X MIND trium

Cone Beam Computed Tomography Scanner, Panoramic and Cephalometric X-ray imaging system

SERVICE MANUAL

THIS MANUAL MUST ALWAYS BE KEPT NEAR THE MEDICAL DEVICE

ACTEON

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1. WARNINGS AND PRECAUTIONS

1.1. WARNINGS TO BE OBSERVED DURING SERVICE

Before attempting to service the X-MIND trium make sure that you know how to operate it. Read the operator's manual.

Read and familiarize yourself with the warnings and precautions listed in the operator's manual.

Only use original spare parts from de Götzen® S.r.l. - ACTEON Group when repairing the X-MIND trium or replacing parts.

WARNING *Radiation Safety*
Before servicing the X-MIND trium familiarize yourself with local and national radiation safety standards and requirements relating to dental X-ray equipment.

WARNING *Electrical Safety*
Disconnect the X-MIND trium from the main power supply before:
- removing any covers
- repairing
- replacing mechanical parts
- replacing circuit boards or other electrical components.

WARNING - CAUTION

ELECTRICAL SHOCK HAZARD!
For your safety, <u>ALWAYS</u> remember to turn the X-MIND trium mains switch off and disconnect the mains X-MIND trium connector, located on the connection panel at the rear of the device, during installation or before carrying out any maintenance operation.

Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before accessing to this board.

Dangerous voltage (385VDC) is present on the Inverter and Power board FOR SOME MINUTES after X-MIND trium mains disconnection: if the LEDs on these boards are ON, high voltage is yet present. DO NOT handle the boards until the high voltage has disappeared and the LEDs are gone out.

Be careful when operating the X-MIND trium not to get body parts or clothing trapped between moving parts.

To let the capacitors on a circuit board or electrical device to completely discharge, wait ten (10) minutes, after disconnecting the X-MIND trium from the main power supply, before handling the board or device.

If you have to leave the X-MIND trium unattended with covers removed during servicing or maintenance, disconnect the X-MIND trium from the main power supply so that anyone who inadvertently touches the X-MIND trium does not receive an electric shock.

This X-MIND trium should only be used in areas that are provided with a protective earth connection to ensure an equipotential ground connection.

WARNING *Explosion hazard*
Some disinfectants and cleaning agents may vaporize to form an explosive vapor. If such disinfectants and cleaning agents are used the vapor should be allowed to disperse before switching the X-MIND trium on.

WARNING *Cleaning the unit*
Switch the X-MIND trium off, disconnect it from the main power supply and wait for 2 minutes before cleaning or disinfecting the unit.

Some parts of the collimator and of the tubehead are made of lead (Pb), which is a toxic material. Do not touch it with your bare hands.

1.2. CAUTIONS FOR ELECTROSTATIC DISCHARGE

WARNING

ESD WARNING!
Pay attention when managing PCB boards!
All PCB boards are made up by electronic components sensitive to Electrostatic Discharge (ESD).
Permanent damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

When servicing the X-MIND trium take precautions to avoid electrostatic build up and discharge. Follow the recommendations for the prevention of ESD that are used in the country in which you are working. If no recommendations are available follow the guide lines below.

Leave all new or replacement circuit boards and electrical parts in their protective packaging until the boards are needed.

Before handling circuit boards and electrical parts make sure that any static electricity charge that has built up in your body is discharged.

When handling circuit boards hold them by their edges and do not touch any connectors or components.

When examining and checking circuit boards use an elasticated wrist wrap which is connected to a ground point through a 1 Mohm current limiting cable. For a ground point use water pipes, radiators or other objects that are known to be connected to the ground. Also use a cable to connect the X-MIND trium to the same ground potential as the wrist wrap.

If an antistatic mat is used, connect the wrist wrap to the mat and the mat to the ground potential.

Wash the wrist wrap and check that it is in good condition frequently.

1.3. GENERAL WARNINGS

All service operations must be made by authorized service personnel only.

The annual preventive maintenance as described in this manual is mandatory for the correct and safe operation of the X-MIND trium.

When taking exposures, operators and service personnel must protect themselves from radiation and remain at least two meters (six feet) away from the X-MIND trium during exposure.

The X-MIND trium or its parts must not be changed or modified in any way without approval and instructions from de Götzen® S.r.l. - ACTEON Group.

The use of accessories not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system.

1.4. UNAUTHORIZED MODIFICATIONS

Unauthorized changes or modifications to any part of the X-MIND trium can have hazardous consequences. Changes or modifications must not be made unless specifically authorized by de Götzen® S.r.l. - ACTEON Group.

Never remove or remanufacture any part of the tubehead assembly or of the fixed/motorized collimator. Never adjust any part of the fixed/motorized collimator unless under the direction of de Götzen® S.r.l. - ACTEON Group or their authorized distributor.

1.5. DISPOSAL

The X-MIND trium, its spare parts, its replacement parts and its accessories may include parts that are made of or include materials that are non-environmentally friendly or hazardous. These parts must be disposed in accordance with all local, national and international regulations regarding the disposal of non-environmentally friendly or hazardous materials.

The X-MIND trium has at least the following parts that should be regarded as non-environmental friendly waste products:
- Tubehead (Pb, oil)
- Fixed/motorized collimator (Pb)
- All electronic boards and circuits.

2. INTRODUCTION

This Service Manual details the corrective maintenance for the X-MIND trium system.
In general, the defective part is located by means of diagnostic messages, self-test information or by the principle diagrams (to be defined).
In the event of electronic defects, repairs are made by replacing one of the following exchangeable units:
- Tubehead,
- Display board,
- Inverter board,
- Main board,
- Add-on board,
- Power board,
- Column board,
- AUX CBCT board,
- AUX Ceph board
- Digital image detector (Pan, Pan/Ceph, CBCT).

In the event of mechanical or motor defects, the following parts can be replaced:
- the headrest assembly,
- the geared motors,
- the rotation motor belt,
- the column motor,
- the ceph motor belt,
- the collimator assembly.

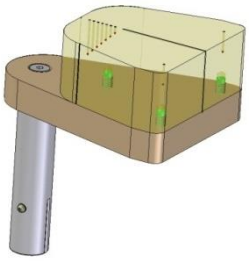
After a replacement of an electronic and/or a mechanical part, calibrations, settings and adjustments may be required: refer to the paragraph ***Calibrations required after spare parts replacement.***

3. EQUIPMENT REQUIRED

To perform corrective maintenance on X-MIND trium system, the following equipment is required:
- standard toolset,

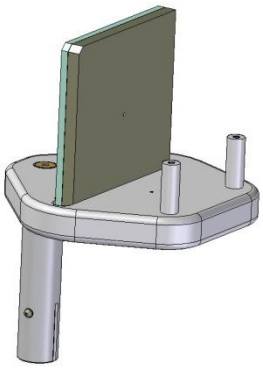
- digital multimeter,
- laser beam phantom, (not supplied: to be ordered separately, code W0900136)

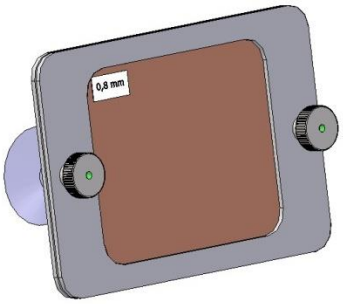
- panoramic geometric calibration phantom, (not supplied, to be ordered separately, code w0900135)



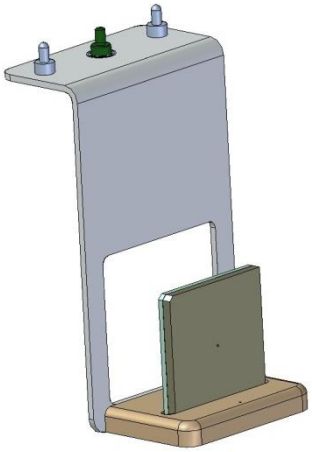
- panoramic/Ceph image quality Quart phantom

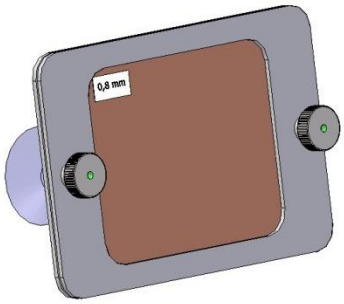
- panoramic support for Quart phantom and additional 0.8mm copper filter, (not supplied, to be ordered separately as a kit, code w0900137)



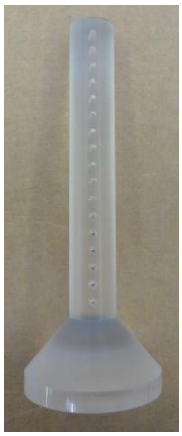


- Ceph support for Quart phantom and additional 1mm copper filter, (not supplied, to be ordered separately as a kit, code w0900138)

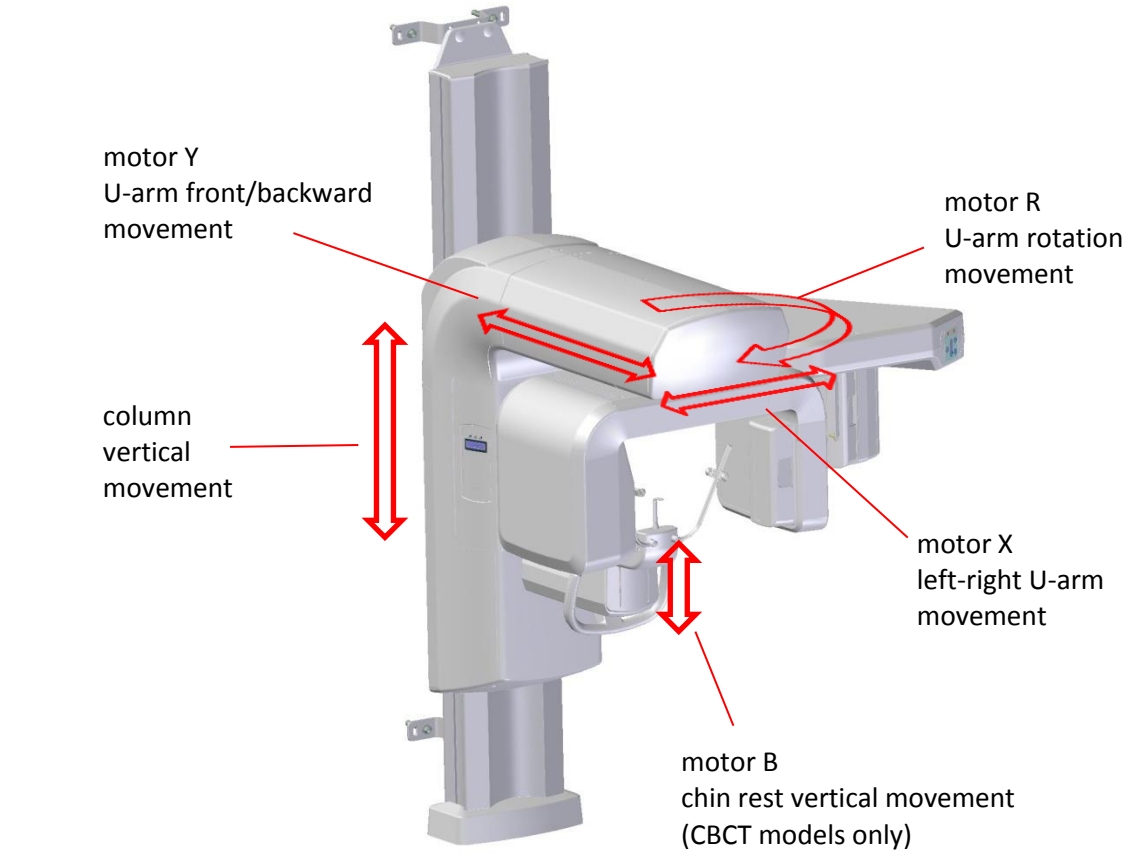


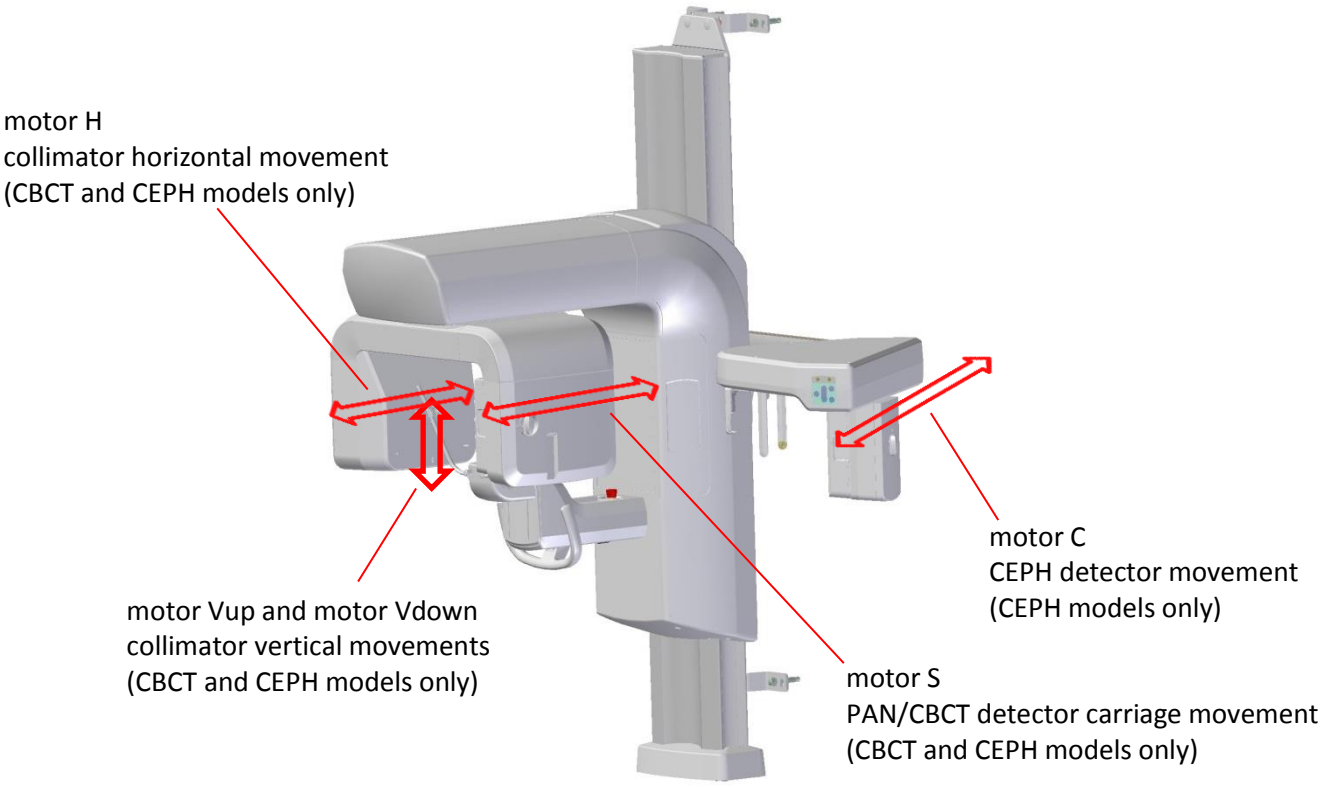


- CBCT geometric calibration phantom (left) and tray (right) (only for CBCT systems).



4. X-MIND trium MOVEMENTS

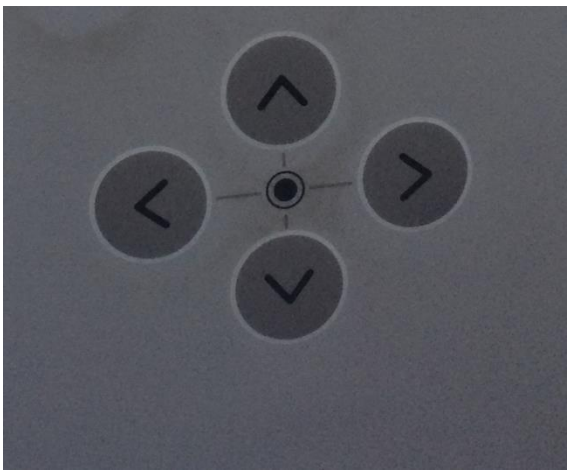




5. U-ARM MOTION MANAGEMENT

The U-ARM can be moved while X-MIND Trium is turned ON and the AIS software is closed (this includes also xmdriver). This is useful during covers installation to position the U-ARM in the most convenient position for each step of the installation of the covers.

How to enable U-ARM motion:
X-MIND Trium turned ON and AIS software/xmdriver closed
Keep presses UP or DOWN arrows until display show the name of the axis selected



How to choose the axis:
X-MIND Trium can be moved on the following axes: X – Y – R

How to move U-ARM:
Once the axis is chosen, keep pressed left or right to move it in the desired direction

6. TROUBLESHOOTING

Error Codes

When an error code appears on the display of the X-MIND trium and on the workstation monitor in AIS software, the unit will stop working and cannot be operated while the error code is on the display.

Acknowledging errors

The unit responds to error situations by reporting a diagnostic message.
Most errors may be reset from AIS software on the workstation.
Some errors require the unit to be rebooted. If such an error occurs, or if the unit fails to operate as described in the operator's manual, switch the unit off, wait a few seconds and the switch the unit on again.

Checking circuit boards

Circuit boards cannot be repaired in the field. The Power board has have fuses that can be replaced. However, if a board is faulty, replace it.

On most of the circuit boards there are indicator LEDs (D) and test points (TP), that allow the operation of the board to be checked and/or tested. The LEDs and test points for each circuit board are described in the paragraph ***Electronic Boards*** of this Service Manual. Use a digital multimeter (DMM) when checking boards.

When handling circuit boards take all necessary precautions to prevent the build up of static electricity and possible static damage to the boards.

DANGER ELECTRICAL SHOCK

WARNING - CAUTION

ELECTRICAL SHOCK HAZARD!
For your safety, ALWAYS remember to turn the X-MIND trium mains switch off and disconnect the mains X-MIND trium connector, located on the connection panel at the rear of the device, during installation or before carrying out any maintenance operation.

Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before accessing to this board.

Dangerous voltage (385VDC) is present on the Inverter and Power board FOR SOME MINUTES after X-MIND trium mains disconnection: if the LEDs on these boards are ON, high voltage is yet present. DO NOT handle the boards until the high voltage has disappeared and the LEDs are gone out.

Checking cables and connectors

Visually check cables for mechanical damage, cuts, damaged insulation and bad twists. If a cable is damaged in any way replace it.

If there is no obvious mechanical damage to a cable but you think that it may be faulty, use a digital multimeter (DMM) to check the resistance of the different wires within the cable. An undamaged wire will have close to no resistance (>0 ohm), a damaged wire will have a high resistance value.

If you find a loose or misaligned connector, disconnect it and check for bent, broken or missing pins. If there is damage that can be easily repaired, for example straightening a bent pin, repair the damage and reconnect the connector. If the damage cannot be repaired replace the cable.

Note! If the connector on the corresponding board is also damaged, the board may also have to be replaced.

7. DIAGNOSTIC MESSAGES

While the X-MIND trium system is running, a number of messages may be generated on the display, to warn the operator of equipment irregularities or to indicate that some fault has occurred.
In the latter case a diagnostic message will help to find the fault.
The meaning of each diagnostic message is given in this paragraph, together with an explanation about the electrical circuit involved with the defective function.
If more than one diagnostic message is detected, the first one acknowledged is displayed and the others are stored in a file (log file) created every day the equipment is used. The log file is stored in the following directory:

C:AISsoftware\XMdriver\XM\config\log_inferr<date>.txt

Here is an example of a log file:
09 dic 2015 14:16:24 START DRIVER :1.2.1.0
09 dic 2015 14:19:10 START ACQ:Exam=1001 kv=75 ma=8 Tms=16880 pulse=1 (4291540656 ms)[nox=204] DAP=128963 COR X=0,Y=0,B=0
09 dic 2015 14:19:11 COOLING TIME PA:T=243072 CT_FACT=917 TEXAM=23600 TOT=246740
09 dic 2015 14:19:42 FRAMES=:3957 su 3957 (exam=1001 maxvel=214000)
09 dic 2015 14:34:05 ERROR:MAIN NEGE err 67 =MOTOR_AXES_DO_BREAK
09 dic 2015 14:34:05 ERROR:AUX NEGE err 165 =PRM_COLLIM_DO_BREAK
09 dic 2015 14:35:02 START ACQ:Exam=1302 kv=79 ma=10 Tms=19400 pulse=1 (4291029096 ms)[nox=204] DAP=38800 COR X=0,Y=0,B=0
09 dic 2015 14:35:03 COOLING TIME PA:T=349200 CT_FACT=799 TEXAM=21680 TOT=300923
09 dic 2015 14:35:31 FRAMES=:2501 su 2502 (exam=1302 maxvel=214000)

where:

09 dic 2015 14:16:24	date and time of the generation on the event in the log file
START DRIVER :1.2.1.0	version of the X-MIND trium driver
START ACQ:Exam=1001 kv=75 ma=8 Tms=16880	starting a panoramic exposure with 75kV – 8mA – 17s
ERROR:MAIN NEGE err 67 =MOTOR_AXES_DO_BREAK	detection of the error 67
ERROR:AUX NEGE err 165 =PRM_COLLIM_DO_BREAK	detection of the error 165
START ACQ:Exam=1302 kv=79 ma=10 Tms=19400	starting a cephalometric exposure with 79kV – 10mA – 19s

In case of request from the de Götzen® S.r.l. - ACTEON Group Technical Support, it is possible to create a back-up of the log file using the procedure described in the paragraph ***Back up of diagnostic messages log file.***

The following table describes the meaning of the various error codes:

CODE	DESCRIPTION	MEANING
A	Serious error	Serious error and reduced functionality. The detected fault is too serious for automatic restoration. The results of the operation are not valid.
B	Error	Serious fault and reduced functionality but automatic restoration procedure can be applied to continue processing. The results of the operation may not be valid. The function may only be partly completed.
C	Anomaly	Something is not working, reduced functionality.
D	Warning	Something may have gone wrong. Indicates a potential error; functionality is not reduced.
E	Information	Simple warning; functionality is not reduced. No error has been detected and no response is required. This message can indicate that a function is in progress or that an operation has been completed successfully.

The following table shows the required actions to solve the problem and the corresponding codes.

CODE	PERSON IN CHARGE OF THE SOLUTION	ACTIONS
A	X-MIND trium	Automatic reset
U	Operator	The operator can solve the problem (or reset the device)
R	Remote assistant	The problem can be solved by means of remote control
T	Technician	A repair by a technician or at the factory is required

✓ General reset

In presence of a diagnostic message, the first action suggested is to reset the message from AIS software on the workstation; if the error persists, turn the X-MIND trium off from the main switch and turn it on again after 30 seconds. If the error still persists, leaving X-MIND trium on, restart the Workstation. If the problem is not solved despite the general reset, technical service is required.

To reset the message from AIS software on the workstation proceed as follows.

a. Click on one of the red icon.

b. The Ais operator panel will open, showing the error codes. Click on ERROR RESET button to erase the error message.


PAN
Scanner in error
E093 MB - HI VOLTAGE ENABLE IN IDLE.
E101 1B - HI VOLTAGE ENABLE IN IDLE.
PAN
TMJ
SINUS
Man
Woman
Child
Small
Medium
Large
Standard
Orthogonal
Frontal
Bitewing
Left
Full
Right
Anodic Current 8 mA
Voltage 75 kV
Options
Show Warnings
Fill Dental Chart
Error Reset
Next

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
0	C	CHECK INTERNAL ETHERNET Hw errror: Main board and ETHERNET switch do not communicate In this condition X-MIND trium and workstation cannot communicate; THIS ERROR APPEARS ONLY ON THE X-MIND trium DISPLAY.	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check connection cable P4051 between Main board K17 and ETHERNET switch 1 + check 12VDC power supply cable P4074 between Power board K22 and ETHERNET switch IN + check 12VDC power supply in the Power board: if missing, replace Power board + replace ETHERNET switch + replace Main board.
13	C	Image detector not grabbing	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains, in case of CEPH or PAN detector, detach it from the equipment and attach it again, ascertaining to lock it correctly. If error remains technical service is required: + after having set the exam from AIS sw, check that the corresponding LED on ETHERNET switch is ON and green (if the LED is ON but orange, the connection is running at low speed and this is not OK): ++ LED 5 for Ceph image detector ++ LED 6 for CBCT Image detector ++ LED 7 for Pan Image detector + check connection cable between image detector and ETHERNET switch: ++ 5 for Ceph image detector (cable P4050) ++ 6 for CBCT Image detector (cable P4104-F) ++ 7 for Pan Image detector (cable P4104-E) + for PAN or CEPH detachable detectors, check that the contacts on interface boards are not damaged (both detector side and equipment side) + check image detector: presence of power supply (+5vDC)
66	E	CONFIG_INFO_UPDATED Configuration data have been updated	U/T	Restart X-MIND trium and workstation in order that modifications will be effective.
67	D	MOTOR_AXES_DO_BREAK **WARNING:** operator has intentionally stopped a movement releasing X-ray button	U	Wait that the full exam procedure is completed before releasing X-ray button: on the workstation will appear the message *"exposure button can be released".*
68	B	MOTOR_AXES_CNTL_FSM Unexpected motors condition	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
69	C	MOTOR_AXES_TRJ_LOAD Trajectory loading from PC is failed	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
70	C	XRAYS_DISA_ETH_LINK X-ray have been disabled by the SW control, due to ETHERNET connection failure. Disabling X-ray is a desired consequence of the failure, implemented in order to avoid to impart useless ionizing radiations to the patient.	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check ETHERNET connection cable P4053 between ETHERNET switch 8 and workstation; + after having set the exam from AIS sw, check that the corresponding LED on ETHERNET switch is ON and green (if the LED is ON but orange the connection is running at low speed and this is not OK): ++ LED 5 for Ceph image detector ++ LED 6 for CBCT Image detector ++ LED 7 for Pan Image detector + check connection cable between image detector and ETHERNET switch: ++ 5 for Ceph image detector (cable P4050) ++ 6 for CBCT Image detector (cable P4104-F) ++ 7 for Pan Image detector (cable P4104-E) + check ETHERNET switch; + check that workstation configuration is in accordance with requirements (network interface card, installed anti-virus, firewall disabled…).
71	C	XRAYS_DISA_PC_ALARM X-ray have been disabled by the SW control, due to failure in image transmission from the image detector to the workstation. The failure is related to the image detector and to its connections and controls. Disabling X-ray is a desired consequence of the failure, implemented in order to avoid to impart useless ionizing radiations to the patient.	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check that workstation configuration is in accordance with requirements (network interface card, e-bus setup, installed anti-virus, firewall disabled…); + perform a calibration of the U-ARM encoder (only for CBCT models); + after having set the exam from AIS sw, check that the corresponding LED on ETHERNET switch is ON and green ++ LED 5 for Ceph image detector ++ LED 6 for CBCT Image detector ++ LED 7 for Pan Image detector + check ETHERNET connection cable P4053 between ETHERNET switch 8 and workstation; + check connection cable between image detector and ETHERNET switch: ++ 5 for Ceph image detector (cable P4050) ++ 6 for CBCT Image detector (cable P4104-F) ++ 7 for Pan Image detector (cable P4104-E) + check ETHERNET switch; + check/replace AUX CBCT board (or, in case of PAN base unit, PAN sensor board); + check/replace image detector.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
72	C	PCDRV_COMM_WDOG_ERR PC communication timeout	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check that workstation configuration is in accordance with requirements (network interface card, e-bus setup, installed anti-virus, firewall disabled…); + check ETHERNET connection cable P4053 between ETHERNET switch 8 and workstation; + check connection cable between image detector and ETHERNET switch: ++ 5 for Ceph image detector (cable P4050) ++ 6 for CBCT Image detector (cable P4104-F) ++ 7 for Pan Image detector (cable P4104-E) + check ETHERNET switch.
73	B	X_AXIS_ERR_RES_RAMP Unexpected condition during X-axis reset	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
74	C	X_AXIS_ERR_RES_TOUT X-axis reset timeout (U-arm movement parallel to the wall)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor X and its cable P4058 to Main board K6; + check X optoswitch and its cable P4063 to Main board K11; + check/replace Main board.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
75	B	Y_AXIS_ERR_RES_RAMP Unexpected condition during Y-axis reset	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
76	C	Y_AXIS_ERR_RES_TOUT Y-axis reset timeout (U-arm movement perpendicular to the wall)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor Y and its cable P4059 to Main board K5; + check Y optoswitch and its cable P4063 to Main board K12; + check/replace Main board.
77	B	R_AXIS_ERR_RES_RAMP Unexpected condition during R-axis reset	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
78	C	R_AXIS_ERR_RES_TOUT R-axis reset timeout (U-arm rotation)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor R and its cable P4060 to Main board K4; + check R optoswitch and its cable P4065 to Main board K13; + check U-arm potentiometer and its cable P4699 to Main board K15; + check/replace Main board.
79	B	C_AXIS_ERR_RES_RAMP Unexpected condition during B-axis reset	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
80	C	C_AXIS_ERR_RES_TOUT C-axis reset timeout (CEPH image detector slider)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor C and its cable P4062 to Add On motor board K3; + check C optoswitch and its cable P4067 to Main board K9; + check/replace Add On motor board; + check/replace Main board.
81	B	S_AXIS_ERR_RES_RAMP Unexpected condition during S-axis reset	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
82	C	S_AXIS_ERR_RES_TOUT S-axis reset timeout (image detectors slider on U-arm)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor S and its cable P4104-C to Add On motor board K2; + check S optoswitch and its cable P4104-D to Main board K7; + check/replace Add On motor board; + check/replace Main board.
83	B	B_AXIS_ERR_RES_RAMP Unexpected condition during B-axis reset	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
84	C	B_AXIS_ERR_RES_TOUT B-axis reset timeout (bite block vertical movement)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor B and its cable P4061 to Add On motor board K1; + check B optoswitch and its cable P4066 to Main board K8; + check/replace Add On motor board; + check/replace Main board.
85	C	R_AXIS_ERR_POT_BLCK R-axis potentiometer (U-arm) blocked (readings not coherent with movement)	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check R-axis potentiometer; + check R-axis potentiometer cable P4699 to Main board K15; + check R-axis potentiometer mechanical coupling on R axis; + check motor R and its cable P4060 to Main board K4; + check R optoswitch and its cable P4065 to Main board K13; + check/replace Main board.
86	B	R_AXIS_ERR_POT_RAMP Unexpected condition during R-axis reset positioning based on potentiometer value	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
87	B	R_AXIS_ENC_HW_FATAL Hardware error on R-axis encoder	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check that encoder LED DL7 on Main board is ON (green); + check that encoder ruler is clean and not damaged; + check encoder cable P4140 to Maind board K25; + replace the whole encoder head (with cable P4140); + check/replace Main board. If R-encoder is not mounted on the equipment check that X-MIND trium model is correctly configured as a model without R-encoder.
88	C	R_AXIS_ENC_CNT_ZERO Zero-search for R-axis encoder is failed	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check R-axis potentiometer calibration; + check if the wanted zero mark of the encoder is encountered during R-axis reset; + check that encoder ruler is clean and not damaged; + check encoder cable P4140 to Maind board K25; + check/replace Main board.
89	B	X_AXIS_ERR_RUN_PTPT Unexpected condition during X-axis position adjustment	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
90	B	Y_AXIS_ERR_RUN_PTPT Unexpected condition during Y-axis position adjustment	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
91	B	B_AXIS_ERR_RUN_PTPT Unexpected condition during B-axis position adjustment	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
92	C	R_AXIS_ERR_RUN_LIMI R-axis position out of range	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
93	C	HI_VOLT_ENA_IN_IDLE X-ray button activated when not allowed **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	U/T	Reset error from AIS software on workstation; if error remains check that X-ray exposure button is not pressed. If error remains technical service is required: + check if X-ray exposure button is shorted; + check the connection between the Remote Box and the Input Box at column basis; + check the cable P4041 between the Input Box at column basis and the Power board K31; + replace the Power board.
94	C	INVERTER_LINK_ERROR CAN communication error between Main board and Inverter board **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + access to the diagnostic message log file to check if additional diagnostic messages are acknowledge: if yes, first follow the troubleshooting suggested for these diagnostic messages; if error 94 remains: + check CAN cable P4037 between Main board K18 and Power board K42; + check CAN cable P4104-G between Power board K29 and Inverter board J1; + check/replace Main board; + check/replace Inverter board. + check/replace the Power board. NOTE: in case of Inverter board replacement, it is necessary to make the RX tube calibration.
95	B	FW_UPDATED_CANT_EXE Cannot execute firmware after update (boards need hardware reset)	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
96	C	EEPROM_DEVICE_ERROR Inverter board error: GENERAL STATE ERROR, bit 0 - EEPROM	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
97	C	EEPROM_DMA_RD_ERROR Inverter board error: GENERAL STATE ERROR, bit 1 - EEPROM READ DMA FAILURE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
98	C	EEPROM_DMA_WR_ERROR Inverter board error: GENERAL STATE ERROR, bit 2 - EEPROM WRITE DMA FAILURE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
99	C	EEPROM_I2CBUS_ERROR Inverter board error: GENERAL STATE ERROR, bit 3 - EEPROM I2CBUS	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
100	C	ANOD_CURR_NOT_CALIB Inverter board error: GENERAL STATE ERROR, bit 4 - ANODIC CURRENT NOT CALIBRATED	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
101	C	HI_VOLT_ENA_IN_IDLE Inverter board error: GENERAL STATE ERROR, bit 5 - HV ENABLE SIGNAL ACTIVE IN IDLE MODE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
102	C	PRE_HEAT_NOT_FINISH Inverter board error: GENERAL STATE ERROR, bit 6 - FILAMENT PRE HEATING NOT COMPLETED	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
103	C	OVER_VOLTAGE_ON_POS Inverter board error: GENERAL STATE ERROR, bit 8 - OVERVOLTAGE ON POSITIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
104	C	OVER_VOLTAGE_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 9 - OVERVOLTAGE ON NEGATIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
105	C	OVER_CURRENT_ON_POS Inverter board error: GENERAL STATE ERROR, bit 10 - OVERCURRENT ON POSITIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
106	C	OVER_CURRENT_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 11 - OVERCURRENT ON NEGATIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
107	C	VOLT_LOW_LIM_ON_POS Inverter board error: GENERAL STATE ERROR, bit 12 - VOLTAGE TOO LOW ON POSITIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
108	C	VOLT_UPP_LIM_ON_POS Inverter board error: GENERAL STATE ERROR, bit 13 - VOLTAGE TOO HIGH ON POSITIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
109	C	VOLT_LOW_LIM_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 14 - VOLTAGE TOO LOW ON NEGATIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
110	C	VOLT_UPP_LIM_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 15 - VOLTAGE TOO HIGH ON NEGATIVE STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
111	C	HI_VOLTS_ARC_ON_POS Inverter board error: GENERAL STATE ERROR, bit 16 - ARC DETECTED ON POSITIVE HV	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
112	C	HI_VOLTS_ARC_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 17 - ARC DETECTED ON NEGATIVE HV	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
113	C	ANOD_CURRENT_ABSENT Inverter board error: GENERAL STATE ERROR, bit 19 - ANODIC CURRENT ABSENT	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
114	C	ANOD_CURR_LOW_LIMIT Inverter board error: GENERAL STATE ERROR, bit 20 - ANODIC CURRENT TOO LOW	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
115	C	ANOD_CURR_UPP_LIMIT Inverter board error: GENERAL STATE ERROR, bit 21 - ANODIC CURRENT TOO HIGH	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
116	C	HEAT_SINK_OVER_TEMP Inverter board error: GENERAL STATE ERROR, bit 23 - HEAT SINK OVER TEMPERATURE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
117	C	FILM_CURR_LOW_LIMIT Inverter board error: GENERAL STATE ERROR, bit 24 - FILAMENT CURRENT TOO LOW	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
118	C	FILM_CURR_UPP_LIMIT Inverter board error: GENERAL STATE ERROR, bit 25 - FILAMENT CURRENT TOO HIGH	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
119	C	EXP_TIME_IS_LOW_LIM Inverter board error: GENERAL STATE ERROR, bit 28 - EXPOSURE TIME TOO SHORT	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
120	C	EXP_TIME_IS_UPP_LIM Inverter board error: GENERAL STATE ERROR, bit 29 - EXPOSURE TIME TOO LONG	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
121	C	EXP_NUM_PLS_LOW_LIM Inverter board error: GENERAL STATE ERROR, bit 30 - TOO FEW EXPOSURES	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
122	C	EXP_NUM_PLS_UPP_LIM Inverter board error: GENERAL STATE ERROR, bit 31 - TOO MANY EXPOSURES	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
123	C	TUBEH_IS_NOT_DETECT Inverter board error: GENERAL STATE ERROR, bit 32 - RX TUBE UNIT NOT CONNECTED OR TEMPERATURE SENSOR FAULT	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
124	C	TUBEH_OVER_TEMP_ERR Inverter board error: GENERAL STATE ERROR, bit 33 - RX TUBE UNIT OVER TEMPERATURE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
125	C	TUBEH_SENS_TEMP_ERR Inverter board error: GENERAL STATE ERROR, bit 34 - RX TUBE UNIT TEMPERATURE SENSOR FAULT	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
126	C	NO_CURR_GENR_ON_POS Inverter board error: GENERAL STATE ERROR, bit 35 - NO CURRENT GENERATED BY POSITIVE HV STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
127	C	NO_CURR_GENR_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 36 - NO CURRENT GENERATED BY NEGATIVE HV STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
128	C	IS_OVER_LOAD_ON_POS Inverter board error: GENERAL STATE ERROR, bit 37 - OVERLOAD ON POSITIVE HV STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
129	C	IS_OVER_LOAD_ON_NEG Inverter board error: GENERAL STATE ERROR, bit 38 - OVERLOAD ON NEGATIVE HV STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
130	C	NO_FBACK_ON_POS_ERR Inverter board error: GENERAL STATE ERROR, bit 40 - NO FEEDBACK ON POSITIVE HV STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
131	C	NO_FBACK_ON_NEG_ERR Inverter board error: GENERAL STATE ERROR, bit 41 - NO FEEDBACK ON NEGATIVE HV STAGE	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check cable between Inverter board J11 and Tubehead J2X and J3X; + check cable between Inverter board J12 and Tubehead J1X; + make a new RX tube calibration; + check/replace Inverter board; + check/replace Tubehead. NOTE: in case of Tubehead and/or Inverter board replacement, it is necessary to make the RX tube calibration. NOTE: in case of Tubehead replacement, it is necessary to make a new collimator calibration (Pan - CBCT - Ceph).
133	C	POWERDEV_LINK_ERROR CAN communication error between Main board and Power board **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check CAN cable P4037 between Main board K18 and Power board K42; + check/replace Main board; + check/replace Power board.
134	C	COL_DCFI_LINK_ERROR CAN communication error between Power board and Column board **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check CAN cable P4039 between Power board K28 and Column board X207; + check/replace Column board; + check/replace Power board.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
135	C	PCF_VOLT_IS_UPP_LIM PFC over voltage detected **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	A/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Power board.
136	C	PCF_VOLT_IS_LOW_LIM PFC under voltage detected **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	A/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Power board.
137	**C**	PCF_TEMP_IS_UPP_LIM PFC over temperature detected **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	A/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check that ambient temperature is in tolerance (max 30°C); + wait 15 minutes for X-MIND trium cooling down; + check/replace Power board.
138	C	PCF_TEMP_IS_LOW_LIM PFC under temperature detected **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	A/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check that ambient temperature is in tolerance (min 10°C); + wait 15 minutes for X-MIND trium cooling up; + check/replace Power board.
139	D	EMERGENCY_STOP_DONE X-MIND trium has rebooted after releasing the emergency stop button	U	Reset error from AIS software on workstation.
140	C	COL_DCFI_LW_VOLTAGE Column board error code 1 - Under-voltage **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check power supply cable P4089 between Column board X200 +/- and Power board K26; + check +40VDC power supply on Power board test points K25-red (+) and K25-white (-); + check/replace Column board; + check/replace Power board.
141	C	COL_DCFI_HI_VOLTAGE Column board error code 2 - Over-voltage **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check power supply cable P4089 between Column board X200 +/- and Power board K26; + check +40VDC power supply on Power board test points K25-red (+) and K25-white (-); + check/replace Column board; + check/replace Power board.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
142	C	COL_DCFI_HI_TEMPRAT Column board error code 5 - Over-heated motor or inverter	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board; + check/replace column motor.
143	C	COL_DCFI_HI_CURRENT Column board error code 9 - Inverter over-current / peak current error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board; + check/replace column motor.
144	C	COL_DCFI_SHORT_CIRC Column board error code 13 - Short-circuit – shut down	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board; + check/replace column motor.
145	C	COL_DCFI_IS_NOT_ENA Column board error code 16 - Not enabled	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
146	C	COL_DCFI_TXCMD_TOUT Column board error code 17 - Time-out – digital interface	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
147	C	COL_DCFI_ON_DIR_ERR Column board error code 18 - Start attempt with directional error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
148	C	COL_DCFI_TIMING_ERR Column board error code 128 - Internal timing error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
149	C	COL_DCFI_SYSTEM_ERR Column board error code 129 - System error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
150	C	COL_DCFI_WDOG_RESET Column board error code 131 - Reset by Watch Dog	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
151	C	COL_DCFI_VDIP_RESET Column board error code 132 - Reset by voltage dip (brown-out)	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
152	C	COL_DCFI_SFTW_RESET Column board error code 133 - Reset by SW	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
153	C	COL_DCFI_E2PROM_CRC Column board error code 140 - Parameter memory CRC error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
154	C	COL_DCFI_E2PROM_TAB Column board error code 141 - Parameter memory table has an error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
155	C	COL_DCFI_DFLT_TABLE Column board error code 142 - Parameter memory factory default table has an error	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check/replace Column board.
156	C	COLUMN_POS_WDG_TOUT Column motion stopped due to CAN communication timeout between Main board and Power board **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check CAN cable P4037 between Main board K18 and Power board K42; + check/replace Main board; + check/replace Power board.
157	C	COLUMN_POS_END_LIMI Column motion stopped because of the achievement of mechanical limit switches	U/T	Reset error from AIS software on workstation. Move the column in the opposite direction. The equipment can be operated, but the occurrence of this error means that the column potentiometer is out of calibration; technical service is required: + carry out column potentiometer calibration.
158	B	COLUMN_POS_RUN_LIMI Column motion stopped because of the achievement of calibrated upper or lower position	U	Only a warning: operator can move in the opposite direction.
159	C	COLUMN_POT_REF_LIMI Reference value for column potentiometer is out of range **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check column potentiometer and its cable P4694 to Power board K35; + check/replace Power board.
160	C	COLUMN_POT_POS_LIMI Read value of column potentiometer is out of range **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the mains supply before replacing this board.**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check column potentiometer and its cable P4694 to Power board K35; + check/replace Power board.
161	C	COLUMN_POT_POS_BLCK Column motion stopped because the column potentiometer is blocked **WARNING** **Dangerous mains voltage (100 – 240 VAC) is present on the Power board even with the mains switch off: disconnect X-MIND trium from the**	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check column potentiometer and its cable P4694 to Power board K35; + check column motor and its cable; + check/replace Column board; + check/replace Power board.

		mains supply before replacing this board.		
CODE	**SER**	**MESSAGE / DESCRIPTION**	**ACT**	**SOLUTION**
163	C	AUX_CBCT_LINK_ERROR CAN communication error between Main board and AUX CBCT board	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check CAN cables between Main board and AUX CBCT; + check/replace Main board; + check/replace AUX CBCT board.
164	B	AUX_CEPH_LINK_ERROR CAN communication error between Main board and AUX CEPH board	T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check CAN cable P4038 between Main board K19 and AUX CEPH board K17; + check/replace Main board; + check/replace AUX CEPH board.
165	C	PRM_COLLIM_DO_BREAK **WARNING:** operator has intentionally stopped a movement releasing X-ray button	U	Wait the full exam procedure is completed before releasing X-ray button: message on workstation “exposure button can be released”.
166	C	PRM_COLLIM_CNTL_FSM Unexpected primary collimator condition	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
167	B	VERT_INF_RESET_RAMP Unexpected condition during reset of primary collimator vertical-inf axis	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
168	C	VERT_INF_RESET_TOUT Timeout of primary collimator vertical-down axis reset	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor vertical-down and its cable P4070 to AUX CBCT board K5; + check optoswitch vertical-down and its cable P4073 to AUX CBCT board K11; + check/replace AUX CBCT board.
169	C	VERT_INF_PT_PT_GOTO The point-to-point positioning of vertical-down axis of primary collimator is failed	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
170	B	VERT_SUP_RESET_RAMP Unexpected condition during reset of primary collimator vertical-up axis	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
171	C	VERT_SUP_RESET_TOUT Timeout of primary collimator vertical-up axis reset	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor vertical-up and its cable P4069 to AUX CBCT board K4; + check optoswitch vertical-up and its cable P4072 to AUX CBCT board K9; + check/replace AUX CBCT board.
172	C	VERT_SUP_PT_PT_GOTO The point-to-point positioning of vertical-up axis of primary collimator is failed	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
173	B	HORZ_ONE_RESET_RAMP Unexpected condition during reset of primary collimator horizontal axis	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.

CODE	SER	MESSAGE / DESCRIPTION	ACT	SOLUTION
174	C	HORZ_ONE_RESET_TOUT Timeout of primary collimator horizontal axis reset	U/T	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation. If error remains technical service is required: + check motor H and its cable P4068 to AUX CBCT board K3; + check optoswitch H and its cable P4071 to AUX CBCT board K7; + check/replace AUX CBCT board.
175	C	HORZ_ONE_PT_PT_GOTO The point-to-point positioning of horizontal axis of primary collimator is failed	A	Reset error from AIS software on workstation; if error remains restart X-MIND trium and workstation.
177	C	XRAYS_EXAM_DO_BREAK **WARNING:** operator has intentionally stopped the X-ray emission releasing X-ray button	U	Wait the full exam procedure is completed before releasing X-ray button; on the workstation will appear the message: *"exposure button can be released".*

8. BACK UP OF DIAGNOSTIC MESSAGES LOG FILE

The diagnostic messages are stored in a file (log file) created every time an error condition is present. The log file is stored in the following directory:

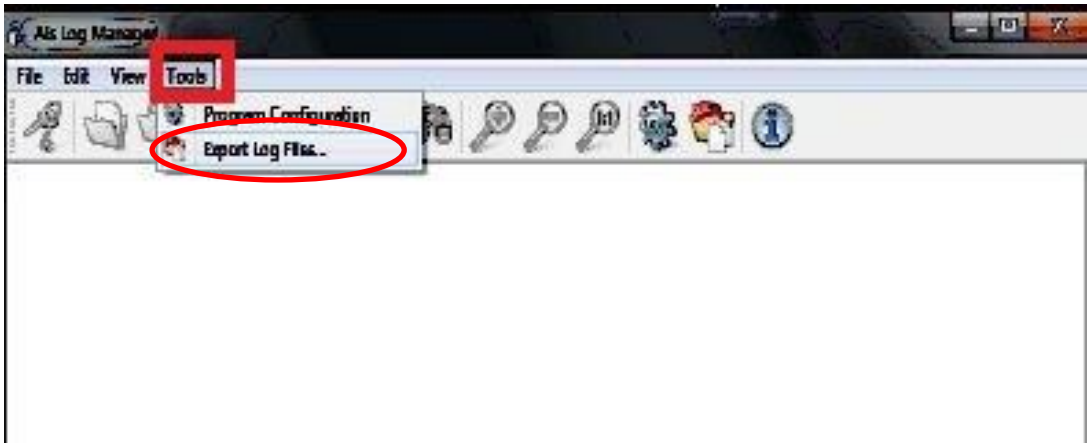
C:AISsoftware\XMdriver\XM\config\log_inferr<date>.txt

In case of request from the de Götzen® S.r.l. - ACTEON Group technical support, it is possible to create a back-up of the log file using the following the procedure.

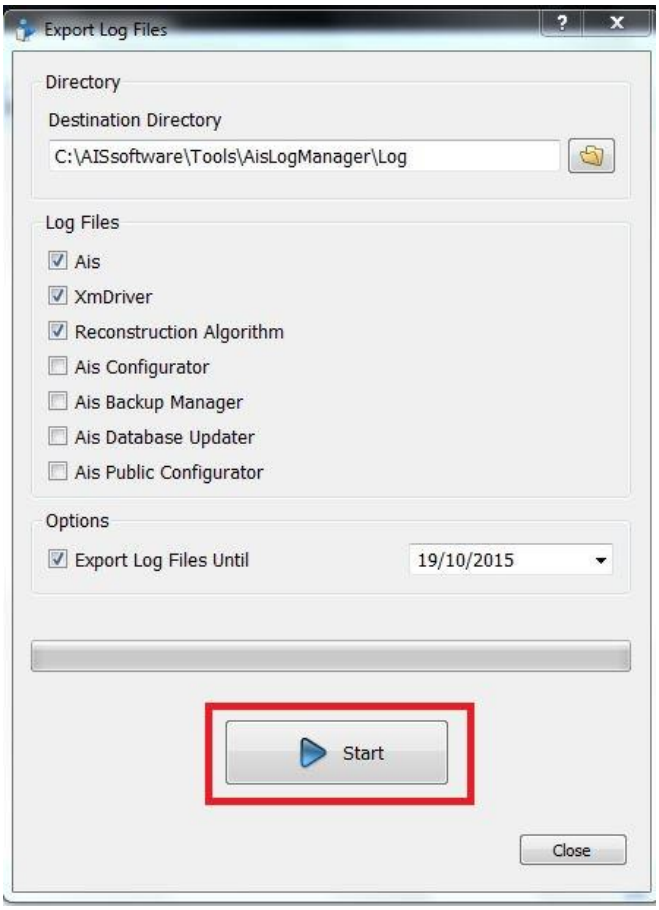
- **PROCEDURE**

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start AIS Log Manager double clicking on the file: C:\AISSoftware\Tools\AisLogManager.bat

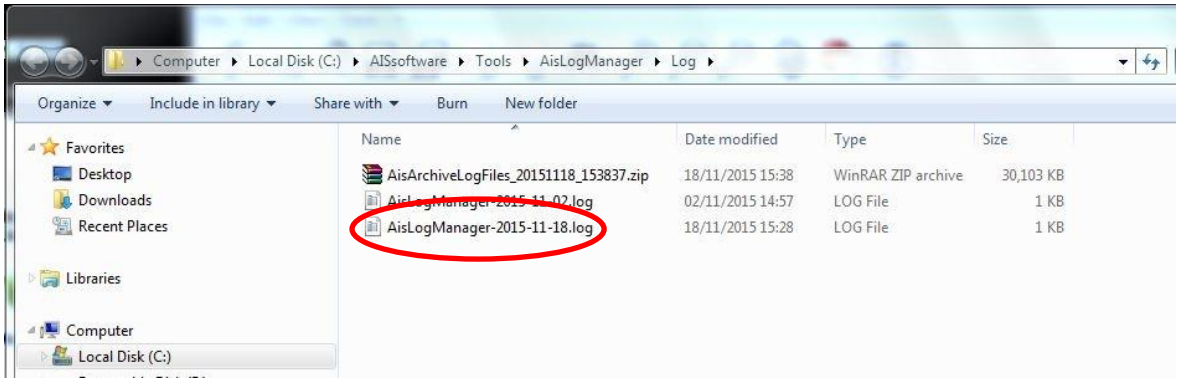
d. Click on TOOL tab and select EXPORT LOG FILES.



e. In the window click on START button.



f. A diagnostic messages log file (AisLogManager<date>.log) will be stored in the following default directory with date and time of the creation:
C:\AISsoftware\Tools\AisLogManager\Log



9. HARDWARE TROUBLESHOOTING

Nothing happens when the X-MIND trium is turned on.

Exposure does not start when the X-ray button is pressed.

Exposure sequence starts but no X-ray are emitted.

Motors not working.

Ceph image detector not working.

The Pan Image Detector is not working.

The CBCT Image Detector is not working.

The Ceph Image Detector is not working.

Poor image quality.

Horizontal bars in the image.

Reduced gray scale.

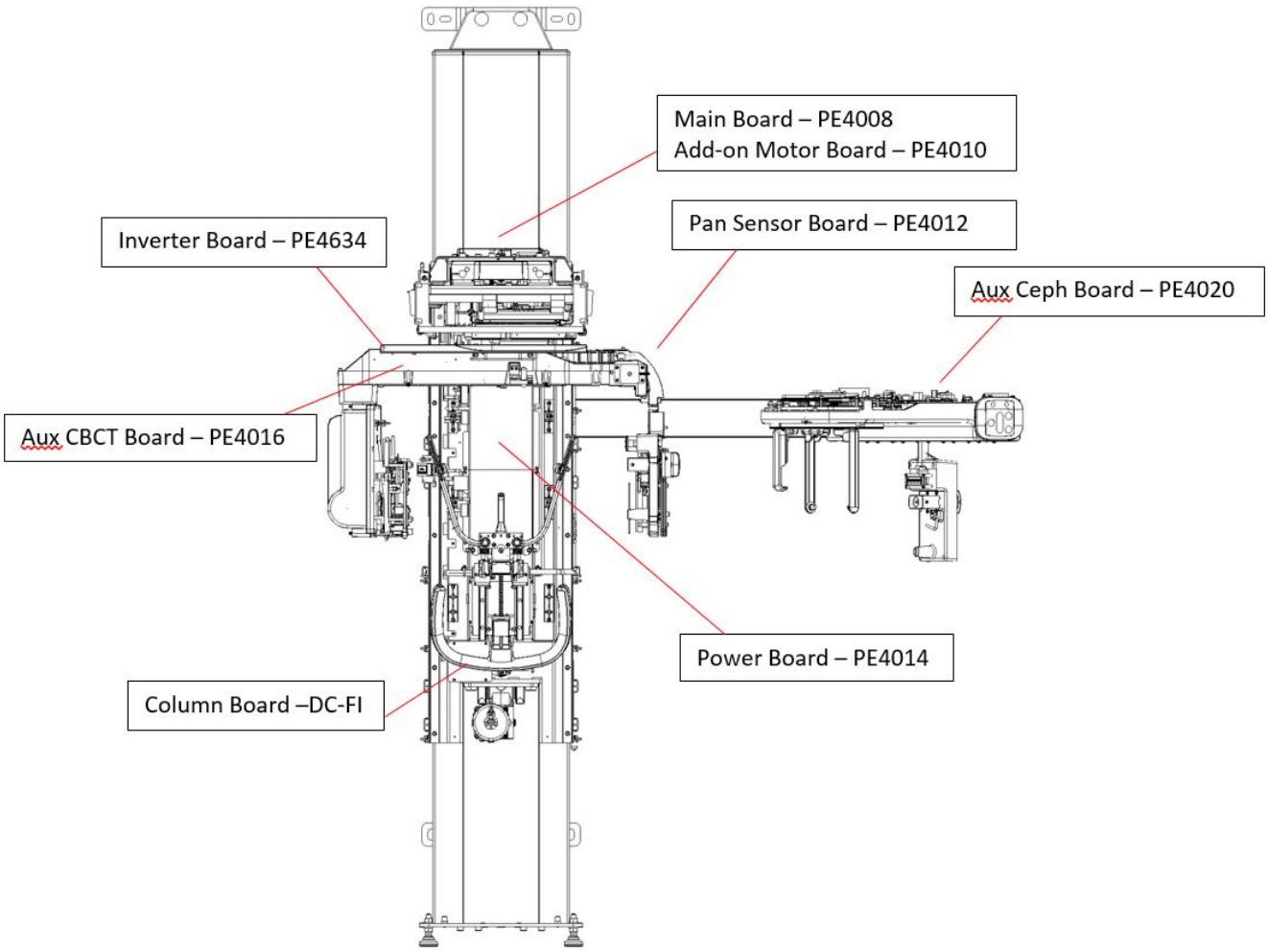
Image is messy.

Image is too dark or too light (preheating check, mA check, kV check).

Column is not moving up/down.

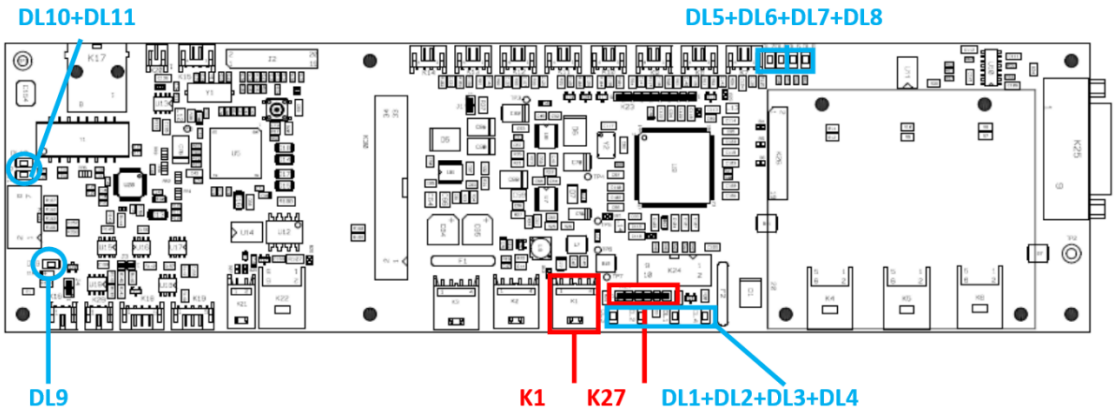
Column is moving in only one direction.

10. ELECTRONIC BOARDS



10.1. MAIN BOARD – PE4008

Functions:
System control.
R, X and Y motor control.
R potentiometer control.
R, X, Y, B, C and S optoswitch control.
Display and control panel control.
X-ray enable signal generation to the Inverter board.
Generation of the trigger signal for the image detector (Pan, CBCT and Ceph).
PAN mid-sagittal laser (patient arm) power supply.
U-arm encoder control.



LED

REF	DESCRIPTION	TROUBLESHOOTING
DL1	+ Green when 12VDC internal voltage is ON	It is always ON
DL2	+ Green when 5VDC internal voltage is ON	It is always ON
DL3	+ Green when 3.3VDC internal voltage is ON	It is always ON
DL4	+ Green when 1.2VDC internal voltage is ON	It is always ON
DL7	+ Green when encoder is ON	It is always ON (CBCT mod.)
DL9	+ Green when image detectors power supply is ON	It is always ON
DL10	+ Green on Ethernet activity	It is always ON
DL11	+ Green on Ethernet activity	It is always ON

JUMPER

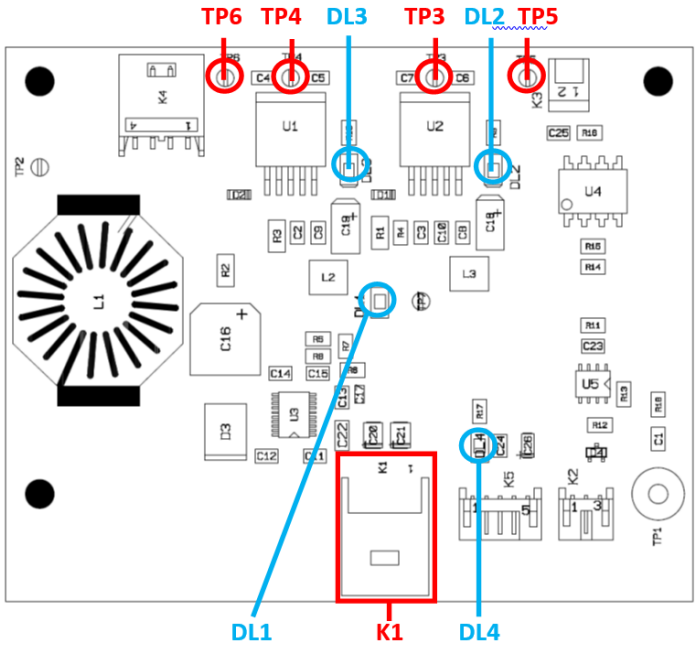
REF	DESCRIPTION	SETTING	
J3	CAN termination	Open = CEPH present	Closed = CEPH not present
J4	Trigger CEPH image detector	Open = CEPH present	Closed = CEPH not present

TEST POINT

TP +	TP -	DESCRIPTION	ACCEPTANCE	TUNABLE
K27 pin 2	K27 pin 1	1.2V internal (derived from +40VDC in)	1.1V – 1.3V	N
K27 pin 4	K27 pin 1	3.3V internal (derived from +40VDC in)	3.1V – 3.6V	N
K27 pin 5	K27 pin 1	5V internal (derived from +40VDC in)	4.7V – 5.5V	N
K27 pin 6	K27 pin 1	12V internal (derived from +40VDC in)	11.3V – 12.8V	N
K1 red	K1 white	40VDC in	39V – 41V	N

10.2. PAN SENSOR BOARD – PE4012 (only PAN base model)

Functions:
Power supply to the Pan image detector.
Trigger signal for the Pan image detector (from Main board).



LED

REF	DESCRIPTION	TROUBLESHOOTING
DL1	+ Green when +12VDC IN is present	It is always ON
DL2	+ Green when PAN image detector analog power supply is ON	It is always ON
DL3	+ Green when PAN image detector digital power supply is ON	It is always ON
DL4	+ Green when trigger power supply is ON	It is always ON

JUMPER

REF	DESCRIPTION	SETTING
J1	Trigger PAN image detector	Closed

TEST POINT

TP +	TP -	DESCRIPTION	ACCEPTANCE	TUNABLE
TP4	TP6	5V digital PAN image detector (derived from 12VDC in) - always present	4.9V – 5.1V	N
TP3	TP5	5V analog PAN image detector (derived from 12VDC in) - always present	4.9V – 5.1V	N
K1 red	K1 white	12VDC in	11.5V – 12.5V	N

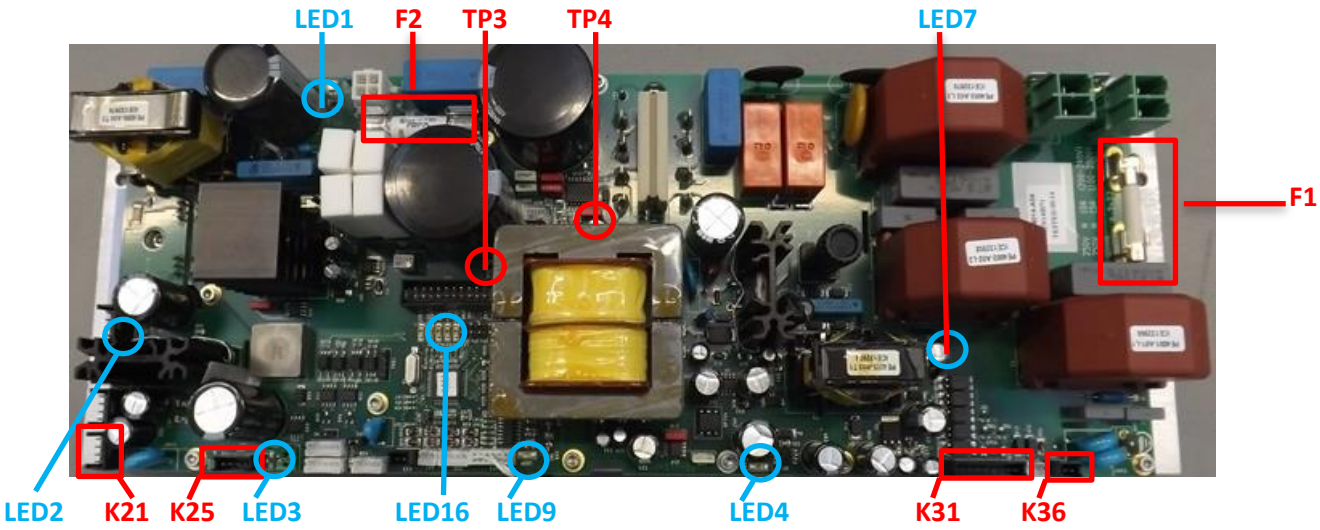
POWER BOARD – PE4014

WARNING

Dangerous 385VDC voltage is present on this board.

Dangerous mains voltage (100 – 240 VAC) is present on this board even when the mains switch is off: disconnect X-MIND trium from the mains supply before accessing to this board.

Functions:
Emergency switch interface.
Connection to the mains supply.
Connection to the mains ON/OFF switch.
Connection to the remote control box.
Generation of +12VDC, +385VDC, +40VDC and +24VDC power supplies.
Control of the upper and lower limits of the column vertical movement.
Control of the column vertical movement potentiometer.



LED

REF	DESCRIPTION	TROUBLESHOOTING
LED1	+ Green when 385VDC OUT power supply is ON + Red in failure state	GREEN always ON when properly working RED general malfunction (check fuse F2)
LED2	+ Green when 12VDC OUT power supply is ON	It is always ON
LED3	+ Green when 40VDC OUT power supply is ON	It is always ON
LED4	+ Green when CAN power supply is ON	It is always ON
LED7	+ Green when 24V OUT is ON	It is always ON
LED9	+ Green when internal 3.3V is ON	It is always ON
LED16	+ Green when microcontroller is running	It is always ON

JUMPER

REF	DESCRIPTION	SETTING
J2	CAN termination	Closed
J3	CAN termination	Open

FUSE

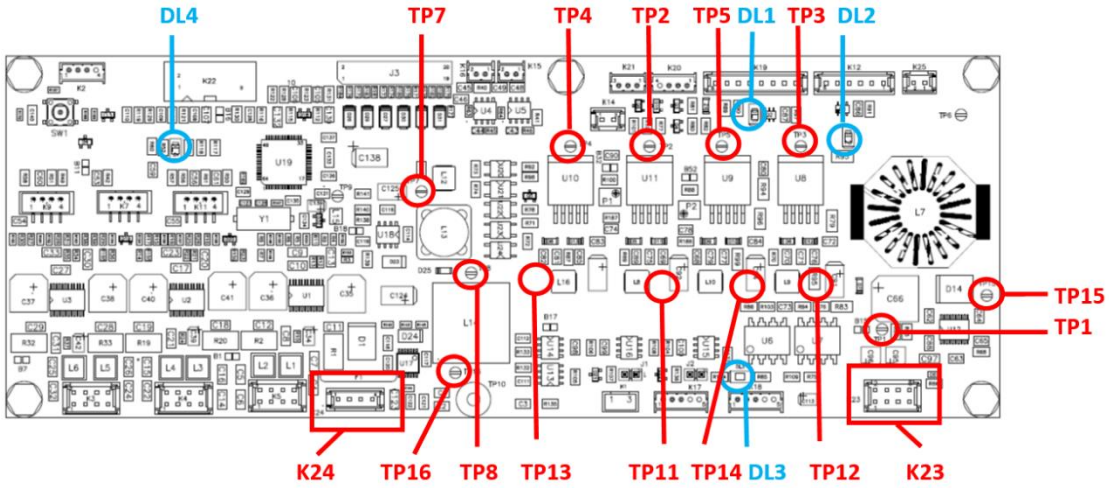
REF	DESCRIPTION	SIZE	RATING
F1	100 – 240 VAC input	6.3 X 32	T 10A – 250V for power supply 200V-240V T 15A – 250V for power supply 100V-200V
F2	+385 VDC power supply	10.3 X 38	F 8A – 600V

TEST POINT

TP +	TP -	DESCRIPTION	ACCEPTANCE	TUNABLE
K31 pin2	K36 pin1	24VDC OUT	22 – 26V	Trimmer P2
TP3	TP4	12V internal PFC	11.5V – 12.5V	N
K21 red	K21 white	12VDC OUT	11.5V – 12.5V	N
K25 red	K25 white	40VDC PUT	39V – 41V	N

10.3. AUX CBCT BOARD – PE4016

Functions:
Power supply to the Pan and CBCT image detector.
Trigger signal for the Pan and CBCT image detector (from Main board).
CBCT mid-sagittal laser (U-arm) and axial laser power supply.
Control of the presence switch for movable Pan/Ceph image detector.
H, Vup and Vdown motorized collimator motor control.
H, Vup and Vdown motorized collimator optoswitch control.



LED

REF	DESCRIPTION	TROUBLESHOOTING
DL1	+ Green when PAN image detector power supply is ON	It is normally OFF; when a PAN exam is selected, this LED is ON until the end of exam
DL2	+ Green when CBCT image detector power supply is ON	It is normally OFF; when a CBCT exam is selected, this LED is ON until the end of exam
DL3	+ Green when CAN power supply is ON	It is always ON
DL4	+ Green when microcontroller is running + Green flashing when microcontroller programming is on going	It is always ON/flashing

JUMPER

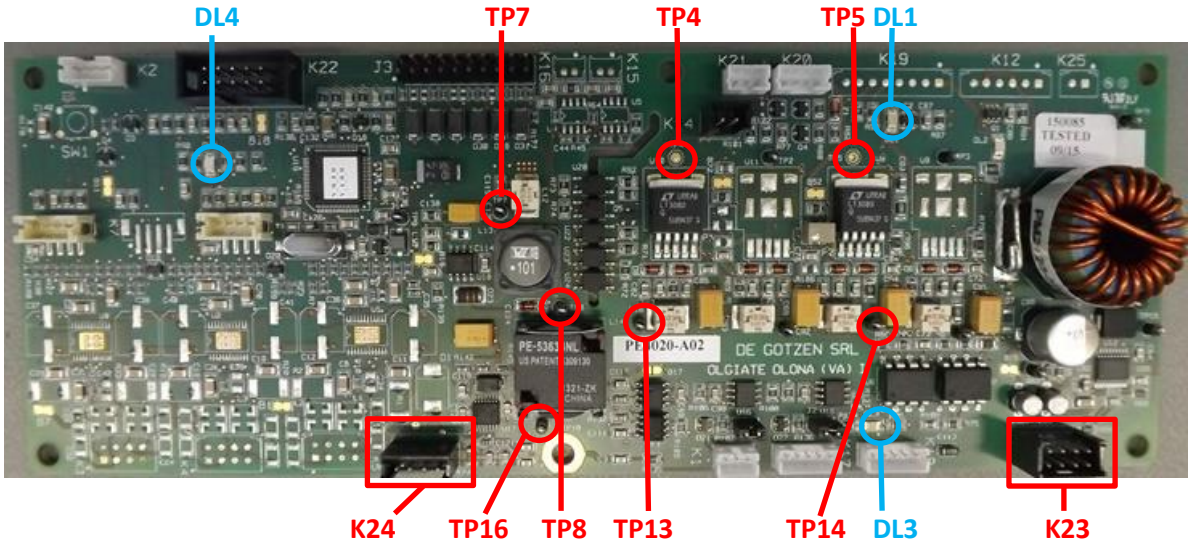
REF	DESCRIPTION	SETTING
J1	Trigger CBCT image detector	Closed
J2	CAN termination	Closed

TEST POINT

TP +	TP -	DESCRIPTION	ACCEPTANCE	TUNABLE
TP7	TP16	3.3V internal (derived from +40VDC in)	3.1V – 3.6V	N
TP8	TP16	5V internal (derived from +40VDC in)	4.7V – 5.5V	N
TP1	TP15	6V internal (derived from +40VDC in)	5.5V – 6.5V	N
TP3	TP12	5V digital CBCT image detector (derived from 12VDC in) - present only when the image detector is ON	4.9V – 5.1V	Trimmer P1
TP2	TP11	5V analog CBCT image detector (derived from 12VDC in) - present only when the image detector is ON	4.9V – 5.1V	Trimmer P1
TP5	TP14	5V digital PAN image detector (derived from 12VDC in) - present only when the image detector is ON	4.9V – 5.1V	Trimmer P2
TP4	TP13	5V analog PAN image detector (derived from 12VDC in) - present only when the image detector is ON	4.9V – 5.1V	Trimmer P2
K23 red	K23 white	12VDC in	11.5V – 12.5V	N
K24 red	K24 white	40VDC in	39V – 41V	N

10.4. AUX CEPH BOARD – PE4020

Functions:
Power supply to the Ceph image detector.
Trigger signal for the Ceph image detector (from Main board).
Control of the presence switch for movable Pan/Ceph image detector.
Control of the nasion potentiometer.
Control of the Ceph control panel.
Cephalostat optoswitches control to detect the LL, AP or PA position.



LED

REF	DESCRIPTION	TROUBLESHOOTING
DL1	+ Green when CEPH image detector power supply is ON	It is normally OFF; when a CEPH exam is selected, this LED is ON until the end of exam
DL3	+ Green when CAN power supply is ON	It is always ON
DL4	+ Green when microcontroller is running + Green flashing when microcontroller programming is on going	It is always ON

JUMPER

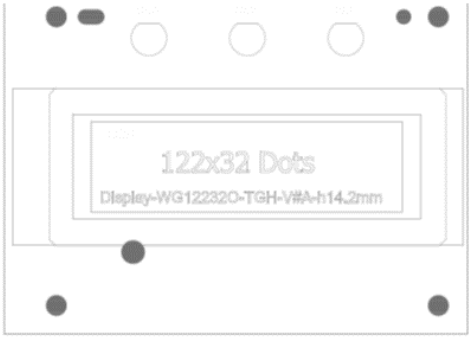
REF	DESCRIPTION	SETTING
J1	Trigger Ceph image detector	Closed
J2	CAN termination	Closed

TEST POINT

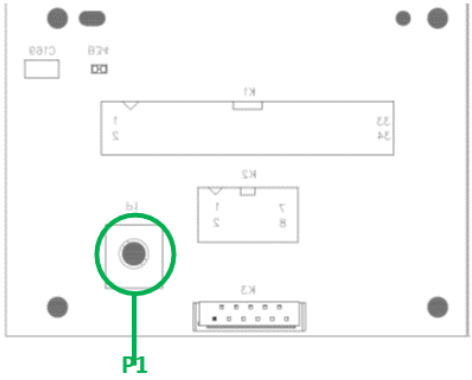
TP +	TP -	DESCRIPTION	ACCEPTANCE	TUNABLE
TP7	TP16	3.3V internal (derived from +40VDC in)	3.1V – 3.6V	N
TP8	TP16	5V internal (derived from +40VDC in)	4.7V – 5.5V	N
TP5	TP14	5V digital CEPH image detector (derived from 12VDC in) - present only when the image detector is ON	4.9V – 5.1V	Trimmer P2
TP4	TP13	5V analog CEPH image detector (derived from 12VDC in) - present only when the image detector is ON	4.9V – 5.1V	Trimmer P2
K23 red	K23 white	12VDC in	11.5V – 12.5V	N
K24 red	K24 white	40VDC in	39V – 41V	N

10.5. DISPLAY BOARD – PE4026

TOP layer with display – not accessible



BOTTOM layer - accessible



Trimmer

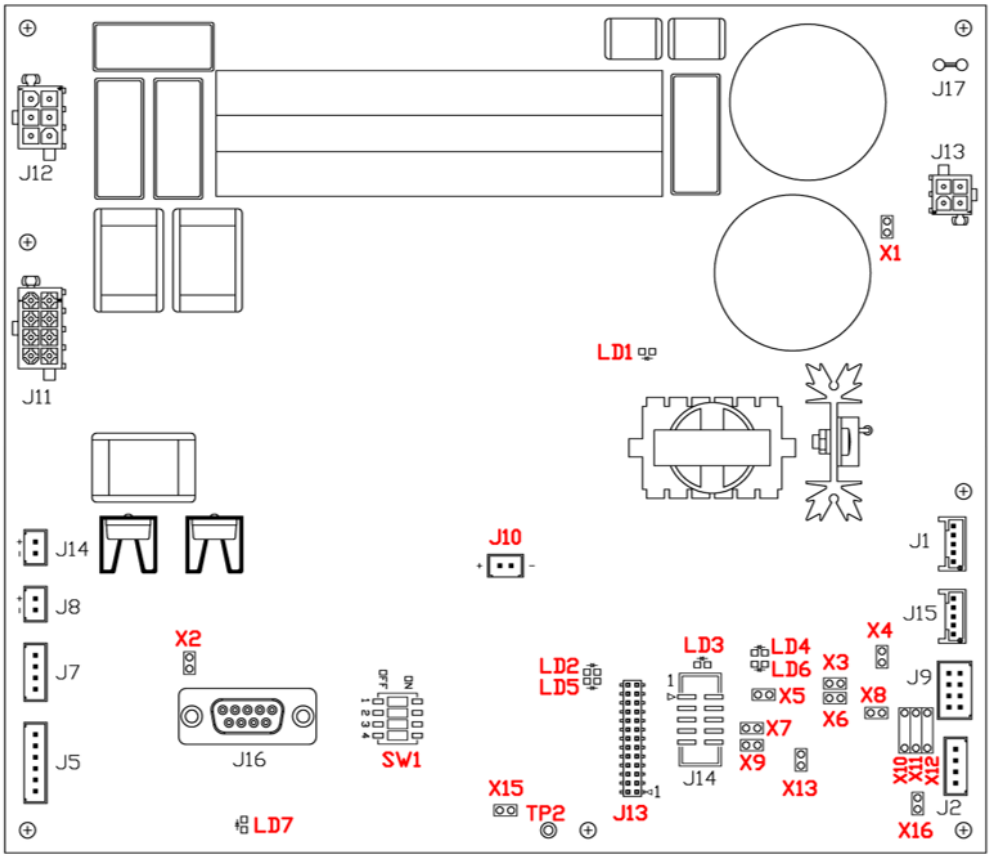
REF	DESCRIPTION
P1	+ Trimmer to tune display brightness

10.6. INVERTER BOARD – PE4634

WARNING

Dangerous 385VDC voltage is present on this board.

Functions:
Generation of the kV and mA power supplies for the tubehead.
Control of the kV and mA power supplies using the kV and mA feedback signals from the tubehead.
Control of the X-ray enable signal from the Main board.
Coronal-canine laser and Frankfurt laser power supply.
Auxiliary fan power supply.



LED

REF	DESCRIPTION	TROUBLESHOOTING
LD1	Red when auxiliary +12VDC power section internal voltage is ON	It is always ON
LD2	Status, green	Blinking = normal operation ON = firmware updating OFF = fault
LD3	Red when +12VDC internal voltage is ON	It is always ON
LD4	Red when +5VDC internal voltage is ON	It is always ON
LD5	Alarm, red	ON when alarm present
LD6	Red when +3.3VDC internal voltage is ON	It is always ON
LD7	Red when +24VDC internal voltage is ON	It is always ON

JUMPER

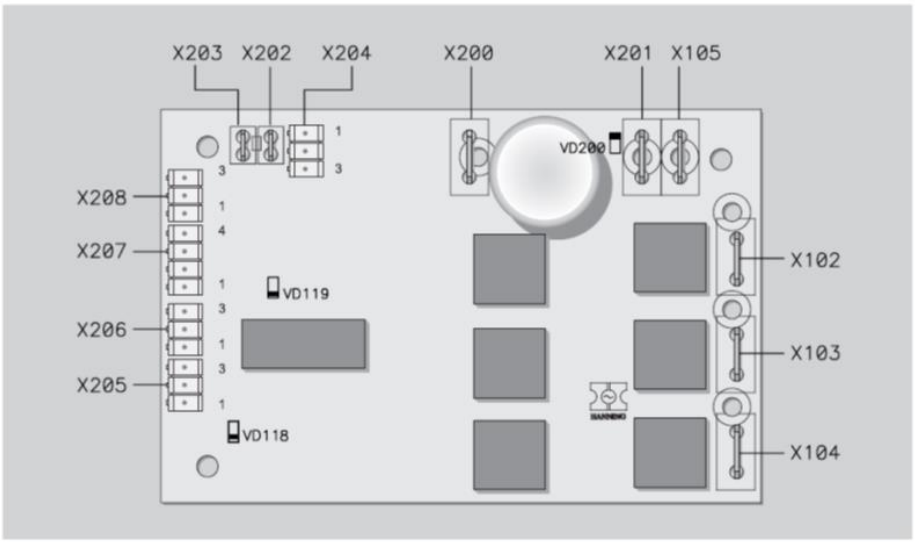
REF	DESCRIPTION	SETTING
X1	Power on switching power supply – CAUTION: CONNECTED TO MAIN VOLTAGE	Open = power supply OFF Closed = power supply ON Default=closed
X2	Laser voltage selection	Open = 5V selected Closed = 3.3V selected Default= closed
X4	CAN termination	Open = not terminated Closed = terminated **Default= closed for PAN only model** **Default= open for PAN-CBCT-CEPH models**
X3	+ 5V CAN bus internal power supply selection	Open = external +5V Closed = internal +5V selected Default=open
X6	GND CAN bus internal reference selection	Open = external GND Closed = internal GND selected Default=open
X7	+ 5V RS485 internal power supply selection	Open = external +5V Closed = internal +5V selected Default=closed
X9	GND RS485 internal reference selection	Open = external GND Closed = internal GND selected Default=Closed
X13	RS485 termination	Open = not terminated Closed = terminated Default=open
X16	X-ray activating signals GND common selection	Open = GND common not selected Closed = GND common selected Default=open
X5, X8, X10, X11, X12, X15	Internal use	Default= Open

TEST POINT

TP +	TP -	DESCRIPTION	ACCEPTANCE	TUNABLE
J13 pin 22	TP2, J13 pin 24	+3.3VDC internal	3.1V – 3.5V	N
J13 pin 21	TP2, J13 pin 24	+5.0VDC internal	4.75V – 5.25V	N
J13 pin 23	TP2, J13 pin 24	+12VDC internal	11.0V – 14.4V	N

10.7. COLUMN BOARD – DC-FI

Functions:
Control of the column motor.



JUMPER

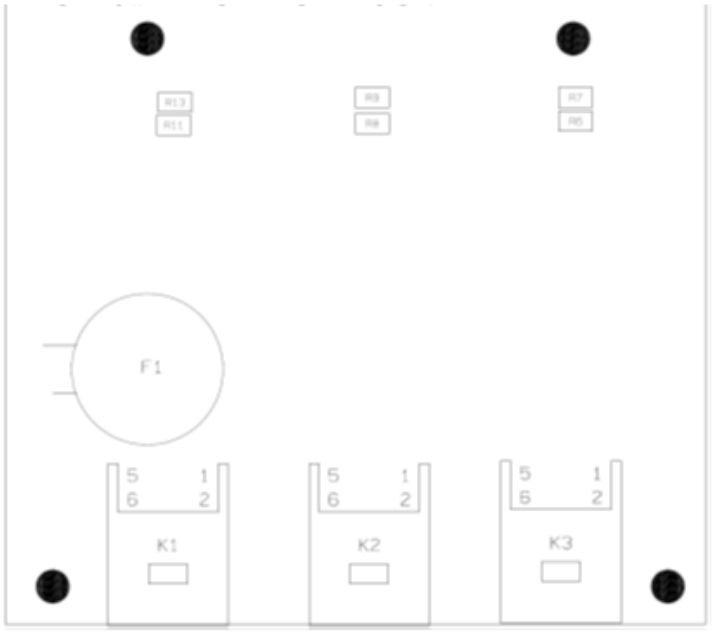
REF	DESCRIPTION	SETTING
X208 pin 2-3	CAN termination	Closed

CONNECTIONS

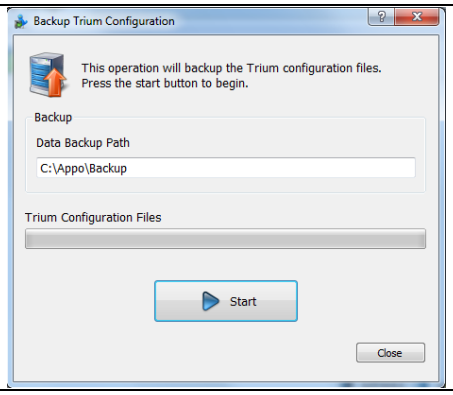
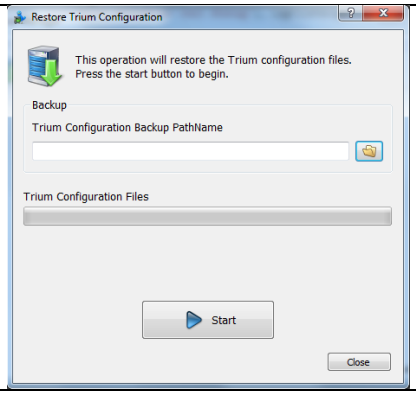
TERMINAL	CONNECTION
X202, X203	Motor temperature sensor
X204	Hall sensor
X200, X201	Power supply
X102, X103, X104, X105	Motor
X205	Control connection 1
X206	Control connection 2
X207	Digital interface (CAN BUS)

10.8. ADD ON MOTOR BOARD – PE4010

Functions:
S, B and C motor control.



11. CONFIGURATIONS

Backup Trium Configuration	Restore Trium Configuration
THIS OPERATION MUST BE PERFORMED EACH TIME THE CONFIGURATION AND/OR THE CALIBRATION (EVEN IF IS ONLY ONE) OF TRIUM IS PERFORMED VIA SERVICE SOFTWARE IN XM DRIVER	
Open AIS Backup Manager -> Tools -> Backup Trium Configuration This function permits the user to execute the backup of the trium configuration files. The backup will be created in the 'Data Backup Path' as show in the user interface. The backup consist in a .tcf file created in the root of 'Data Backup Path'. To execute the backup, press the Start button and wait the end of the process.	**Open AIS Backup Manager -> Tools -> Restore Trium Configuration** This function permits the user to execute the restore of the trium configuration files. To execute the restore, clicks on the folder button to select a valid backup file, than press the Start button and wait the end of the process.
	

11.1. EXECUTE "SERVICE" FOR X-MIND trium

- **INTRODUCTION**

In this paragraph you can find instructions to execute the "SERVICE" software for the configuration of the X-MIND trium.

With the "SERVICE" software it is possible to configure:
- ✓ the IP address
- ✓ the X-MIND trium model
- ✓ the external light modality
- ✓ the vertical X-ray beam limitation
- ✓ the serial number
- ✓ the firmware update.

- **PROCEDURE**

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.

c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

11.2. IP ADDRESS SETUP

- **INTRODUCTION**

In order that AIS software and X-MIND trium can communicate, the IP address programmed on Main board of X-MIND trium must be set into X-MIND driver; the IP address of the Network Interface Card (NIC) of the WorkStation must be of the same family of X-MIND trium IP address.

In this paragraph, you can find instructions to:

- ✓ Verify and setup IP address of X-MIND trium, that is programmed on Main board
- ✓ Verify and setup IP address on X-MIND driver
- ✓ Verify and setup IP address on Network Interface Card (NIC) of the WorkStation.

- **PROCEDURE TO VERIFY IP ADDRESS OF X-MIND trium (programmed on Main board)**

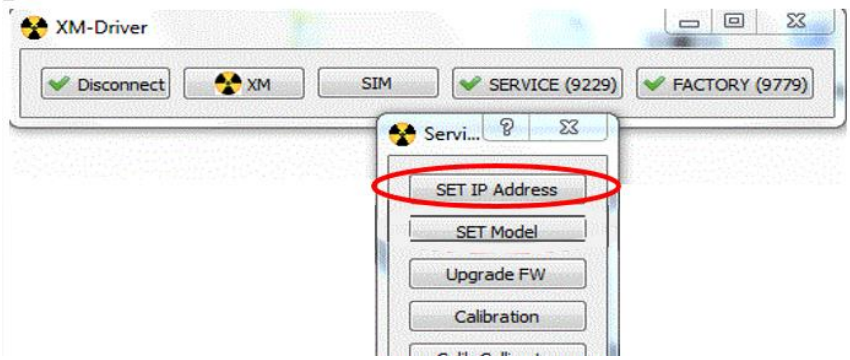
a. Power ON X-MIND trium.
b. The IP address is shown for some seconds immediately after turning ON the equipment.

- **PROCEDURE TO VERIFY IP ADDRESS OF X-MIND DRIVER**
  - **LOGIN to SERVICE**

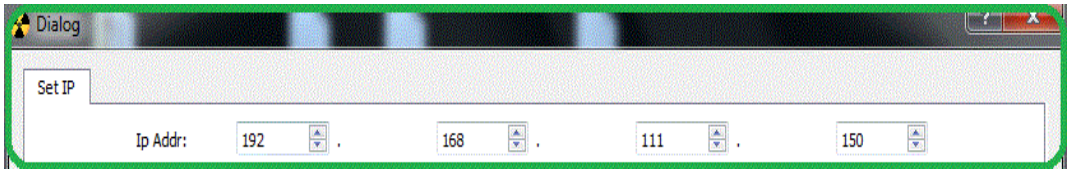
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Click on SERVICE tab and enter the required password: rdtech.

  - **VERIFY IP address**

e. Select SET IP address.

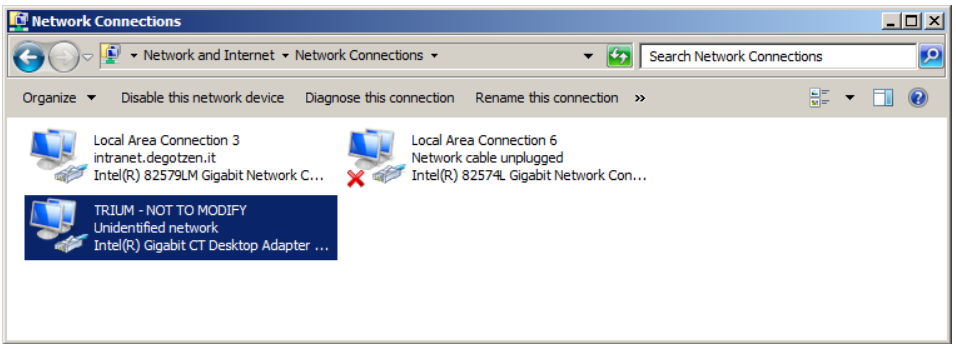


f. In the window is shown the IP address used by X-MIND driver to establish connection with X-MIND trium.

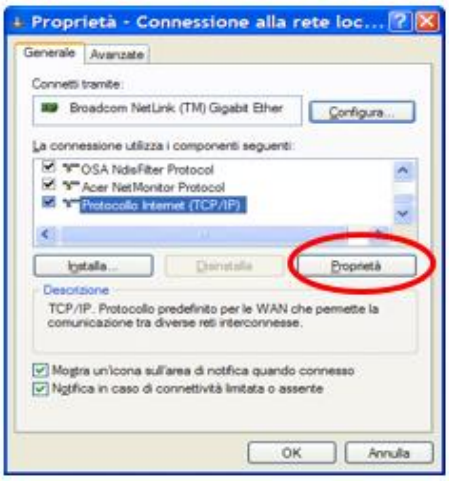


- **PROCEDURE TO VERIFY PERSISTENT IP ADDRESS USED BY NETWORK INTERFACE CARD (NIC) OF WORKSTATION**

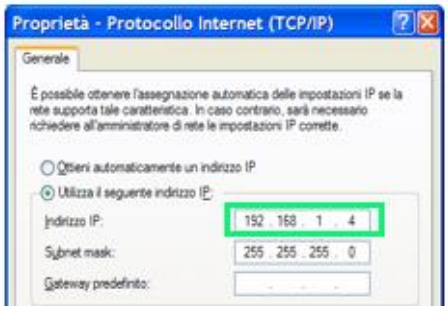
a. In Windows control panel select Network connections.
b. Right click on “TRIUM DO NOT MODIFY” network board and select properties.



c. Select Internet Protocol and click on Properties.



d. The persistent IP address used by NIC is shown in the window as follows:



- ## PROCEDURE TO SETUP IP ADDRESS FOR NIC, DRIVER AND MAINBOARD OF X-MIND trium

Below are the two scenarios for properly configuring the IP address:

CASE A) SET NEW IP ADDRESS FOR X-MIND DRIVER WITHOUT CHANGING IP ADDRESS OF X-MIND trium

Do this when it is not possible to establish connection with X-MIND trium (having a different IP address).

○ TAKE NOTE OF THE IP ADDRESS OF X-MIND trium

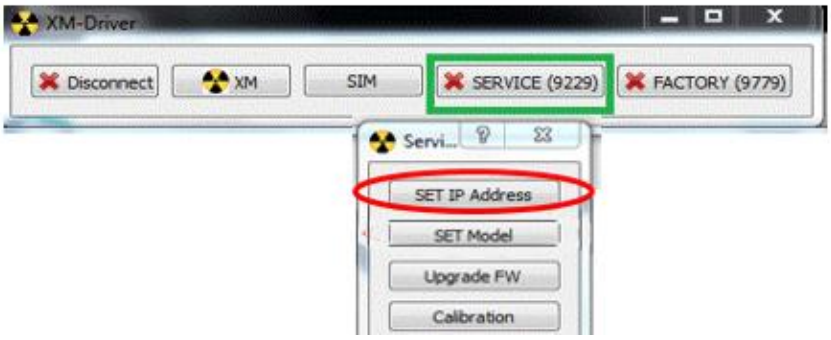
a. Power ON X-MIND trium.
b. The IP address is shown for some seconds immediately after turning ON the equipment: take not of it.

○ LOGIN TO SERVICE

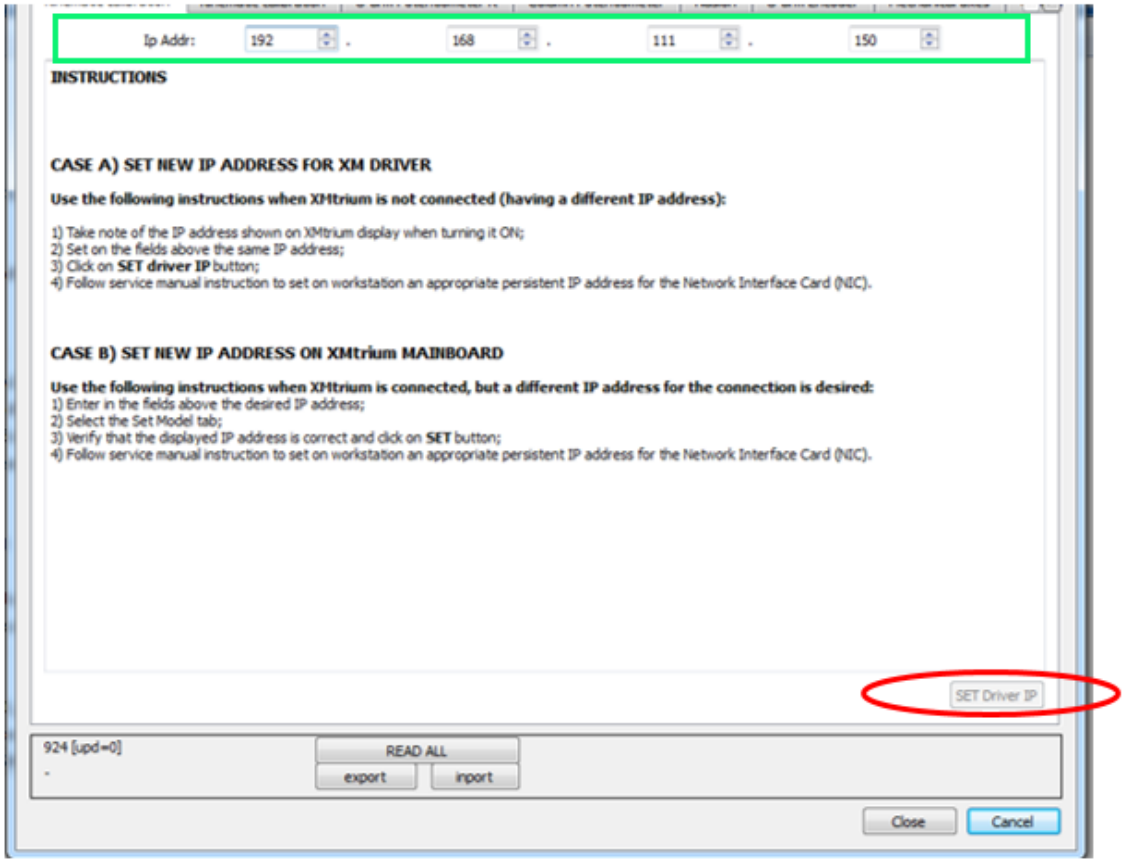
c. End execution of AIS.
d. Turn OFF then ON X-MIND trium.
e. Start XMdriver Show double clicking on the file: C:\AISSoftware\XMdriver\XMdriverShow.bat
f. Click on SERVICE tab and enter the required password: rdtech.

○ SET ACCORDINGLY IP ADDRESS OF X-MIND trium DRIVER

g. Select SET IP address.

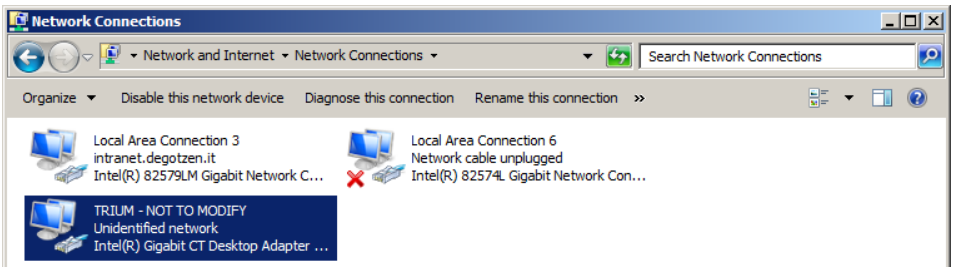


h. Enter in the fields below the same IP address taken from X-MIND trium display (192.168.111.150 in this example).
i. Click on SET driver IP button.

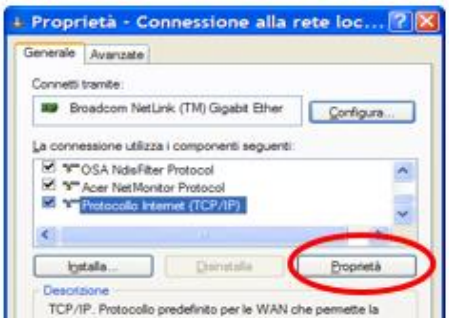


○ SET ACCORDINGLY IP ADDRESS OF WORKSTATION NIC

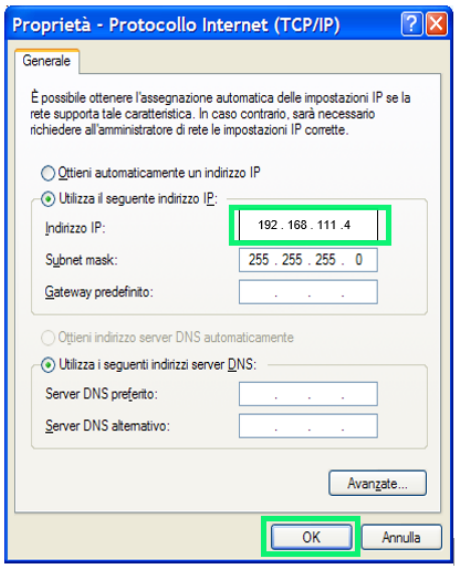
j. In Windows control panel select Network connections.
k. Right click on “TRIUM DO NOT MODIFY” network board and select properties.



l. Select Internet Protocol and click on Properties.



m. Set the IP address as persistent and enter IP address value in accordance with X-MIND trium IP address value (192.168.111.4 in this example).
n. SET Subnet mask to 255.255.255.0.



o. Make effective the modification by ending the X-MIND driver SERVICE.

○ VERIFY THAT CONNECTION WITH X-MIND trium IS ESTABLISHED

p. Turn OFF then ON X-MIND trium.
q. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
r. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).

CASE B) SET NEW IP ADDRESS FOR X-MIND trium ON MAIN BOARD

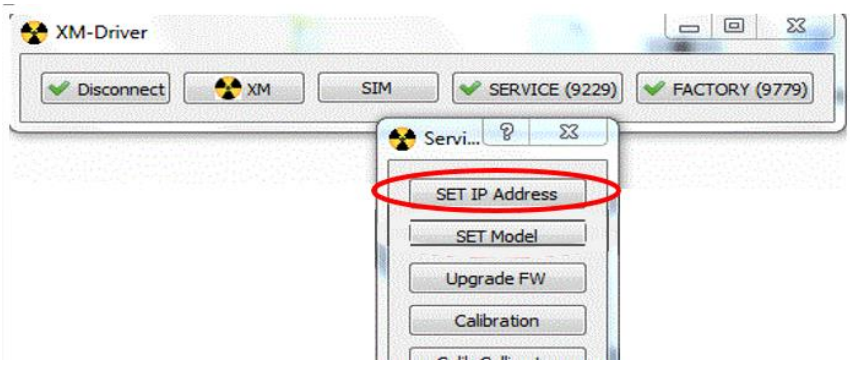
Do this when a different IP address from the factory one is desired for X-MIND trium.

○ LOGIN TO SERVICE

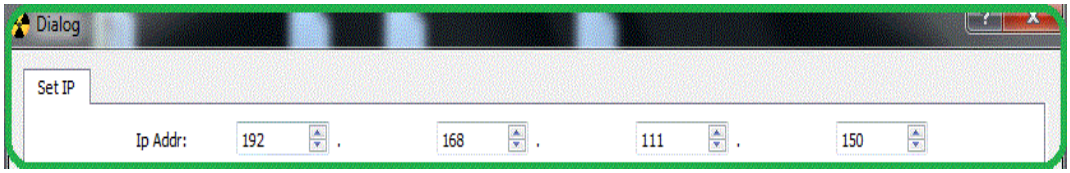
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (Workstation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ SET IP ADDRESS OF X-MIND DRIVER AND X-MIND trium

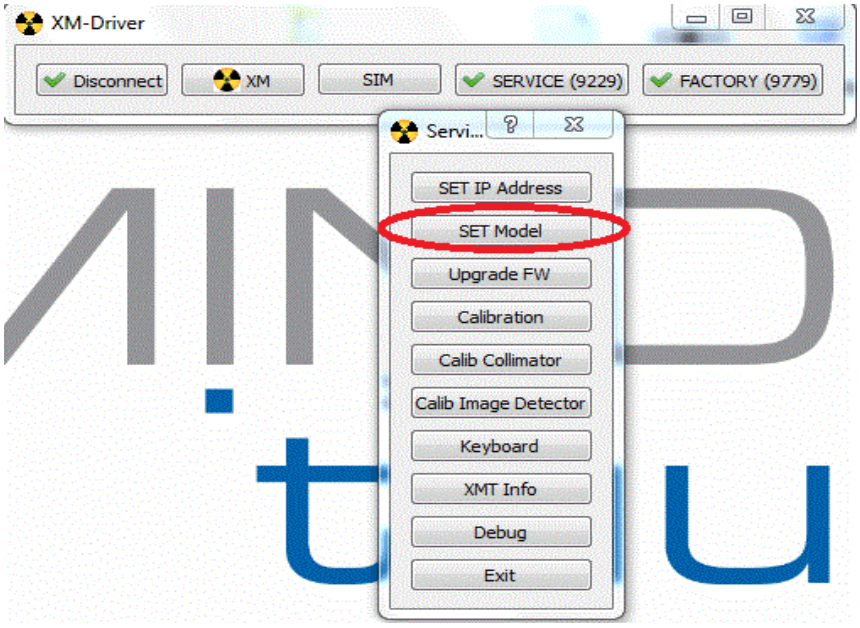
f. Select SET IP address.



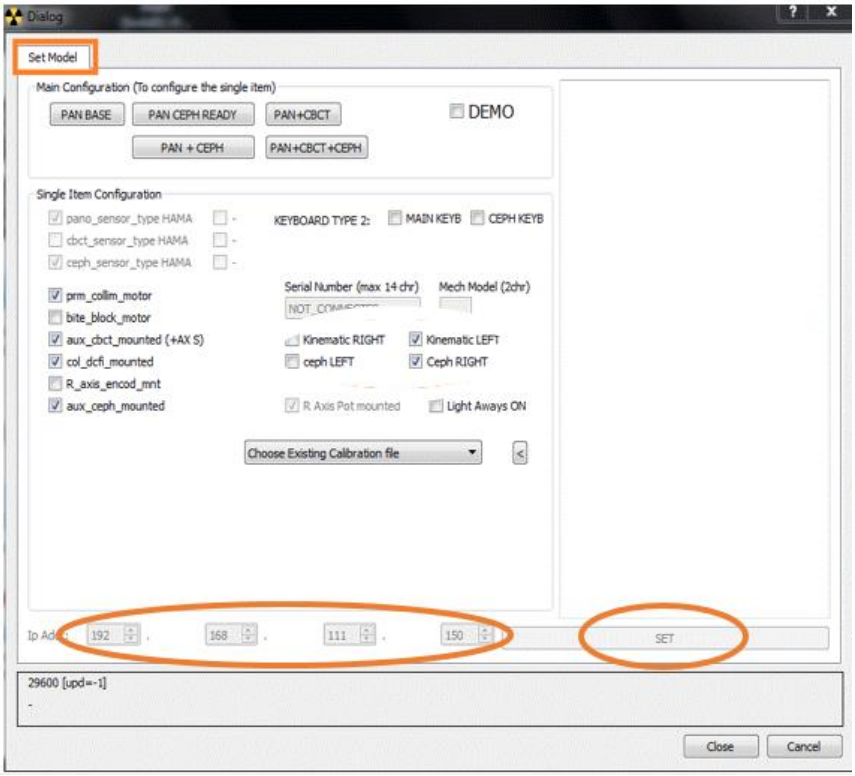
g. Enter in the fields below the new desired IP address (192.168.111.150 in this example).



h. Select the SET Model tab.

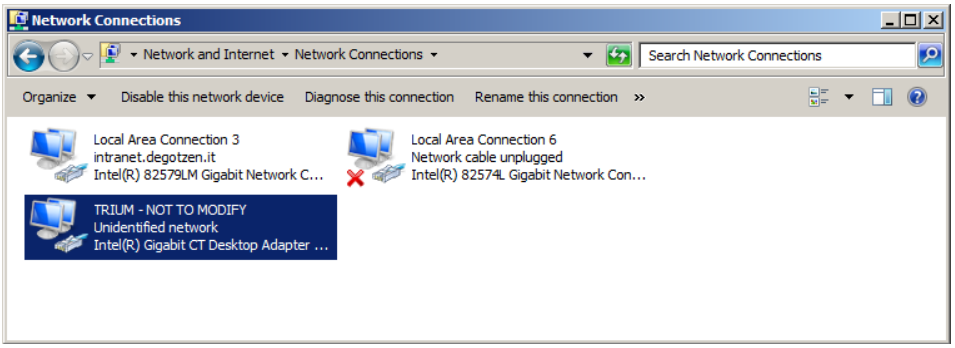


i. Verify that the displayed IP address is correct and click on SET button.

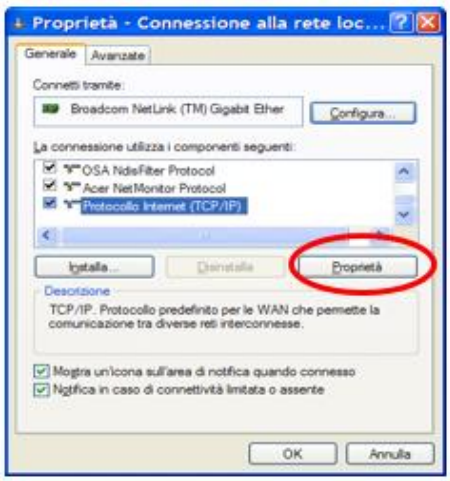


○ SET ACCORDINGLY IP ADDRESS OF WORKSTATION NIC

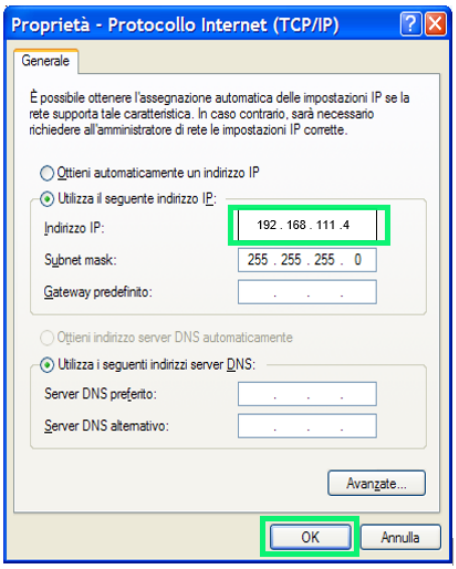
j. In Windows control panel select Network connections.
k. Right click on “TRIUM DO NOT MODIFY” network board and select properties.



l. Select Internet Protocol and click on Properties.



m. Set the IP address as persistent and enter IP address value in accordance with new X-MIND trium IP address value (192.168.111.4 in this example).
n. SET Subnet mask to 255.255.255.0.



o. To make effective the modification turn OFF X-MIND trium.
p. End X-MIND driver SERVICE.

○ VERIFY THAT CONNECTION WITH X-MIND trium IS ESTABLISHED

q. Turn ON X-MIND trium.
r. Start XMdriver Show double clicking on the file:
C:\AISSoftware\XMdriver\XMdriverShow.bat
s. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).

11.3. SET MODEL SETUP

- **INTRODUCTION**

In next paragraphs you can find instructions to:

✓ Verify and configure X-MIND trium model, among the following:
- PAN base
- PAN CEPH ready
- PAN-CEPH
- PAN-CBCT
- PAN-CBCT-CEPH

✓ Verify and configure position of kinematic and CEPH, among the following:
- Kinematic and control panel LEFT, CEPH LEFT
- Kinematic and control panel LEFT, CEPH RIGHT
- Kinematic and control panel RIGHT, CEPH LEFT
- Kinematic and control panel RIGHT, CEPH RIGHT

➔ **IMPORTANT NOTICE:** All the above software configurations must be in accordance with the ACTUAL hardware configuration of the equipment; example: if you have a PAN base unit, you cannot configure it by software as a PAN-CBCT unit.

✓ Configure the modality for external light ON.
✓ Configure the vertical limitation of X-ray beam (in order to enable or disable the white stripes on top and bottom part of 2D images).
✓ Set the serial number of X-MIND trium on Main board.

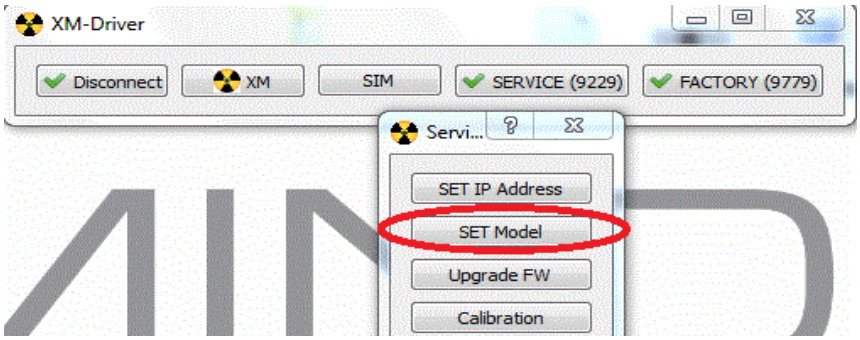
11.3.1. Set Model PAN - CBCT - CEPH

- **LOGIN TO SERVICE**

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file: C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

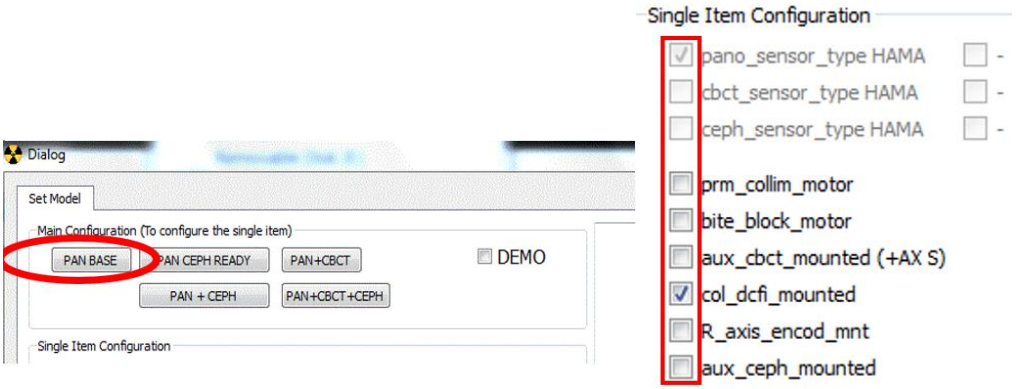
SET Model PROCEDURE

f. Click on SET Model tab.

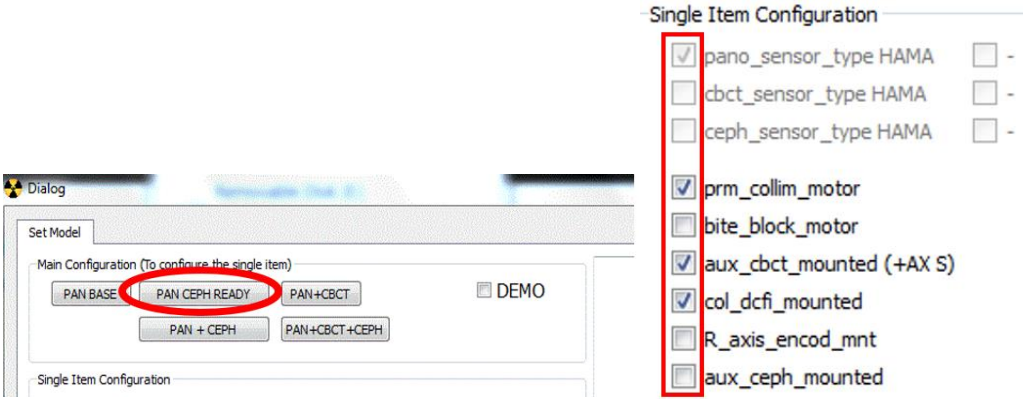


g. Verify that, depending on the actual model of X-MIND trium that is installed, the configuration in SET Model tab is as follows; if not click on the corresponding button (under Main Configuration):

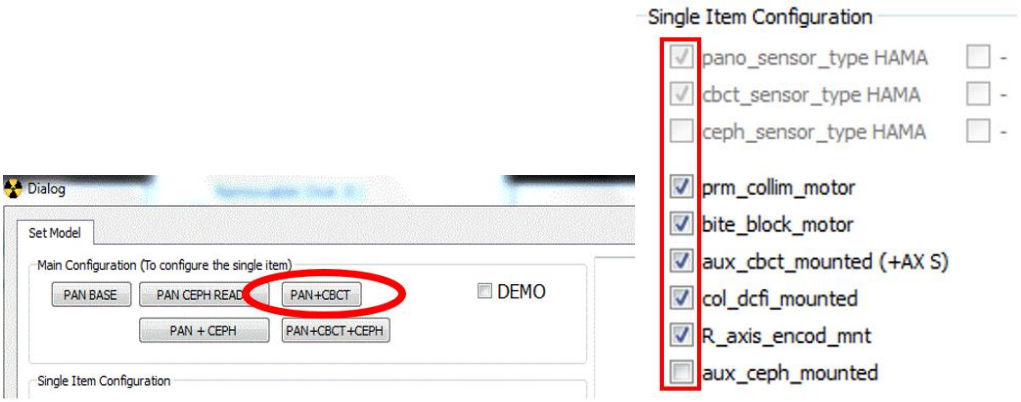
If the X-MIND trium is a **PAN base**:



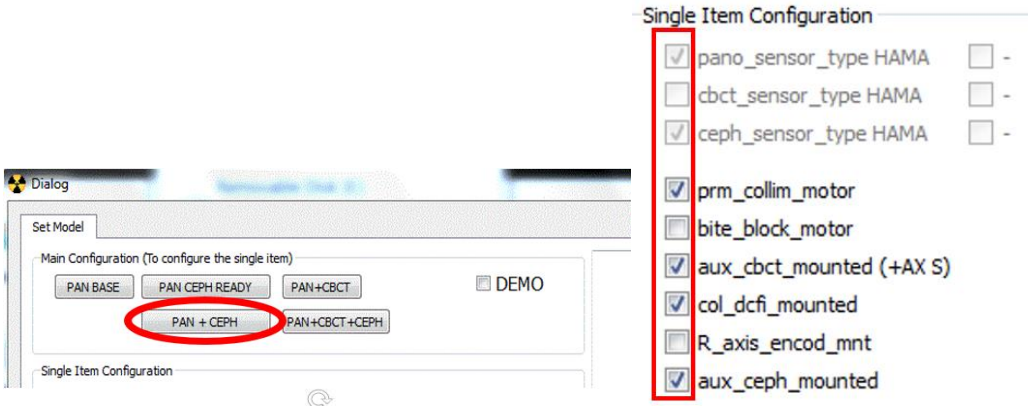
If the X-MIND trium is a **PAN-CEPH ready**:



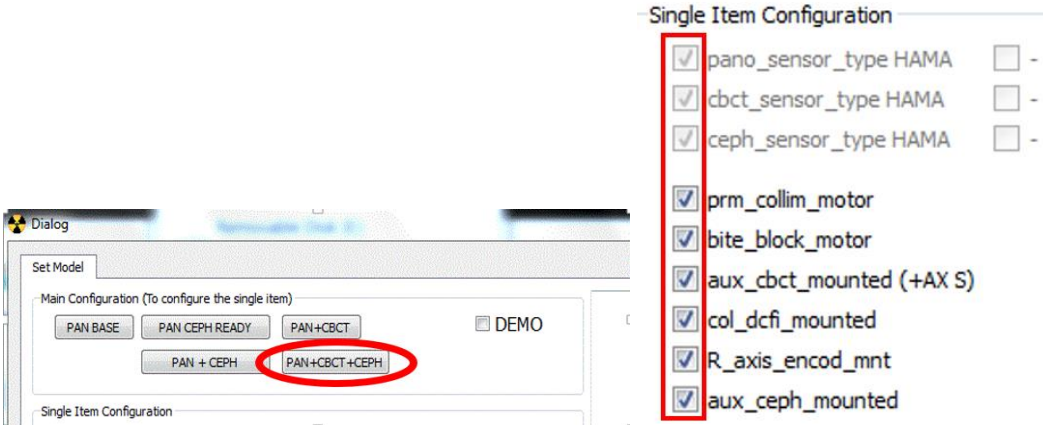
If the X-MIND trium is a **PAN-CBCT** or a **PAN-CBCT-CEPH ready**:



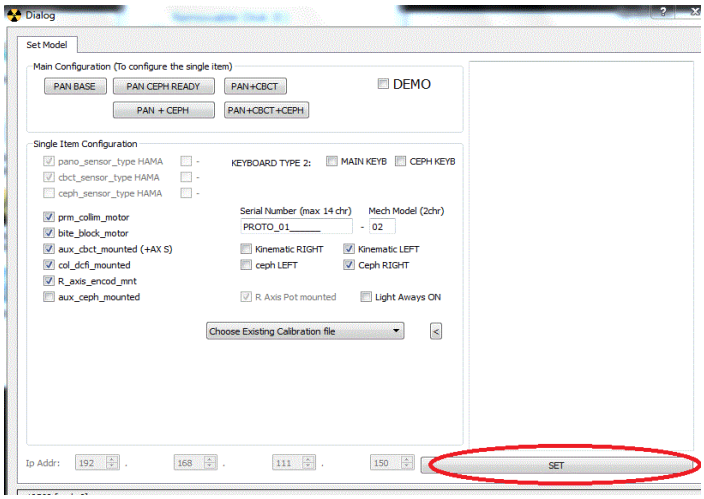
If the X-MIND trium is a **PAN-CEPH**:



If the X-MIND trium is a **PAN-CBCT-CEPH**:



h. In case in the setting above you have modified something, click on SET button.



Consequently on the X-MIND trium control panel the red LED will be ON:

i. To make effective the modification turn OFF X-MIND trium.

j. End X-MIND driver SERVICE.

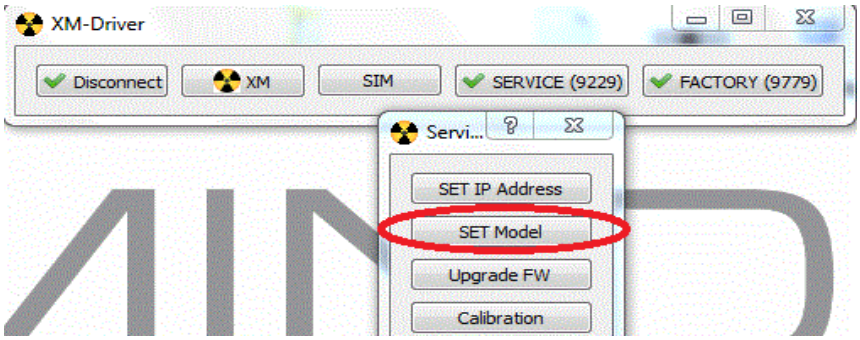
11.3.2. Set Model LEFT - RIGHT

○ LOGIN to SERVICE

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating)
e. Click on SERVICE tab and enter the required password: rdtech.

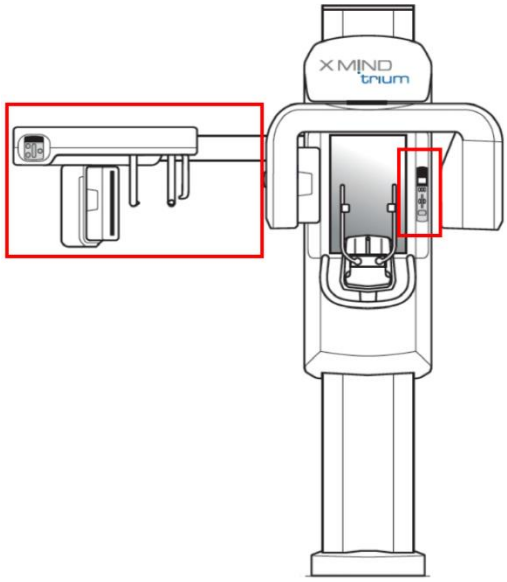
○ SET LEFT/RIGHT procedure

f. Click on SET Model tab.

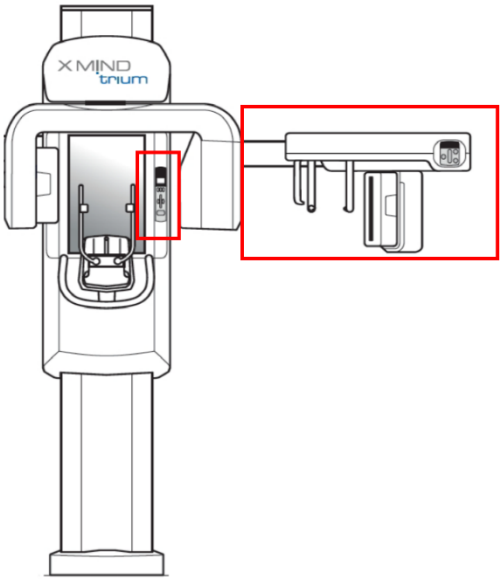


g. Verify that, depending on the actual model of X-MIND trium that is installed, the configuration LEFT/RIGHT in SET Model tab is as follows; if not flag the appropriate check box.

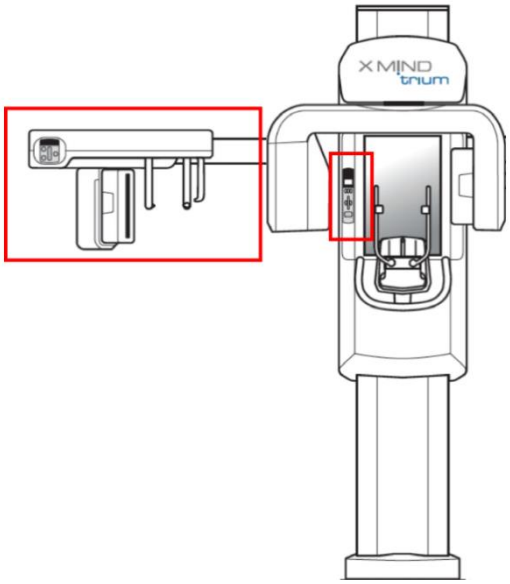
If the X-MIND trium is a **PAN kinematic right (ie control panel right) – CEPH left**:



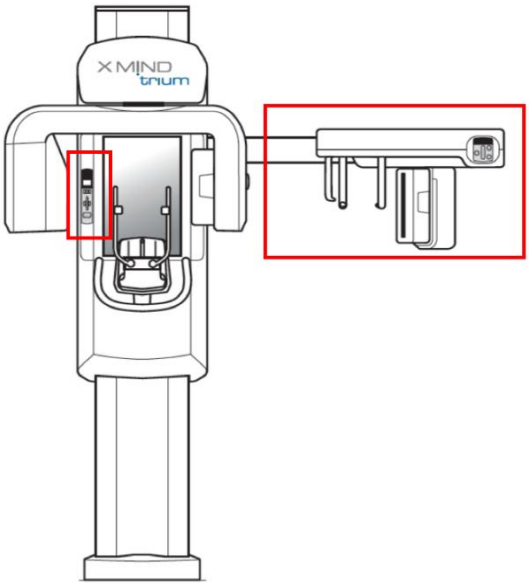
If the X-MIND trium is a **PAN kinematic right (ie control panel right) – CEPH right**:



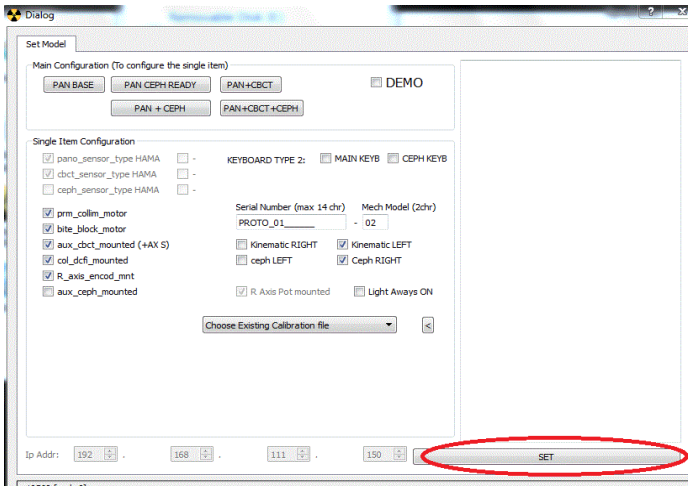
If the X-MIND trium is a **PAN kinematic left (ie control panel left) – CEPH left**:



If the X-MIND trium is a **PAN kinematic left (ie control panel left) – CEPH right**:



h. In case in the setting above you have modified something, click on SET button.



Consequently on the X-MIND trium control panel the red LED will be ON.

i. To make effective the modification turn OFF X-MIND trium.
j. End X-MIND driver SERVICE.

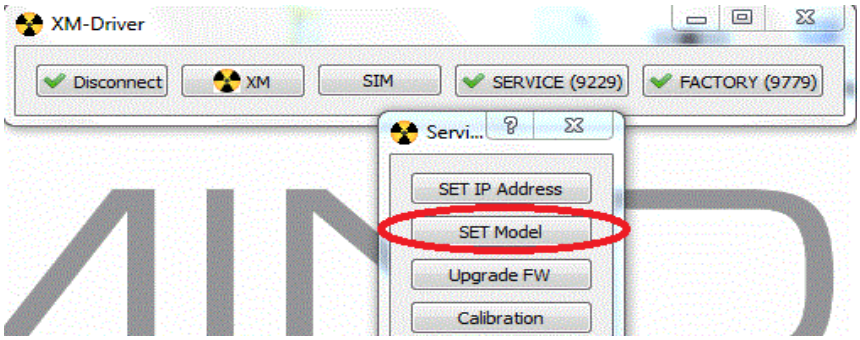
11.4. SET EXTERNAL LIGHT MODALITY

○ LOGIN TO SERVICE

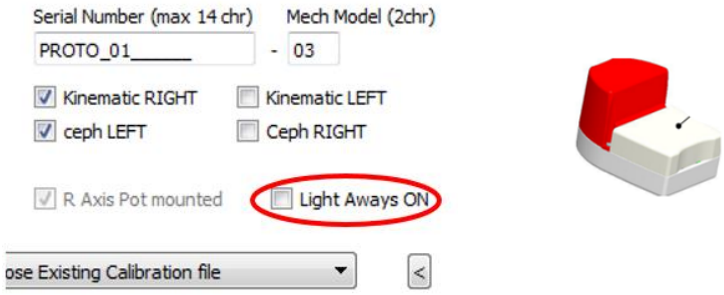
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ SET EXTERNAL LIGHT MODALITY PROCEDURE

f. Click on SET Model tab.



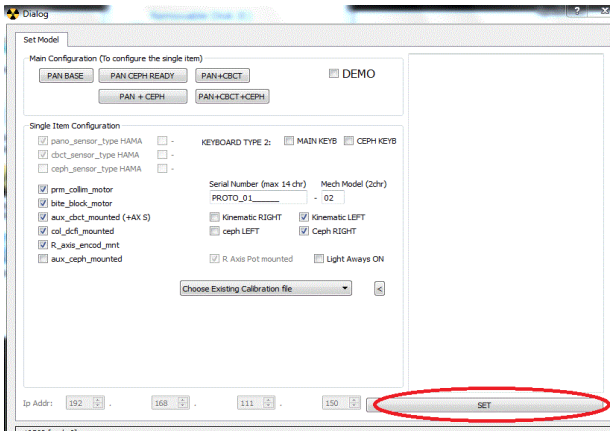
g. Depending on the desired modality of external light, flag or unflag the “Light always ON” check box.



Above field **FLAGGED**: the external light is always ON when X-MIND trium is ON.

Above field **NOT FLAGGED**: the external light is ON only during X-ray exposure.

h. In case in the setting above you have modified something, click on SET button.



Consequently on the X-MIND trium control panel the red LED will be ON:

i. To make effective the modification turn OFF X-MIND trium.
j. End X-MIND driver SERVICE.

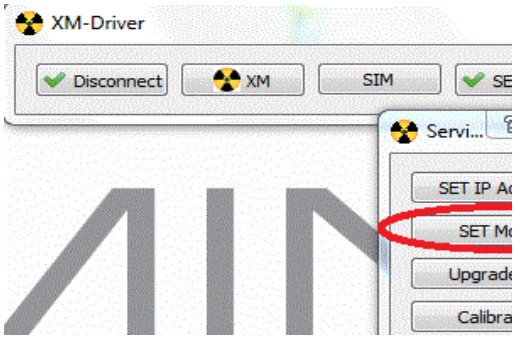
11.5. SET COUNTRY CUSTOMIZATIONS OF X-MIND trium

○ LOGIN TO SERVICE

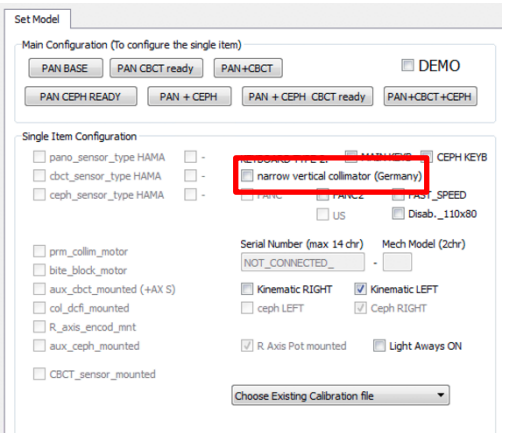
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ GERMANY - SET VERTICAL LIMITATION X-RAY BEAM PROCEDURE

a. Click on SET Model tab.



b. Depending on the desired vertical limitation of X-ray beam, flag or unflag the "narrow vertical collimator (Germany)" check box.



Above field **FLAGGED**: all 2D images (Pan and CEPH) have white stripes on top and bottom parts.

Above field **NOT FLAGGED**: all 2D images (Pan and CEPH) do not have any white stripes on top and bottom parts.

c. In case in the setting above you have modified something, click on SET button.

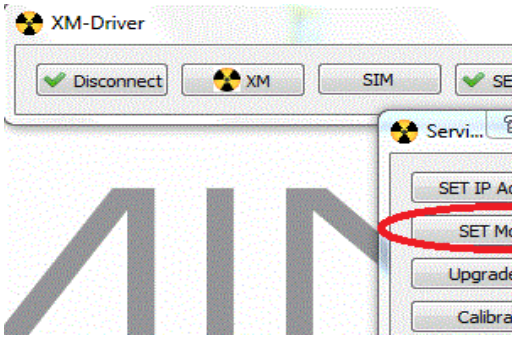
Consequently on the X-MIND trium control panel the red LED will be ON:

d. To make effective the modification turn OFF X-MIND trium.

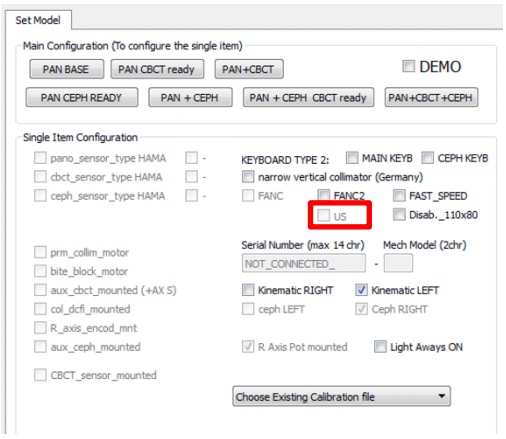
e. End X-MIND driver SERVICE.

○ UNITED STATES – REDUCED LOAD FACTORS

a. Click on SET Model Tab



b. Depending on the desired loading factors of X-ray beam, flag or unflag the "US" check box.



Above field **FLAGGED**: all scans will use reduced loading factors for X-RAYS generation.

Above field **NOT FLAGGED**: all scans will use standard loading factors for X-RAYS generation.

c. In case in the setting above you have modified something, click on SET button.

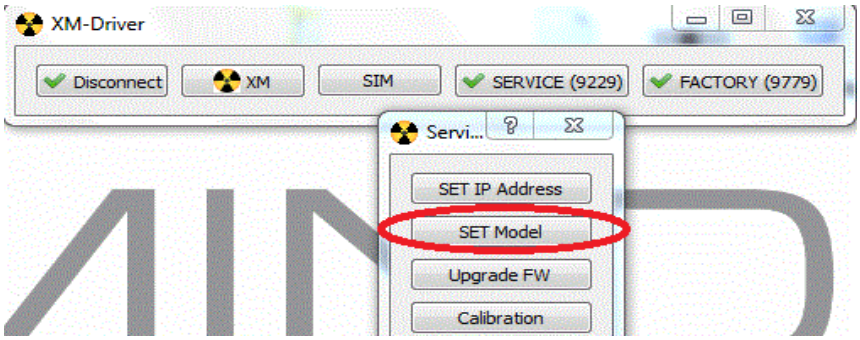
Consequently on the X-MIND trium control panel the red LED will be ON:

d. To make effective the modification turn OFF X-MIND trium.

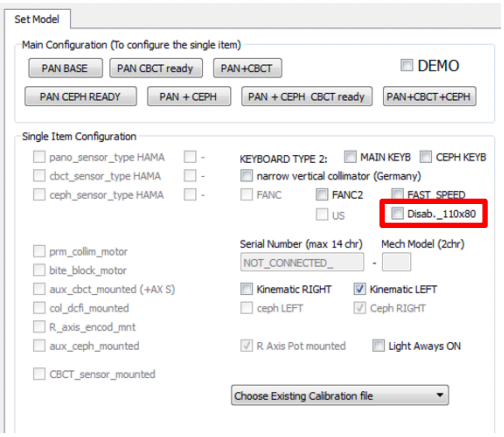
e. End X-MIND driver SERVICE.

○ CANADA (ONTARIO) – FOV LIMITER (Disable 11x8)

a. Click on SET Model tab.



f. Depending on the desired FOV 11x8 status (enabled /disabled), flag or unflag the "Disab._110x80" check box.



Above field **FLAGGED**: for CBCT scans, FOV 11x8 NOT available.

Above field **NOT FLAGGED**: for CBCT scans, FOV 11x8 available.

g. In case in the setting above you have modified something, click on SET button.

Consequently on the X-MIND trium control panel the red LED will be ON:

h. To make effective the modification turn OFF X-MIND trium.

i. End X-MIND driver SERVICE.

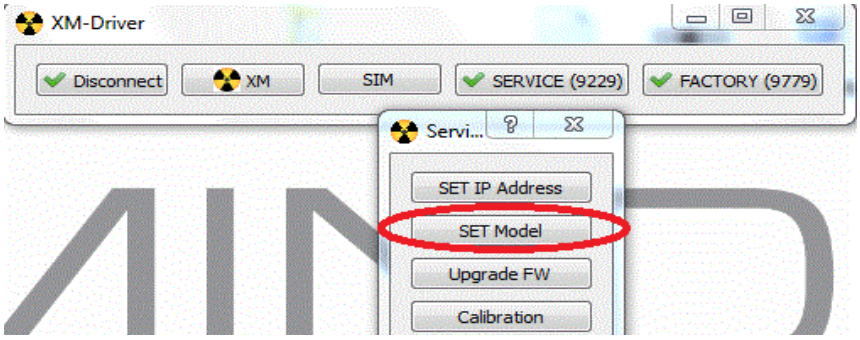
11.7. SET SERIAL NUMBER OF X-MIND trium

○ LOGIN TO SERVICE

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

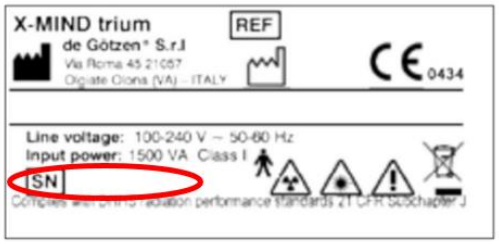
○ SET SERIAL NUMBER OF X-MIND trium ON MAIN BOARD

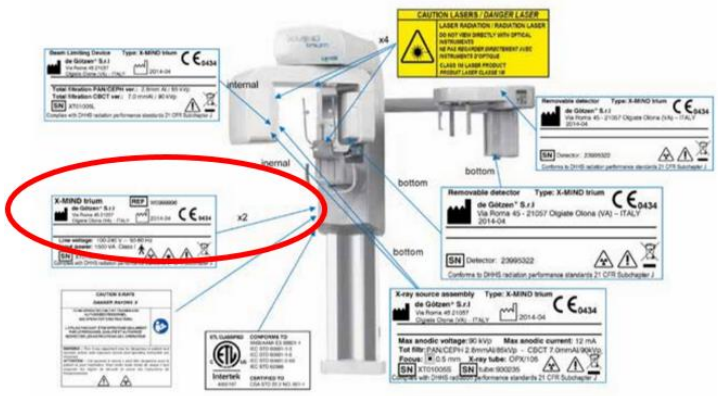
f. Click on SET Model tab.



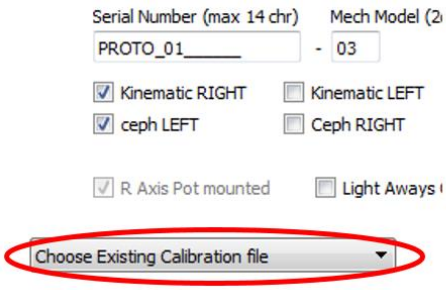
g. Take note of the serial number of X-MIND trium from label on the equipment.

X-MIND TRIUM LABEL

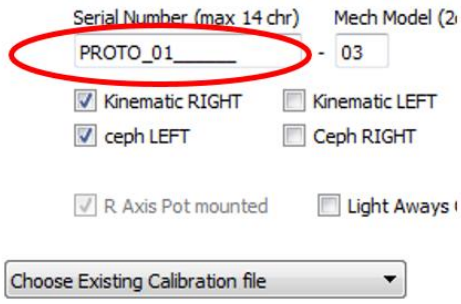




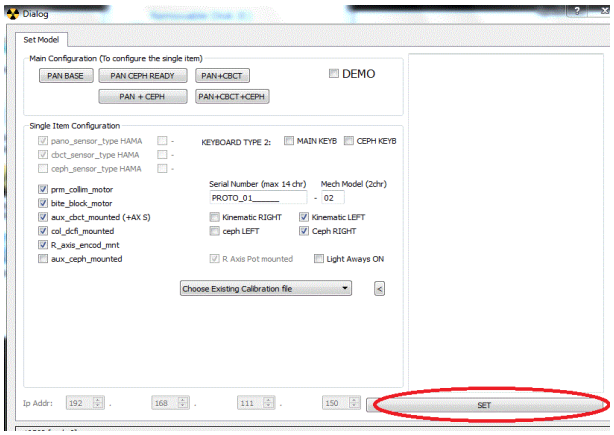
h. From the list of units installed on the WorkStation select the correct serial number:



i. If not present in the list, edit the appropriate field with the serial number in the format XT01029C; **if the serial number is not present in the list, all calibrations of the unit must be carried out.**



j. Click on SET button.



Consequently on the X-MIND trium control panel the red LED will be ON.

k. To make effective the modification turn OFF X-MIND trium.

l. End X-MIND driver SERVICE.

11.8. FIRMWARE UPDATE

- **INTRODUCTION**

In this paragraph you can find instructions to update the Firmware (FW) of X-MIND trium electronic boards.
These instructions are applicable to all X-MIND trium models.
Perform this upgrade when:

✓ You install an upgrade of AIS software package and FW upgrade is proposed automatically
✓ You have postponed the FW upgrade proposed automatically after AIS SW package upgrade.

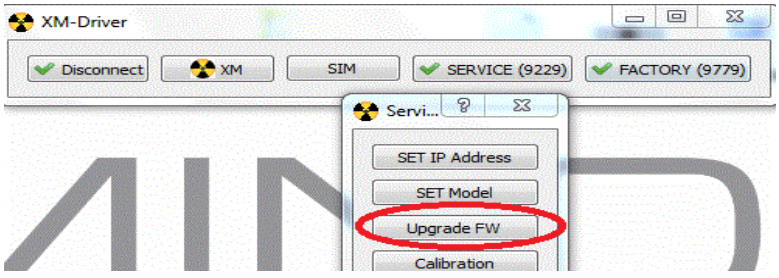
- **PROCEDURE**

  - **LOGIN TO SERVICE**

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

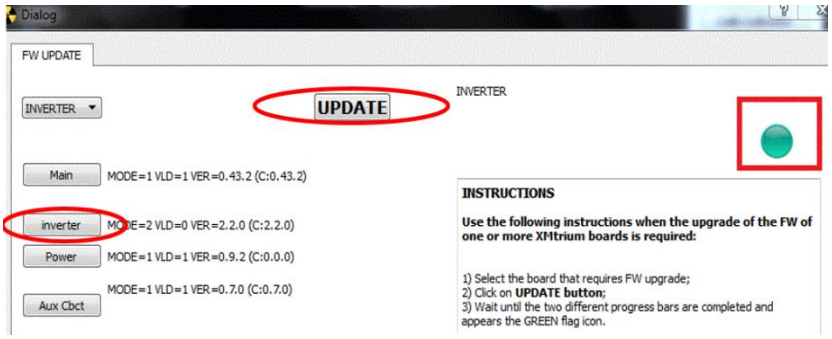
  - **FW upgrade**

f. Click on Upgrade FW tab.

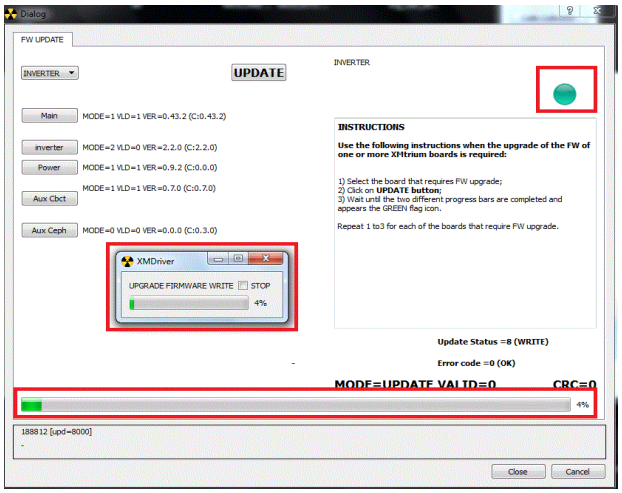


g. Individuate the board that requires FW upgrade (Inverter board in this example).
The board requires upgrade if the “VER” and “C” fields (underlined below) are different.

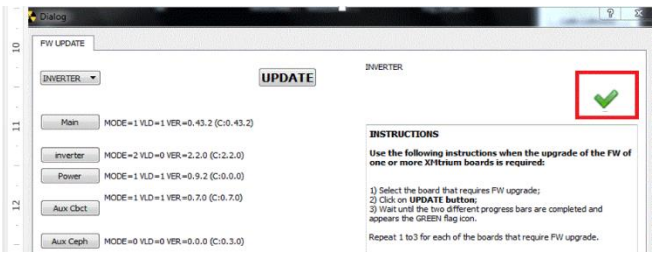
h. Select the board and click on UPDATE button (Inverter board in this example).



i. Wait until the two different progress bars are completed and appears the GREEN round icon.



j. When the GREEN round icon stops blinking and becomes a flag, the upgrade is finished.

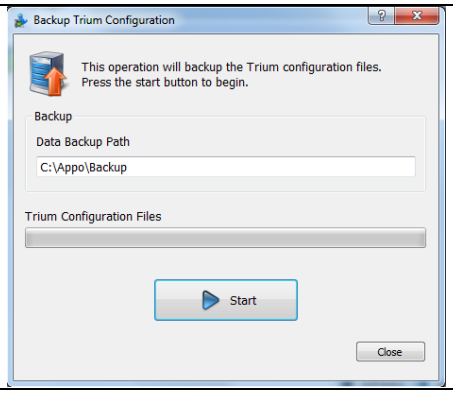
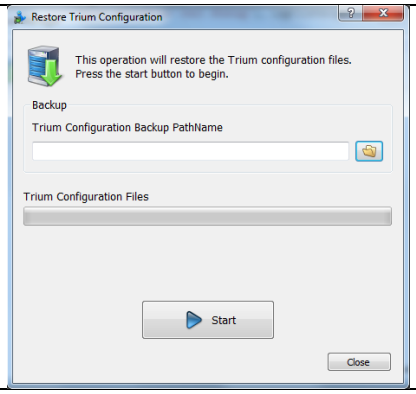


k. To make effective the modification turn OFF X-MIND trium and **<u>leave it OFF at least</u>**:

2 minutes after Inverter board FW upgrade
30 seconds after other boards FW upgrade

l. End X-MIND driver SERVICE.

12. CALIBRATIONS

Backup Trium Configuration	Restore Trium Configuration
THIS OPERATION MUST BE PERFORMED EACH TIME THE CONFIGURATION AND/OR THE CALIBRATION (EVEN IF IS ONLY ONE) OF TRIUM IS PERFORMED VIA SERVICE SOFTWARE IN XM DRIVER	
Open AIS Backup Manager -> Tools -> Backup Trium Configuration This function permits the user to execute the backup of the trium configuration files. The backup will be created in the 'Data Backup Path' as show in the user interface. The backup consist in a .tcf file created in the root of 'Data Backup Path'. To execute the backup, press the Start button and wait the end of the process.	**Open AIS Backup Manager -> Tools -> Restore Trium Configuration** This function permits the user to execute the restore of the trium configuration files. To execute the restore, clicks on the folder button to select a valid backup file, than press the Start button and wait the end of the process.
	

In next paragraphs you can find instructions to execute the **"SERVICE"** software for the calibration of the following items:

- ✓ U-arm potentiometer (all X-MIND trium models)
- ✓ Column potentiometer (all X-MIND trium models)
- ✓ Limitation of maximum height of X-MIND trium (all X-MIND trium models)
- ✓ Nasion Ceph potentiometer (Ceph X-MIND trium models only)
- ✓ U-arm encoder (CBCT X-MIND trium models only)
- ✓ RX tube (all X-MIND trium models)
- ✓ Motorized collimator (Ceph and CBCT X-MIND trium models only)
- ✓ Fixed collimator (Pan X-MIND trium model only)
- ✓ Image detector (Pan – Ceph – CBCT)
- ✓ Pan kinematic (all X-MIND trium models).

The CBCT geometric calibration (CBCT X-MIND trium models only) is carried out by using the "**WHCalibration"** software module.

12.1. U-ARM POTENTIOMETER CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to calibrate U-arm potentiometer.
These instructions are applicable to all X-MIND trium models.
Perform this calibration when:

- ✓ You replace the whole F group, L group or kinematic group
- ✓ You handle or replace the U-arm potentiometer
- ✓ In some cases of U-arm potentiometer failures, depending on troubleshooting diagnostic messages.

➔ **IMPORTANT NOTICE:** Before this software calibration, the potentiometer must be mechanically and electrically set as per relevant instructions of spare parts manual.

- **PROCEDURE**

  - **LOGIN TO SERVICE**

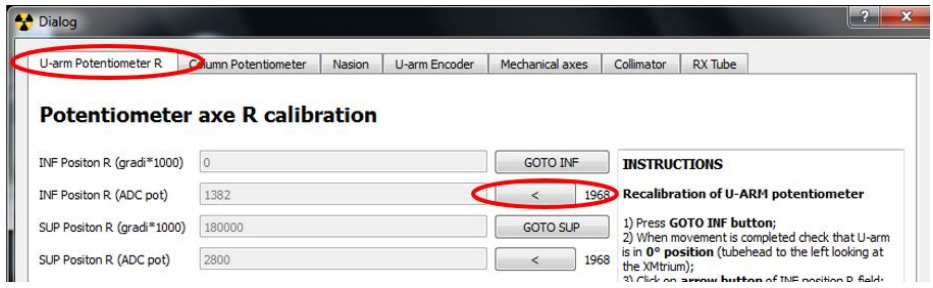
a. End execution of AIS
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ U-arm potentiometer CALIBRATION

f. Click on Calibration tab and then click on U-arm potentiometer tab.

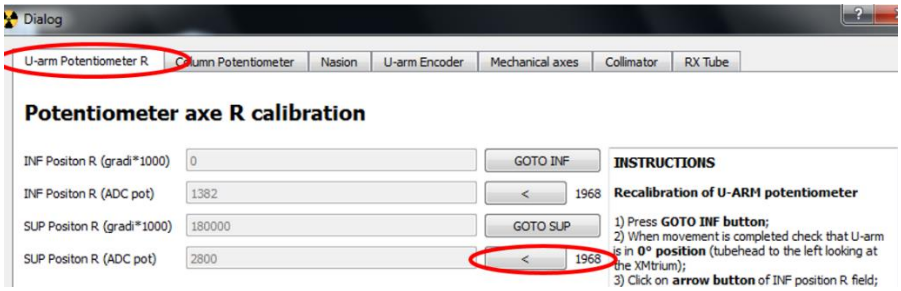
g. Click on GOTO INF button.

h. When movement is completed and U-arm is in the zero position (tubehead at the left looking at X-MIND trium from the front) click on arrow button of INF position field.

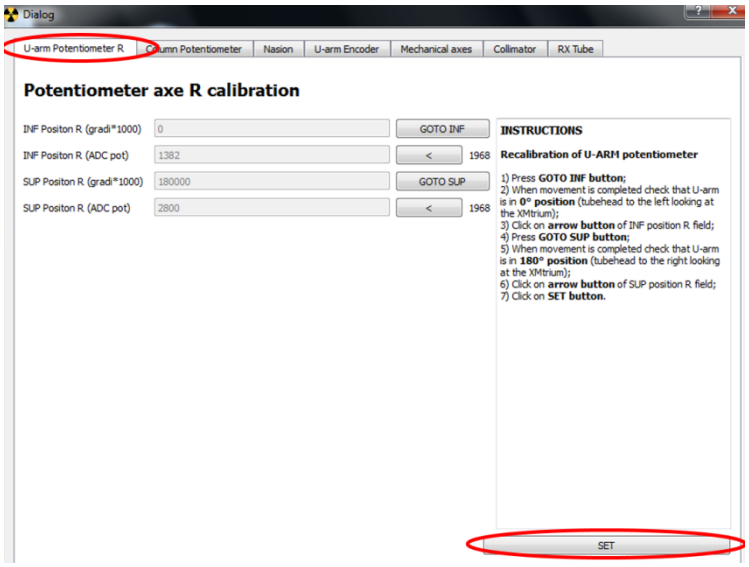


i. Click on GOTO SUP button.

j. When movement is completed and U-arm is at the 180° position (tubehead at the right looking at X-MIND trium from the front) click on arrow button of SUP position field.



k. Click on SET button.



l. To make effective the modification turn OFF X-MIND trium.

m. End X-MIND driver SERVICE.

12.2. COLUMN POTENTIOMETER CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to calibrate the column potentiometer.
These instructions are applicable to all X-MIND trium models.
Perform this calibration when:

- ✓ You handle or replace the column potentiometer
- ✓ You handle or replace the column motor
- ✓ In some cases of column potentiometer failures, depending on troubleshooting diagnostic messages.

➔ **IMPORTANT NOTICE:** Before this Software calibration, the potentiometer must be mechanically and electrically set as per relevant instructions of spare parts manual.

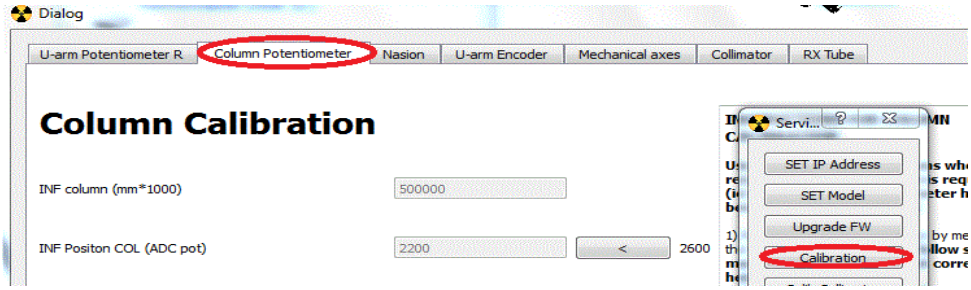
- **PROCEDURE**

  - **LOGIN TO SERVICE**

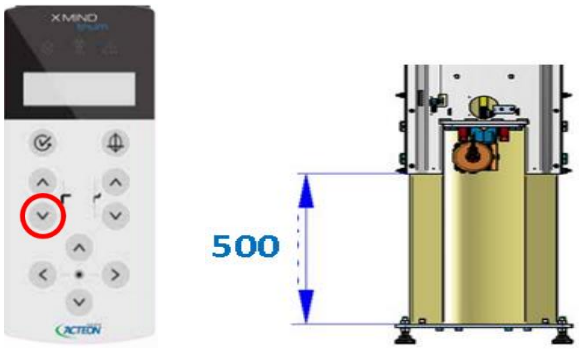
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ Column potentiometer CALIBRATION

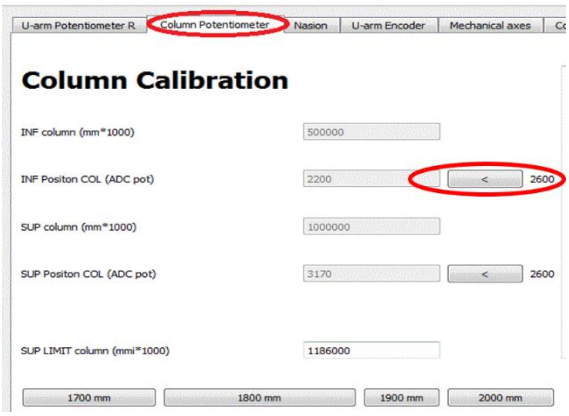
f. Click on Calibration tab and then click on Column potentiometer tab.



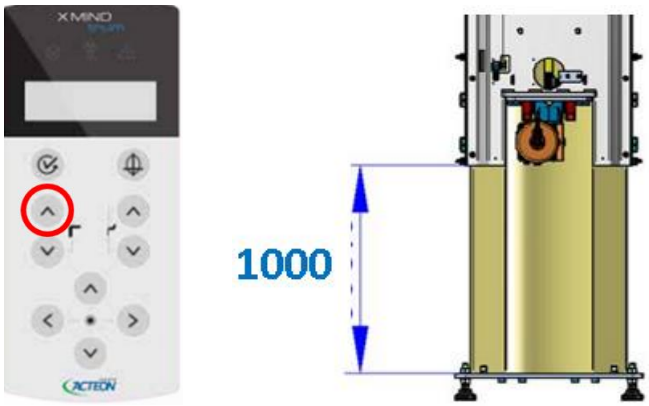
g. Move column to 500 mm from BOTTOM position as per the following picture:



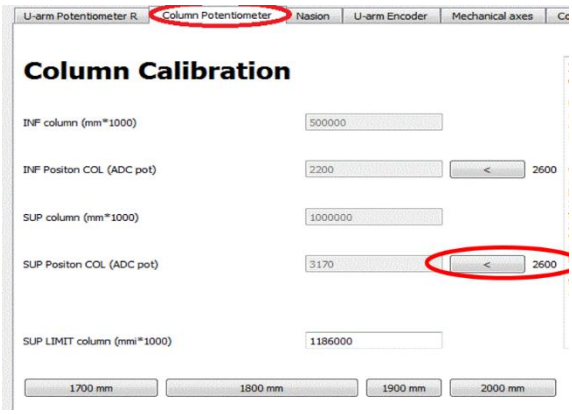
h. Click on arrow button of INF position field.



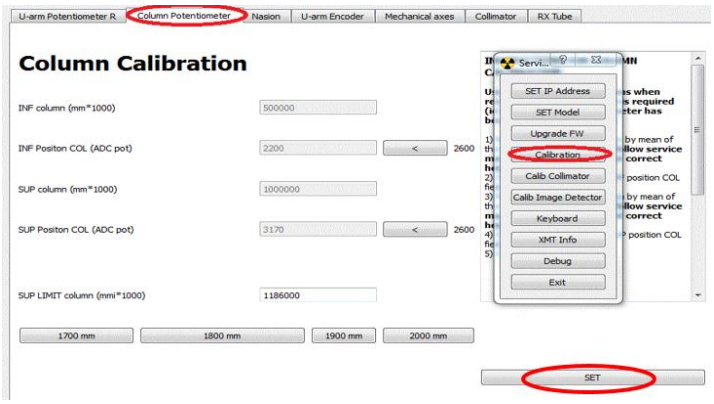
i. Move column to 1000 mm from BOTTOM position as per the following picture:



j. Click on arrow button of SUP position field.



k. Click on SET button.



l. To make effective the modification turn OFF X-MIND trium.

m. End X-MIND driver SERVICE.

12.3. LIMITATION OF X-MIND trium MAXIMUM HEIGHT

- **INTRODUCTION**

In this paragraph you can find instructions to limit the X-MIND trium maximum height in order to install the equipment in a room less higher than the prescribed 2.4m.
These instructions are applicable to all X-MIND trium models.
Perform this calibration when:

✓ The room where X-MIND trium has to be installed is less than 2.4m high.

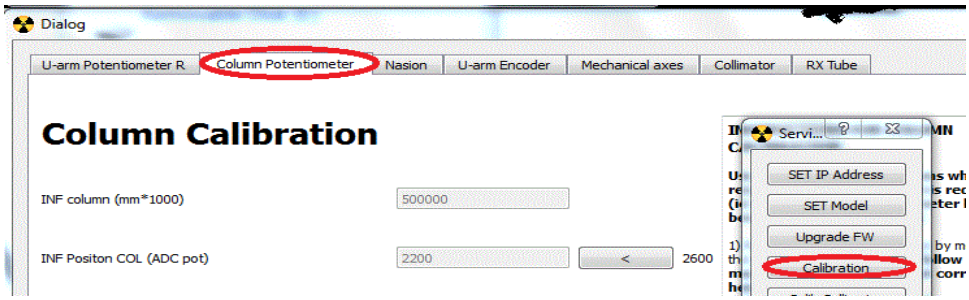
- **PROCEDURE**

  - **LOGIN TO SERVICE**

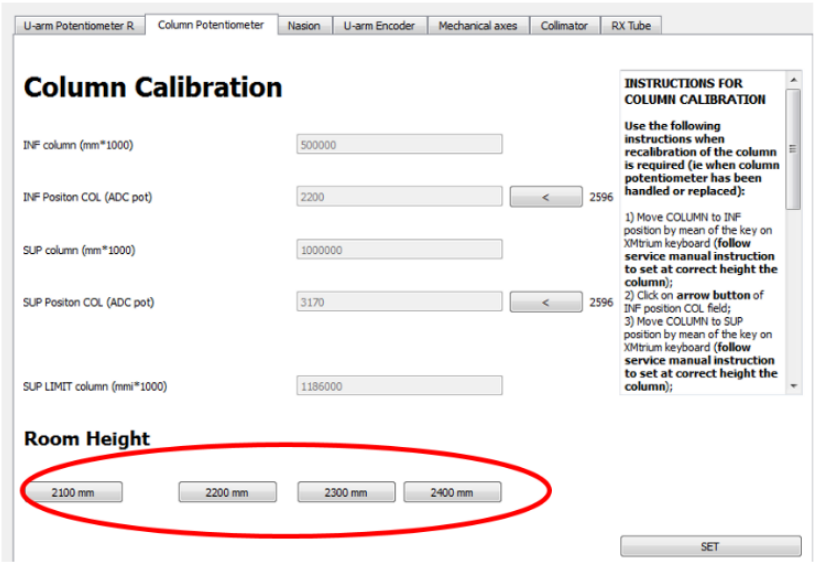
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ MAXIMUM HEIGHT LIMITATION

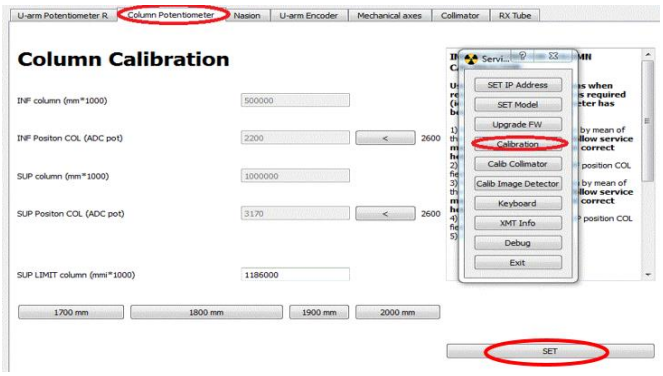
f. Click on Calibration tab and then click on Column potentiometer tab.



g. Click on the button with the desired room height.



h. Click on SET button.



i. To make effective the modification turn OFF X-MIND trium.
j. End X-MIND driver SERVICE.

12.4. CEPH NASION POTENTIOMETER CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to calibrate the CEPH Nasion potentiometer.
These instructions are applicable only to X-MIND trium CEPH models.
Perform this calibration when:

- ✓ You replace the whole CEPH arm
- ✓ You handle or replace the CEPH Nasion potentiometer
- ✓ In some cases of CEPH Nasion potentiometer failures, depending on troubleshooting diagnostic messages.

➔ **IMPORTANT NOTICE:** Before this software calibration, the potentiometer must be mechanically and electrically set as per relevant instructions of spare parts manual.

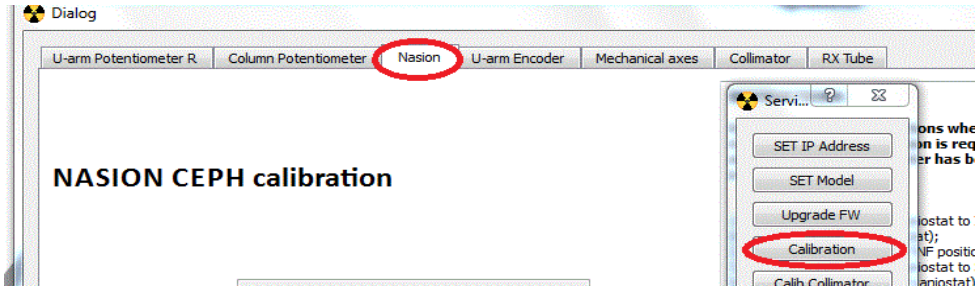
- **PROCEDURE**

  - **LOGIN TO SERVICE**

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

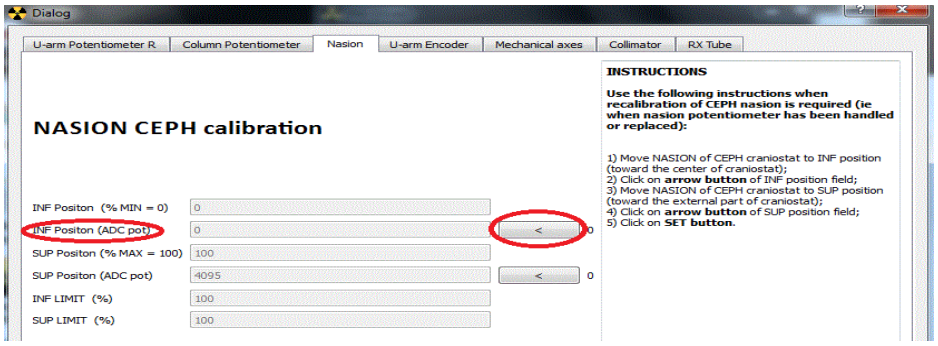
○ CEPH Nasion potentiometer CALIBRATION

f. Click on Calibration tab and then click on Nasion tab.



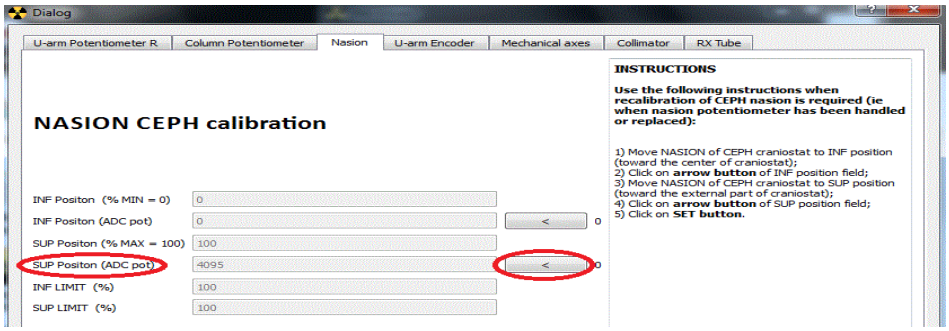
g. Move the NASION of CEPH craniostat to INF position (toward the center of craniostat).

h. Click on arrow button of INF position field.

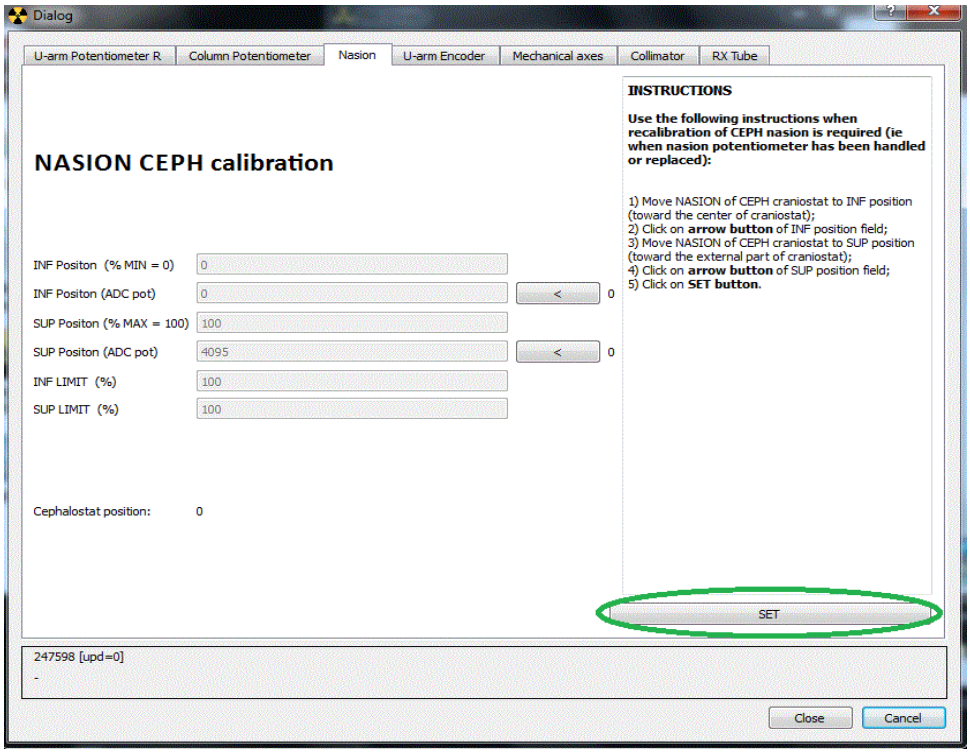


i. Move the NASION of CEPH craniostat to SUP position (toward the external part of craniostat).

j. Click on arrow button of SUP position field.



k. Click on SET button.



l. To make effective the modification turn OFF X-MIND trium.

m. End X-MIND driver SERVICE.

12.5. U-ARM ENCODER CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to calibrate the U-Arm encoder.
These instructions are applicable to the X-MIND trium CBCT models only.
Perform this calibration when:

- ✓ You replace the whole F group, L group or kinematic group
- ✓ You handle or replace the U-Arm encoder
- ✓ You install for the first time the U-Arm encoder, in case of upgrade to CBCT of a non CBCT model
- ✓ You change X-MIND trium model from left to right or viceversa
- ✓ In some cases of encoder failures, depending on troubleshooting diagnostic messages.

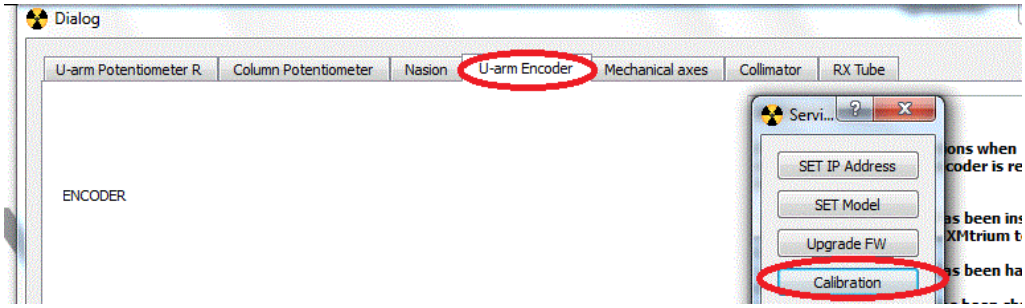
- **PROCEDURE for U-Arm Encoder Calibration**

  - **LOGIN TO SERVICE**

a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating)
e. Click on SERVICE tab and enter the required password: rdtech.

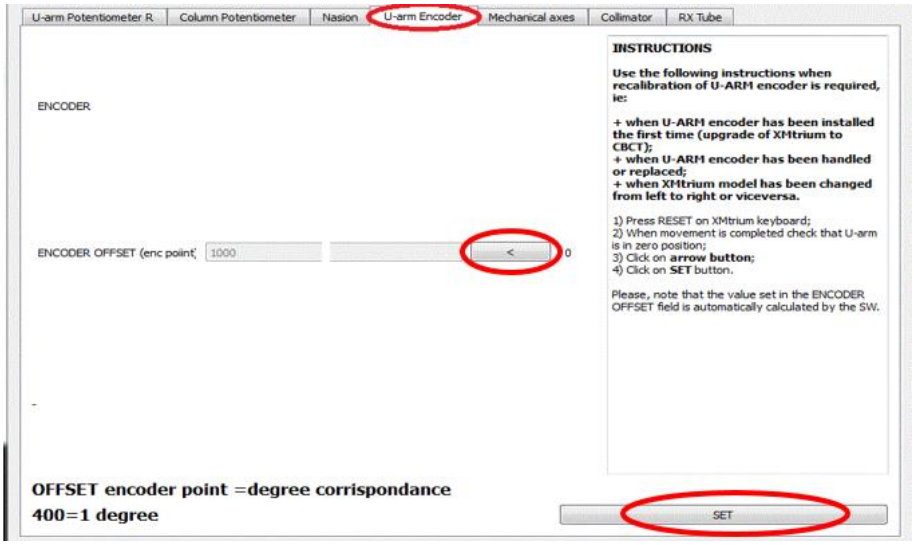
○ U-Arm ENCODER CALIBRATION

f. Be sure that the unit is already set as “kinematic right” or “kinematic left” as you desire (see paragraph ***SET model***).
g. Click on Calibration tab and then click on U-Arm Encoder tab.



h. Press RESET key on X-MIND trium.

i. When movement is completed and U-arm is in the zero position click on arrow button, then on SET button.



j. To make effective the modification turn OFF X-MIND trium.
k. End X-MIND driver SERVICE.

12.6. RX TUBE CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to calibrate the RX tube.
These instructions are applicable to all the X-MIND trium models.
Perform this calibration when:

- ✓ You replace the whole U-arm group
- ✓ You replace the RX tube
- ✓ You replace the Inverter board
- ✓ In some cases of RX tube failures, depending on troubleshooting diagnostic messages.

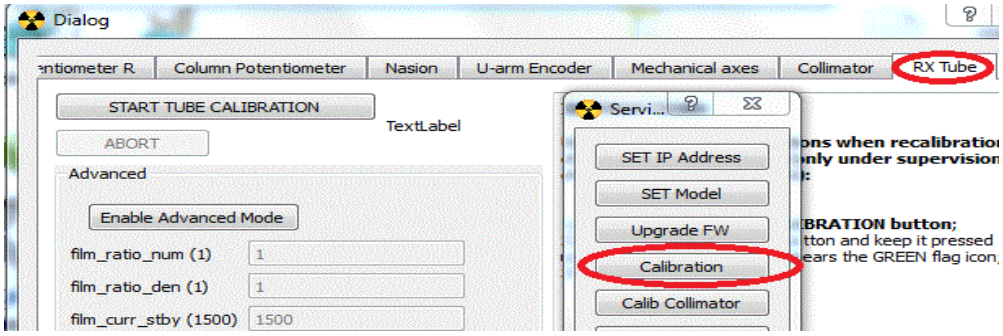
- **PROCEDURE**

  - **LOGIN to SERVICE**

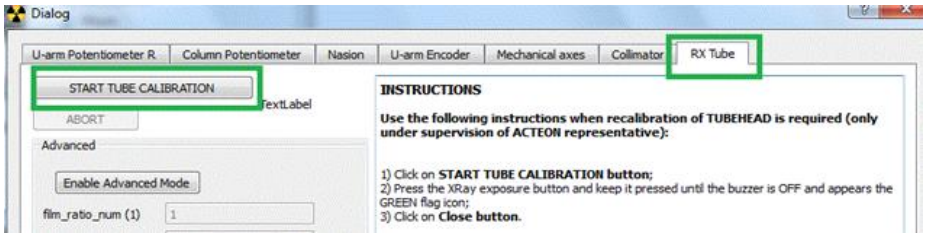
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

  - **RX TUBE CALIBRATION**

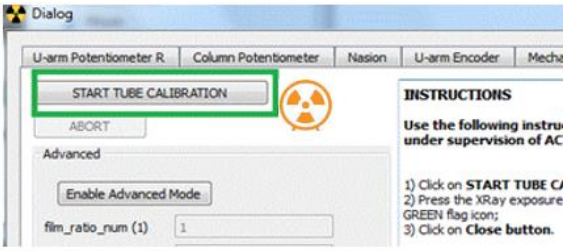
f. Click on Calibration tab and then click on RX tube tab.



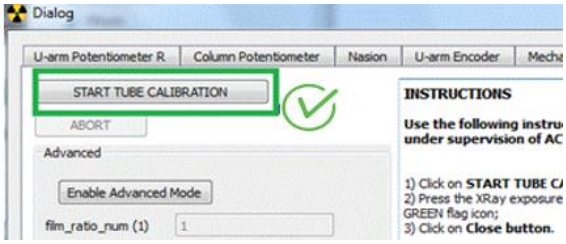
g. Click on on START tube calibration.



h. Keep continuously pressed the X-ray exposure button



until the buzzer is OFF and appears the green fixed icon.



➔ **<u>It can take up to 2 minutes: DO NOT INTERRUPT the procedure</u>**

i. To make effective the modification turn OFF X-MIND trium.
j. End X-MIND driver SERVICE.

12.7. MOTORIZED COLLIMATOR CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to align the X-ray beam emerging from collimator for all exams type.
These instructions are applicable to all CEPH and all CBCT X-MIND trium models having motorized collimator.
Perform this calibration when:

- ✓ You handle or replace the whole motorized collimator group
- ✓ You handle or replace one or more of the optoswitches of all X-MIND trium mechanical axes
- ✓ You handle or replace one sensor
- ✓ In some cases of collimator failures, depending on troubleshooting diagnostic messages.

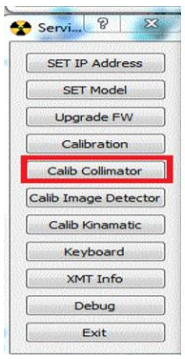
- **PROCEDURE**

  - **LOGIN TO SERVICE**

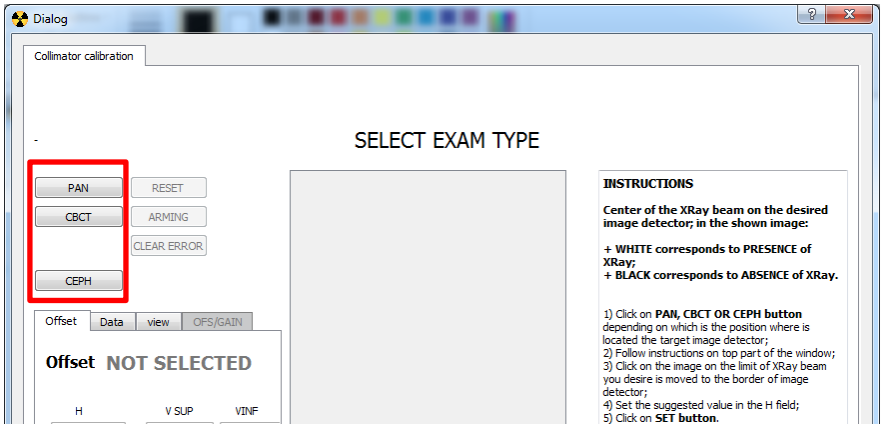
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ MOTORIZED COLLIMATOR CALIBRATION

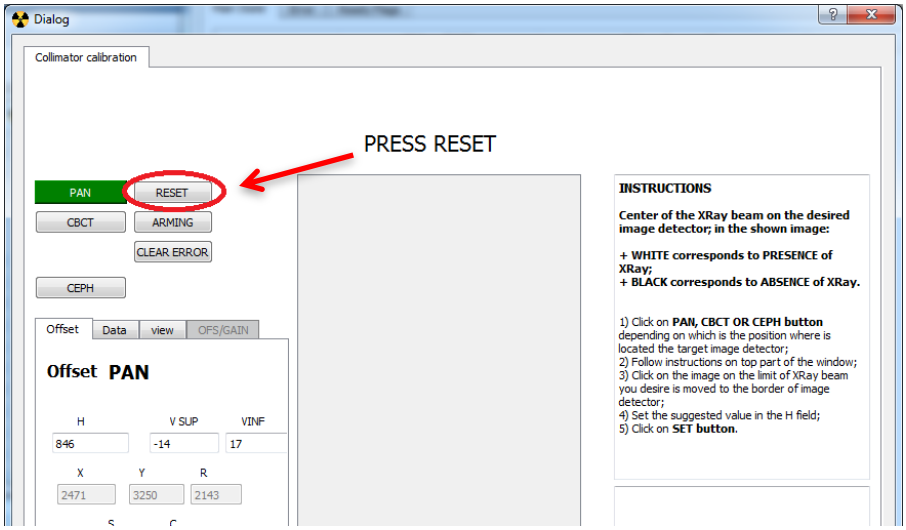
f. Click on Calib. Collimator tab.



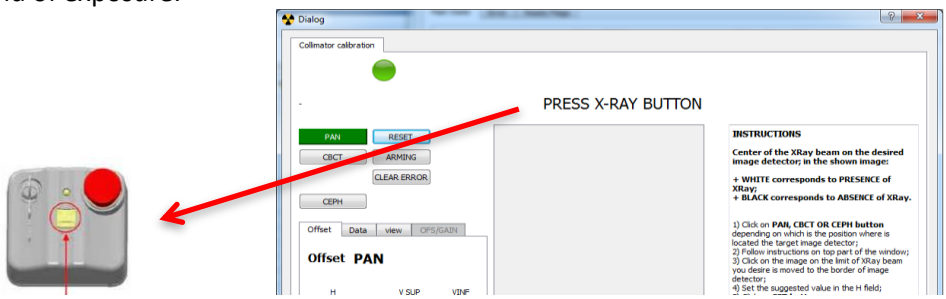
g. Select the type of exam for which you desire to align the X-ray beam (PAN, CBCT or CEPH).



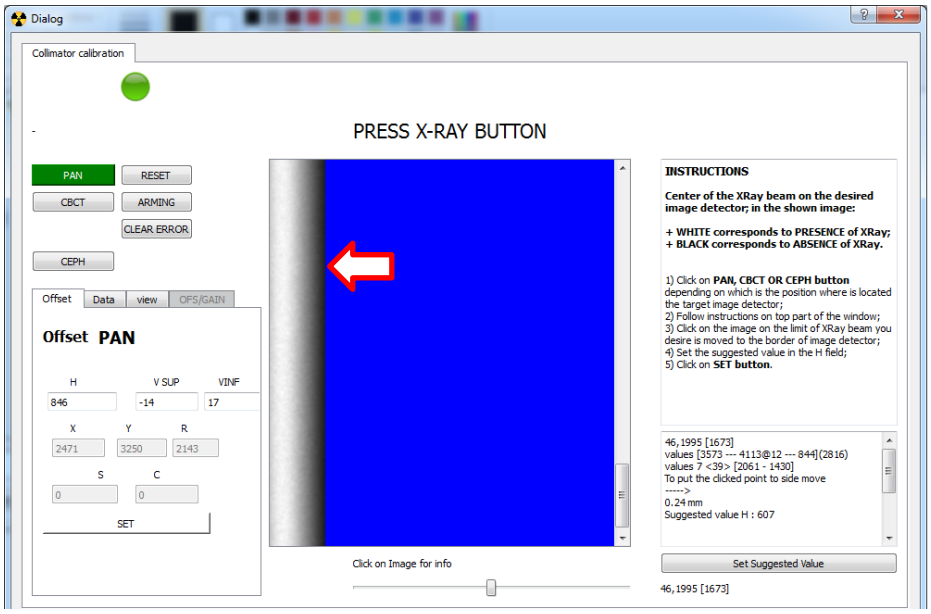
h. Follow instruction on top of window: click on RESET button.



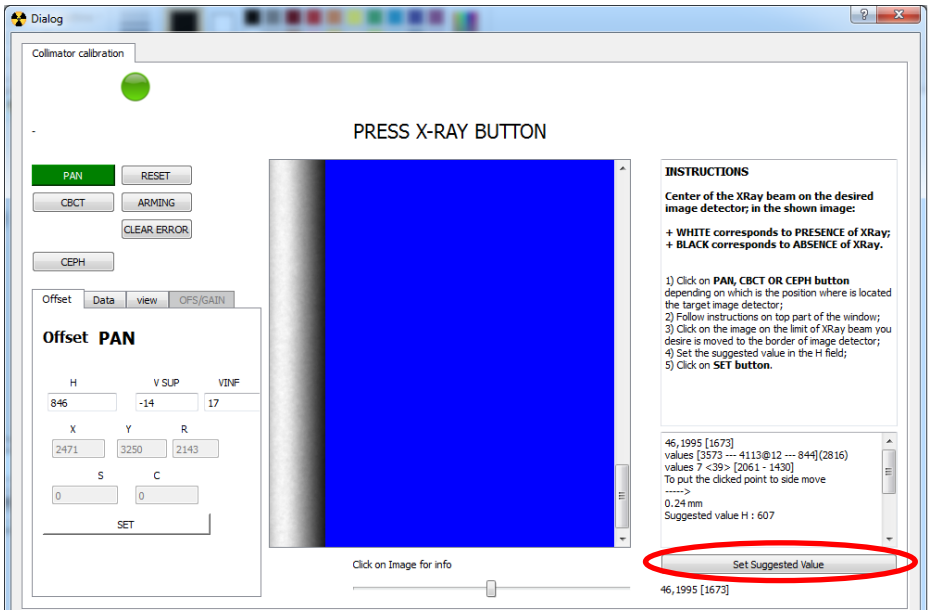
i. Follow instruction on top of window: press continuously X-ray exposure button until the end of exposure.



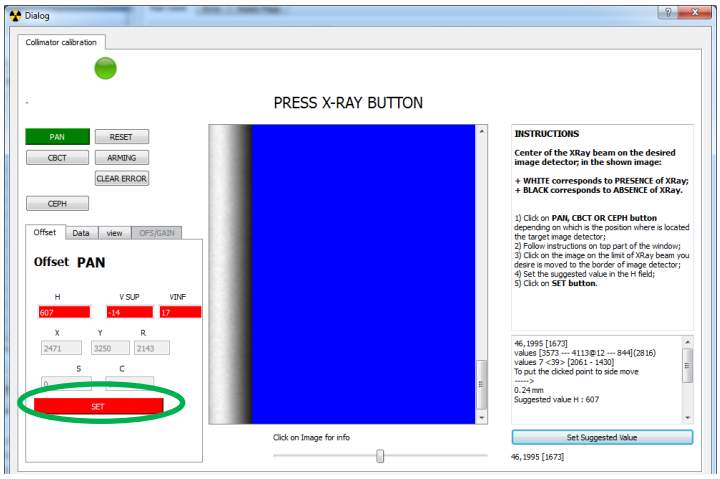
j. Click on the image of the X-ray beam in order to move the X-ray beam in the desired direction respect to the border of the image detector. In the following example the X-ray beam must be shifted to the right:



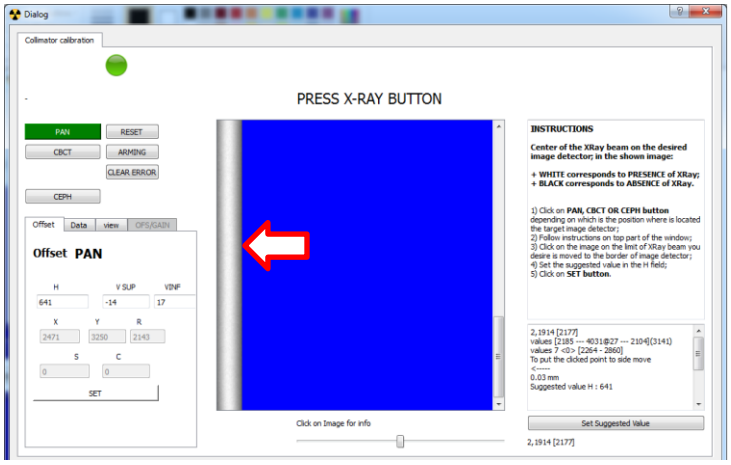
k. Click on button Set Suggested value.



l. Click on SET button.



m. **Repeat steps from h to l** until the X-ray beam covers correctly the image detector.

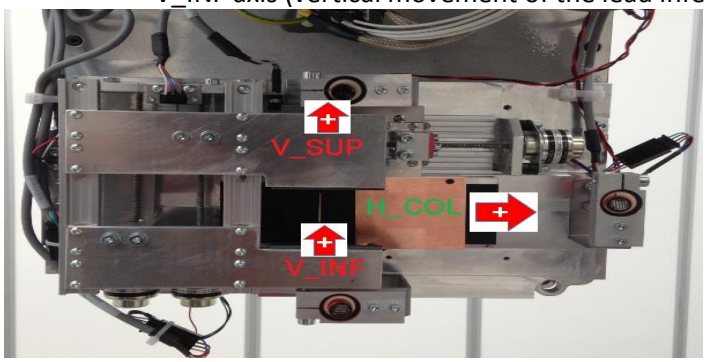


n. To make effective the modification turn OFF X-MIND trium.
o. End X-MIND driver SERVICE.

○ NOTE ON MOTORIZED COLLIMATOR CALIBRATION

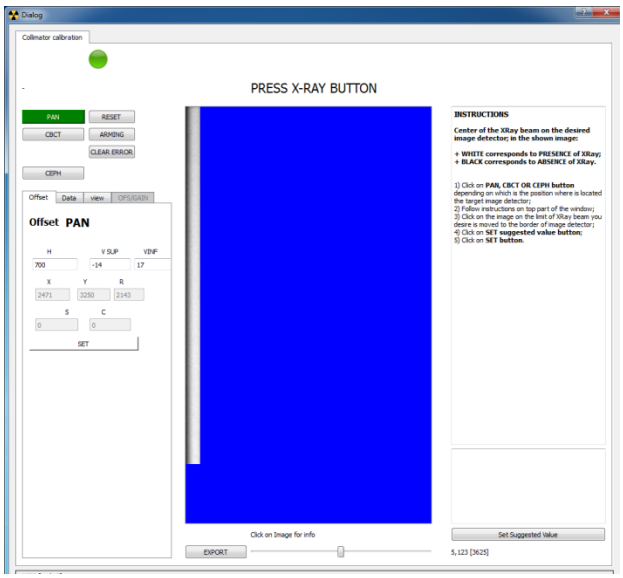
The picture below shows the positive directions of the translation of the three collimator axis:

- ✓ H axis (horizontal movement of the lead aperture mask)
- ✓ V_SUP axis (vertical movement of the lead superior limiter)
- ✓ V_INF axis (vertical movement of the lead inferior limiter)

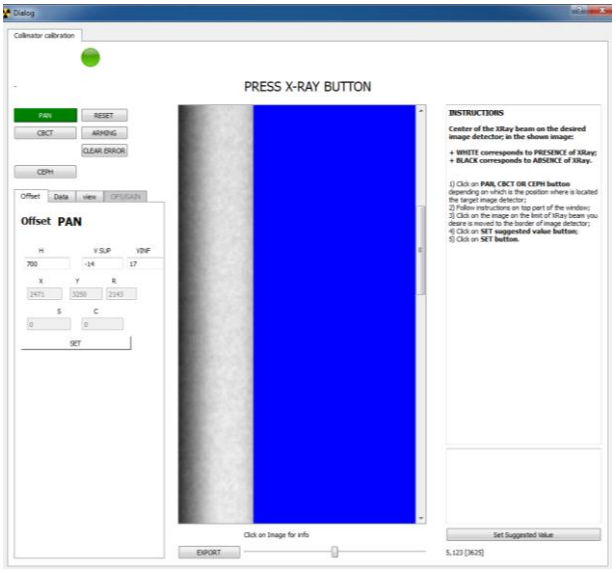


Here are some examples of correct and not correct collimator calibrations:

- ✓ Panoramic collimator not ok: X-ray beam must be shifted to the left

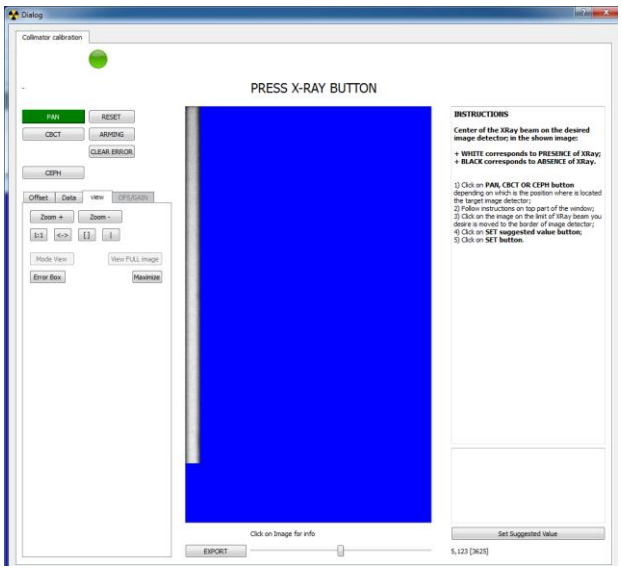


real dimension image

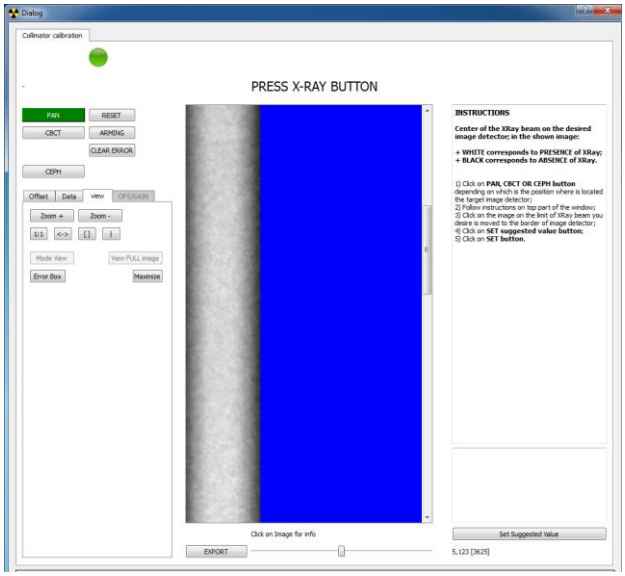


zoomed image

- ✓ Panoramic collimator ok

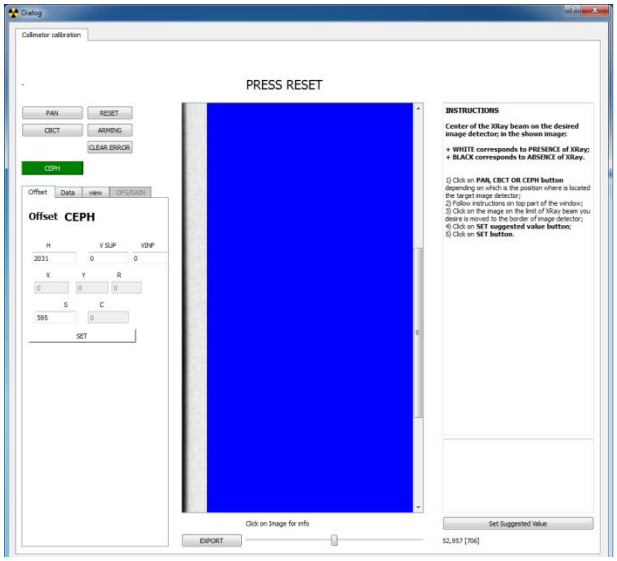


real dimension image

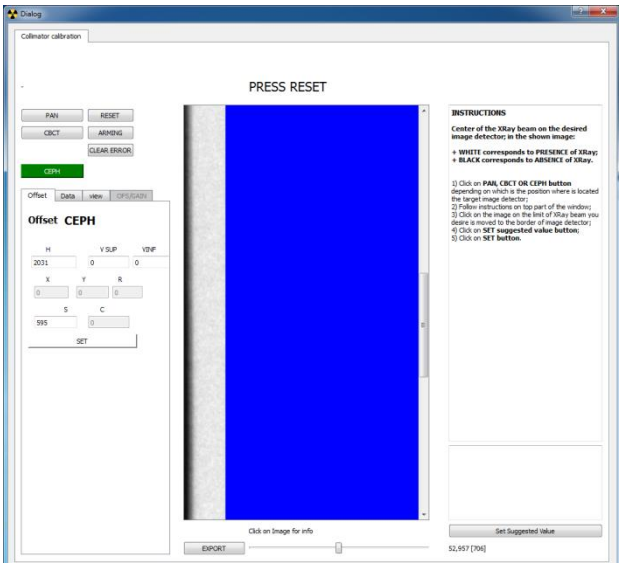


zoomed image

✓ Ceph collimator not ok: X-ray beam must be shifted to the left

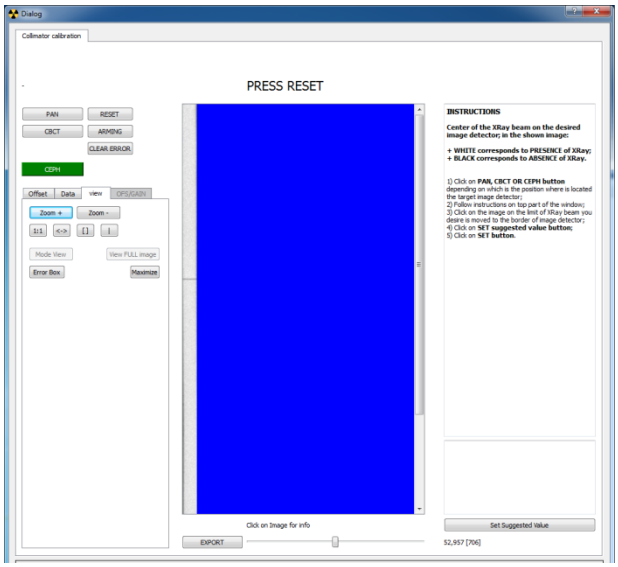


real dimension image

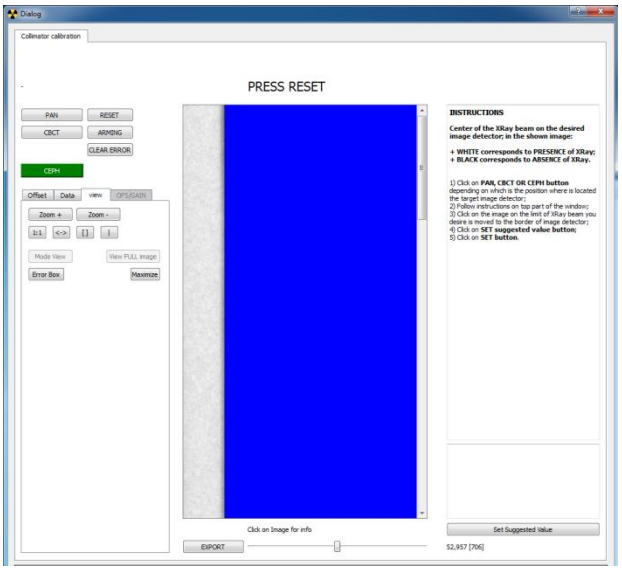


zoomed image

✓ Ceph collimator ok

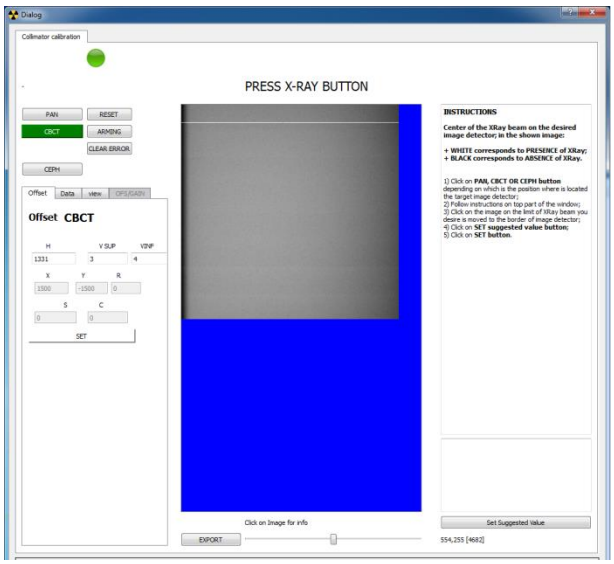


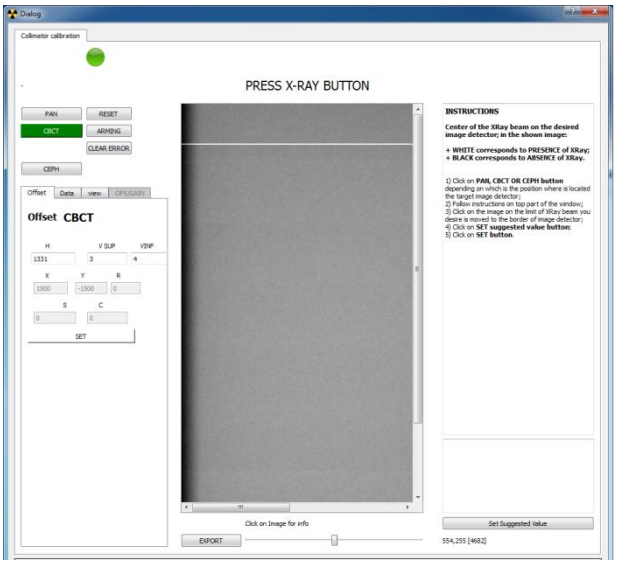
real dimension image



zoomed image

✓ CBCT collimator not ok: X-ray beam must be shifted to the left

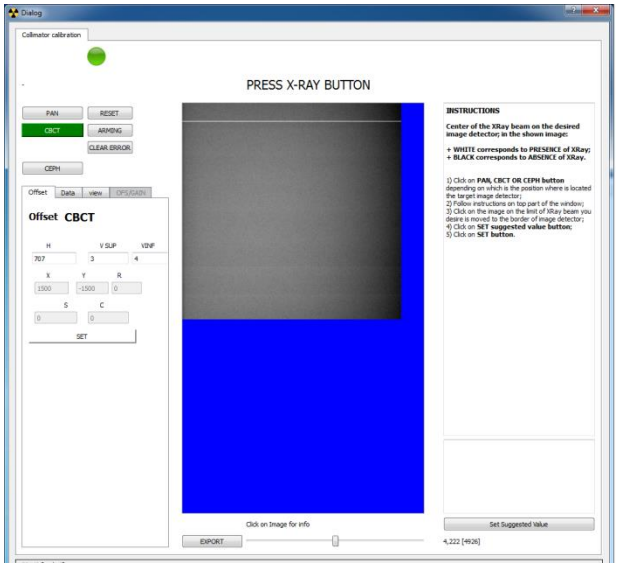


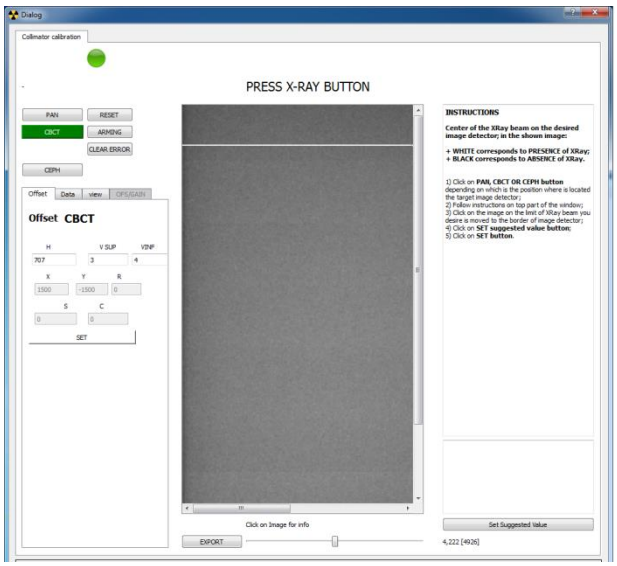


real dimension image **zoomed image**

(blemish raw can be ignored)

✓ CBCT collimator ok

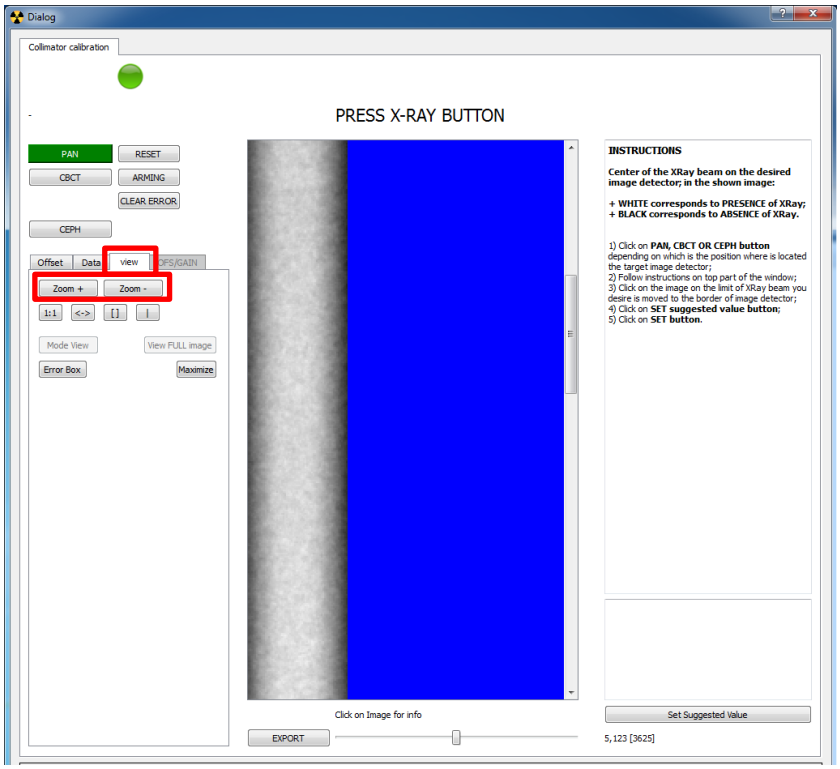




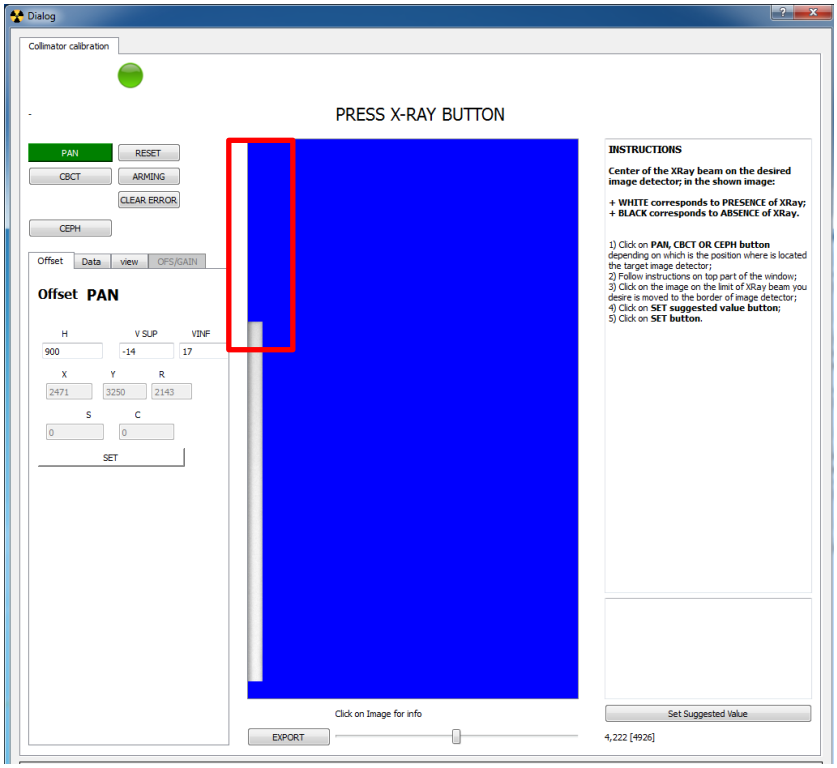
real dimension image **zoomed image**

(blemish raw can be ignored)

Note: to zoom and image, select VIEW menu and then ZOOM + or ZOOM –



Note: In case a Ceph image detector is used in panoramic, the frames acquired will show a reduced vertical dimension (the vertical dimension of the panoramic X-ray beam is smaller than the dimension of the Ceph image detector).



12.8. FIXED COLLIMATOR CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to align the X-ray beam emerging from the fixed collimator for all exams type.
These instructions are applicable only to PAN X-MIND trium models having the fixed collimator.
Perform this calibration when:

- ✓ You handle or replace the whole fixed collimator group
- ✓ You handle or replace one or more of the optoswitches of all X-MIND trium mechanical axes
- ✓ In some cases of collimator failures, depending on troubleshooting diagnostic messages.

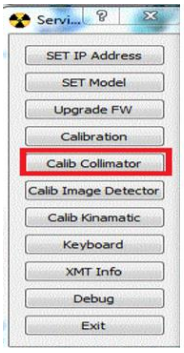
- **PROCEDURE**

  - **LOGIN TO SERVICE**

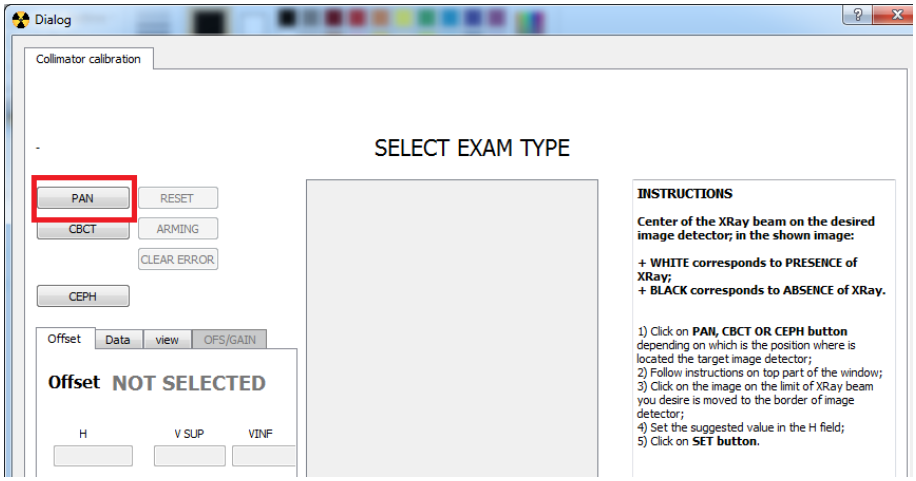
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ FIXED COLLIMATOR CALIBRATION

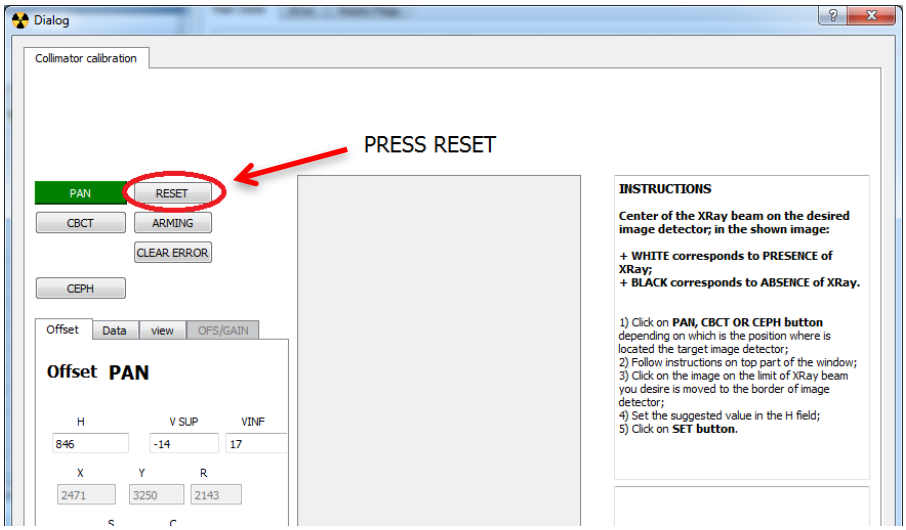
f. Click on Calib. Collimator tab.



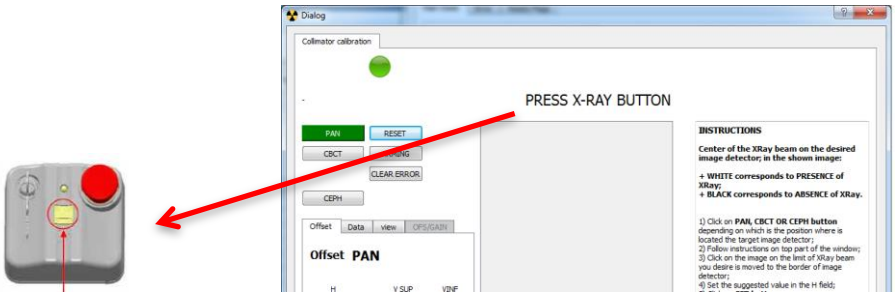
g. Select the PAN exam for which you desire to align X-ray beam.



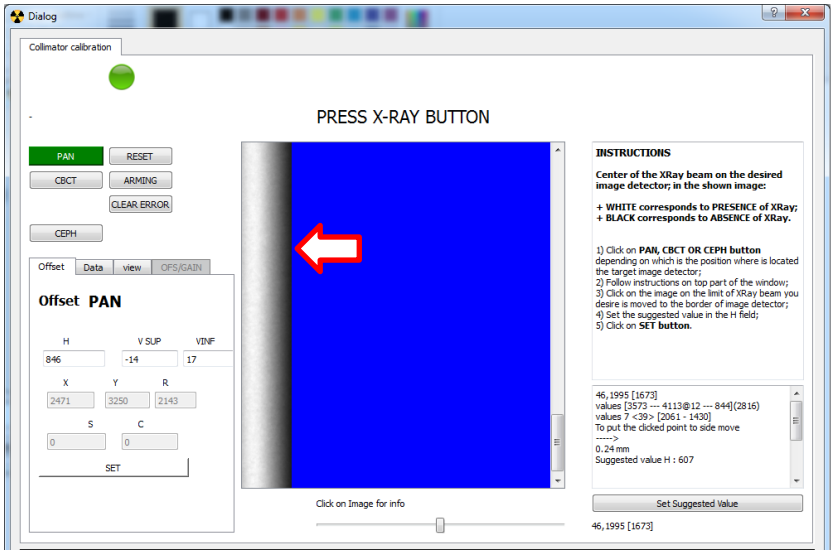
h. Follow instruction on top of window: click on RESET button.



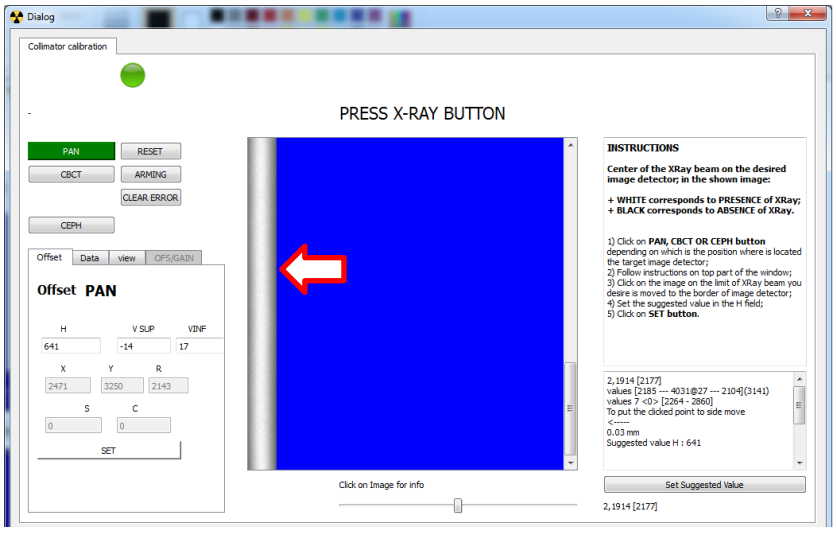
i. Follow instruction on top of window: press continuously X-ray exposure button until the end of exposure.



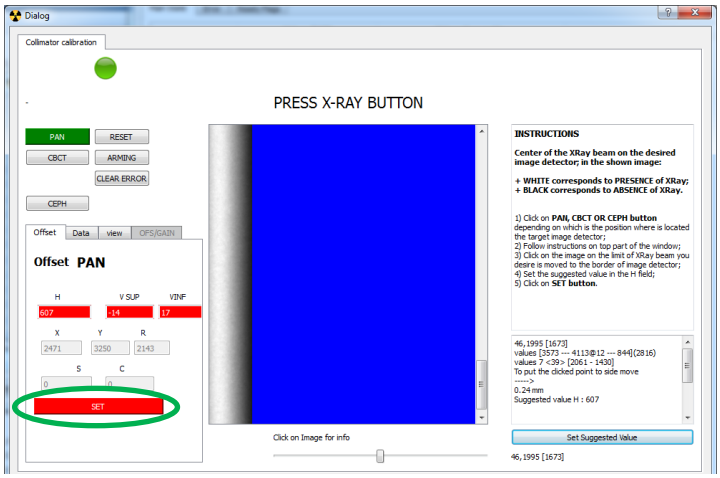
j. Verify the position of the X-ray beam respect to the image detector. In the following example the X-ray beam must be shifted to the right:



k. Adjust the collimator manually in the desired direction and **repeat steps from h to j** till the X-ray beam covers correctly the image detector.



l. Click on button SET.



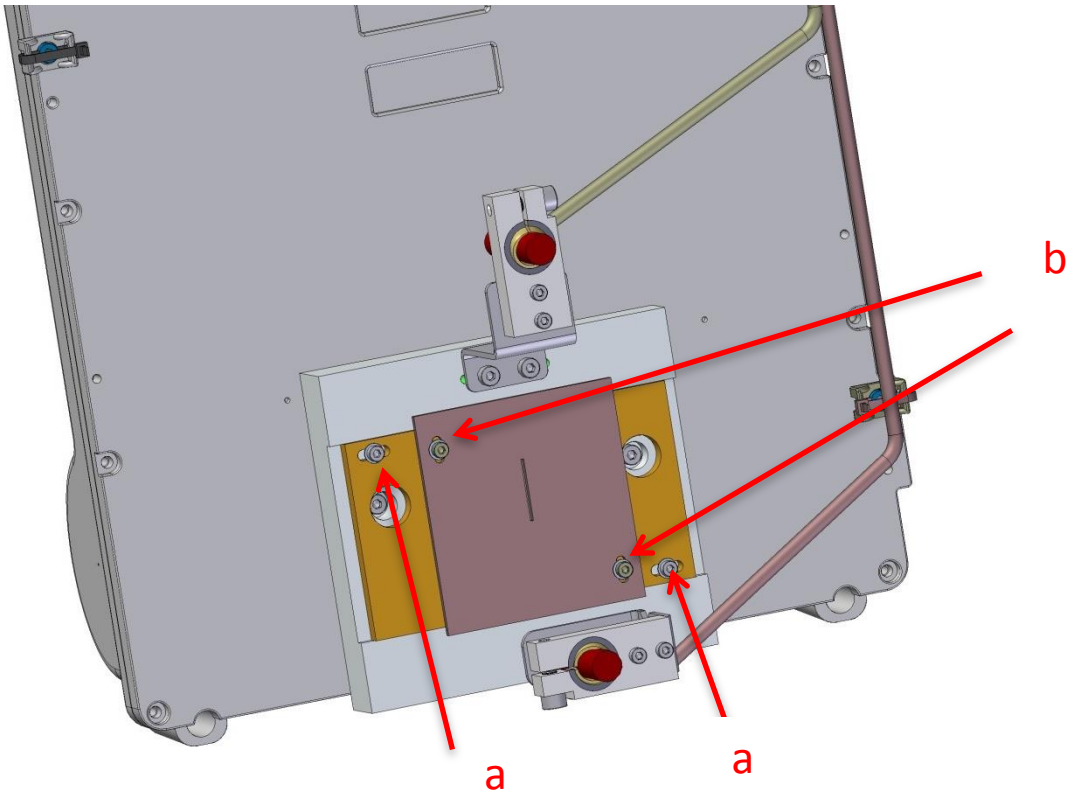
m. To make effective the modification turn OFF X-MIND trium.

n. End X-MIND driver SERVICE.

○ NOTE ON FIXED COLLIMATOR CALIBRATION

The picture below shows how to adjust the translation of the fixed collimator:

- ✓ unlock the screws (a) to move the lead aperture horizontally
- ✓ unlock the screws (b) to move the lead aperture vertically.



12.9. IMAGE DETECTOR CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to calibrate the image detectors.
These instructions are applicable to all the X-MIND trium models.
Perform this calibration:

✓ In some cases of image detector failures, depending on troubleshooting diagnostic messages.

➔ **IMPORTANT NOTICE:** When replacing an image detector in the field, it is not necessary to carry out a new calibration: it is sufficient to install the calibration files supplied by the factory with the new image detector, in the folder as indicated in this chapter.

- **PROCEDURE**

  - **PRE-REQUISITES**

✓ Before calibrating an image detector it is mandatory to disable narrow vertical collimator, to cover with X-ray the whole image detector area: see instruction in paragraph ***Set vertical X-ray beam limitation.***

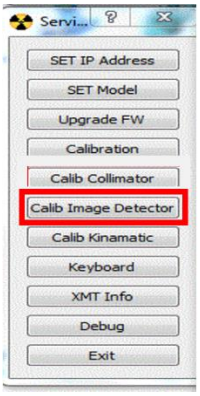
✓ Before calibrating an image detector it is mandatory to carry out the collimator calibration, to ascertain that the X-ray beam is correctly aligned on the image detector: see instruction in paragraphs ***Motorized Collimator Calibration*** and ***Fixed Collimator Calibration.***

  - **LOGIN TO SERVICE**

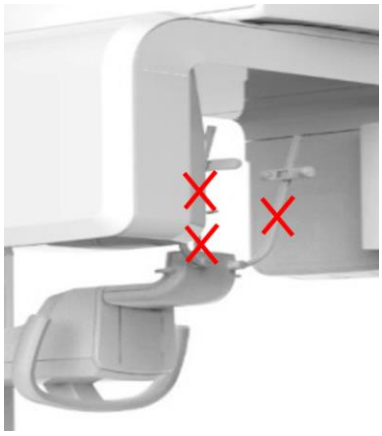
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ IMAGE DETECTOR CALIBRATION

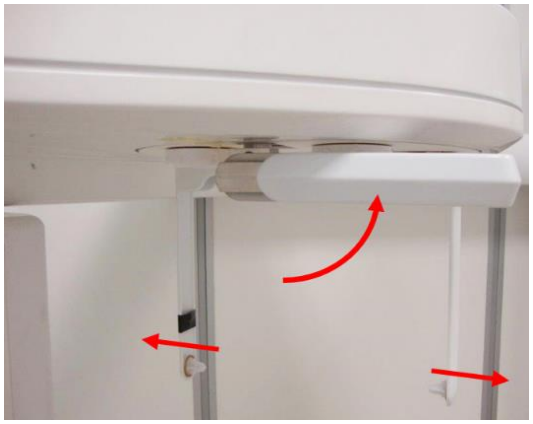
f. Click on Calib. Image Detector tab.



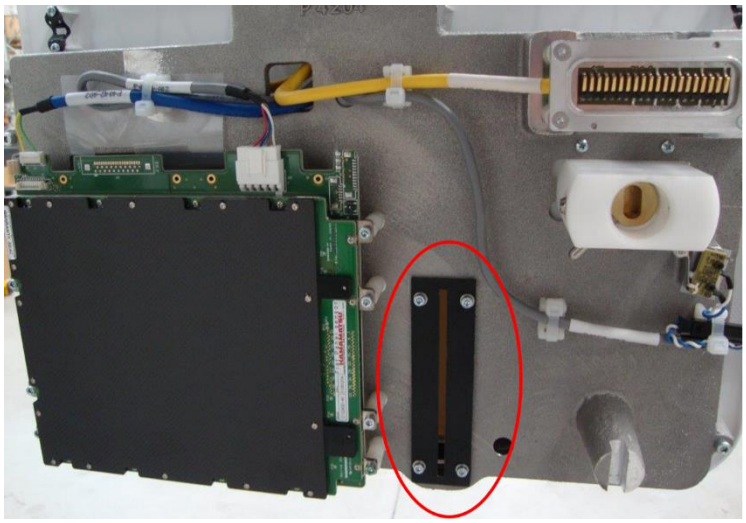
g. Remove all patient positioning aim devices from PAN/CBCT position.



h. **Only for CEPH models:** place CEPH craniostat in AP position, rotate CEPH nasion in horizontal position and open at their maximum the ear rests.

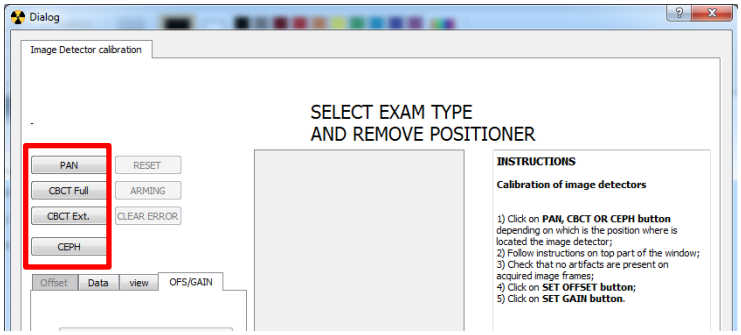


i. **Only for CEPH models:** remove Secondary collimator lead from the translating PAN/CBCT image detector carriage.

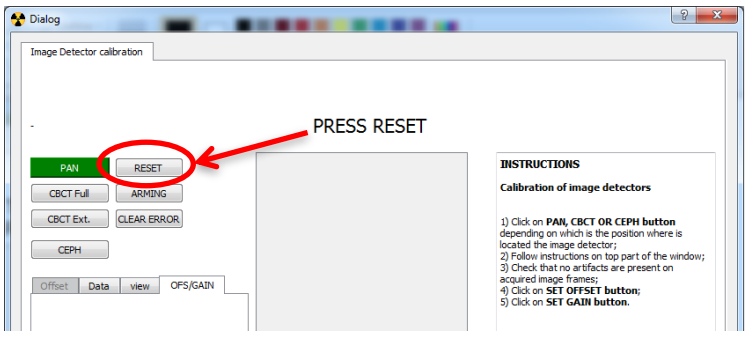


➔ **IMPORTANT NOTICE:** at the end of this calibration, when you put in place again this secondary collimator, **IT IS MANDATORY** to carry out a new calibration of the collimator for the CEPH position.

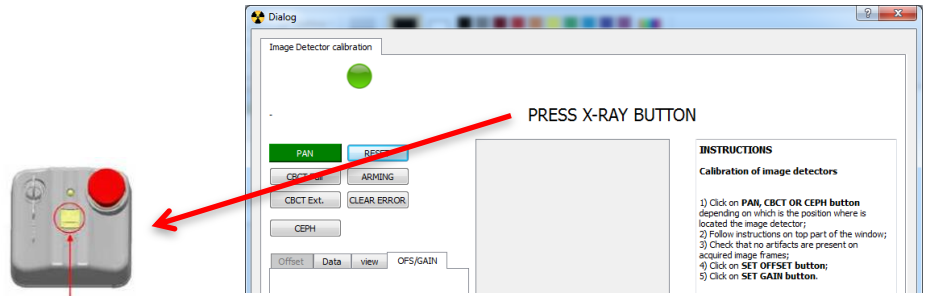
j. Select the image detector that you desire to calibrate (PAN, CBCT or CEPH).



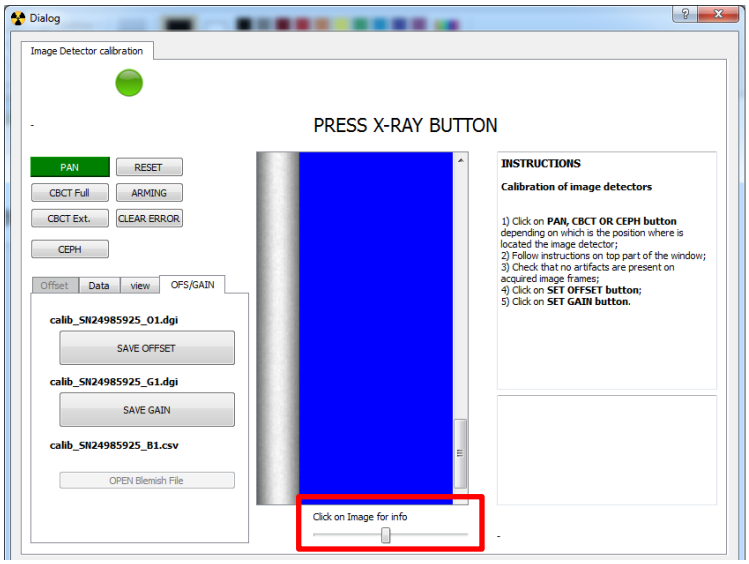
k. Follow instruction on top of window: click on RESET button.



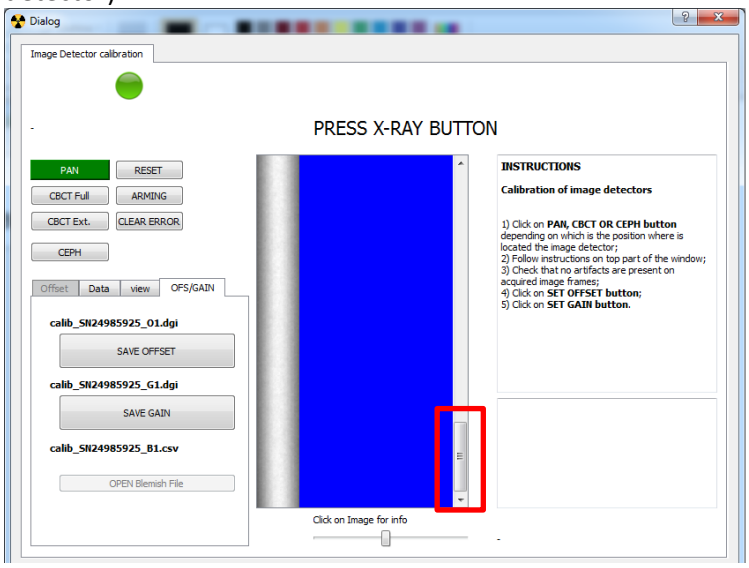
l. Follow instruction on top of window: pess continuously the X-ray exposure button until the end of exposure.



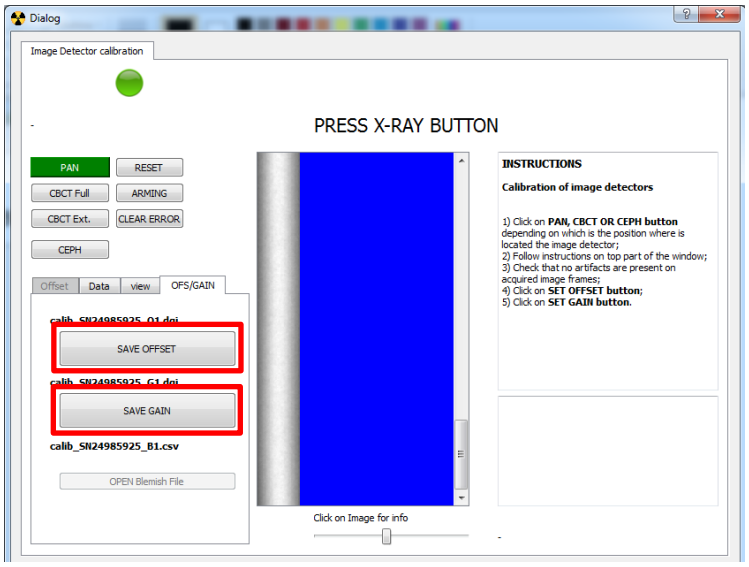
m. Verify that all frames acquired do not have any artifacts, using the slider under the image.



n. Verify all frames acquired in the vertical dimension using the slider on the right of the image.
In case a Ceph image detector is used for panoramic and the Pan Image detector calibration is made, the frames acquired will show a reduced vertical dimension (the vertical dimension of the panoramic X-ray beam is smaller than the dimension of the Ceph image detector).



o. Press SAVE OFFSET and SAVE GAIN buttons.



p. To make effective the modification turn OFF X-MIND trium.

q. End X-MIND driver SERVICE.

r. Verify that the calibration files of the image detector have been saved in the folder: C:\AISSoftware\XMdriver\XM\config

The saved files are the following, depending on which image detector has been calibrated:

- Calibration for **PAN exams with PAN image detector** (only if PAN image detector is provided) related files:
  - Offset: **calib_SN<PAN SerialNumber>_O1.dgi**
  - Gain : **calib_SN<PAN SerialNumber>_G1.dgi**
  - Blemish: **calib_SN<PAN SerialNumber>_B1.csv**

- Calibration for **PAN exams with CEPH image detector** (only if CEPH image detector is provided) related files:
  - Offset: **calib_SN<CEPH SerialNumber>_O1.dgi**
  - Gain: **calib_SN<CEPH SerialNumber>_G1.dgi**
  - Blemish: **calib_SN<CEPH SerialNumber>_B1.csv**

- Calibration for **CEPH exams with CEPH image detector** related files:
  - Offset: **calib_SN<CEPH SerialNumber>_O1_C.dgi**
  - Gain: **calib_SN<CEPH SerialNumber>_G1_C.dgi**
  - Blemish: **calib_SN<CEPH SerialNumber>_B1_C.csv**

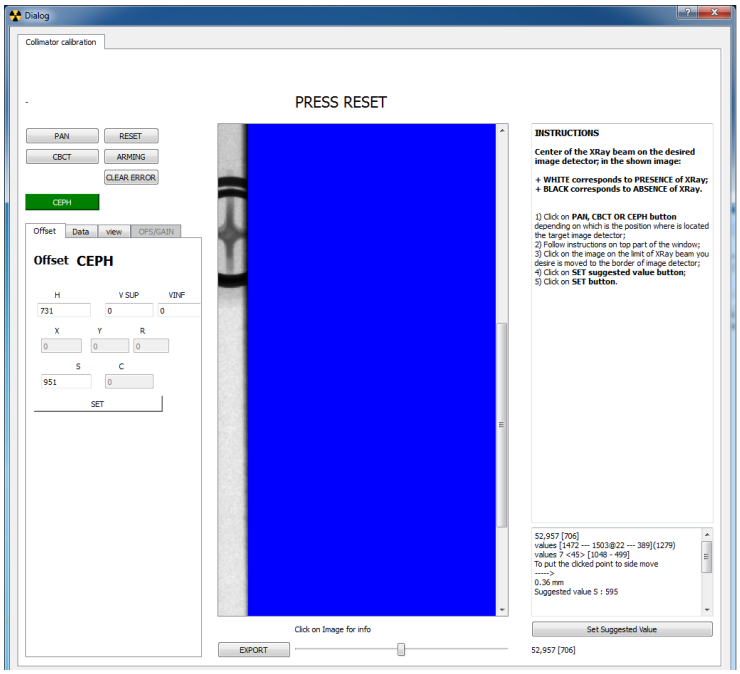
- Calibration for **CBCT Full view exams with CBCT image detector** related files:
  - Offset: **calib_SN<CBCT SerialNumber >_O2.dgi**
  - Gain: **calib_SN<CBCT SerialNumber>_G2.dgi**
  - Blemish: **calib_SN<CBCT SerialNumber>_B2.csv**

- Calibration for **CBCT Extended view exams with CBCT image detector** related files:
  - Offset: **calib_SN<CBCT SerialNumber >_O2_E.dgi**

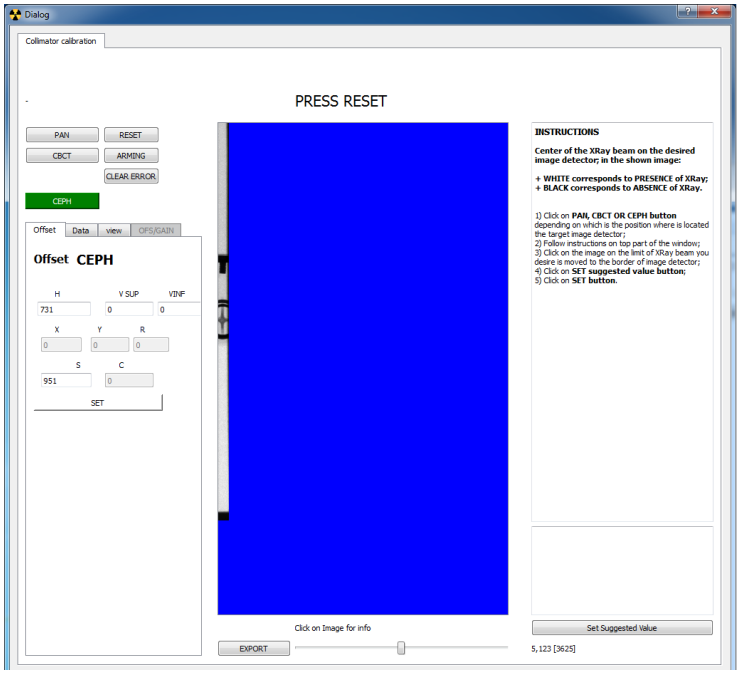
- Gain: **calib_SN<CBCT SerialNumber>_G2_E.dgi**
- Blemish: **calib_SN<CBCT SerialNumber>_B2_E.csv**

Here is an example of bad acquired frames:

✓ Ceph frames with artifacts: ear rests not opened at the maximum (zoomed image)



Ceph frames with artifacts: ear rests not opened at the maximum (real dimension image)



12.10. PAN KINEMATIC CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to carry out the geometric calibration of PAN exams.
The geometric calibration corrects the zero positions of the kinematic axes (X, Y and R) in order to obtain PAN images that have symmetry, horizontal centring and focus inside the required tolerance of 1.5mm.
These instructions are applicable to all the of X-MIND trium models.
Perform this calibration when:

- ✓ At first X-MIND trium installation
- ✓ You handle or replace the whole F group, L group, kinematic group, patient arm group or U-arm group
- ✓ You handle or replace one or more of the three optoswitches of kinematic group (X, Y and R axes)
- ✓ You handle or replace the optoswitches of axis S (translating PAN/CBCT sensor carriage)
- ✓ In some cases of PAN image defects, depending on troubleshooting diagnostic messages.

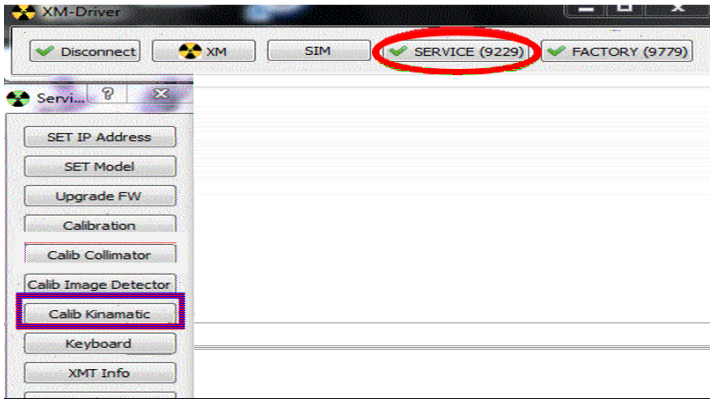
- **PROCEDURE**

  - **LOGIN TO SERVICE**

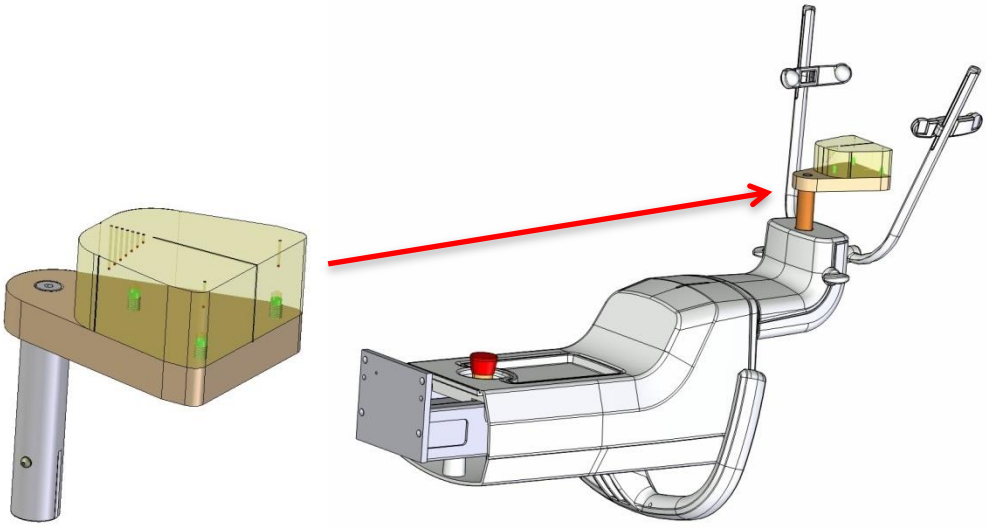
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

○ PAN KINEMATIC CALIBRATION

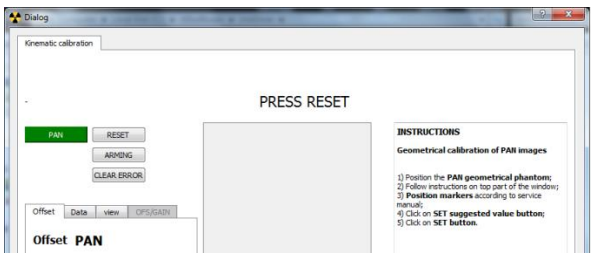
f. Click on Calib. Kinematic tab.



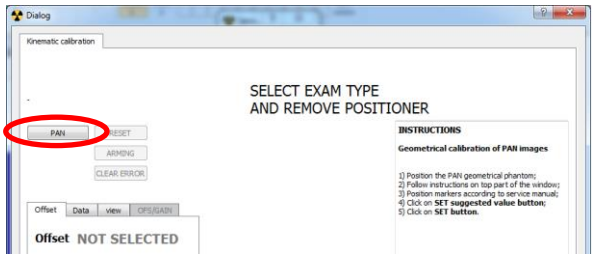
g. Place the PAN geometric calibration phantom into the bite block holder



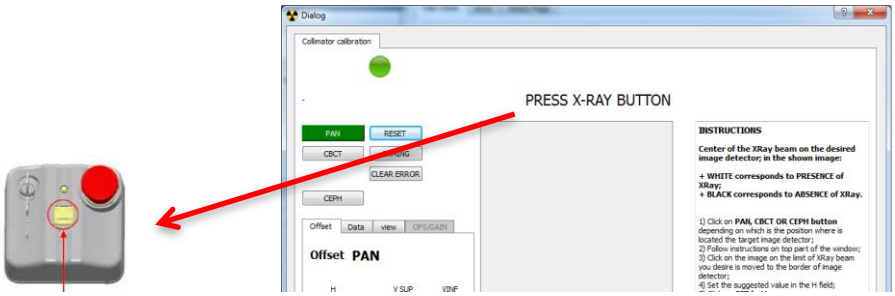
h. Follow instruction on top of window: click on RESET button.



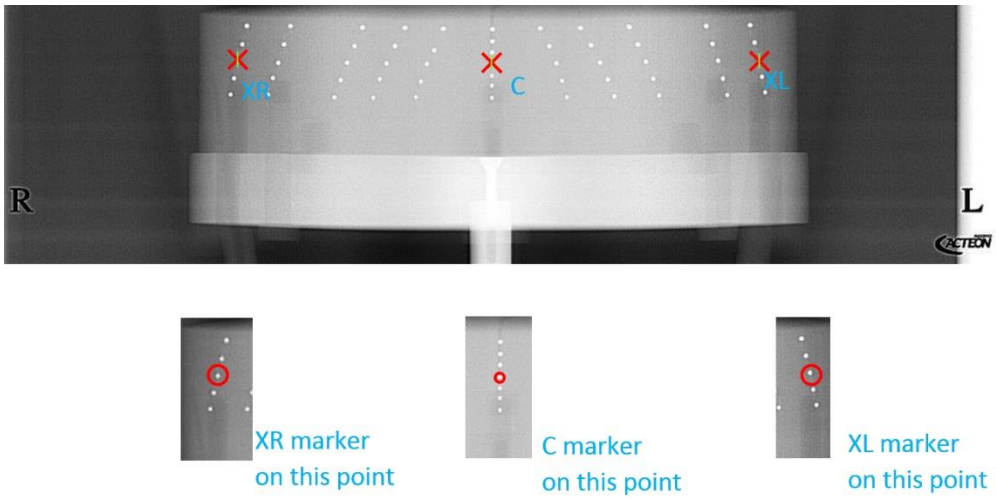
Follow instruction on top of window: select PAN EXAM TYPE.



i. Follow instruction on top of window: press continuously the X-ray exposure button until the end of exposure.

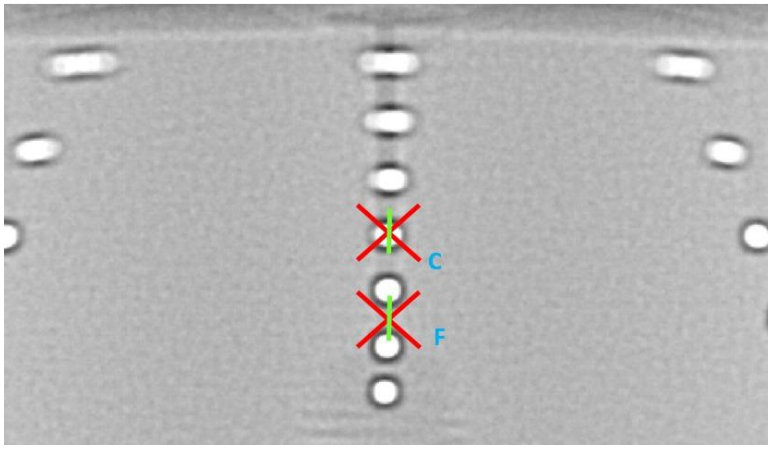


j. On the obtained PAN image position **the markers XL, XR and C**, right clicking on the image desired point:



XL, XR and C markers must be positioned **<u>on the central ball</u>** as indicated above.

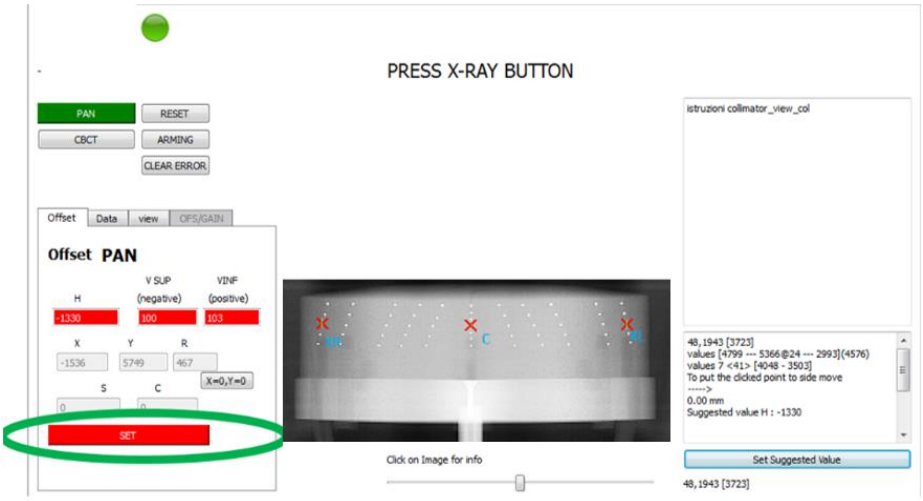
k. On the obtained PAN image position the **marker F** in the most focused position, right clicking on the image desired point, as per following instructions:



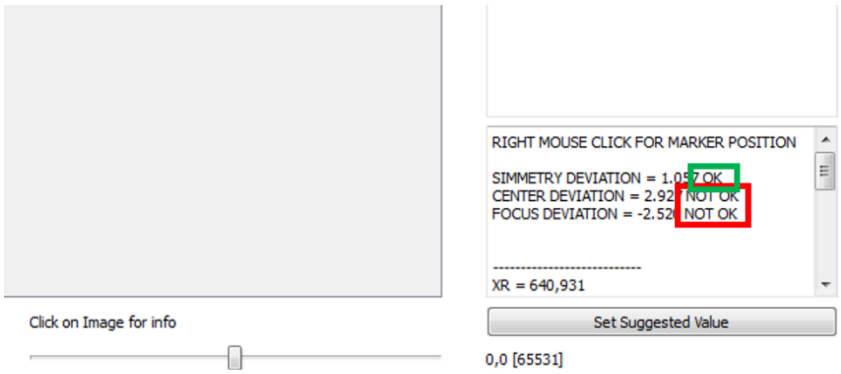
marker F has to be positioned **<u>on the central vertical line, not necessarily in correspondance of a ball,</u>** as in the example above.

l. Click on Set Suggested value button.

m. Click on SET button.



n. Repeat steps from **h to m** until the image of the PAN geometric phantom is correctly centered, ie when in final report all 3 parameters are OK: in the example below simmetry is OK, center and focus are NOT OK.



o. To make effective the modification turn OFF X-MIND trium.

p. End X-MIND driver SERVICE.

12.11. CBCT CALIBRATION

- **INTRODUCTION**

In this paragraph you can find instructions to carry out the CBCT geometric calibration by using the **WHCalibration** software module.

The calibration calculates the parameters that describe the spatial configuration of the scanning apparatus.
These instructions are applicable to the CBCT X-MIND trium models only.
Perform this calibration when:

- ✓ At first X-MIND trium installation
- ✓ You handle or replace the whole F group, L group, kinematic group, patient arm group or U-arm group
- ✓ You handle or replace one or more of the three optoswitches of kinematic group (X, Y and R axes)
- ✓ You handle or replace the optoswitches of axis S (translating PAN/CBCT sensor carriage)
- ✓ You handle or replace the U-arm encoder head and/or tape
- ✓ You replace the complete Ceph arm
- ✓ Whenever the X-MIND trium withstands accidental mechanical stress or impact, even though no damage is evident
- ✓ In some cases of CBCT image defects, depending on troubleshooting diagnostic messages.

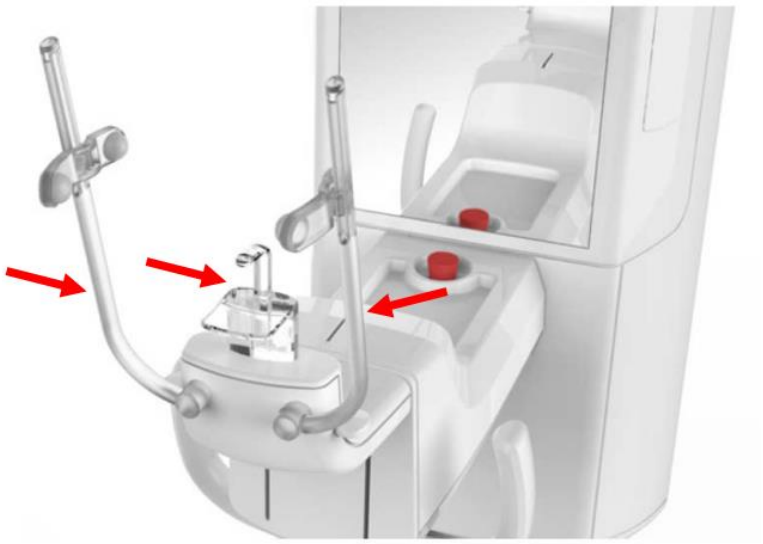
- **PROCEDURE**

To perform the calibration the operator shall use the following tools:

- the **WHCalibration** software module
- a geometric calibration phantom
- a geometric calibration tray.

Geometric calibration phantom (left) and tray (right).

a. Remove any patient support from the device (temple rest, chin rest and bite block).



b. Turn ON the X-MIND trium.

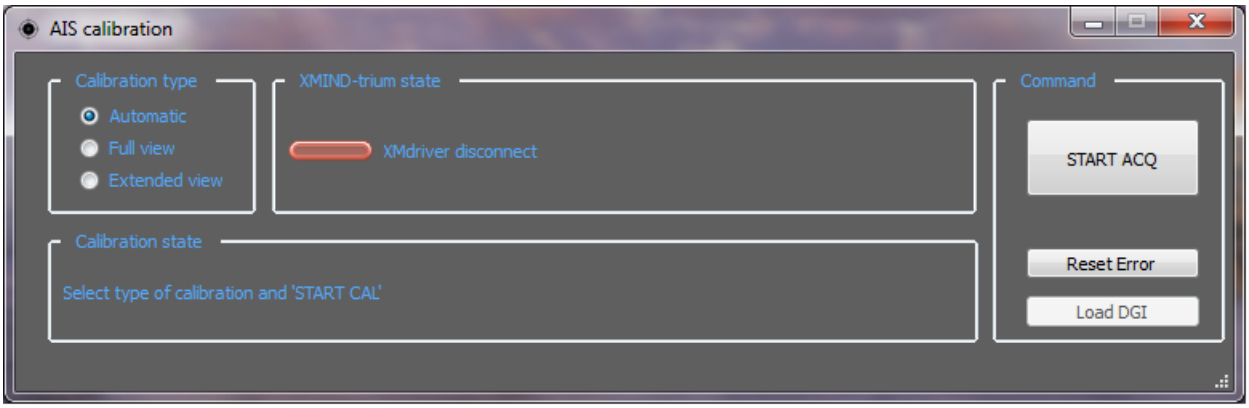
c. Install the geometric calibration tray in the bite block holder.

d. Place the geometric calibration phantom on the calibration tray.

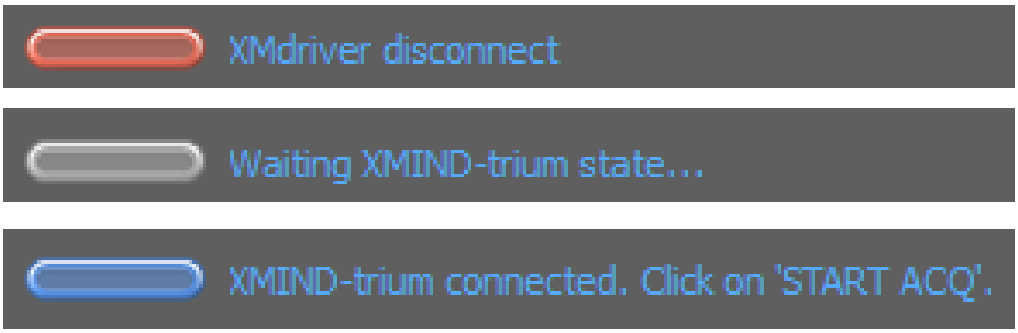
e. Turn ON the Work Station and complete the OS boot.

f. Double click on the **WHCalibration** icon on the **Desktop** to start the software module.

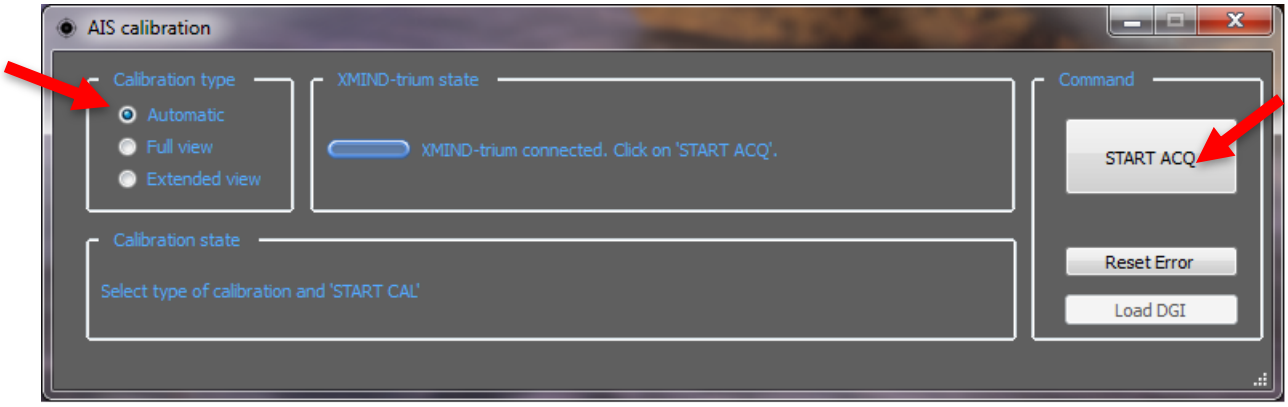
The **WHCalibration** interface will appear and a red led in the **X-MIND trium state** section will indicate that the X-MIND trium is not connected yet.



g. Wait until the led in the **X-MIND trium state** section turns to blue indicating that the X-MIND trium is properly connected.

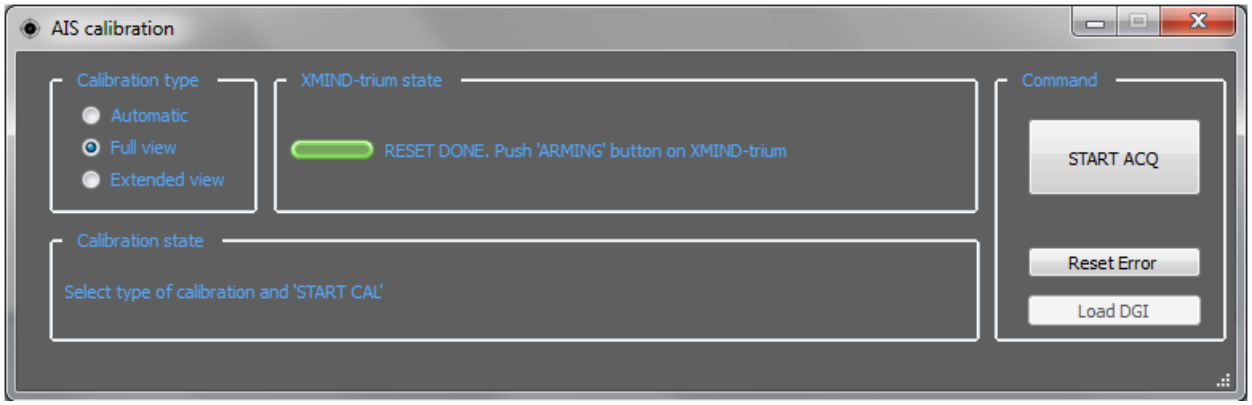


h. Set the radio button in the **Calibration type** section to **Automatic** and click on **START ACQ**.
The software module will automatically start the first phase of the geometric calibration for the full view mode.



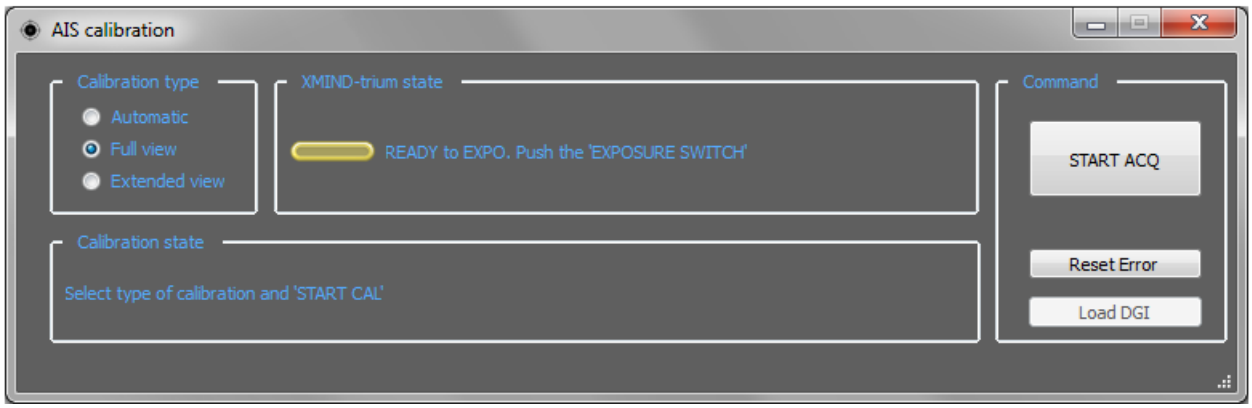
i. Reset the X-MIND trium by pushing the **RESET** key on the **control panel**.

j. Wait until the reset is completed as indicated by the green led in the **X-MIND trium state** section.



k. Arm the X-MIND trium by pushing the **START EXAM** key on the **control panel**.

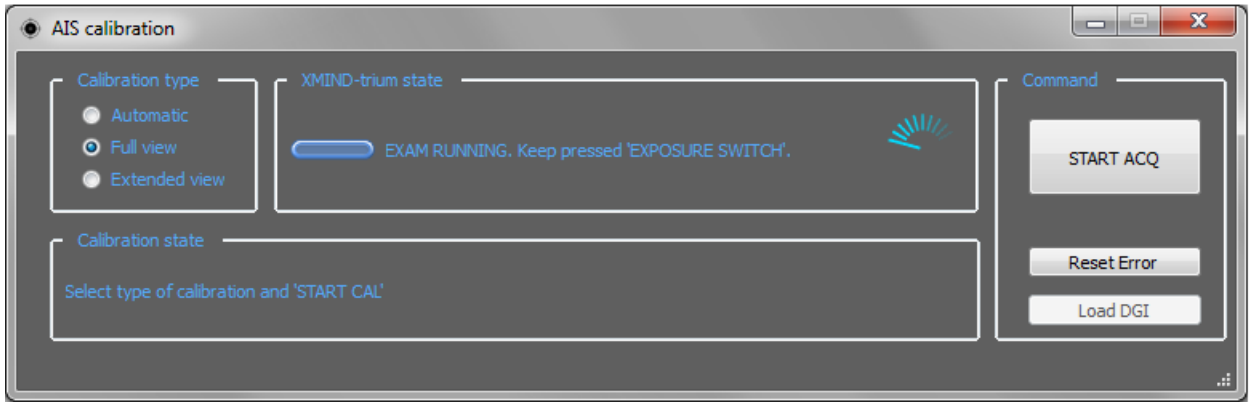
l. Wait until the X-MIND trium is ready to scan as indicated by the yellow led in the **X-MIND trium state** section.



m. Perform the scan of the calibration phantom by pressing the **EXPOSURE SWITCH** on the **X-MIND trium remote control**.

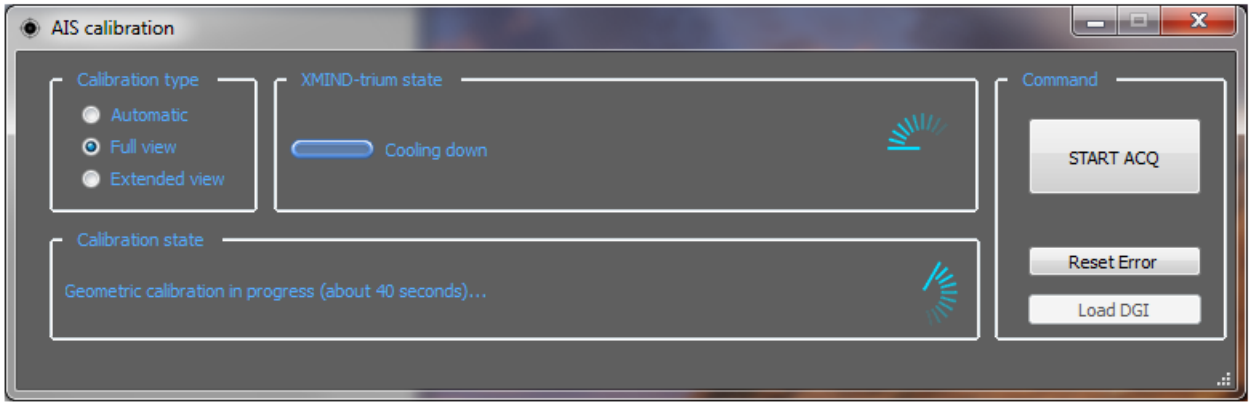
n. Keep pressed the **EXPOSURE SWITCH** until the U-arm stops.

If the **EXPOSURE SWITCH** is released too early, an error condition will occur; in this case, the operator needs to reset the error condition as described in the paragraph **ERROR MANAGEMENT** and repeat the procedure.

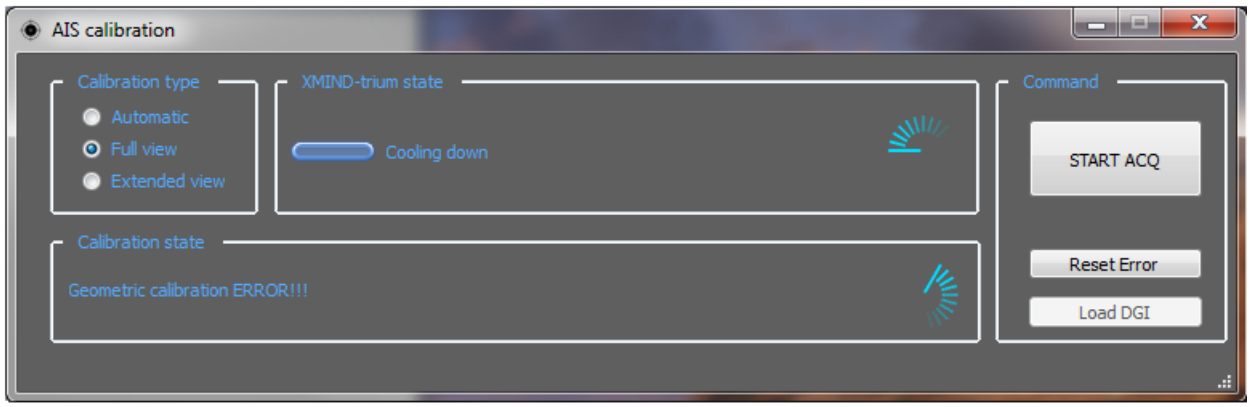


o. Release the **EXPOSURE SWITCH**.

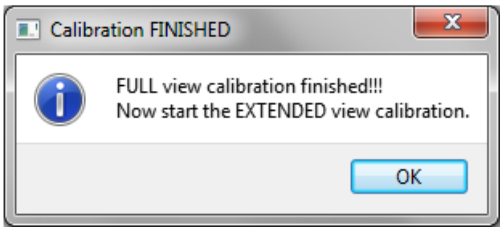
p. Wait until the geometric calibration for the full view mode and the cooling down are completed. The process will take 40-60 seconds.



If the geometric calibration for full view mode fails, the warning message "**Geometric Calibration ERROR!"** will be displayed in the **Calibration state** section; **in this case, repeat the entire procedure.**

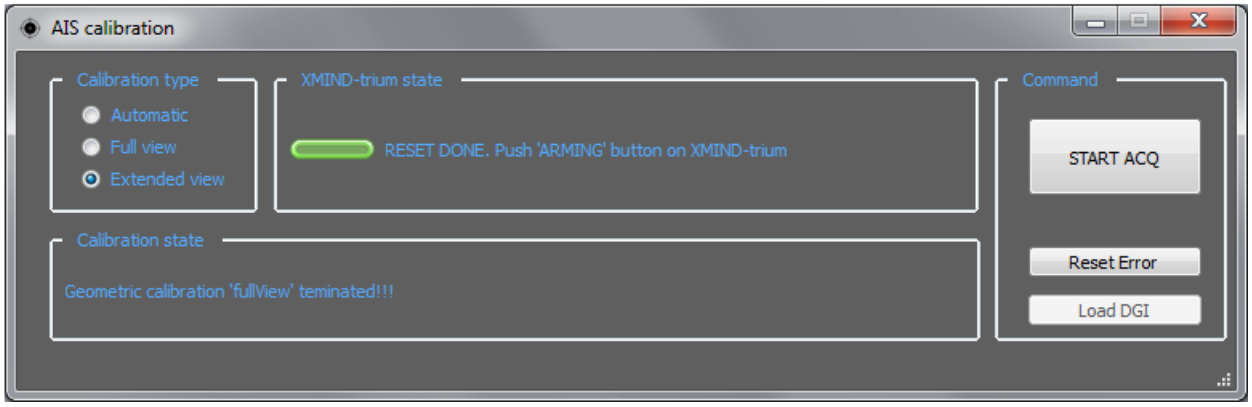


q. When the calibration for the full view mode is completed click on **OK** in the **Information Window**. The software module will automatically start the second phase of the geometric calibration for the extended view mode.



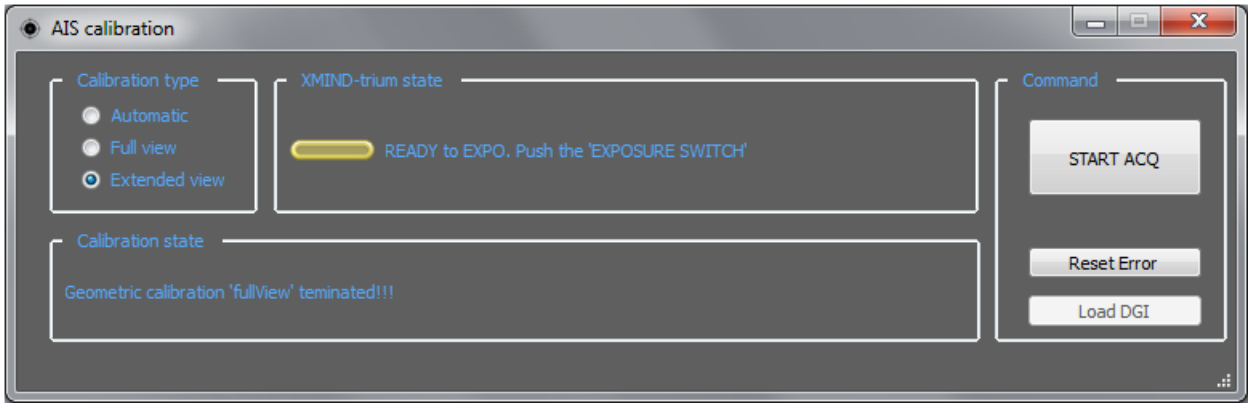
r. Reset the X-MIND trium by pushing the **RESET** key on the **control panel**.

s. Wait until the reset is completed as indicated by the green led in the **X-MIND trium state** section.



t. Arm the X-MIND trium by pushing the **START EXAM** key on the **control panel**.

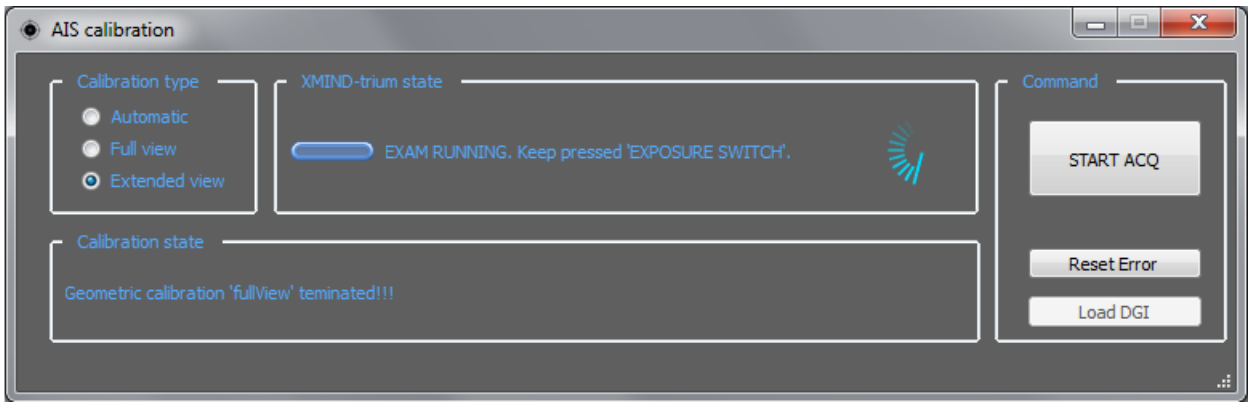
u. Wait until the X-MIND trium is ready to scan as indicated by the yellow led in the **X-MIND trium state** section.



v. Perform the scan of the calibration phantom by pressing the **EXPOSURE SWITCH** on the **X-MIND trium remote control**.

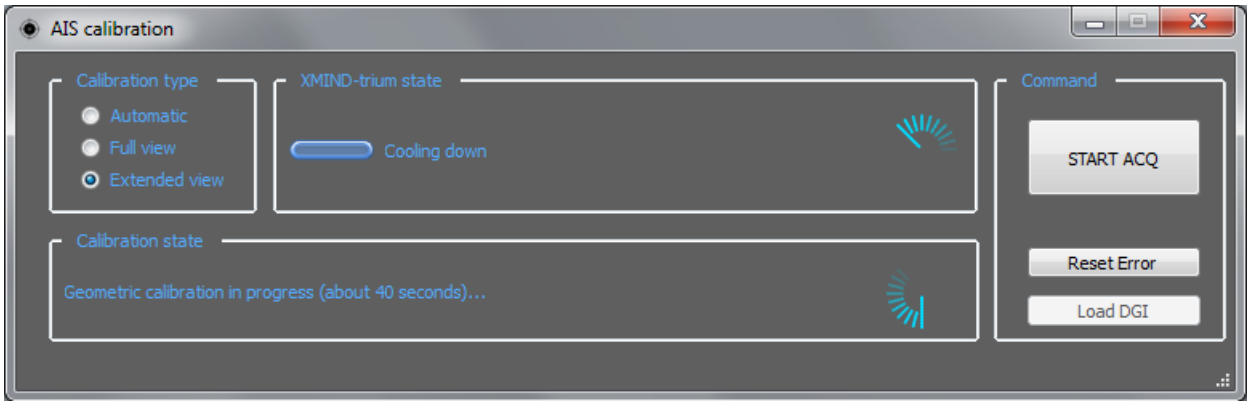
w. Keep pressed the **EXPOSURE SWITCH** until the U-arm stops.

If the **EXPOSURE SWITCH** is released too early, an error condition will occur; in this case, the operator need to reset the error condition as described in the paragraph **ERROR MANAGEMENT** and repeat the procedure.

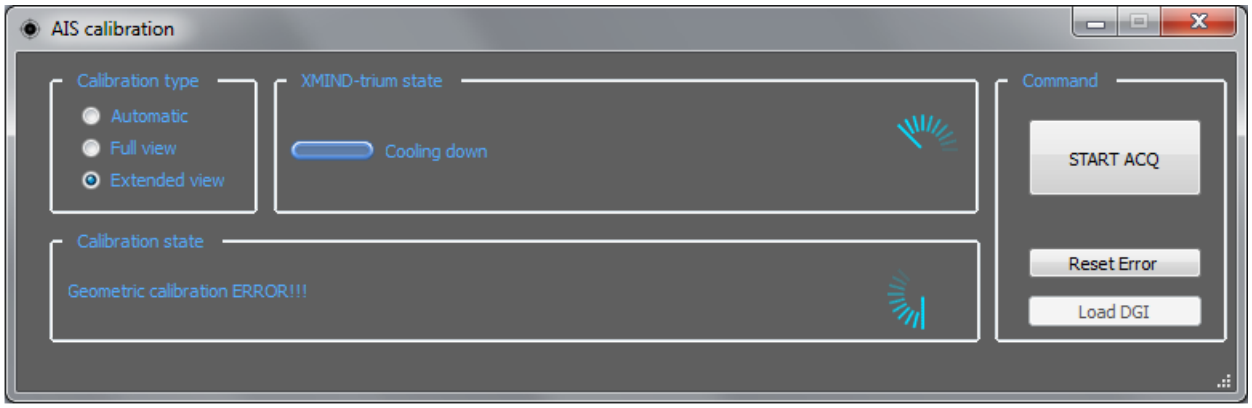


x. Release the **EXPOSURE SWITCH.**

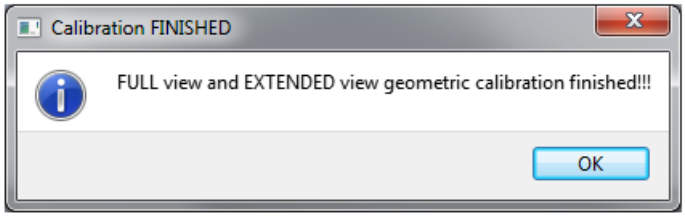
y. Wait until the geometric calibration for the extended view mode and the cooling down are completed.
The process will take 40-60 seconds.



If the geometric calibration for extended view mode fails, the warning message "**Geometric Calibration ERROR!"** will be displayed in the **Calibration state** section; **in this case, repeat the entire procedure.**



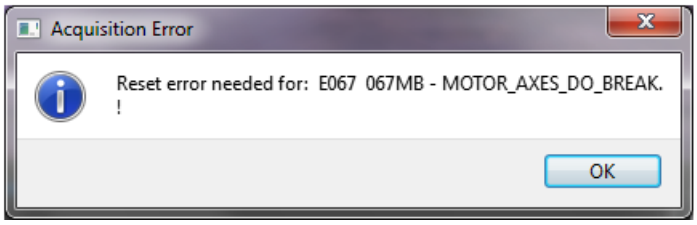
z. When the calibration for the extended view mode is completed click on **OK** in the **Information Window**.



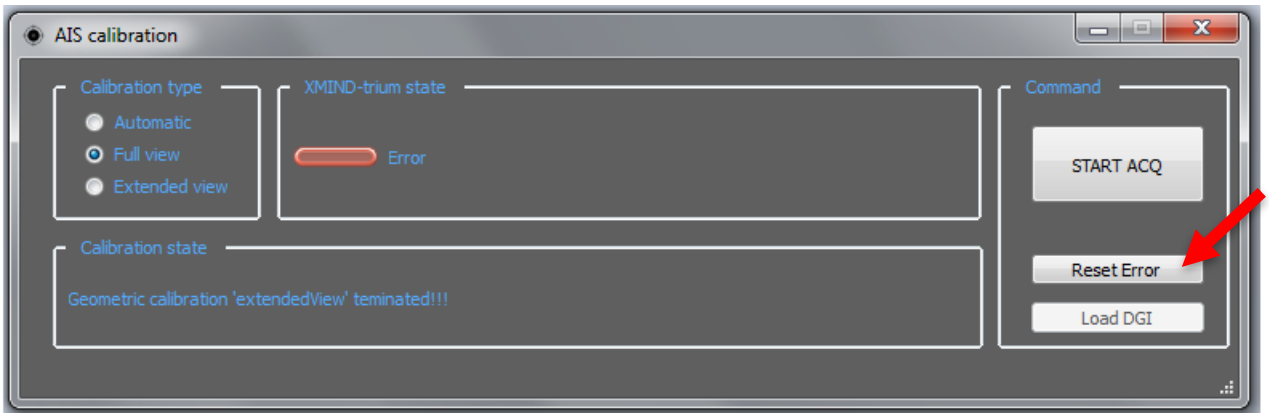
- ## ERROR MANAGEMENT

The **WHCalibration** sotware module allows the operator to reset accidental error conditions that might occur during the calibration process. Execute the following instructions to reset an error:

a. If during the geometric process an error occurs, the **Information Window** notifies the fault condition.
Click on **OK** in the **Information Window**.

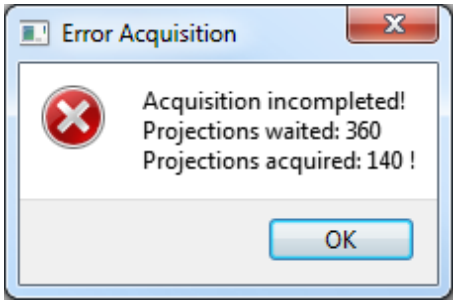


b. Reset the error condition by clicking on **Reset Error**.



c. Depending on the type of error condition occurred, the operator might need to repeat the entire calibration procedure.

d. A message box advises the operator in case the acquisition is terminated before acquiring all the waited projections. The operator might need to repeat the entire calibration procedure.



13. ADJUSTMENTS

13.1. ADJUSTMENT OF THE LASERS

In the X-MIND trium there are five laser projectors. When the patient positioning laser button is pressed on the key pad panel, the lasers are turning on as follows:

PAN exam selected -> lasers ON are:

- PAN mid-sagittal from patient arm
- Canine from Tubehead
- Multi-line Frankfurt from Tubehead

CBCT exam selected -> lasers ON are:

- CBCT mid-sagittal from U-arm
- Axial (horizontal) from Tubehead.

Note: Canine and Coronal laser beams from the Tubehead are emitted by the same laser projector.

Note: For the laser projectors adjustment it is necessary the laser phantom, **not supplied** with the X-MIND trium: ordering code W0900136.

⚠ **CAUTION**

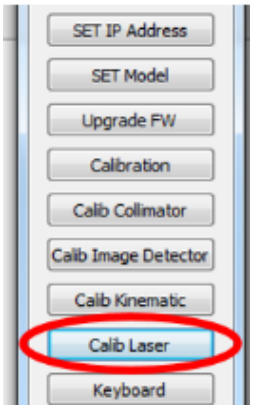
- **Do not stare into laser beam or view directly with optical instruments.**
- **The patient positioning lasers are Class 1M (IEC 60825-1). The corneal reflex (in response to potential risks) prevents damage to the eyes. It is important not to stare into the laser beam for a long period of time.**

If necessary, during the laser projectors adjustment procedure it is possible to turn on the laser beams for 10 minutes, by using the following the procedure:

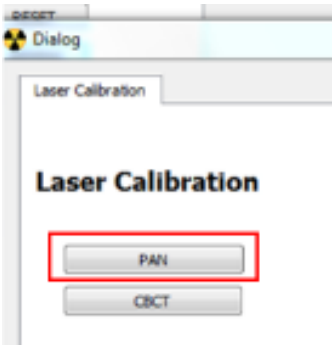
○ LOGIN TO SERVICE

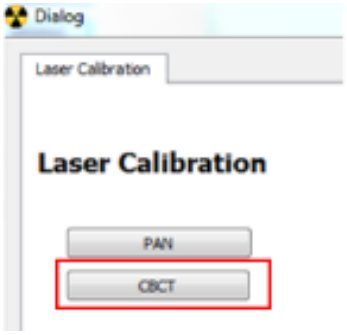
a. End execution of AIS.
b. Turn OFF then ON X-MIND trium.
c. Start XMdriver Show double clicking on the file:
   C:\AISSoftware\XMdriver\XMdriverShow.bat
d. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
e. Click on SERVICE tab and enter the required password: rdtech.

f. Click on Calib Laser tab.



g. Follow instruction on top of window: click on PAN or CBCT button depending of the laser projector that has to be aligned.





h. Wait until the movement of the U-arm is completed.

i. Turn on the lasers from the X-MIND trium control panel. The lasers will stay on for 10 minutes: if longer time is required, turn off and then on again the lasers, so that the countdown will restart.

13.1.1. Adjustment of mid-sagittal pan laser

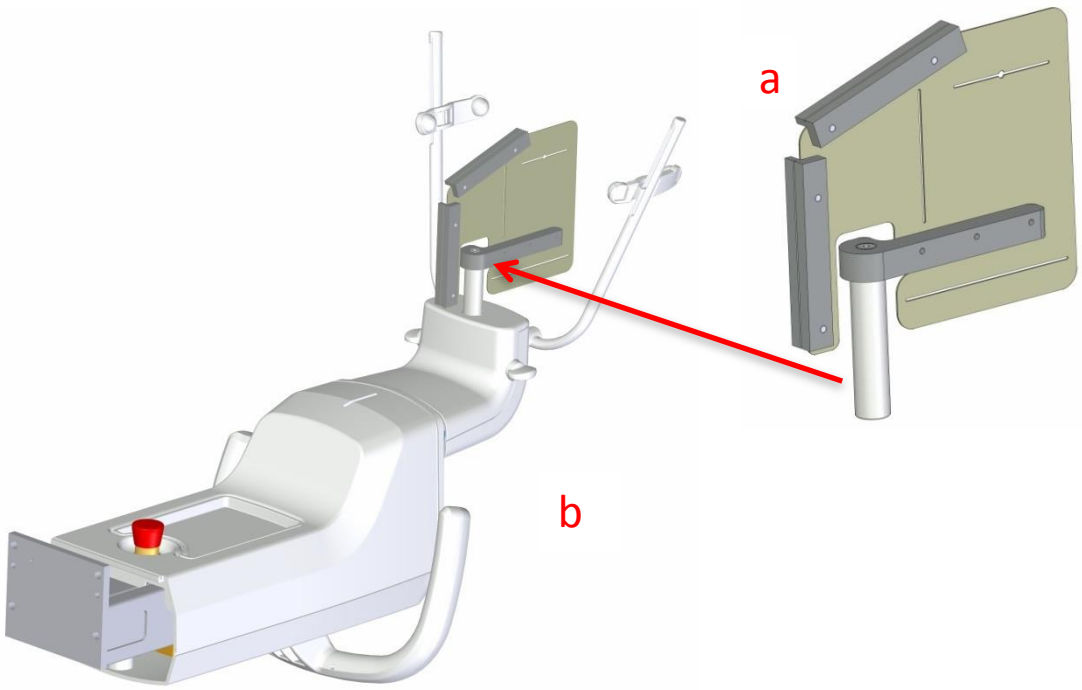
⚠ CAUTION

During the adjustment procedure, avoid to expose the eyes directly to the laser beam.

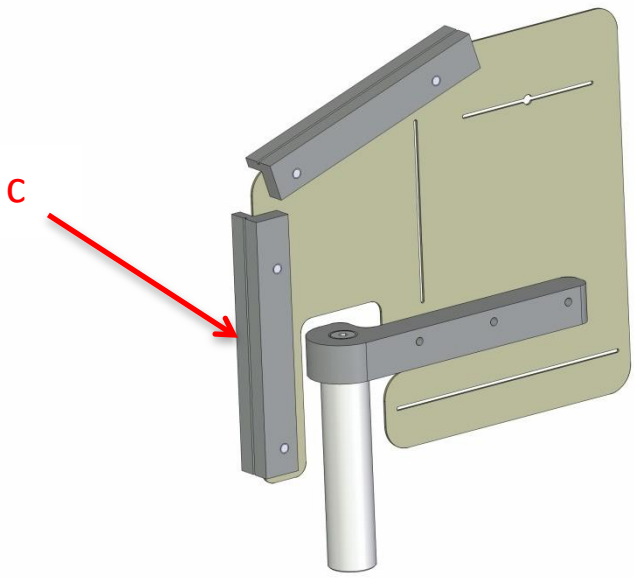
To adjust the mid-sagittal pan laser projector located in the Patient Arm, proceed as follows:

a. Make sure that the X-MIND trium is in the reset position (PAN).

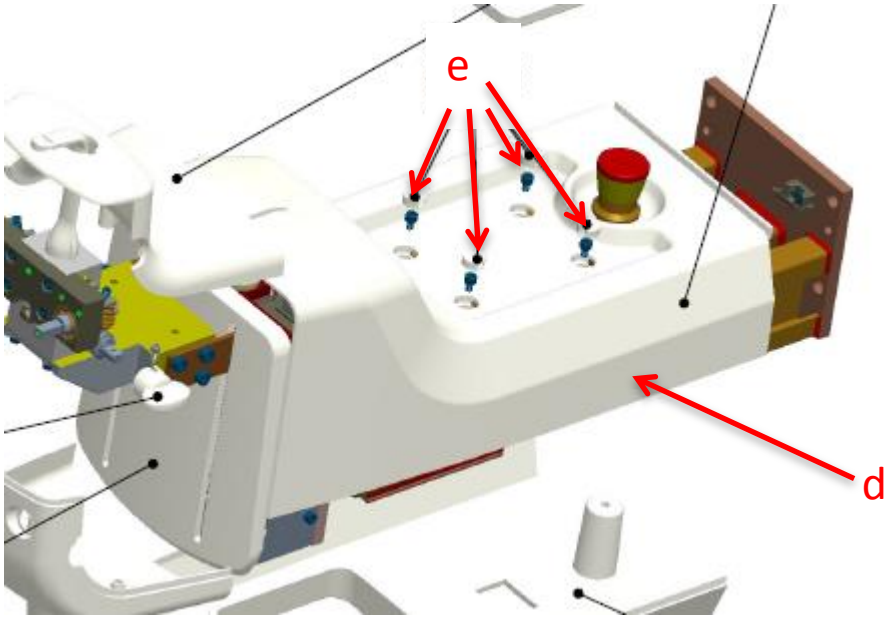
b. Insert the laser phantom (a) into the bite block holder (b).



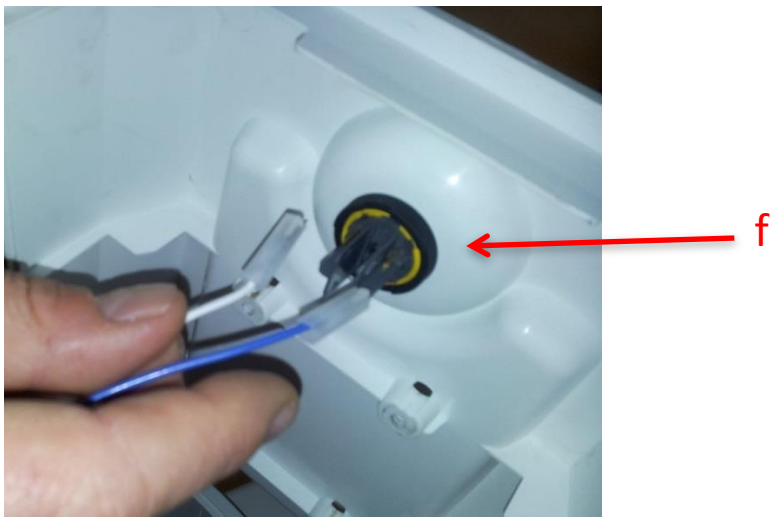
c. Switch on the laser by pressing the LASER key on the control panel and verify that the mid-sagittal pan vertical laser beam is aligned with the groove (c) of the phantom.



d. If not, access to the mid-sagittal pan laser projector by removing the handling cover (d) unscrewing the 4 screws (e).

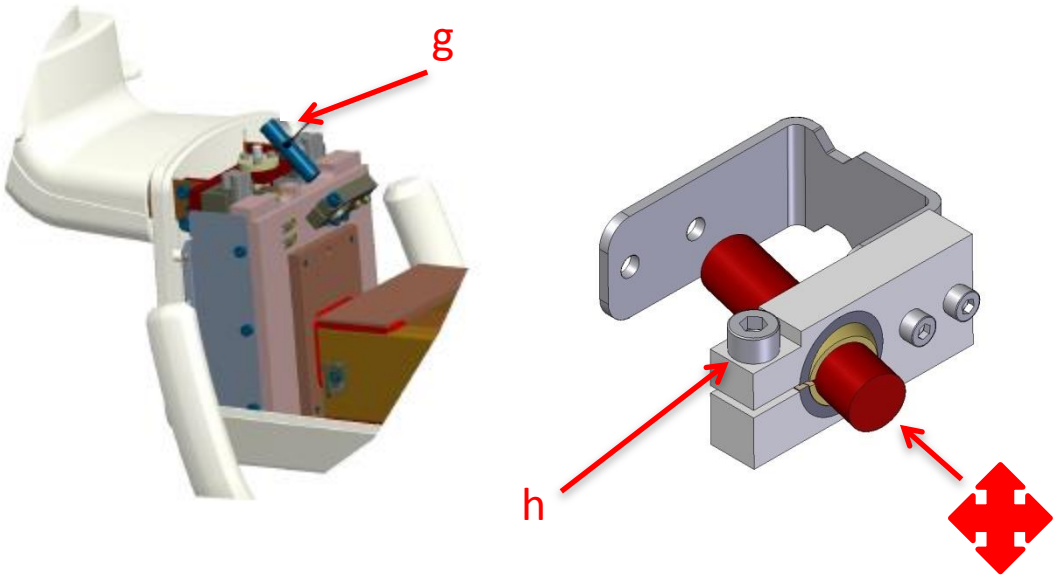


e. When removing the handling cover, disconnect the 2 wires from the safety switch (f); when reconnect the wires, polarity of the connection is not significant.



f. Access to the mid-sagittal pan laser projector (g) and unlock the Allen screw (h) to rotate the laser projector in the desired position.

After the adjustment, when fixing the Allen screws (h), be sure that the laser beam is not moving.



g. After the installation of the handling cover, verify that the laser beam is still visible on the laser phantom.

13.1.2. Adjustment of axial laser

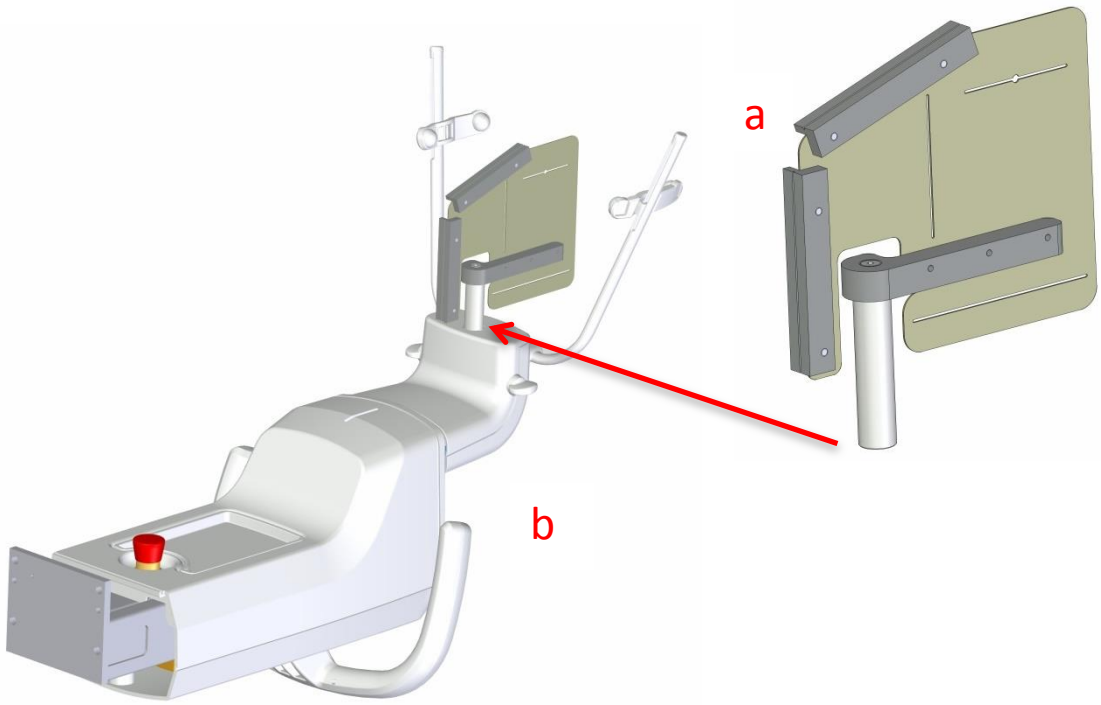
⚠ CAUTION

During the adjustment procedure, avoid to expose the eyes directly to the laser beam.

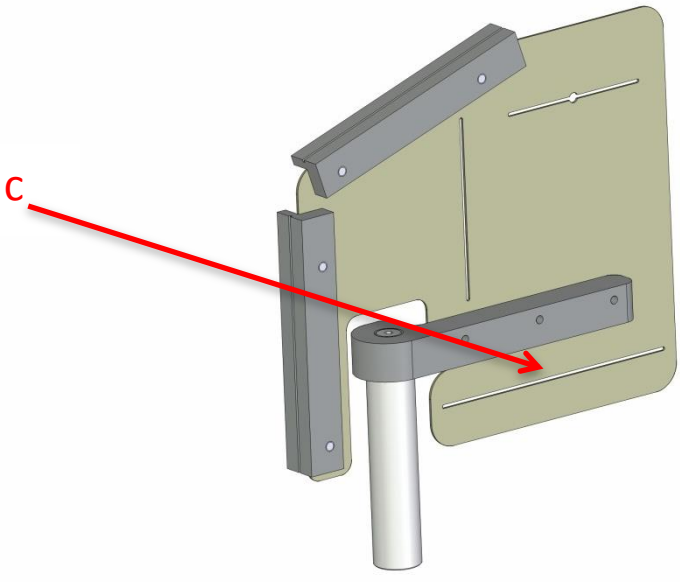
To adjust the axial laser projector located in the Tubehead assembly, proceed as follows:

a. Make sure that the X-MIND trium is in the reset position (CBCT).

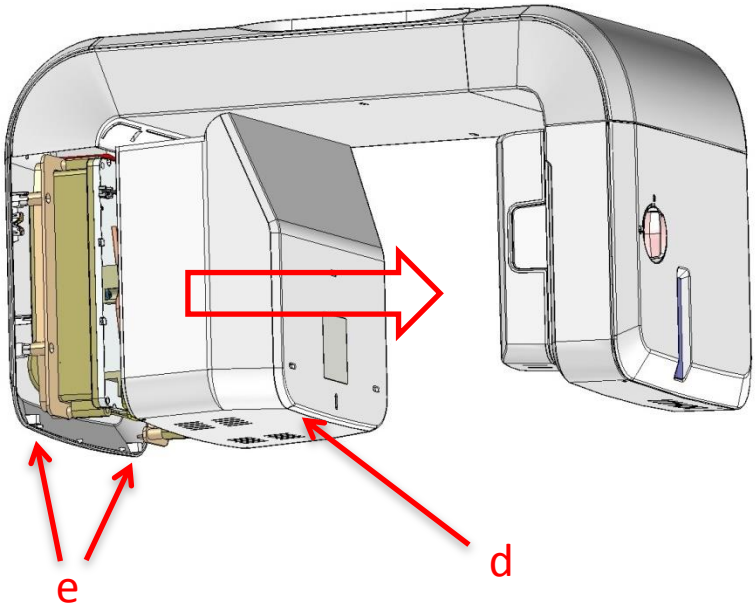
b. Insert the laser phantom (a) into the bite block holder (b).



c. Switch on the laser by pressing the LASER key on the control panel and verify that the axial laser beam is aligned with the groove (c) of the phantom.

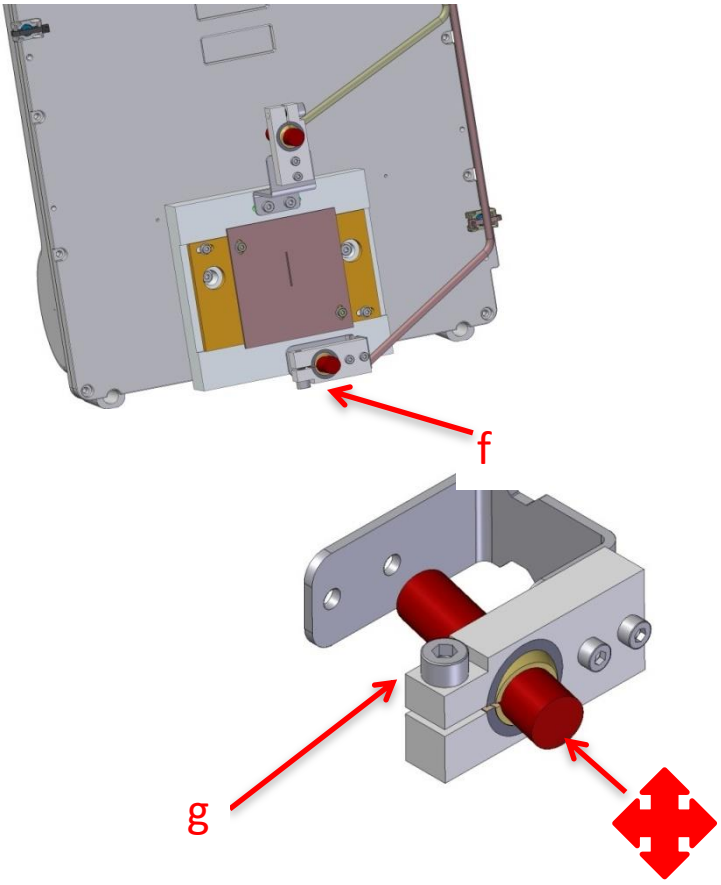


d. If not, access to the axial laser projector by removing the frontal Tubehead cover (d), unscrewing the 2 screws (e) and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.



e. Access to the axial laser projector (f) and unlock the Allen screw (g) to rotate the laser projector in the desired position.

After the adjustment, when fixing the Allen screws (g), be sure that the laser beam is not moving.



f. After the installation of the frontal Tubehead cover, verify that the laser beam is still visible on the laser phantom.

13.1.3. Adjustment of coronal/canine laser

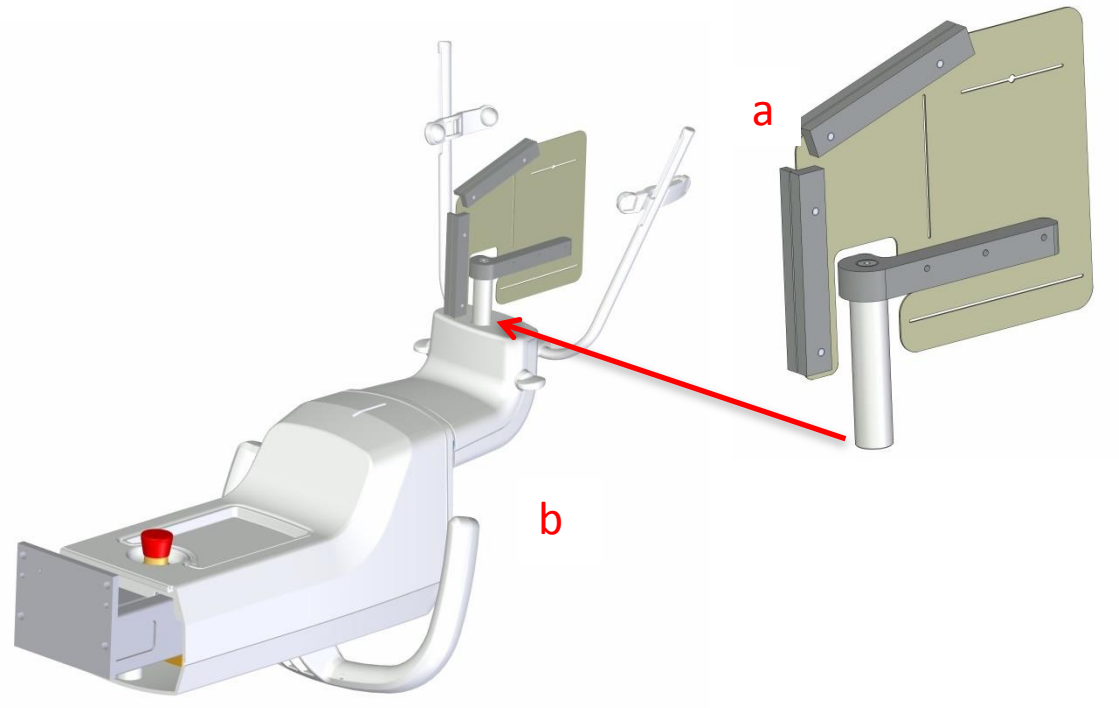
⚠ CAUTION

During the adjustment procedure, avoid to expose the eyes directly to the laser beam.

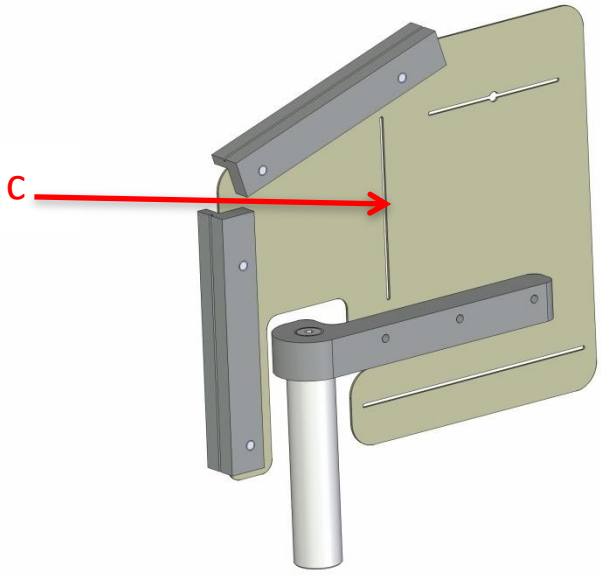
To adjust the coronal/canine laser projector located in the Tubehead assembly, proceed as follows:

a. Make sure that the X-MIND trium is in the reset position (PAN).

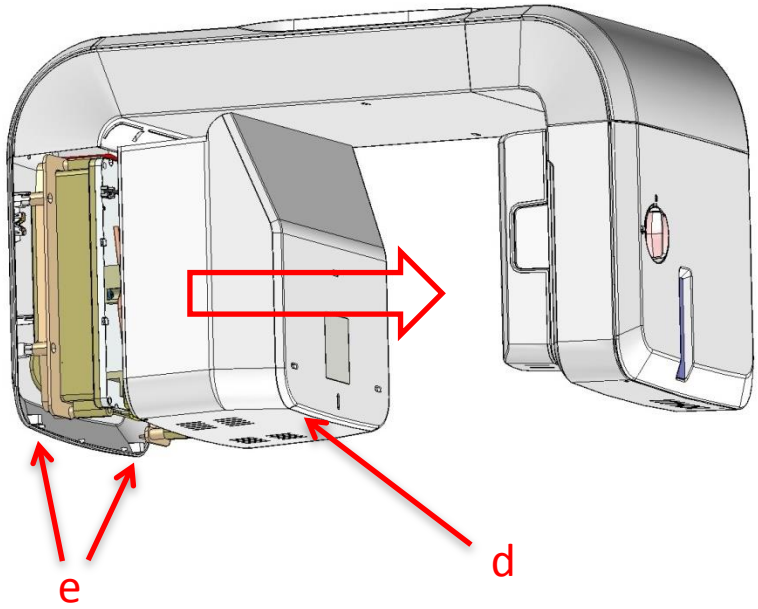
b. Insert the laser phantom (a) into the bite block holder (b).



c. Switch on the laser by pressing the LASER key on the control panel and verify that the coronal/canine vertical laser beam is aligned with the groove (c) of the phantom.

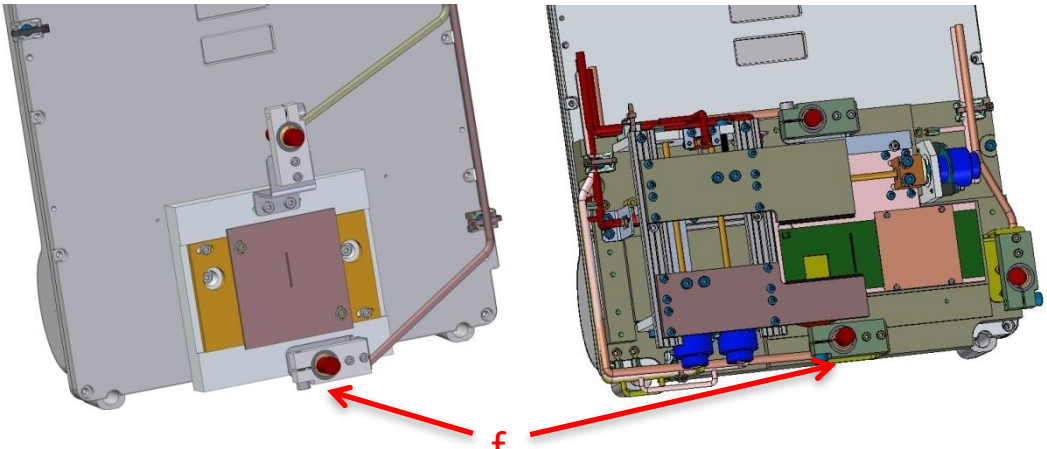


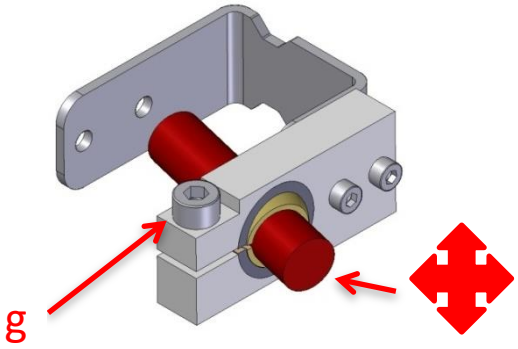
d. If not, access to the coronal/canine laser projector by removing the frontal Tubehead cover (d) unscrewing the 2 screws (e) and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.



e. Access to the coronal/canine laser projector (f) and unlock the Allen screw (g) to rotate the laser projector in the desired position.

After the adjustment, when fixing the Allen screws (g), be sure that the laser beam is not moving.





f. After the installation of the frontal Tubehead cover, verify that the laser beam is still visible on the laser phantom.

13.1.4. Adjustment of multi-line Frankfurt laser

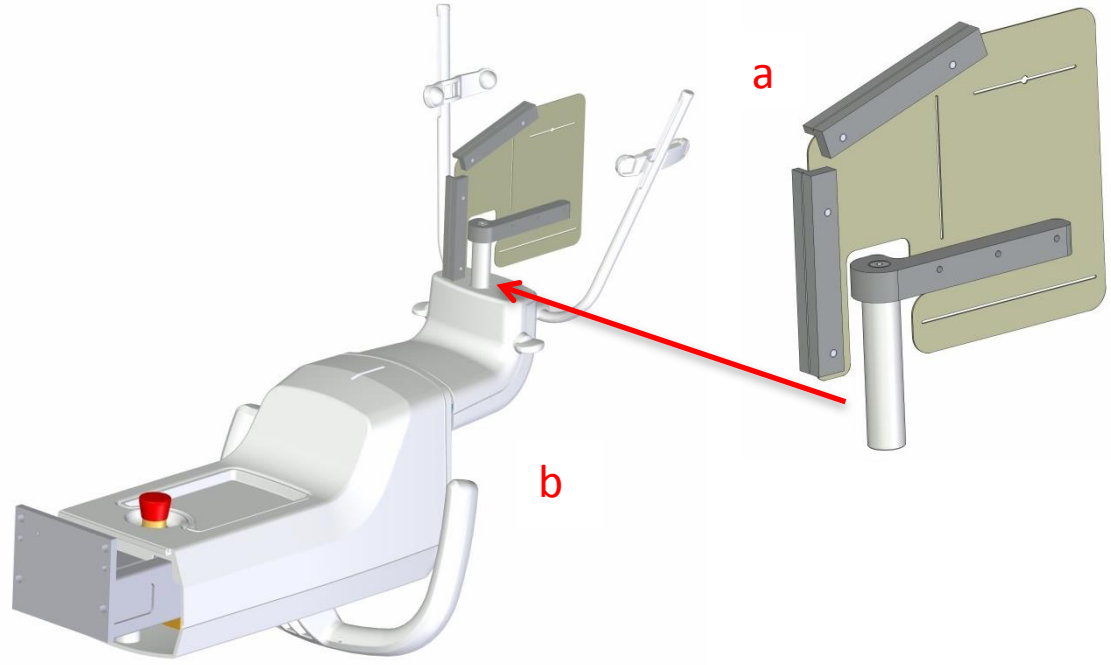
⚠ CAUTION

During the adjustment procedure, avoid to expose the eyes directly to the laser beam.

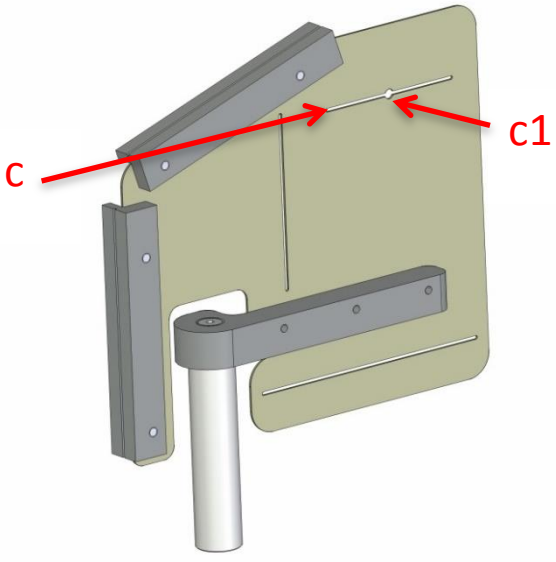
To adjust the Multi-line Frankfurt laser projector located in the Tubehead assembly, proceed as follows:

a. Make sure that the X-MIND trium is in the reset position (PAN).

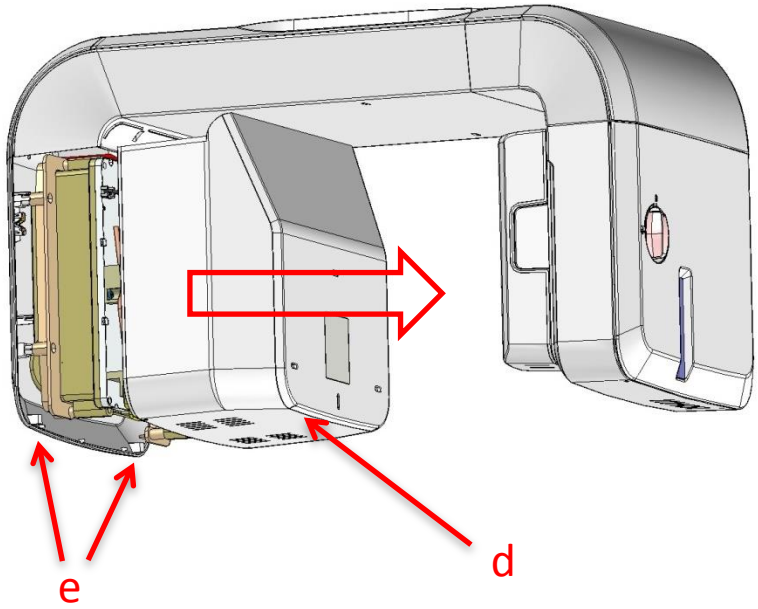
b. Insert the laser phantom (a) into the bite block holder (b).



c. Switch on the laser by pressing the LASER key on the control panel and verify that the CENTRAL LINE of the multi-line Frankfurt light beam is horizontal and that it is aligned with the groove (c) of the phantom and the central dot is in the center (c1) as indicated on the phantom.

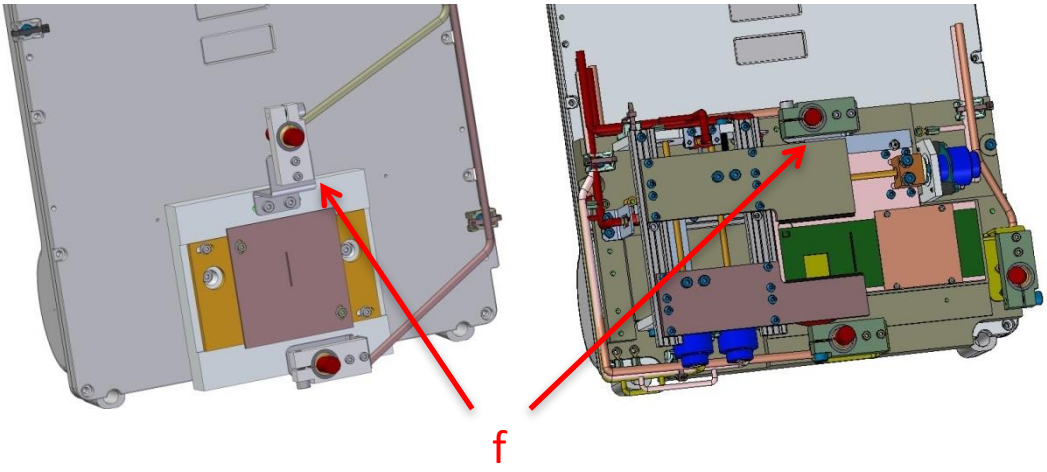


d. If not, access to the Multi-line Frankfurt laser projector by removing the frontal Tubehead cover (d) unscrewing the 2 screws (e) and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.



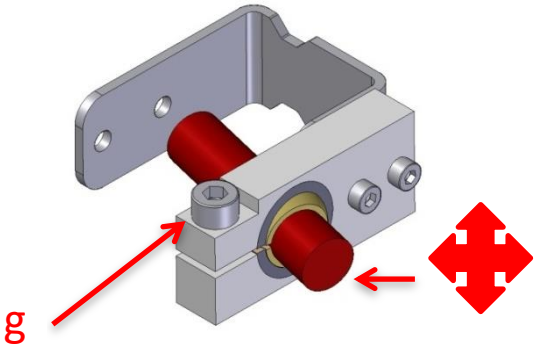
e. Access to the Multi-line Frankfurt laser projector (f) and unlock the Allen screw (g) to rotate the laser projector in the desired position.

After the adjustment, when fixing the Allen screws (g), be sure that the laser beam is not moving.



X-MIND trium Pan model

X-MIND trium Pan-CBCT-Ceph models



f. After the installation of the frontal Tubehead cover, verify that the laser beam is still visible on the laser phantom.

13.1.5. Adjustment of CBCT mid-sagittal laser

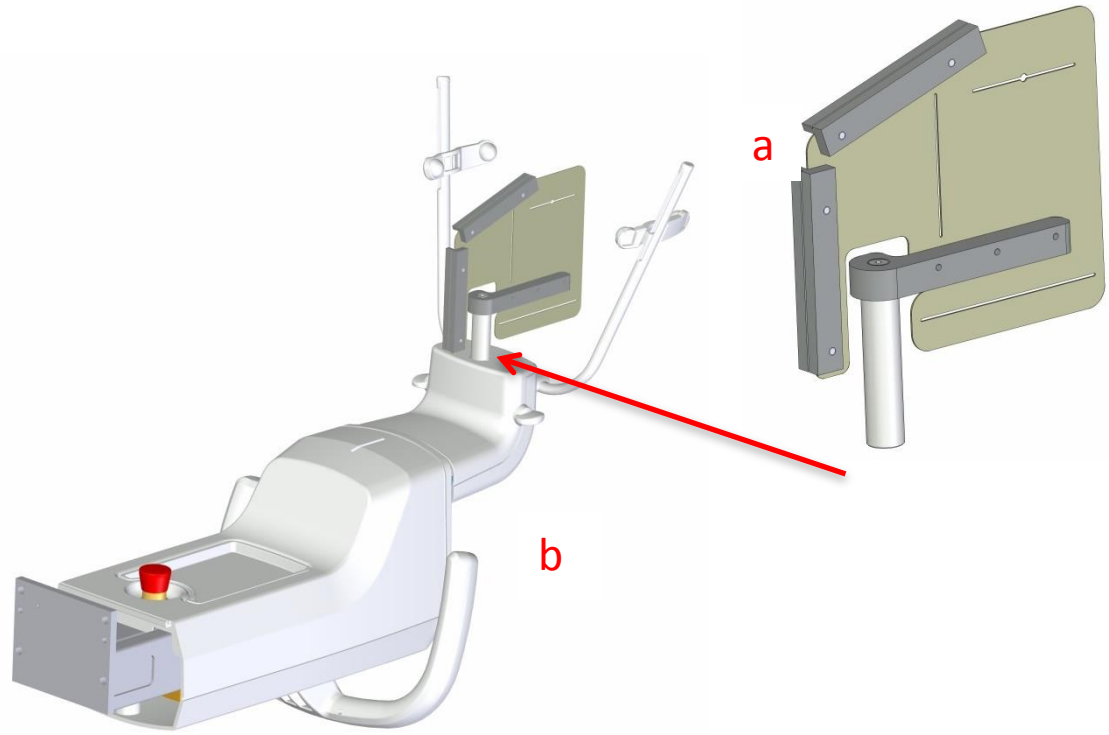
⚠ **CAUTION**

During the adjustment procedure, avoid to expose the eyes directly to the laser beam.

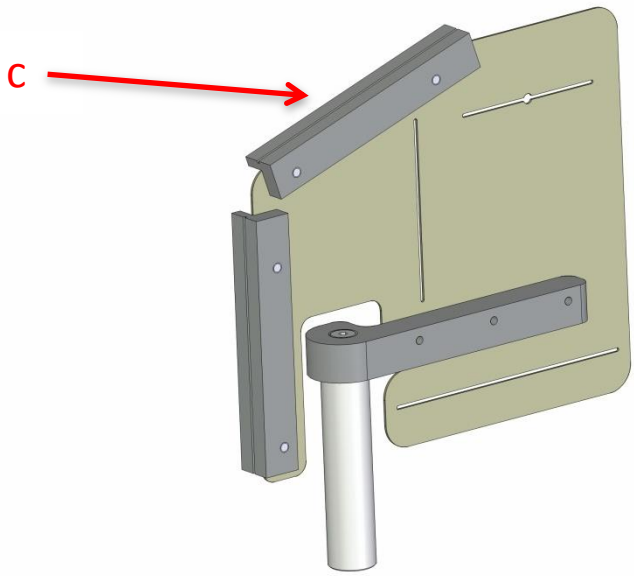
To adjust the CBCT mid-sagittal laser located in the U-arm, proceed as follows:

a. Make sure that the X-MIND trium is in the reset position (CBCT).

b. Insert the laser phantom (a) into the bite block holder (b).

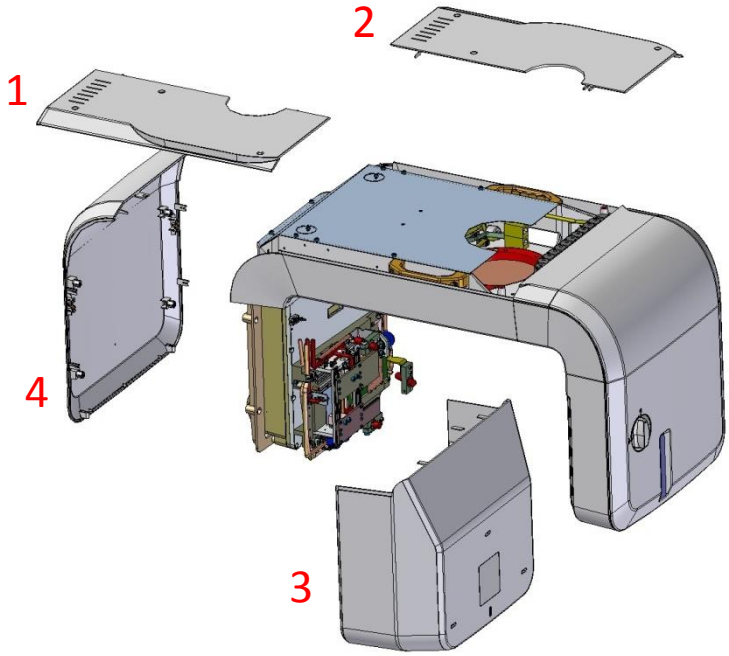


c. Switch on the laser by pressing the LASER key on the control panel and verify that the CBCT mid-sagittal vertical laser beam is aligned with the groove (c) of the phantom.

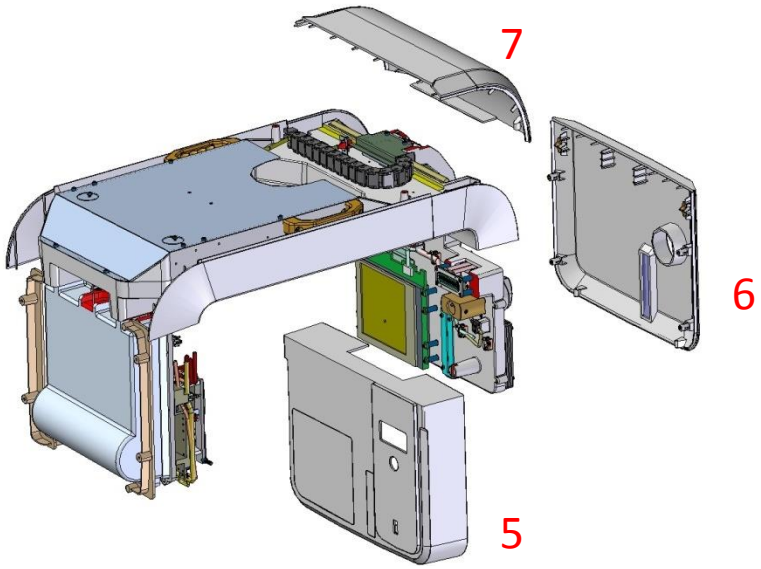


d. If not, access to the CBCT mid-sagittal laser projector; to do this, it is necessary to remove the following covers in sequence:

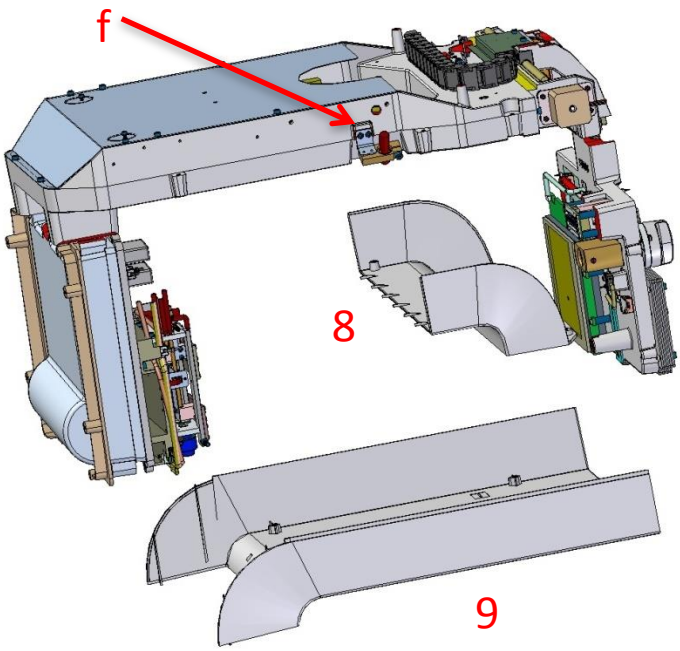
1. U-arm top cover back by means of 3 screws.
2. U-arm top cover front by means of 3 screws.
3. Tubehead front cover by means of 2 screws and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.
4. Tubehead rear cover by means of 6 screws.



5. PAN/CBCT image detector carriage front cover by means of 2 screws.
6. PAN/CBCT image detector carriage rear cover by means of 4 screws.
7. U-arm cover top by means of 2 screws.

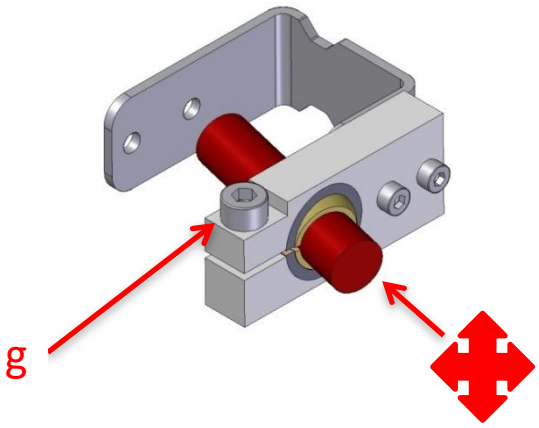


8. U-arm cover bottom by means of 4 screws.
9. U-arm bottom cover bottom by means of 4 screws.



e. Access to the CBCT mid-sagittal laser projector (f) (see figure above) and unlock the Allen screw (g) to rotate the laser projector in the desired position.

After the adjustment, when fixing the Allen screws (g), be sure that the laser beam is not moving.

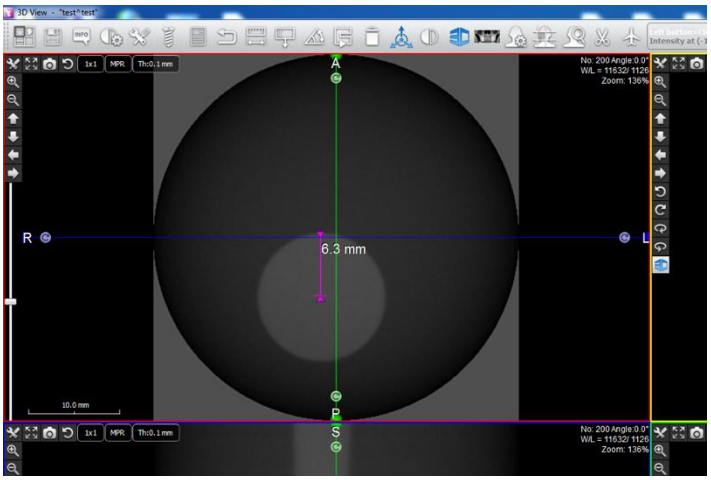


f. After the installation of the U-arm bottom cover, verify that the laser beam is still visible on the laser phantom.

13.2. CORONAL LASER OFFSET

If the coronal laser intersection with Sagittal is not centered, proceed as follows:

a. Place geocal tool on X-MIND Trium with tray.
b. Set a CBCT scan with the following parameters:
   Small child
   Medium Resolution
   FOV 40x40
   Voxel size 75um
c. Center lasers on the tool.
d. Execute the scan.
e. Open the scan with AIS 3DApp and measure the <u>vertical</u> distance between center of scan and geocaltool center.
f. End execution of AIS.
g. Turn OFF then ON X-MIND trium.
h. Start XMdriver Show double clicking on the file: C:\AISSoftware\XMdriver\XMdriverShow.bat
i. Verify that SERVICE tab has green flag (WorkStation and X-MIND trium are communicating).
j. Click on SERVICE tab and enter the required password: rdtech.



k. Click on “CBCT coronal laser”

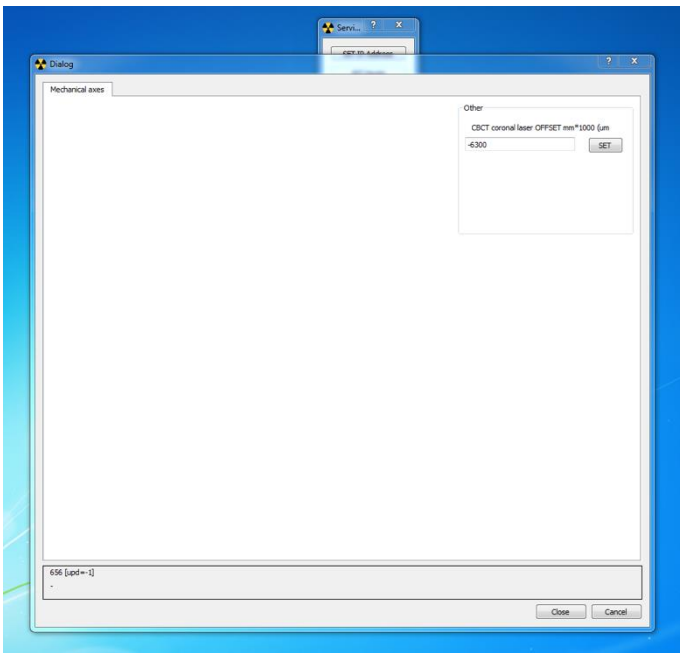
l. On the following screen, input the measured distance in mm multiplied by 1000 (positive values move towards Posterior), and click on SET

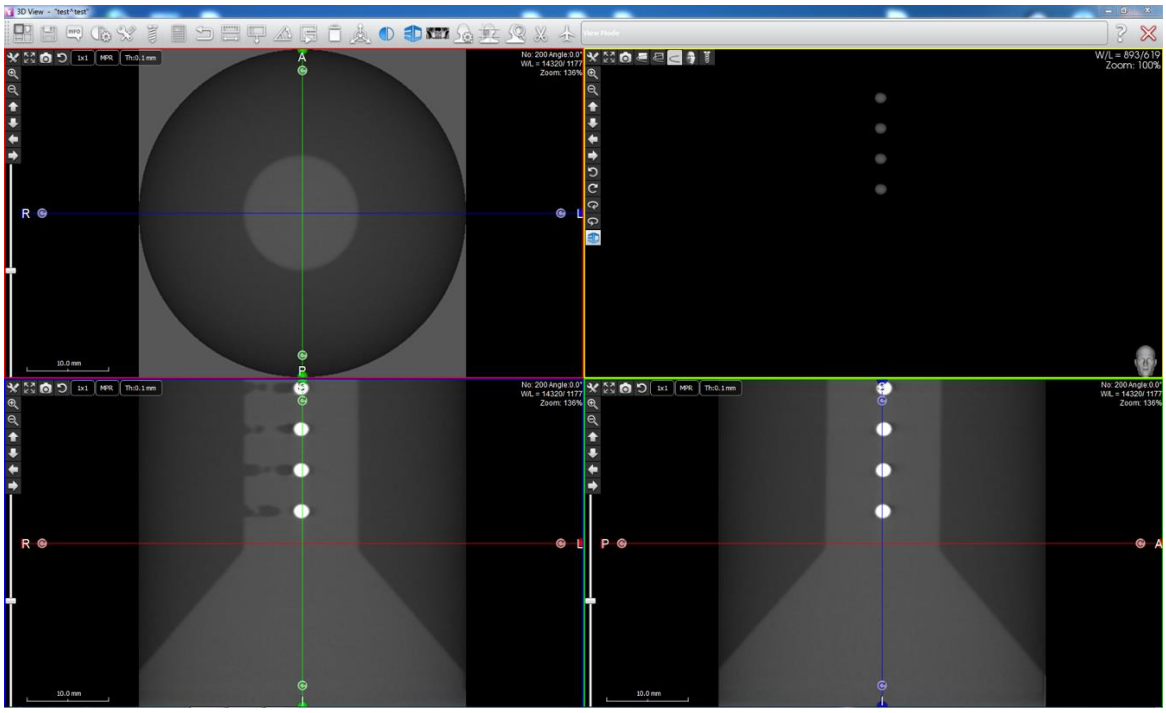
m. Example: in the screenshots 6,3 mm are equivalent to -6300 (the value is negative to move the center towards up

n. Close XMDriver and turn OFF X-MIND Trium and turn turn it ON again after 1 minute

o. Make a scan with same parameters as the first

p. The result should be as the picture below. If not repeat procedure from point “e”

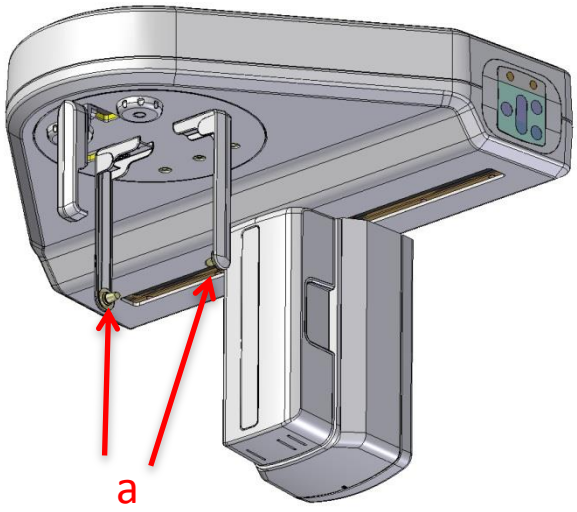




13.4. ADJUSTMENT OF CEPH PATIENT EAR RESTS

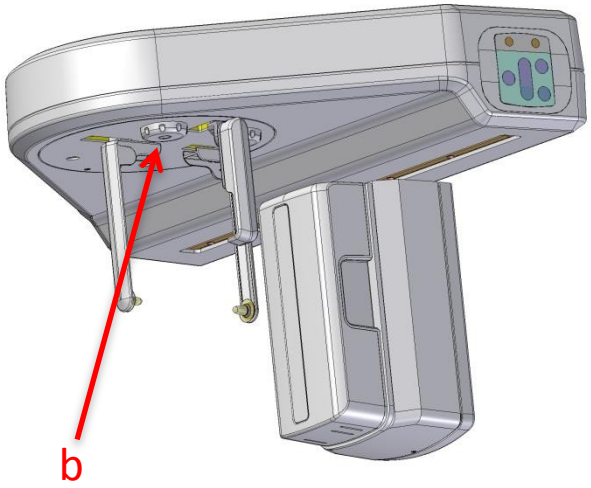
To adjust the patient ear rests of the ceph craniostat proceed as follows:

q. Check that the metal rings (a) are mounted on the ear rests.



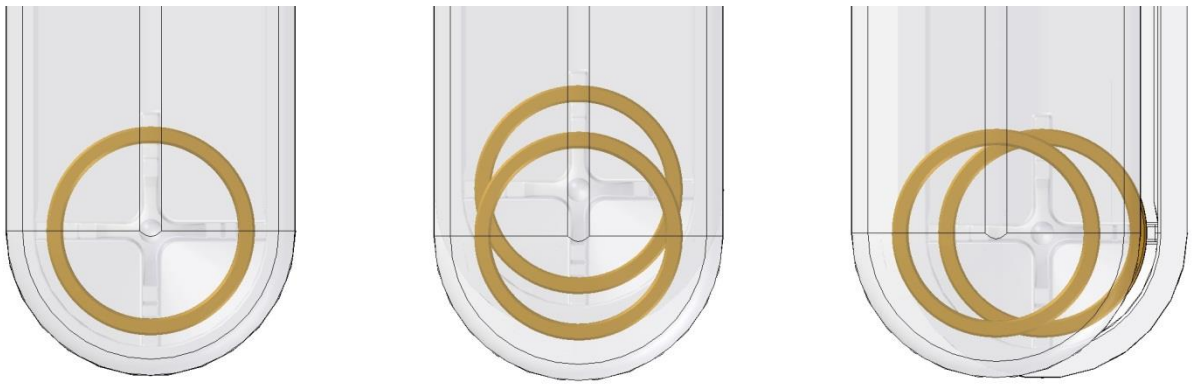
r. Rotate the ceph craniostat in the LL position.

s. Set the ear rests in the middle opening position acting on the knob (b).



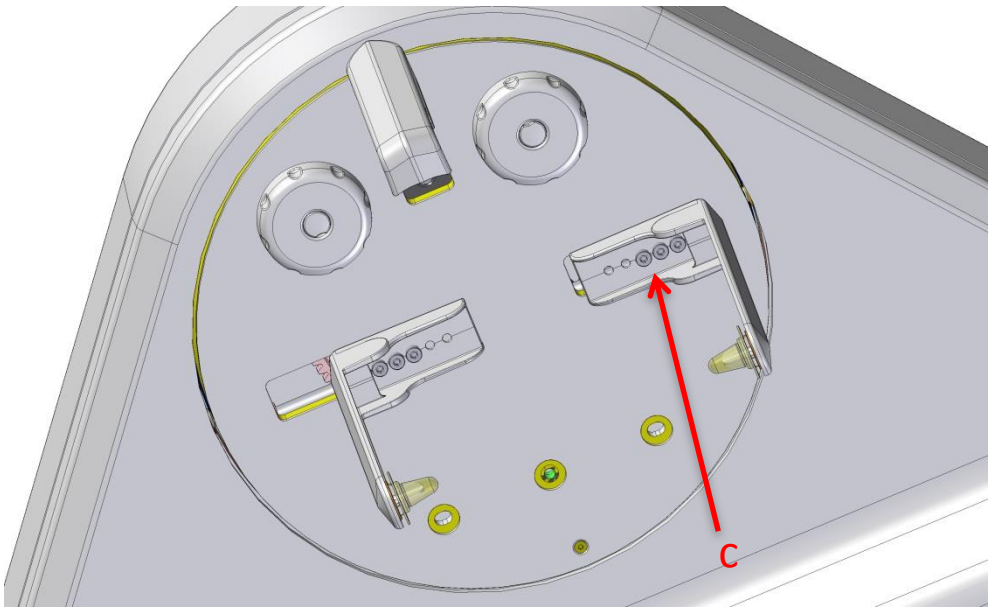
t. Make an exposure with 60kV – 4mA.

u. On the image that will appear on the Work Station verify that the two ear rests are aligned (the smaller depicted ring is the ear rest closest to the sensor). See the figure below:



RIGHT **WRONG: Vertical Misaligned** **WRONG: Horizontal Misaligned**

v. If adjustments are necessary, adjust the position of the external ear rest (the one far away from the sensor) in the desired direction by loosing the screws (c).



14. QUALITY CHECK

Depending on local and national requirements, a Quality Check has to be done using the Quality Check phantoms supplied, as explained in the XMt quality assessment manual.

15. PREVENTIVE MAINTENANCE

PLEASE NOTE

This *Preventive Maintenance Checklist* must be carried out:

- At least each year after installation of all CBCT models of X-MIND trium

This *Preventive Maintenance Checklist* is suggested to be carried out:

- At least each year after installation of all CBCT models of X-MIND trium

Instructions and checklist available on the “XMt Installation manual EN”

16. CALIBRATIONS REQUIRED AFTER PARTS REPLACEMENT

In the following table is explained which setting, calibration, verification and alignment are needed after a replacement of a spare part.

For spare parts not included in the table, no actions are required.

Spare part ID	Item Nr	Description	Setting and Calibration needed	Notes
-	-	F group	• Settings: ○ IP addres (if default is not used) ○ model ○ external light ON modality ○ vertical X-ray beam limitation ○ X-MIND trium serial number • Calibrations: ○ U-arm potentiometer ○ U-arm encoder ○ Collimator ○ Pan kinematics ○ CBCT geometry	+ Verification of jumpers of Main board and Power board. + Verification of all laser alignment. + If also Image detectors have been replaced, install calibration files supplied by factory.
-	-	L group	• Settings: ○ IP addres (if default is not used) ○ model ○ external light ON modality ○ vertical X-ray beam limitation ○ X-MIND trium serial number • Calibrations: ○ U-arm potentiometer ○ U-arm encoder ○ Collimator ○ Pan kinematics ○ CBCT geometry	+ Verification of jumpers of Main board and Power board. + Verification of all laser alignment. + If also image detectors have been replaced, install calibration files supplied by factory.
-	-	Patient arm	• Calibrations: ○ Pan kinematics	+ Verification of all laser alignment.
-	-	Kinematic group	• Calibrations: ○ U-arm potentiometer ○ U-arm encoder ○ Collimator (Ceph only) ○ Pan kinematics ○ CBCT geometry	-
-	-	U-arm	• Calibrations: ○ U-arm potentiometer ○ U-arm encoder ○ RX tube ○ Collimator ○ Pan kinematics ○ CBCT geometry	+ Verification of jumpers of Inverter board and Aux CBCT board. + Verification of all laser alignment. + If also image detectors have been replaced, install calibration files supplied by factory.
35	W0900089	XMT MOTOR & NUT FOR VER COLUMN -> Motor column	• Calibration: ○ Column potentiometer	-
-	-	Column potentiometer	• Calibration: ○ Column potentiometer	-
31	W0900085	XMT MOTOR & NUT FOR X-Y AXES KINEMATIC GROUP -> Motors: axes X and Y	• None	Suggested: + Verification of PAN kinematics calibration + Verification of CBCT geometry calibration + Verification of all laser alignment.
-	-	X axis optoswitch	• Calibrations: ○ Collimator (Ceph only) ○ Pan kinematics ○ CBCT geometry	+ Verification of all laser alignment.

Spare part ID	Item Nr	Description	Setting and Calibration needed	Notes
-	-	Y axis optoswitch	• Calibrations: ○ Collimator (Ceph only) ○ Pan kinematics ○ CBCT geometry	+ Verification of all laser alignment.
32	W0900086	XMT MOTOR & NUT FOR R AXIS KINEMATIC GROUP -> Motor: axis R	• None	Suggested: + Verification of PAN kinematics calibration + Verification of CBCT geometry calibration + Verification of all laser alignment.
-	-	R axis optoswitch	• Calibrations: ○ Collimator (Ceph only) ○ Pan kinematics ○ CBCT geometry	+ Verification of all laser alignment.
-	-	U-arm potentiometer	• Calibration: ○ U-arm potentiometer	-
48	W0900082	XMT ENCODER HEAD & TAPE - U-arm encoder	• Calibrations: ○ U-arm encoder ○ CBCT geometry	-
34	W0900087	XMT MOTOR & NUT FOR SLIDING CASSETTE -> Motor: axis S	• None	Suggested: + Verification of PAN kinematics calibration + Verification of collimator calibration (Ceph only).
-	-	S axis optoswitch (cassette)	• Calibrations: ○ Collimator (Ceph only) ○ Pan kinematics ○ CBCT geometry	+ Verification of all laser alignment.
36	W0900088	XMT MOTOR & NUT FOR CHIN REST -> Motor: axis B	• Calibrations: ○ Pan kinematics ○ CBCT geometry	+ Verification of mid-sagittal pan laser alignment.
-	-	B axis optoswitch (motorized chin rest)	• None	+ Verification of all laser alignment.
-	-	Complete Ceph arm	• Calibrations: ○ Collimator (Ceph only) ○ Nasion Ceph potentiometer ○ CBCT geometry	+ Manual mechanical adjustment of Ceph ear plugs.
54	W0900108	XMT MOTOR & NUT FOR CEPH ARM -> Motor: axis C	• None	Suggested: + Verification of collimator calibration (Ceph only).
-	-	C axis optoswitch (Ceph)	• Calibration: ○ Collimator (Ceph only)	-
-	-	Nasion Ceph potentiometer	• Calibration: ○ Nasion Ceph potentiometer	-
50	W0900044	XMT X-RAY LIMITER PAN – Not motorized full collimator	• Calibration: ○ Collimator, with manual adjustment of limiter position	+ Verification of all laser alignment.
51	W0900045	XMT X-RAY LIMITER CEPH 3D – Motorized full collimator	• Calibration: ○ Collimator	+ Verification of all laser alignment.
29	W0900058	XMT MOTOR & NUT FOR X-RAY LIMITER CEPH 3D -> Motorized collimator motors: axes H, V_SUP, V_INF	• None	Suggested: + Verification of collimator calibration.
-	-	H axis optoswitch (collimator)	• Calibration: ○ Collimator	-
-	-	V_SUP axis optoswitch (collimator)	• Calibration: ○ Collimator	-

Spare part ID	Item Nr	Description	Setting and Calibration needed	Notes
-	-	V_INF axis optoswitch (collimator)	• Calibration: ○ Collimator	-
40	W0900060	XMT MAINBOARD PE4008 - Main board	• Settings: ○ IP address (if default is not used) ○ X-MIND trium serial number	+ Verification of jumpers on this board.
42	W0900063	XMT INVERTER BOARD KIT PXHVI - Inverter board	• Calibration: ○ RX tube	+ Verification of jumpers on this board.
52	W0900043	XMT TUBEHEAD	• Calibrations: ○ RX tube ○ Collimator	+ Verification of all laser alignment.
-	-	PAN image detector	• None	+ Install the calibration files supplied by factory in the Work Station.
-	-	CBCT image detector	• None	+ Install the calibration files supplied by factory in the Work Station.
-	-	CEPH image detector	• None	+ Install the calibration files supplied by factory in the Work Station.

17. REPLACEMENT PROCEDURES

In this paragraph you can find instructions for the replacement of the most important spare parts.

17.1. TUBEHEAD REPLACEMENT

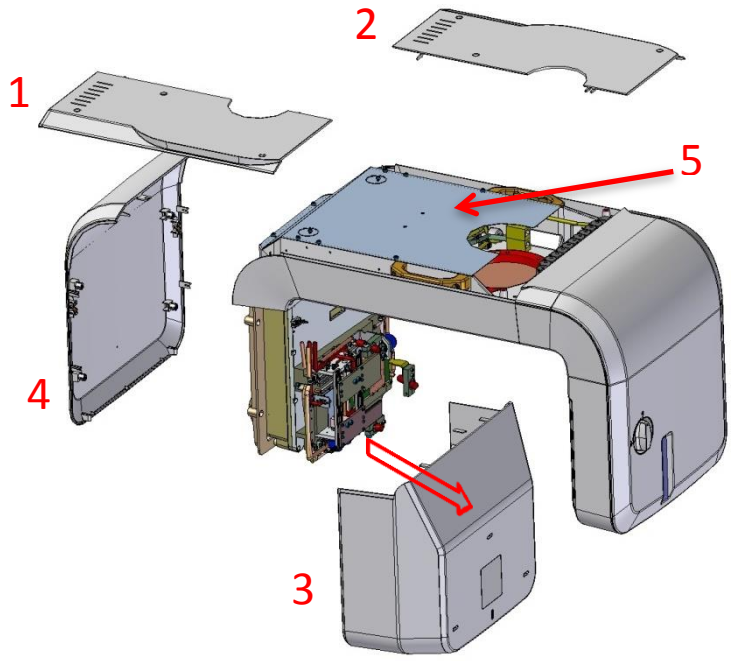
NOTE

During the dismounting and mounting of the Tubehead is recommended the presence of two persons.

To replace the Tubehead proceed as follows:

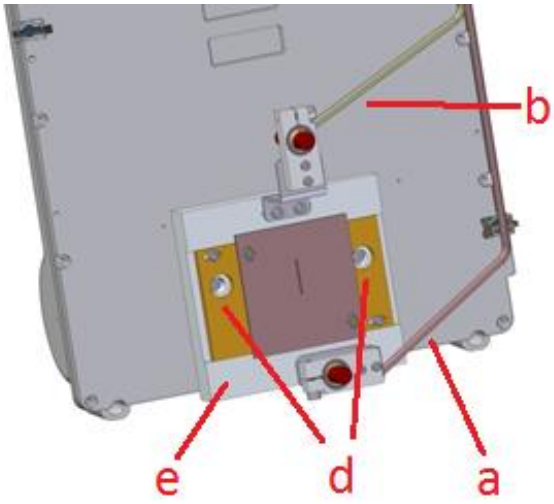
a. Turn OFF the X-MIND trium.

b. Remove the following covers in sequence:
   1. U-arm top cover back by means of 3 screws.
   2. U-arm top cover front by means of 3 screws.
   3. Tubehead front cover by means of 2 screws (placed below the cover) and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.
   4. Tubehead rear cover by means of 6 screws.
   5. Metallic electronic boards protection cover by means of 6 screws.



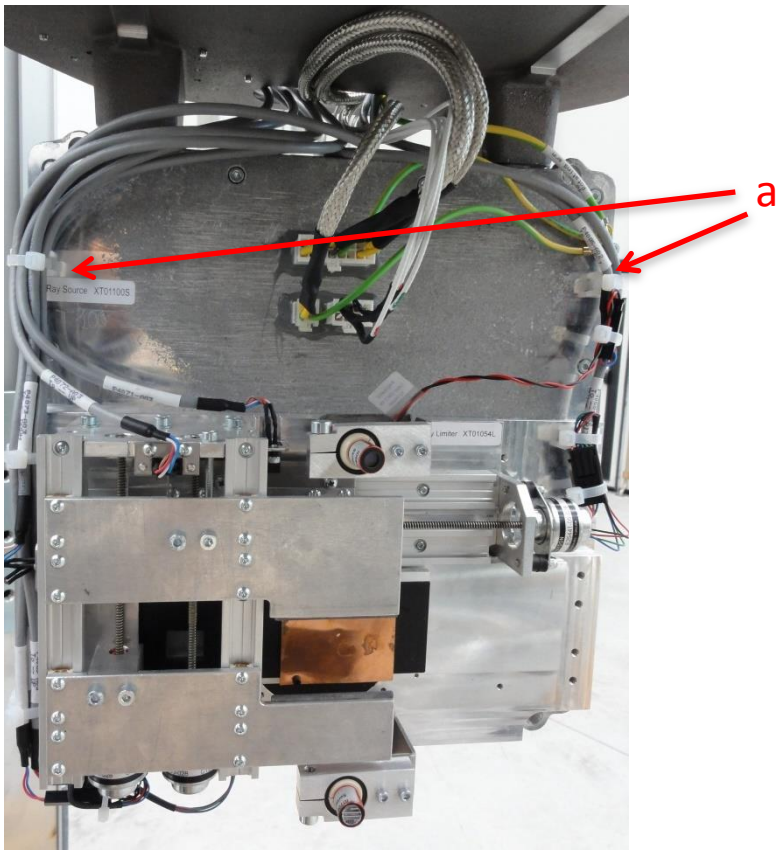
c. X-MIND trium pan model:

- disconnect the cable P4086 from the coronal laser projector (a)
- disconnect the cable P4085 from the Frankfurt laser projector (b)
- remove the fixed collimator (d) by unscrewing the 2 screws (e)

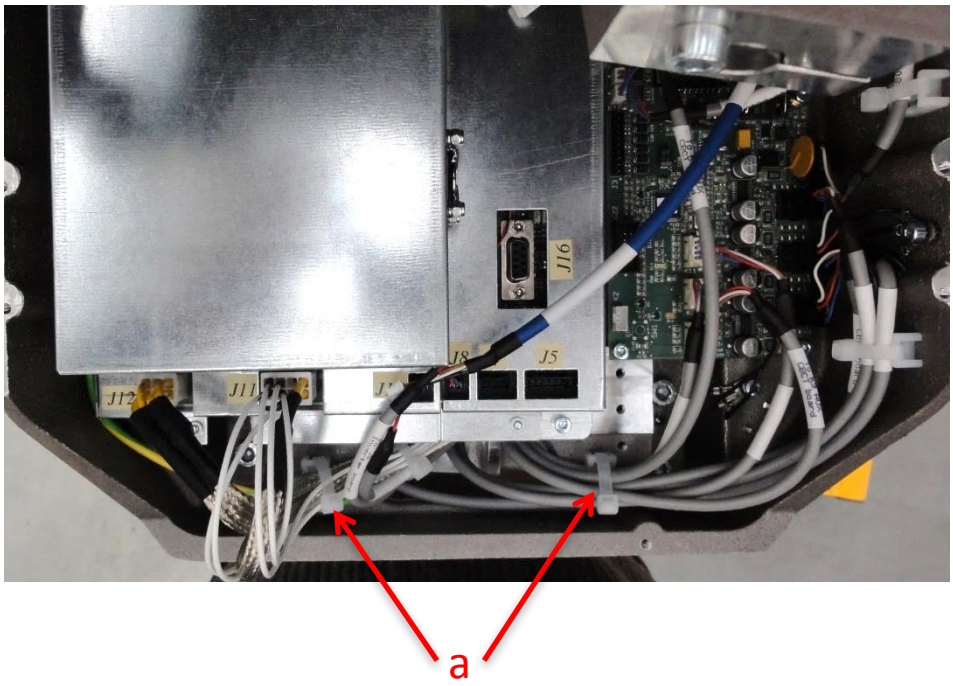


d. X-MIND trium Pan-CBCT-Ceph models:

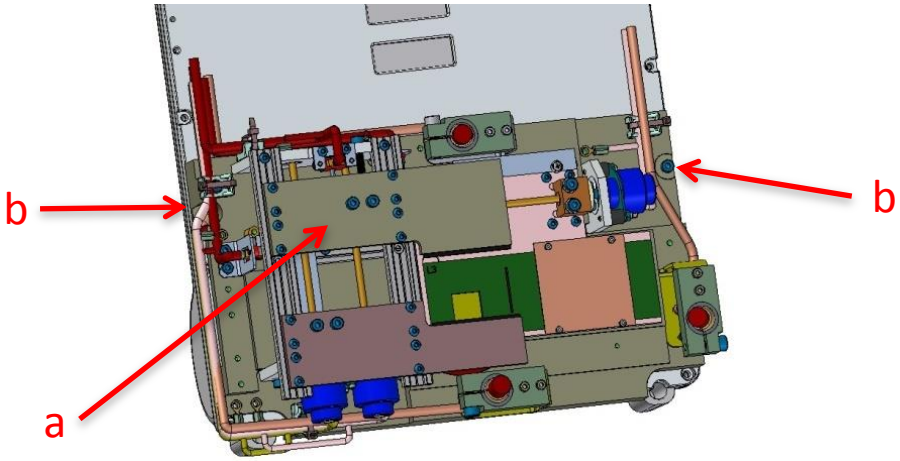
- disconnect the connectors K3, K4, K5, K7,K9, K11 and K16 from the AUX CBCT board and the relevant ground connections
- disconnect the connectors J14 and J8 from the Inverter board)
- cut the 2 cable retainers (a) on the Tubehead



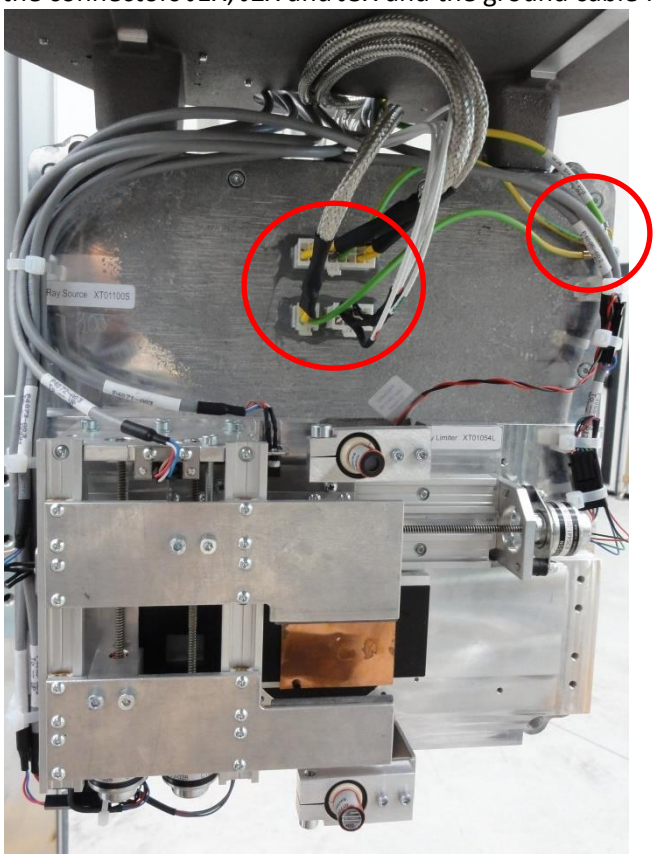
cut the 2 cable retainers (a) on the close to the Inverter board



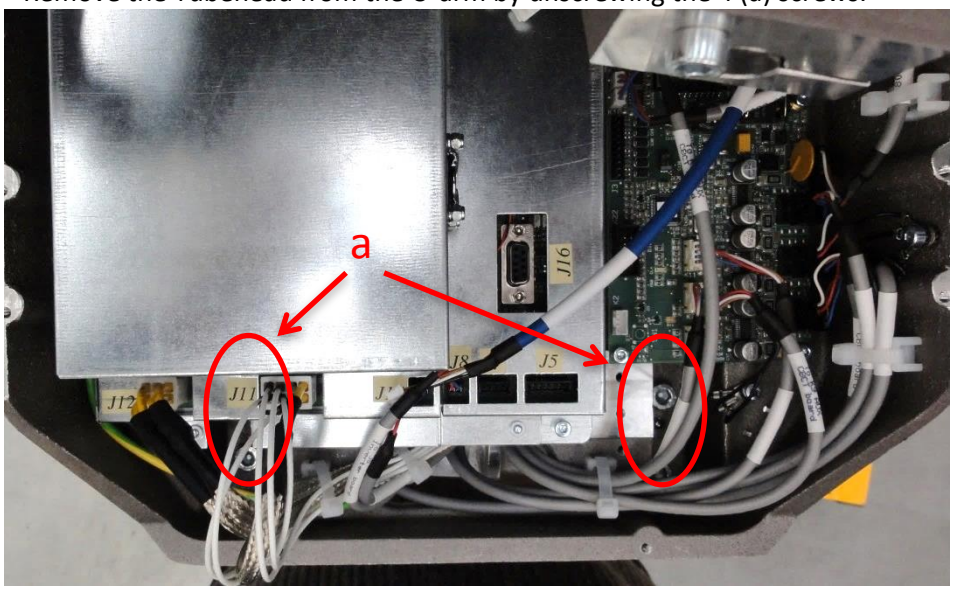
- remove the motorized collimator (a) with all the cables by unscrewing the 2 screws (b)



e. Disconnect the connectors J1X, J2X and J3X and the ground cable from the Tubehead.



f. Remove the Tubehead from the U-arm by unscrewing the 4 (a) screws.



g. Proceed backwards for the mounting of the new Tubehead.

h. Finally, it is necessary to perform the following calibrations and adjustment:

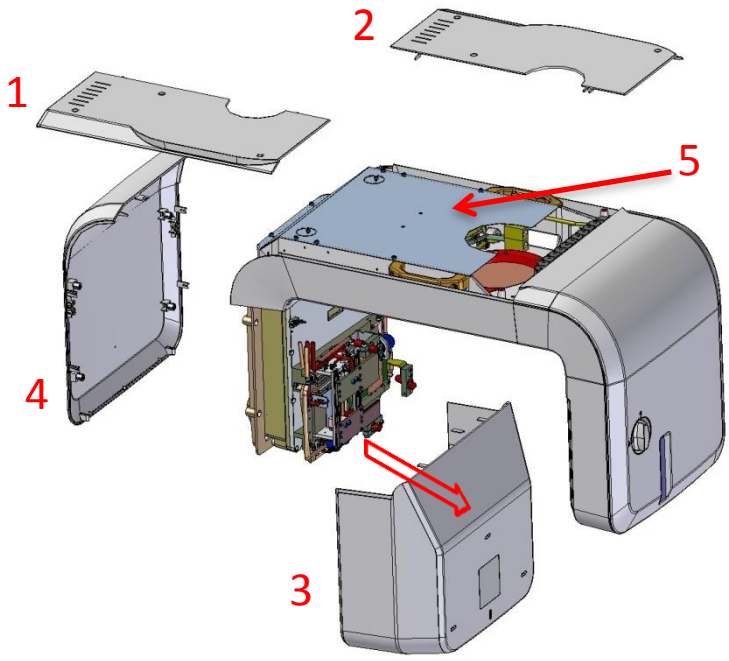
• Calibrations: ○ RX tube ○ Collimator	• Adjustment: ○ Verification of all laser alignment

17.2. INVERTER BOARD REPLACEMENT

To replace the Inverter board proceed as follows:

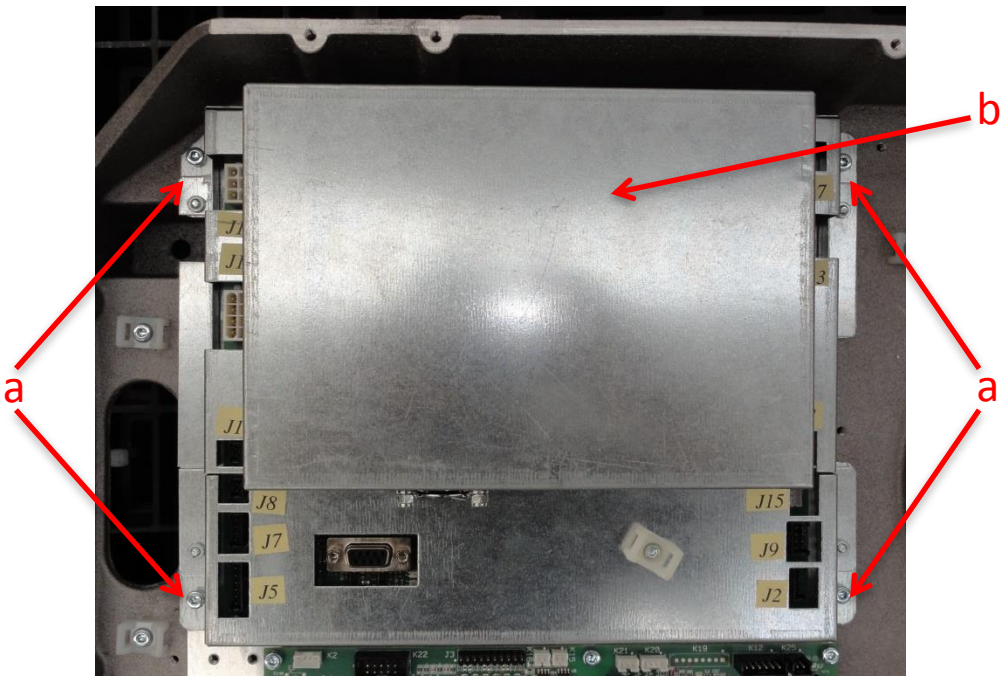
a. Turn OFF the X-MIND trium.

b. Remove the following covers in sequence:
   1. U-arm top cover back by means of 3 screws.
   2. U-arm top cover front by means of 3 screws.
   3. Tubehead front cover by means of 2 screws (placed below the cover) and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.
   4. Tubehead rear cover by means of 6 screws.
   5. Metallic electronic boards protection cover by means of 6 screws.



c. Disconnect all the connectors from the Inverter board.

d. Remove 4 fixation screws (a) then remove the Inverter (b) with the metallic protection cover.

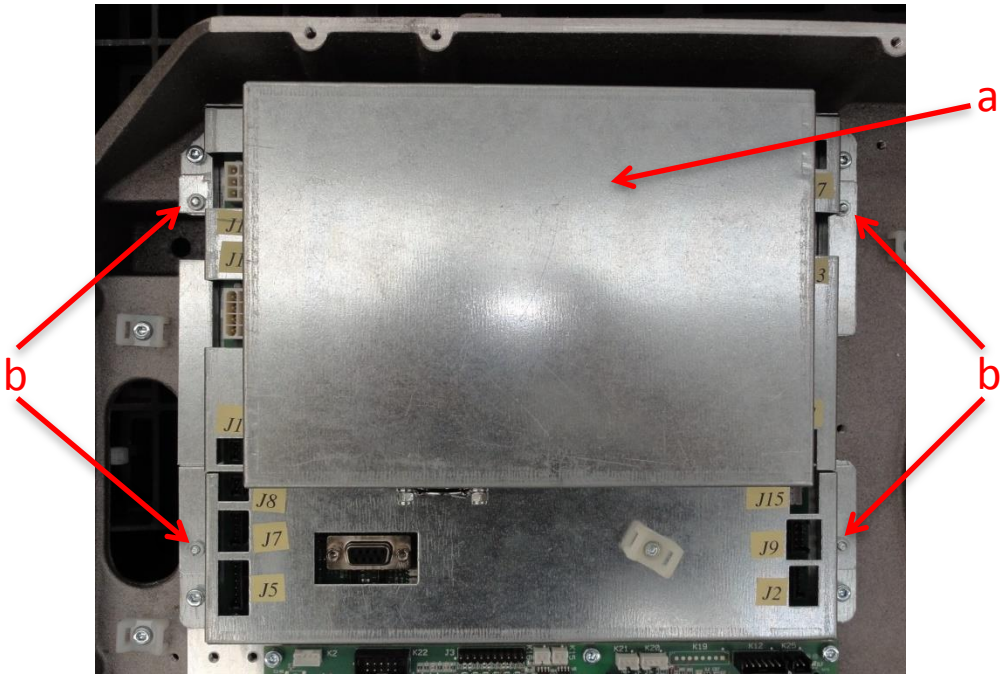


e. Proceed backwards for the mounting of the new Inverter board.

f. Before mounting the new Inverter board, verify that the setting of all jumpers on the new Inverter board is the same as the old one, in particular verify the jumper X4:

X4	CAN termination	Open = not terminated Closed = terminated **Default= closed for PAN only model** **Default= open for PAN-CBCT-CEPH models**

To do this, it is necessary to access to the Inverter board by removing the metallic protection cover (a) fixed with the 4 screws (b).



g. Finally, it is necessary to perform the following calibration and adjustment:

• Calibration: ○ RX tube	• Adjustment: ○ None

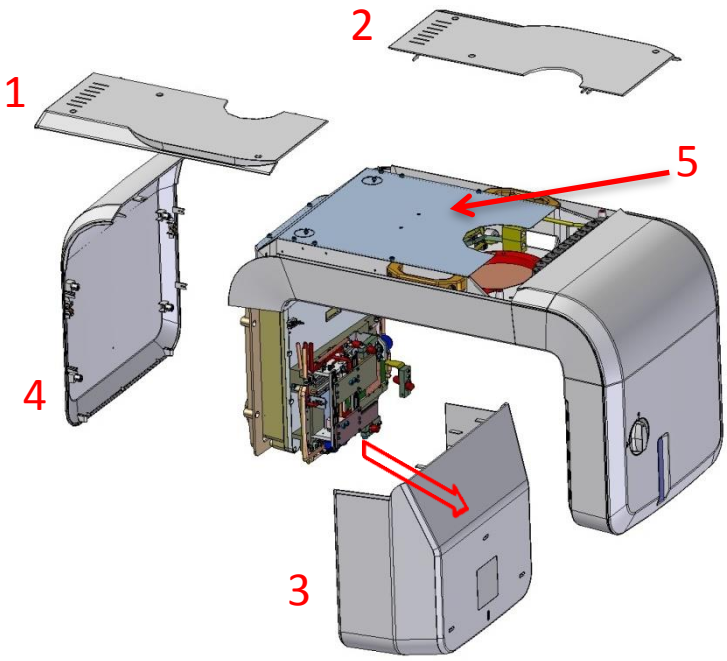
17.3. AUX CBCT BOARD REPLACEMENT

To replace the Aux CBCT board proceed as follows:

a. Turn OFF the X-MIND trium.

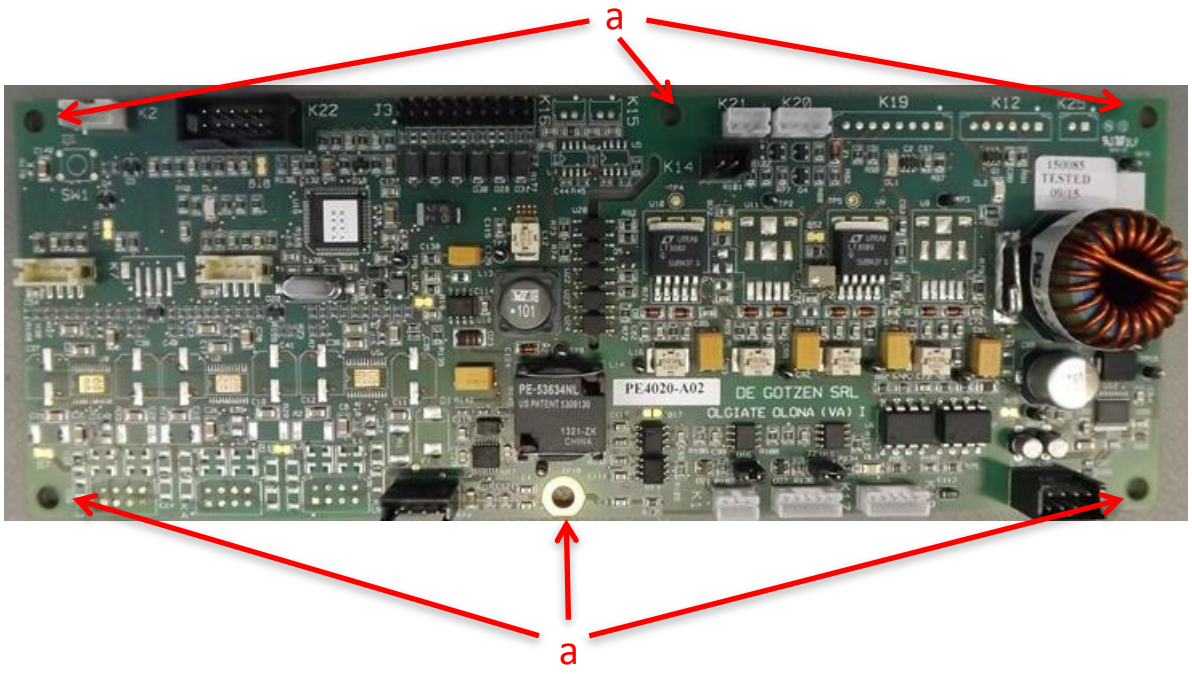
b. Remove the following covers in sequence:

1. U-arm top cover back by means of 3 screws.
2. U-arm top cover front by means of 3 screws.
3. Tubehead front cover by means of 2 screws (placed below the cover) and pushing the cover toward the chin rest arm to disengage the spring latches from the rear cover.
4. Tubehead rear cover by means of 6 screws.
5. Metallic electronic boards protection cover by means of 6 screws.



c. Disconnect all the connectors from the Aux CBCT board.

d. Remove the 6 fixation screws (a) and then remove the Aux CBCT board.



Proceed backwards for the mounting of the new Aux CBCT board.

e. Verify that the setting of all jumpers on the new Aux CBCT board is the same as the old one.

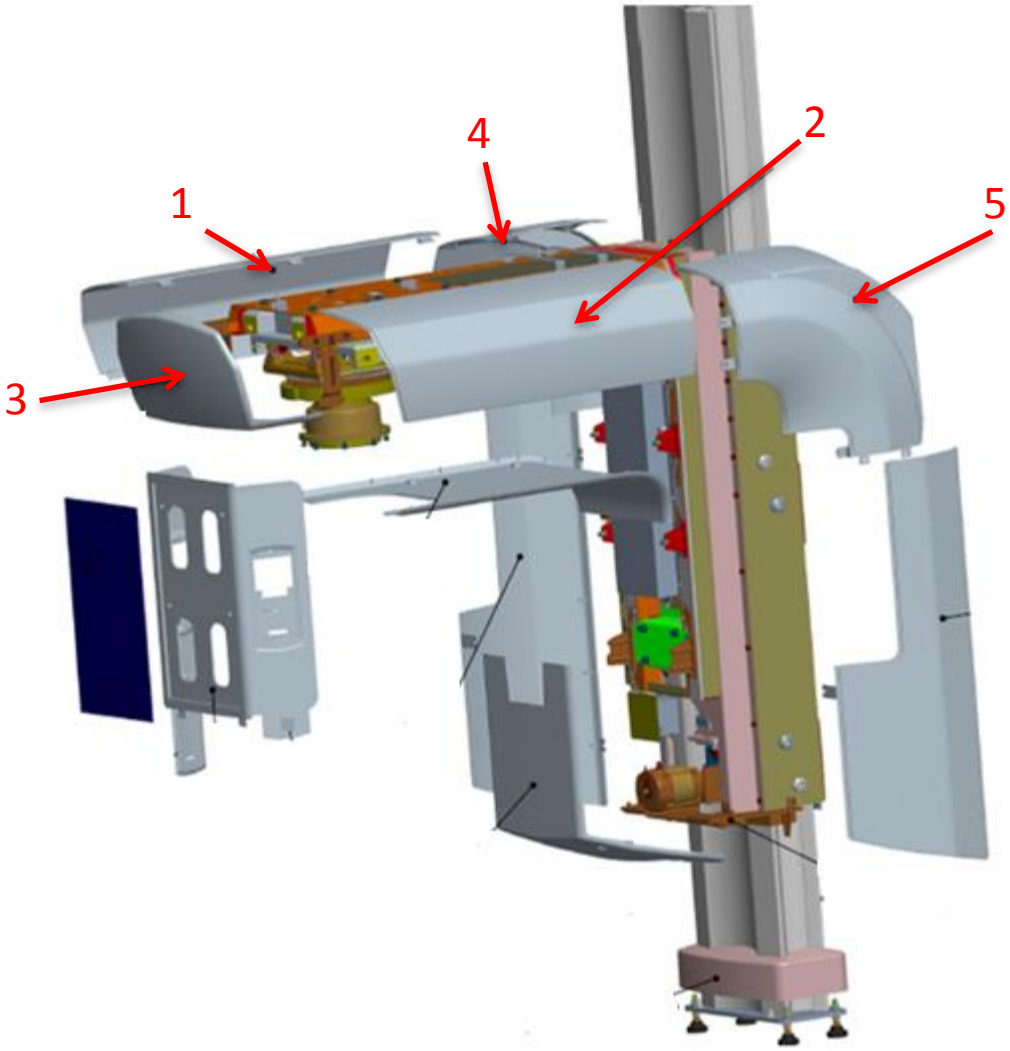
17.4. MAIN BOARD REPLACEMENT (with or without the Add-on board)

To replace the Main board proceed as follows:

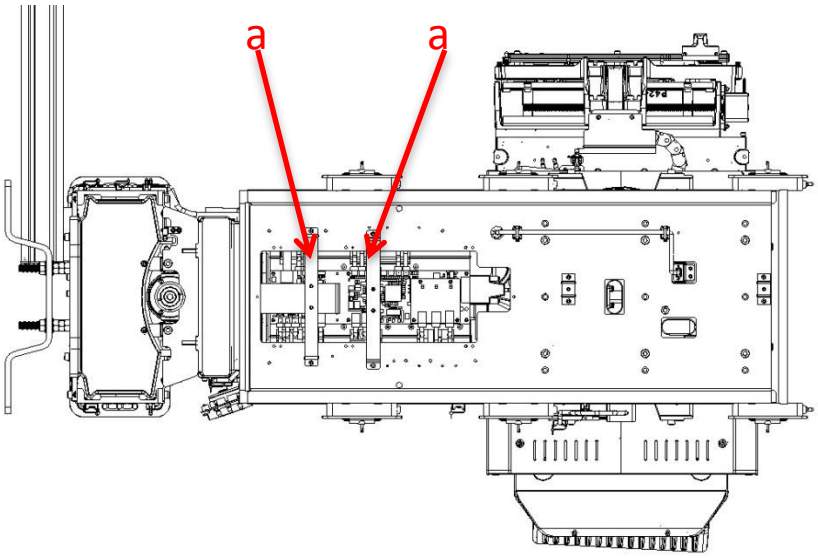
a. Turn OFF the X-MIND trium.

b. Remove the following covers in sequence:

1. Top cover left by means of 3 screws.
2. Top cover right by means of 3 screws.
3. Front cover by means of 2 screws.
4. Head cover left by means of 5 screws.
5. Head cover right by means of 5 screws.

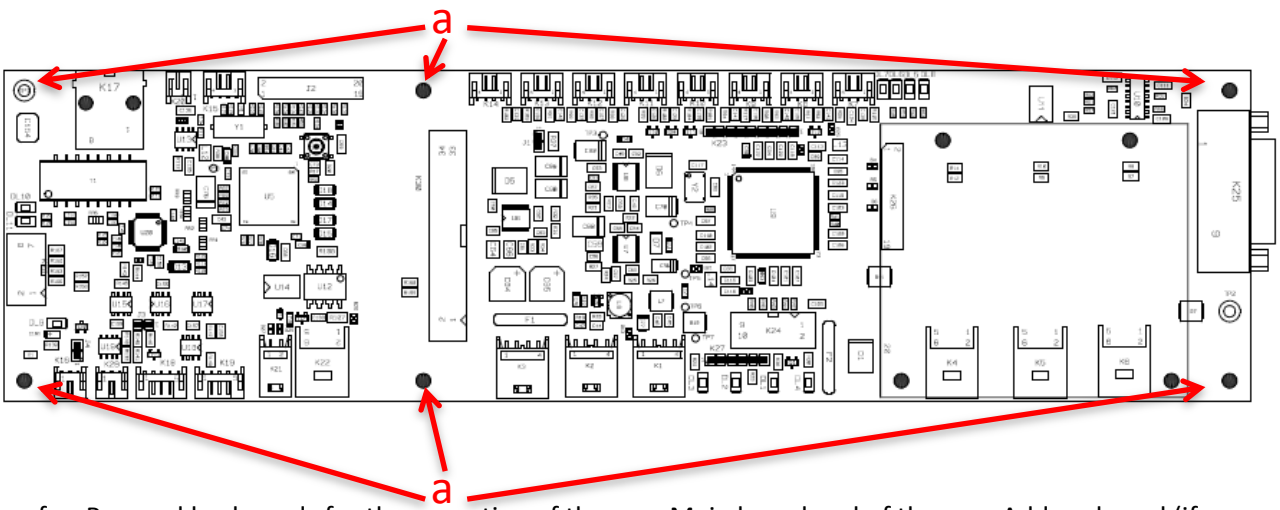


c. Do not Remove the two brackects (a).



d. Disconnect all the connectors from the Main board and from the Add-on board (if present), taking care of the cables position (this because the name of the cable is not always easy visible) to do not make wrong connections when the new Main board is mounted.

e. Remove the 6 fixation screws (a) and then remove the Main board and the Add-on board (if present).



f. Proceed backwards for the mounting of the new Main board and of the new Add-on board (if present).

g. Verify that the setting of all jumpers on the new Main board is the same as the old one.

REF	DESCRIPTION	SETTING	
J3	CAN termination	Open = CEPH present	Closed = CEPH not present
J4	Trigger CEPH image detector	Open = CEPH present	Closed = CEPH not present

h. Finally, it is necessary to perform the following settings, calibration and adjustment:

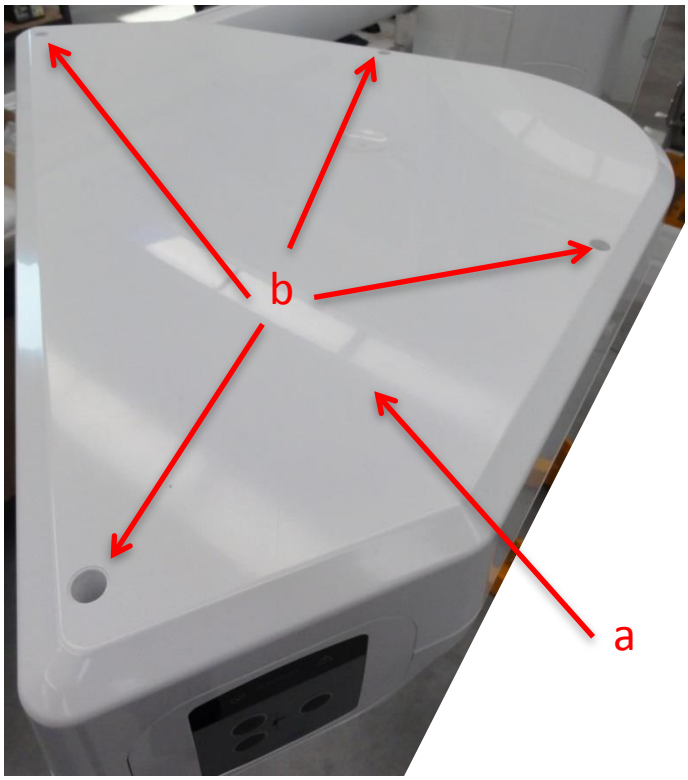
• Settings: ○ IP address (if before replacement a value different from default was used) ○ Serial number of X-MIND trium	• Calibration & Adjustment: ○ None

17.5. AUX CEPH BOARD REPLACEMENT

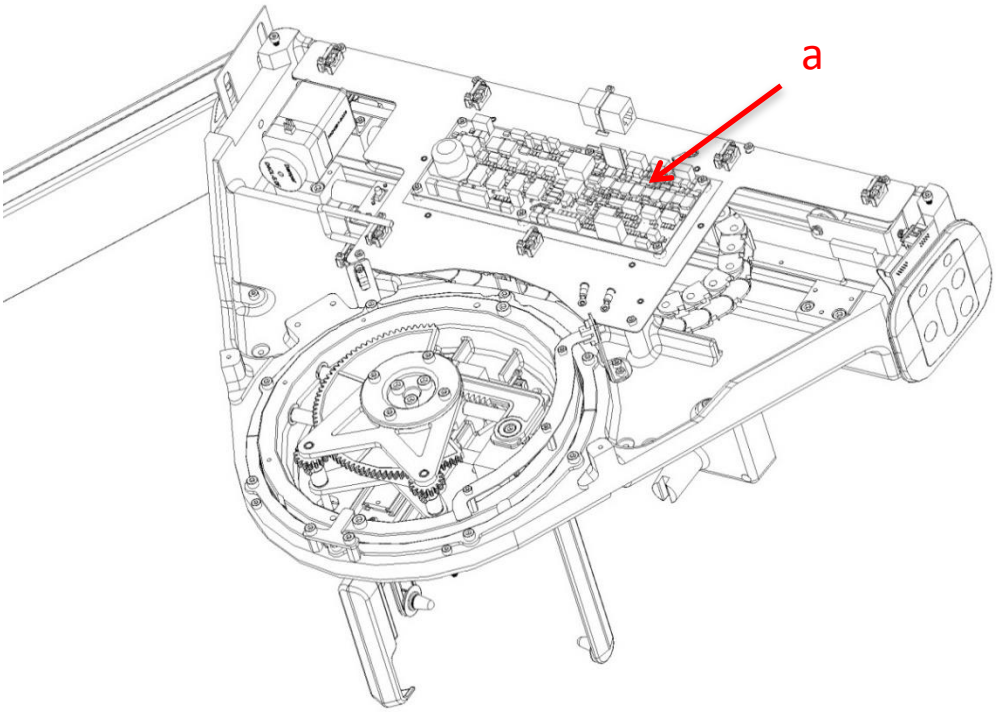
To replace the Aux Ceph board proceed as follows:

a. Turn OFF the X-MIND trium.

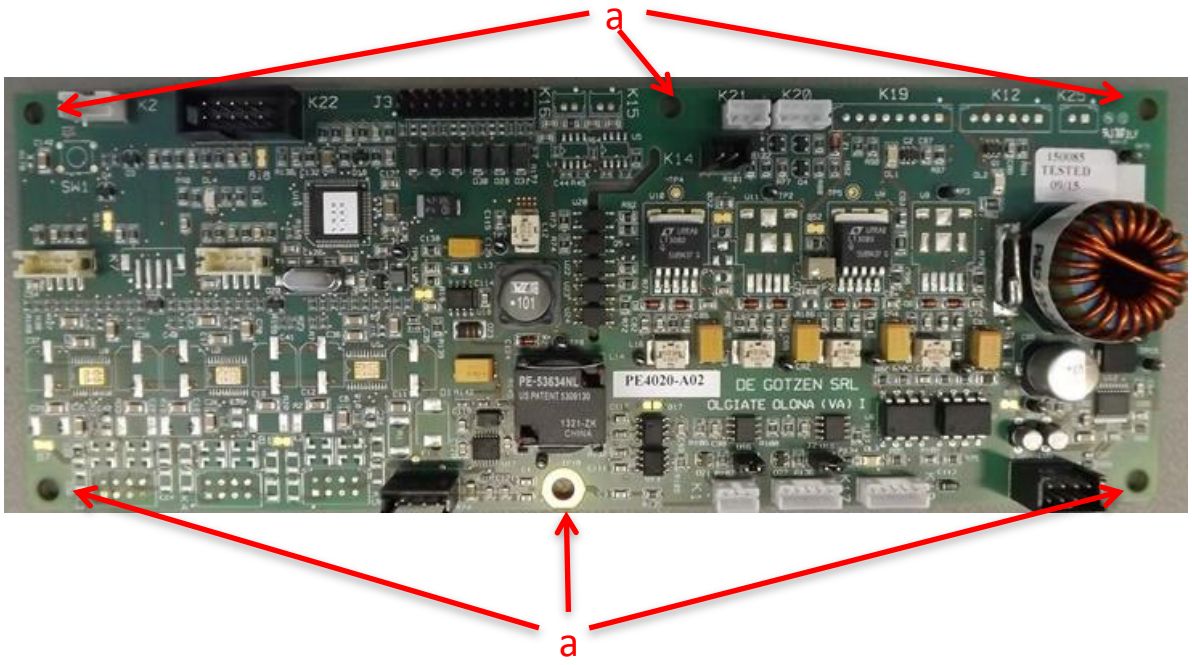
b. Remove the top cover (a) of the Ceph craniostat by unscrewing the 4 screws (b).



c. Disconnect all the connectors from the Aux Ceph board (a).


a

d. Remove the 6 fixation screws (a) and then remove the Aux Ceph board.



e. Proceed backwards for the mounting of the new AUX Ceph board.

f. Verify that the setting of all jumpers on the new AUX Ceph board is the same as the old one.

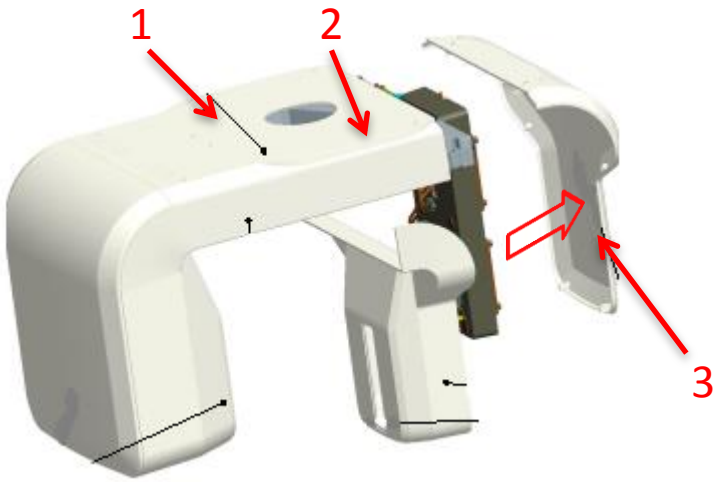
REF	DESCRIPTION	SETTING
J1	Trigger Ceph image detector	Closed
J2	CAN termination	Closed

17.6. PAN SENSOR BOARD REPLACEMENT

To replace the Pan Sensor board proceed as follows:

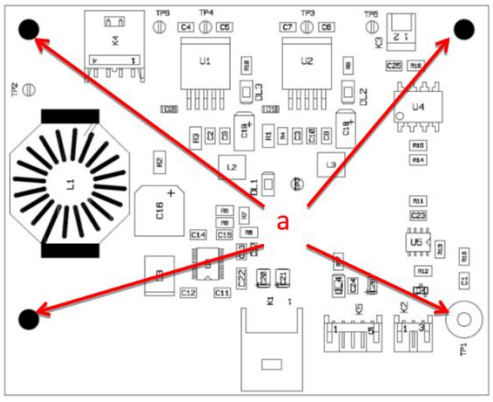
a. Turn OFF the X-MIND trium.

b. Remove the following covers in sequence:
   1. Top cover left by means of 3 screws.
   2. Top cover right by means of 3 screws.
   3. Rear Pan sensor fixed cover by means of 4 screws (2 on the bottom and 2 on the top) and then pushing the cover toward the outside to disengage the spring latches from the front cover.



c. Disconnect all the cables from the Pan Sensor board.

d. Remove the Pan Sensor board by unscrewing the 4 screws (a).



e. Proceed backwards for the mounting of the new Pan Sensor board.

f. Verify that the setting of the jumper on the new Pan Sensor board is the same as the old one.

REF	DESCRIPTION	SETTING
J1	Trigger PAN image detector	Closed

17.7. POWER BOARD REPLACEMENT

WARNING

Dangerous 385VDC voltage is present on this board.

Dangerous mains voltage (100 – 240 VAC) is present on this board even when the mains switch is off: disconnect X-MIND trium from the mains supply before accessing to this board.

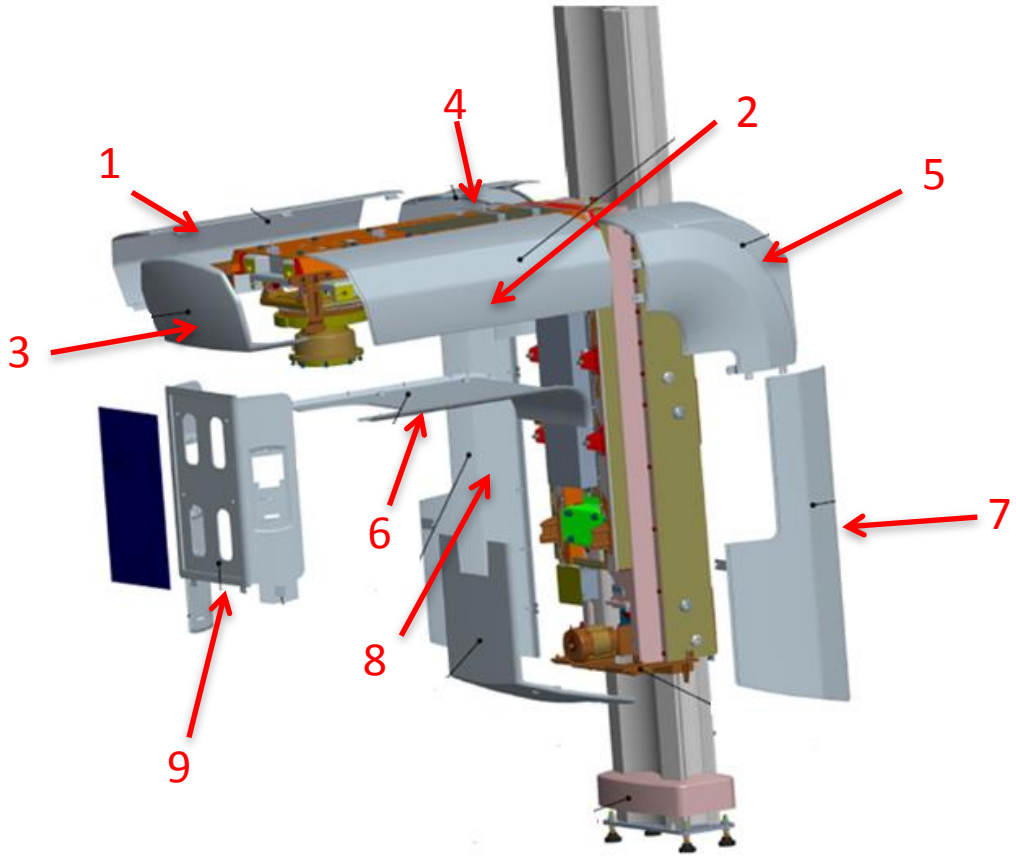
To replace the Power board proceed as follows:

a. Turn OFF the X-MIND trium.

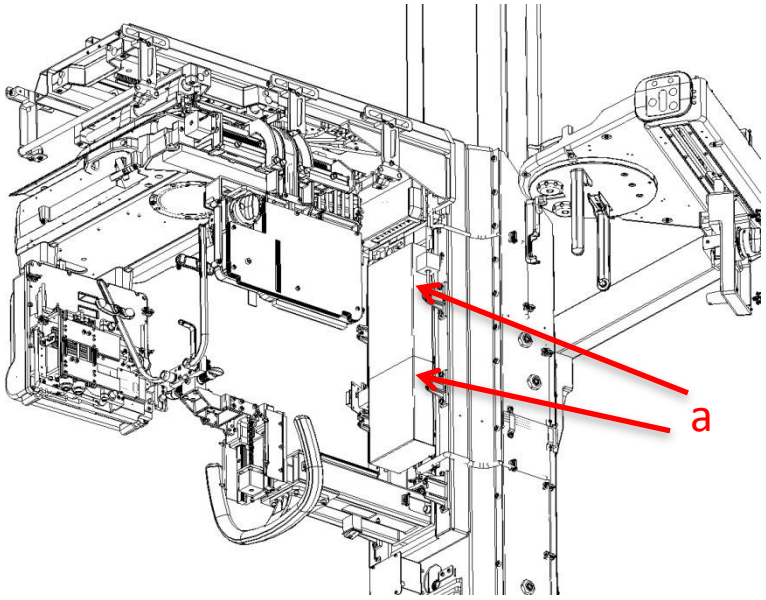
b. Disconnect the X-MIND trium from the mains supply.

c. Remove the following covers in sequence:

1. Top cover left by means of 3 screws.
2. Top cover right by means of 3 screws.
3. Front cover by means of 2 screws.
4. Head cover left by means of 5 screws.
5. Head cover right by means of 5 screws.
6. Bottom cover by means of 4 screws.
7. Side cover right by means of 4 screws.
8. Side cover left by means of 4 screws.
9. Frontal cover with mirror by means of 2 screws and disconnect the cables from the Display board.



d. Remove the 2 metallic protection covers (a) by means of 8 screws.



e. Disconnect all the connectors from the Power board.

⚠ **CAUTION**

Take note of the polarity of the mains connection cables: Line to connector K39, Neutral to K17 and PE to K40.

f. Remove the Power board with the heatsink by unscrewing the 4 screws (a).

g. Proceed backwards for the mounting of the new Power board.

h. Verify that the setting of all jumpers on the new Power board is the same as the old one.

REF	DESCRIPTION	SETTING
J2	CAN termination	Closed
J3	CAN termination	Open

i. Verify that the rating of the fuse F1 is correct for the power supply provided.

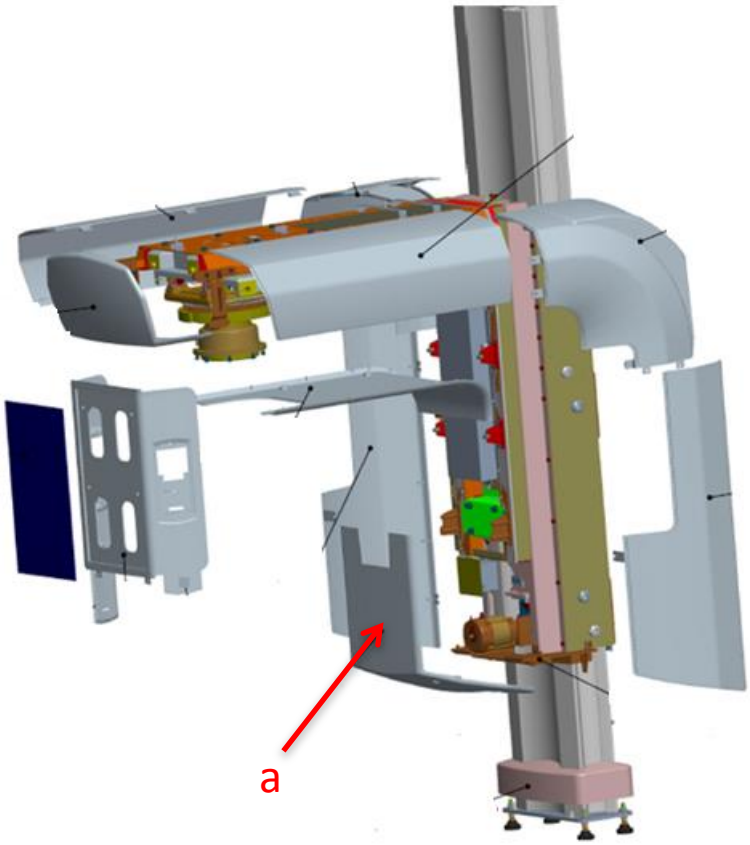
REF	DESCRIPTION	SIZE	RATING
F1	100 – 240 VAC input	6.3 X 32	T 10A – 250V for power supply 200V-240V T 15A – 250V for power supply 100V-200V

17.8. COLUMN BOARD REPLACEMENT

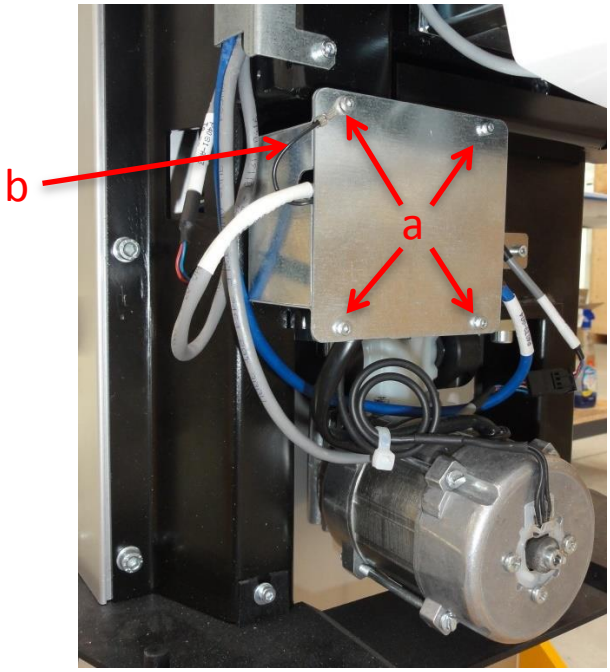
To replace the Column board proceed as follows:

a. Turn OFF the X-MIND trium.

b. Remove the lower cover (a) by means of 4 screws.

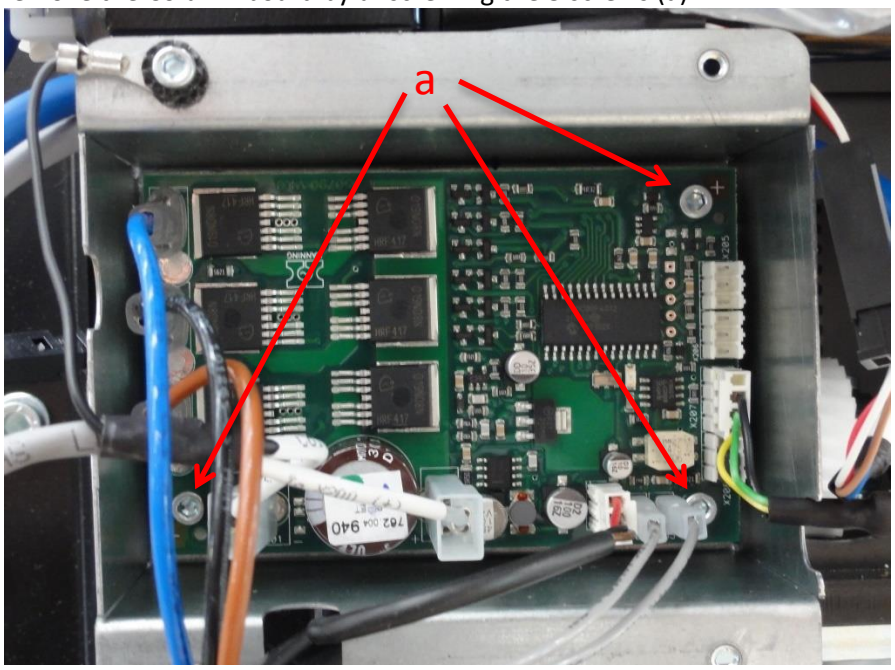


c. Remove the metallic protection cover (a) by means of 4 screws and disconnect the ground cable (b).

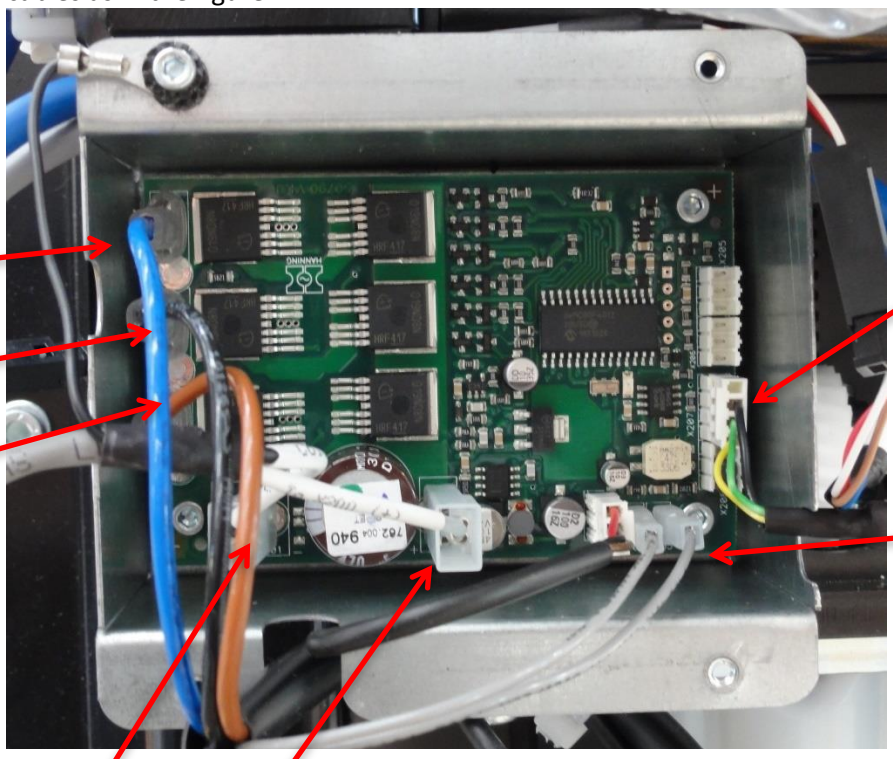


d. Disconnect all the connectors from the Column board.

e. Remove the Column board by unscrewing the 3 screws (a).



f. Proceed backwards for the mounting of the new Column board, taking care to reconnect the cables as in the figure.



g. Verify that the setting of the jumpers on the new Column board is the same as the old one.

REF	DESCRIPTION	SETTING
X208 pin 2-3	CAN termination	Closed

18. UPGRADE PROCEDURES

In this paragraph you can find instructions for the upgrade that can be carried out in the field.

18.1. Upgrade from keyboard LEFT to keyboard RIGHT (all models)

To move the keyboard from left to right proceed as follows:

a. Turn OFF the X-MIND trium.
b. For all CBCT models: Mechanically move axial laser on the Tubehead from right position to left position (looking at the frontal part of the Tubehead).
c. For all CBCT models: Mechanically move CBCT mid-sagittal laser on the U-arm to the position close to the column (with U-arm rotated having the Tubehead on the right looking frontally at the X-MIND trium).
d. Turn ON the X-MIND trium.
e. Execute " SERVICE", SET MODEL:
    1. Set Kinematic right, according to the new side of keyboard (as per CONFIGURATIONS instructions).
    2. Turn OFF the X-MIND trium.
    3. Turn ON the X-MIND trium.
    4. For all CBCT models: Calibrate U-arm encoder.
f. For all CBCT models: align axial laser and CBCT mid-sagittal laser.
g. For all models: align Frankfurt laser.

18.2. Upgrade from keyboard RIGHT to keyboard LEFT (all models)

To move the keyboard from right to left proceed as follows:

a. Turn OFF the X-MIND trium.
b. For all CBCT models: Mechanically move axial laser on the Tubehead from left position to right position (looking at the frontal part of the Tubehead).
c. For all CBCT models: Mechanically move CBCT mid-sagittal laser on the U-arm to the position far from the column (with U-arm rotated having the Tubehead on the right looking frontally at the X-MIND trium).
d. Turn ON the X-MIND trium.
e. Execute "SERVICE", SET MODEL:
    1. Set Kinematic left, according to the new side of keyboard (as per CONFIGURATIONS instructions).
    2. Turn OFF the X-MIND trium.
    3. Turn ON the X-MIND trium.
    4. For all CBCT models: Calibrate U-arm encoder.
f. For all CBCT models: align axial laser and CBCT mid-sagittal laser.
g. For all models: align Frankfurt laser.

18.3. Upgrade from CEPH ready to CEPH

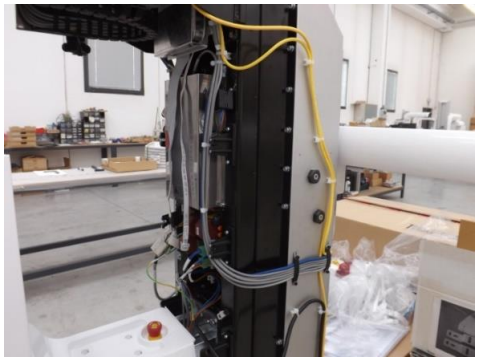
NOTE

During the dismounting and mounting of the CEPH is recommended the presence of two persons.

To install CEPH arm (on a CEPH ready unit) proceed as follows:

a. Mount mechanically CEPH arm with craniostat.
b. Drive cables on column side as following pictures:

CEPH RIGHT




CEPH LEFT

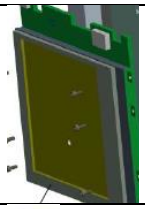

c. Set jumper on the electronic boards as follows:
   1. MAIN BOARD – remove J3 and J4 jumpers;
   2. AUX CEPH BOARD – verify that J1 and J2 jumpers are present.
d. From the USB key supplied by the factory copy the CEPH image detectors calibration file to the folder: AisSoftware\XMdriver\XM\Config
e. Execute "SERVICE:
   1. In SET MODEL:
      i. Set PAN - CEPH or PAN – CBCT - CEPH model, according to the actual model;
      ii. Set CEPH arm right or left, according to the actual side of CEPH.
   2. In CALIBRATION:
      i. Calibrate CEPH nasion potentiometer.
   3. In CALIBRATION COLLIMATOR:
      i. Carry out CEPH collimator calibration.
f. Execute a CEPH LL exam, with empty field, opening the ear rests in the middle position, at 60kV-4mA and verify that the ear rings are one inside the other: if not, adjust mechanically the fixation of the ear rest bars (as per instructions in the paragraph ADJUSTMENT OF CEPH PATIENT EAR RESTS of this manual).

18.4. Upgrade from 3D ready to 3D

WARNING

ELECTROSTATIC SENSITIVE DEVICE
The CBCT panel is an electrostatic sensitive device.
Observe precautions when handling it, to avoid permanent damages occur to the sensor; in particular do not touch electronic parts and sensor active area (the black one).

Content of the upgrade box W0900227

Item Nr	Quantity	Description	Picture
XMT GROUP UPGRADE TRANSLATING CASSETTE			
3.95.00891	1	SENSOR RX CBCT TRIUM C12280-40 (12x12)	
P4168	8	SCREW TCEI UNI EN ISO 4762 M3x8 BR	
-	1	INSTRUCTIONS FOR UPGRADE	
XMT GROUP 3D WS			
3.94.01093	1	WORKSTATION DELL 3620XCTO +SO +M2000 +GIGABIT NIC CARD 3DApp STD SW licence already activated	
3.94.01077	1	MONITOR 24 INCHES DELL P2417H	
3.98.00923	1	DONGLE KEY TRIUM (LICENCE SW RECONSTR) (fixed to rear part of WorkStation)	
GEOMETRIC PHANTOM FOR CBCT			
2.19.02175	1	TRIUM CALIBRATION PHANTOM	
2.75.02176	1	TRIUM CALIBRATION PHANTOM SUPPORT	

Quick guide for upgrade

CASE 1 – The X-Mind trium has already been installed in the field and used with a customer PC (2D PC) as PAN only or PAN/CEPH only unit:

2D PC
AIS backup manager -> Tools -> Backup

- Backup patient database
- Backup trium configuration

→ **External drive** →

3D workstation (part of 3D upgrade)
AIS backup manager -> Tools -> Backup

- Restore patient database
- Restore trium configuration

CASE 2 – The X-Mind trium has not been installed in the field as PAN only or PAN/CEPH only unit:

USB key <u>from the X-Mind trium</u> 3D ready

→

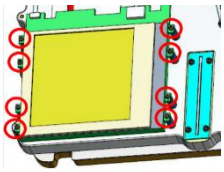
3D workstation (part of 3D upgrade)
TriumConfig_Installer_v1.4.0-1

- Restore FACTORY trium configuration

THEN, FOR BOTH CASES ABOVE:

On X-Mind Trium

- Mount the CBCT panel



WARNING

ELECTROSTATIC SENSITIVE DEVICE
The CBCT panel is an electrostatic sensitive device. Observe precautions when handling, to avoid permanent damages occur to the sensor; in particular do not touch electronic parts and sensor active area (the black one).

On 3D workstation (part of 3D upgrade)

- Connect the DONGLE KEY TRIUM (with LICENCE SW RECONSTR) from rear part of the workstation

- Check presence of calibration files of the CBCT sensor in folder: C:\AISSoftware\XMdriver\XM\config

- SET MODEL as PAN-CBCT or PAN-CEPH-CBCT
- Adjust X-Ray collimation on CBCT sensor

- Carry out whole procedure of geometric calibration

On all CLIENT PCs

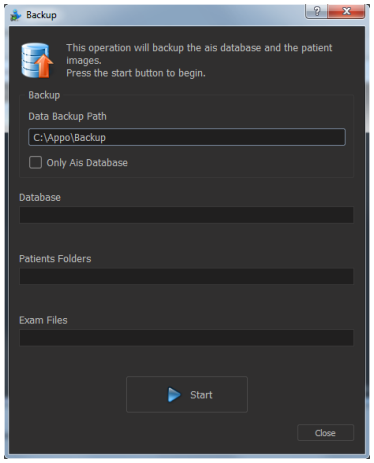
- Upgrade AIS (client version) to the same release number of AIS present on the 3D WorkStation
- Install and activate AIS 3DApp

Detailed procedure for upgrade

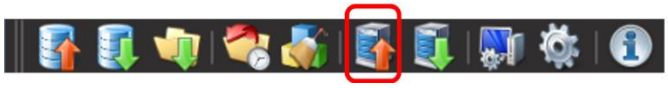
a. On the 2D PC, if previously used in the field with X-Mind trium as PAN or PAN-CEPH only:

i. Backup patient database and images to an external hard disc or USB key:
AIS backup manager -> Tools -> Backup

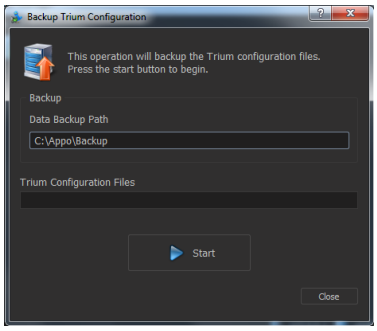
Select destination folder on an external hard disc or USB key -> DO NOT flag “Only AIS database” -> Click on **Start**



ii. Backup trium configuration to an external hard disc or USB key:
AIS backup manager -> Tools -> Backup Trium configuration



Select destination folder on an external hard disc or USB key -> Click on **Start**



b. On the 3D WorkStation part of upgrade kit:

i. **If the trium has already been used in the field with a 2D PC:**

a. Restore patient database and images (from backup of 2D PC as per instruction above):
AIS backup manager -> Tools -> Restore database

AIS backup manager -> Tools -> Restore images

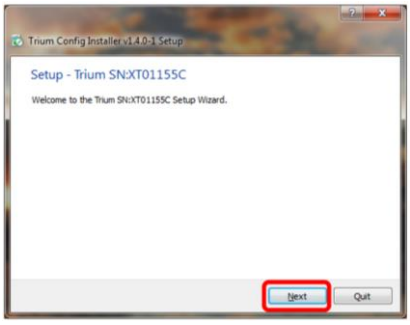
b. Restore Trium configuration (from backup of 2D PC as per instruction above):
AIS backup manager -> Tools -> Restore Trium configuration

ii. **Else, if the trium has not yet been used in the field, restore FACTORY trium configuration:**

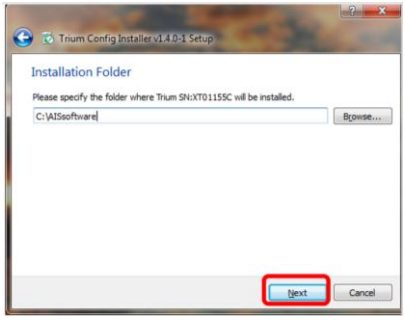
a. Connect the USB key from X-Mind trium box to the 3D workstation part of upgrade

b. Run TriumConfig_Installer_v1.4.0-1, double clicking on the setup file

c. Click on 'Next' to proceed with the installation path:

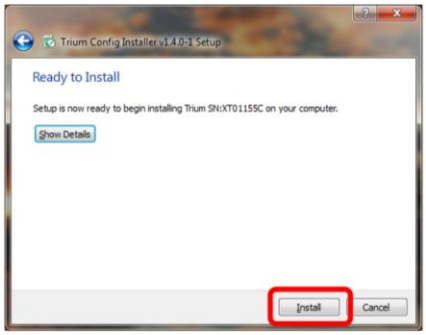


d. Don't change the installation path, or the machine will not be functional

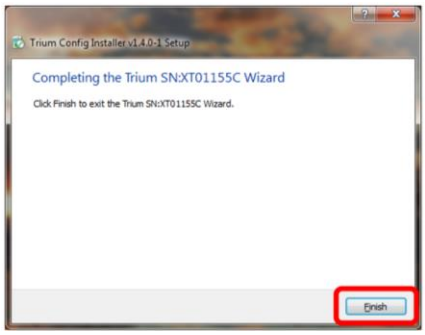


e. Proceed with license agreement, then click on ‘Next’

f. Click on ‘Install’ to start the installation



g. Click on ‘Finish’ to complete the installation.



c. On X-Mind trium:

i. Turn off the equipment

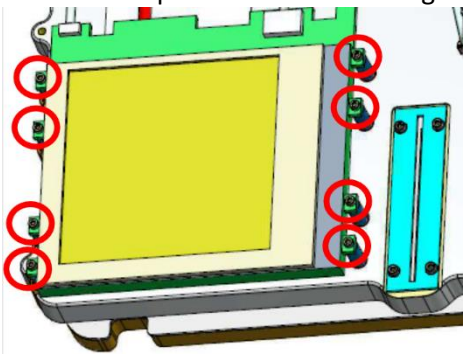
ii. Mount mechanically the CBCT panel:

WARNING

ELECTROSTATIC SENSITIVE DEVICE
The CBCT panel is an electrostatic sensitive device.
Observe precautions when handling it, to avoid permanent damages occur to the sensor; in particular do not touch electronic parts and sensor active area (the black one).

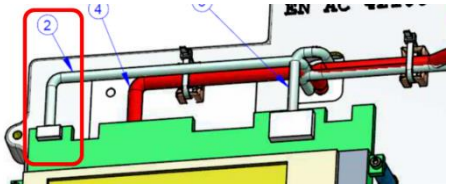
– Remove frontal cover of translating cassette (remind the two screws on the bottom)

– Fix the CBCT panel to the translating cassette, using the **8 M3x8 screws**

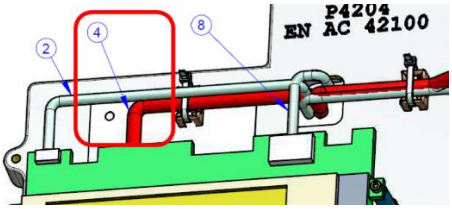


– Connect on the panel **the cable 2** - P4042_CAVO-TRIGGER-ISO-AUXCBCT-CBCTSENSOR

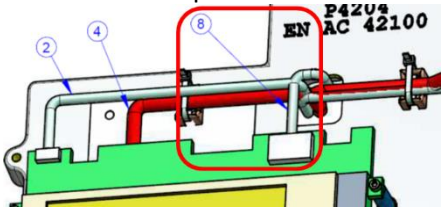
WARNING: handle with care this connector; it is very easy to damage it



– Connect **on the REAR of panel the cable 4** - P4047_CAVO-GBIT-ROTANTECBCT-CBCTSENSOR



– Connect on the panel **the cable 8** - P4079_CAVO-5VISO-AUXCBCT-CBCTSENSOR

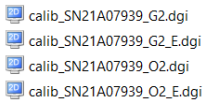


– Fix frontal cover of translating cassette (remind the two screws on the bottom)

d. On the 3D WorkStation + X-Mind trium:

i. Take the DONGLE KEY TRIUM (with LICENCE SW RECONSTR) from rear part of the workstation and connect to a USB port of the workstation itself

ii. Check that the calibration files of the CBCT panel from are present in the folder:
C:\AISSoftware\XMdriver\XM\config of the 3D workstation



iii. Set appropriate model of the X-Mind trium as PAN-CBCT or PAN-CEPH-CBCT
   a. Follow instructions of paragraph 11.3 SET MODEL SETUP

iv. Adjust X-Ray collimation on CBCT sensor
   a. Follow instructions of paragraph 12.7 MOTORIZED COLLIMATOR CALIBRATION

v. Carry out full procedure of geometric calibration
   a. **WARNING - complete the calibration procedure in all 4 configurations:**
      Full view with PAN sensor present
      Extended view with PAN sensor present
      Full view without PAN sensor present
      Extended view without PAN sensor present
   b. Place in patient holder position the geometric calibration phantom on his holder

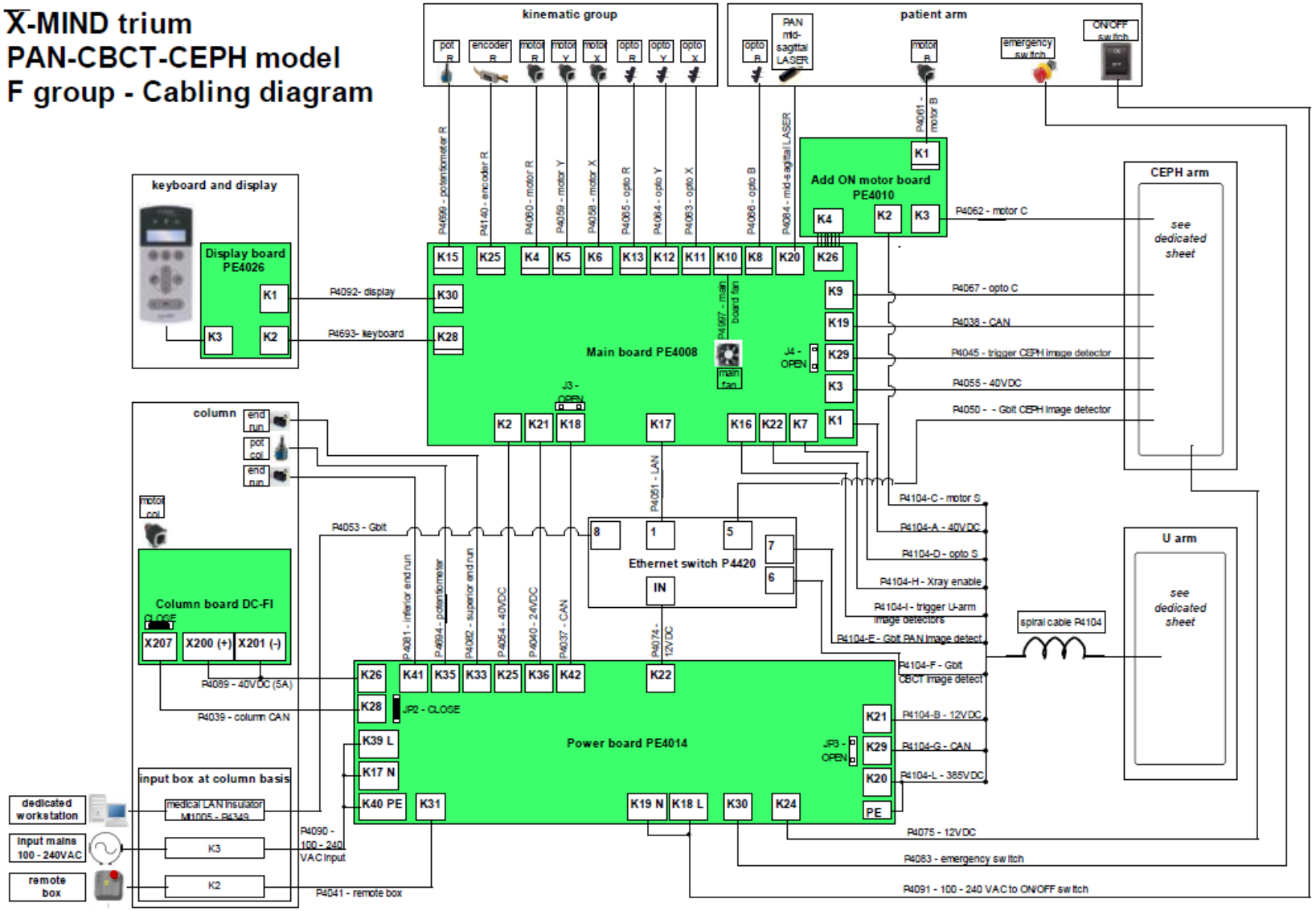
   c. Execute the WH calibration tool, double clicking on the icon on the desktop of 3D workstation

– For detailed instructions see manual XMt Geometric Calibration Guide EN NTR0EN060B

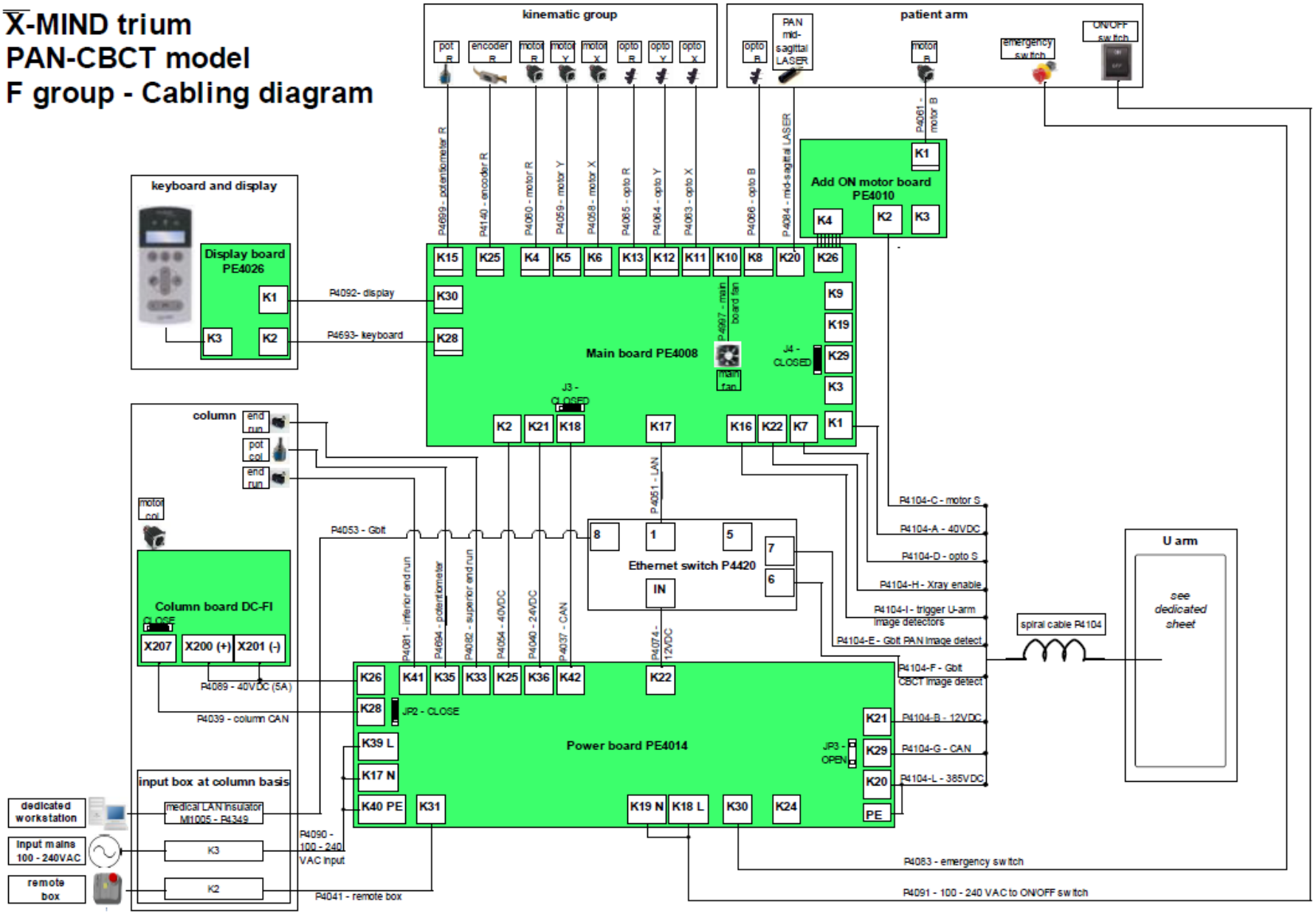
e. On all the client PCs:

i. Upgrade AIS (client version) to the same release number of AIS present on the 3D WorkStation
ii. Install and activate 3DApp

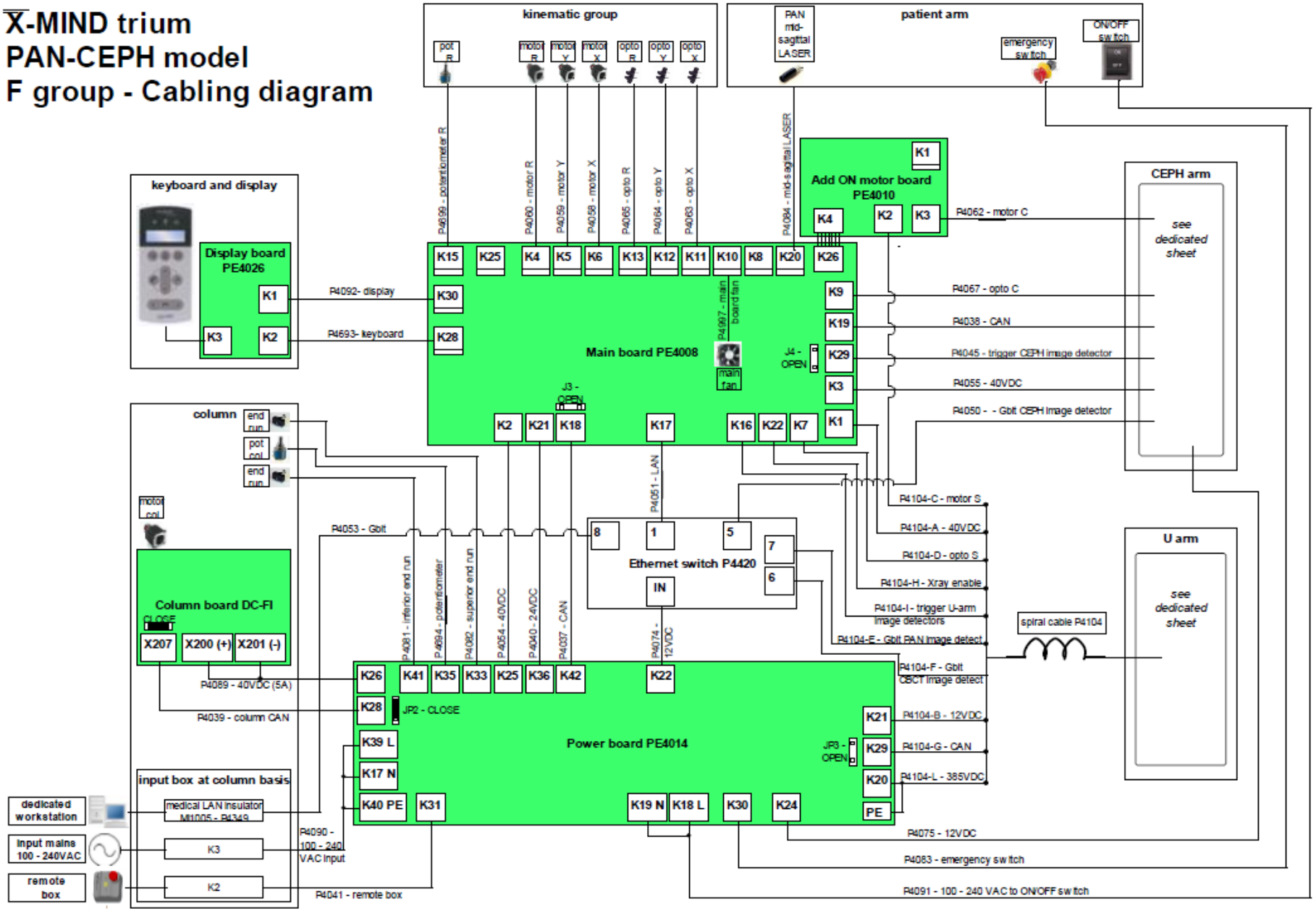
19. CABLING DIAGRAMS



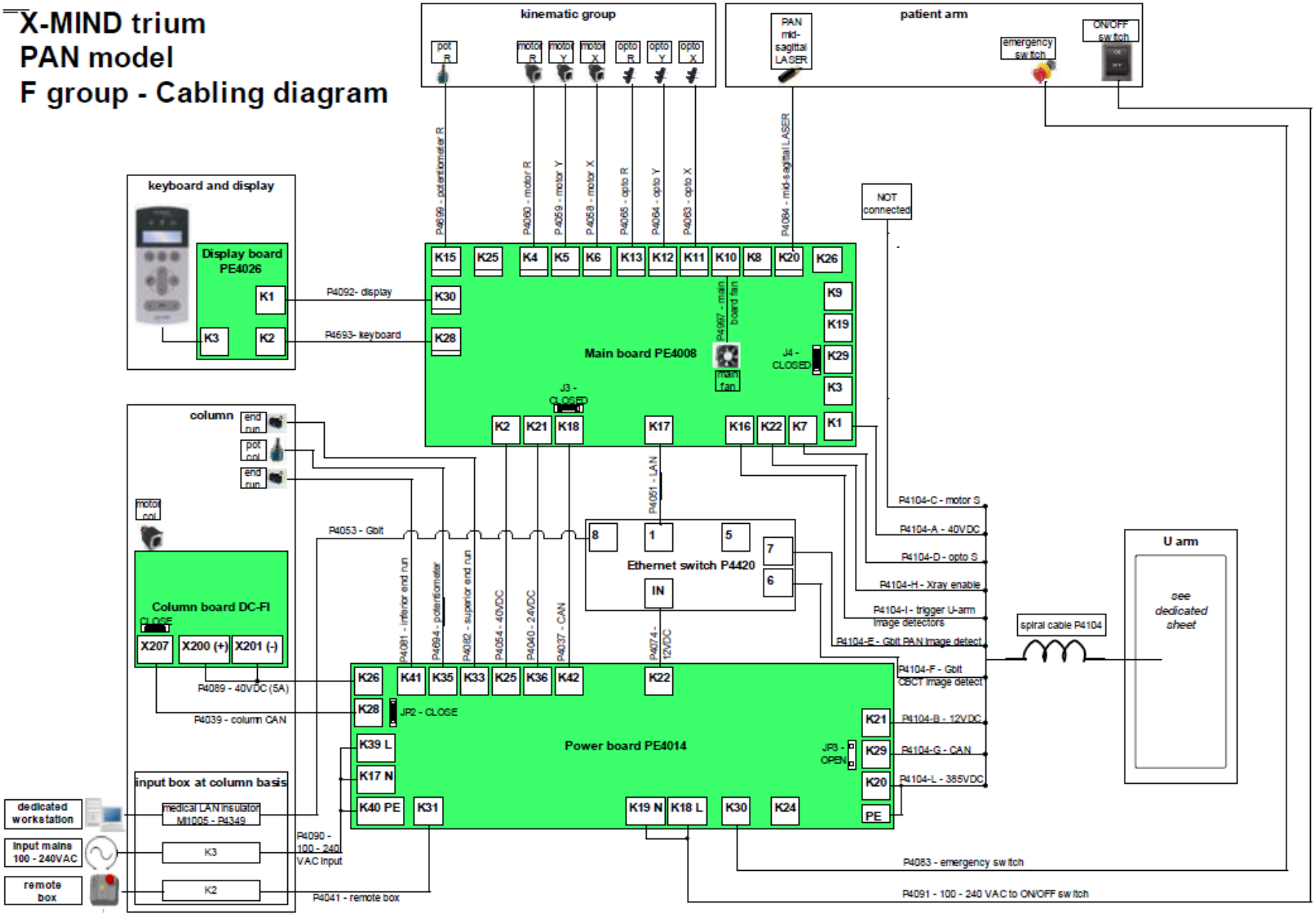
X-MIND trium
PAN-CBCT model
F group - Cabling diagram



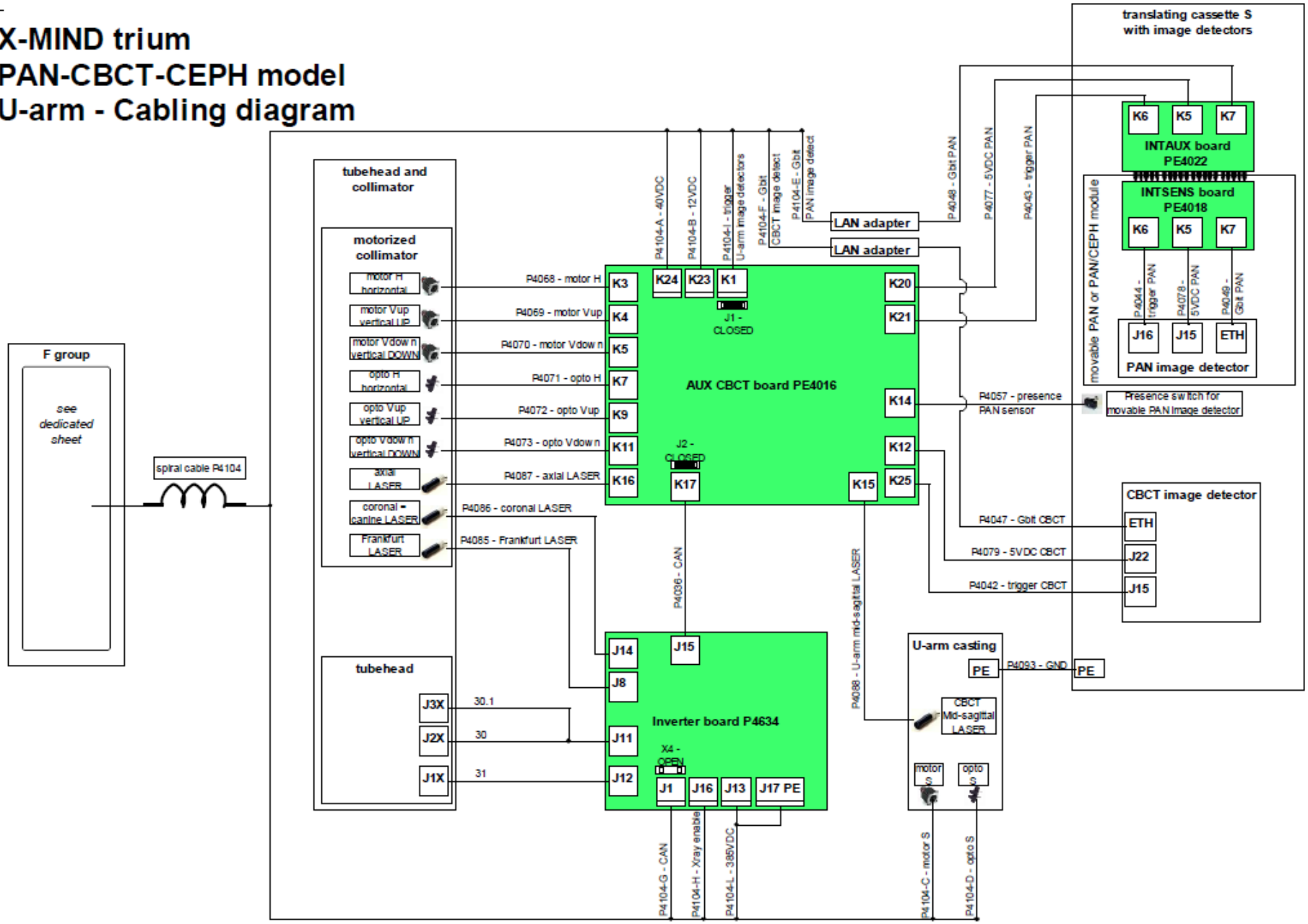
X-MIND trium
PAN-CEPH model
F group - Cabling diagram



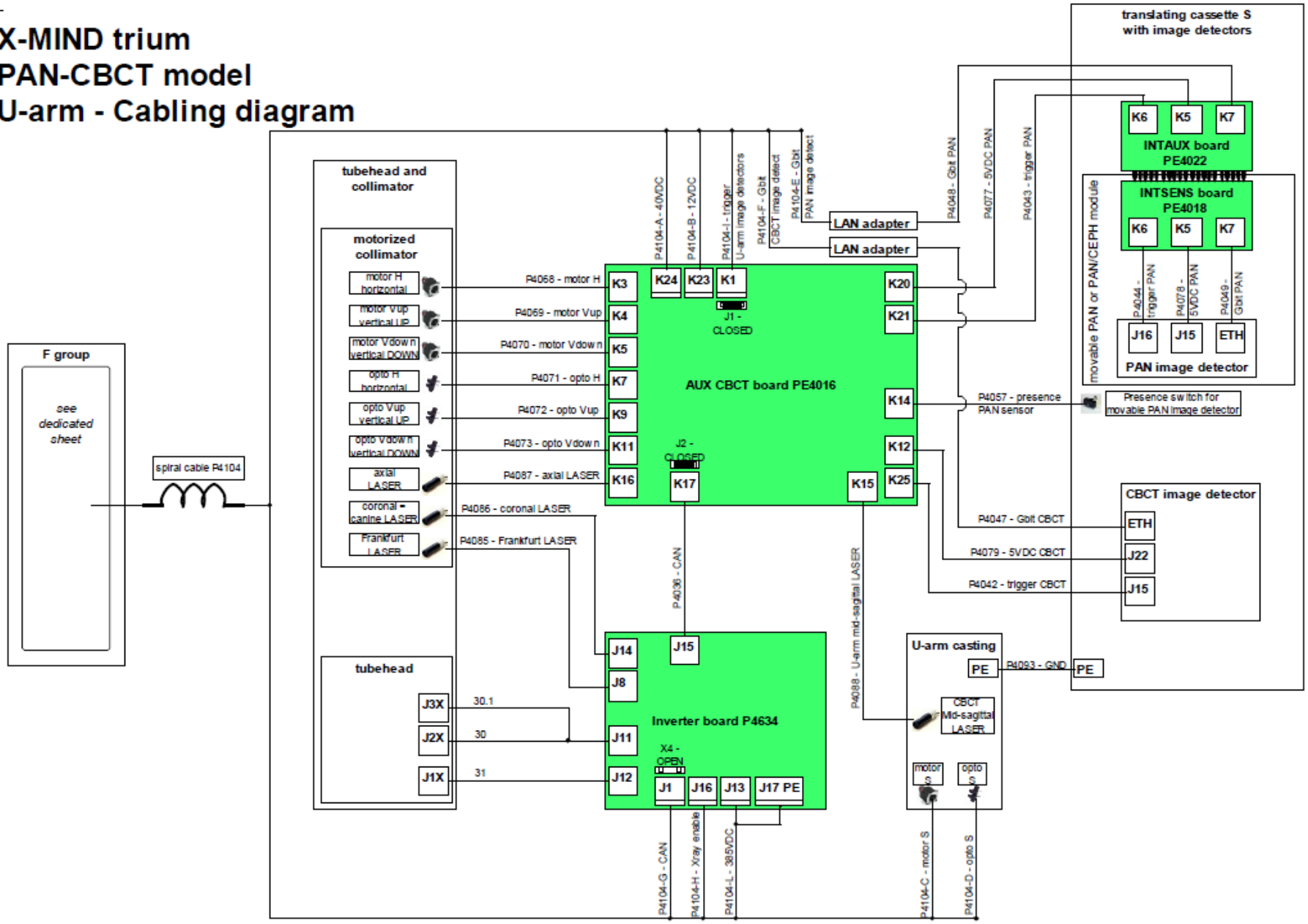
X-MIND trium
PAN model
F group - Cabling diagram



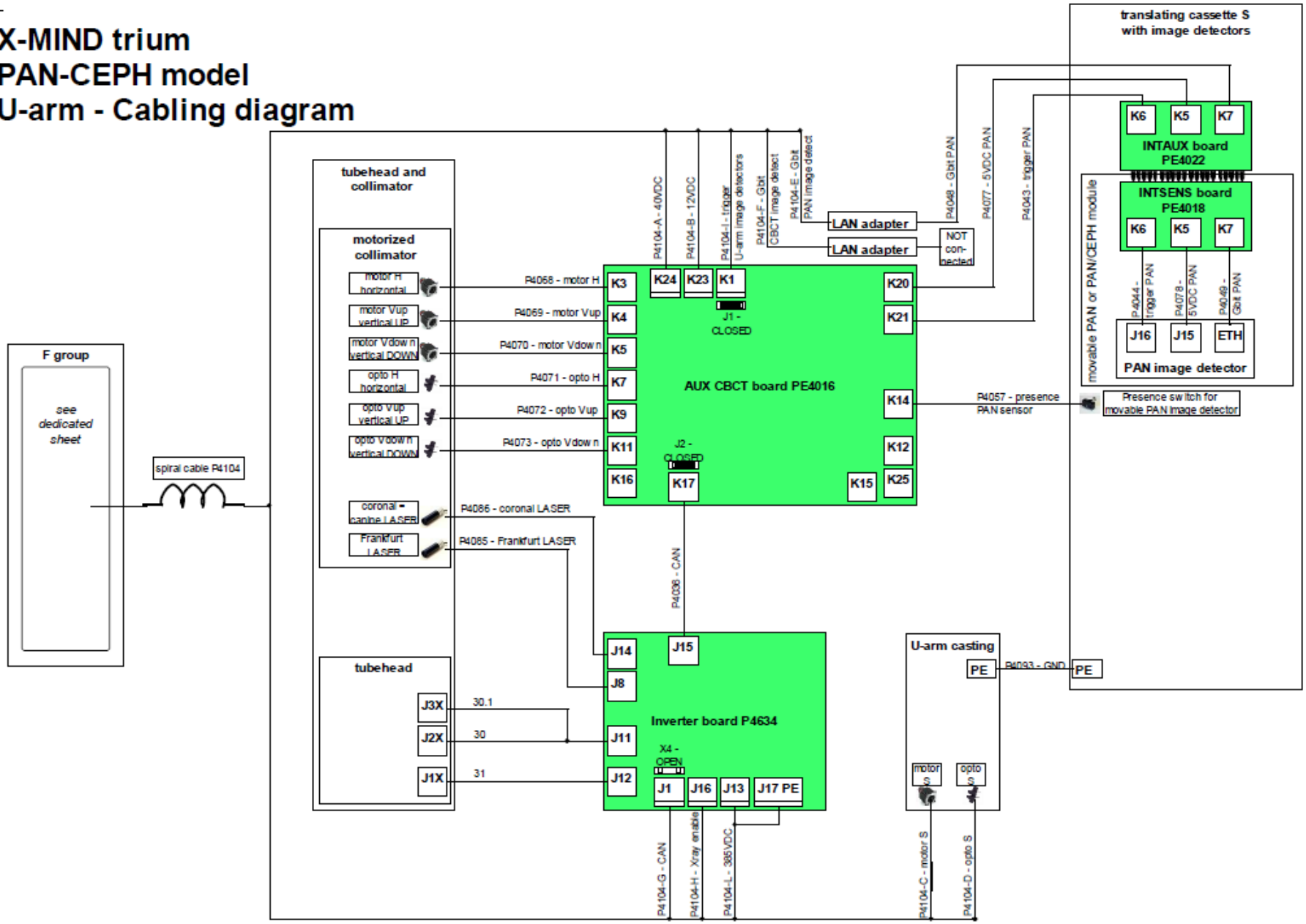
X-MIND trium
PAN-CBCT-CEPH model
U-arm - Cabling diagram



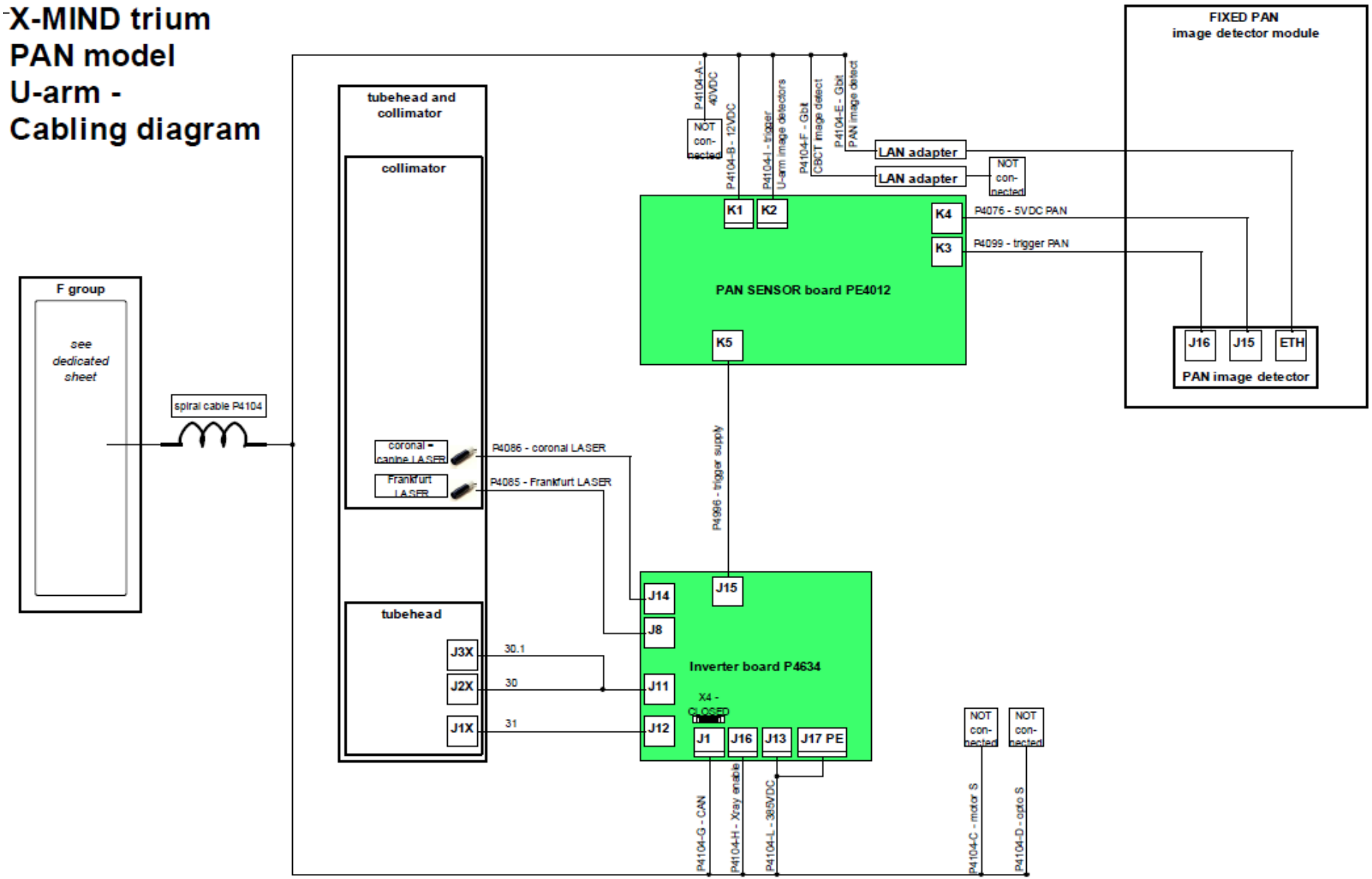
X-MIND trium
PAN-CBCT model
U-arm - Cabling diagram



X-MIND trium
PAN-CEPH model
U-arm - Cabling diagram



X-MIND trium PAN model U-arm - Cabling diagram



X-MIND trium
CEPH-arm - Cabling diagram