CN1106
MCU Board MCU 002-R02
CN 800
R_MOTOR
H000921A
CN 1105
CN 900
C_MOTOR
X-Axis Light Barrier
microSD
CN 1101
CN 1104
CN 1103
CN 1102
CN 1200
R_C_ MOTOR
SPEAKER CN1200
CN1101
H000905B
H000906D
H000906D
H000930C
H000929A
H000934A
H000920A
SUB010 CN1
Canine poti
Spekaer left
Speaker right
DC MOTOR
CN2
CN1
H000934A – Laser and speaker on pano patient unit
L
R
SPEAKER
Height Control Board SUB010-R03
VR
H000935A
Median laser
Canine laser
U/D_SW – 9 pole up and down seriel
LCD
JAW
H000935A
LASER2 VERTICAL
LASER CANINE
JAW
H000921A – Control ceph unit
SEN_PULSE
H000925A SEN_PULSE
COLUMN LIMIT
ONE_SHOT
CSMO
ONE IN / OUT
LASER1 HORIZONTAL
DC MOTOR
C2MO
H000923C CSM_ORG
H000925A CEPH PULSE – Ceph sensor
H000918A
Touch display
Motor Ceph Sensor
H000922C C2MO_ORG
Motor Ceph Coll.
Height Motor
Height contact switch
J2
Light Barrier Ceph Sensor
H000922C C2MO_ORG
Light Barrier Ceph Coll.
H000919A – Exposure switch and inidcator
H000923C CSM_ORG
PC 232
EX/SW
INDIKATOR

Fig. 132 MCU board wiring diagram

6.4 Power board

The power board acts as the internal power supply. From the input voltage of AC 100 – 230 Volt (+/- 10%) it generates the voltages 5, 15, 24 and 380 Volt. Near to the input voltage there are 3 fuses on the board that should be checked if you are in any doubt.

The power board does not contain any configurable software. There are generally no dependencies to other electronic components, so it can be replaced individually if required.

The first generation of the ProVecta S-Pan had a start-up current limiter in the scope of delivery. The task of this was to limit the current that temporarily exceeded 16A during switch-on. Domestic fuses with automatic circuit breakers in categories A and B would normally trip without this current limiter. On the subsequent generations of the unit (all ProVecta S-Pan from serial number E203700164) the task of the switch-on current limiter was permanently integrated in the power board. Older boards without the built-in current limiter can be replaced with a newer board if desired.

Fig. 133 Separate switch-on current limiter for initial versions of the unit

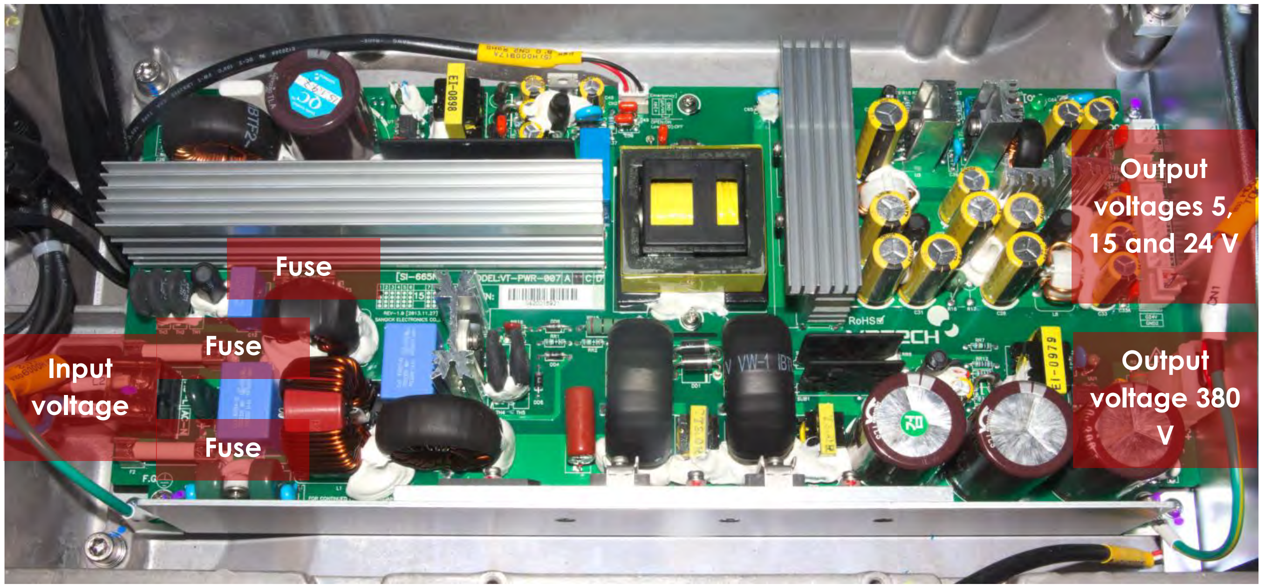


Fig. 134 Power board

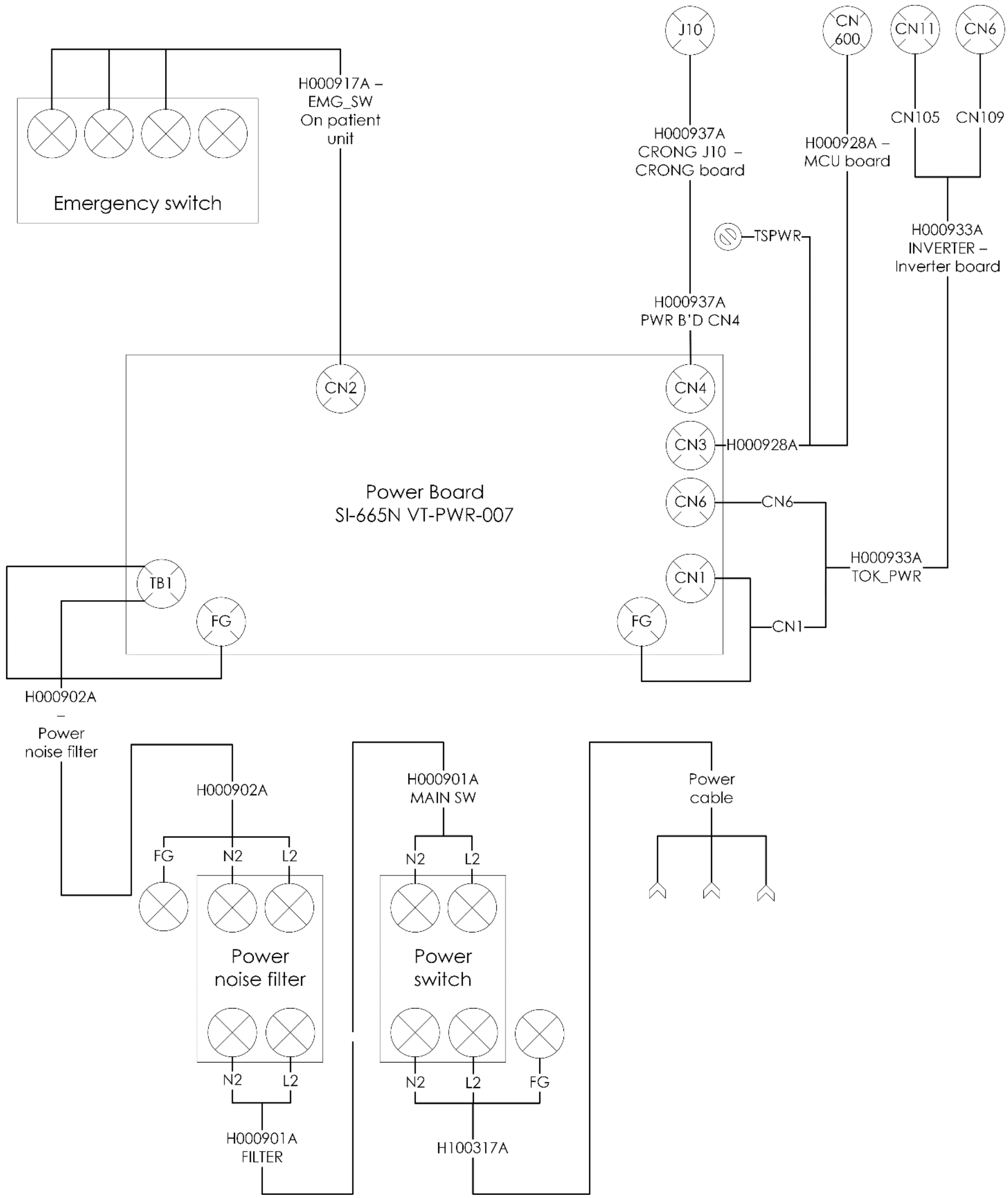


Fig. 135 Power board wiring diagram

6.5 Inverter board

The inverter board primarily controls the X-ray tube. It supplies the tube with 380 V DC and monitors the tube during image acquisition.

The inverter board does not contain any configurable software.

The inverter board is paired with the X-ray tube. If either component is defective then generally both elements should be replaced. In some cases it may also be necessary to replace the power board. For more information see section **17 Error messages** on page 211.

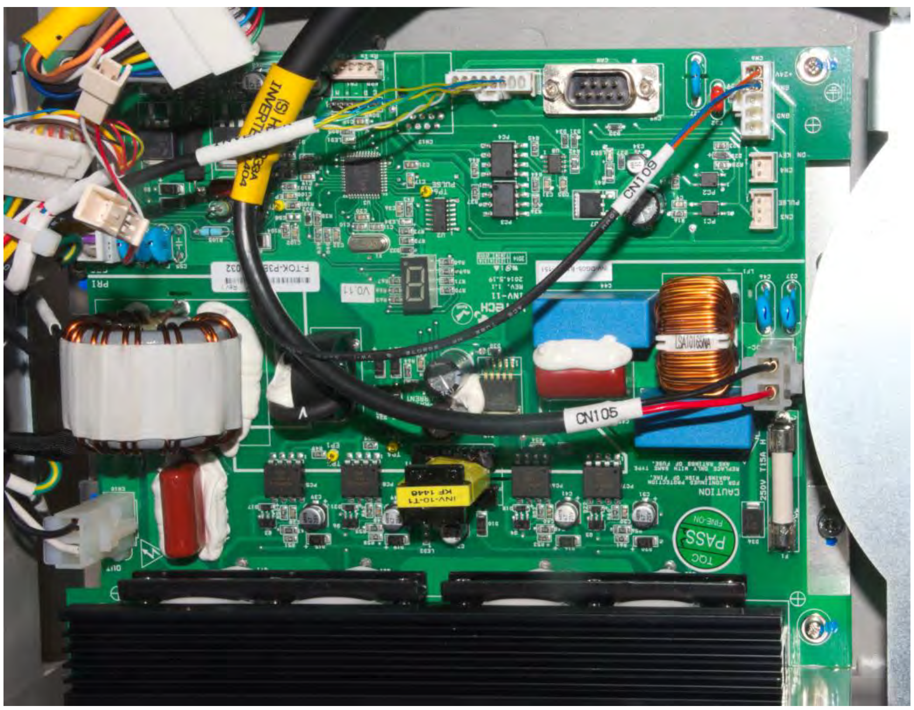


Fig. 136 Inverter board

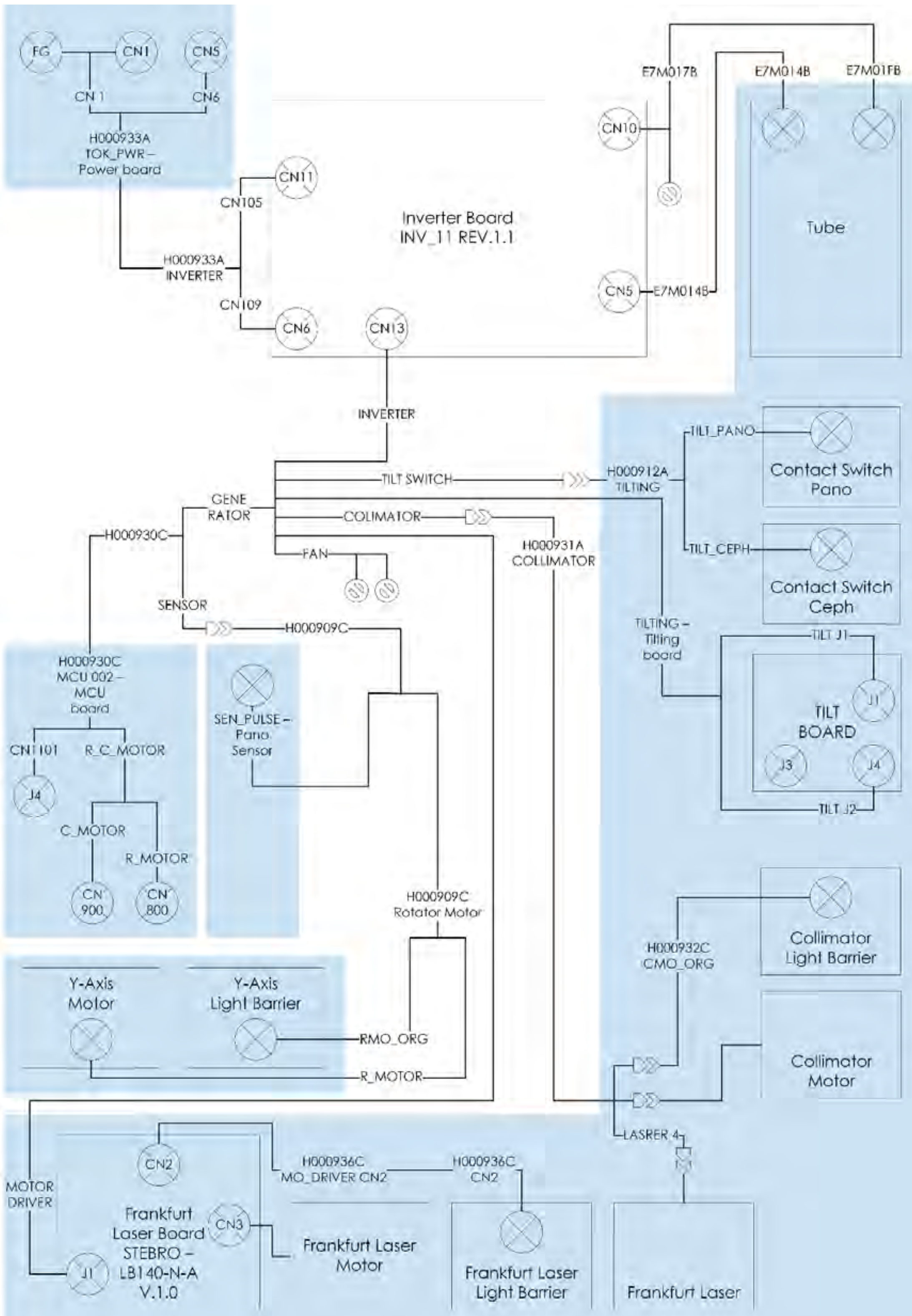

FG
CN1
CN5
CN 1
CN6
H000933A
TOK_PWR –
Power board
CN11
CN105
Inverter Board
INV_11 REV.1.1
H000933A
INVERTER
CN109
CN6
CN13
CN10
CN5
E7M014B
E7M017B
E7M014B
E7M01FB
Tube
INVERTER
TILT SWITCH
GENE
RATOR
COLIMATOR
FAN
H000930C
H000931A
COLLIMATOR
H000912A
TILTING
TILT_PANO
Contact Switch
Pano
TILT_CEPH
Contact Switch
Ceph
TILTING –
Tilting
board
TILT J1
J1
TILT
BOARD
J3
J4
TILT J2
SENSOR
H000909C
H000930C
MCU 002 –
MCU
board
CN1101
R_C_MOTOR
J4
C_MOTOR
R_MOTOR
CN
900
CN
800
SEN_PULSE –
Pano
Sensor
H000909C
Rotator Motor
H000932C
CMO_ORG
Collimator
Light Barrier
Collimator
Motor
Y-Axis
Motor
Y-Axis
Light Barrier
RMO_ORG
R_MOTOR
LASRER 4
MOTOR
DRIVER
CN2
H000936C
MO_DRIVER CN2
H000936C
CN2
Frankfurt
Laser Board
STEBRO –
LB140-N-A
V.1.0
CN3
J1
Frankfurt Laser
Motor
Frankfurt Laser
Light Barrier
Frankfurt Laser

Fig. 137 Inverter board wiring diagram

6.6 Board for controlling the X-ray positioning beam for the Frankfort horizontal

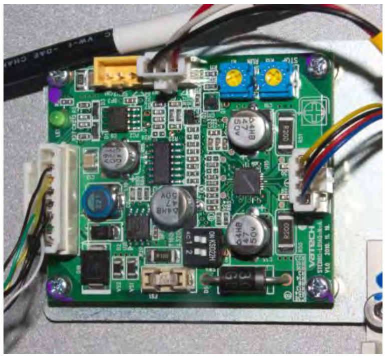


Fig. 138 Board for controlling the X-ray positioning beam for the Frankfort horizontal

Information about wiring can be found in **Fig. 137 Inverter board wiring diagram** on page 127.

The board for controlling the X-ray positioning beam for the Frankfort horizontal plane does not contain any configurable software. There are generally no dependencies relating to other electronic components, so it can be replaced individually if required.

6.7 Board for controlling the height of the unit

Fig. 136 Board for controlling the height of the unit

Information about wiring can be found in **Fig. 132 MCU board wiring diagram** on page 122.

The board for controlling the height of the unit does not contain any configurable software. There are generally no dependencies relating to other electronic components, so it can be replaced individually if required.

6.8 Touchscreen (incl. board)

Fig. 140 Touchscreen incl. board

Information about wiring can be found in **Fig. 130 CRONG board wiring diagram** on page 112.

The touchscreen does not contain any configurable software. There are generally no dependencies relating to other electronic components, so it can be replaced individually if required.

6.9 Sensor (incl. board)

Information about wiring can be found in **Fig. 130 CRONG board wiring diagram** on page 112.

The sensor incl. board has an internal calibration. This can be performed as described in section **11.4 Resetting the sensor** on page 169.

The sensor incl. board is an independent unit. However, in the event that it needs to be replaced the sensor will need to be recalibrated (for more information see section **4.1 Sensor calibration** on page 37).

6.10 X-ray tube (incl. board)

Information about wiring can be found in **Fig. 137 Inverter board wiring diagram** on page 127.

The X-ray tube (incl. board) does not contain any configurable software.

The X-ray tube is paired with the inverter board. If either component is defective then generally both elements should be replaced. In some cases it may also be necessary to replace the power board. For more information see section **17 Error messages** on page 211.

6.11 Board for control of the X-ray alignment (ProVecta S-Pan Ceph only)

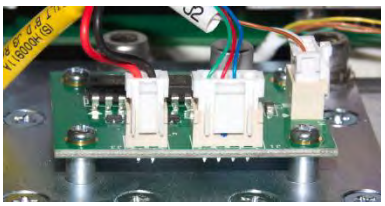


Fig. 141 Board for control of the X-ray alignment

Information about wiring can be found in **Fig. 137 Inverter board wiring diagram** on page 127.

The board for control of the X-ray alignment does not contain any configurable software. There are generally no dependencies relating to other electronic components, so it can be replaced individually if required.

7 Command window in the AISU software

The *Command Window* offers the following options:

- It offers a clear overview of previous communications between the computer and the ProVecta S-Pan.
- Individual commands can be transmitted directly to the X-ray unit.

Finally, during calibration the AISU software performs a large number of individual unit commands one after the other, and during this process it receives information and images, which it then evaluates. In individual cases it may be necessary to send commands manually to the ProVecta S-Pan.

Here, the commands are placed in standardised square brackets. Underscores are used to separate the command structures and their values. Example:

[SPM_L_DE]

7.1 Open command window

The command windows can page be opened from the AISU software. See chapter **3.2 Operation** on page 28 how to start the AISU software.

Fig. 142 Overview AISU software

With *Command Window (F4)* the command window will open in a new screen.

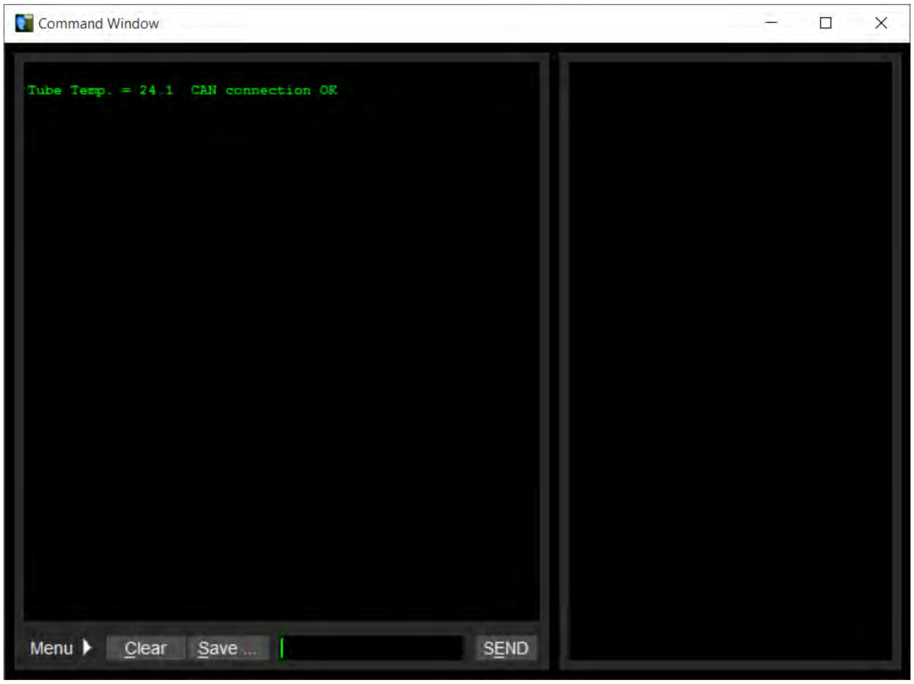


Fig. 143 Command window

The window shows the last commands between the ProVecta S-Pan and the computer. The bottom field allows you to type the command inside. These will send by *SEND* to the device.

The Clear button will clear the history from the command communication window. Clicking on Save … will enable you to create a new *.txt file with the current communication history.

Note: Independently of any commands that are sent, the device will periodically send the tube temperature to the command window.

7.2 Possible commands

7.2.1 Unit parameter output

Output of all parameters located on the MCU board (including the firmware version):

[SPM_PVER]

7.2.2 Change audio language

[SPM_L_x]

Possible values for x

- AE = Arabic
- CN = Chinese
- DE = German
- ES = Spanish
- FR = French
- IT = Italian
- JP = Japanese
- KR = Korean
- PT = Portuguese
- RU = Russian
- TW = Taiwanese
- US = English (US)

7.2.3 Switching the transport mode on and off

[SPM_PKEN_000x]

Possible values for x

- 0 = Transport mode is deactivated
- 1 = Transport mode is activated

7.2.4 Activation of various unit tests

[SPM_TEST_x]

Possible values for x

- Unit LEDs (green and blue) and the 3 lasers flash
  - Activate: 1
  - Deactivate: 1_
- Continuous operation of the Y-axis (rotation) On / Off
  - Activate: 1000

- Deactivate: 1000_
- Continuous operation of the X-axis (rotation) On / Off
    - Activate: 1001
    - Deactivate: 1001_
- Continuous operation of the collimator motor
    - Activate: 1002
    - Deactivate: 1002_
- Unit moves upwards
    - Activate: 1003
    - Deactivate: 1003_
- Continuous operation of the tube swivel function (between panorama and ceph positions)
    - This function is only available for the ProVecta S-Pan Ceph.
    - Activate: 1004
    - Deactivate: 1004_
- Continuous operation of the X-ray positioning beam for the Frankfort horizontal plane
    - In conjunction with the ProVecta S-Pan Ceph the secondary collimator moves on an alternating basis with the X-ray positioning beam.
    - Activate: 1005
    - Deactivate: 1005_
- Ceph sensor carriage runs in continuous operation
    - This function is only available for the ProVecta S-Pan Ceph.
    - Activate: 1006
    - Deactivate: 1006_
- Height motor runs in continuous operation, slowly changing the unit height
    - Activate: 1007
    - Deactivate: 1007_
- Activation of the X-ray positioning beam
    - Activate: LON_
    - Deactivate: LOF_
- Tube test for constant kV and mA values
    - Activate: TUTS
    - The exposure button needs to be pressed once this command has been sent. AISU will then provide the kV and mA values (0060 / 0040)
    - Caution: The tube generates X-ray radiation.
- Tube test for kV and mA values used on input of exposure time
    - Activate: XTST_x -> x defines the time period. For 1 second the value is 100, for 10 seconds the value is 1000.

- The exposure button needs to be pressed once this command has been sent, and it must remain pressed for the defined time period. For this period the LED color changes to yellow.
- Caution: The tube generates X-ray radiation.
- Test of the exposure button
  - Activate: ECHK
  - Note: The exposure button must be pressed while the command is issued. AISU reports [EPM_ECHK_001] if the exposure button is not pressed when the command is issued. Alternatively: [EPM_ECHK_002].

7.2.5 Activating and deactivating the sensor

[SPM_CPON] starts/activates the sensor.

[SPM_CPOF] deactivates the sensor.

7.2.6 Reading the image counter

[SPM_GCNT]

Delivers as its result [SPM_ECHK_x], where x represents the number of panorama image acquisitions performed, and [SPM_HCNT_y], where y represents the number of ceph image acquisitions performed.

7.2.7 Automatic return after panorama image acquisition

[SPM_ISRT] informs whether or not the automatic return is activated.

[SPM_RTOP_000x] automatic return if x = 1. Return is deactivated if x = 0

8 DDIPS software

The DDIPS software is used to optimize image reconstruction processes. The reconstruction processes shown on the lower part of **Table 10 Flow chart for the image acquisition procedure** on page 143 are adjusted by the DDIPS software.

Typical tasks for the DDIPS software include:

- Adjustment for the filtering stage (severity of the image acquisition filters) for the image reconstruction of pano image acquisitions. (*PANO Processing*)
- Adjustment for the filtering stage (severity of the image acquisition filters) for the image reconstruction of ceph image acquisitions. (*CEPH Processing*)
- Adjustment of the homogeneity of the ceph image (*CEPH Calibration*)

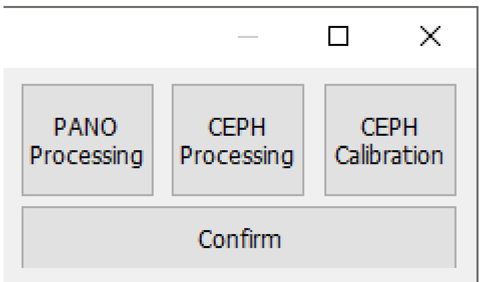


Fig. 144 DDIPS modes

The parameters for the reconstruction processes are edited and adjusted in the following two configuration files:

- ZeusPano2.ini (see section **10.4 ZeusPano2.ini** on page 148)
- ZeusCeph.ini (see section **10.5 ZeusCeph.ini** on page 149)

If values are to be adjusted, the impact of the changes will be visible in all future image acquisitions. This will not have an effect on past image acquisitions.

The DDIPS software will manipulate one of the two configuration files during the course of the adjustment. Manual adjustment of the configuration files is not recommended. Once the calibration is complete, it makes sense to back up both files.

Caution: The DDIPS software will overwrite existing reconstruction parameters when it is used. In all cases we recommend creating a back-up of the existing reconstruction parameters before using the software (for more information refer to section **8.6 Saving and restoring a calibration** on page 141).

8.1 Installation and requirements

8.1.1 Installation and update

The DDIPS software is included in the VistaPano InstallPackage (see section **2.1 ProVecta S-Pan** Installation Software

on page 17).

It is not possible to manually install the DDIPS software.

8.2 Operation

The DDIPS software always works with existing Raw images from the connected unit. These Raw images need to be created before the DDIPS software is launched (the file location and file name are irrelevant). The DDIPS software itself does not have a module for directly controlling the ProVecta S-Pan.

Note: As a minimum, the Raw data for the last generated image will always be available on the computer for use. The Raw data for the last image acquisition is always only overwritten when a new image is taken; this data is not removed automatically after every successful reconstruction.

One of the three modes is selected.

- *PANO Processing* – Adjustment of the image reconstruction for the pre-defined filtering for panorama image acquisitions.
- *CEPH Processing* – Adjustment of the image reconstruction for the pre-defined filtering for ceph image acquisitions.
- *CEPH Calibration* – Calibration process for ensuring the homogeneity of the ceph images. The flow chart **Fig. 161 Process for calibration of homogeneity** on page 150 shows the process.

The choice is then confirmed via Confirm to activate the relevant required module.

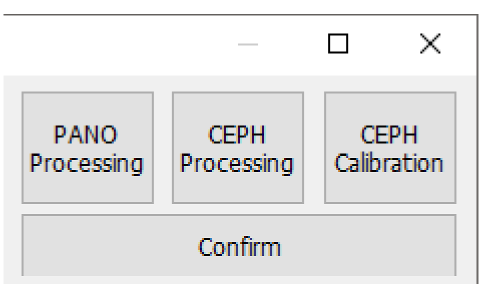


Fig. 145 DDIPS modes

Here, the two modes *PANO Processing* and *CEPH Processing* access the image defined in the upper area of the DDIPS software.

Fig. 146 The path under *Raw file* for the modes *PANO Processing* and *CEPH Processing*

By contrast, the *CEPH Calibration* mode accesses the location defined under Options and the Raw file selected there (for more information refer to section **8.5.2.2 Selecting the Raw file for ceph calibration** on page 131).

8.2.1 Launching the DDIPS software

The DDIPS software (similar to the AISU software) cannot be accessed via the Windows interface as administration software. There are three different ways to launch the software:

- You can run it directly from the installation path: C:\Program Files page (x86)\Air Techniques\ProVecta S-Pan\Util
- You can run it via VistaConfig (when using VistaEasy or DBSWIN) – for more information refer to section **2.2.4 Acquisition modes and maintenance** on page 26).

After every X-ray image (from DBSWIN, VistaSoft or via an available interface) has been generated (and reconstructed), the image can be found in Raw format in one of the following locations (depending on the acquisition mode):

- Pano SD and HD images: C:\ProgramData\Duerr\VistaPano\Acquisition\Pano\PAN\
- Ceph SD images: C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Fast\PAN\
- Ceph HD images: C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Norm\PAN\

In addition, images generated with the AISU software can be found in Raw format under:

C:\Program Files (x86)\Duerr\VistaPano\Util\Result\[Unit-SN]\

The Raw file saved under one of the paths stated above (normally saved under the name capture.raw) is overwritten with every new image. After successful image acquisition, this file can be copied to a location of your choice and renamed.

Note: For panoramic images in S-Pan mode: in addition to the capture.raw file, the file ampt.raw is also saved to the PAN folder. Here, the file ampt.raw contains the Raw image for the S-Pan reconstruction. The file capture.raw contains the Raw image for the standard reconstruction. Ultimately, both files can be used for adjustment of the image reconstruction for panorama images.

8.3 Adjustment of the image reconstruction for panorama images

8.3.1 When does the image reconstruction need to be adjusted?

In individual cases, you will need to subjectively assess the X-ray images in order to determine whether or not it makes sense to adjust the image reconstruction parameters. The pre-set parameters are defined from typical values for dental radiology. For a ProVecta S-Pan system installed in this environment we do not recommend adjusting the parameters immediately after the unit is installed.

Any optimisation should wait until the operator has been consulted once he/she has gained experience in use of the system.

The assessment of the need for any adjustments should be made on the basis of X-ray images of actual patients.

Calibration of the image reconstruction makes sense under the following conditions:

- If the operator feels that the image result is generally washed out or too sharply focused.
- If the operator generally thinks that the brightness of the image is inappropriate.
- If the operator notices pronounced artifacts in the images.

Note: If panorama images (with a realistic attenuating body) have horizontal bars then the calibration of the sensor should be checked. For more information refer to section **4.1 Sensor calibration** on page 37 and section **11.3.6.2 Horizontal stripes in the images** on page 168.

8.3.2 Selection of the Raw file

To start with, you need to select the required Raw file.

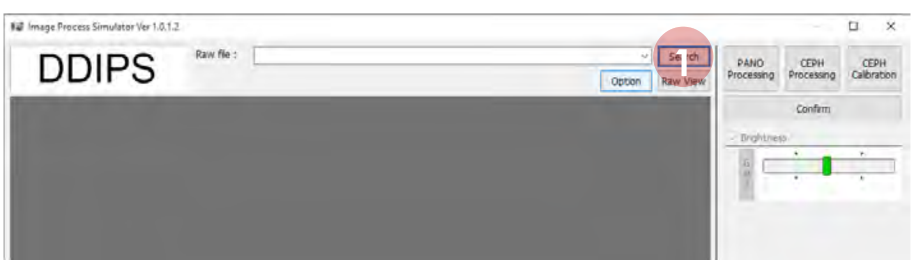


Fig. 147 Calling up the options in DDIPS

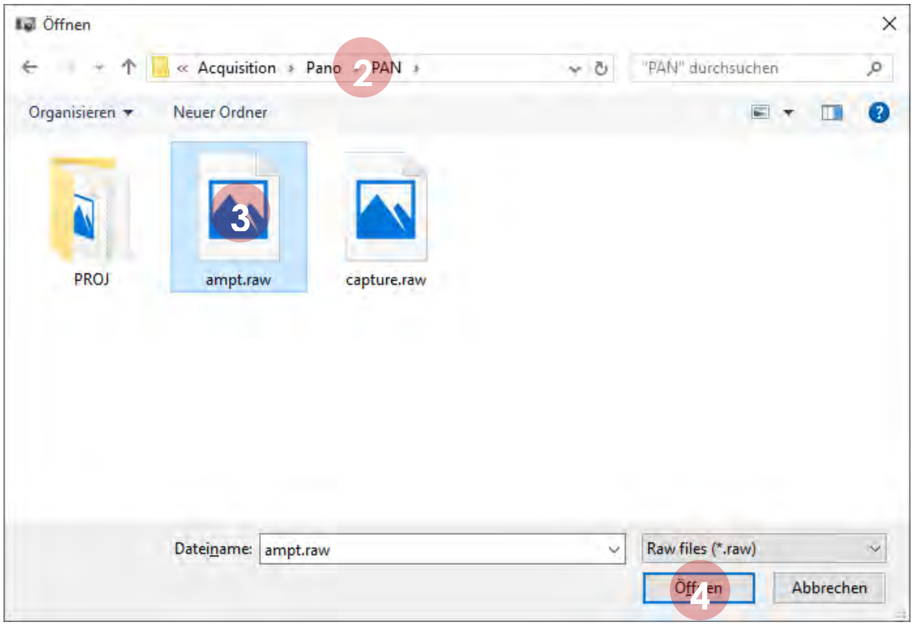


Fig. 148 Selecting ampt.raw (or capture.raw)

8.3.3 Adjusting the filtering stage (severity) and brightness

After selection of the Raw file, the calibration is confirmed via *PANO Processing* and *Confirm*.

Afterwards the DDIPS software loads the Raw file in five different states and displays them. Underneath the image, five grey dots show the individual editing states.

Clicking on one of the dots will change the display by including the revised filtering parameters. The middle point corresponds to the display in delivery state.

Note: We recommend defining the preferred filter level together with the operator.

Possible outcomes are shown below.

Fig. 149 Display of a panorama image with a low filter level

Fig. 150 Display of a panorama image with a medium filter level (default)

Fig. 151 Display of a panorama image with a high filter level

In addition to adjustments to the filtering, it is also possible to alter the image brightness. This is done via the *Brightness* area on the right-hand side of the DDIPS software.

The brightness of the image can be adjusted via the slider on the right (sliding the control to the right will make the image darker). The change does not happen immediately. If you click the *Simulation* button, the selected brightness stage is recalculated with the currently selected filter level. The outcome of this is that a red dot (to the right of the dot for the selected filter level) is displayed underneath the image.

Fig. 152 OPG image after rendering of the *Simulation*

Clicking on this dot displays both the corrected values for the filter stage and the adjusted brightness.

Fig. 153 Resulting image after adjustment of the filter level and brightness

The *Apply* button is then used to save the result (if the brightness has not been adjusted then *Apply* can be used without the *Simulation* function).

The results are saved in the file ZeusPano2.ini.

8.4 Adjustment of the image reconstruction for ceph images

The procedure for adjusting the image reconstruction parameters for ceph images is largely identical to the one for adjusting image reconstruction parameters for panoramic images. For more information see section **8.3 Adjustment of the image reconstruction for panorama images** on page 138.

Differences:

- In step **8.3.2 Selection of the Raw file** on page 123 the file required for the ceph image needs to be selected. In addition, the calibration should be started via the buttons *CEPH Processing* and *Confirm*.
- In step **8.3.3 Adjusting the filtering stage (severity) and brightness** on page 125, three possible filter stages are offered for the ceph calibration instead of five. In addition, the results are saved in the file ZeusCeph.ini instead of ZeusPano2.ini.

Possible outcomes are shown below.

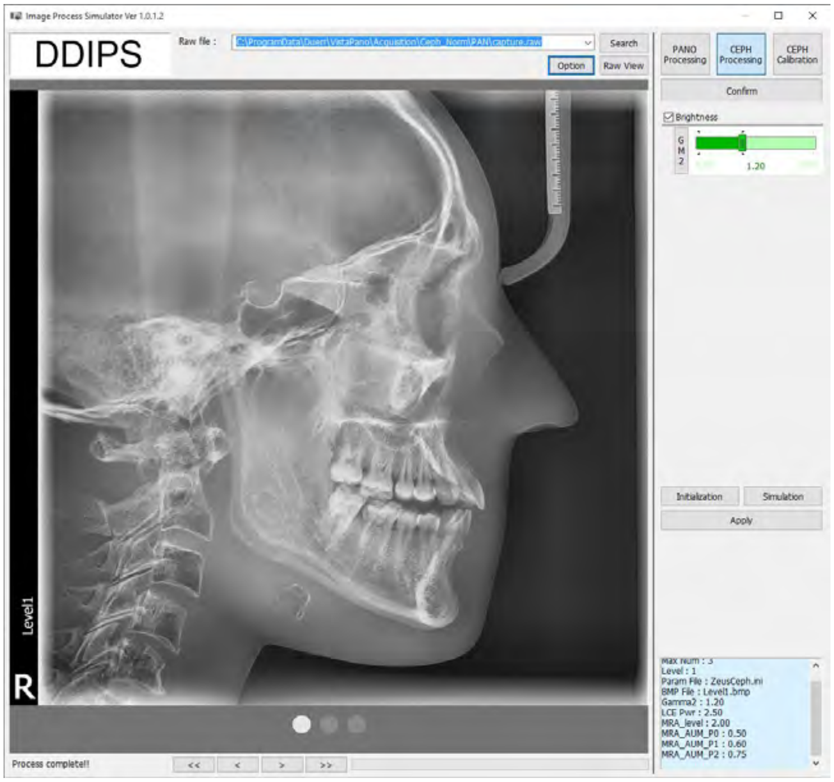


Fig. 154 Filter stage 1 on a lateral image

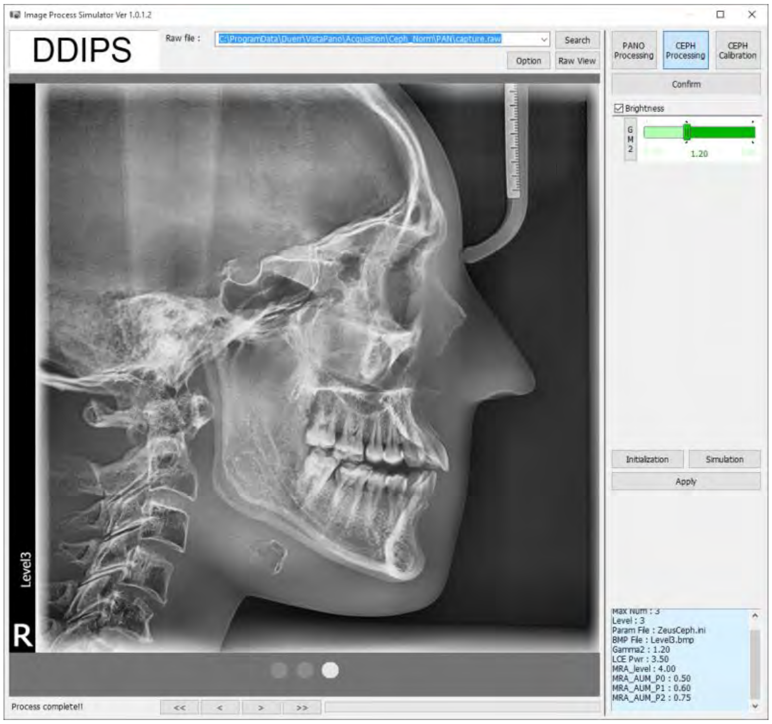


Fig. 155 Filter stage 3 on a lateral image

8.5 Calibration of ceph image homogeneity

The DDIPS software offers the function *CEPH Calibration* as a tool for calibrating the homogeneity of the generated images.

8.5.1 When should the homogeneity of ceph images be calibrated?

The assessment of whether or not it is necessary is made on the basis of generated ceph images. Here, it is important that the images have been created with a realistic attenuating body (patient X-rays or at least copper as the primary absorber).

Note: The calibration of homogeneity in ceph mode is not normally necessary during installation of the unit.

In panoramic mode, the fixed setup of the sensor in relation to the tube means that there is no need for a homogeneity calibration. If panoramic images (with a realistic attenuating body) have horizontal bars then a calibration of the sensor should be performed (for more information refer to section **4.1 Sensor calibration** on page 37 and section **11.3.6.2 Horizontal stripes in the images** on page 168).

Calibration of the homogeneity of ceph images makes sense under the following conditions:

- If individual areas of the images are displayed with unnaturally bright or dark greyscale values in comparison to other areas of the image.
- If vertical stripes can be seen in the image.

8.5.2 Performing the calibration for ceph homogeneity

As described in section **8.2 Operation** on page 121, the DDIPS software operates only with Raw files that need to be created beforehand.

8.5.2.1 Creating the Raw files for ceph calibration

For a complete homogeneity calibration the following four images will need to be present in Raw format beforehand:

- Ceph Lateral (LA) in SD with 97 kV and 15 mA
- Ceph Lateral (LA) in HD with 85 kV and 10 mA
- Ceph Posterior-Anterior (PA) in SD with 97 kV and 15 mA
- Ceph Posterior-Anterior (PA) in HD with 85 kV and 10 mA

All four images must be created without an absorber or test object.

Alignment of the ear studs:

- For the lateral image acquisitions, the ear studs should be aligned similarly to a real patient X-ray (approximately in the central position).
- For the posterior-anterior image acquisitions the ear studs should be aligned similarly to a real patient X-ray (i.e. in the open position).

Nasion alignment:

- The nasion is folded down for the lateral image acquisitions in similar fashion to a real patient X-ray and should be moved to the inner position.
- For the posterior-anterior image acquisitions the nasion should be moved to the folded-up position.

8.5.2.2 Selecting the Raw file for ceph calibration

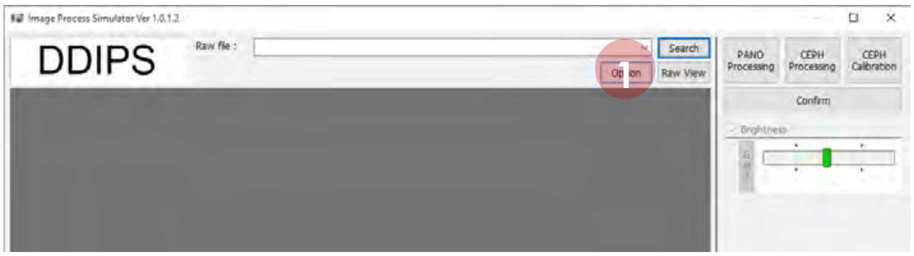


Fig. 156 Calling up the options in DDIPS

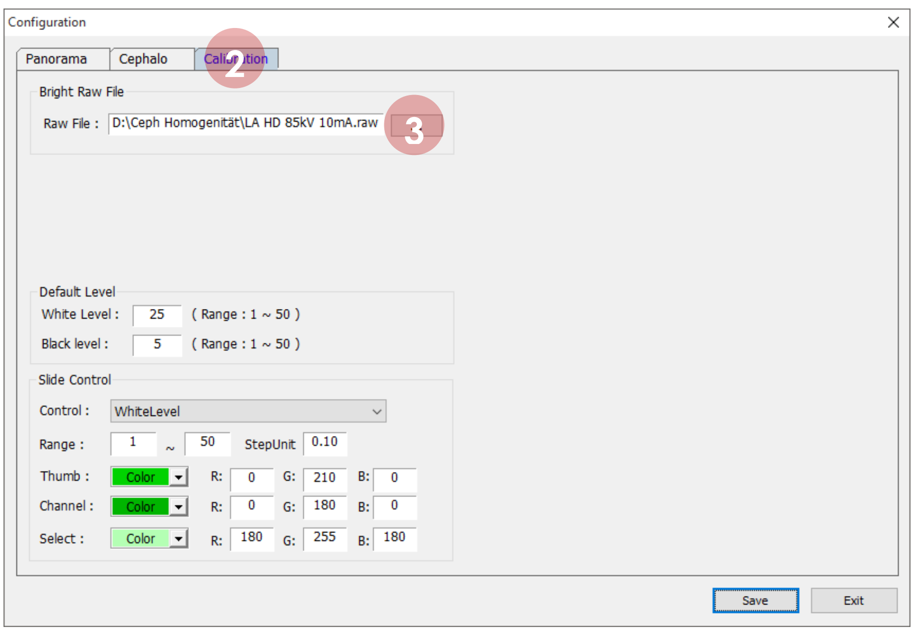


Fig. 157 Changing to the *Calibration* tab and then opening the path selection via "..."

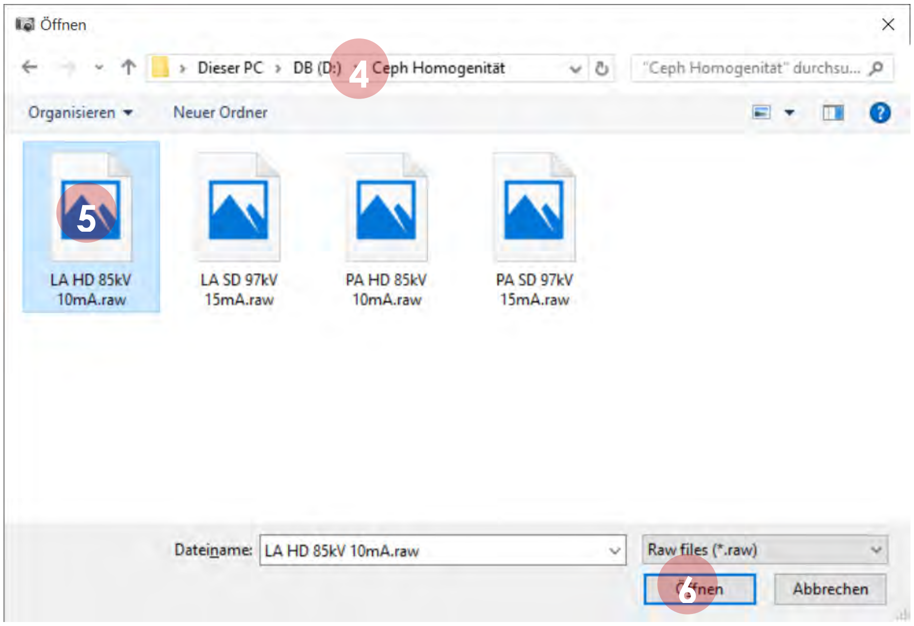


Fig. 158 Specifying the path and file name of the required Raw file and confirming via the *Open* button

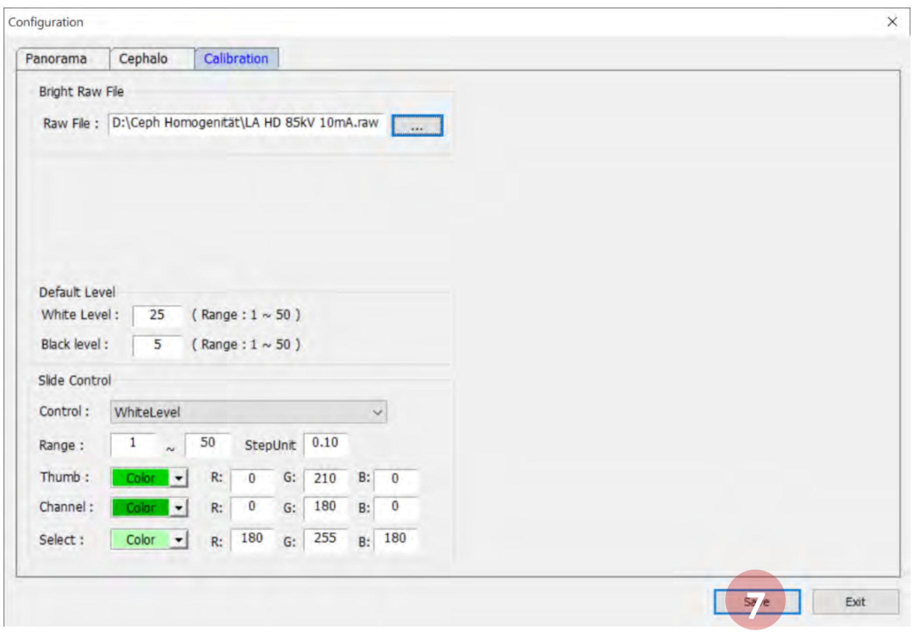


Fig. 159 Clicking *Save* to confirm the window

Afterwards DDIPS will use this Raw file for the function *CEPH Calibration* until the path and file are changed again.

8.5.2.3 Starting the ceph calibration

The calibration mode is started via the buttons *CEPH Calibration* and *Confirm*. Here, the previously defined Raw file is opened and displayed.

8.5.2.4 Defining the title for the calibration

The area *Param Title* is located on the right-hand side of the DDIPS software screen. It provides a drop-down menu from which the calibration for a relevant program can be selected.

After the subsequent calibration steps, the parameters that are obtained are assigned via the *Apply* button to the program previously selected under *Title*. A calibration can (and should) therefore be performed for every program listed under *Title* (if there is no image acquisition homogeneity in several ceph programs).

The four Raw images that are generated are suitable for certain programs defined under *Title*. This suitability is as follows:

The image "Lateral ins SD with 97 kV and 15 mA" is used for the *Title*

- CEPH_LAT_FAST

The image "Lateral in HD with 85 kV and 10 mA" is used for the *Title*

- CEPH_LAT

The image "Posterior-anterior in SD with 97 kV and 15 mA" is used for the *Titles*

- CEPH_FOA_FAST
- CEPH_CAR_FAST
- CEPH_SMV_FAST
- CEPH_WATERS_FAST

The image "Posterior-anterior in HD with 85 kV and 10 mA" is used for the *Titles*

- CEPH_FOA
- CEPH_CAR
- CEPH_SMV
- CEPH_WATERS

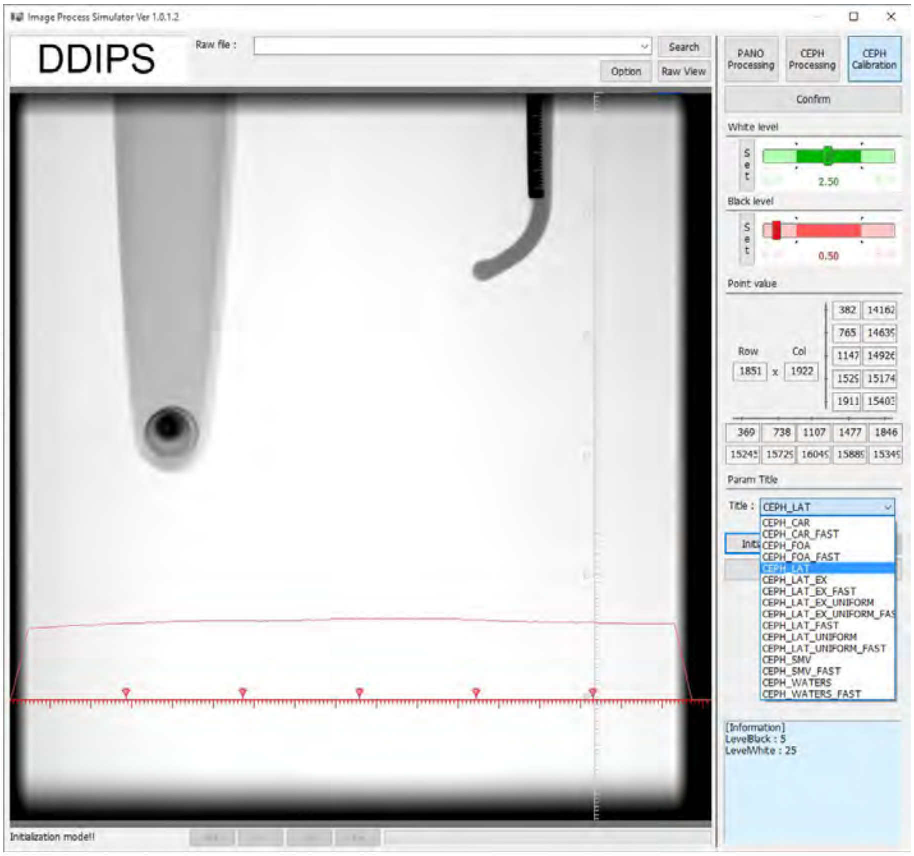


Fig. 160 Title selection

This means that 4 *Titles* need to be selected for each of the two posterior-anterior images (whereas just one *Title* needs to be selected for the two lateral images).

Once all of the *Titles* for an image have been successfully edited and saved via *Apply*, the step described in section **8.5.2.2 Selecting the Raw file for ceph calibration** on page 131 is repeated in order to select the next Raw file.

The flow chart below highlights the process.

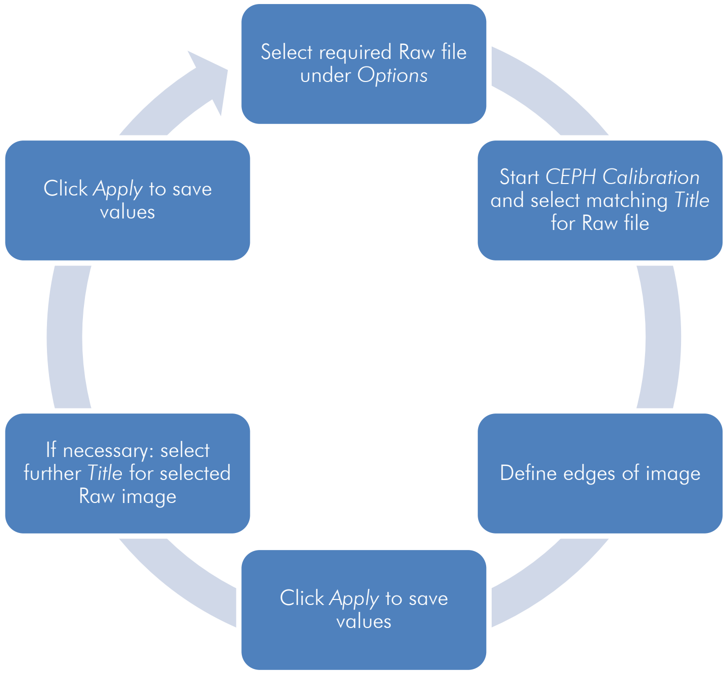


Fig. 161 Process for calibration of homogeneity

8.5.2.5 Defining the edges of the image

The calibration mode is started via the buttons *CEPH Calibration* and *Confirm*. Here, the previously defined Raw file is opened and displayed.

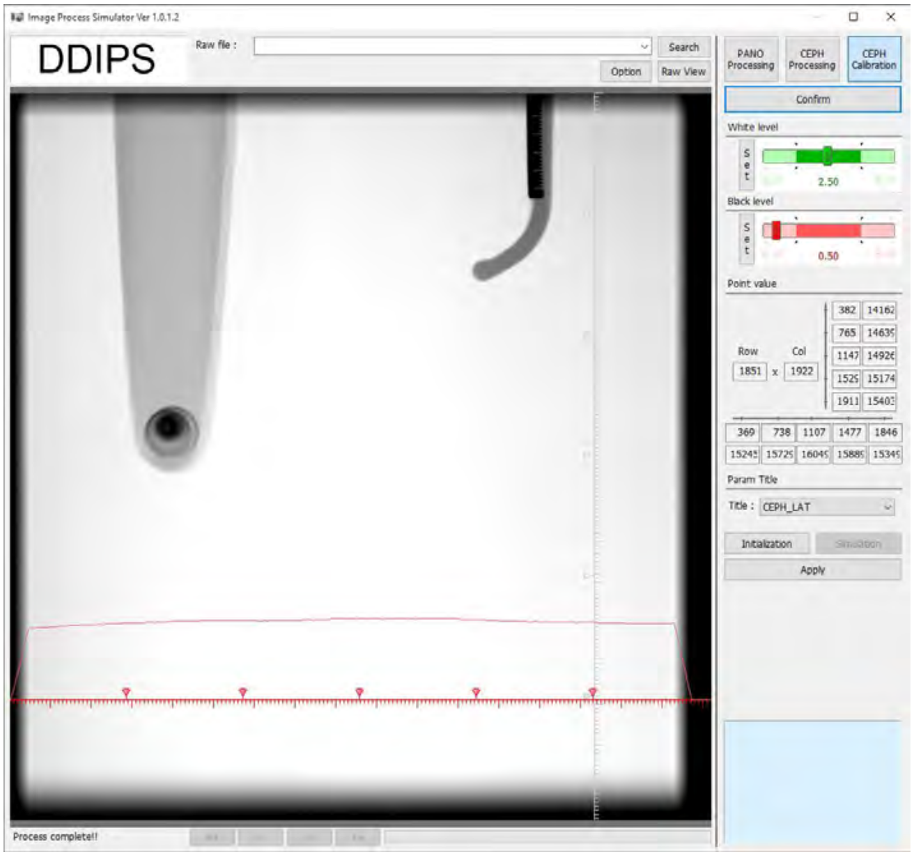


Fig. 162 Raw image in CEPH Calibration (lateral HD image)

The image is shown with a horizontal grid line and a vertical grid line. If you click on one of the lines it changes colour (the horizontal line turns red, the vertical one blue). Parallel to the coloured line a histogram is formed in the same colour. This shows the brightness of the detected greyscale at the height of the grid line.

In the following steps the edges of the image need to be defined. Here, start by dragging the red line (and subsequently the blue line) to the lower edge of the image (or to the right-hand edge) until it starts to lose brightness and fades into the black background.

Note: The button *Initialization* can be used to reset the set positions of the red and blue lines.

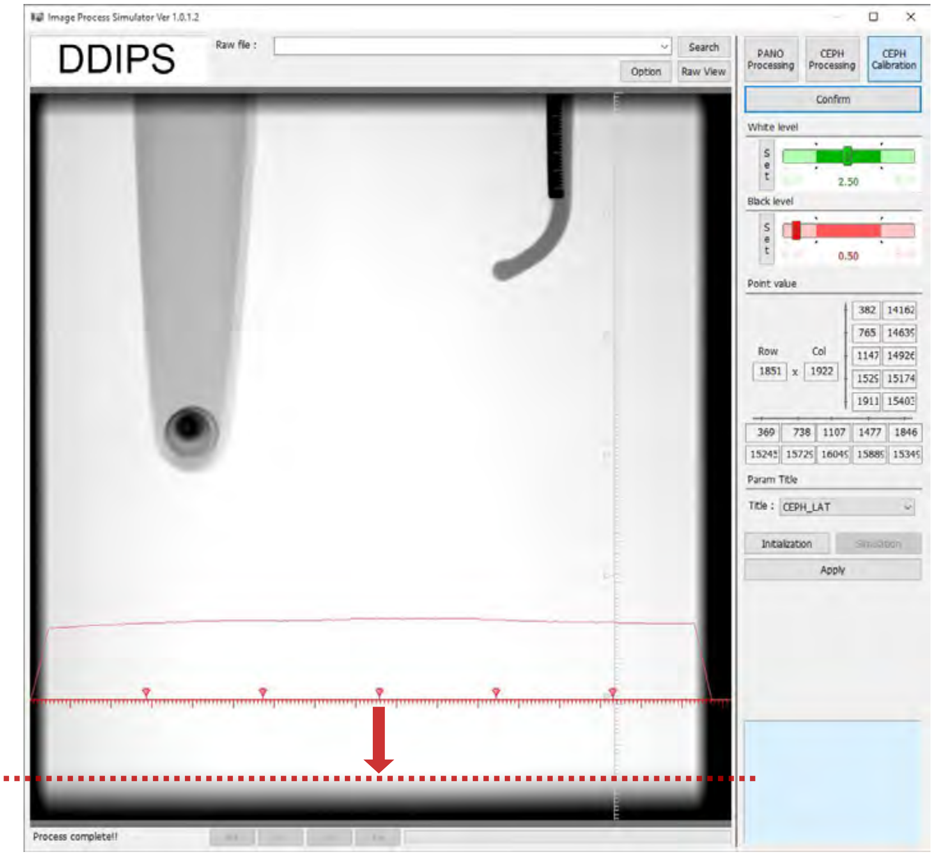


Fig. 163 Dragging the vertical line downwards

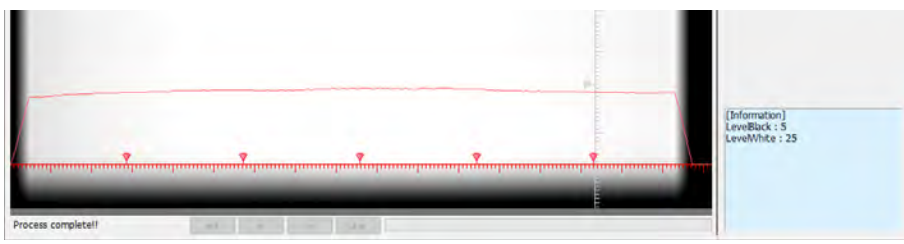


Fig. 164 Position of the vertical line at the bottom edge of the image

Subsequently, the left-hand edge and the right-hand edge need to be defined at the height of the red grid line. This is done with the aid of the two outer arrows of the 5 arrows that point at the grid line and can be moved themselves. The two arrows need to be dragged to the position at which the histogram forms an edge and drops off significantly to the black background.

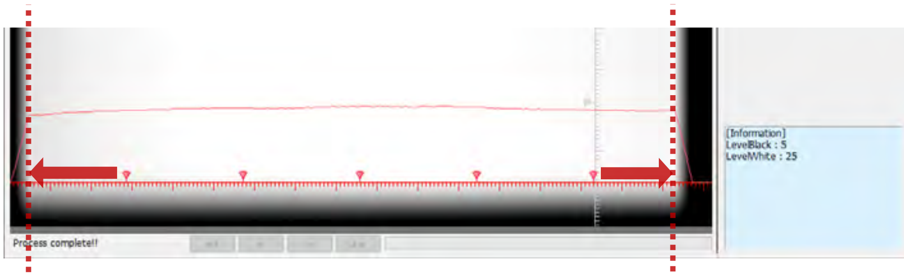


Fig. 165 Alignment of the left and right-hand edges on the red grid line

In addition, the two inner arrows need to be aligned in line with the red grid line. This is done by placing them approximately centrally between the middle arrow and the two outer arrows.

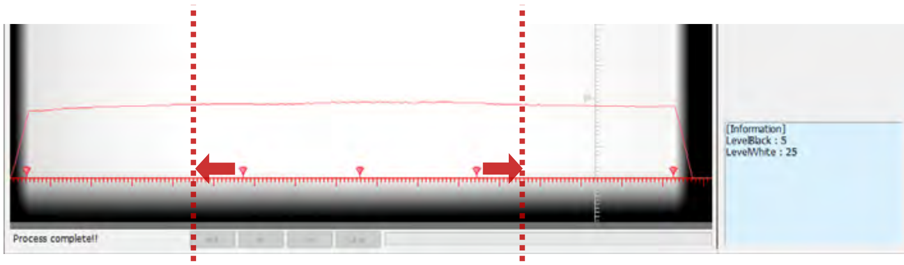


Fig. 166 Alignment of the middle arrows on the red grid line

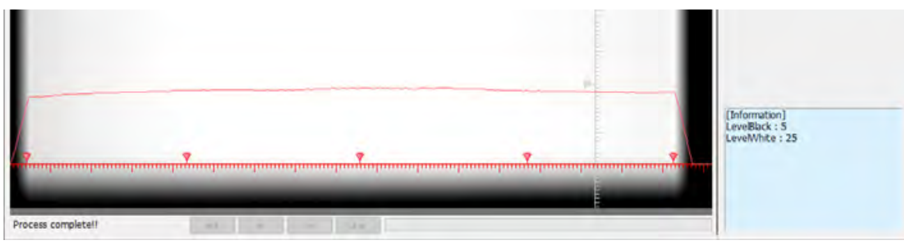


Fig. 167 Result of the alignment of the red grid line

Afterwards the procedure is repeated for the blue grid line following the same approach, whereby the blue grid line is aligned with the right-hand edge of the screen.

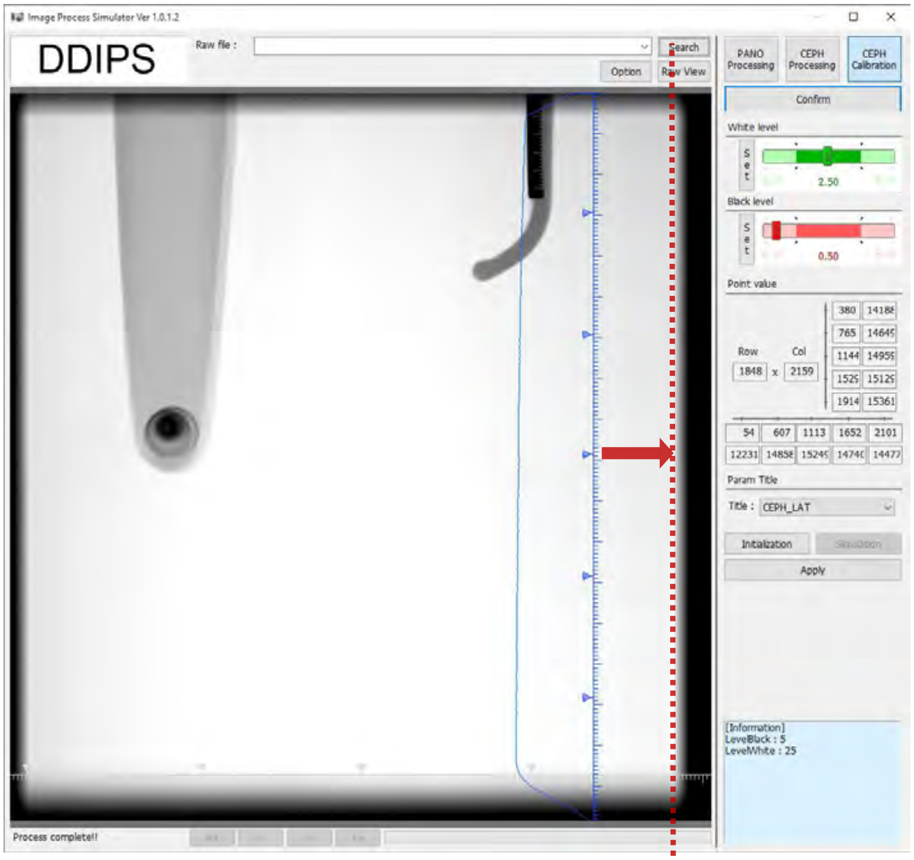


Fig. 168 Alignment of the blue grid line with the edge of the image

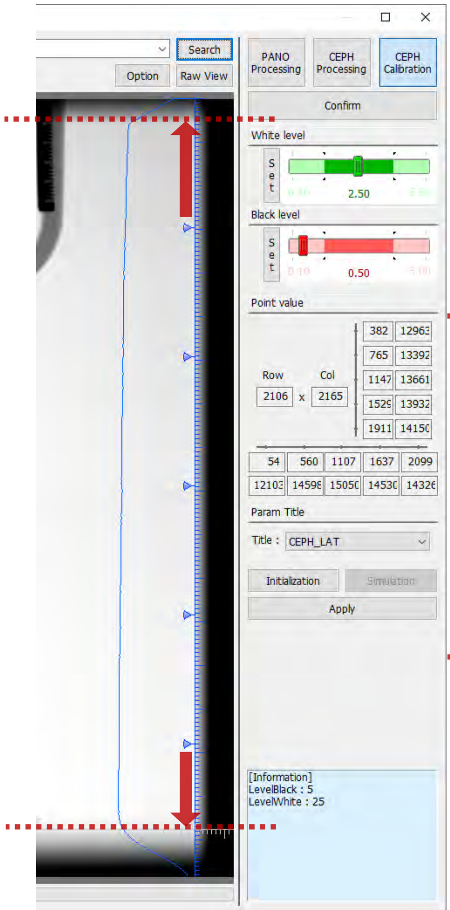


Fig. 169 Alignment of the left and right-hand edges on the blue grid line

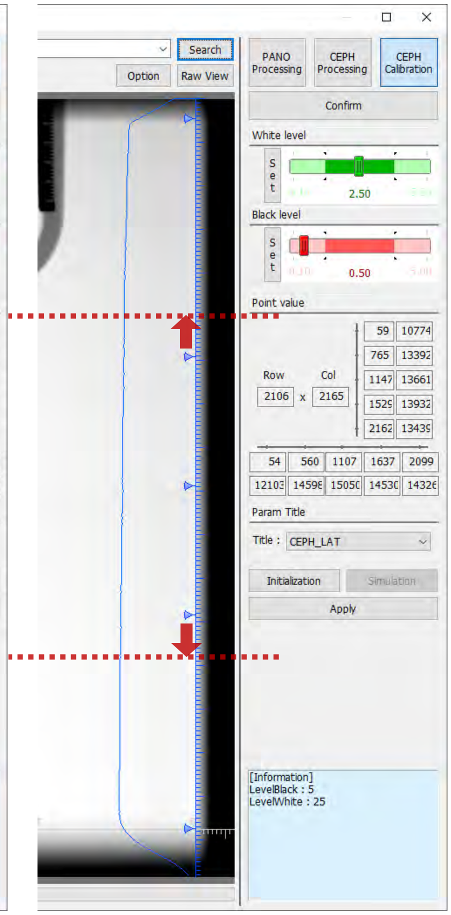


Fig. 170 Alignment of the middle arrows on the blue grid line

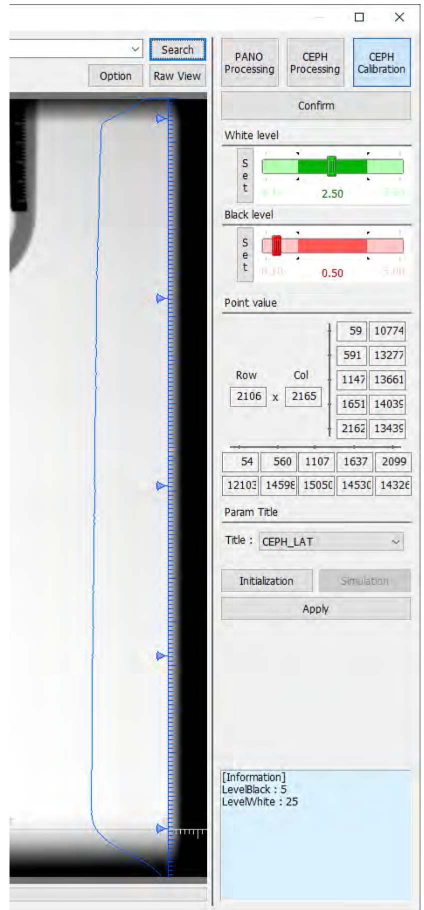


Fig. 171 Result of the alignment of the blue grid line

After successful adjustment of the red and blue grid lines (and their arrows) the parameters need to be saved. This is done by clicking the button *Apply*. Once this has been done the file ZeusCeph.ini (see section **10.5 ZeusCeph.ini** on page 149) will have been adapted for the selected *Title*.

Depending on the selected Raw image you can now select further *Titles* (refer again to section **8.5.2.4 Defining the title for the calibration** on page 133) that are suitable for the Raw image and save them via *Apply*. Alternatively you can select the next Raw file in the Options (for more information refer again to section **8.5.2.2 Selecting the Raw file for ceph calibration** on page 131) to repeat the procedure with a suitable *Title*.

The calibration process is complete as soon as all of the Titles listed in section **8.5.2.4 Defining the title for the calibration** on page 133 (or at least the ones that were causing non-homogeneous images) have been adjusted and viewed. It is strongly recommended that the ZeusCeph.ini file is then saved.

8.6 Saving and restoring a calibration

The DDIPS software makes changes to the following files:

- ZeusPano2.ini (see section **10.4 ZeusPano2.ini** on page 148)
- ZeusCeph.ini (see section **10.5 ZeusCeph.ini** on page 149)
- (Possibly to VAPAN.tsf. This can be found under: C:\ProgramData\Duerr\VistaPano\Acquisition\[Modus]\)

The results can be backed up by simply saving the files. The same applies to restoring them.

Since the file ZeusCeph.ini in particular is very important (especially after homogeneity adjustments have been made), there is an upload function to the unit for ZeusCeph.ini via the *Calibration Uploader*. This function should be viewed as a type of backup. The *Calibration Downloader* can then be used later on to restore the ZeusCeph.ini file on the computer.

To transfer the ZeusCeph.ini file to the ProVecta S-Pan, launch the *Calibration Uploader* and select at least the entry *Zeus Ceph File* under *Select File*.

Details about use of the *Calibration Downloader* and *Calibration Uploader* can be found in section **5.4.1 Download (Calibration Downloader)** on page 95 and in section **5.4.2 Upload (Calibration Uploader)** on page 97.

Note: The image reconstruction is influenced by several files. To ensure that all of the parameters of the reconstruction are backed up, a backup of the entire directory C:\ProgramData\Duerr\VistaPano\ is recommended.

9 Image acquisition procedure

Connection

- Address via IP 10.42.43.10 / 20130 TCP
- Check whether VersionInfo.txt and Sensor Cal Files exist; download them if necessary.

Image acquisition

- VistaPano.exe is opened and patient information is added (where available).
- The operator chooses the program and parameters for the image acquisition.

Information

- Information is sent to the unit:
  Which patient?
  Which program/parameters?

Alignment

- The unit aligns itself (panorama/ceph).
- The touchscreen is enabled.

Positioning

- Positioning with the aid of positioning beams/positioning aids
- Activation of readiness for image acquisition on the touchscreen

Acquisition

- Software readiness is ensured.
- Acquisition of the images starts when the exposure button is pressed.

Recording

- Depending on the selected mode, raw data of the individual layer images is created in:
  C:\ProgramData\Duerr\VistaPano\Acquisition\[Modus]\PAN\PROJ

Reconstruction 1

- Creates the raw image based on the individual layers (PROJ)
  C:\ProgramData\Duerr\VistaPano\Acquisition\[Modus]\PAN\capture.raw
  C:\ProgramData\Duerr\VistaPano\Acquisition\[Modus]\PAN\ampt.raw (S-Pan image acquisition)

Reconstruction 2

- Image reconstruction based on ZeusPano2.ini or ZeusCeph.ini (DDIPS) to C:\ProgramData\Duerr\images
  DCM[date+time]_org_proc.dcm and DCM[date+time]_org_raw.dcm
  DCM[date+time]_proc.dcm and DCM[date+time]_raw.dcm

Selection / save

- Depending on the settings: output and choice between *org_proc.dcm (default) or *proc.dcm (S-Pan)
- Saving of *org_proc.dcm (default) or *proc.dcm (S-Pan) and transfer to imaging software

Table 10 Flow chart for the image acquisition procedure

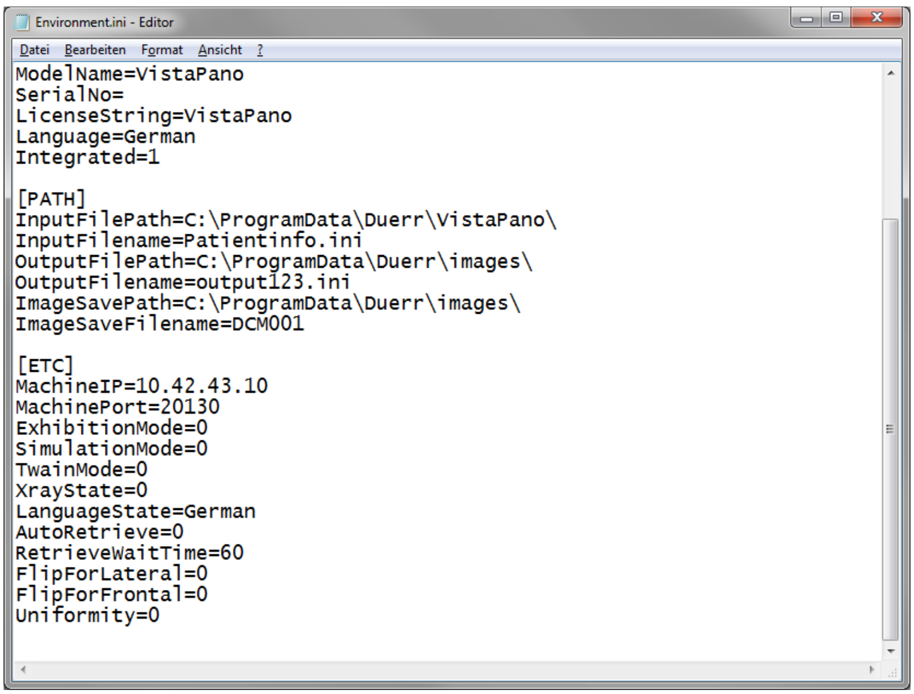
10 Configuration files

10.1 Environment.ini

The file Environment.ini contains basic settings for controlling the ProVecta S-Pan. Here, the focus is on defining the operating mode (Normal, Demo, Simulation) and setting a watermark (lettering) on each X-ray image.

Since the settings cannot be adjusted via a graphical user interface, this file will need to be manually adjusted if required.

Location of the file: C:\ProgramData\Duerr\VistaPano\SettingFiles



Environment.ini - Editor

Datei Bearbeiten Format Ansicht ?

```
ModelName=VistaPano
SerialNo=
LicenseString=VistaPano
Language=German
Integrated=1

[PATH]
InputFilePath=C:\ProgramData\Duerr\VistaPano\
InputFilename=Patientinfo.ini
OutputFilePath=C:\ProgramData\Duerr\images\
OutputFilename=output123.ini
ImageSavePath=C:\ProgramData\Duerr\images\
ImageSaveFilename=DCM001

[ETC]
MachineIP=10.42.43.10
MachinePort=20130
ExhibitionMode=0
SimulationMode=0
TwainMode=0
XrayState=0
LanguageState=German
AutoRetrieve=0
RetrieveWaitTime=60
FlipForLateral=0
FlipForFrontal=0
Uniformity=0
```

Fig. 172 Environment.ini

10.1.1 Adjusting the side watermark to the image

A watermark (lettering) is depicted to the left of every acquired image. The default wording is "VistaPano". However, this lettering can be freely changed. The following entry is located in the *[GENERAL]* area for this purpose:

LicenseString=VistaPano

The text to the right of *LicenseString=* can be freely changed (e.g. to include the name of the practice or hospital).

10.1.2 Activating Demo mode

ProVecta S-Pan has a Demo mode (e.g. for exhibitions and trade fairs), which can be activated from the relevant image acquisition computer. The Demo mode is therefore not activated on the unit itself, but on the software side.

In Demo mode, the ProVecta S-Pan behaves exactly the same as in normal operation from the point of view of the operator, but no X-ray radiation is generated. In addition, an X-ray image located in the memory of the computer is transmitted and displayed in the X-ray software.

The following activities can always be shown for demonstration purposes on the ProVecta S-Pan even without a computer connected:

- Switching on, booting process
- Height adjustment
- Activation of the alignment beams, positioning
- Test runs for panorama and ceph image acquisitions

To activate the Demo mode, go to the *[ETC]* area and make the following changes to the entry:

ExhibitionMode=1

As soon as the file has been saved and the image acquisition process is called up again, the software itself will show that the ProVecta S-Pan is in Demo mode and that, as a result, no X-ray radiation will be emitted.

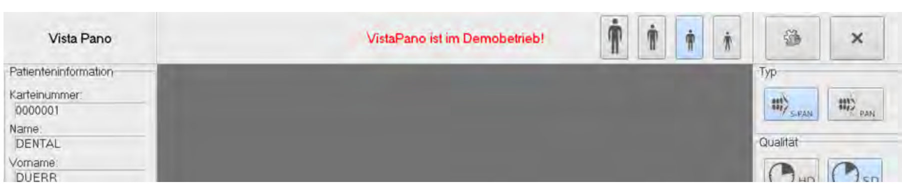


Fig. 173 VistaEasy / DBSWIN display showing that the system is in Demo mode

10.1.3 Activating Simulation mode

For more information refer to the description in section **13 Installing and activating Simulation mode** on page 192.

10.2 VersionInfo.txt

The file VersionInfo.txt primarily identifies the ProVecta S-Pan at the computer. The file is divided into two areas:

- [SOFTWARE_VERSION]
- [HARDWARE_VERSION]

The entries under *[HARDWARE_VERSION]* are used for unit identification (serial numbers). The presence of the file VersionInfo.txt and the entries in *[HARDWARE_VERSION]* are a fundamental requirement for communication between the computer and ProVecta S-Pan.

The entries under [SOFTWARE_VERSION] are a mixture of firmware status information for the ProVecta S-Pan and version information for the software installed on the computer.

With every ProVecta S-Pan that is shipped, the file VersionInfo.txt is already located on the microSD card of the CRONG board (for more information refer to section **6.2 CRONG** on page 101). As with the calibration files for the sensor, this file is transferred via the Calibration Downloader from the ProVecta S-Pan to the computer (for more information refer to section **5.4.1 Download (Calibration Downloader)** on page 95).

Location of the file: C:\ProgramData\Duerr\VistaPano

VersionInfo.txt - Editor

Datei Bearbeiten Format Ansicht ?

```
[SOFTWARE_VERSION]
InstallShield=1.4.0.2
VistaPano=1.4.0.4
VAPAN_ETH_Pano=7.9.2.2
VAPAN_ETH_Ceph=7.9.2.2
VAKCAP_Pano=7.6.0.8
VAKCAP_Ceph=7.6.0.8
ZeusCeph.dll=2.0.0.10
ZeusPano2.dll=2.0.0.6
Calibration_Downloader=1.3.1.3
Calibration_Uploader=1.3.1.3
cpc_script=1.1.0.0
AISU=2.0.1.1
MCUFirmware=9.10.12
CrongImage=1.4.0.3
CrongLCD=1.4.0.3

[HARDWARE_VERSION]
MachineSN=F203000099
CrongBoardSN=0360072021
MCUBoardSN=0360066730
SensorSN=F15H0GCB14-0330
CephSensorSN=F23HOBH814-00128
TubeSN=F203100090
GeneratorSN=F203100090
ModelName=VistaPano S Ceph
```

Fig. 174 VersionInfo.txt

Note: If a component listed under *[HARDWARE_VERSION]* is replaced then the steps detailed in section **12.7 Updating changed version numbers in VersionInfo.txt** on page 191 must be followed.

10.3 VistaPano.ini

The file VistaPano.ini contains primary path information for the software modules and admin tools, as well as settings for VistaConfig.

As a result, it is adjusted in part by VistaConfig (when using VistaEasy or DBSWIN). It is not normally necessary to manually adjust the file.

Location of the file: C:\ProgramData\Duerr\Config

VistaPano.ini - Editor

Datei Bearbeiten Format Ansicht ?

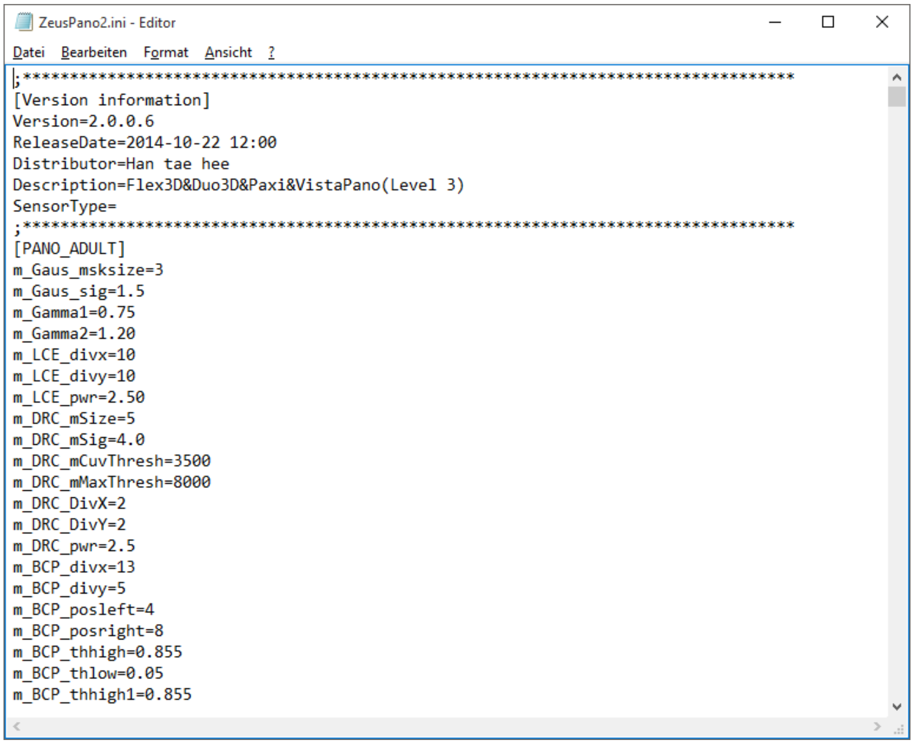
```
[VistaPano]
VistaPanoExe=C:\Program Files (x86)\Duerr\VistaPano\exe\VistaPano.exe
VistaPanoDataDownloader=C:\Program Files (x86)\Duerr\VistaPano\util\Cali
AISUExe=C:\Program Files (x86)\Duerr\VistaPano\util\AISU2.exe
DDIPSExe=C:\Program Files (x86)\Duerr\VistaPano\util\DDIPS\DDIPS.exe
EnvironmentIni=C:\ProgramData\Duerr\VistaPano\SettingFiles\Environment.i
PowerParamIni=C:\ProgramData\Duerr\VistaPano\SettingFiles\PwrParam_Pano.
DemoImageS-Pan=VPDemoSP.dcm
DemoImageStandard=VPDemo.dcm
Registered=1
[Mode]
ID=0
PanoType=S-Pan
ImageQuality=Standard
Script=
Range=AutoGrayRange lo=0 up=0 htyp=0
[ModeCeph]
ID=2
PanoType=S-Pan
ImageQuality=Standard
Script=
Range=AutoGrayRange lo=0 up=0 htyp=0
[HARDWARE_VERSION]
MachineSN=F203000099
MCUBoardSN=0360066730
TubeSN=F203100090
SensorSN=F15H0GCB14-0330
GeneratorSN=F203100090
CrongBoardSN=0360072021
CephSensorSN=F23HOBH814-00128
[CommonSettings]
AutoCloseAfterStandard=1
AutoCloseAfterSuperPan=1
[XrChecks]
```

Fig. 175 VistaPano.ini

10.4 ZeusPano2.ini

The file ZeusPano2.ini contains a large number of reconstruction parameters for panorama image acquisitions.

Location of the file: C:\ProgramData\Duerr\VistaPano\SettingFiles


ZeusPano2.ini - Editor

Datei Bearbeiten Format Ansicht ?

```
;**************************************************************************************
[Version information]
Version=2.0.0.6
ReleaseDate=2014-10-22 12:00
Distributor=Han tae hee
Description=Flex3D&Duo3D&Paxi&VistaPano(Level 3)
SensorType=
;**************************************************************************************
[PANO_ADULT]
m_Gaus_msksize=3
m_Gaus_sig=1.5
m_Gamma1=0.75
m_Gamma2=1.20
m_LCE_divx=10
m_LCE_divy=10
m_LCE_pwr=2.50
m_DRC_mSize=5
m_DRC_mSig=4.0
m_DRC_mCuvThresh=3500
m_DRC_mMaxThresh=8000
m_DRC_DivX=2
m_DRC_DivY=2
m_DRC_pwr=2.5
m_BCP_divx=13
m_BCP_divy=5
m_BCP_posleft=4
m_BCP_posright=8
m_BCP_thhigh=0.855
m_BCP_thlow=0.05
m_BCP_thhigh1=0.855
```

Fig. 176 ZeusPano2.ini

Once the raw data for a panorama image has been created, this data is reconstructed into an effective image (for more information refer to section **Table 10 Flow chart for the image acquisition procedure** on page 159). The parameters required to do this are defined in ZeusPano2.ini.

It is not normally necessary to make any changes to the file ZeusPano2.ini. If the operator is not satisfied with the results of the image reconstruction, the file is not manually adjusted. Instead, this is done with the aid of the software DDIPS (see section **8 DDIPS software** on page 135).

Section **8.3.1 When does the image reconstruction need to be adjusted** on page 138 explains when it makes sense to adjust the reconstruction parameters with the aid of the DDIPS software.

10.5 ZeusCeph.ini

The file ZeusCeph.ini contains a large number of reconstruction parameters for the different ceph modes.

Location of the file: C:\ProgramData\Duerr\VistaPano\SettingFiles

ZeusCeph.ini - Editor

Datei Bearbeiten Format Ansicht ?

```
;*************************************************************************************
[Version information]
Version=2.0.0.10
ReleaseDate=2014-10-31 12:00
Distributor=Han tae hee
Description=AnyCeph Sensor (Level 1)
;*************************************************************************************
[CEPH_LAT]
m_Gaus_msksize=3
m_Gaus_sig=2.0
m_Gamma1=1.0
m_Gamma2=1.20
m_LCE_divx=10
m_LCE_divy=10
m_LCE_pwr=2.50
m_DRC_mSize=5
m_DRC_mSig=4.0
m_DRC_mCuvThresh=4000
m_DRC_mMaxThresh=16383
m_DRC_DivX=2
m_DRC_DivY=2
m_DRC_pwr=2.0
m_DRC_BGLevel=0.12
m_BCP_divx=0
m_BCP_divy=0
m_BCP_posleft=4
m_BCP_posright=8
m_BCP_thhigh=0.855
m_BCP_thlow=0.05
m_BCP_thhigh1=0.855
```

Fig. 177 ZeusCeph.ini

Once the raw data for a ceph image has been created, this data is reconstructed into an effective image (for more information refer to section **Table 10 Flow chart for the image acquisition procedure** on page 159). Here, issues relating to image homogeneity are also addressed. The parameters required to do this are defined in ZeusCeph.ini.

It is not normally necessary to make any changes to the file ZeusCeph.ini. If the operator is not satisfied with the results of the image reconstruction, the file is not manually adjusted. Instead, this is done with the aid of the software DDIPS (see section **8 DDIPS software** on page 135).

Section **8.3.1 When does the image reconstruction need to be adjusted?** on page 138 and section **8.5.1 When should the homogeneity of ceph images be calibrated?** on page 144 explains when it makes sense to adjust the reconstruction parameters with the aid of the DDIPS software.

11 Solving problems

11.1 Error messages

See section **17 Error** messages on page 228.

11.2 Troubleshooting

11.2.1 Unit cannot be switched on

Situation: ProVecta S-Pan is switched on but there is no response.

Approach:

1. Check the input voltage (first-generation units require a start-up current limiter – see section **6.4 Power board** on page 122).
2. Check whether the LED in the switch-on button lights up green when switched on.
3. Check whether the emergency off button is active (it lights up red).
4. Check whether the input voltage to the power board is present (see section **6.4 Power board** on page 122).
5. Check the three fuses on the power board (see section **6.4 Power board** on page 122).

11.2.2 Unit starts up, but the touchscreen stays dark or flickers

Situation: The ProVecta S-Pan is switched on and starts up, but the touchscreen display is either completely black, says that no signal is being transmitted, or it flickers.

Approach:

1. The touchscreen is controlled via three cables. Check these three cables (unplug them and plug them back in again). To do this, the cover of the positioning unit needs to be opened (for more information refer to section **4.3.9 Symmetry between the left and right-hand halves of the jaw** on page 77).
2. Two of the three cables run to the CRONG board. Here the connections should also be checked and reconnected if required.
3. Remove and re-insert the microSD card on the CRONG board.
4. Replace the USB and HDMI cables between the touchscreen and CRONG board to test (if present).

11.2.3 Unit starts up and displays "Software not ready"

Situation: ProVecta S-Pan is switched on and starts up; the touchscreen displays the message "Software not ready" and does not respond.

Approach: Generally speaking this is not a fault. If the ProVecta S-Pan has not received an active X-ray job from the imaging software it will block the image acquisition function. However, the functions in the lower menu bar of the touchscreen and the height adjustment can be activated at any time. If it still cannot be operated after an X-ray job has been opened then the following steps should be followed.

1. Is the image acquisition dialog of the X-ray software reporting a fault?
2. Check the computer settings (in particular the IP and firewall settings – for more information refer to section **2 Software installation and Configuration** on page 18).
3. Send a ping to IP: 10.42.43.10 to check the connection.
4. Download the unit data from the ProVecta S-Pan (see section **5.4.1 Download (Calibration Downloader)** on page 104).
5. Deactivate the energy saving option for the network card.
6. If you are working with VistaEasy, generate a test image via VistaConfig.
7. Check whether ProVecta S-Pan is communicating with the AISU software.

11.2.4 Image acquisition window appears incomplete on the computer screen

Situation: The image acquisition dialog on the computer appears, but parts of the window are not displayed (usually the items on the right-hand side of the screen).

Approach:

1. Check the minimum resolution of 1280 x 1024 pixels.
2. Update the graphics card driver.
3. Replace the graphics card.

11.2.5 No images can be created with the ProVecta S-Pan

Situation: No images can be created.

Approach: There are many possible causes for this. The following approach may help to solve this type of problem:

1. Check that there is at least 1 GB (or 5 GB on earlier versions) of free space on the hard disk of the system drive.
2. Restart ProVecta S-Pan and the computer.

3. Follow the points in section **11.2.3 Unit starts up and displays "Software not ready"** on page 167 and section **11.3 Possible solutions for problems relating to unit connections and data transmission** on page 180.

11.2.6 The side of the acquisition window in DBSWIN is cut off

Situation: The Capture window in DBSWIN (from the VistaPano.exe) is not completely opened on the screen. The right hand column is not visible or is only partially displayed.

Fig. 178 Acquisition window in DBSWIN is cut off

Approach: This is due to the combination of graphics card and software. The effect occurs in conjunction with onboard graphics cards. The following procedure solves the problem:

1. Update the video card driver
2. For DBSWIN in versions 5.11 and 5.12 there is a patch. This can be obtained from the DÜRR dental service department. Starting with version 5.14, the patch is integrated directly into the software.

Note the points from section **11.2.3 Unit starts up and displays "Software not ready"** on page 167 and section **11.3 Possible solutions for problems relating to unit connections and data transmission** on page 180.

11.2.7 Device creates a humming noise after switch on

Situation: When ProVecta S-Pan is switched on, after a few seconds (during initialisation) a loud humming noise will be heard.

Approach: The device must be turned off immediately. The humming noise is most likely caused by the presence of the transport screws or an over-run of the maximum position of the stepper motor (X-axis).

1. Remove the top cover of the device (7 screws).
2. Check that the two screws for transport lock are removed (detailed information you will found at the installation manual).
3. Move the slider towards the middle of the device, by turning the motor coupling manually. Around 2 cm movement of the slider will be sufficient.

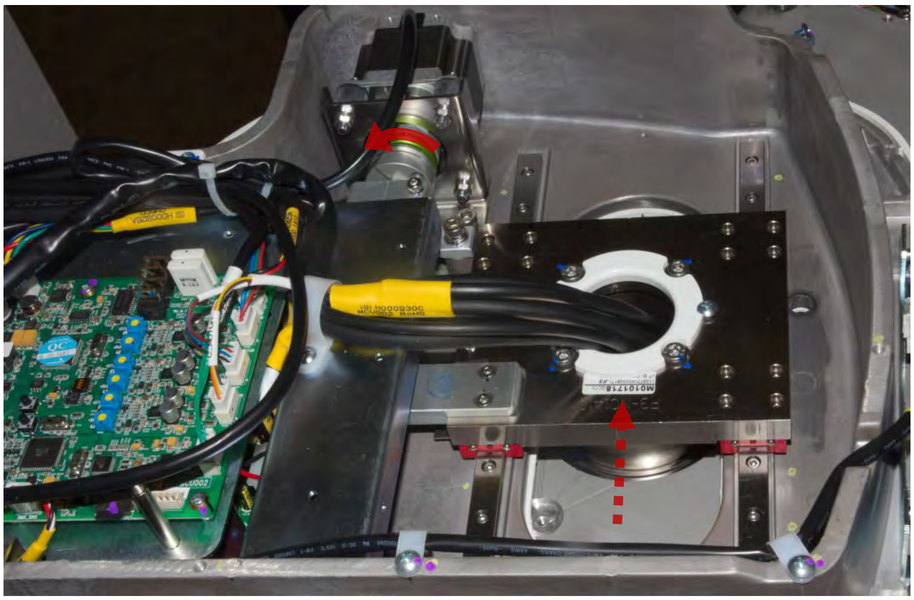


Fig. 179 Turn motor coupling to move slide

Note: In case of an X-axis over-run: The issue is caused by an over-run of the light barrier when servicing the machine or during the last acquisition. This rare incident occurs only with old devices, when the unit is activated with the C-arm in an unrecognised position.

Devices up to the following serial numbers are affected:

- G203700104 (ProVecta S-Pan)
- G203000100 (ProVecta S-Pan Ceph)

A Firmware-Update of the Crong-Image (see section **12 Firmware updates** on page 193) and the update of VistaPano InstallPackage (see section **2.1 ProVecta S-Pan** Installation Software

on page 18) prevent the issue occurring in the future (Crong-Image version ≥ 1.4.0.7; VistaPano InstallPackage version ≥ 1.4.0.11).

11.2.8 Black / Dark vertical strips or regions within the shot

Situation: The device intake is unobstructed from a mechanical point of view. However, the acquisition result shows vertical strips or entire areas that are completely black or distorted or offset in the structure. These strips or areas appear in a slightly changing location in the images.

Fig. 180 Vertical black regions in the shot

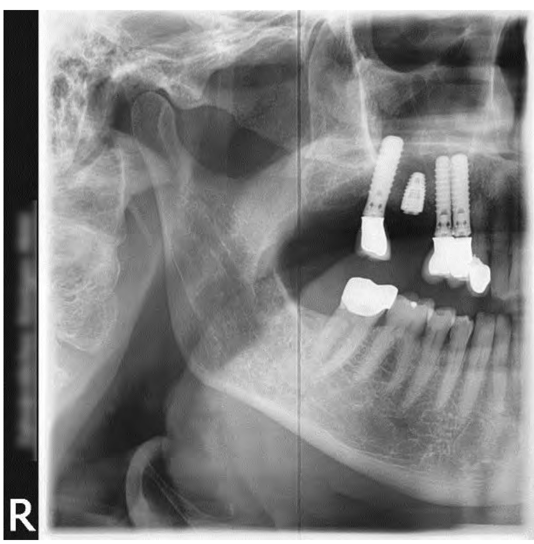


Fig. 181 Vertical Stripe in the shot

Cause: The cause is probably found in the connection between sensor and CRONG board. At the rotation of the C-arm.

Approach: The cable connection between the sensor and the CRONG board must be replaced. In the DuerrDental.NET there is a service video which describes the replacement of the harness.

1. On the schematic diagram **Fig. 130 CRONG board wiring diagram** on page 112 as well as **Fig. 137 Inverter board wiring diagram** on page 127 the cabling H000047A, H000914B, H000909C can be seen. A cable break in particular in H000047A is responsible for such effects.
2. The cables are included in the spare part 2207-984-02 (wiring harness).
3. Open the top cover of the unit and completely remove the housing of the C-arm.
4. Replace all the cables in question from the harness set 2207-984-02. Some are stabilized with cable ties. Remove them and replace them with new ones.
5. If the error persists, a replacement of the CRONG board must be carried out.

11.2.9 Cut or squashed recording

Situation: The device intake is unobstructed from a mechanical point of view. However, the recording result shows a truncated (incomplete) recording or is compressed.

Fig. 182 Cut-off recording

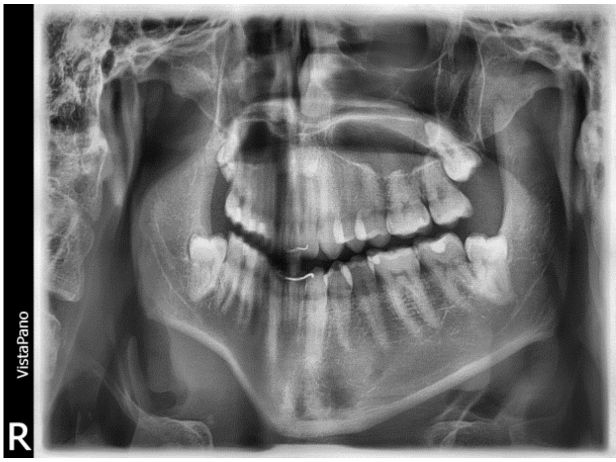


Fig. 183 Squashed recording

Cause: See section **11.2.8 Black / Dark vertical strips or regions within the shot** on page 170.

Approach: See section **11.2.8 Black / Dark vertical strips or regions within the shot** on page 170.

11.2.10 The C-arm stops rotation during the child acquisition

Situation: A Child image was started (child arch). During the rotation, the C-arm stops before there it reaches its end position. The result will be an incomplete image such as this:

Fig. 184 uncompleted child image

Approach: Because of a faster rotation speed in child images (compared to adult images), the toothed belt on the Y-axis motor is probably too tight. The Y-axis motor movement should be checked.

1. After removing the white cover behind the sensor (4 screws), you will see the mechanism for the Y-axis movement. The stepper motor is connected to the gear by a toothed belt:

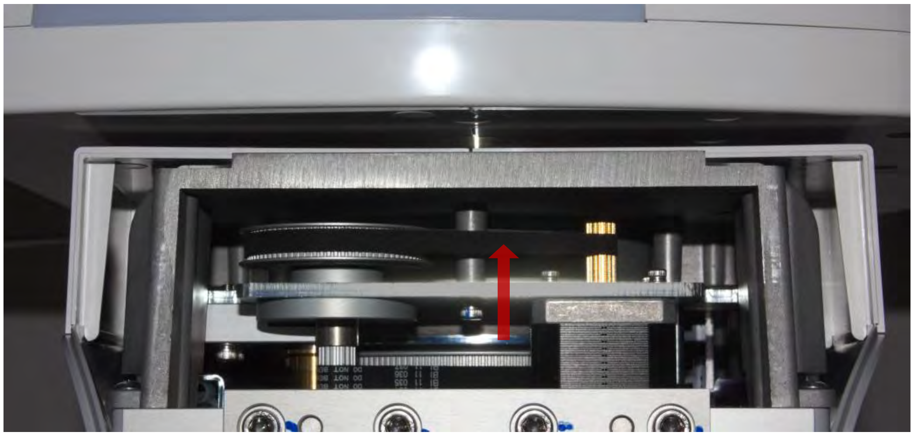


Fig. 185 Toothed belt for Y-Axis rotation

2. The tension of the toothed belt must be checked. The tension is most likely too strong. This means that the stepper motor needs more power to rotation freely. On-site you can check the strain of the toothed belt. By pressing down the side of the toothed belt with slight pressure (towards the floor), the toothed belt must be able to flip around 90° to be parallel to the floor:

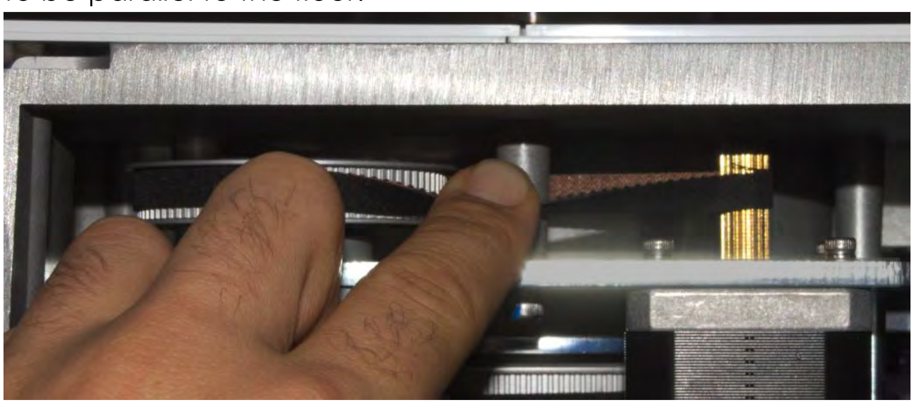


Fig. 186 Toothed belt check

3. When the toothed belt tension is inappropriate, the position of stepper motor must be adjusted. Loosen the 4 screws of the stepper motor. The stepper motor can then be moved sideways (it is recommended that you mark the motor position before you move it):

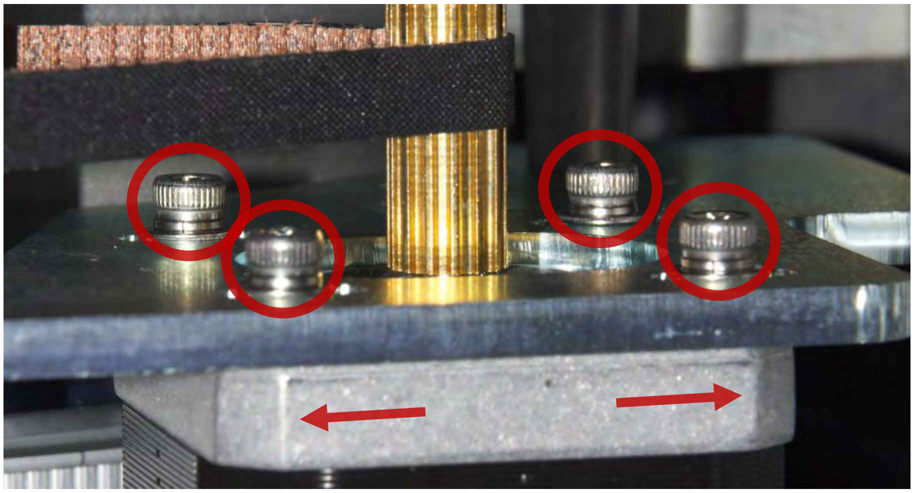


Fig. 187 Loosen stepper motor to change toothed belt tension

11.2.11 The touch display detects the pressure at an offset point

Situation: A position pressed by the finger on the touch display seems to be detected at an offset. For example, the display will be drawn further to the left or higher.

Note This effect is likely after the display is replaced.

Approach:

The touch display must be re-calibrated. To do this, follow these steps:

1. Start ProVecta S-Pan and connect to PC.
2. Set up telnet on your PC. You can do this either by installing the Windows Telnet feature or by using an external tool such as Putty.
   By default, the Telnet client is not active in Windows. However, it can be installed by going into Control Panel > programs and features > Enable or disable Windows features.

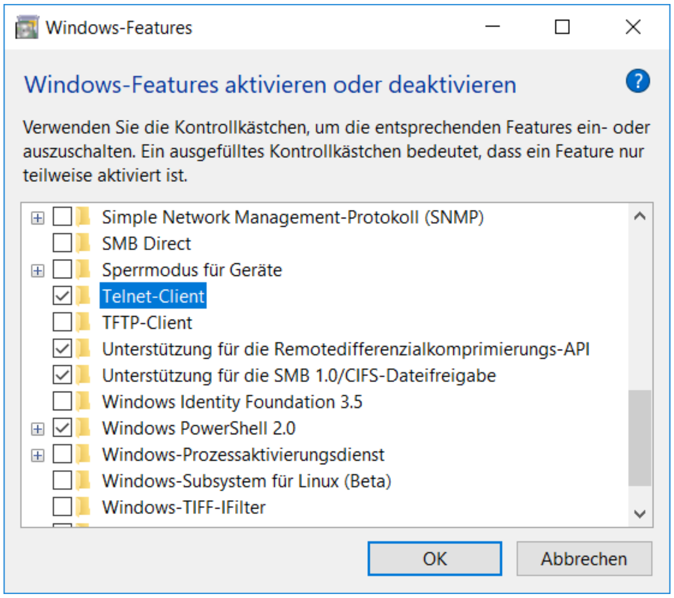


Fig. 188 Telnet-Client in Windows configuration

3. Telnet-connect to ProVecta S-Pan. Once the Telnet client has been installed, the call is made via
    - *Windows key + R > cmd*
    - *telnet 10.42.43.10 23*

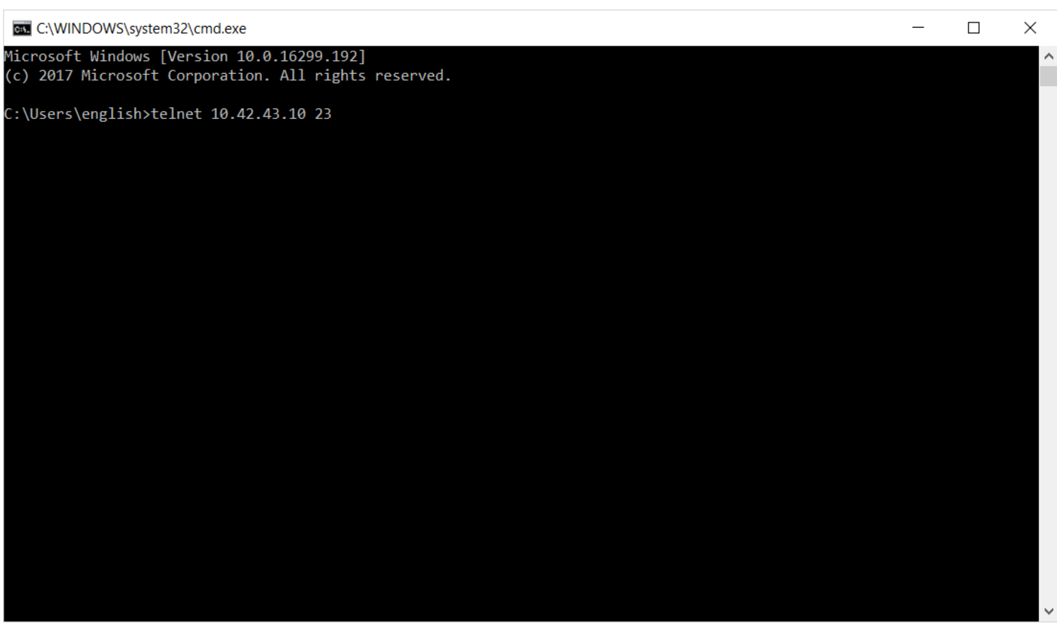


Fig. 189 Telnet Connect to device

4. After a successful connection, a login is required. To do this, you must enter the root user

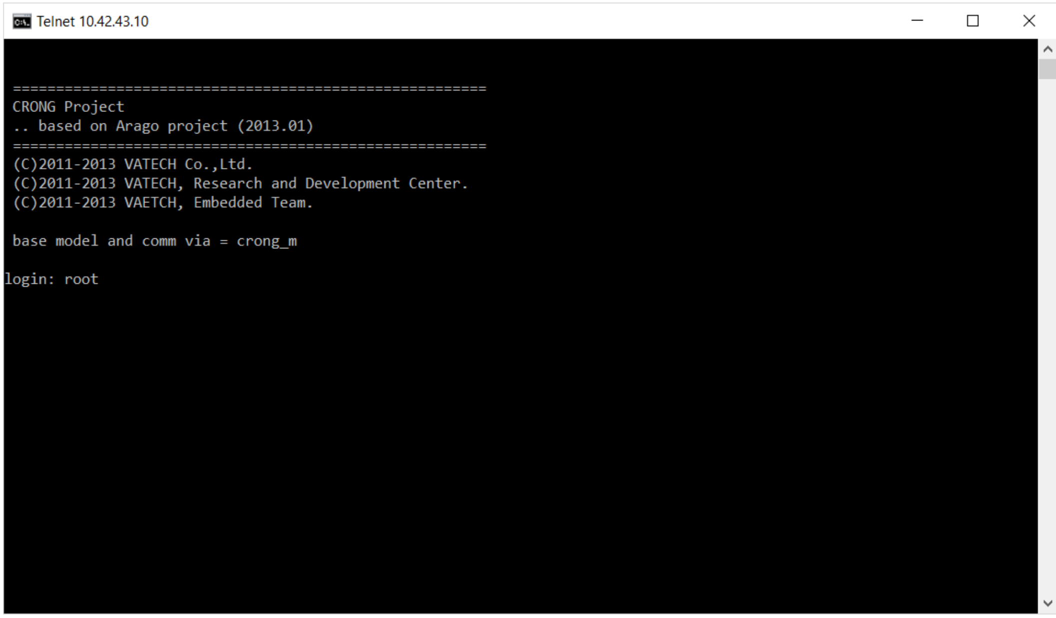


Fig. 190 Telnet connection – Login with root user

5. Following three commands ensure that access to the display is terminated
    - *killall nano-X*
    - *killall clcd_crong*
    - *killall launcher*

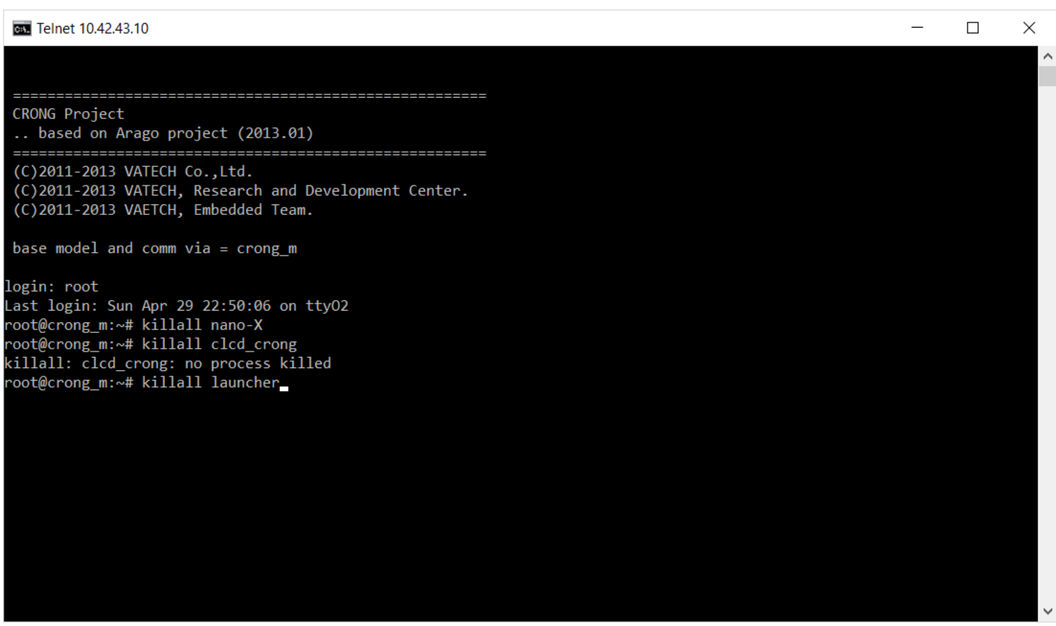


Fig. 192 Telnet connection – Stop Access processes

6. The touch display then displays a black screen
7. The actual calibration is now started using the command ts_calibrate

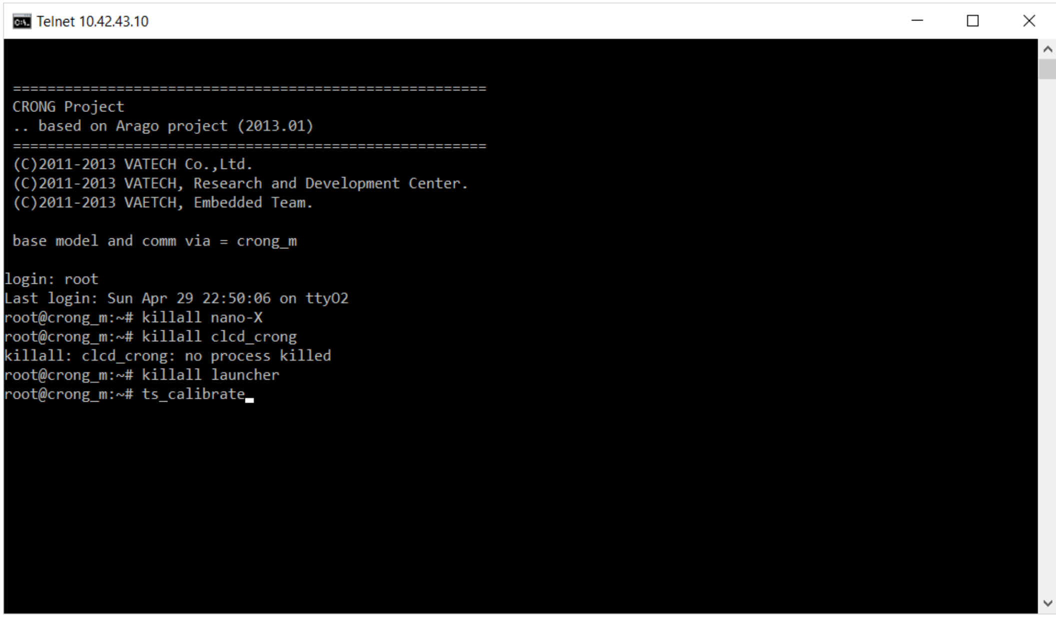


Fig. 192 Telnet connection – Start calibration

8. The display now shows 5 crosses on the touch display in turn. After pressing the first cross on the display, the next cross is shown

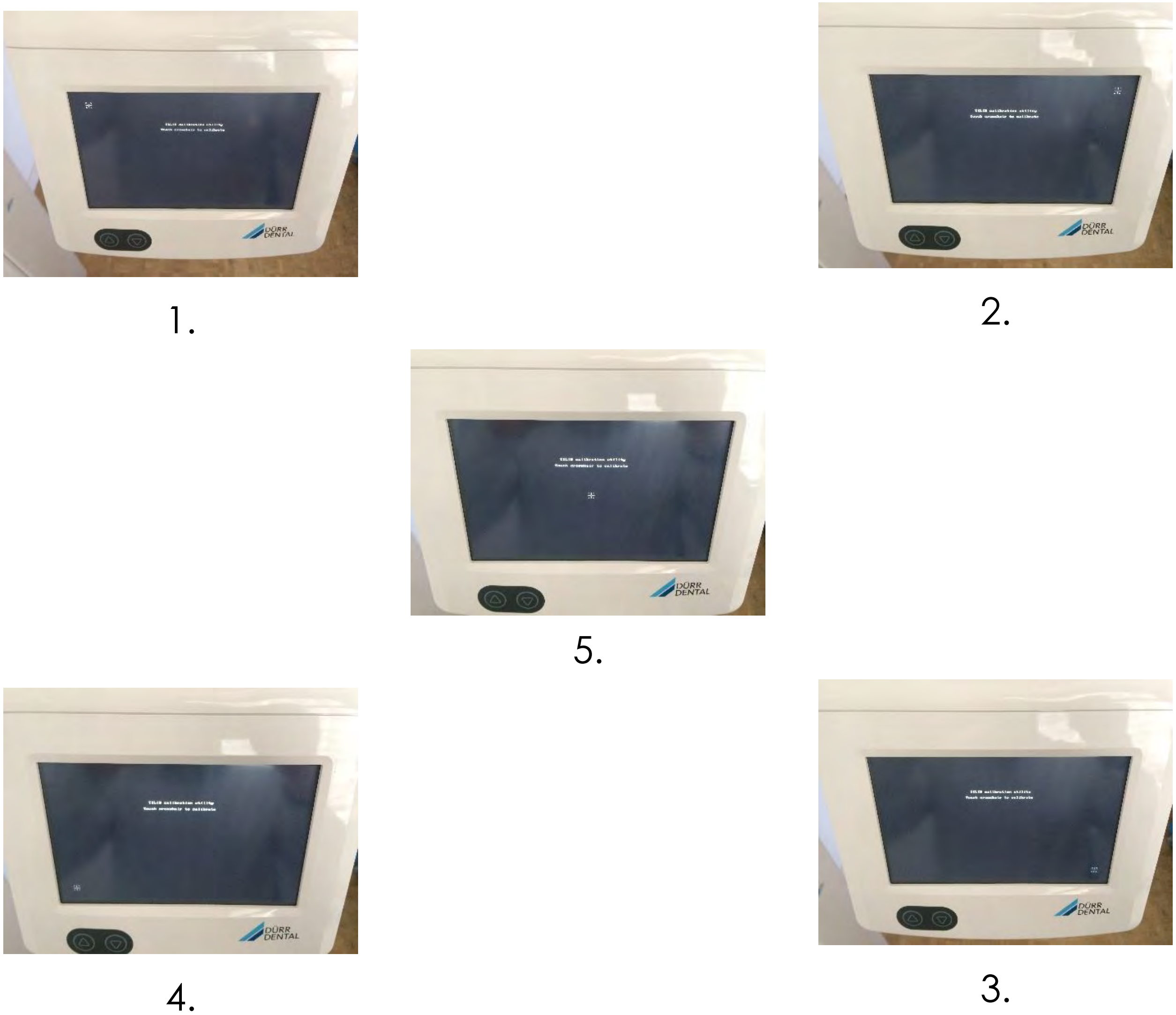
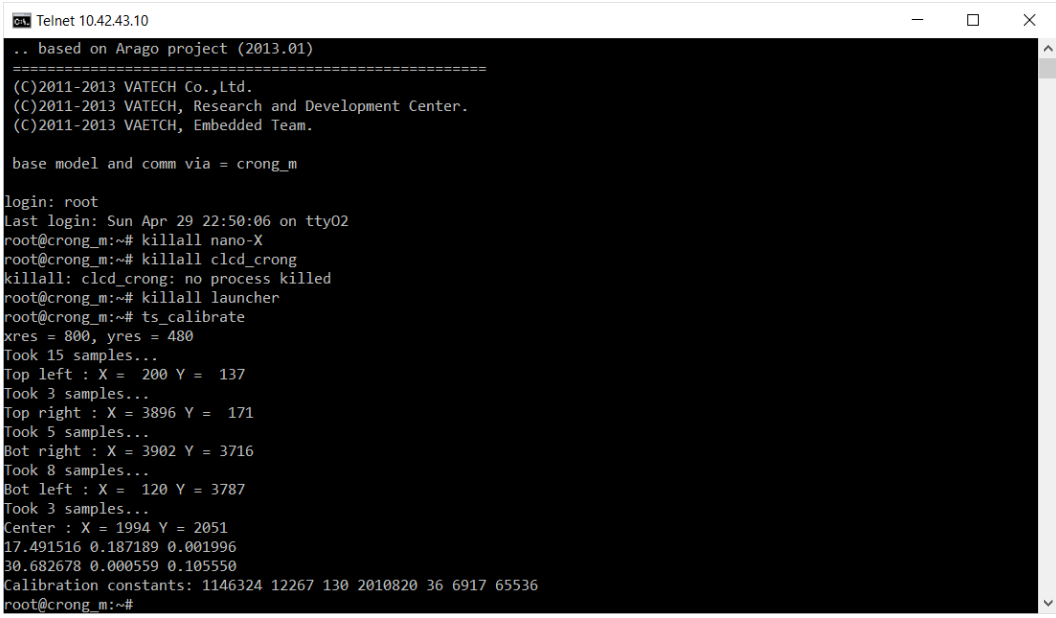


Fig. 193 Touch Display Calibration

9. The individual calibration results are displayed in the Telnet window



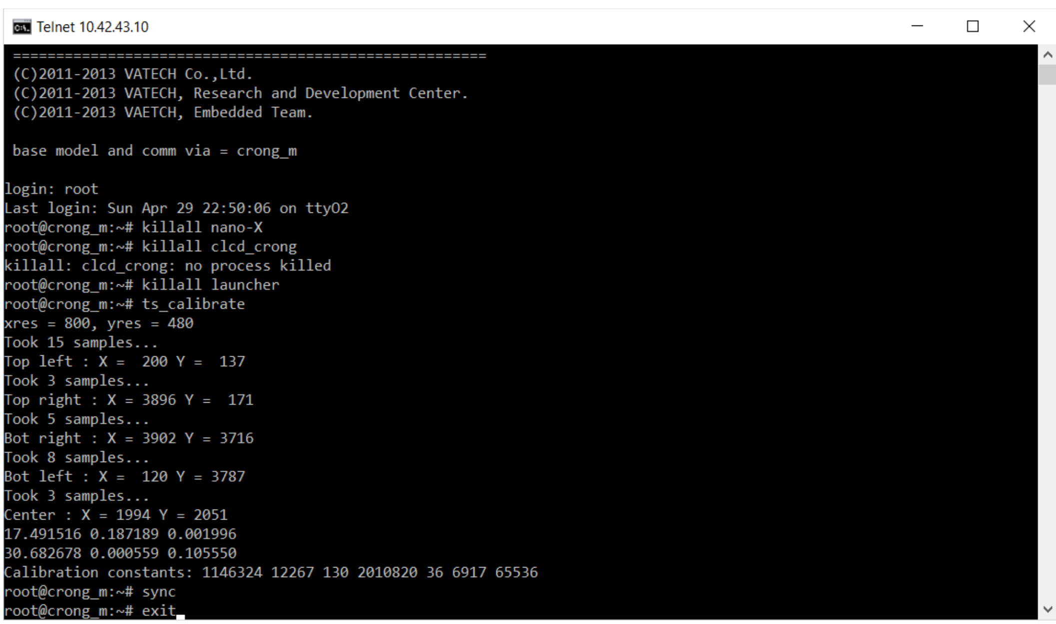
```
Telnet 10.42.43.10
 .. based on Arago project (2013.01)
 ======================================================
 (C)2011-2013 VATECH Co.,Ltd.
 (C)2011-2013 VATECH, Research and Development Center.
 (C)2011-2013 VAETCH, Embedded Team.

 base model and comm via = crong_m

login: root
Last login: Sun Apr 29 22:50:06 on tty02
root@crong_m:~# killall nano-X
root@crong_m:~# killall clcd_crong
killall: clcd_crong: no process killed
root@crong_m:~# killall launcher
root@crong_m:~# ts_calibrate
xres = 800, yres = 480
Took 15 samples...
Top left : X =  200 Y =  137
Took 3 samples...
Top right : X = 3896 Y =  171
Took 5 samples...
Bot right : X = 3902 Y = 3716
Took 8 samples...
Bot left : X =  120 Y = 3787
Took 3 samples...
Center : X = 1994 Y = 2051
17.491516 0.187189 0.001996
30.682678 0.000559 0.105550
Calibration constants: 1146324 12267 130 2010820 36 6917 65536
root@crong_m:~#
```

Fig. 194 Telnet connection – Calibration result

10. The sync command is used to transfer the results to the display electronics memory. Only with this step is the calibration completed
11. The connection to the device is disconnected via exit



```
Telnet 10.42.43.10
 ======================================================
 (C)2011-2013 VATECH Co.,Ltd.
 (C)2011-2013 VATECH, Research and Development Center.
 (C)2011-2013 VAETCH, Embedded Team.

 base model and comm via = crong_m

login: root
Last login: Sun Apr 29 22:50:06 on tty02
root@crong_m:~# killall nano-X
root@crong_m:~# killall clcd_crong
killall: clcd_crong: no process killed
root@crong_m:~# killall launcher
root@crong_m:~# ts_calibrate
xres = 800, yres = 480
Took 15 samples...
Top left : X =  200 Y =  137
Took 3 samples...
Top right : X = 3896 Y =  171
Took 5 samples...
Bot right : X = 3902 Y = 3716
Took 8 samples...
Bot left : X =  120 Y = 3787
Took 3 samples...
Center : X = 1994 Y = 2051
17.491516 0.187189 0.001996
30.682678 0.000559 0.105550
Calibration constants: 1146324 12267 130 2010820 36 6917 65536
root@crong_m:~# sync
root@crong_m:~# exit
```

Fig. 195 Telnet connection – Replay and Exit Calibration

12. The ProVecta S-Pan must be restarted afterwards

11.3 Possible solutions for problems relating to unit connections and data transmission

This section describes the processes for connecting units and for data transmission in detail to offer possible approaches to troubleshooting.

The content of this section is summarised in **Table 10 Flow chart for the image acquisition procedure** on page 159.

11.3.1 Establishing the hardware connection to ProVecta S-Pan

The ProVecta S-Pan unit has a fixed IP address 10.42.43.10 and is addressed via the port 20130. As soon as the ProVecta S-Pan has booted up it will respond to a ping. No software elements that are specific to Dürr Dental need to be installed on the computer for this.

If the ProVecta S-Pan does not respond to the ping, check that the following requirements are satisfied:

1. The computer has the IP address 10.42.43.x, where x is not 10.
2. The ProVecta S-Pan is directly connected to the computer (not via a switch).
3. The network cable between ProVecta S-Pan and the computer is the original cable or a cable as specified in section **1.3.3.2 Replacement** on page 13.
4. The firewall of the computer permits a ping (this can be tested by sending a ping to a different computer in the network).
5. Repeat the tests on a different computer that is connected to the ProVecta S-Pan.

If the cause cannot be found during this test then there is a defect. The following things should be done:

1. Check the internal cable connection between the socket and the CRONG board (cable: H000028A). Here, the network cable of the computer is plugged directly into the CRONG board (socket J9).
2. Save and then re-write the CRONG image (for more information refer to section **12.6 Performing an update of the CRONG image on the CRONG board** on page 201).
3. Replacement of the CRONG board

11.3.2 Establishing the software connection to ProVecta S-Pan

As soon as DBSWIN, VistaEasy or VistaSoft is installed the VistaPano InstallPackage will also be installed on the computer. This takes care of communications to the unit. As soon as VistaNetConfig or the unit configuration is opened in VistaSoft, a connection is established in the background to ProVecta S-Pan. The connection is successful once the status in of ProVecta S-Pan changes to active in VistaNetConfig or there is a tick next to *Connected* in VistaSoft.

If this is not the case then the following should be checked:

1. The points described in section **11.3.1 Establishing the hardware connection to ProVecta S-Pan** on page 180 have been checked.
2. VistaPano InstallPackage has been successfully installed on the system. If this is not the case, run a new installation or an update via the Dürr Dental software (for more information see section **2.1 ProVecta S-Pan** Installation Software
3. on page 18).
4. Check whether the file VersionInfo.txt exists under *C:\ProgramData\Duerr\VistaPano* (further information about VersionInfo.txt can be found in section **10.2 VersionInfo.txt** on page 161). This is automatically retrieved in the background from ProVecta S-Pan and transferred to the computer. If it is not present then the following should be checked:
    1. Is it possible to manually download VersionInfo.txt via the Calibration Downloader (for more information refer to section **5.4.1 Download (Calibration Downloader)** on page 104)?
    2. TCP port 20130 must be open in the firewall.
    3. Ensure that the energy saving option for the network card is disabled (for more information refer to section **Error! Reference source not found. Error! Reference urce not found.** on page **Error! Bookmark not defined.**).
    4. The file VersionInfo.txt is contained (along with other calibration data) on the microSD card of the CRONG board. It is not straightforward to check whether or not this file is present here, as the partition of the microSD card cannot be accessed. If the microSD card has been replaced it will be necessary to restore the calibration data via the Calibration Uploader. To do this, call up the Calibration Uploader and enable all available content under *Select File* (details about this can be found in section **5.4.2 Upload (Calibration Uploader)** on page 106).
5. If all of the above steps are unsuccessful then the CRONG board should be replaced.

11.3.3 Preparations for image acquisition

As soon as an image acquisition is started via DBSWIN, VistaEasy or VistaSoft, the next communication takes place with the ProVecta S-Pan. Here, the file VersionInfo.txt mentioned in section **11.3.2 Establishing the software connection to ProVecta S-Pan** on page 181 is transferred to the computer. The data for the sensor calibration are included as well. The computer in turn transmits patient data to the ProVecta S-Pan.

This is done again via the Calibration Downloader and VistaPano.exe. Both elements are part of the VistaPano InstallPackage. Provided the sensor calibration has been successfully transferred, the sensor files will be stored in the following directory:

C:\ProgramData\Duerr\VistaPano\Acquisition\[Ceph_Fast or Pano or Ceph_Norm]\CAL

This directory contains 7 Raw files for each sensor. If this is not the case, then either the download of the calibration data was unsuccessful or the sensor calibration is not complete. The Calibration Download should be performed manually for the sensor calibration as described in section **11.3.2 Establishing the software connection to ProVecta S-Pan** on page 181. Renewed installation of the sensor calibration is described under **4.1 Sensor calibration** on page 37.

If after the download and renewed sensor calibration (including upload) none or not all of the data for the sensor calibration is available, then the microSD card on the CRONG board should be replaced, and the data should then be restored via the Calibration Downloader. If this still fails to resolve the fault then the CRONG board should be replaced.

11.3.4 Acquisition of the image

During image acquisition the raw data from the sensor is transferred to the computer. The data is saved in the following directory:

C:\ProgramData\Duerr\VistaPano\Acquisition\[Ceph_Fast or Pano or Ceph_Norm]\PAN\PROJ

After successful reconstruction the data is not removed from the directory. It is not overwritten until the next image acquisition. Part of the content in the *PROJ* directory can be deleted.

11.3.5 Reconstruction of the image

Reconstruction of the image data starts as soon as all of the raw data has been transferred. This can be divided into two parts:

1. Generation of the capture.raw file (and ampt.raw file for S-Pan images) through evaluation of the PROJ directory.
2. Generation of the DCM files taking into account the reconstruction parameters (ZeusPan2.ini and ZeusCeph.ini) from the files capture.raw (and ampt.raw for S-Pan images).

As the first step, the capture.raw or ampt.raw file is saved under the following path:

C:\ProgramData\Duerr\VistaPano\Acquisition\[Ceph_Fast or Pano or Ceph_Norm]\PAN

In the second step the effective DCM files are saved. These image files are the final result, which are then in turn sent to the relevant X-ray program. The DCM files are saved in the following directory:

C:\ProgramData\Duerr\images

2 or 4 DCM images are saved for every image. 2 DCM files are saved for all ceph modes and for a panorama image in standard mode. 4 DCM images are saved for an S-Pan image. Ultimately only one of the images is transferred to the X-ray program.

Layout and content of the DCM files:

- DCM[date+time]_org_proc.dcm (standard image)
- DCM[date+time]_org_raw.dcm (standard image as raw image)
- DCM[date+time]_proc.dcm (S-Pan image)
- DCM[date+time]_raw.dcm (S-Pan image as raw image)

Note: If it has been set up in VistaNetConfig or in the VistaSoft settings that S-Pan images are not automatically transferred, then the operator will be shown 2 of the 4 DCM images (*proc.dcm and *raw.dcm). The operator then needs to choose one of the two images.

If problems occur during saving of the Raw and DCM image then check the following:

- Does the user have the necessary rights for deleting and creating data in the stated directories?
- Have the reconstruction files been manipulated (in particular ZeusPano2.ini and CeusCeph.ini)?

If the problem with the reconstruction persists, perform a backup and then update or reinstall the VistaPano InstallPackage (see **2.1 ProVecta S-Pan** Installation Software on page 18).

11.3.6 Poor image quality

The criteria for optimum representation of an X-ray image are highly subjective. Different operators often interpret the image quality differently. As a general rule, the first step is to ensure optimum image quality from a technical point of view before then adjusting the reconstruction parameters in the second step.

11.3.6.1 Images display high noise levels

Situation: High levels of noise can be seen on the patient images.

Approach:

1. Check the collimator position (see section **4.2 Collimator calibration (Collimator Alignment)** on page 50).
2. Check the patient dose used.
3. Perform a sensor calibration (for more information refer to section **4.1 Sensor calibration** on page 37).

11.3.6.2 Horizontal stripes in the images

Situation: Horizontal stripes can be seen on the patient images.

Approach: This cannot be checked with an open-air image acquisition or a phantom/test body image acquisition without absorber. The check requires an absorber with 1.8 mm copper.

1. Perform a sensor calibration (for more information refer to section **4.1 Sensor calibration** on page 37).
2. In the case of the ceph unit, check the reconstruction parameters of the ceph unit (for more information see section **8 DDIPS software** on page 135).

11.3.6.3 Images washed out or too sharply in focus (with possible formation of artifacts)

Situation: Contrasts cannot be made out clearly enough on the patient images. The contrasts are too sharp, or there is pronounced formation of artifacts at the edges of metallic objects.

Approach:

1. Follow the points in section **11.3.6.1 Images display high noise levels** on page 184.
2. Check the reconstruction parameters with the aid of the DDIPS software and adjust them if required (see section **8 DDIPS software** on page 135).

11.4 Resetting the sensor

If there are repeated problems connecting to ProVecta S-Pan (i.e. it is impossible to start the image acquisition) or the image quality is poor despite calibration of the collimator and sensor (this refers to horizontal blocks or lines within the patient image) then a reset of the sensor should be performed.

Attention: Resetting the sensor is a critical intervention in the system and should only be carried out when instructed by the DÜRR Dental service department!

After a successful reset of the sensor, the calibration of the sensor will need to be performed again.

11.4.1 Procedure

Before you can reset the sensor you will first need to remove the housing parts at the sensor.

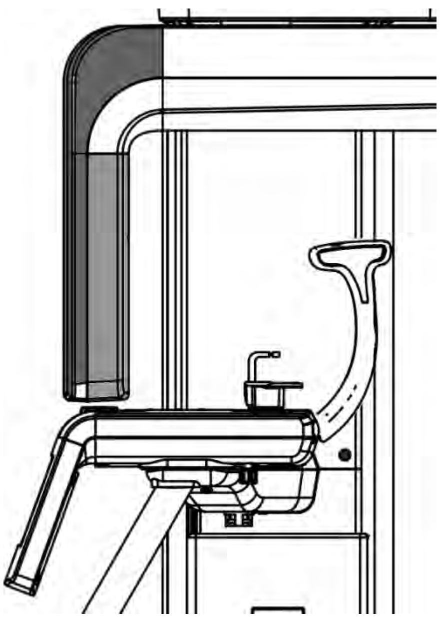


Fig. 196 Removal of the housing parts from the sensor

Afterwards the sensor needs to be activated. This is done either by starting an image acquisition or (if it is not possible to start an image acquisition) via commands.

11.4.1.1 Activating and resetting the sensor via image acquisition

Independently of the X-ray software used to operate the ProVecta S-Pan, during a typical image acquisition the sensor activates immediately before the system is ready to take an image. The following steps need to be performed:

1. Start any panorama or ceph image acquisition in the software (patient name, dose parameters and mode are irrelevant).

2. Confirm readiness for image acquisition on the touchscreen.
3. Wait until the status LED of the ProVecta S-Pan changes from blue to green.

As soon as the status LED changes to green the sensor can be reset. For this purpose there is a small push button on the sensor that can be depressed with a small screwdriver. In order to reset the sensor this push button needs to be pressed for around 5 seconds.

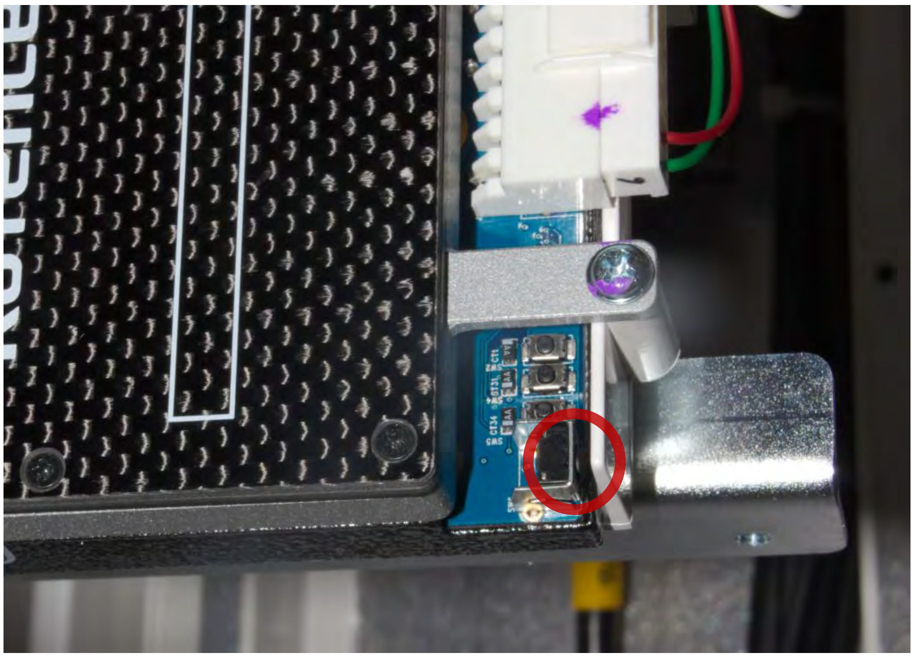


Fig. 197 Resetting the sensor

The ProVecta S-Pan will not show any response to the sensor being reset. Cancel the image acquisition after performing the reset. The existing sensor calibration will now be invalid. Sensor calibration will need to be repeated immediately and then uploaded to the ProVecta S-Pan. For more information see section **4.1 Sensor calibration** on page 37.

11.4.1.2 Activating and resetting the sensor via commands

In order to activate the sensor via commands it is merely necessary to switch on ProVecta S-Pan and successfully connect it to the computer. As described in section **7 Command window in the AISU software** on page 130, ProVecta S-Pan should be controlled with the aid of the AISU software via the *Command Window*.

Send the following commands to ProVecta S-Pan:
1. [SPM_PANO]
2. [SPM_CPON]

In order to subsequently reset the sensor, there is a small push button on the sensor that can be depressed with a small screwdriver. In order to reset the sensor this push button needs to be pressed for around 5 seconds.

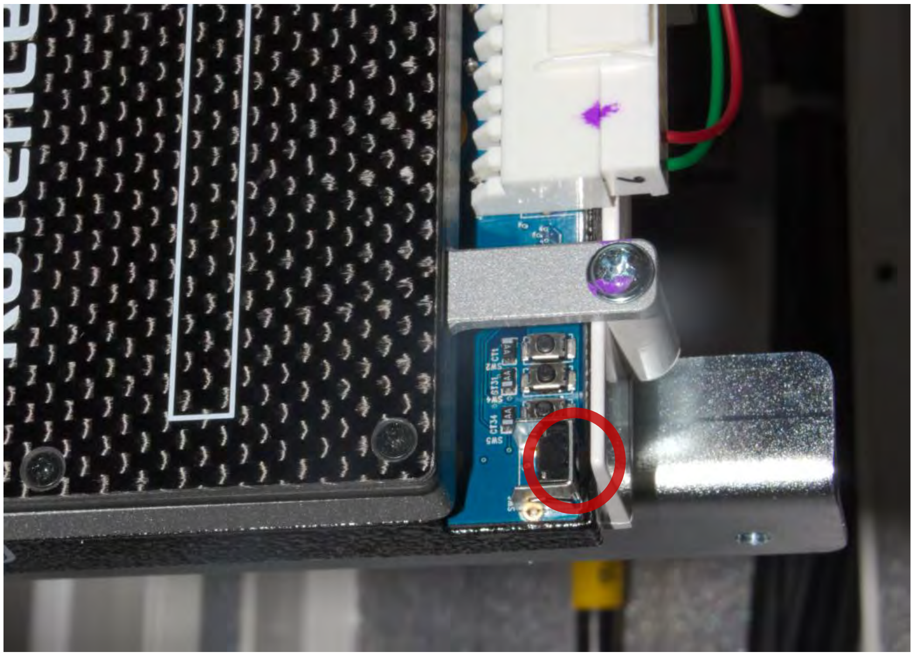


Fig. 198 Resetting the sensor

The ProVecta S-Pan will not show any response itself to the sensor being reset. Deactivate the sensor again after the reset. This is done via the following command:

[SPM_CPOF]

The existing sensor calibration will now be invalid. Sensor calibration will need to be repeated immediately and then uploaded to the ProVecta S-Pan.

11.5 Deactivating the energy saving option for the network card ⏻

If the energy saving option of the network card is active, then the situation may arise that the computer is unable to establish communications with the unit. For this reason, we generally recommend disabling the energy saving option for the network card. The screenshots below show how this is done from *Control Panel > Network and Sharing Center*.

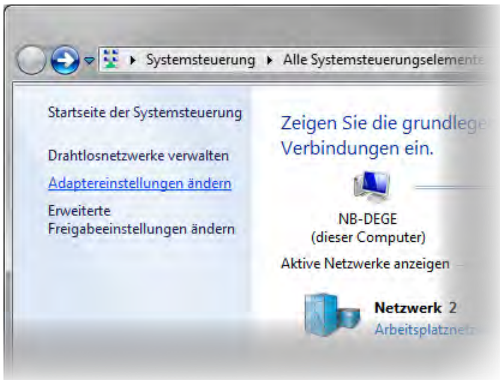


Fig. 199 Changing the adapter settings under Network and Sharing Center

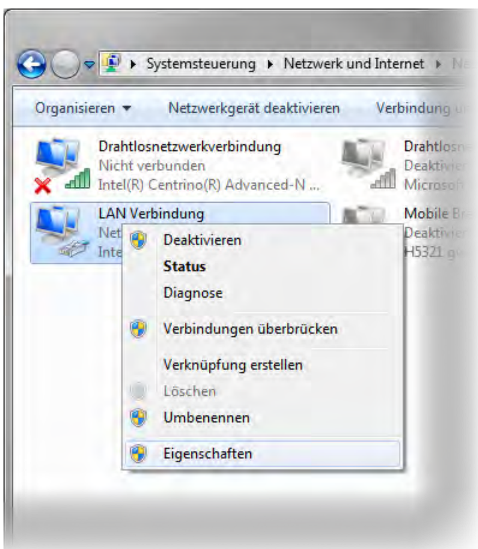


Fig. 200 Right-clicking on the corresponding LAN connection > Properties

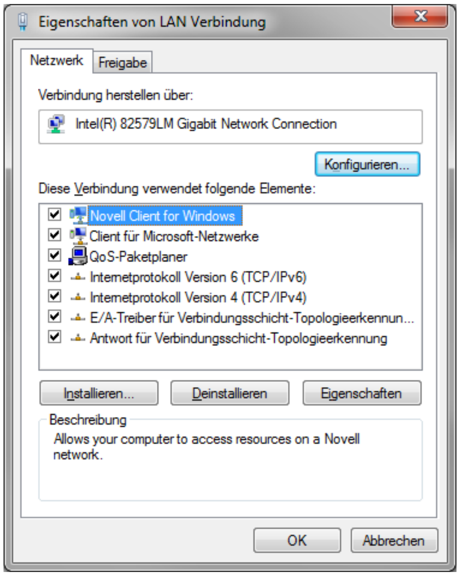


Fig. 201 Calling up the network card configuration

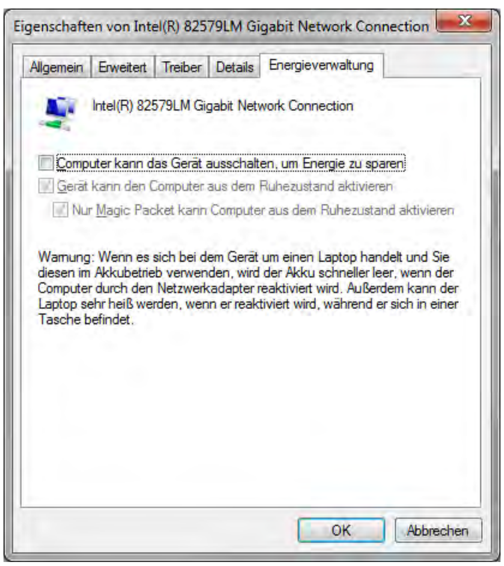


Fig. 202 Deactivating the energy saving option

11.6 Replacing components with a registered serial number

If you need to replace a component of the ProVecta S-Pan that has been registered within the unit with a serial number, then the new serial number needs to be communicated to the unit. If this registration does not take place after a replacement, no direct malfunction is to be expected. However, the assignment of serial numbers for log files, acceptance tests etc. will not tally with the overall system.

The following components are registered with a serial number within the unit:

- CRONG board
- MCU board
- Panorama sensor
- (Ceph sensor)
- X-ray tube
- Generator board

The stated points with the previous serial number can be found in the file C:\ProgramData\Duerr\VistaPano\VersionInfo.txt in the area *[HARDWARE_VERSION]*:

- *CRONGBoardSN=[SN]*
- *MCUBoardSN=[SN]*
- *SensorSN=[SN]*
- *(CephSensorSN=[SN])*
- *TubeSN=[SN]*
- *GeneratorSN=[SN]*

The relevant entry should be corrected with the new serial number.

Afterwards the revised file VersionInfo.txt needs to be uploaded to ProVecta S-Pan. This is done via the Calibration Uploader with the active option *VersionInfo File* (see section **5.4.2 Upload (Calibration Uploader)** on page 106).

Note: For details about file **VersionInfo.txt** refer to section **10.2 VersionInfo.txt** on page 161.

11.7 Check high voltage (kV)

To measure and check the high voltage on a panoramic system with a dose meter is possible, but in principle made difficult. That is because the panoramic machine change the high voltage during the acquisition (the ProVecta S-Pan increased the high voltage at the spine are around 20%).

If the dose meter is not able to display the hole exposure time as a graph and tell the effective kV, the following procedure will show an alternative measurement procedure. At this the kV and mA settings for the tube will set to a fix value and the c-arm will not move around.

11.7.1 Measurement procedure

1. The dose meter probe needs to be positioned on the front of the ProVecta S-Pan detector at that way that the active are of the dose meter probe is inside the marked area of the detector.

Fig. 203 Messsonde an Detektor positionieren

2. The computer must be connected with the ProVecta S-Pan and the device is on.
3. All holders and patient positioning tools must be removed from the device.
   Note: Depending on specifications of the dose meter, could it needed to use an absorber (e.g. 0,8 mm cupper) on the tube.
4. With the AISU software open the command window (see chapter **7.1 Open command window** on page 130).
5. Using the following commands set (as an example) the tube to 72 kV and 10 mA:
   - *[SPM_PANO]*
   - *[SPM_HV___0720]*
   - *[SPM_HA___1000]*
6. With the command *[SPM_TUTS]* the device will be disable the movement and start the tube test.
7. The tube will put out the radiation by pressing the exposure switch. The Command window will show during the exposure alternately the kV and mA values. The radiation will stop by releasing the exposure switch (for a kV measurement are ~ 5 sec. exposure recommended).
8. Subsequently the result can be read out from the dose meter.

Note: Section **0 Check high voltage (kV)** on page 226 contains a checklist bout the procedure.

12 Firmware updates

ProVecta S-Pan (just like ProVecta S-Pan Ceph) has two software modules that can be updated. These are:

- The unit firmware, which is located on the MCU board
- The control software (referred to in the following as the CRONG image) for the touchscreen and the IT data processing, which is located on the CRONG board

Caution: A firmware update represents a major intervention in the system. It should not be performed without good cause or by anyone who lacks the necessary background knowledge.

In general, we recommend updating both software modules via a direct connection. Please ask the Service department of Dürr Dental for information about which versions are compatible with each other.

The update should be coordinated and performed with the Service department of Dürr Dental.

Updated firmware versions often also require the VistaPano InstallPackage to be updated to a compatible version (for more information see section **2.1 ProVecta S-Pan** Installation Software

The compatible version number of the VistaPano InstallPackage should be requested from the Service department of Dürr Dental.

Before performing the update, backup the unit data (for more information refer to section **12.4 Backing up** on page 197). Likewise, the previous versions should also be available so that the original status can be restored.

Note: Section **16.8 Firmware updates** on page 223 contains a checklist for performing the firmware update.

12.1 Requirements for a firmware update

The following requirements must be met for the update of the MCU firmware:

- A computer that has been successfully set up for ProVecta S-Pan must be connected to the ProVecta S-Pan.
- The ProVecta S-Pan must be switched on.
- The program file CRONG_updater.exe must be located on the computer (this can be obtained via the Dürr Dental Service department).

- The firmware file in the form of a *.mot file must be ready on the computer (this can be obtained via the Dürr Dental Service department).

The following requirements must be satisfied in order to update the CRONG image on the CRONG board:

- ProVecta S-Pan must be switched off.
- The microSD card of the CRONG board (not to be confused with the microSD card of the MCU board – see section **6.2 CRONG board** on page 110) must be taken out and connected to a computer.
- The program *USB Image Tool* must be located on the computer (this can be obtained via the Dürr Dental Service department).
- The CRONG image in the form of a *.img file must be ready on the computer (this can be obtained via the Dürr Dental Service department).

12.2 Checking the version of the firmware of the MCU board

The current status of the firmware on the MCU board can be checked via the *Command Window* within the AISU software. This is done with the following command:

[SPM_PVER]

(For information about execution and application of *Command Window* see section **7 Command window in the AISU software** on page 130).

The output list of unit data contains the installed firmware version number as its first entry:

<===== P axis B'd (VistaPano) =====>
Version : x.xx.xx
<=========================>

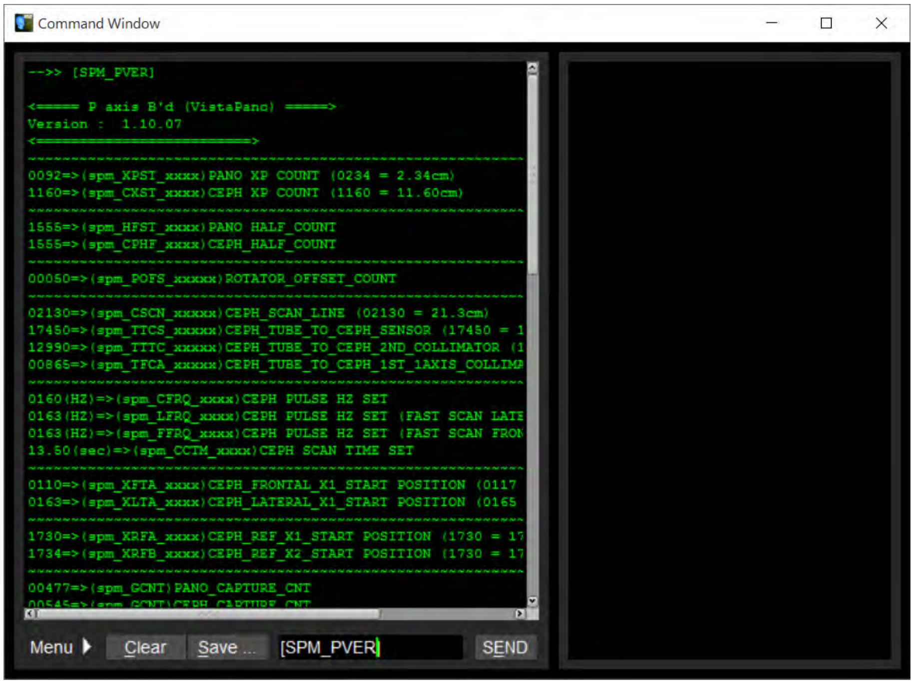


Fig. 204 Unit parameter output via SPM_PVER

Note: In theory, a quicker method for checking the firmware version is to check the file VersionInfo.txt (for more information refer to section **10.2 VersionInfo.txt** on page 161). However, it is important to note that the version indicated there may not necessarily be up to date. This would be the case if a firmware update had already been uploaded in the past without making the corresponding changes to the file VersionInfo.txt (this step is described in section **12.7 Updating changed version numbers in VersionInfo.txt** on page 207).

12.3 Checking the version of the CRONG image on the CRONG board

The version of the CRONG image on the CRONG board can be read off from the touchscreen of the ProVecta S-Pan.

The version is output at the upper edge of the screen when the settings are activated on the touchscreen.

version x.x.x.x (EMBEDDED)

Fig. 205 Settings on the touchscreen

Note: In theory, a quicker method for checking the CRONG image version is to check the file VersionInfo.txt (for more information refer to section **10.2 VersionInfo.txt** on page 161). However, it is important to note that the version indicated there may not necessarily be up to date. This would be the case if an update of the CRONG image had already been uploaded in the past without making the corresponding changes to the file VersionInfo.txt (this step is described in section **12.7 Updating changed version numbers in VersionInfo.txt** on page 207).

12.4 Backing up unit data before the firmware update

Make sure that the following unit data is backed up before you update the software:

- All of the elements of the *Calibration Downloader* listed under *Select File* (for more information see section **5.4.1 Download (Calibration Downloader)** on page 104).
- We recommend backing up the content of the entire directory C:\ProgramData\Duerr\VistaPano after the download.
- All of the MCU unit data via the backup function of the *AISU software* (for more information refer to section **5.1.1 Backing up the MCU parameters** on page 99) or alternatively via the *Command Windows* within the *AISU software* with the command [SPM_PVER] (for more information refer to section **7.2.1 Unit parameter output** on page 132).

12.5 Performing firmware updates for the MCU board

The software *CRONG_updater.exe* establishes (via the CRONG board) a connection to the MCU board and overwrites the firmware there later in the process.

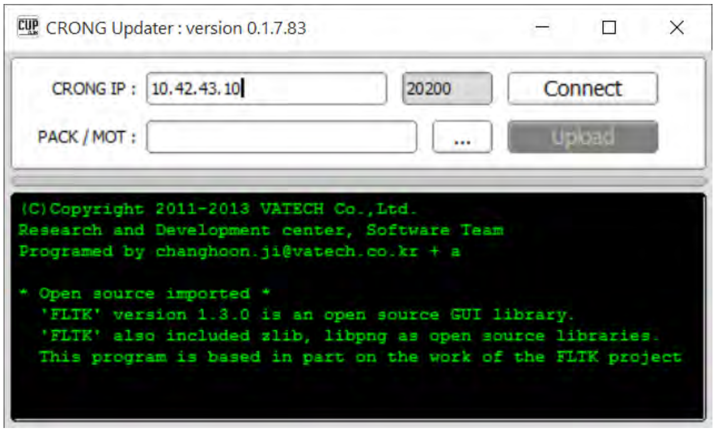


Fig. 206 CRONG updater

Connect is used to establish a connection to ProVecta S-Pan.

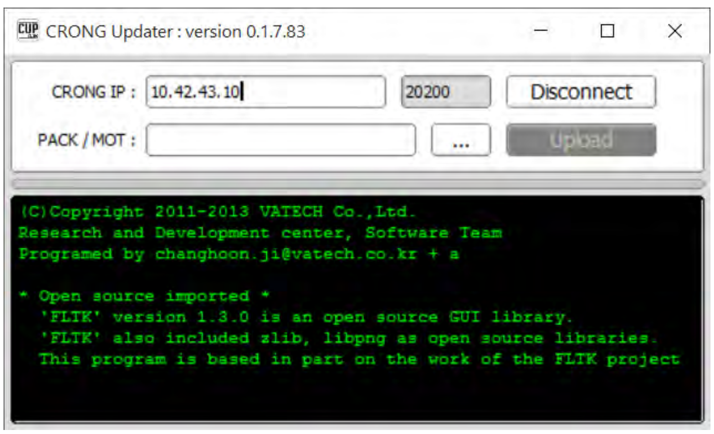


Fig. 207 Connection established

Click on "..." to specify the location in which the *.mot file is saved. In addition, the file type needs to be corrected from *PACK FILE* to *MOT FILE*.

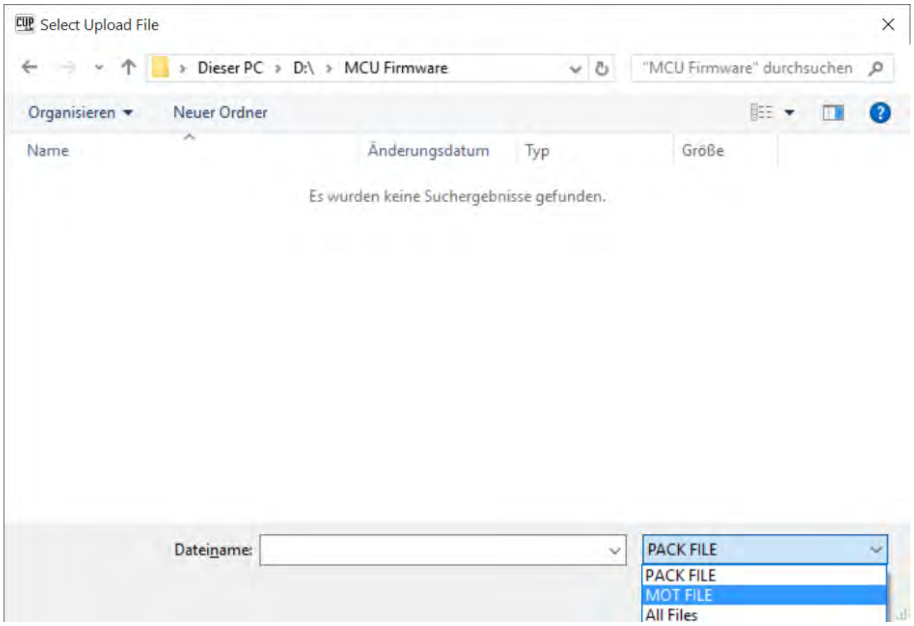


Fig. 208 Specifying the location and changing the file type

Select the required firmware file.

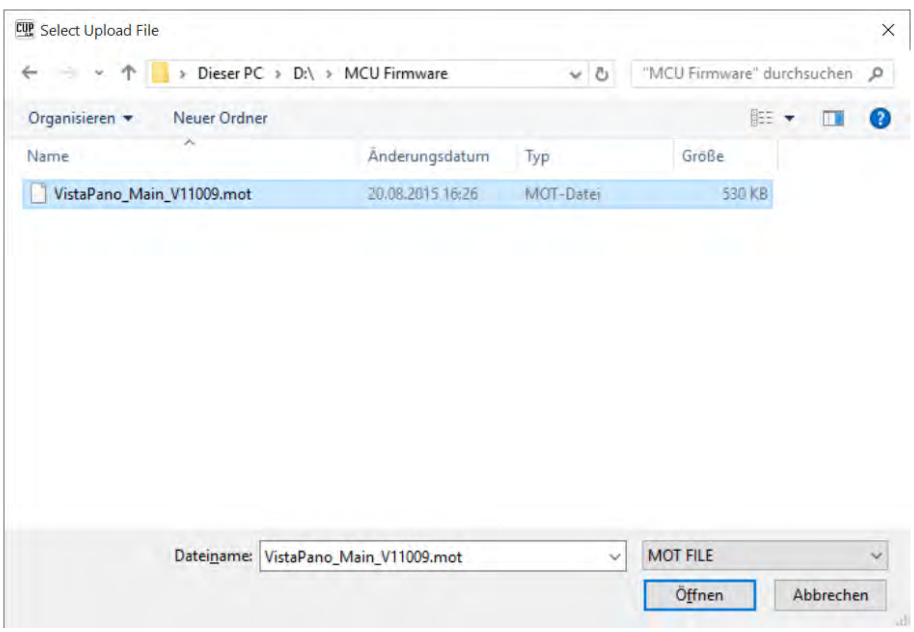


Fig. 209 Selecting the file

Acknowledge the warning prompt.

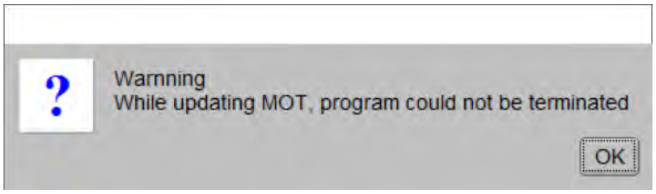


Fig. 210 Firmware update warning

Click *Upload* to confirm the update.

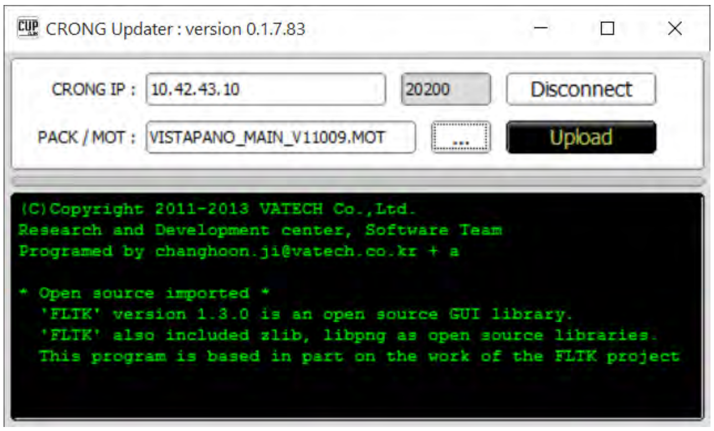


Fig. 211 Starting the firmware update

The firmware update can take up to 5 minutes. A green loading bar indicates the progress of the update.

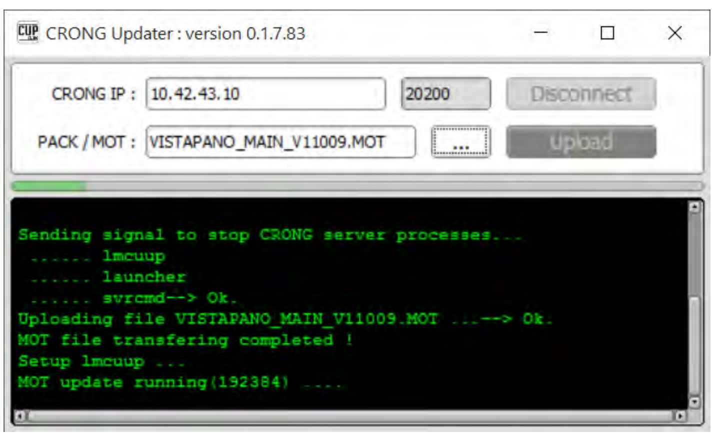


Fig. 212 Firmware update status

If even after several minutes the CRONG Updater fails to show the start of the green loading bar, close the software and repeat the steps.

Once the update has been successfully completed the following message is displayed: *MOT update running done : Progress completed*.

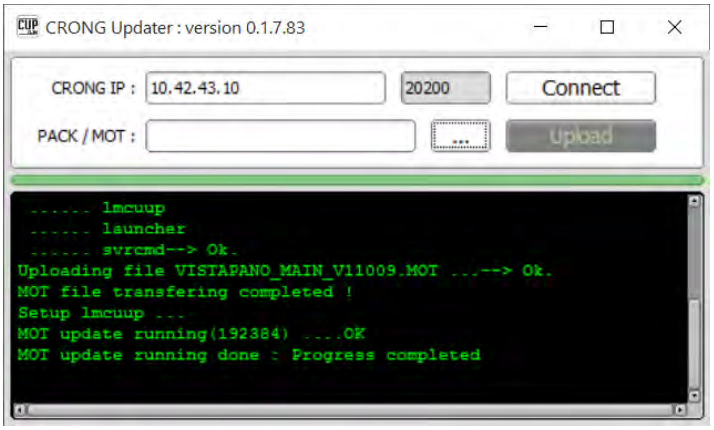


Fig. 213 Firmware update successfully completed

ProVecta S-Pan then automatically restarts the firmware . However, ProVecta S-Pan needs to be switched off and restarted in order to activate the changes.

After a successful update of the MCU firmware it is not necessary to restore the parameters for the MCU board. However, we do recommend that the parameters are checked (e.g collimator position).

12.6 Performing an update of the CRONG image on the CRONG board

When the CRONG image is updated, the program *USB Image Tool* also overwrites the entire content of the microSD card. The unit data saved here (such as the sensor calibration data or the file VersionInfo.txt) is also included. Therefore, once the image has been successfully overwritten the data will need to be restored with the aid of the *Calibration Uploader*.

The software *USB Image Tool* is called up by running *USB Image Tool.exe*.

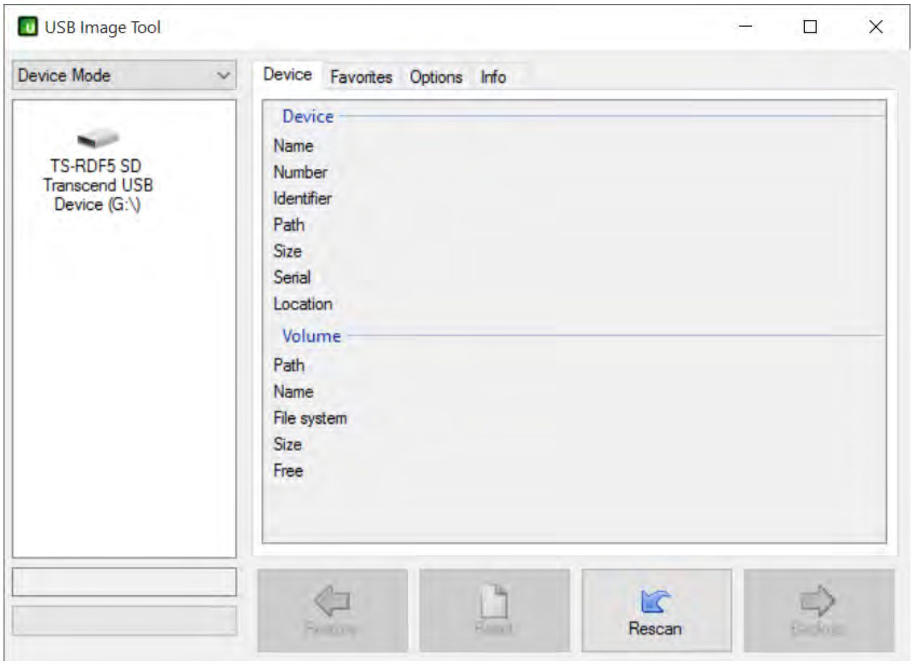


Fig. 214 USB Image Tool

On the left-hand side select the reader unit that will be used to activate the microSD card on the computer.

Then the unit data of the reader unit and of the microSD card are displayed. At the moment, microSD cards with a capacity of 2 GB and 4 GB are used. The same Image should be applied for both.

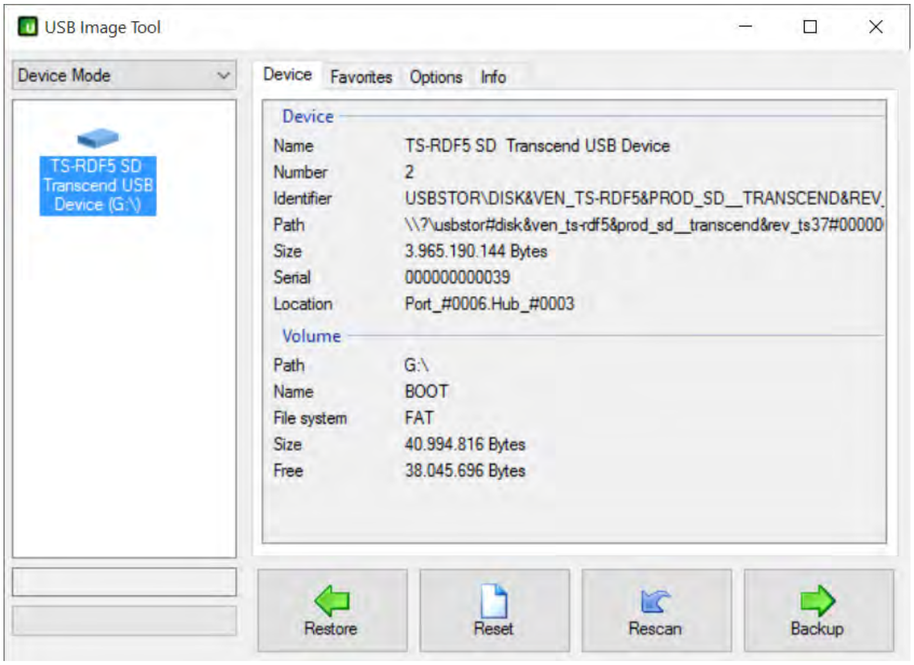


Fig. 215 Selection of the unit in USB Image Tool

Select the options shown below in the *Options* tab.

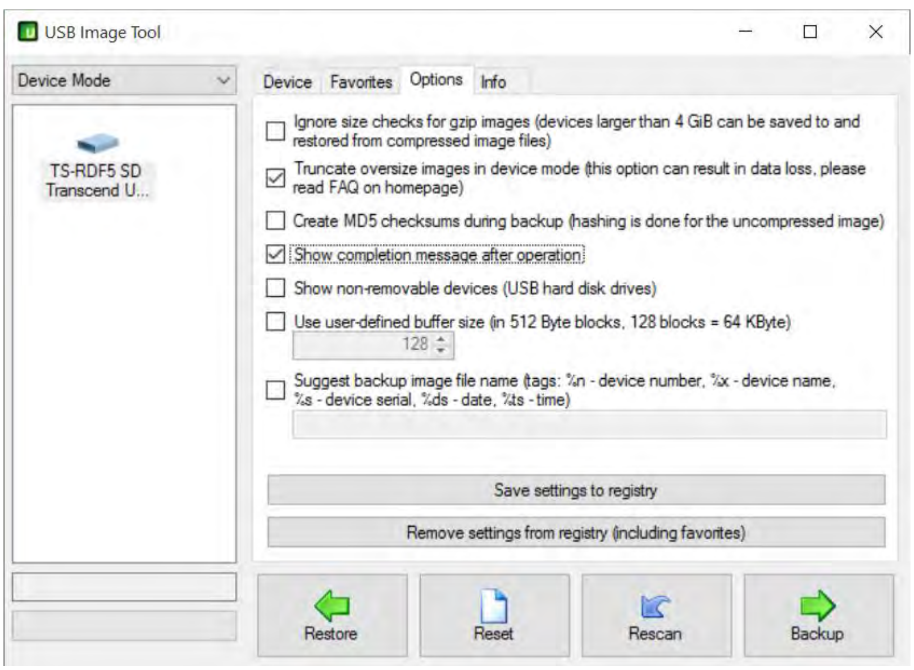


Fig. 216 Selection of options in USB Image Tool

With the aid of the *Backup* function it is possible to create an image from the previous content of the microSD card. This is strongly recommended before copying a new image. A location and a file name need to be specified for this.

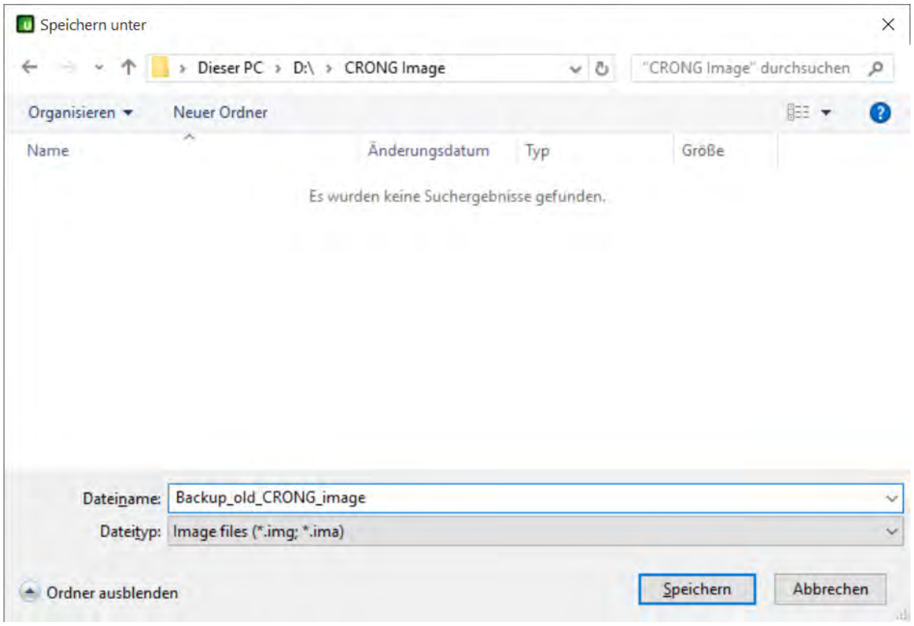


Fig. 217 Definition of the save location and file name for saving the CRONG image

Click *Save* to create the image. The status is displayed.

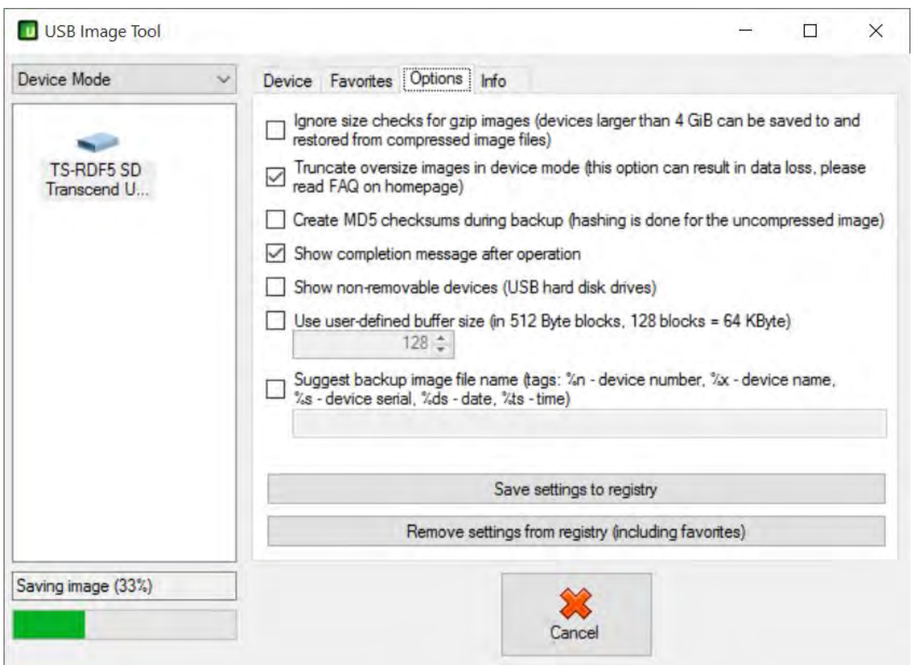


Fig. 218 Image save status

After a successful backup the following message is displayed.

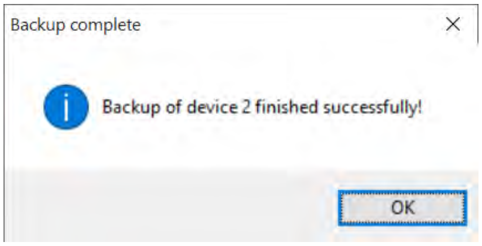


Fig. 219 Backup successfully completed

The actual update is performed via the function *Restore*. A window opens in which the location and file name of the new CRONG image can be specified.

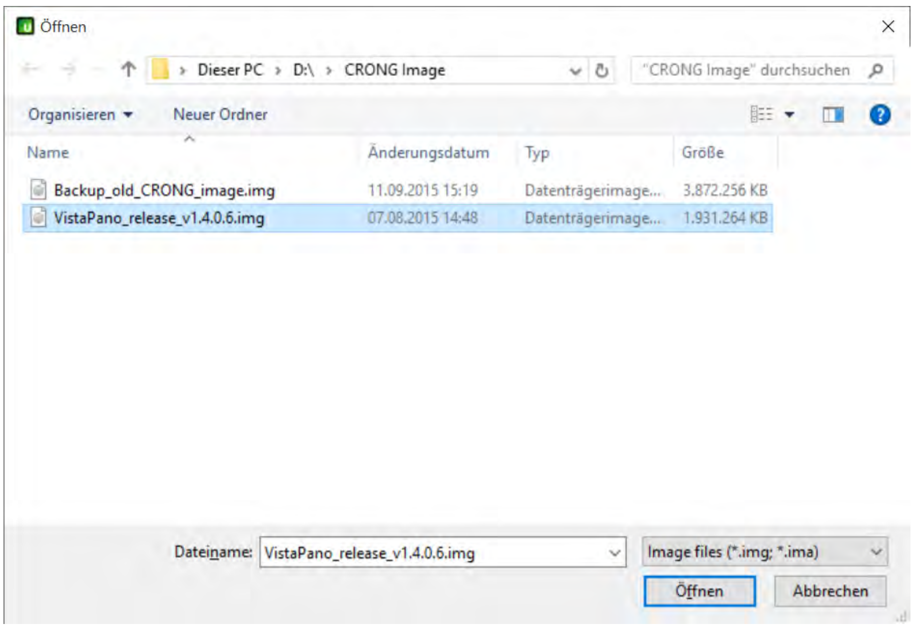


Fig. 220 Location and file name for the new CRONG image

When you click *Open* a prompt will appear to check that you want to restore the image.

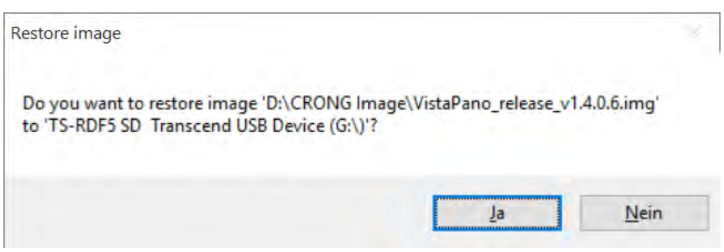


Fig. 221 Safety prompt before restoring the image

If you click "Yes" the data on the microSD card will be overwritten. Here again, the status is shown in the main window.

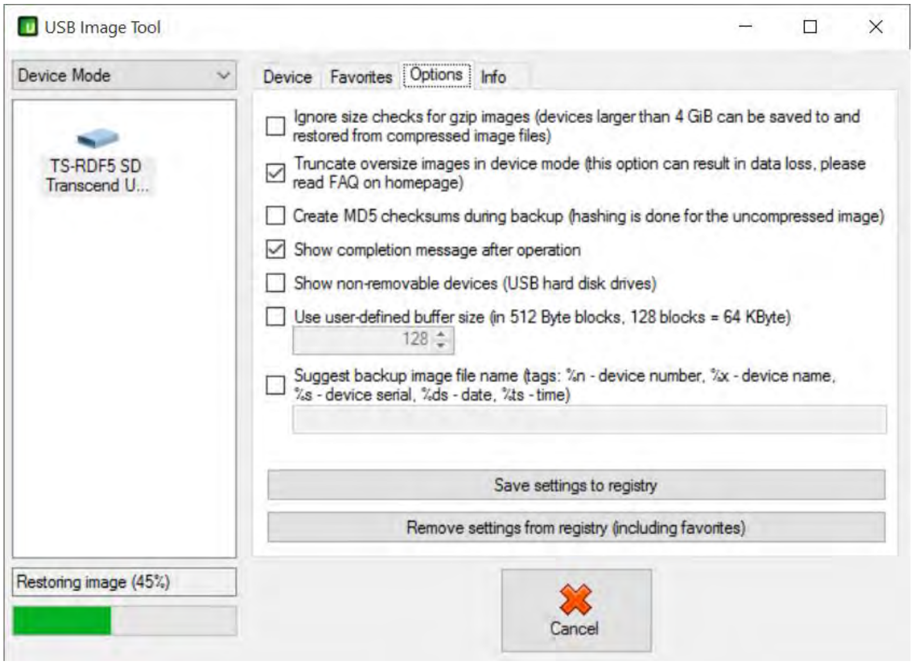


Fig. 222 Status of the image update

The software confirms that the image has been successfully saved.

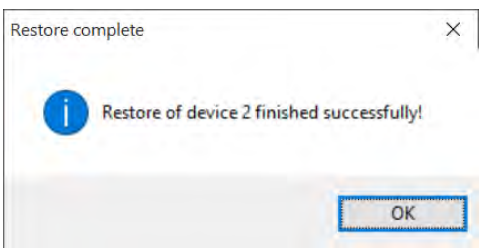


Fig. 223 Image save successfully completed

Afterwards the microSD card needs to be installed in the CRONG board of the ProVecta S-Pan again. After starting the unit you will already be able to see the new version number when you switch to the settings (for more information see section **12.3 Checking the version of the CRONG image on the CRONG board** on page 196).

After this the unit data that was previously saved on the microSD card and backed up by the *Calibration Downloader* needs to be restored. To restore this data, call up the *Calibration Uploader* and enable all available content under *Select File* (details about this can be found in section **5.4.2 Upload (Calibration Uploader)** on page 106).

Caution: The *Calibration Uploader* should be called directly (C:\Program Files (x86)\Duerr\VistaPano\Util\Calibration Uploader.exe) or via the shortcut within the Service tab of the *AISU Software*.

Starting up VistaConfig could cause the local file VersionInfo.txt on the computer to be deleted, as VistaConfig compares the unit data of the ProVecta S-Pan with those of the computer during initialisation. However, once the image has been saved this data will no longer be available on the ProVecta S-Pan or it will not tally with the system. Therefore, it is best practice to start the AISU software manually and not via VistaConfig.

12.7 Updating changed version numbers in VersionInfo.txt

After a successful update of the MCU firmware and/or the CRONG image the file VersionInfo.txt should be corrected with the changed versions. This is done via the software *VP VER REF*. To launch the software, go to:

C:\Program Files (x86)\Duerr\VistaPano\Util\vpverefrsh.exe

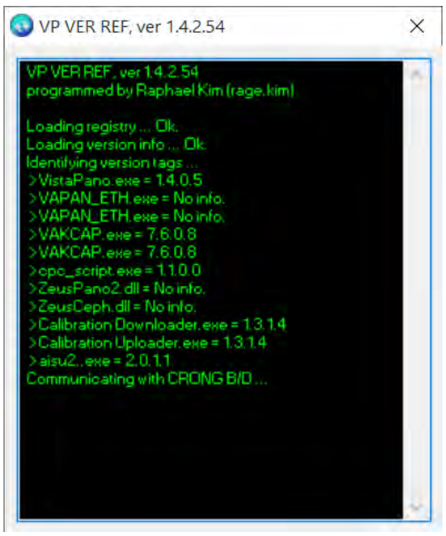


Fig. 224 Running VP VER REF

The software will close itself once it has been executed. Afterwards the file VersionInfo.txt on the computer will have been updated with the correct version numbers. This file should then be transferred via the *Calibration Uploader* to the ProVecta S-Pan (for more details refer to section **5.4.2 Upload (Calibration Uploader)** on page 106). Here, under *Select File* the item *VersionInfo File* needs to be selected.

12.8 System test after a firmware update

After a successful update and restore of the parameters the ProVecta S-Pan needs to be restarted.

A comprehensive system test is required in order to ensure full functioning capability. Afterwards the created backups can be removed.

13 Installing and activating Simulation mode

The Simulation mode allows simulation of the ProVecta S-Pan in the imaging software. Here, the X-ray software reacts in the same way as it would during proper operation, but instead of a real ProVecta S-Pan it communicates with the simulation software. The software receives all queries and responds to them in similar fashion to a real ProVecta S-Pan.

13.1 Installation

Before it can be used, the simulation software needs to be installed on the computer beforehand. It can be found in the DownloadCenter at DuerrDental.NET.

The download includes a ZIP file with the following content (version 1.4.0.5):

- Installation instructions
- Additional Files.zip
- LCD-Simulator Software.zip

The content of *Additional Files.zip* must be unpacked as follows.

Files from archive…	Unpack to…
Acquisition\Ceph_Fast\CAL*	C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Fast\CAL*
Acquisition\Ceph_Norm\CAL*	C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Norm\CAL*
Acquisition\Pano\CAL*	C:\ProgramData\Duerr\VistaPano\ Acquisition\Pano\CAL*
SettingFiles\Environment.ini	C:\ProgramData\Duerr\VistaPano\SettingFiles\Environment.ini
VersionInfo.txt	C:\ProgramData\Duerr\VistaPano\ VersionInfo.txt

Table 11 Unpacking Additional Files.zip

Note: We recommend backing up the entire directory C:\ProgramData\Duerr\VistaPano\ before the copying process.

As long as the content from *Additional Files.zip* is present in the stated directories the X-ray software will keep trying to address the simulation software and will not communicate with a ProVecta S-Pan unit that may be connected.

The content of *LCD Simulation Software.zip* can be unpacked to any location. It contains the actual simulation software, which is then opened by running *clcdc.exe*.

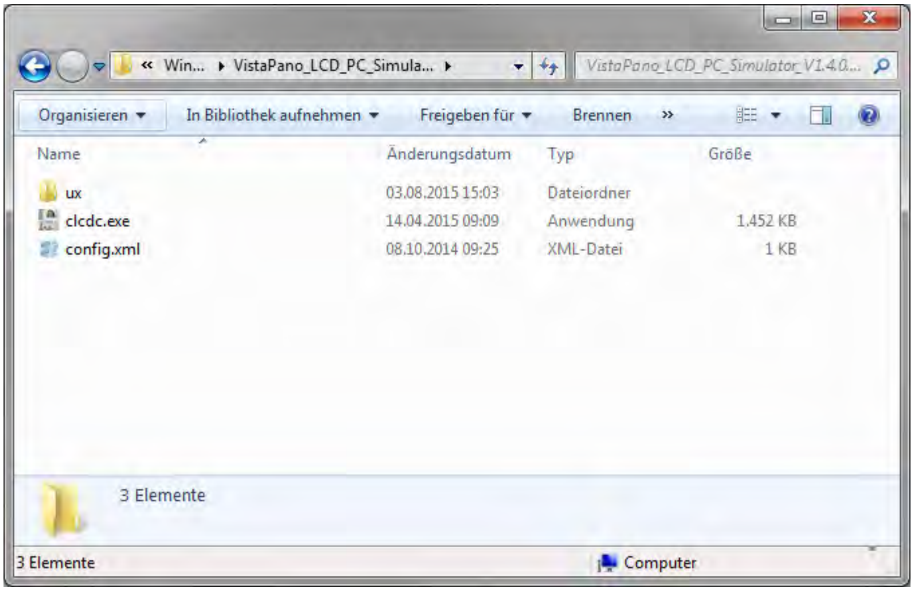


Fig. 225 Content of LCD Simulation Software.zip

We recommend creating a shortcut to *clcdc.exe* on the desktop or in the Start menu.

13.2 Application

Before starting an image acquisition from the X-ray software the file *clcdc.exe* needs to be opened. It generates a display and response that are identical to the touchscreen of ProVecta S-Pan.

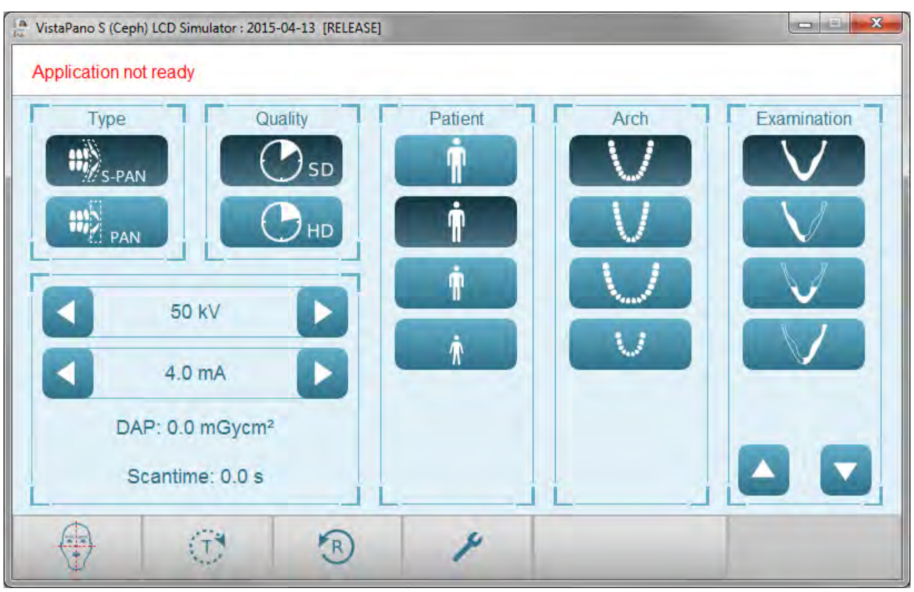


Fig. 226 LCD Simulator

As long as the simulation software is open it is possible to start a simulated image acquisition process from the X-ray software. Here, the usual image acquisition screen is displayed on the computer, with an additional message informing the operator that it is running in Demo mode.

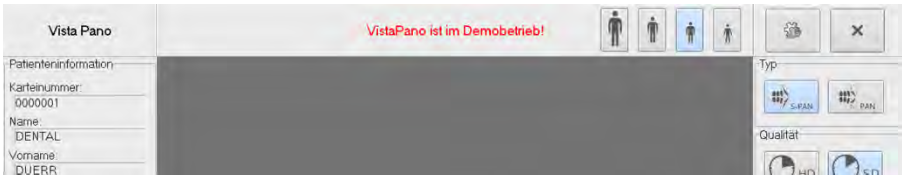


Fig. 227 – Demo mode display in VistaEasy / DBSWIN

As soon as the image acquisition screen is confirmed, the typical image acquisition elements like the patient name, pre-selected program etc. are transmitted to the simulation software in the same way they would be transmitted to the ProVecta S-Pan.

Fig. 228 LCD Simulator with patient data

The simulation software and the image acquisition screen are thus synchronised. The display can be used in exactly the same way as a real ProVecta S-Pan.

As soon as the image acquisition is activated in the simulation software (tick at the bottom right) the simulation software transmits a demo image to the X-ray software. For this purpose a program opens up for a short time to transfer the demo data to the X-ray software.

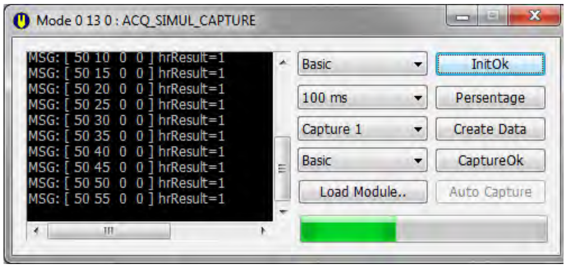


Fig. 229 Transmission of the demo data

14 Log files

14.1 ProVecta S-Pan interface

All of the information gathered during the communication with the unit is saved by the interface in the following directory:

C:\ProgramData\Duerr\VistaPano\LOG

14.2 AISU software

During calibration, the AISU software creates a log file from which all commands, unit communications and any additional information can be taken.

The log files are saved in the following directory:

C:\Program Files (x86)\Duerr\VistaPano\Util\Result\[Unit SN]\Log

14.3 VistaEasy software

All log information that is specific to VistaEasy is saved in the following directory:

C:\ProgramData\Duerr\log

14.4 VistaSoft software

All log information that is specific to VistaSoft is recorded within the database. A dedicated *Problem Analysis* mode allows the log level to be increased for a defined time period. The function *Support ZIP File* is used to compress all of the log information into an archive.

15 Spare parts

An overview of spare parts can be seen in **Fig. 237 Spare parts overview** on page 227.

A detailed listing with corresponding item numbers can be found in the electronic spare parts catalogue. This is available online as part of DuerrDental.NET (online version). Alternatively you can also download an offline version from DuerrDental.NET.

http://www.duerrdental.net

16 Checklists

The checklists below cover merely the key steps in the required procedures. Detailed information about the procedures can be found in the relevant sections stated.

16.1 Collimator calibration – panorama ⓘ

No.	Activity	Performed
1	Start the AISU software and go to *Image Calibration* > *PANO* > *Collimator Alignment* > *GO*.	☐
2	After *Initialize* generate an image for *Adult* via *Capture*.	☐
3	Via *Check Align* assess the image in Raw Viewer. Adjust the *Adult* value (to move the exposed area in Raw Viewer to the right the value needs to be reduced).	☐
4	Repeat the procedure until an unexposed edge can be seen in red on all sides. Then perform the process for the *Child* collimator.	☐

Details on the steps involved can be found in section **4.2 Collimator calibration (Collimator Alignment)** on page 50.

16.2 Collimator calibration – ceph ⓘ

No.	Activity	Performed
1	Start the AISU software and go to *Image Calibration* > *CEPH* > *Collimator Alignment* > *GO*.	☐
2	After *Initialize* generate an image for *Second* via *Capture*.	☐
3	Via *Check Align* assess the image in Raw Viewer and correct it if necessary: • If the X-ray field is not vertical: manually adjust the angle of the secondary collimator • If the position of the X-ray field is too far to the left or right, adjust the *Second* collimator value. To move the exposed area in Raw Viewer to the right the value needs to be increased. **Note:** It is assumed at this point that the position of the *First* collimator is properly aligned.	☐

4	Repeat the procedure until an unexposed edge can be seen in red on all sides (if necessary increase the *T*-value in Raw Viewer to 95).	☐

See section **4.2 Collimator calibration (Collimator Alignment)** on page 50 for details.

16.3 Adjustment of the ceph unit ⓘ

No.	Activity	Performed
1	Start the AISU software and go to *Image Calibration* > *CEPH* > *Phantom Alignment* > *GO*. (Alternatively, the image acquisition can also be triggered directly from the X-ray software.)	☐
2	In *Lateral* mode create a standard lateral image via *Capture* (under open air and with the ear studs in the central position, remove the silicone hygiene protection from the studs).	☐
3	Use *Raw Viewer* to assess the image. If the two ear studs are not one above the other, perform a mechanical adjustment. • Adjustment of the height of the ear studs if they are not above each other in the horizontal alignment. • Adjustment of the angle of the ear studs if they are not above each other in the vertical alignment.	☐
4	Repeat the process until the ear studs are above each other.	☐

See section **4.4 Phantom Alignment Ceph** on page 86. For details

16.4 Backup after installation ⓘ

No.	Activity	Performed
1	Start the AISU software and switch to the *Service* area.	☐
2	Call up the Calibration Downloader via *Download*. Under *Select File* enable all of the points and click *Download* to perform the download.	☐
3	Via *Backup(Save) Info.* save the MCU parameters with the following path and file name: C:\ProgramData\Duerr\VistaPano\mcu_params.ini	☐
4	Call up the Calibration Uploader via *Upload*. Under *Select File* enable the point *MCU Params File* and click *Upload* to perform the upload.	☐
5	Backup the folder C:\ProgramData\Duerr\VistaPano.	☐

Details about the steps involved can be found in section **5.1 Machine information (unit backup and restore)** on page 98 and in section **5.4 Bright file upload/download** on page 104.

16.5 DGUV (BGV A3) measurement

16.5.1 After initial installation ⓘ

The following measurement points are recommendations for checking the electrical safety of the system. They may need to be adapted to suit the specific requirements of your situation.

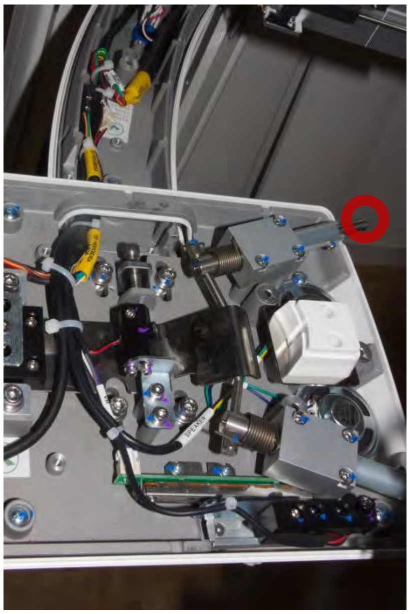


Fig. 230 Measurement point 1

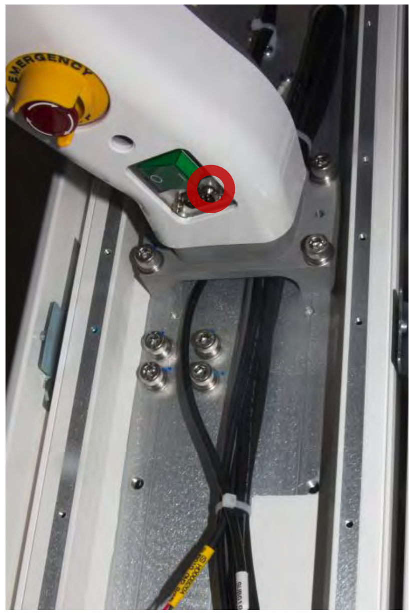


Fig. 231 Measurement point 2

No.	Activity	Limit value	Checked
1	Measurement between measurement point 1 and earth	< 200 mΩ	☐
2	Measurement between measurement point 2 and earth	< 200 mΩ	☐

Place / date checked

Checked by / signature

16.5.2 After replacement of component(s)

The following measurement points are recommendations for checking the electrical safety of the system. They may need to be adapted to suit the specific requirements of your situation.

Fig. 232 Measurement point 1

Fig. 233 Measurement point 2

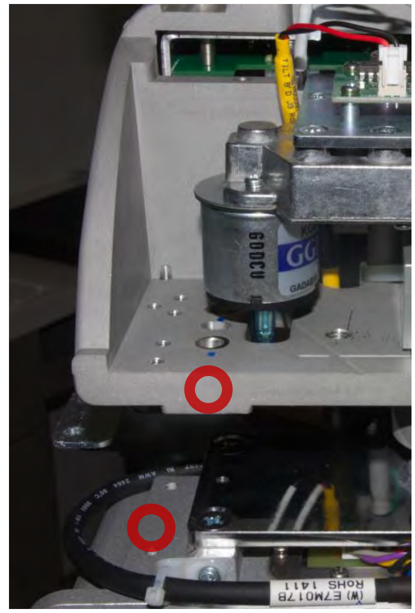


Fig. 234 Measurement points 3, 4

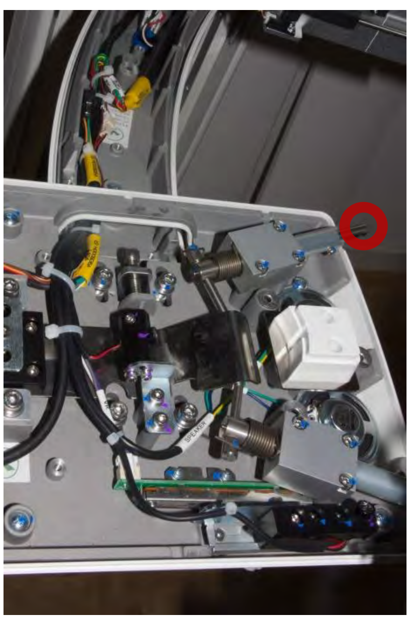


Fig. 235 Measurement point 5

Fig. 236 Measurement point 6

No.	Activity	Limit value	Checked
1	Measurement between measurement point 1 and earth	< 200 mΩ	☐
2	Measurement between measurement point 2 and earth	< 200 mΩ	☐
3	Measurement between measurement point 3 and earth	< 200 mΩ	☐
4	Measurement between measurement point 4 and earth	< 200 mΩ	☐
5	Measurement between measurement point 5 and earth	< 200 mΩ	☐
6	Measurement between measurement point 6 and earth	< 200 mΩ	☐

Place / date checked

Checked by / signature

16.6 Sensor calibration – panorama

No.	Activity	Performed
1	Backup of the existing calibration data (C:\ProgramData\Duerr\VistaPano\Acquisition\Pano\CAL).	☐
2	Start the AISU software and switch to the following area: *Image Calibration > PANO > Sensor Calibration > GO.*	☐
3	After clicking *Initialize,* start the calibration via *Auto calibration*.	☐
4	Remove all holders etc. from the ProVecta S-Pan.	☐
5	Follow the instructions in the AISU software (press/release the exposure button). This is followed by: • Initial irradiation of the sensor in order to determine the suitable dose (output as "1 Point Bright Calibration"). • Generation of the effective calibration files (output as "1 Point Bright Calibration" … "5 Point Bright Calibration").	☐
6	Message from the AISU software to confirm successful calibration.	☐
7	In the AISU software, change from the *Image calibration* area to the *Service* area.	☐
8	Click *Upload* to start the Calibration Uploader. **Note:** It is important that this step is performed immediately after the calibration data is generated.	☐
9	Selection of *Pano Calibration Files* and then uploading via *Upload*.	☐
10	Generate a test image using a 1.8 mm copper plate as an absorber (not an open air image).	☐

Details on the steps involved can be found in section **4.1 Sensor calibration** on page 37.

16.7 Sensor calibration – ceph

No.	Activity	Performed
1	Backup of the existing calibration data (C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Fast\CAL and C:\ProgramData\Duerr\VistaPano\Acquisition\Ceph_Norm\CAL).	☐
2	Start the AISU software and switch to the following area: *Image Calibration > CEPH > Sensor Calibration > GO.*	☐
3	After clicking *Initialize,* start the calibration via *Auto calibration*.	☐
4	Remove all holders etc. from the ProVecta S-Pan.	☐
5	Follow the instructions in the AISU software (press/release the exposure button). This is followed by: • Attach 1 mm copper at the tube. • Initial irradiation of the sensor in order to determine the suitable dose (output as "1 Point Bright Calibration"). • Generation of the effective calibration files (output as "1 Point Bright Calibration" … "5 Point Bright Calibration"). • Remove the copper for the 5th image acquisition.	☐
6	Message from the AISU software to confirm successful calibration.	☐
7	In the AISU software, change from the *Image calibration* area to the *Service* area.	☐
8	Click *Upload* to start the Calibration Uploader. **Note:** It is important that this step is performed immediately after the calibration data is generated.	☐
9	Selection of *Ceph HD Calibration Files* and *Ceph SD Calibration Files* and then uploading via *Upload*.	☐
10	Generate a test image using a 1.8 mm copper plate as an absorber (not an open air image).	☐

Details on the steps involved can be found in section **4.1 Sensor calibration** on page 37.

16.8 Firmware updates

No.	Activity	Performed
1	Check of the compatibility of the versions of: • Installed X-ray software • Installed VistaPano InstallPackage • Required firmware for MCU board • Required software for CRONG board	☐

16.8.1 MCU firmware update

No.	Activity	Performed
2	Start the AISU software and switch to the *Service* area.	☐
3	Via *Backup(Save) Info*. state the name and save location for the MCU parameters and save.	☐
4	Start the software *CRONG_updater.exe*. Establish the connection to ProVecta S-Pan via *Connect*. Click "…" to specify the location of the *.mot file (change the file type to *MOT FILE* in the selection window).	☐
5	Click *Upload* to start the firmware update. The green status bar indicates the progress of the update.	☐
6	Wait until the following message appears: *MOT update running done : Progress completed*. After a successful update of the MCU firmware it is not necessary to restore the MCU parameters.	☐

16.8.2 CRONG software update

No.	Activity	Performed
7	Start the AISU software and switch to the *Service* area.	☐
8	Call up the Calibration Downloader via *Download*. Under *Select File* enable all of the points and click *Download* to perform the download.	☐
9	Backup the folder C:\ProgramData\Duerr\VistaPano.	☐
10	Switch off ProVecta S-Pan and take out the microSD card from the CRONG board, then connect the card to the computer.	☐
11	Start the software *USB Image Tool.exe*. Select the microSD card in the area on the left and then click the *Options* tab. Only select the two points *Truncate oversize images …* and *Show completion message after operation*.	☐
12	Start the data backup by clicking *Backup*. In the next window enter the save location and name for the backup, then execute the backup. The software confirms successful completion of the backup.	☐
13	Activate the download of the new software via *Restore*. In the next window, select the location and *.img file that is to be downloaded. The software confirms that the download has been successfully performed.	☐
14	Insert the microSD card into the CRONG board and start ProVecta S-Pan.	☐
15	Run *Calibration Uploader.exe* directly from the directory C:\Program Files (x86)\Duerr\VistaPano\Util. Activate all of the points under *Select File* and start the data transfer by clicking *Upload*. **Note:** It is important that the Calibration Uploader is called directly and not via VistaConfig > AISU software.	☐

Details on the steps involved can be found in section **12 Firmware updates** on page 193.

16.9 Maintenance of the unit

The ProVecta S-Pan needs to be serviced every 3 years.

No.	Activity	Checked
1	Functional test of the touchscreen. Are all symbols displayed?	☐
2	Functional test of the capture button.	☐
3	Do the various status LEDs light?	☐
4	Check that the head supports mechanism functions correctly. Are the head supports easy to detach and put on.	☐
5	Functional test of the EMERGENCY OFF button. Is the EMERGENCY OFF button easy to operate mechanically and does it light up when pressed?	☐
6	Light barrier test of all light barriers installed in the appliance.	☐
7	Visually check the patient positioning beams. Check the operation of the adjustment lever for the upper canine positioning beam.	☐
8	Check the X-ray images for artifacts and adjust the collimator and/or calibrate the sensor if required.	☐
9	Check the firmware and software version.	☐
10	Perform a comparative dose measurement based on the requirements from the acceptance test.	☐
11	Recurrent tests and test after the repair of medical electrical equipment - DIN EN 62353 (VDE 0751-1).	☐
12	Visually and acoustically check linear movements on the C-shaped curved section; if necessary clean the sliding rails with alcohol and grease them with Vaseline.	☐
13	Check the operation of the lift motor. Does the appliance lift and lower without any noise? If necessary, clean with alcohol and grease with Vaseline.	☐

Place / date checked

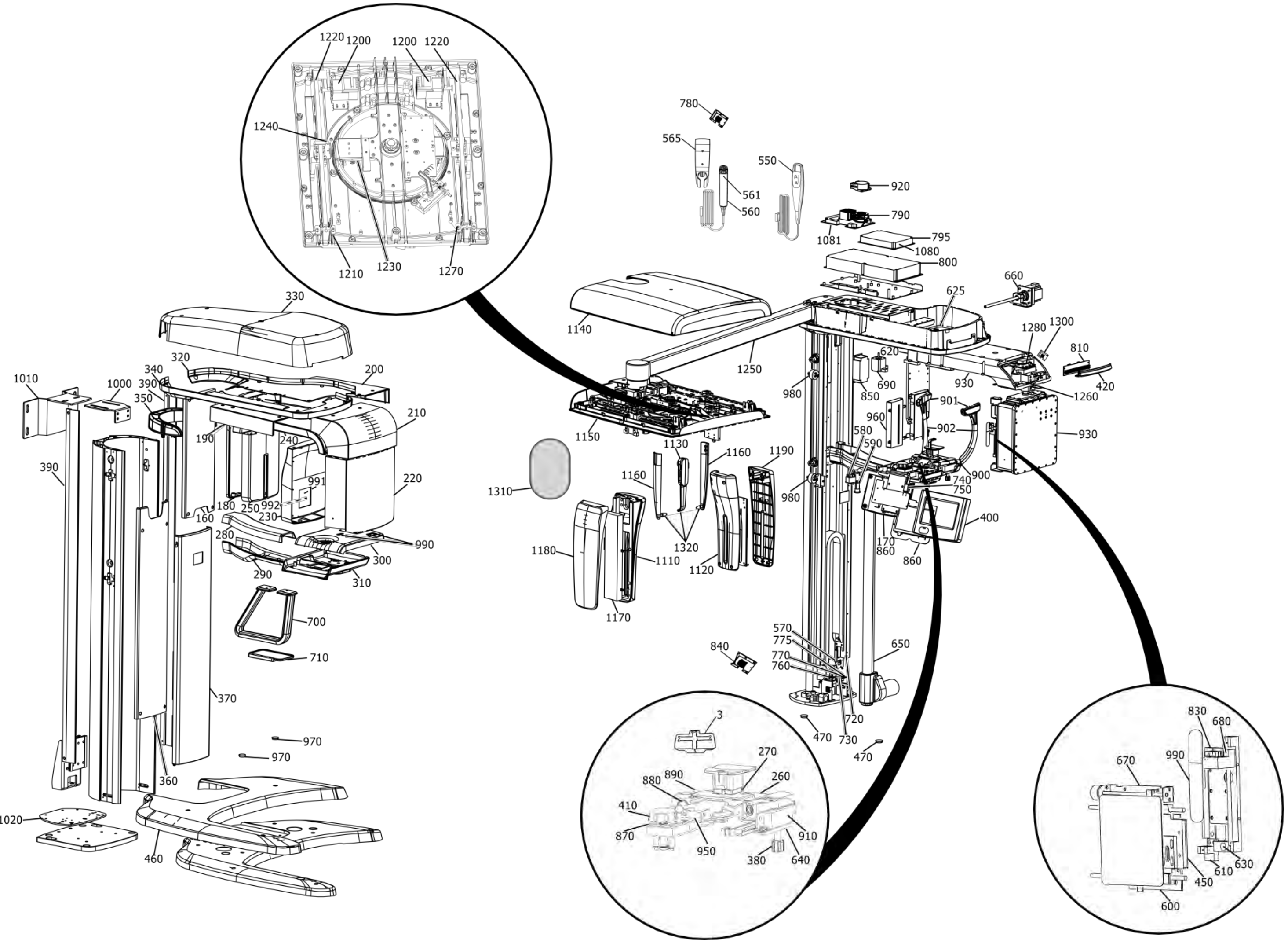
Checked by / signature

Check high voltage (kV)

No.	Activity	Checked
1	Place a dose meter probe in active are in front of ProVecta S-Pan detector.	☐
2	All other elements for patient positioning are to be removed. Place an absorber in front of tube if necessary.	☐
3	Start the AISU software and switch to *Command Window*.	☐
4	Type in the following commands: • *[SPM_PANO]* • *[SPM_HV___0720]* (can be changed at will) • *[SPM_HA___1000]* (can be changed at will) • *[SPM_TUTS]*	☐
5	Expose the probe for around 5 seconds and check the measurement on the dose meter.	☐

Details on the steps involved can be found in section **11.7 Check high voltage (kV)** on page 190.

Fig. 237 Spare parts overview



17 Error messages

Any errors are output via the image acquisition screen in DBSWIN or VistaSoft. ProVecta S-Pan is not able to output error messages itself.

The scenarios described in section **11.2 Troubleshooting** on page 166 and the points described in section **11.3 Possible solutions for problems relating to unit connections and data transmission** on page 180 offer approaches to solving problems without a specific error message.

Normally, every output fault has a clear fault number. Details and approaches to solving the problems can be found in the tables below.

17.1 Software-related error messages

#	Error message	Approach to solving the problem
0	A software-related error has occurred: 0	This message is displayed if the attempt to start the software for unit actuation and communication is unsuccessful. The cause for this might be the unit data (VersionInfo.txt and Cal-Files) on the microSD card of the CRONG board. Check whether the microSD card is correctly inserted. If necessary upload the data again to ProVecta S-Pan.
1	Manual exposure button released too soon. The image acquisition is aborted.	If this fault is not remedied within the operation of the ProVecta S-Pan then the connection between ProVecta S-Pan and the exposure button should be checked. If the signal from the exposure button has been checked, then the internal wiring should be checked: cable H000919A, which connects the exposure button with the MCU board. Socket on the MCU board: CN600. If the internal wiring has been checked, check the MCU board and replace it if necessary.
2	A software-related error has occurred: 2	This message is displayed if the dark image of the sensor cannot be created successfully. This is recreated prior to every image acquisition and transferred to the computer; it can be viewed as the initialisation of the sensor. This message may indicate a defect on the sensor or its wiring, as a result of which the sensor is no longer capable of sending information to the CRONG board. Here, the cables H000046A (Panorama) and H000047A (Ceph), which are connected to J2 and J1 on the CRONG board, need to be tested.

3	A software-related error has occurred: 3	This message is displayed if the raw data of the image have not been successfully transferred to the computer. Details and possible approaches to solving the problem can be found in section **11.3.4 Acquisition of the image** on page 182.
4	A software-related error has occurred: 4	This message is displayed if it is not possible to create the DCM files after completion of the image acquisition (and transmission of the raw data). Details and possible approaches to solving the problem can be found in section **11.3.5 Reconstruction of the image** on page 183.
5	A software-related error has occurred: 5	The reconstructed and generated image cannot be saved. Details and possible approaches to solving the problem can be found in section **11.3.5 Reconstruction of the image** on page 183.
6	A software-related error has occurred: 6	
7	A software-related error has occurred: 7	
8	A software-related error has occurred: 8	The door switch connected to the ProVecta S-Pan is reporting that the door is open.
9	A software-related error has occurred: 9	The parameters transmitted to the ProVecta S-Pan are outside the possible range.
10	A software-related error has occurred: 10	The file contains no information.
11	No connection to the unit. Please check that VistaPano is switched on and that the Ethernet cable	This message is displayed if the file VersionInfo.txt still does not exist even after running the *Calibration Downloader*. Details and possible approaches to solving the problem can be found in section **11.3.2 Establishing the software connection to ProVecta S-Pan** on page 181.

	is connected.	
12	A software-related error has occurred: 12	Unable to transmit a command to ProVecta S-Pan.
13	A software-related error has occurred: 13	The unit is in PackingMode – this needs to be deactivated via a command. Information about calling the Command Window can be found in section **7 Command window in the AISU software** on page 130. The command is: [SPM_PKEN_0001].
37	A software-related error has occurred: 37	The MCU parameters for the unit version (Pano/Ceph) should be checked. [SPM_TITY_000x] 0:NO tube tilting Mode (for only Pano Model) 1:Using tube tilting mode [SPM_CISC_000x] 0:Disable 1:Scan Ceph 3:One-Shot Ceph
210	Insufficient data present in the unit.	This message is displayed if the image information for the X-ray image acquisition is incomplete. The reason for this message might be a defect on the CRONG board, sensor or wiring. Details and possible approaches to solving the problem can be found in section **11.3 Possible solutions for problems relating to unit connections and data transmission** on page 180.
211	Unable to read out the unit memory.	Details and possible approaches to solving the problem can be found in section **11.3 Possible solutions for problems relating to unit connections and data transmission** on page 180.
212	Unable to process the data in the unit.	Details and possible approaches to solving the problem can be found in section **11.3 Possible solutions for problems relating to unit connections and data transmission** on page 180.
213	No data is present any longer in the unit.	This message is displayed as soon as an attempt is made to read image data from ProVecta S-Pan if no data is present. This is e.g. the case if the unit has been restarted without properly closing the application VAPAN_ETH.EXE. In this case the application should be restarted. In other cases check the CRONG board. This contains the image cache.
230	Unable to acquire an image.	The system drive has less than 1 GB or 5 GB of free space (depending on the version).

231	A software-related error has occurred: 231	The sensor calibration files are incomplete or defective. Check the files at C:\ProgramData\Duerr\VistaPano\Acquisition\[mode]\CAL
	The version information of the unit is invalid. Please contact the hotline.	Different entries are imported from VersionInfo.txt. If they do not exist (or they are empty) then no image acquisition is possible. These are: MachineSN=x MCUBoardSN=x TubeSN=x SensorSN=x GeneratorSN=x CRONGBoardSN=x For further information about VersionInfo.txt refer to **10.2 VersionInfo.txt** on page 161.
	The image acquisition window appears incomplete on the computer screen.	The graphics card or unit drivers are defective. Replace the graphics card or update the drivers.
	Fault during startup of the data downloader.	This message is displayed if the *Calibration Downloader* cannot be launched. Either it is not present or it cannot be executed. For further information about the *Calibration Downloader* refer to section **5.4.1 Download (Calibration Downloader)** on page 104.

Table 12 Software-related error messages

17.2 Hardware-related error messages

Area of use	Error message in the image acquisition screen	#	Details of the error message	Approach to solving the problem
Tube-related faults	Error number [#] has occurred in relation to the X-ray tube. Please consult your technical documentation.	1	X-ray tube not reporting ready for use	Check the 24V voltage on the inverter board. Check the 24V voltage on the power board. If possible replace the power board, tube and inverter board. Alternatively replace at least the power board.
		2	The cable connection between the monoblock and the inverter board is not connected.	Check the cable connection between the tube and the inverter board. Measure the resistance of the cable. Check and if necessary replace the tube and inverter board.
		3	Maximum current exceeded during X-ray image acquisition.	Defect on the tube, current draw too high. Check and if necessary replace the tube and inverter board.
		8	Monoblock temperature is higher than the specified temperature (55°C).	Tube temperature is above 55°C. Safety shut-down. Allow the tube to cool down.
		9	Incorrect output current at the inverter board during image acquisition.	Current draw too high. Defect on the X-ray tube. Replace the tube and inverter board.
		10	Exposure button released during image acquisition.	If the exposure button was not released during the image acquisition, check the exposure button and the wiring. Check the 380 V voltage on the inverter board.
		11	After the exposure button is released (0.5 seconds) no "X-ray radiation	Trigger contact timeout. Check the exposure

			deactivated" signal is received.	button and wiring. Check and replace the CRONG board.
		12	The displayed kV value is less than the set value (-20kV).	Fault in the current/voltage supply. All 3 components (tube, inverter board and power board) should be replaced.
		13	The displayed kV value is greater than the set value (+20kV).	Fault in the current/voltage supply. All 3 components (tube, inverter board and power board) should be replaced.
		14	The displayed mA value is less than the set value (-50%).	Fault in the current/voltage supply. All 3 components (tube, inverter board and power board) should be replaced.
		15	The displayed mA value is less than the set value (+50%).	Fault in the current/voltage supply. All 3 components (tube, inverter board and power board) should be replaced.
Motor-related fault	A motor-related fault has occurred: [#]. Please consult your technical documentation.	20	P-axes motor – homing error	Check and if necessary replace the light barrier (# 2207-981-10) or drive motor.
		21	Rotation motor – homing error	Check and if necessary replace the light barrier (# 2207-981-07) or drive motor.
		26	Collimator motor – sec. Ceph homing error	Check and if necessary replace the light barrier (# 2207100046) or drive motor.
		36	Collimator motor – homing error	Check and if necessary replace the light barrier (# 2207-981-05) or drive motor.

Exposure button-related fault	Error number [#] has occurred in relation to the exposure button. Please consult your technical documentation.	60	The exposure button was pressed while the unit was being switched on.	Check the exposure button and wiring and replace if necessary.

Table 13 Hardware-related error messages

18 Directory structure

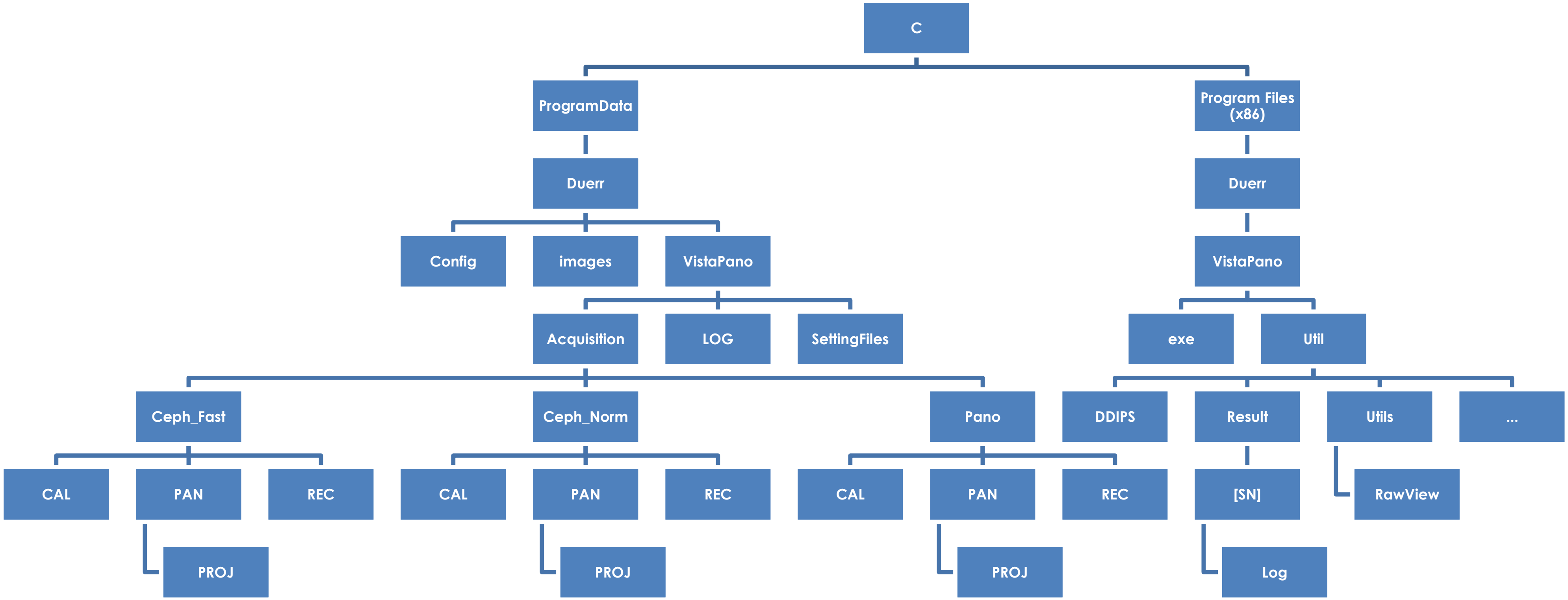


Fig. 238 Directory structure from Windows Vista or higher (64-bit)