EN • SERVICE MANUAL

NIMXEN080H • December 2022

i-max 3D CEPH PRO

MAKES LIFE EASIER

NEW PANORAMIC UNIT GENERATION

2D, 3D, CEPH VERSION

Language of original document: English.

CE 0051

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Rev.	Date	Page/s	Modification description
P	XX.07.19	-	Preliminary version release: starting from 6904913503_Rev3 the modification for the CEPH option has been added
0	30/11/2019	all	Initial release
B	02/2022	all 1	Single version for I-Max 3D & I-Max CEPH 3D and I-Max CEPH 3D Black power switch
C	04/2022	6, 17, 18, 20, 21 34 37, 38 From 352 to 370	Update laser labels Update exposure times Update laser and sensor characteristics Update spare parts codes in *Spare parts* section
D	10/2022	42 From 352 to 370 288, 292 From 352 to 370	Update image of the reduced height chin rest support at par. *Separate parts supplied with I-MAX 3D & I-MAX CEPH 3D* Update spare parts codes in *Spare parts* section Added sections concerning four blade collimator and single four blade collimator motors replacement Update spare parts section
E	11/2022	From 352 to 370	Update spare parts codes in *Spare parts* section (added kit 3d sensors H1 and H2)
F	11/2022	31 46 From 340 to 345	Updated 3D Digital sensor characteristics Added a warning advice Updated general schematic drawings
G	12/2022	15 172	Expanded section on external surface cleaning procedures Error 376 added to error table
H	04/2023	-- --	Updated images, cover image for I-MAX pro Updated spare parts codes section for I-MAX pro

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Contents

1. INTRODUCTION

Note
The present manual is updated for the product it is sold with in order to grant an adequate reference in performing diagnostics and repair operations normally carried out by the service engineer.
The manual may not reflect changes to the product not impacting service operations.

This manual provides the instructions for proper and safe installation and maintenance of the appliance by technical personnel.

This manual is limited to the description of the radiographic equipment; the instructions for the image acquisition, manipulation and processing are given in the user manual supplied with the imaging software used with the I-Max 3D & I-Max CEPH 3D unit.

Note
The present manual is for I-Max 3D with **black power switch**.

If your device has a **white power switch**, refer to service manual **NIMXEN070F**

Warning

- I-Max 3D & I-Max CEPH 3D is an electro-medical device, and it can be used only under the supervision of a physician or of highly qualified personnel, with the necessary knowledge on X-ray protection.
- The device must be used in compliance with the procedures described, and never be used for purposes different from those herewith indicated.
- The user is liable with regards to the legal fulfilment related to the installation and the operation of the device.
- Service engineers who install and maintain the device need knowledge of radiation protection and must read the Service Manual prior to use the X-ray equipment. They must be qualified and authorized by Owandy.

1.1. Icons appearing in the manual

This icon indicates a “NOTE”: please read the items marked by this icon thoroughly.

This icon indicates a “WARNING”: the items marked by this icon refer to safety aspects of the patient and/or operator.

1.2. How to contact OWANDY technical service

For any technical queries please contact the following:

- Telephone number +33(0)1 64 11 18 18
- Fax number +33(0)1 64 11 18 10
- E-mail: info@owandy.com

If a technical service intervention is required, it is mandatory to provide OWANDY technical service the following information:

- Unit Serial Number
- Unit firmware & driver version: MCU, CCU, HF(XCU), OSP/VSP, QuickVision (see chapter 8)
- Other software version used with I-Max 3D & I-Max CEPH 3D
- Problem description including condition/unit-state, sequence in which the anomaly occurs and how it can be reproduced.
- If one or more errors messages are displayed:
  - Errors messages numbers.
  - Results of all the errors troubleshooting tests.
  - Part codes to be replaced (if required by the troubleshooting tests).
  - Additional information or data required by the troubleshooting of the displayed errors.

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2. SAFETY INFORMATION

Warning
Please read this chapter thoroughly.

Owandy Radiology designs and manufactures its devices in compliance with safety requirements; furthermore, it supplies all information necessary for correct use, and warnings related to dangers associated with X-ray generating units.

Owandy Radiology cannot be held liable for:

- Use of I-Max 3D & I-Max CEPH 3D other than its intended use
- Damage to the unit, the operator or the patient, caused both by installation and maintenance procedures other than those described in this Manual and in the Service Manual supplied with the unit, and by erroneous operations
- Mechanical and/or electrical modifications performed during and after the installation, other than those described in the Service Manual.

Installation and any technical operations must only be performed by qualified technicians authorised by Owandy Radiology.

Only authorised personnel may remove the covers and/or have access to live components.

Warning
In compliance with the IEC 60601-1 standard, the modification of the equipment or its parts is strictly prohibited.

2.1. Warnings

The device must be used in compliance with the procedures described and never be used for purposes different from those herewith indicated.
Before performing any maintenance operation, disconnect the unit from the power supply using the provided circuit breaker.
I-MAX 3D & I-MAX CEPH 3D is an electro-medical device and therefore it can be used only under the supervision of suitably qualified medical personnel, with the necessary knowledge on X-ray protection.
The user is responsible for the fulfilment of the legal requirements regulating the ownership, installation and use of the equipment itself.
This device has not been designed to be used in environments where vapours, anaesthetic mixtures flammable with air, or oxygen and nitrous oxide, can be detected.
Do not let water, or other liquids, into the device, as this could cause short-circuits and corrosion.
Before cleaning the device, be sure that the main power supply has been disconnected from the equipment. Pushing the ON/OFF button of the equipment, it mustn't switch on.
Wherever necessary, use the appropriate accessories, such as the leaded aprons, to protect the patient from radiation.
While performing the radiography, no-one, apart from the operator and the patient, must remain in the room.
I-MAX 3D & I-MAX CEPH 3D has been built to support a continuous operation at intermittent load; therefore, please follow the described use cycles to enable the device to cool down.
I-MAX 3D & I-MAX CEPH 3D must be switched off while using electrosurgical devices or similar apparatus.

Warning
For safety reasons, it is prohibited to abnormally overload the patient support arm, for example by leaning on it. The traction force on the handle shall be less than 16kg.

Warning
To avoid risk of electric shock, this equipment must only be connected to a supply main with protective earth.

Please clean and disinfect, when necessary, all parts that can be in contact with the patient.
The centering bite, the bite protective sleeve and the ear pin covers must be replaced after each examination in which they were used.
Never try to rotate the moving arm manually when the unit is switched on, to avoid permanent damage to the unit.
Movement is only possible in case of Error 362 because motors are disabled to permit the patient exit.

Note
When the unit is switched on, do not move the rotating arm or the tube-head).

2.1.1. Precautions while using laser centring devices

For patient positioning, I-Max 3D uses two laser diodes with optical power on the working surface < 1 mW.

The directive CEI-EN 60825-1 defines the laser as "any device that produces or amplifies electromagnetic radiation in a coherent manner which includes a wave lengths from 180 nm to 1 mm by means of a stimulated emission". In reference to this directive, the lasers present on the I-Max 3D are parts of class 1.

A warning label (See picture below) is affixed to I-Max 3D to indicate a laser in class 1 is mounted internally and caution is advised.

Warning

- Always keep the room well lit.
- Do not look into the output windows of laser centring units.
- Do not stare at the reflections of laser pointers.
- Instruct the patient to keep his/her eyes closed as long as the laser pointers are active.
- Before starting an exam, the patient must remove earrings, glasses, necklaces and any other item that could reflect the laser beam or be impressed on the radiographic image.
- Do not clean the openings of laser centring devices with tools that could modify the optics. Any cleaning must only be performed by authorized technicians.
- Operations other than those indicated could cause the emission of dangerous non-ionizing radiation.

2.2. Protection against radiation

Although the dose supplied by dental X-ray units is quite low and distributed on a fairly small surface, the operator must adopt precautions and/or suitable protection for the patient and himself, during radiography.

Warning
Protection against radiation is regulated according to law.
The equipment may only be used by specialised personnel.

It is advisable to control the X-ray emission from a protected area, by remote control. If it is necessary to operate near the patient, stay as far as the remote-control cable allows, or at least 2 m both from the X-ray source and from the patient, as shown in the following figure.

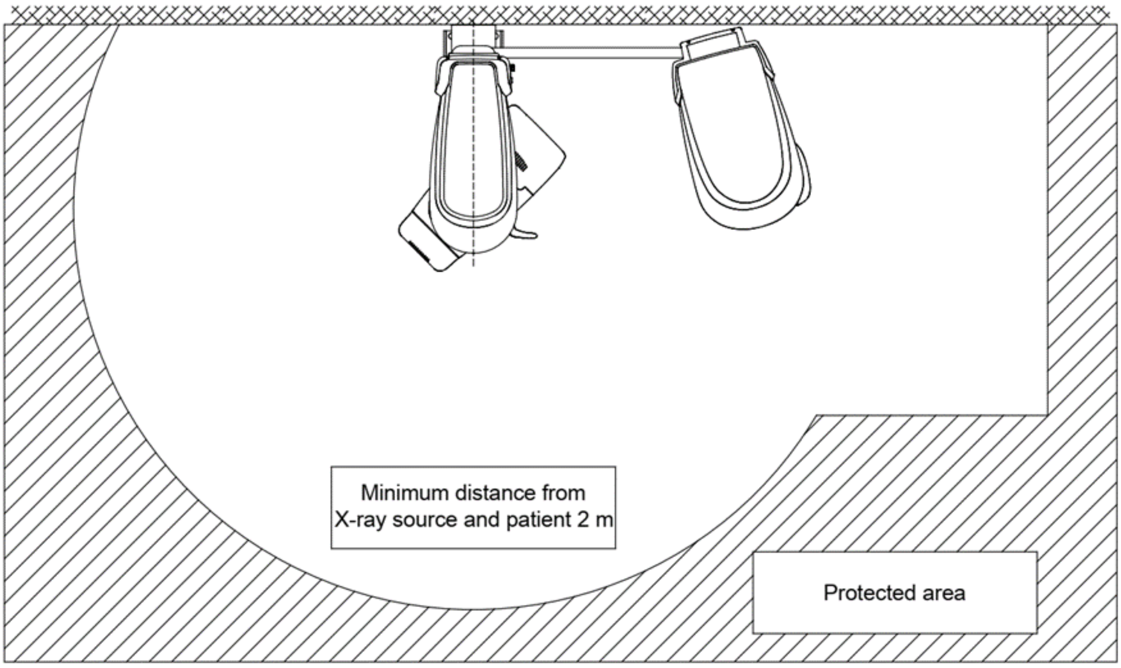

Figure 1

2.3. Information about Electromagnetic Compatibility

Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the accompanying documents.

Portable and mobile RF communications equipment can affect medical electrical equipment.

The equipment can be installed both in professional buildings (e.g. hospitals or clinics) and in residential buildings. Residential buildings, according to IEC 60601-1-2 4th edition, are intended to be connected to dedicated power supply system (normally fed by separation transformers).
For the purpose of EMC environment classification according to IEC 60601-1-2 4th edition, both installations are classified as "Professional healthcare facility environment".

The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment, even if it is usually permanently installed in X-Ray shield locations, might not offer adequate protection to radio-frequency communication services. If abnormal performance is observed, such as degradation of essential performance in the form of lack of accuracy of exposure parameters and lack of reproducibility of exposure parameter, additional measures may be necessary, such as re-orienting or relocating the device.

Warning
The use of cables other than:

- Ethernet cable CAT.6 L=5 m
- Ethernet cable CAT.6 L=10 m

with the exception those sold by the manufacturer of the equipment or system as replacement parts for internal components, may result in increased emission or decreased immunity of the equipment or system.

Warning
I-Max 3D & I-Max CEPH 3D should not be used adjacent to or stacked with other equipment; if adjacent use is necessary, I-Max 3D & I-Max CEPH 3D has to be observed to verify if it operates in a normal way.

Interference may occur in the vicinity of equipment marked with the symbol

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Warning
Portable and mobile RF communications equipment should be used no closer to any part of I-Max 3D & I-Max CEPH 3D, including cables. Minimum distance 30 cm.

2.3.1. Electromagnetic emissions

In accordance with the IEC 60601-1-2 Ed4 standard, I-Max 3D & I-Max CEPH 3D is suitable for use in the electromagnetic environment specified below.
The customer or user of the system must ensure that it is used in the said environment.

Emissions test	Compliance	Electromagnetic environment
RF emissions CISPR 11	Group I	I-Max 3D & I-Max CEPH 3D uses RF energy only for its internal function. Therefore, its R.F. emissions are very low and are not likely to cause any interference in nearby electronic equipment.
	Class A	I-Max 3D & I-Max CEPH 3D is suitable for use in all establishments other than domestic and those directly connected to the public low voltage power supply network that supplies buildings used for domestic purposes.
Harmonics emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

2.3.2. Electromagnetic immunity

In accordance with the IEC 60601-1-2 Ed4 standard, I-Max 3D & I-Max CEPH 3D is suitable for use in the electromagnetic environment specified below.
The customer or user of the system must ensure that it is used in the said environment.

Immunity test	IEC 60601-1-2 test level	Compliance level	Electromagnetic environment
Electrostatic discharge (ESD) IEC 61000-4-2	8 kV contact 2/4/8/15 kV air	IEC 60601-1-2 Test level	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Radiated electromagnetic field IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz	IEC 60601-1-2 Test level	Portable and mobile RF communications equipment should be used no closer to any part of I-Max 3D & I-Max CEPH 3D including cables. Minimum distance 30 cm
Electrical fast transient/burst IEC 61000-4-4	2 kV for power supply lines 1 kV for input/output lines > 3 m	IEC 60601-1-2 Test level	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC 61000-4-5	0.5/1 kV differential mode 0.5/1/2 kV common mode	IEC 60601-1-2 Test level	Mains power quality should be that of a typical commercial or hospital environment
Conducted disturbances induced by RF fields IEC 61000-4-6	3 V 150 kHz to 80 MHz 6 V ISM frequencies	IEC 60601-1-2 Test level	Portable and mobile RF communications equipment should be used no closer to any part of I-Max 3D & I-Max CEPH 3D, including cables. Minimum distance 30 cm
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	10 ms – 0 % a 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° 20 ms – 0% a 0° 500 ms – 70% a 0° 5 s – 0%	IEC 60601-1-2 Test level	Mains power quality should be that of a typical commercial or hospital environment. If the user of the EUT requires continued operation during power mains interruptions, it is recommended that the EUT be powered from an uninterruptible power supply or a battery
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	IEC 60601-1-2 Test level	Power frequency magnetic fields should be at levels characteristics of a typical location in a typical commercial or hospital environment

2.4. Cybersecurity measures

Like all computer-based systems, I-Max 3D & I-Max CEPH 3D might be exposed to Cybersecurity threats.
I-Max 3D & I-Max CEPH 3D is equipped with hardware provisions that make sure that no unwanted X-ray exposure, laser radiation or motorized movements can be activated even in case of cyber-attack or software failure.
Nevertheless, in order to minimize the possibility of cyber-attacks, it is user responsibility to make sure that the following protection measures are followed.

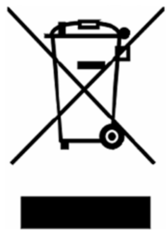
- The initial software installation and system set-up shall be done by authorized and trained personnel only and using the software provided with the machine.
- Any software or firmware upgrade of the equipment shall be done by authorized and trained personnel only.
- After any software or firmware upgrade, or any other maintenance operation, image quality checks shall be performed to ensure the system is working as expected. Instructions are given in User Manual, chapter 7.
- Password-protect each user account on the Windows login. Passwords shall be strong enough (at least made of 8 alphanumeric characters), shall be safely managed by every user (for example they have not been written down), and should be periodically changed (if the system is supplied with a PC, the Windows user is password-protected, but it is user responsibility to change the default password and set new ones for all the different users that will have access to the system).
- Activate a screensaver that requires a password to be unblocked after a timeout of 5-10 minute, giving this way an automatic timed method to terminate sessions, preventing an unauthorized access to the computer when it is not used (if the system is supplied with a PC, the screen saver is activated by default).
- Install an antivirus software and keep virus definitions up to date.
- Activate the windows firewall on the host PC (if the system is supplied with a PC, the Windows firewall is activated by default).
- It is recommended to activate a hardware firewall on the WAN router/modem used for internet connection, if present.
- Make sure that all other PCs in the network are protected by an anti-virus.
- Make a virus scan of USB pen drive or CD/DVD media before using them to check they are free from viruses, malware or any dangerous software.
- Avoid installation of an unknown or untrusted software since it may undermine performance and safety of the computer and the equipment.
- Keep the Windows operating system up to date by installing all security patches.
- Make regular copies (backup) of all your valuable data and store them in a safe place, separately from the host PC.

2.5. Environmental risks and disposal

Some parts of the device contain materials and liquids that, at the end of the unit's lifecycle, must be disposed of at appropriate disposal centres.
In particular, the device contains the following materials and/or components:

- Tube-head: dielectric oil, copper, iron, aluminium, glass, tungsten, lead.
- Collimator: lead
- Other parts of the device: non-biodegradable plastic materials, metal materials, printed circuits, iron-plastic materials, lead.

Note
Information for users of the European Community according to 2011/65/EU Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment.



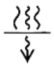
The symbol of the crossed waste container on the equipment or packaging shows that the product, at the end of its lifecycle, must be collected separately from other types of waste.
The separate collection of this equipment at the end of its lifecycle is organised and managed by the manufacturer. Users who need to dispose of this equipment should therefore contact the manufacturer and follow the procedure adopted by the manufacturer for the separate collection of the equipment at the end of its lifecycle.
Proper separate collection for subsequent recycling, treatment and compatible environmental disposal of equipment helps avoid possible negative effects on the environment and on health and encourages the reuse or recycling of materials the equipment is made from.

The CER code for the device is *160213 - Equipment containing different hazardous components (complete radiographs and radiographs only)*

Illegal disposal of the product by the owner of the equipment will result in administrative sanctions, as provided for by applicable regulations.

2.6. Symbols used

In this manual and on I-Max 3D & I-Max CEPH 3D itself, apart from the symbols indicated on the keyboard, the following icons are also used:

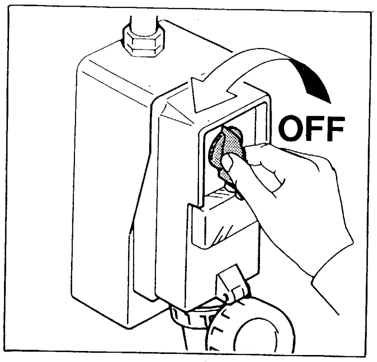
Symbols	Description
	Device with type B applied parts
	Some parts of the device contain materials and liquids that, at the end of the unit's lifecycle, must be disposed of at appropriate disposal centres.
~	A.C. voltage
N	Connection point to the neutral conductor
L	Connection point to the line conductor
	Protection grounding
	Functional grounding
	OFF; device not connected to the mains
I	ON; device connected to the mains
	Laser
	Dangerous voltage
REF	Product identification code
SN	Serial number
	Manufacturing date (year and month)
	Name and address of the manufacturer
	Filtration
	Tube-head
	X-Ray tube

Symbols	Description
	Focal spot according to IEC 60336
	Follow instructions for use
CE 0051	Conformity to the Directive 93/42/EEC and its revised version and all other applicable Directives
	Exposure enabled status (the corresponding green LED is on)
	CEPH sensor properly connected
	X-Ray emission (the corresponding yellow LED is on)

3. CLEANING AND DISINFECTION

In order to guarantee a good level of hygiene and cleaning, it is necessary to carry out the following procedures.

Warning
Disconnect the unit from the mains before performing any cleaning.



Do not let water or other liquids penetrate the unit, as these could cause corrosion or short circuits.

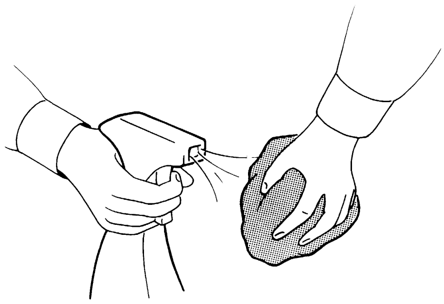
For ordinary cleaning it is recommended to apply a small dose of a mild detergent to clean the painted surfaces, accessories and connection cables and then wipe with a dry cloth. Do not use corrosive, abrasive solvents such as alcohol, benzene or trichloroethylene.

Especially, do not apply alcohol on Polycarbonate-based components such as labels to avoid their embrittlement

For extraordinary cleaning use detergents that **do not** contain alkaline solutions, saline solutions, amides, ketones, aromatic hydrocarbons, hexane, trichloroethane, acrylonitrile or dichloromethylene.

Do not apply any oil-based detergent or aggressive detergent and, in any case, do not use a steel sponge, but always soft cloths

Absolutely use zero corrosion cleaners



The centring bite or the bite protective sleeve and the cephalometric ear pin sleeves must be replaced after each exam.

Thoroughly clean the chin support, resting handles, temple clamps, CEPH rods, nasion reference and carpus plate whenever they are used.
The chin support, resting handles temple clamps, CEPH rods, nasion reference and carpus plate should be disinfected (when considered necessary) with a solution of 2% glutaraldehyde.

Note
To ensure a greater level of hygiene the handles of the equipment are covered with a special antibacterial paint which, thanks to the emission of silver ions, prevents the development of micro-organisms.

4. DESCRIPTION

4.1. Functions, models and versions

I-Max 3D & I-Max CEPH 3D ceph, manufactured by Owandy Radiology, is a complete panoramic X-ray system that can perform the following exams:

- Panoramic adult or child exams, with 3 sizes and 3 types of biting for a total of 18 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- Sinus mode makes it possible to take exams of the paranasal sinuses with front projection (postero/anterior).
- TMJ closed/open mouth in lateral projection.
- Right or Left Emi-panoramic, to be used when the patient is known to have a problem only on one side of the arch, in order to reduce radiation.
- Reduced dose Panoramic, which reduces the dose radiated by excluding the TMJ's ascending rami from the radiograph.
- Frontal dentition, for a radiograph of the front part (roughly from canine to canine).
- Panoramic with improved orthogonality, which reduces teeth overlap, thereby improving the diagnosis of interproximal decay.
- Bitewing left or right, for lateral dentition (generally from eighth to fourth) with a trajectory that reduces teeth overlap
- Bitewing (left and right), which sequentially performs both bitewings, showing them on the same image.
- 3D Full Dentition (FOV 85 x 93 mm) with 3 sizes for a total of 6 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- 3D Single Jaw (FOV 85 x 50 mm) with two different FOV positions (Maxillary, Mandibular), and 3 sizes for a total of 12 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- 3D Mandibular Teeth (FOV 50 x 50 mm) with five different FOV positions (Frontal, Pre-Molars and Molars), and 3 sizes for a total of 30 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- 3D Maxillary Teeth (FOV 50 x 50 mm) with five different FOV positions (Frontal, Pre-Molars and Molars), and 3 sizes for a total of 30 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12 mA in the R20 scale steps.
- 3D TMJ (FOV 85 x 93 mm) with two different FOV positions (R or L), 3 sizes for a total of 12 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- 3D Sinus (FOV 85 x 93 mm) with 3 sizes for a total of 6 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60kV and 86kV, in 2kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- 3D Extended Volume (FOV 120 x 100 mm) with 3 sizes for a total of 6 combinations with automatic selection; with manual selection, it is possible to select an high voltage between 60 kV and 86 kV, in 2 kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.
- 3D Airways (FOV 120 x 100 mm) with 3 sizes for a total of 6 combinations with automatic selection; with manual selection, it is possible to select a high voltage between 60 kV and 86 kV, in 2 kV steps and anodic current from 2 mA to 12.5 mA in the R20 scale steps.

- Cephalometric L-L projections in the formats 18x24, 24x24, 30x24 and 18x18, 24x18, 30x18; the selection between HS High Speed and HD High Definition is available;
- Cephalometric A-P projections in the format 24x24 and 24x18 the selection between HS High Speed and HD High Definition is available;
- Carpus Projection in the format 18x24, only in HD High Definition mode.

Note of cephalometric image formats:

For user convenience, the CEPH projections are named following the conventional format of the film-cassettes (24 cm), although the vertical active area of the cephalometric sensor is 22.8 cm.

4.2. Block diagram

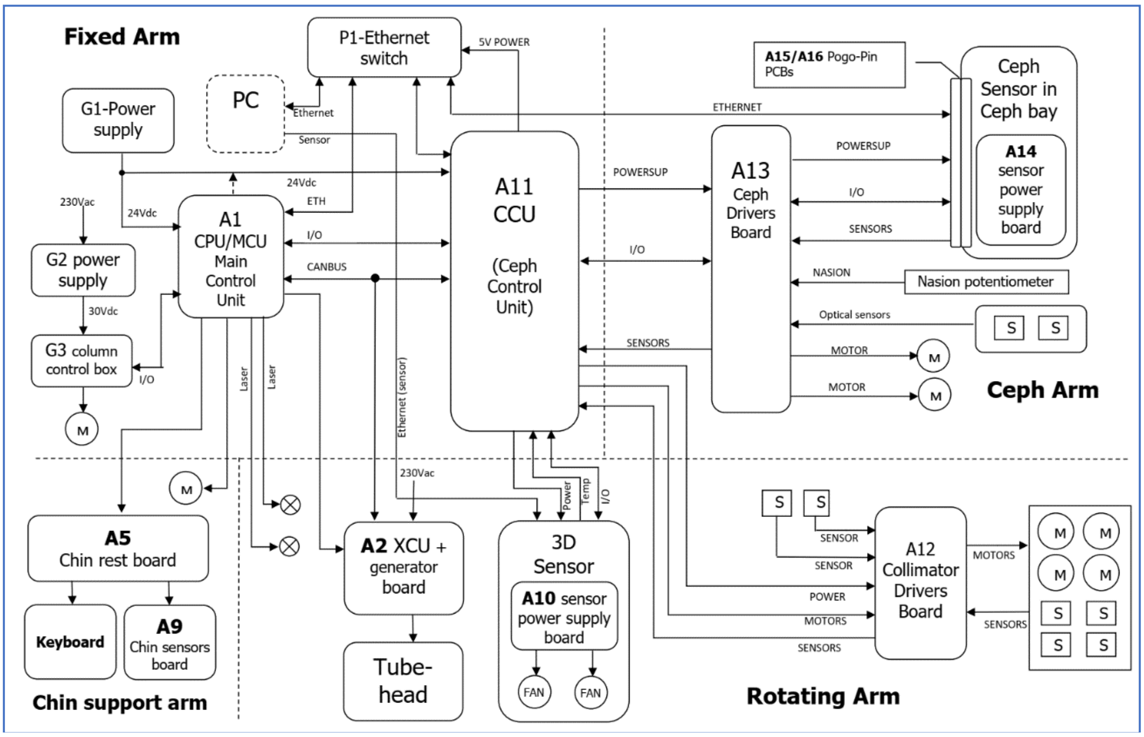
4.2.1. Block diagram I-Max 3D

MCU board A1 is the main board that manages directly all the components of the unit.
It is connected to the following components:

- Power supply assembly (G1)
- Chin Rest motor and collimator motor
- Zero position sensors
- X-ray button
- External signal board (A6)
- Lift motors control rack (G2)
- Generator board (A2) ---> (Tubehead)
- Overlay keyboard
- 3D sensor Power board
- Sensor 3D -→ (PC) Ethernet 1
- Host PC → Ethernet 2

MCU board and HF board are equipped with a local microcontroller that shares information using a CANbus transmission line and protocol.

4.2.2. Block diagram I-Max CEPH 3D



MCU board A1 is the main board that manages directly all the components of the unit.
It is connected to the following components:

- Power supply assembly (G1)
- Chin Rest motor
- Zero position sensors
- X-ray button
- External signal board (A8)
- Lift motors control box (G3)
- Generator board XCU (A2) ---> (Tubehead)
- CEPH Control Board (CCU, A11)
- Collimator driver board (A12)
- CEPH Driver board (A13)
- CEPH Sensor power supply board (A14)
- Overlay keyboard
- 3D sensor Power board (A10)
- 3D Sensor --> (PC) Ethernet 1
- CEPH sensor and host PC via a 5-ports ethernet switch

MCU board, CCU board and HF board are equipped with a local microcontroller that shares information using a CANbus transmission line and protocol.
An additional power supply assembly (G2) is directly connected to the column driver.

4.2.3. Power supply circuit

It is positioned in the top part of the unit and it is mainly composed by mains switch (S1), line filter (Z1), a 24Vdc 7.5A switching mode power supply (G1), located under the MCU board which supplies 24 Vdc to the logic boards, a 30Vdc power supply (G2) that supplies the lift motor.

- G2 power supply provides power to the motor control box (G3) which dirves the up/down motor (M1). located in the lower part of the unit.
- Safety switch S2 located in the top side of the unit (red button) cuts power **ONLY** to the up/down motor in case of malfunction
- Mains voltage is also provided to the Generator Board A2 used to generate High voltage to the tube head.

Note
The S2 emergency switch **doesn’t cut power to the X-ray generator** or to other circuits, **therefore mains voltage is still present** in the unit even when the S2 emergency swith has been pressed.

The unit does not include a voltage selector circuit for the mains voltage. Therefore, the unit is manufactured in different versions, depending on the line voltage of the installation place.

4.2.4. MCU board (A1)

It is located on top of the unit.
Main tasks are:

- General controlling of the unit, receiving the signals from the keyboard and from the different optical sensors.
- Communicating to the PC via ethernet connection.
- Driving of the stepper motors of Rotation, Y axis and chin rest.
- Monitoring the functioning of the motors through the analysis of the signals (zero position) coming from the zero position light sensors.
- Driving of the HF group (Generator board and tubehead) in order to provide the X-ray doses set by the operator on the PC (kV and mA set point) and in the meantime, check the functioning of this group through the managing of the relevant alarm signals.
- Driving of the x-ray button signal and the digital sensor board used to synchronize sensor acquisition with X-ray emission.
- Activation of the 2 laser centering devices.
- Managing of the alarms that can be generated by anomalous conditions present in the unit and caused by the operator or by a fault. These signals are sensed by the local MCUs and signal led using specific CANBus messages and reading temperature sensor placed on the 3D sensor power board.

MCU includes also the configuration and calibration data stored in the EEPROM memory and the HW key to activate the optional XP exam package and extended volumes package.

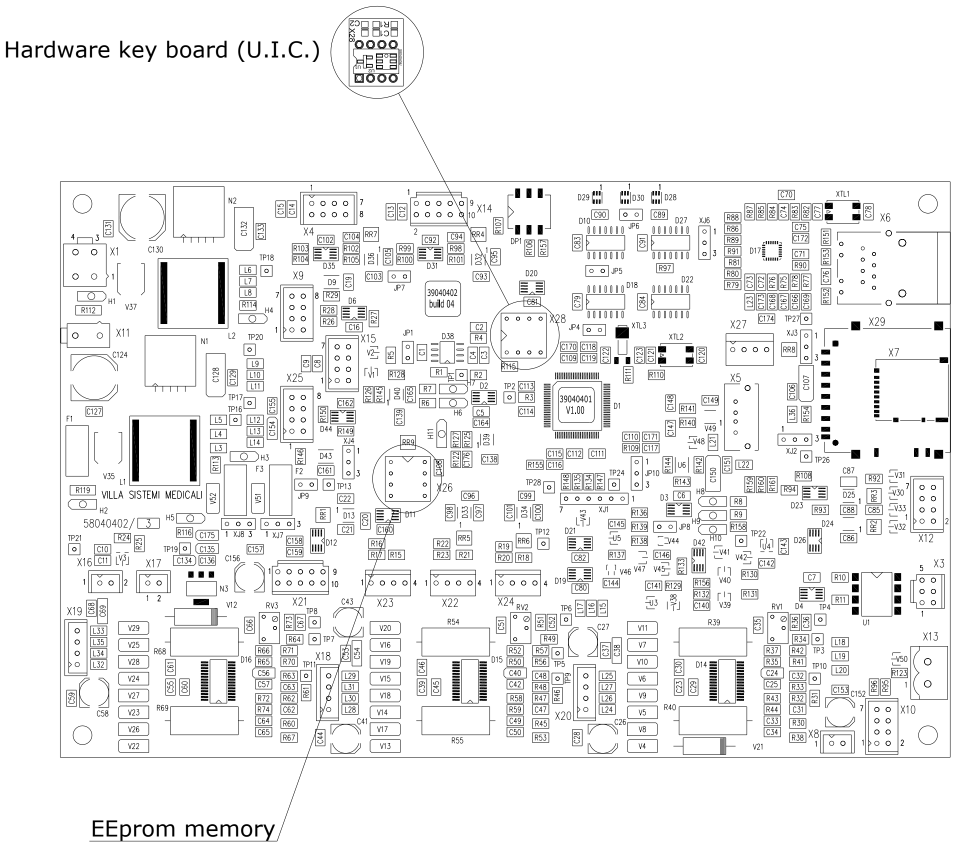


Figure 2

4.2.4.1. MCU board DIP Switches

The following table shows the different modalities of DIP Switches present on the MCU board.

Code (*)	1	2	3	Function
0	ON	ON	ON	Normal mode
1	OFF	ON	ON	EEPROM reset (see paragraph 9.2.2.1)
2	ON	OFF	ON	Exhibition demo mode allows rotation without X-ray emission (see paragraph 7.15.2)
4	ON	ON	OFF	- Axis alignment service mode: used to check laser centering rotating between the arm 0°, 90° and 180° positions by pressing >0<.
5	OFF	ON	OFF	- MCU bootloader forced by DIP switches

** It is possible to see this code by keeping the MCU SD card log (see paragraph 11.2.1.2)*

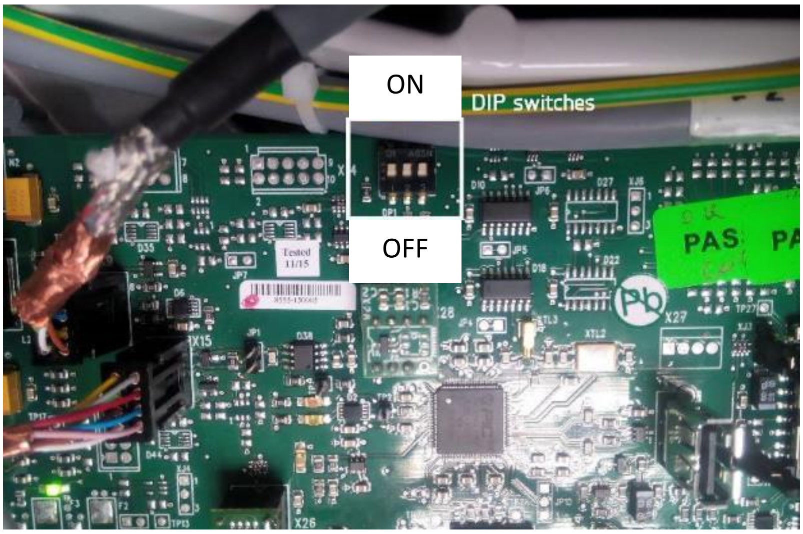


Figure 3

4.2.5. Generator board (A2) and Tubehead

The Generator board and the tubehead are located on the rotating arm. The power supply voltage is directly provided by the mains line.
Generator board includes a µprocessor which communicates with the MCU board (A1) through the CANBus cable (X15-X32). This cable also has a dedicated wire to bring the X-ray button signal to this board, so the "dead man switch" method is generated directly on the board.

The high frequency (HF) circuit is based on an inverter circuit working at the frequency about 100kHz, which drives the tubehead through an output stage based on IGBT components.

The Generator board receives the signals concerning the X-ray dose to provide (kV and mA), from the MCU board through CANBus messages; it is the Generator µprocessor that generates the commands used for the X-ray emission. The Generator board provides to the tubehead the voltages that drive the high voltage transformers that then drive anode and filament of the X-ray tube, also giving the relevant timing.

The tubehead is composed by the X-ray tube (CEI OPX 105-12) inserted in a sealed container, together with the high voltage transformers, filled with dielectric oil.

The Generator board controls the X-ray emission parameters feedbacks, generated by the tubehead. Any anomalies are then communicated to the MCU board (A1) which generates error codes to alert the operator.

4.2.6. 3D Sensor Power board (A10)

It is located behind the 3D sensor support.
The main tasks are:

- Give the power supply to the 3D Sensor.
- Give to the MCU the temperature of the 3D Sensor, through which the system can manage the switching ON / OFF of fans, if present, and the 3D sensor power supply.
- Allows the transmission of the 3D exams clock signal from the Generator board (A2) through the MCU to the 3D Sensor.

4.2.7. CCU CEPH Control Board (A11)

Its main tasks are:

- Managing the stepper motors of the CEPH arm and 4 blade primary collimator.
- Monitoring the functioning of these motors through the analysis of the signals (zero position) coming from the zero position light sensors.
- Managing the potentiometer on the nasion
- Managing the passage of the 3D sensor from pano/3D position to CEPH position.
- Driving of the HF group (Generator board and tubehead) for the CEPH exams, in order to provide the X-ray doses set by the operator on the PC (kV and mA set point)
- Managing of the alarms that can be generated by anomalous conditions present in the cephalometric arm and collimator.

4.2.7.1. CCU board DIP Switches

The following table shows the different modalities of DIP Switches present on the CCU board.

Code (*)	1	2	3	Function
0	**ON**	**ON**	**ON**	Normal mode
1	**OFF**	**ON**	**ON**	CCU bootloader forced by DIP switches

** It is possible to see this code by keeping the MCU SD card log (see paragraph11.2.1.3)*

4.2.8. Collimator Driver Board (A12) - only

It is located in the rotating arm just above the collimator itself.
On this board there are the stepper motor drivers of the 4 blades collimator.
It is also an interconnection board to route the cables of collimator zero sensors and 3D detector open/close position sensors to the Control Units Boards.

4.2.9. CEPH Driver Board (A13)

It is located in the bottom part of CEPH unit. It can be accessed after removing a dedicated cover in the bottom part of the CEPH device.

- On this board there are the stepper motor drivers of the cephalometric arm.
- It is also an interconnection board to route the cables (power supply, signals and zero sensors) from the machine to the cephalometric arm.

4.2.10. CEPH sensor power supply board (A14)

It is located Inside the CEPH sensor enclosure.
The main tasks are:

- Give the power supply (12V) to the CEPH Sensor.
- Give to the MCU the temperature of the CEPH Sensor, through which the system can manage the switching ON / OFF of its power supply.

4.3. Keyboard - Description and functions

Figure 4 shows a general view of I-Max 3D & I-Max CEPH 3D control Interface.

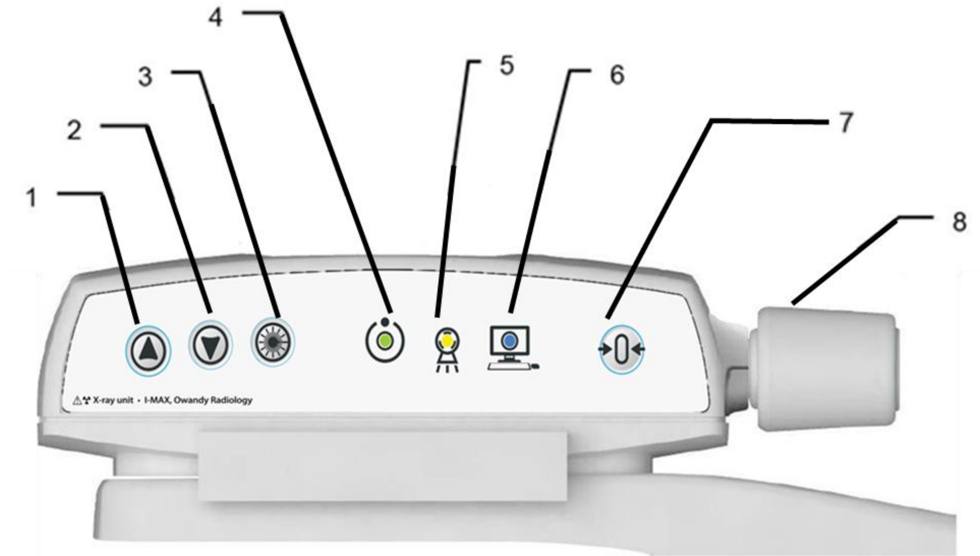
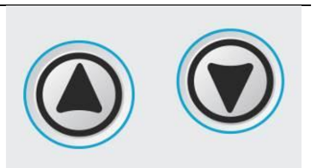


Figure 4 - Keyboard

Label	Description	
1 & 2	The up/down movement of the column is controlled by the corresponding keys. The movements are enabled during equipment setting. Column movement is not possible if the emergency button is pressed.	
3	The "Luminous centring device" key turn the laser centring devices ON/OFF, allowing the correct positioning of the patient.	
4	Light indicator of "Machine Ready" status: • Green fixed, alerts the user that by pressing the X-ray button, X-ray emission will start • Green blinking slowly, indicates that by pressing >0< button, axis reset will start, • Green blinking fast, indicates the equipment cooling status.	
5	Light indicator "X-Ray Emission" status. It indicates the emission of X-rays.	

Label	Description	
6	Light indicator of "Computer connection" status: • Blue fixed, computer connection established, • Blue blinking slowly, waiting for computer connection. No X-ray emission available • Blue blinking fast, the equipment is in error state. Refer to the GUI for error description.	
7	The "Centring/Patient Entrance" key is used to: • Start/Stop the exam procedures • Put the rotation arm in the patient entrance position at the end of the exam.	
8	Temple clasps closing/release knob.	
	Chin rest control LED: • White fixed, the chin rest is correct for the selected exam • White blinking, the chin rest is not present or not correct for the selected exam	

5. TECHNICAL CHARACTERISTICS

General features	
Type	I-Max 3D & I-Max CEPH 3D
Manufacturer	Owandy Radiology
Class	Class I with type B applied parts according to IEC 60601-1 classification.
Protection degree	IPX0 standard device
Line voltage	99-264 V
Rated line voltage	110--240V
Line frequency	50/60Hz
Maximum line current	14.5A @115V 50/60Hz 6A @ 230V 50/60Hz
Technical factors for maximum line current	86kV, 12.5mA
Power consumption	1.8kVA @ 115V 50/60Hz 1.4kVA @ 230V 50/60Hz
Protection fuse (F1)	20 A T 250V 6.3x32 mm 10kA@125V 8 A T 250V 6.3x32 mm 200A@250V
Column protection fuse (F2) I-Max 3D	3 A T 250V 6.3x32 mm 10kA@115V 1.6 A T 250V 6.3x32 mm 100A@250V
Column protection fuse (F2) I-Max CEPH 3D	4 A T 250V 6.3x32 mm 10kA@125V 2.5 A T 250V 6.3x32 mm 100A@250V
Maximum Line apparent resistance	0.2 Ω max (96-197 V) 0.5 Ω max (197-264 V)
Rated output voltage (kVp)	60 - 86kVp, with 2 kVp steps
Anodic current	2 - 12.5mA, with R20 scale steps (2, 2.2, 2.5, 2.8, 3.2, 3.6, 4, 4.5, 5, 5.6, 6.3, 7.1, 8, 9, 10, 11, 12.5)
Total filtration	≥ 2 mm Al eq. @ 86 Kv ref. IEC 60601-1-3 Par. 7.1

Exposure times	
Panoramic exam (PAN)	14 s Adult / 12.8 s Child
Emi-panoramic exam	7.7 s Adult / 7.1 s Child
Improved orthogonality panoramic exam	11.5 s Adult / Child
Reduced dose panoramic exam	11.6 s Adult / 10.4 s Child
Frontal dentition	4.1 s Adult / Child
Bitewing R, Bitewing L	3.1 s Adult / Child
Bitewing R&L	6.2 s Adult / Child
TMJ mouth closed/open	10.6 s for left and right joint in open and closed condition
TMJ single phase	5.3 s
Sinus P/A projection	9 s
3D exams (except TMJ 3D)	5.7 s
TMJ 3D	5.0 s
Latero lateral 18x24 and 18x18 cephalometric exam (I-Max CEPH 3D only)	9.1 s HD / 4.4 s HS
Latero lateral 24x24 and 24x18 cephalometric exam (I-Max CEPH 3D only)	12.1 s HD / 5.8 s HS
Latero lateral 30x24 and 30x18 cephalometric exam (I-Max CEPH 3D only)	15.1 s HD / 7.3 s HS
Antero posterior 24x24 and 24x18 cephalometric exam (I-Max CEPH 3D only)	12.1 s HD / 5.8 s HS
Carpus (I-Max CEPH 3D only)	4.5 s
Carpus (I-Max CEPH 3D only)	9.1 s
Exposure time accuracy	± 5 % or ± 20ms whichever is greater

Exam modes	
Exam selection	• Automatic selection for Adult and Child, 3 Sizes • 3 biting modes (Panoramic exam) • Manual selection
Panoramic exam NOTE: Some of these exams are optional and depend on the system configuration.	• Standard panoramic • Half panoramic L/R • Improved orthogonality panoramic • Reduced dose panoramic • Frontal dentition • Bitewing L/R • Bitewing L and R
TMJ (Temporal Mandibular Joint) exam	TMJ open and closed mouth
Sinus exam	Sinus P/A projection
Volumetric 3D exams	Automatic selection for Adult and Child, 3 sizes chosen between: entire Dentition, Mandibular Dentition, Maxillary Dentition, Small Volumes (frontal, premolar, molar), TMJ Left, TMJ Right, Sinus

3D Dentition reconstructed volume	
Entire volume (*)	85 mm x 93 mm (Diameter x Height)
Mandibular and Maxillary volume (*)	85 mm x 50 mm (Diameter x Height)
Small volumes	50 mm x 50 mm (Diameter x Height)
Extended volumes	120 mm x 100 mm (Diameter x Height)
Cephalometric exams	
Lateral projections	formats 18x24, 24x24, 30x24 and 18x18, 24x18, 30x18
Antero-posterior projections	format 24x24 and 24x18
Carpus exam	format 18x24

Note of cephalometric image formats:
For user convenience, the CEPH projections are named following the conventional format of the film-cassettes (24 cm), although the vertical active area of the cephalometric sensor is 22.8 cm.

(*) In case collimator kit code 6604061200 is present, the values will change to: Entire volume 80 mm x 80 mm (Diameter x Height); Mandibular and Maxillary volume 80 mm x 50 mm (Diameter x Height)

Image magnification	**Geometric magnification**	**Magnification after software correction (*)**
Adult / Child standard Panoramic	1 : 1.28 (constant over dentition part)	1 : 1
TMJ open/closed mouth	1 : 1.25 (nominal)	1 : 1
Sinus	1 : 1.27 (nominal)	1 : 1
Cephalometric exams	1 : 1.1 (nominal)	1 : 1
Carpus exam	1 : 1.06 (nominal)	1 : 1

(*) Warning
The declared image magnification value is valid after proper software calibration.

Note
I-Max 3D & I-Max CEPH 3D is based on a standard dentition and ascending rami shape.
This shape, based on statistical studies, establishes a form for the dentomaxillofacial complex, adopted as "standard".
I-Max 3D & I-Max CEPH 3D follows a rototranslation path which maintains the magnification factor as stated in the Technical Characteristics of each type of exam as constant along this "standard" shape only along the dentition area. The patient’s anatomy can differ significantly from the statistical model, so the magnification factor is not maintained and may be different from the value stated. Based on experience and competence, the user has to judge this variation.
In any case, TMJ radiography cannot be used to perform calculations of distances, angles etc. on the film.

Tube-head characteristics	
Model	MPV 05
Manufacturer	Owandy Radiology
Maximum tube voltage	86 kVp
kVp accuracy	± 8 %
Maximum anodic current	12.5 mA
Anodic current accuracy	± 10 %
Duty cycle	1 : 16
Reference loading conditions related to maximum energy input to the anode	2812.5 mAs/h @86 kVp
Nominal power	1.075 kW (86 kVp - 12.5 mA)
Total filtration	≥ 2.5 mm Al eq. @ 86 kVp
HVL (Half value layer)	> 3.2 mm Al eq. @ 86 kVp
Transformer insulation	Oil bath
Target angle and reference axis	See Figure 6
Cooling	By convection
Leakage radiation at 1 m	< 0.5 mGy/h @ 86 kVp - 12.5 mA - 3s duty cycle 1/16
Tube-head maximum thermal capacity	310kJ

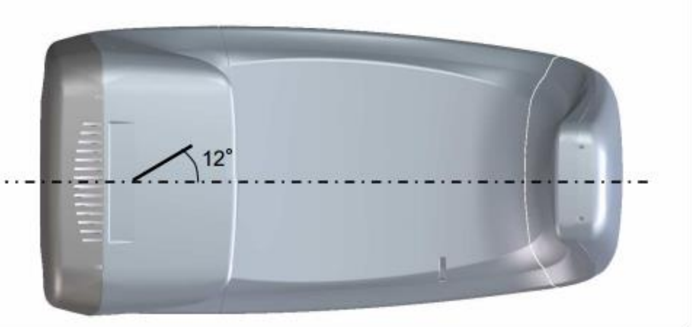


Figure 5: Tube-head target angle (view from the bottom)

X-ray tube characteristics	
Manufacturer	CEI
Type	OPX 105-12
Nominal focal spot	0.5 EN 60336
Inherent filtration	0.8 mm Al eq. @ 86 kV
Anode tilt	12°
Anode material	Tungsten
Nominal maximum voltage	110 kVp
Filament max current	4 A
Filament max voltage	6.7 V
Anode thermal capacity	30 kJ
Anode thermal capacity during continuous operation	300 W

Laser centring devices

2 laser beams are used for patient positioning; beams that align the sagittal and Frankfurt planes (please refer to relevant paragraphs for a detailed explanation).

LN60-650	
Wave length	650 nm
Divergence	< 2.0 mRad
Optical power on the working surface	< 1 mW
Laser class	Class 1 laser product according to IEC standard 60825-1:2014

LN60-635	
Wave length	635 nm
Divergence	< 2.0 mRad
Optical power on the working surface	< 1 mW
Laser class	Class 1 laser product according to IEC standard 60825-1:2014

03015L	
Wave length	650 nm
Divergence	< 2.0 mRad
Optical power on the working surface	< 1 mW
Laser class	Class 1 laser product according to IEC standard 60825-1:2014

IDT065001P	
Wave length	640 nm
Divergence	< 2.0 mRad
Optical power on the working surface	< 0.39 mW
Laser class	Class 1 laser product according to IEC standard 60825-1:2014

3D Digital sensor	
Detector type	CMOS flat panel
Sensitive Area (H x L)	139.2 : 150.5 x 113.7 : 119.6 mm
Pixel dimensions	100-120 µm 200-240 µm (2x2 binning)
Number of pixels (H x L)	656:812 x 616:740 600:726 x 494:598 (2x2 binning)
Voxel dimensions	145-175 µm HD mode. 72.5-87.5 µm XD mode (only in the models for which is intended)
Grey levels	16384 (14 bit) - 65536 (16 bit)
Resolution	Up to 4.16 lp/mm (non binning mode)
Sensor cover attenuation equivalent	< 0.4 mm Al eq.

Cephalometric Digital sensor (only for I-Max CEPH 3D)	
Detector type	CMOS flat panel
Sensitive Area (H x L)	228 x 6.7 mm
Pixel dimensions	99 µm 198 µm (2x2 binning)
Number of pixel (H x L)	2304 x 68 (non-binning mode)
gray levels	16384 (14 bit)
Resolution (spatial frequency at CTF=5%)	5 lp/mm (non-binning mode)
Sensor cover attenuation equivalent	< 0.4 mm Al eq.

Mechanical characteristics	
Focal spot to image receptor distance (panoramic and 3D)	52 cm (20")
Focal spot to image receptor distance (cephalometric)	165 cm (65")
Telescopic motorised column run (I-Max 3D)	66 cm (26”)
Telescopic motorised column run (I-Max CEPH 3D)	70 cm (27"1/2)
Maximum total height Note: For the wall mount model this value refers to the recommended installation height	219 cm (86")
Maximum total height (I-Max CEPH 3D)	223 cm (88")
Weight (I-Max 3D)	67 kg (148 lbs) base version
Column base (optional I-Max 3D only)	6 kg (13 lbs)
Weight (I-Max CEPH 3D)	123 kg (271 lbs)

Environmental conditions	
Minimum room size (I-Max 3D)	120 x 115 cm (47"x45")
Recommended room size (I-Max 3D)	160 x 150 cm (63"x59")
Minimum room size (I-Max CEPH 3D)	186 x 121 cm (75"x49")
Recommended room size (I-Max CEPH 3D)	200 x 130 cm (80"x52")
Working temperature range	+ 10° ÷ + 35°
Working relative humidity (RH) range	30% ÷ 75%
Working atmospheric pressure range	700 ÷ 1060 hPa
Temperature range for transport and storage	- 20° ÷ + 70°
Humidity range for transport and storage	< 95% without condensation
Minimum atmospheric pressure for transport and storage	630 hPa

Note
The handles of the equipment are covered with a special antibacterial paint which, thanks to the emission of silver ions, reduces the development of micro-organisms.

5.1. Dimensions

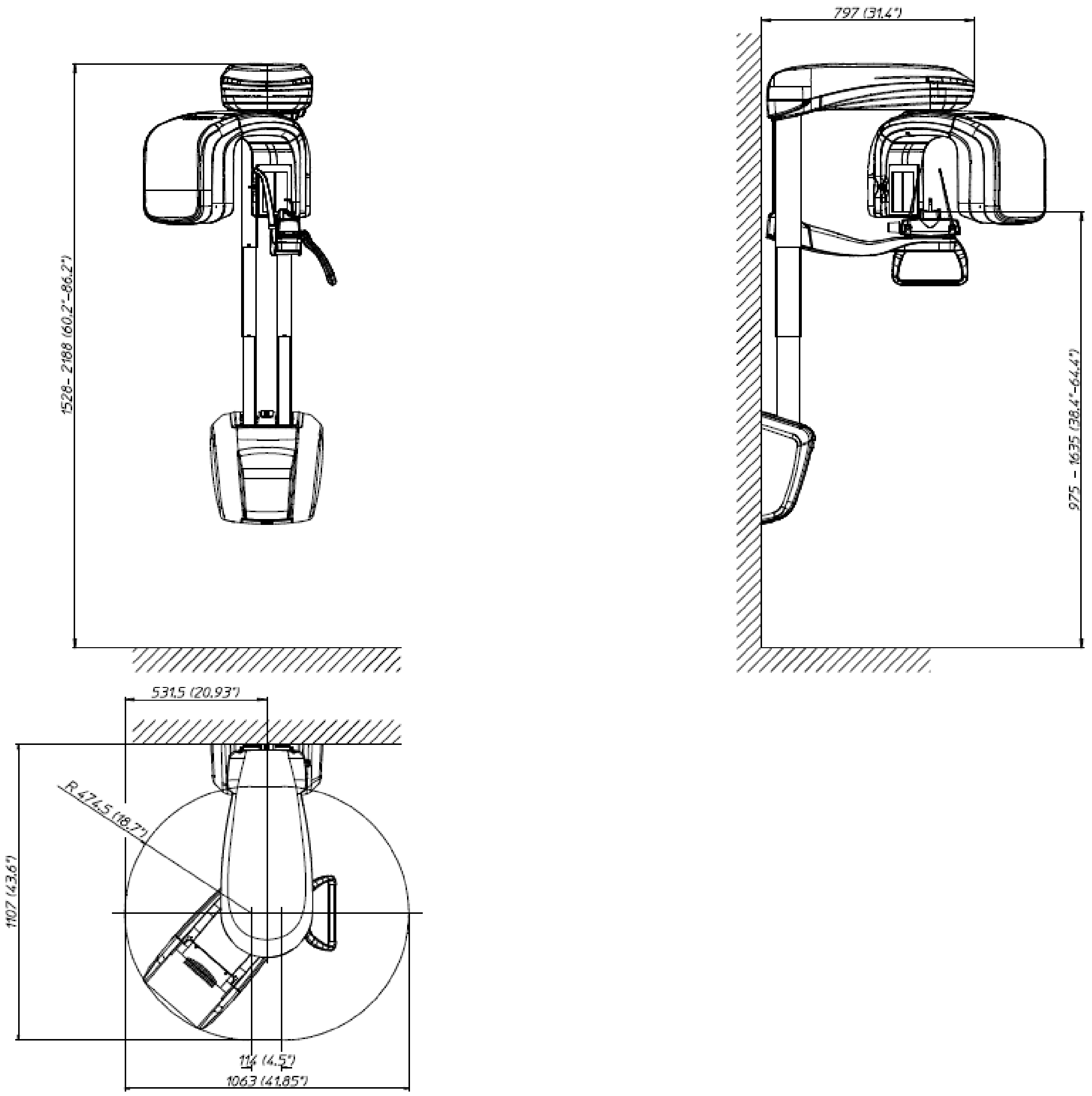


Figure 6: I-MAX 3D dimensions - Wall mounted version

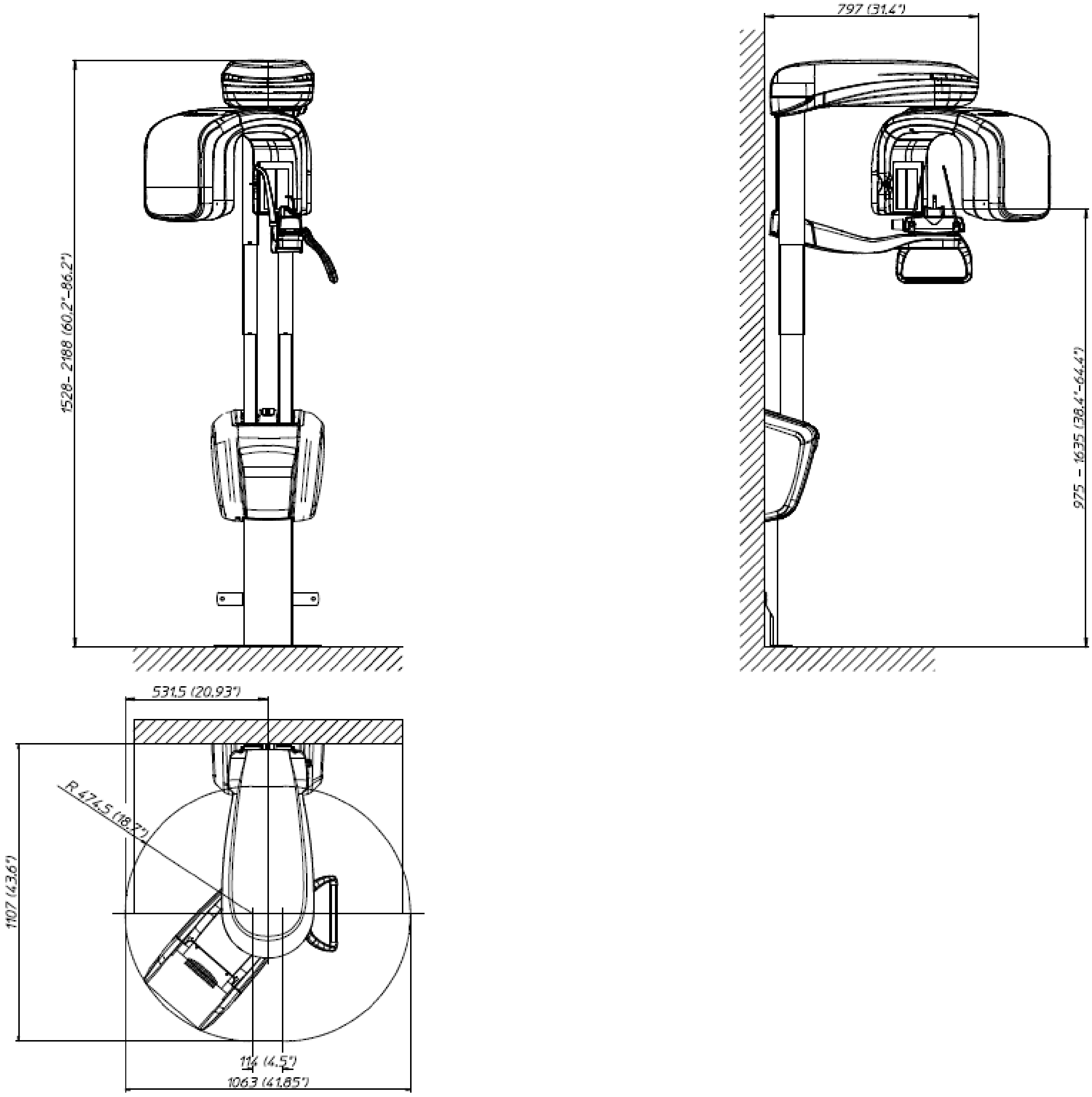


Figure 7: I-MAX 3D dimensions - Wall mounted with floor support version

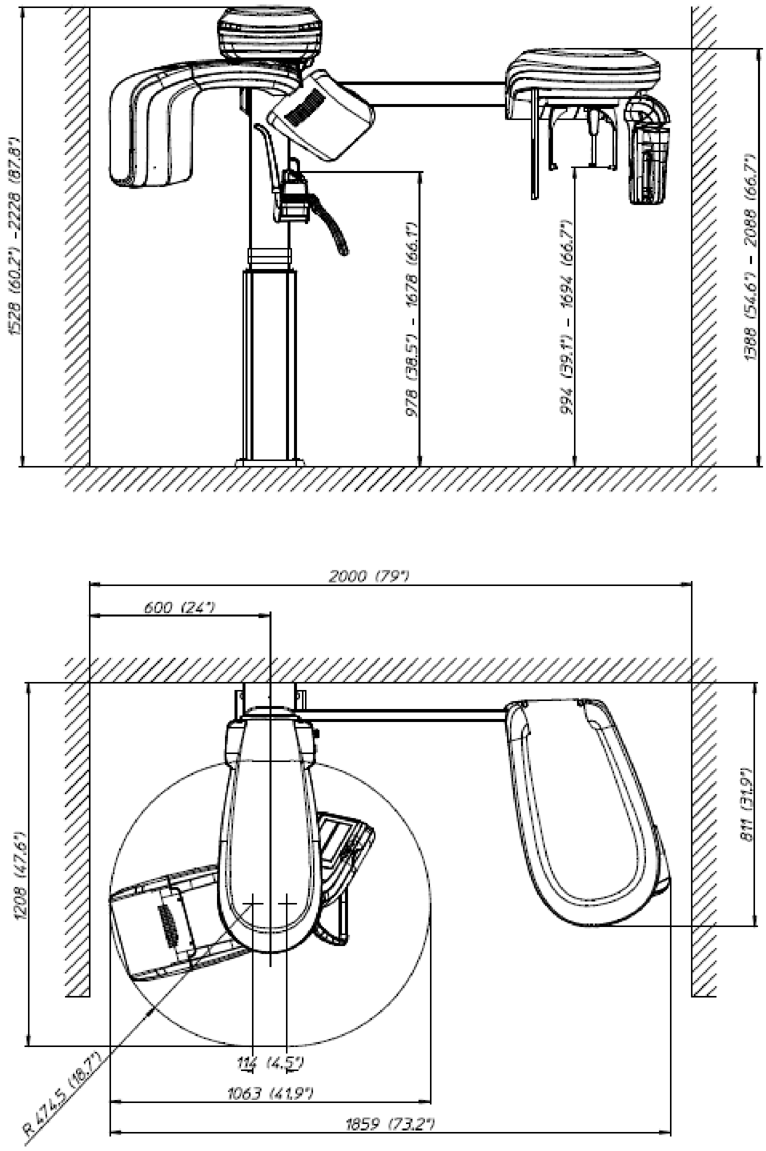


Figure 8: I-MAX 3D dimensions - Floor mounted version

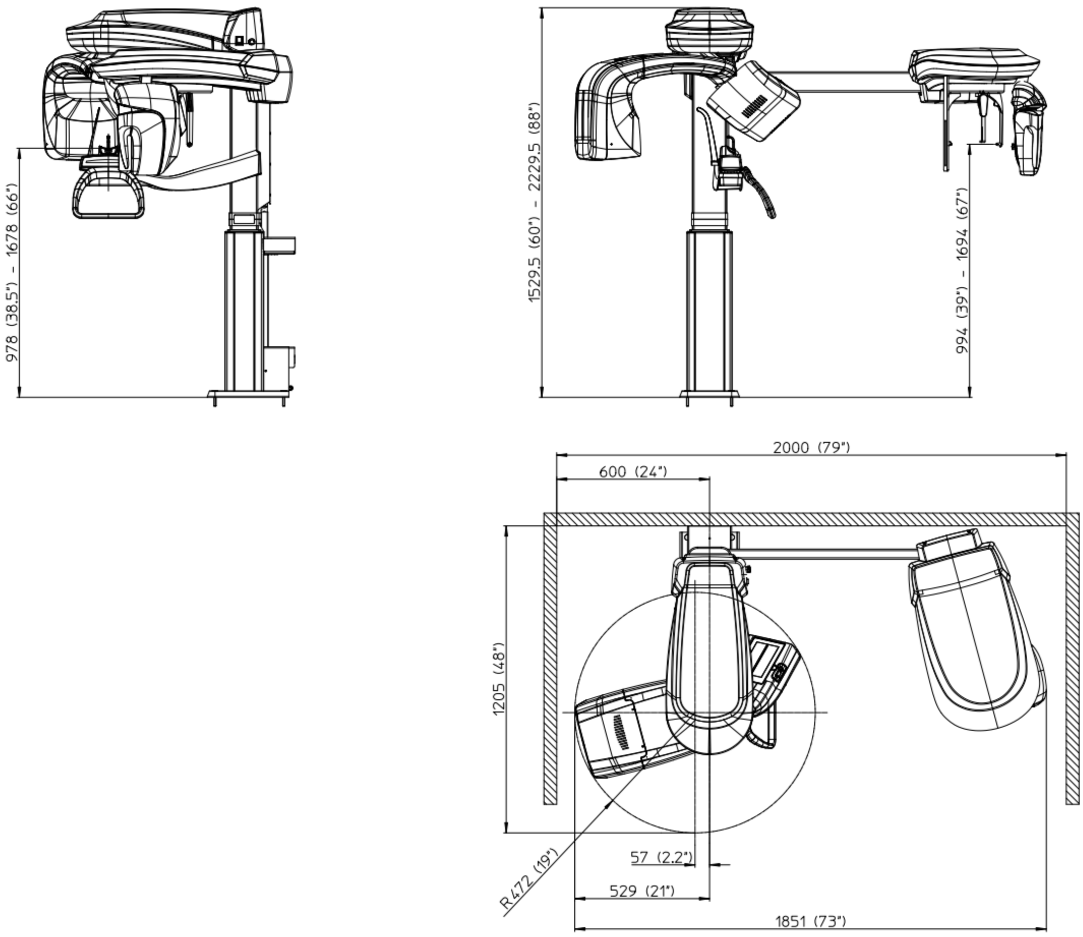


Figure 9: I-Max 3D & I-Max CEPH 3D dimensions - Wall mounted version

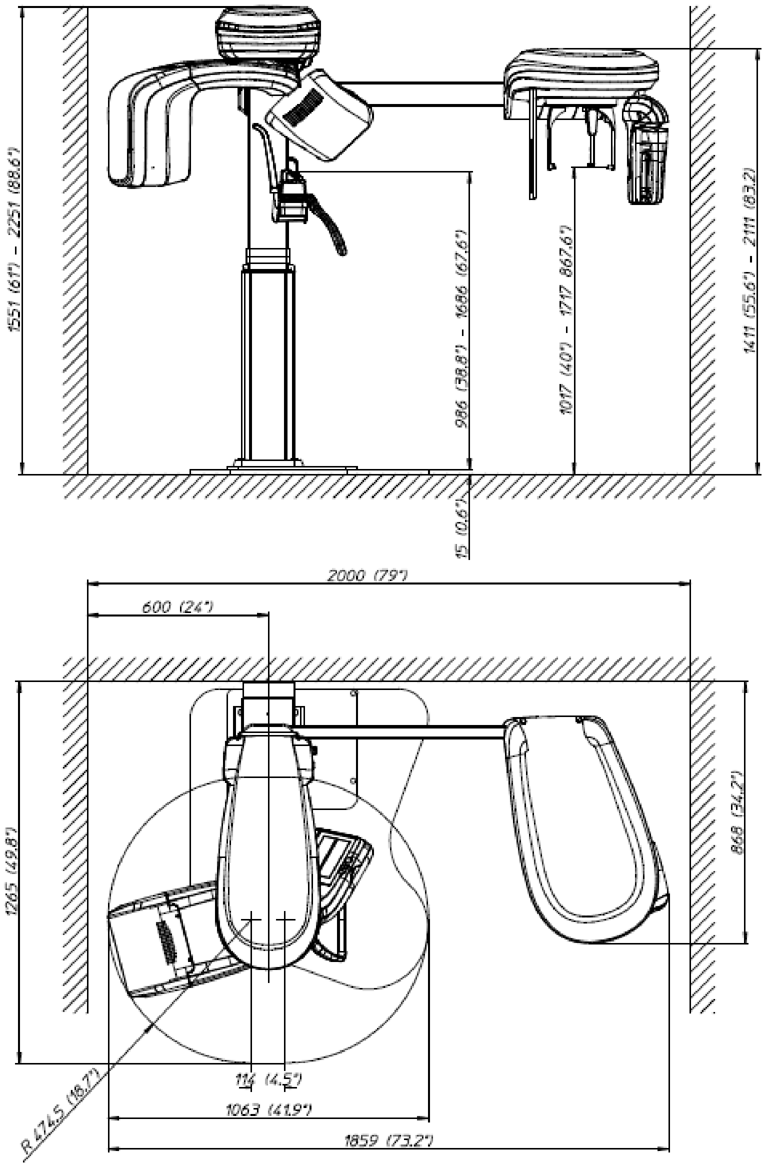
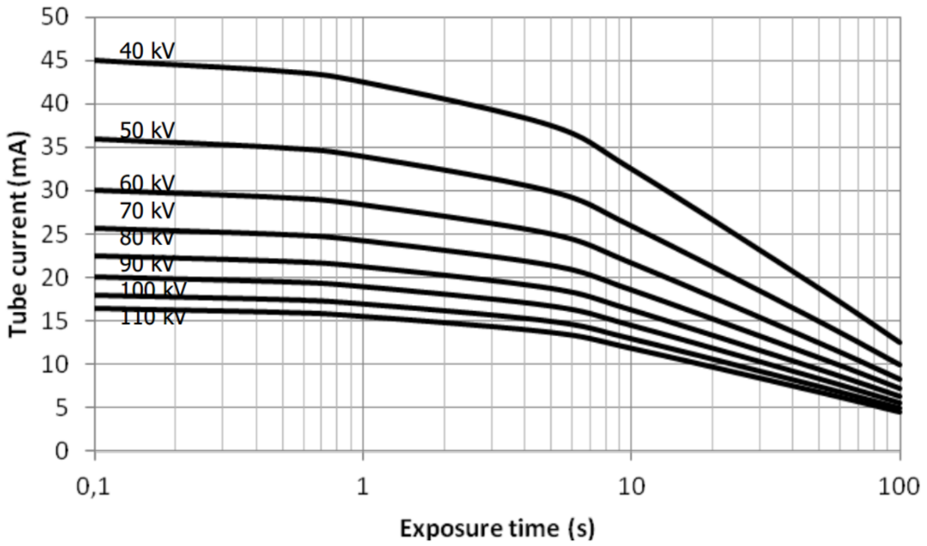


Figure 10: I-Max 3D & I-Max CEPH 3D dimensions - Floor mounted version

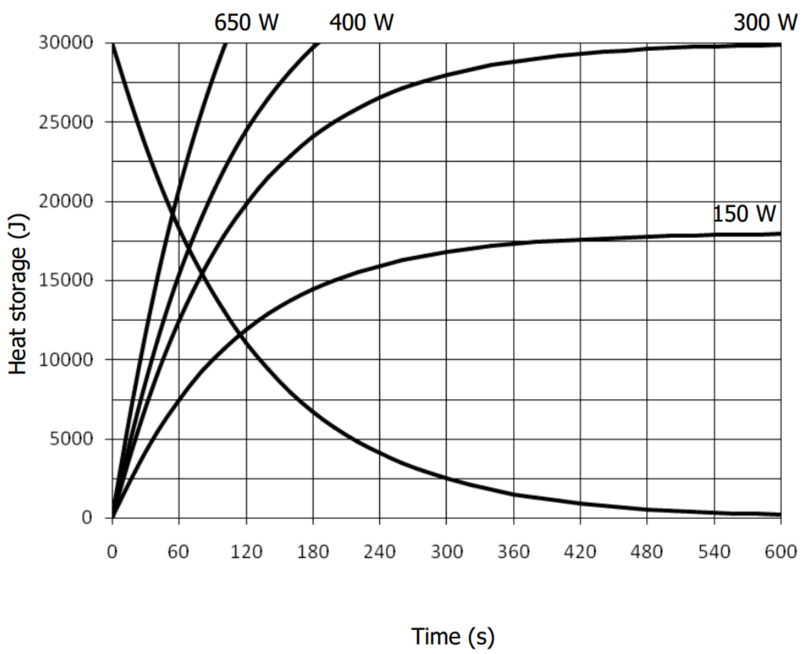
Warning for free standing floor mounted unit
In case the unit shall be moved for service or other extraordinary operation, maximum caution shall be taken to prevent the unit from tilting and falling to the ground.

5.2. Loading curve of the tube and cooling curve of the anode

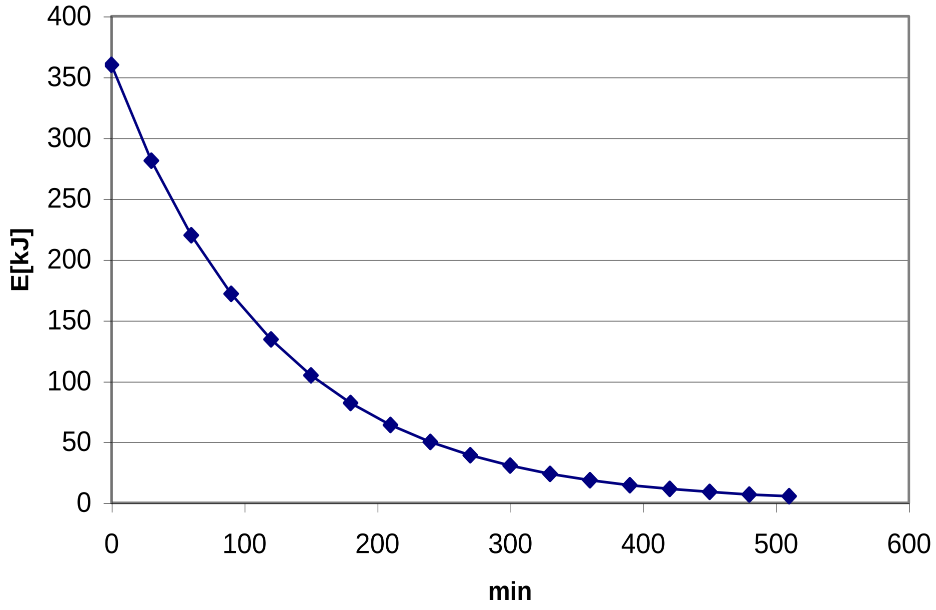
Tube "CEI OPX 105-12" (0.5 IEC 336)
Load



Anode cooling curve



Tube head cooling curve



5.3. PC requirements

The equipment is supplied with an Intel I350-T2VD dual port or with an Intel PRO1000 dual port Network Interface Card. It is mandatory to use this Network Card for connection with the equipment.

Warning
PC to be used with the machine must comply with the standard IEC 60950-1:2005.

Note on Monitor characteristics:
the PC and the monitor are not supplied with the equipment.
In order to properly view images taken with I-Max 3D & I-Max CEPH 3D, the PC monitor must have the following minimum characteristics:

- Resolution: 1366 x 768 pixels
- Colour depth: 16M of colours
- Contrast: 500:1
- Brightness 200cd/m^2

5.3.1. PC minimum characteristics

- Mother board with at least one free PCI express X16 slot (mandatory for the Dual Port Network Card provided with the unit).
- Processor Intel Core I5 (2.66 GHz Quad core).
- 4GB Ram.
- Hard drive 1TB.
- DVD recorder.
- Graphics card with the following specifications (they are mandatory):
  - chipset Nvidia
  - Global memory ≥ 1024 Mbytes
  - Capability (=architecture) ≥ Fermi (that’s to say: Fermi, Kepler, Maxwell).
- Operating System Windows 10 - 64bit.

Note
Using a PC with these minimum characteristics the High Definition mode of 3D exam is not supported. Use a PC with the suggested characteristics to use the High Definition mode.

5.3.2. PC suggested characteristics

- Mother board with at least one free PCI express X16 slot (mandatory for the Dual Port Network Card provided with the machine).
- Processor Intel Core i7 (4 cores 8 threads) 3 GHz or higher.
- 8Gb Ram.
- Hard drive 1TB.
- DVD recorder.
- Graphics card with the following specifications (ex : GTX 9 Go or NVIDIA® QUADRO® M2000):
  - chipset Nvidia
  - Global memory ≥ 4Gb
  - Capability (=architecture) ≥ Maxwell.
- Operating System Windows 10 - 64bit.

5.4. Software

The equipment Graphical User Interface can be run with the software provided with the machine or integrated in a third party imaging and database software that complies with the following specifications: it has to be CE marked as medical device of class IIa and integrate the equipment SDK according to what stated in the document PANOW3D API programmer's guide Vn (n is the document revision), contact Owandy Radiology to have the latest revision of the programmer's document.

The 3D exams can be viewed with any software that can import, view and manage 3D volumes saved in dicom slices with the following maximum dimensions:
- Normal resolution full volume: 532 slices, 492x492 pixels per slice, 12 or 16 bits, for a total of 484 kB/slice
- Full resolution 80x50 volume: 542 slices, 984x984 pixels per slice, 12 or 16 bits, for a total of 968 kB/slice.

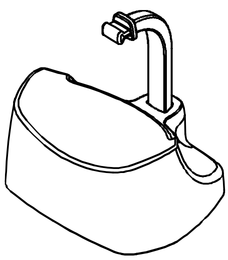
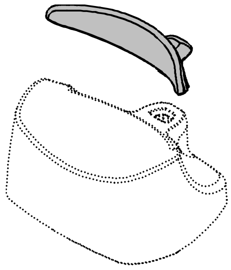
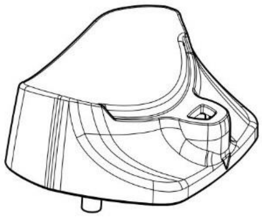
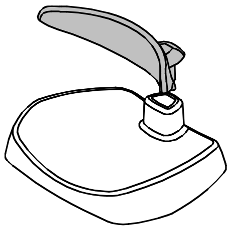
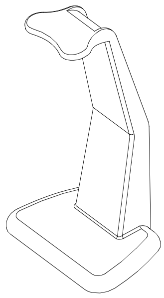
5.5. I-Max 3D & I-Max CEPH 3D – PC communication

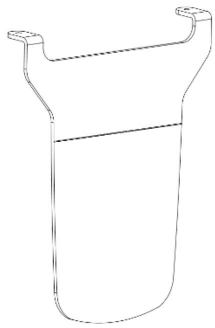
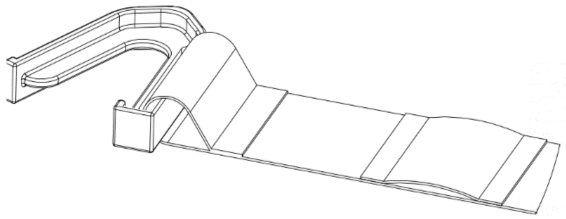
I-Max 3D & I-Max CEPH 3D requires connection to a host PC to transfer images and to exchange the machine status. The communication between I-Max 3D & I-Max CEPH 3D and computer requires two dedicated Giga-Ethernet channels that are provided by the dual port Network Interface Card supplied with the unit.
The information flow from I-Max 3D & I-Max CEPH 3D includes image data and system status messages that are exchanged only with the host PC via a point-to point connection separated from the rest of the network. The communication requires fixed IP addresses.
The two ethernet cables from the unit must be connected to such ports for the unit to operate correctly.
In order to properly operate the unit follow carefully the instructions reported at paragraph 7.6.
The system is provided with two Ethernet cat 5e cables in order to permit the PC connection. In case of replacement, cables of the same or superior category have to be used.
If the communication between I-Max and PC is not properly set problems in unit connection causing impossibility of acquisition or loss of frames causing distortion and artifacts on the images can occur.

Note
I-Max 3D & I-Max CEPH 3D is not intended to transmit or receive information to/or from other equipment through network/data couplings.

5.6. Separate parts supplied with I-MAX 3D & I-MAX CEPH 3D

I-MAX 3D & I-MAX CEPH 3D comes with the following removable accessories:

Chin rest for standard panoramic, supplied with removable appendix for edentulous patients	 
Reduced height chin rest for standard panoramic	
Lowered chin rest for 2D and 3D Sinus and 3D TMJ, made by lowered chin rest and appendix for edentulous patients	
Standard TMJ positioning support	
Left temple support	

Right temple support	
Hand plate support for carpus exam – Only for I-Max CEPH 3D	
Head strips for 3D exams	
Bites, bite protective sleeves, TMJ positioner protective and CEPH ear pins protective sleeves	Disposable and unsterilized parts. Replace after every use.

Note
These removable parts are considered "type B applied parts", in accordance with IEC 60601-1, edition 3.1.
Some of these parts do not carry identification codes due to their small size. The use of these parts on other devices is not possible, since they are parts designed specifically for the I-MAX 3D & I-MAX CEPH 3D.

5.7. Reference standard

Medical electrical equipment for extra-oral dental radiography I-Max 3D & I-Max CEPH 3D complies with:

IEC 60601 1: 2005 (3rd ed.)
Medical electrical equipment - Part 1: General requirements for basic safety and essential performance

IEC 60601 1: 2005 (3rd ed.) + Am1:2012
Medical electrical equipment - Part 1: General requirements for basic safety and essential performance

IEC 60601-1-6:2010 (3rd Ed.)
Medical electrical equipment - Part 1-6: General requirements for safety - Collateral Standard: Usability including IEC 62366: Application of usability engineering to medical devices.

IEC 60601-1-6:2010 (3rd Ed.) + Am1:2013
Medical electrical equipment - Part 1-6: General requirements for safety - Collateral Standard: Usability including IEC 62366: Application of usability engineering to medical devices.

IEC 60601-1-2:2007 (3rd Ed.)
Electromagnetic compatibility - Requirements and tests.

IEC 60601-1-2:2014 (4th Ed.)
Electromagnetic disturbances - Requirements and tests.

IEC 60601-1-3:2008 (2nd Ed.)
Medical electrical equipment - Part 1-3: General Requirements for Radiation Protection in Diagnostic X-Ray Equipment.

IEC 60601-1-3:2008 (2nd Ed.) + Am1:2013 (ed. 2.1)
Medical electrical equipment - Part 1-3: General Requirements for Radiation Protection in Diagnostic X-Ray Equipment.

IEC 60601-2-63:2012 (1st ed.)
Medical electrical equipment - Part 2-63: Particular requirements for the basic safety and essential performance of extra-oral dental X-ray equipment.

IEC 60601-2-63:2012 (1st ed.) + Am1:2017 (ed. 1.1)
Medical electrical equipment - Part 2-63: Particular requirements for the basic safety and essential performance of extra-oral dental X-ray equipment.

IEC 62366:2007 (1st Ed.)
Medical devices – Application of usability engineering to medical devices.

IEC 62366:2007 (1st Ed.) + Am1:2013
Medical devices – Application of usability engineering to medical devices.

IEC 62304:2006 (1st Ed.) + Ac:2008
Medical devices software – Software life-cycle processes.

IEC 62304:2006 (1st Ed.) + Am1:2015 (ed. 1.1)
Medical devices software – Software life-cycle processes.

IEC 60825-1:1993 (1nd ed.)
Safety of laser product – Part 1: equipment classification and requirements.

IEC 60825-1:2007 (2nd ed.)
Safety of laser product – Part 1: equipment classification and requirements.

EN-ISO 14971:2012
Medical Devices - Application of Risk Management to Medical Devices.

CAN/CSA-C22.2 No 60601-1:08
Canadian National deviations to IEC 60601-1.

CAN/CSA-C22.2 No 60601-1:14
Canadian National deviations to IEC 60601-1.

ANSI/AAMI ES60601-1:2005/A2:2010
US National differences to IEC 60601-1.

ANSI/AAMI ES60601-1:2005/(R)2012 and A1:2012
US National differences to IEC 60601-1.

CE 0051 Guarantees the compliance of I-Max 3D & I-Max CEPH 3D with Directives 93/42/EEC (as amended), 2011/65/EU, 2006/42/EC.

Classifications

I-Max 3D & I-Max CEPH 3D is an electrical medical X-ray device classified as class I type B according to EN 60601-1, with continuous operation and intermittent load.

According to 93/42/EEC Medical Devices Directive, the equipment is classified as class II B.

According to Canadian MDR, the equipment belongs to class II.

According to FDA 21 CFR, the equipment belongs to class II.

6. PRE-INSTALLATION

The instructions indicated in this and in the following chapter enable to perform a correct installation in order to grant a regular operation of I-Max 3D & I-Max CEPH 3D.
The supplier can supply the assistance and the necessary technical advice for pre-installation.
All masonry works and the pre-installation phase are at the customer's charge and must be performed complying with the indications given below.

The requirements for a correct installation of I-Max 3D & I-Max CEPH 3D are:

- minimum height of the room: 2.5 m (8.20') and a surface variable according to the configuration of I-Max 3D & I-Max CEPH 3D to be installed
- No heating devices in close proximity of the unit
- the entrances in the room, for the transport of the unit (after unpackaging), must have a minimum width of
  - 80cm (31.50") for I-Max 3D
  - 65 cm (25.6") for I-Max CEPH 3D

6.1. Electrical setting up

The main electrical characteristics of I-Max 3D and I-Max CEPH 3D are:

• Single-phase grounding supply	110-240 V ~
• Frequency	50/60 Hz
• Power consumption	1.8 kVA (at 115 V) 1.4 kVA (at 230 V)
• Current consumption	14.5 A (at 115 V) 6 A (at 230 V)
• Apparent line resistance	0.2 Ω (96-197 V) 0.5 Ω (197-264 V)
• Line voltage regulation	< 3 % at 99 V

⚠ **Warning**
The unit is classified as **"Permanently Installed"** according to EN 60601-1, meaning that the mains cable shall be permanently connected to the mains line.
DO NOT connect the unit to the power using a detachable plug, to avoid compromising the electrical safety.

⚠ **Warning**
The unit is classified as **"IPX0"** according to EN 60529, meaning that the unit provides **NO protection against the ingress of liquids**

The unit must be connected to a differential magneto-thermal switch, to separate the unit from the mains line in case of maintenance operations. This switch must comply with the electrical regulations in force in the country of installation.

The differential magneto-thermal switch must have a breaking capacity greater than or equal to 1500A.

The unit comes equipped with a 3-meters mains connection cable (13 AWG, 2.63 mm2) already connected to the unit mains terminals.

The installer is responsible for verification of the mains line characteristics in the installation site. The minimum recommended wire gauge is:

- 1.5 mm2 (16 AWG) for 200-240Vac nominal range power supply input.
- 2.63 mm2 (13 AWG) for 110-200Vac nominal range power supply input.

The general grounding must comply with the rules in force; a wrong quality of the grounding could be dangerous for the patient and operator's safety and might cause malfunction of the unit.

Other than the power supply, I-Max 3D provides the following connections.

All connections are located in the base of the unit and are protected by a metallic cover.

- **RJ45 Ethernet connection for 3D detector**: dedicated line for point-to-point connection from the 3D detector to the host PC. A Cat 6 cable (5m long) is supplied with the unit. In case a longer cable is needed, make sure the cable is Cat 6 or better.
- **RJ45 Ethernet connection for CEPH detector and system interface**: point-to-point connection from the unit to the host PC. A Cat 6 cable (5m long) is supplied with the unit. In case a longer cable is needed, make sure the cable is Cat 6 or better.
- **READY light**: The signal is active when the unit is ready to perform the exam. Normally Open dry Contact, maximum load 24V, 40W. Contacts X11-1 and X11-2
- **X-RAY ON light**: The signal is active during X-Ray emission. Normally Open dry Contact, maximum load 24V, 40W. Contacts X11-3 and X11-4

The unit only provides dry contacts relative to the above mentioned functions. Power supply for the relevant devices has to be provided externally, making sure not to exceed the indicated ratings.

- **Remote X-RAY button**: An external pushbutton can be connected so that the operator can start exposure from outside the exam room. It is mandatory to use a **MOMENTARY pushbutton** in order to guarantee "dead man" operation. The standard X-ray button supplied with the unit has the above characteristic. Contacts X51-3 and X51-4. Only a dry contact shall be connected to this input.

Warning
It is installer's responsibility to check the characteristics of the remote X-ray button.
No current or voltage must pass through remote control hand switch.
Wrong connections may damage the unit.

See paragraph 7.3 for details of the connections.

6.2. Packaging

6.2.1. I-Max 3D

I-Max 3D is delivered in a single carton-board box.
Package itself became a tool used to install the unit.

Contents	Packing dimension	Weight	
		Net	**Gross**
Complete unit	120x80x67 cm (47.3"x31.5"x26.4")	62 kg (137 lbs)	80 kg (176 lbs)

Note
The box mount shock detectors..

At the receiving and before install the unit, verify that those sensors have not been activated.

Warning
Owandy Radiology will not bear any responsibility for damages caused to the equipment due to improper unpackaging procedure, and for the relevant costs.

6.2.2. I-Max CEPH 3D

The unit is delivered on one pallet containing three cardboard boxes

Contents	Packing dimension	Weight	
		Net	Gross
Complete unit	150x100x H145 cm (59.1”x39.4”x57.1”)	123 kg (271 lbs)	165 kg (364 lbs)
Main unit	122x100x H63 cm (48”x39.4”x24.8”)	101 kg (223 lbs)	130 kg (287 lbs)
CEPH arm	150x92x H66 cm (59.1”x39.4”x26”)	22 kg (48 lbs)	26 kg (57 lbs)
<Empty> Filler box only for delivery	100x26x H63 cm (39.4”x10.3”x26”)	0	2 kg (11 lbs)

Note
A shock detector is applied to the packaging.

Upon receipt of the unit, check that the sensor has not been activated.
In case the sensor has been activated, immediately notify the forwarder and sign the delivery note as “Provisionally accepted”.

Warning
Owandy Radiology will not bear any responsibility for damages caused to the equipment due to improper unpackaging procedure, and for the relevant costs.

Note
The package will be used as a tool during the initial steps of the installation. Do not discard the packaging until installation has been completed and unit is fully operational.

6.3. Space requirements

6.3.1. I-Max 3D

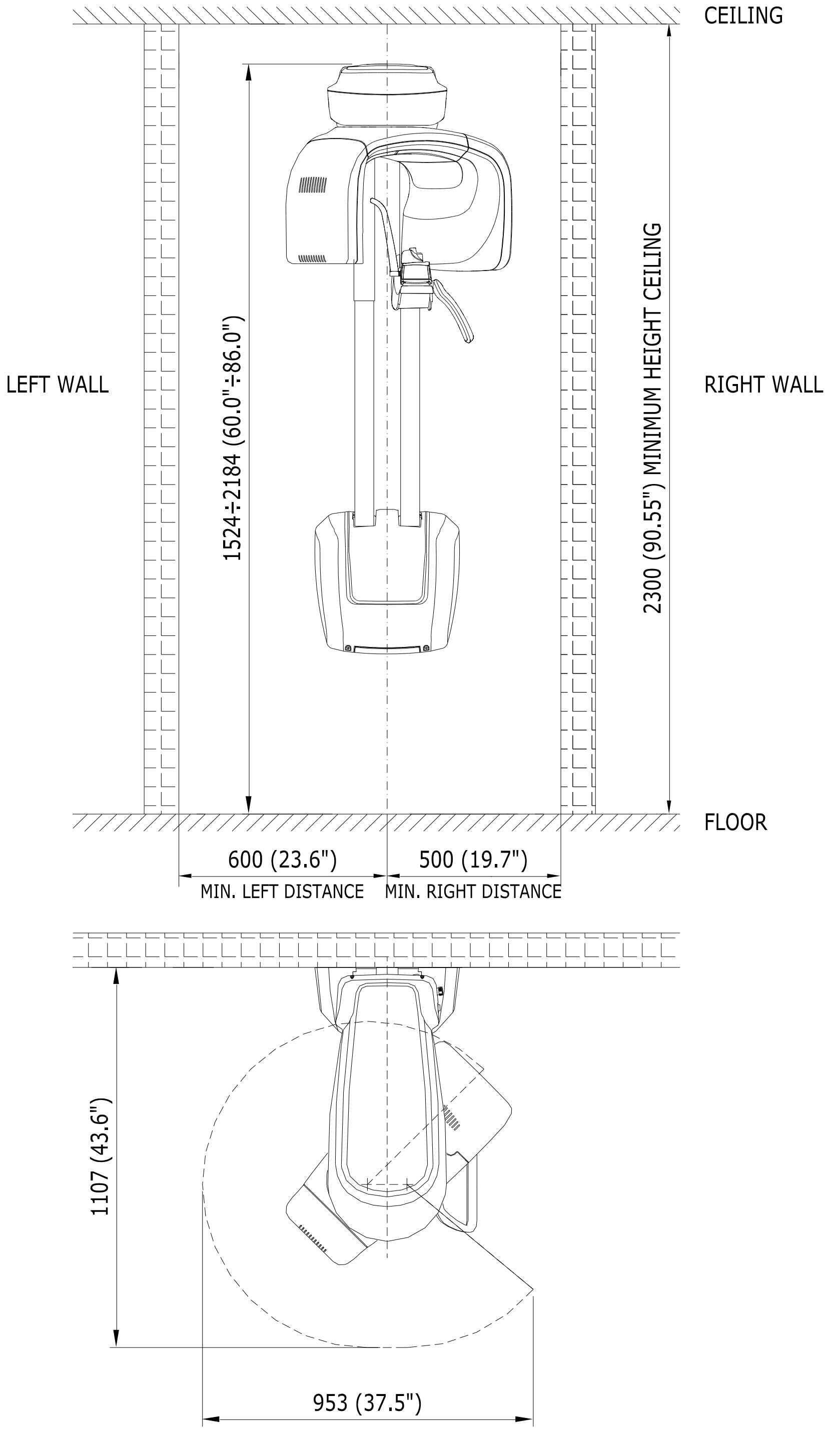


Figure 11

6.3.2. I-Max CEPH 3D

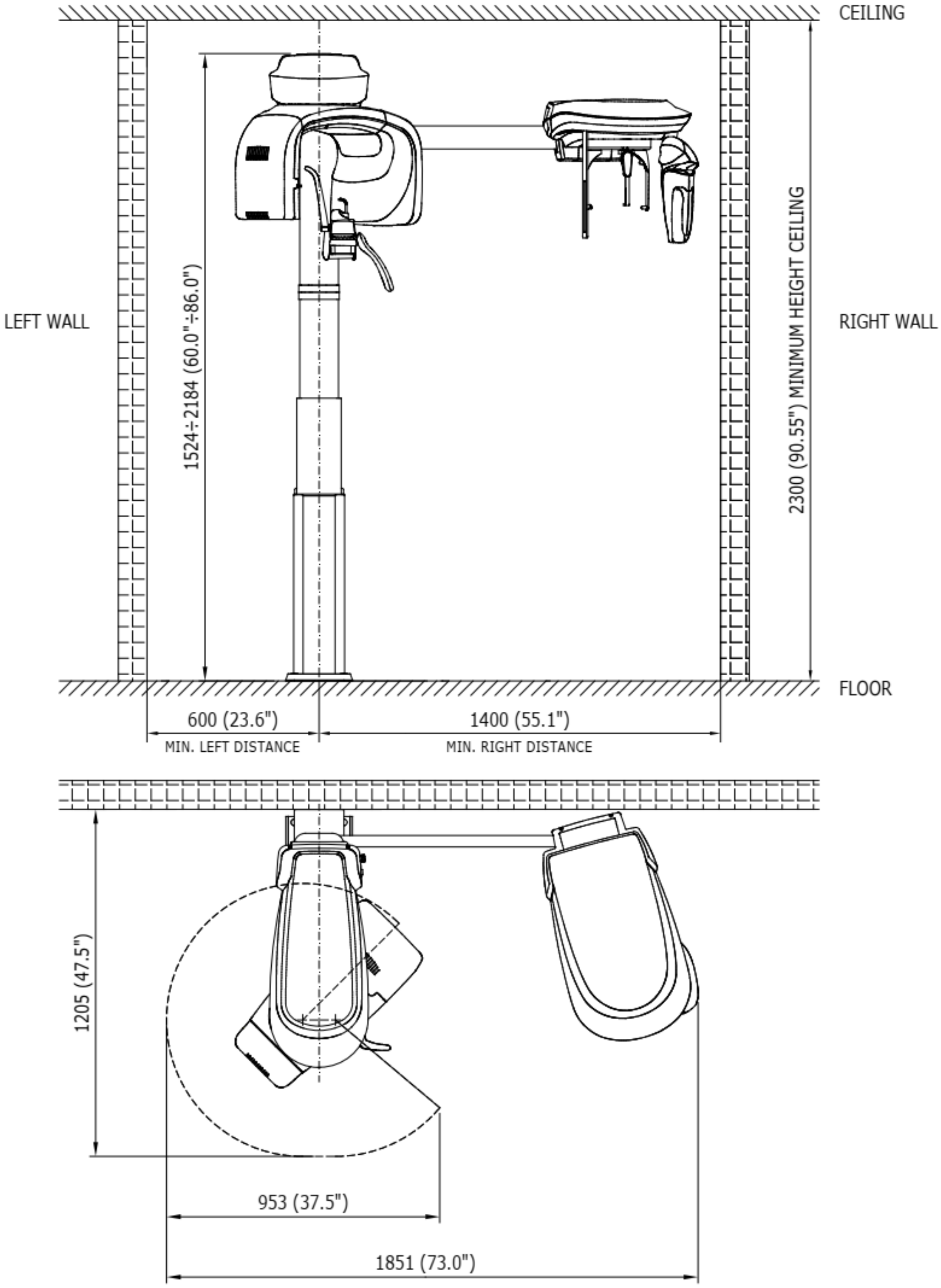


Figure 12

6.4. Drilling templates

6.4.1. I-Max 3D

Note
Also if package can be used as tool to install the I-MAX 3D, here following the indication of the drill layout for the standard height in case it is necessary to prepare the room before you receive the unit.
Fixing to the wall must be done using the 4 holes indicated in the Figure 13.

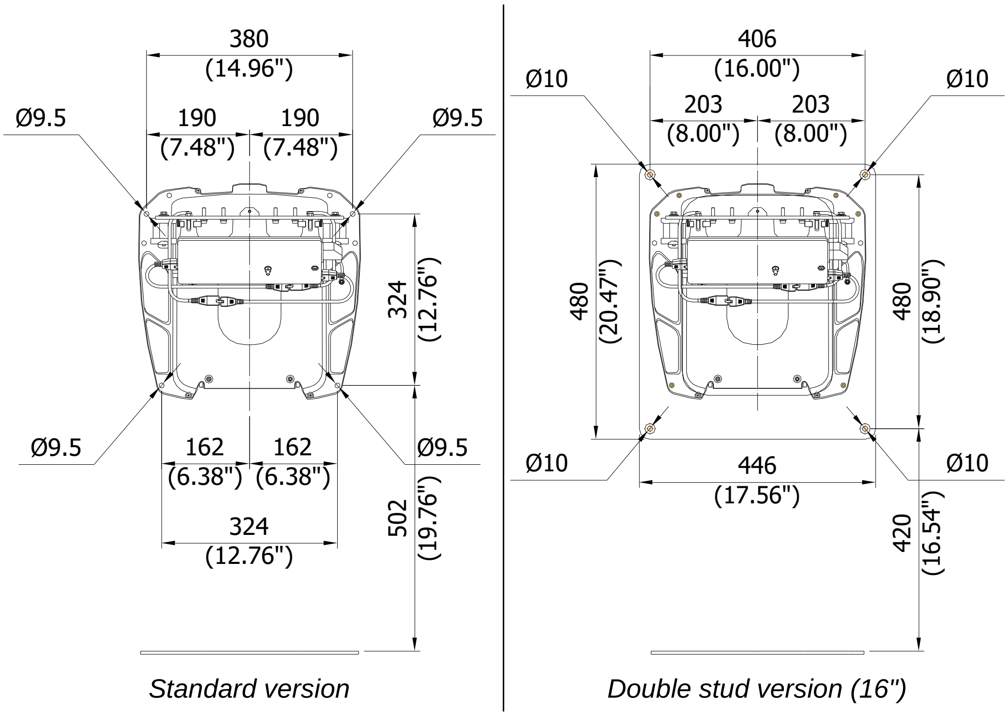


Figure 13

Warning
In its standard versions, I-MAX 3D can be fixed directly to the wall. It is responsibility of the installer to verify the type of wall and use the correct fixing anchor.
Here following some suggestion that can help installer to find the correct method depending on wall and installation type.

- **Standard installation (wall mounted)** with the unit installed directly on the wall. Extraction force on each anchor is about 85 Kg.
  - In case of full concrete (class C20/C25 thickness >200mm): drill with Ø8 + Fischer Anchor FAZ II 8/10. Tightening force 20Nm.
  - In case of full bricks: drill Ø14 + chemical Anchors FIS V-BOND 300T + Steel Insert FIS E 11X85 M6 + screws M6x25. This solution permit to avoid the use of threated bars. Tightening force 4Nm.
  - In case of hollow brick: drill Ø16 + chemical Anchors FIS V-BOND 300T Plastic anchor FIS H 16X85 K + Steel Insert FIS E 11X85 M6. This solution permit to avoid the use of threated bars. Tightening force 2Nm.

- **Wall mounted with floor support installation (optional)** with unit installed to wall and floor. Extraction force on each anchor is about 72.5 Kg each.
  - In case of full concrete (class C20/C25 thickness > 200mm): drill with Ø8 + Fischer Anchor FAZ II 8/10. Tightening force 20Nm.
  - In case of full bricks: drill Ø14 + chemical Anchors FIS V-BOND 300T + Steel Insert FIS E 11X85 M6 + screws M6x25. This solution permit to avoid the use of threated bars. Tightening force 4Nm.
  - In case of hollow brick: drill Ø16 + chemical Anchors FIS V-BOND 300T Plastic anchor FIS H 16X85 K + Steel Insert FIS E 11X85 M6. This solution permit to avoid the use of threated bars. Tightening force 2Nm.

- **Floor installation (optional**). Extraction force on each anchor is about 63 Kg each.
  - In case of full concrete (class C20/C25 thickness > 200mm): drill with Ø8 + Fischer Anchor FAZ II 8/10. Tightening force 20Nm.
  - In case of hollow brick: drill Ø16 + chemical Anchors FIS V-BOND 300T ART. 516352 Plastic anchor FIS H 16X85 K + Steel Insert FIS E 11X85 M6. This solution permit to avoid the use of threated bars.
  - In case of full bricks: drill Ø14 + chemical Anchors FIS V-BOND 300T + Steel Insert FIS E 11X85 M6. This solution permit to avoid the use of threated bars.

6.4.2. I-Max CEPH 3D

Note
Although it is recommended to use the package as a tool to install the I-Max 3D & I-Max CEPH 3D, here following the indication of the drill layout for the standard height in case it is necessary to prepare the room before you receive the unit.
The unit can be fixed in different ways:

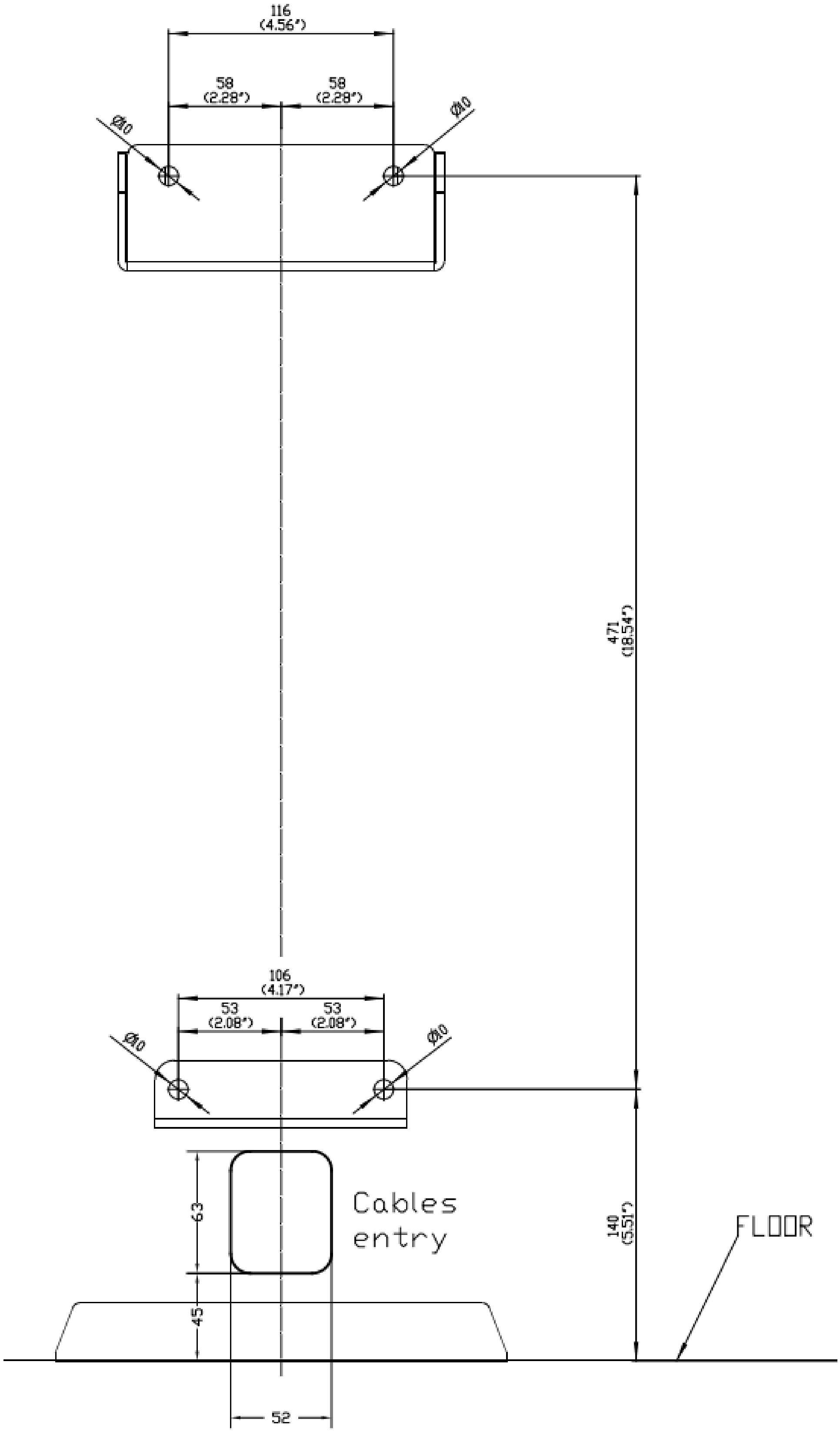
- To the wall only, using the upper bracket (2 screws) and lower bracket (2 screws)
- To the wall and floor using the upper bracket (2 screws), lower bracket (2 screws) and the floor plate (4 screws). This installation is recommended when the wall strength is uncertain.
- A 16” bracket adapter is available for dual-stud installation on wooden walls.

Note

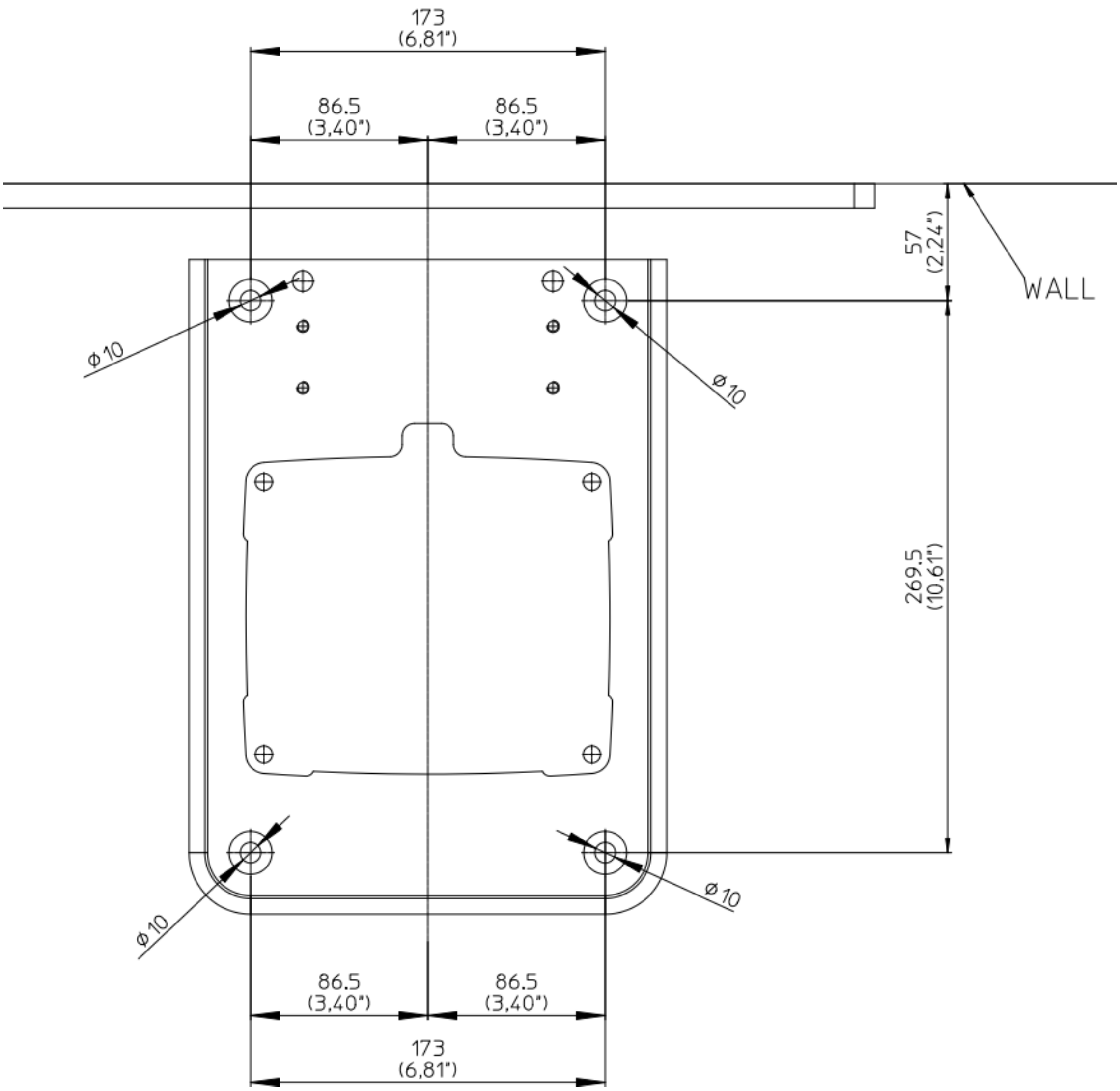
A free-standing floor plate is also available for installations where drilling holes in the walls is not possible. Although this kind of installation provides the necessary structural safety, the unit might have higher vibrations and oscillations.

Warning for free standing floor mounted unit.

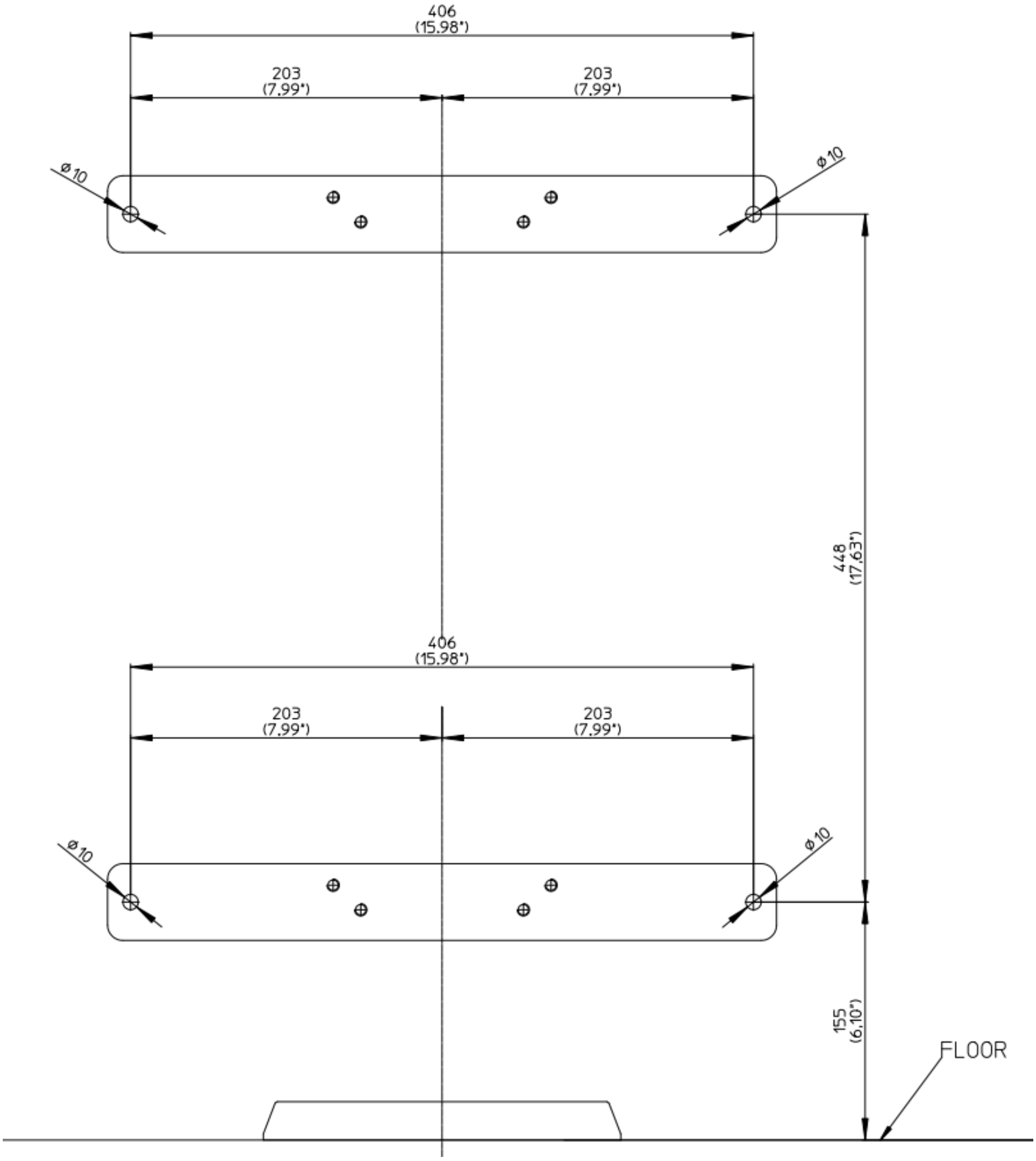
In case the unit shall be moved for service or other extraordinary operation, maximum caution shall be taken to prevent the unit from tilting and falling to the ground.



Standard Wall mount



Floor plate mount



Wall mount with 16" Adapter

Warning
It is responsibility of the installer to verify the type of wall and use the correct fixing anchor.
Here following some suggestion that can help installer to find the correct method depending on wall and installation type.

- **Standard wall installation.** Unit is fixed using two screws on the upper bracket and two screws on the lower bracket. Extraction force on each anchor is about **55 kg**.
  - In case of full concrete (class C20/C25 thickness >200mm): drill with Ø8 + Fischer Anchor FAZ II 8/10. Tightening force 20Nm.
  - In case of full bricks: drill Ø14 + chemical Anchors FIS V-BOND 300T + Steel Insert FIS E 11X85 M6 + screws M6x25. This solution permit to avoid the use of threated bars. Tightening force 4Nm.
  - In case of hollow brick: drill Ø16 + chemical Anchors FIS V-BOND 300T Plastic anchor FIS H 16X85 K + Steel Insert FIS E 11X85 M6. This solution permit to avoid the use of threated bars. Tightening force 2Nm.

- **Wall-floor installation. This installation is recommended when the wall strength is uncertain.** Unit is fixed using two screws on the upper bracket, two screws on the lower bracket and four screws on the base plate. Extraction force on wall anchors is about **46 kg** and on floor anchors is **73 kg**.
  - In case of full concrete (class C20/C25 thickness > 200mm): drill with Ø8 + Fischer Anchor FAZ II 8/10. Tightening force 20Nm.
  - In case of full bricks: drill Ø14 + chemical Anchors FIS V-BOND 300T + Steel Insert FIS E 11X85 M6 + screws M6x25. This solution permit to avoid the use of threated bars. Tightening force 4Nm.
  - In case of hollow brick: drill Ø16 + chemical Anchors FIS V-BOND 300T Plastic anchor FIS H 16X85 K + Steel Insert FIS E 11X85. This solution permit to avoid the use of threated bars. Tightening force 2Nm.

- **Wall installation with 16" adapter brackets (optional kit, p/n 6104101200).** Unit is fixed using two screws on the upper bracket and two screws on the lower bracket. Extraction force on each anchor is about **25 kg**.
  - Anchors shall be chosen according to the wall stud material.

- **Free-standing floor plate (optional kit p/n 6104103000)**. No fixation is necessary.

Warning
Installation using only the 4 base plate holes doesn't provide structural stability and is STRICTLY FORBIDDEN

7. INSTALLATION

Note for I-Max 3D
I-Max 3D is delivered completely pre-mounted; it is contained in a single box.
The mechanical mounting consists exclusively in fixing the unit to the wall and complete with few operations the installation. Most of the adjustments are carried out in factory.
A single technician will be able to install the unit as package is used to support the unit during installation.

Note for I-Max CEPH 3D
The mechanical mounting consists in fixing the unit to the wall, install the CEPH arm and complete the installation with few operations. Most of the adjustments are carried out at the factory.
A single technician will be able to install the unit as the package is used to support the unit during installation.

7.1. Mechanical installation

7.1.1. I-Max 3D

1. Remove the carton box and the higher polystyrene section.

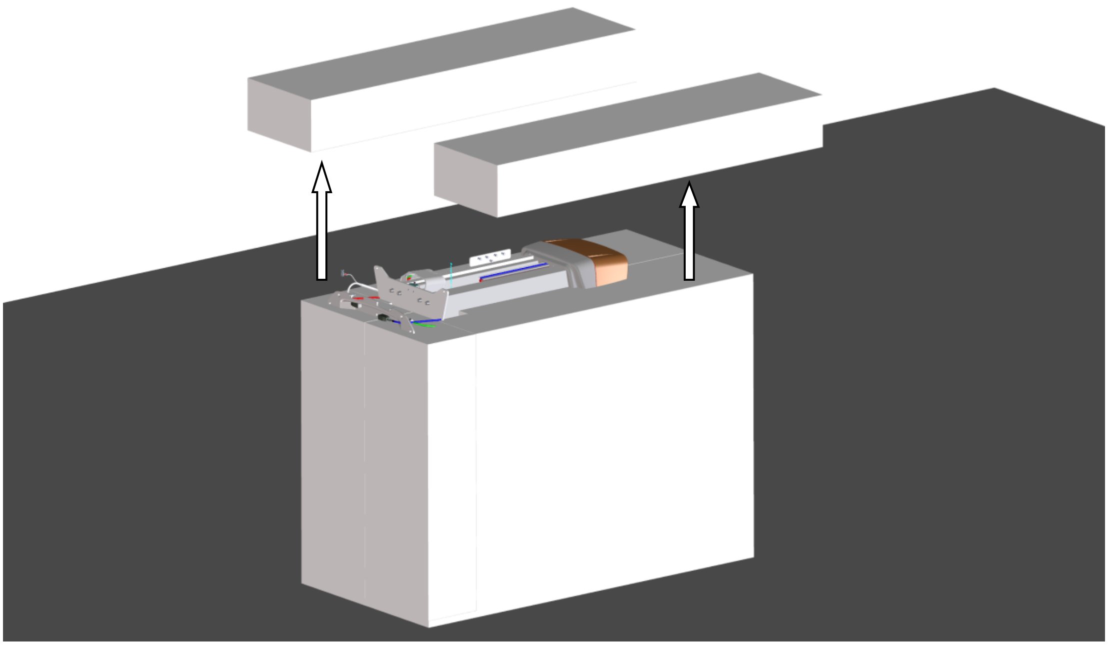


Figure 14

2. Remove the front polystyrene section.

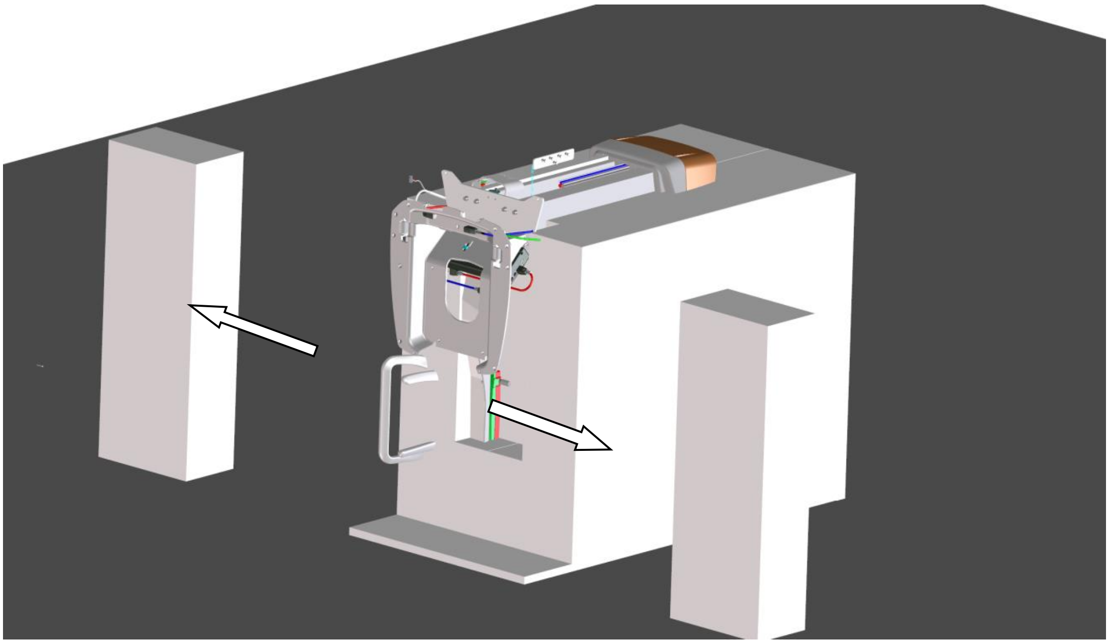


Figure 15

3. Slide the packaging from the polystyrene base close to the wall in the position where the I-MAX 3D will be installed.
4. Push the packaging until the wall plate is against the wall.

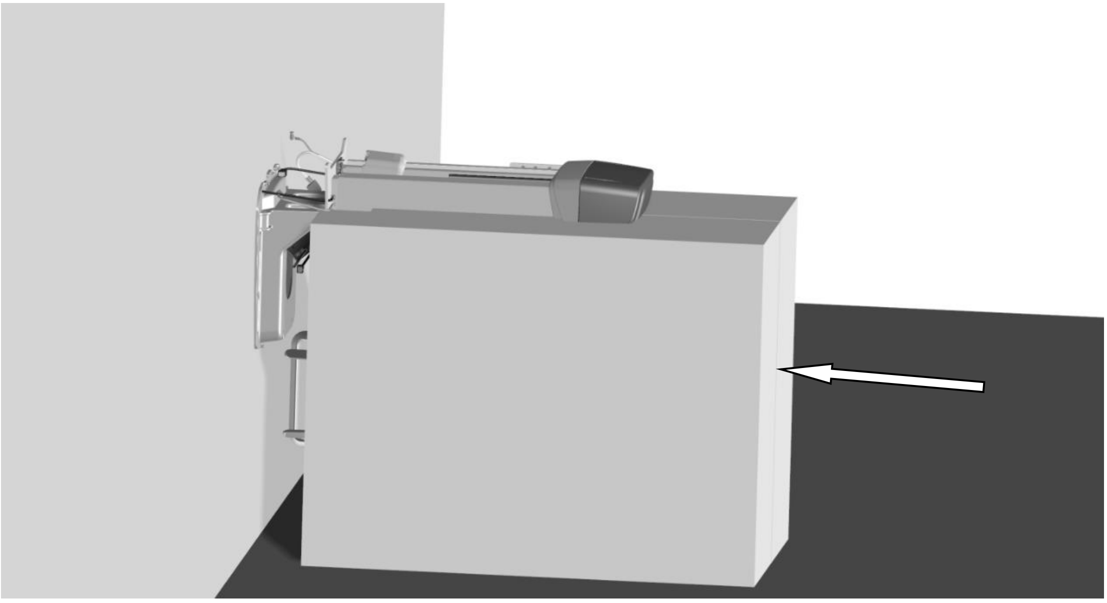


Figure 16

5. Verify with an air bubble lever that the plate is horizontal.

Put the air bubble level in this position over the wall plate

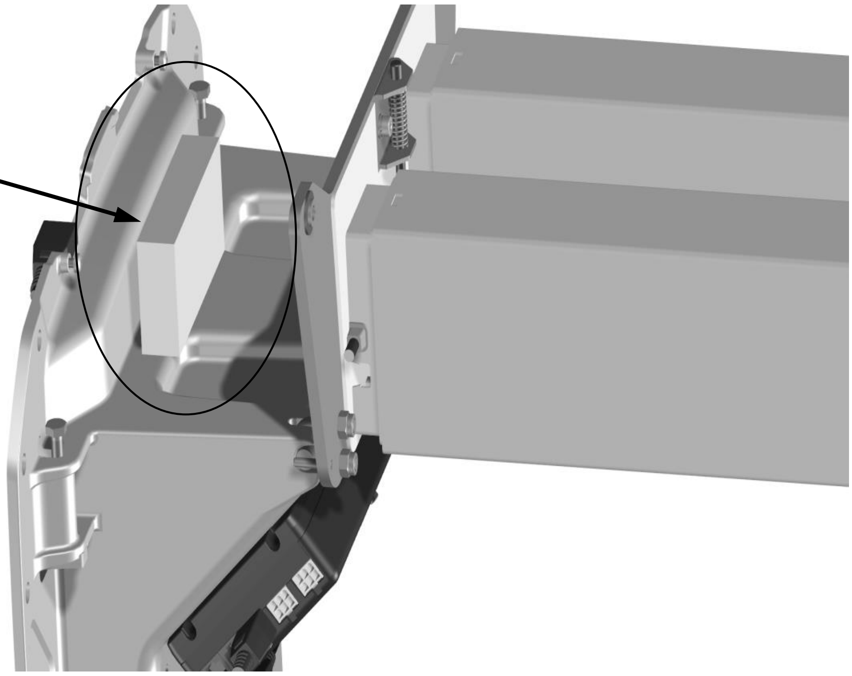


Figure 17

6. Mark on the wall the position of the dowels holes.
7. Move back the packaging, drill the wall, put the dowels, reposition the packaging against the wall and secure the wall plate to the wall with the screw.

Warning
Extracting force on each dowel are:

- 85 Kg for standard installation (wall mounted)
- 72.5 Kg for wall mounted with floor support installation (optional)
- 63 Kg for floor installation (optional).

It is responsibility of the installer to verify type and solidity of the wall and identify the correct type of fixing method (metallic dowels, plastic dowels or chemical fixing anchors etc…).

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8. Remove the plastic protection between plate and rotating part.

Figure 18

9. Once fixed the plate to the wall, remove the tilting plate locking screws, and their nuts, locking the wall plate.

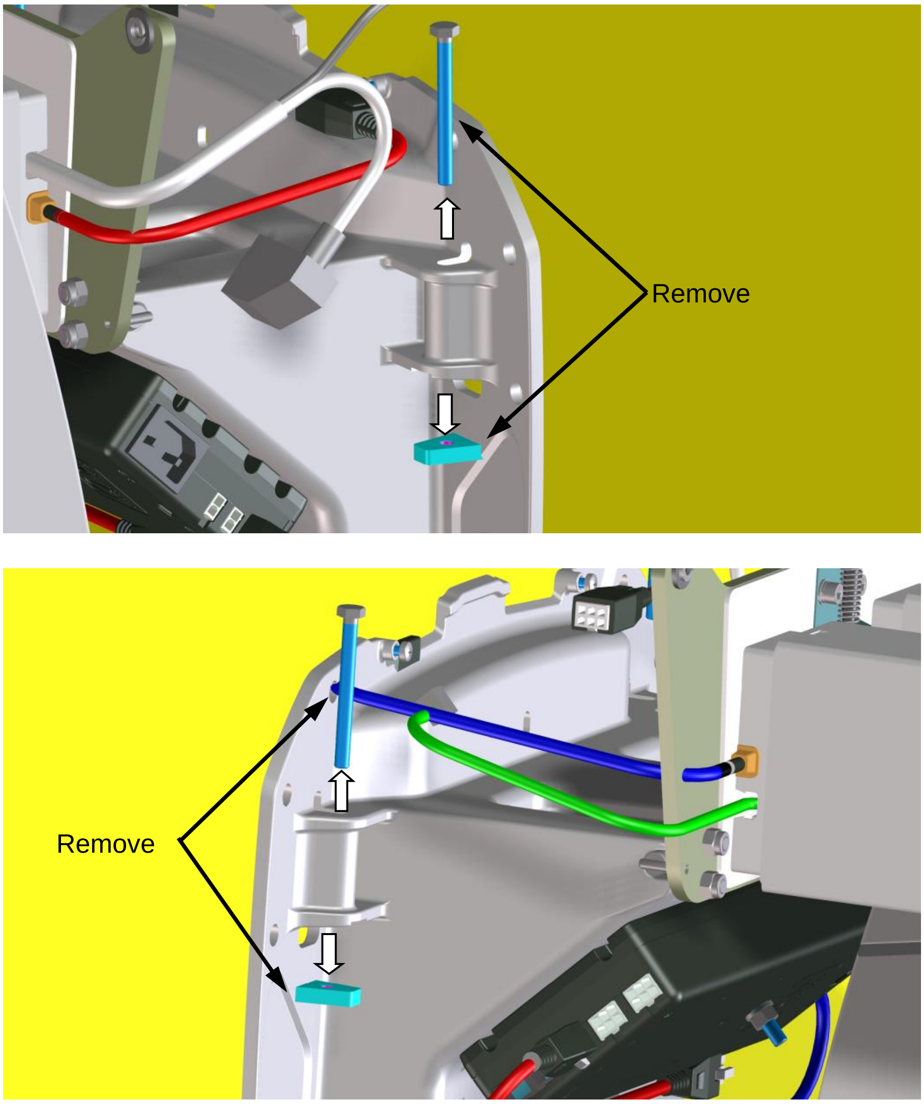


Figure 19

10. Grab the packaging and lift until the insertion of the pin-lock is in its seat.

Note
The force necessary to lift the I-MAX 3D is about 20kg, so that a single technician can be enough to install the unit.

Figure 20

11. Once the unit reaches the final position, be sure that the safety pin is properly locked before to leave the package.

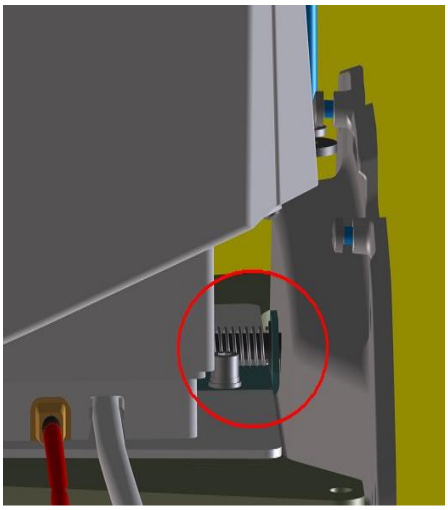


Figure 21

12. Reinsert immediately the tilting plate locking screws, and their nuts and lock the tilting plate at the wall plate.

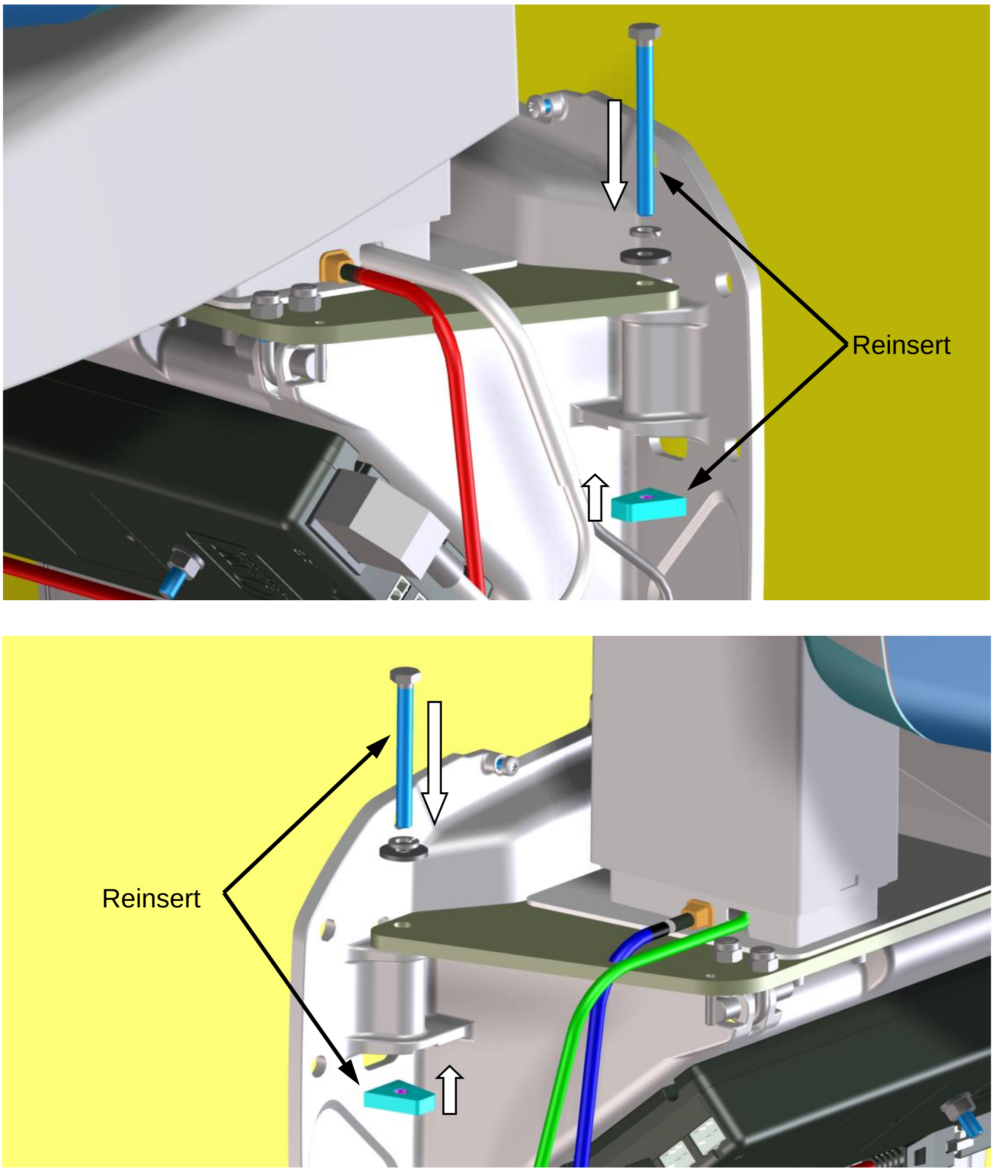
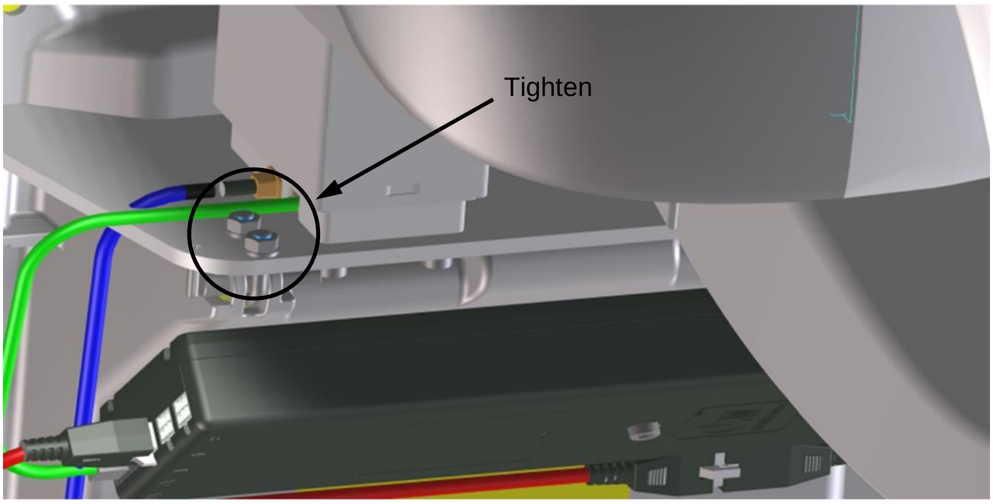


Figure 22

13. Tighten the nuts of the eyebolts of the rotation pins.



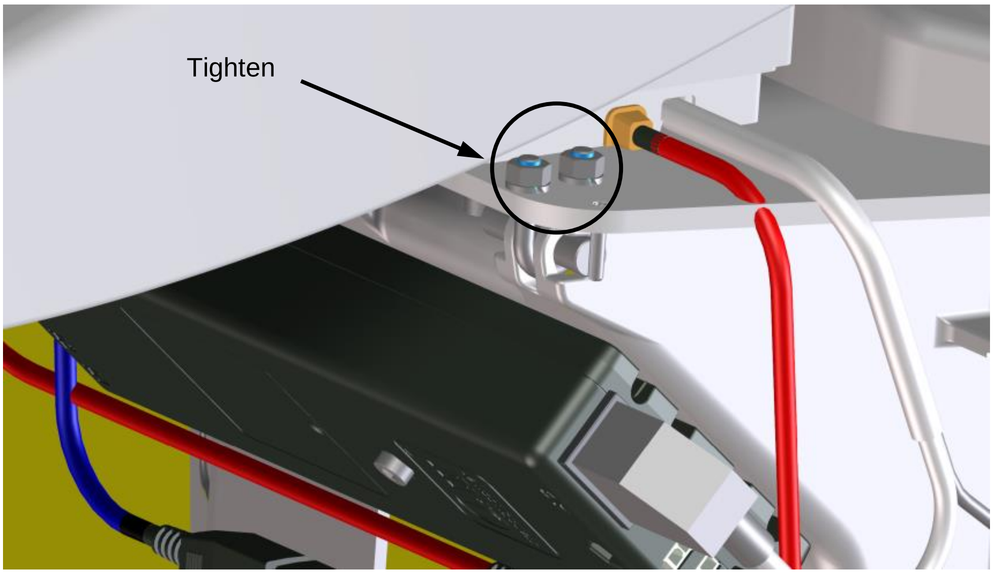


Figure 23

Warning
In case of dismounting the unit (i.e. after exhibition), it is necessary to loosen these nuts in order to avoid damages to the hinge during rotation.

14. Cut the straps that join the two polystyrene elements and remove them.

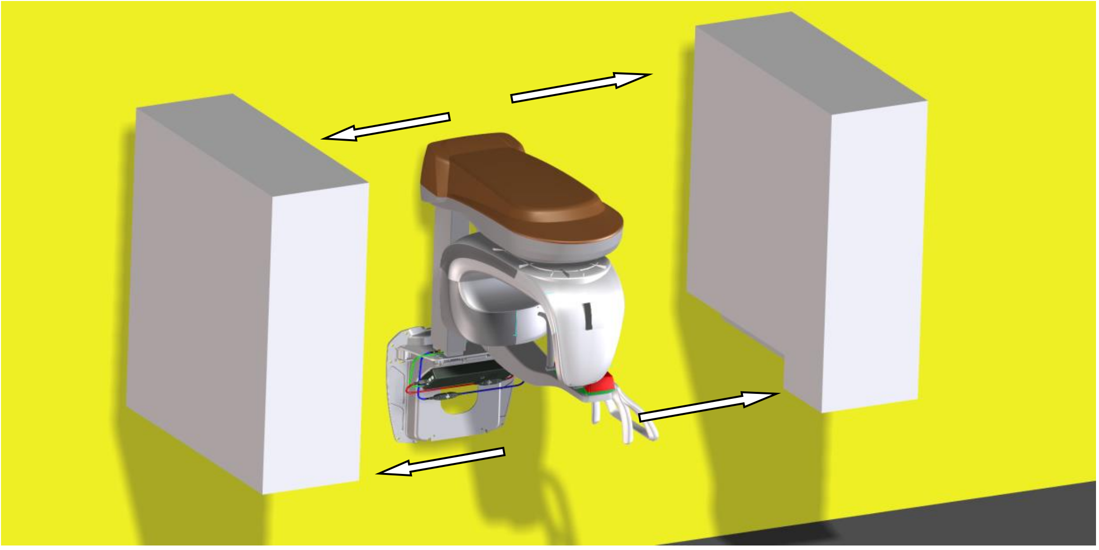


Figure 24

Note
Inside the polystyrene elements, you can find the unit accessories and the wall plate cover.

15. Remove the upper cover releasing the two screws present in the back side (wall direction); front side of the cover is fixed without screw (locking pins).
Remove the safety plate used do keep the rotating arm fixed during transportation.

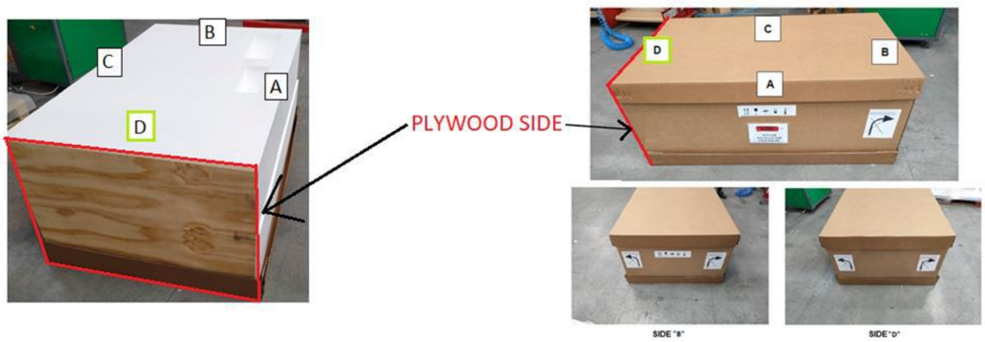
Figure 25

7.1.2. I-Max CEPH 3D

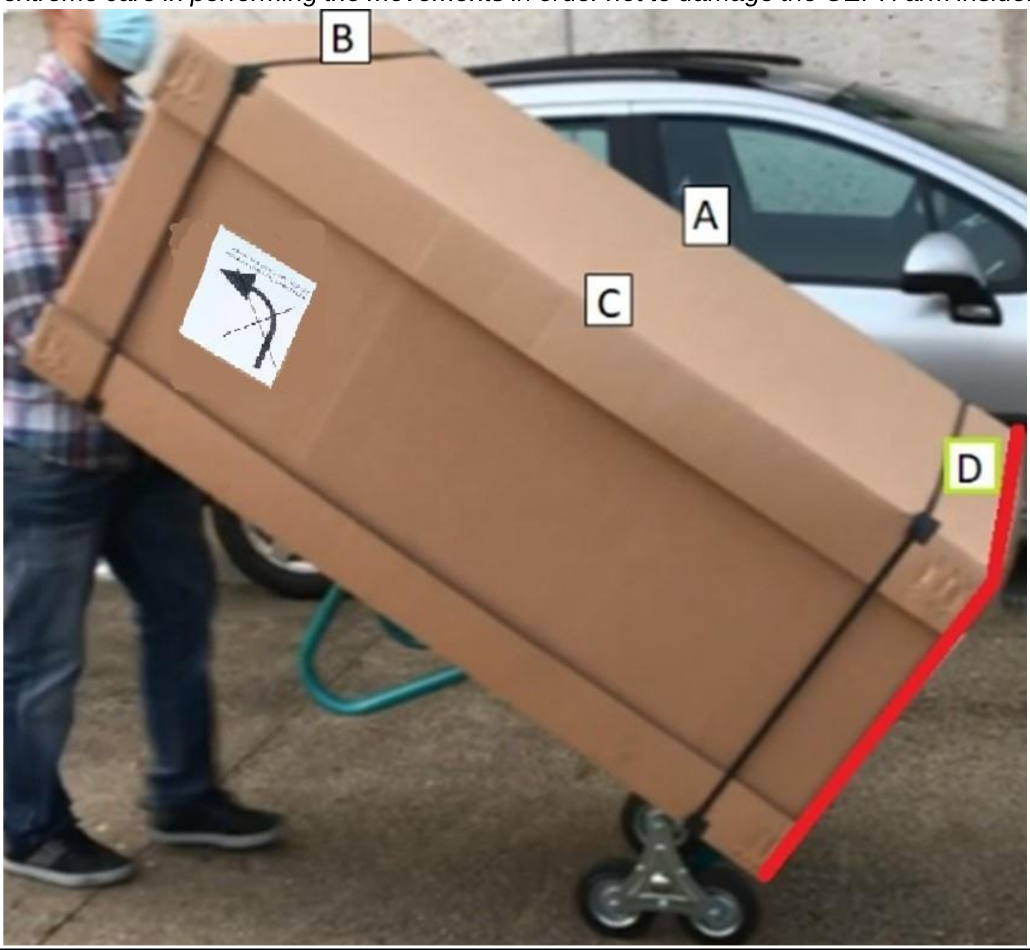
1. Remove the straps and place the packaging of the CEPH arm on the floor (Warning! Don't overturn the box to avoid damaging the contents). This should be done by two operators.

Warning

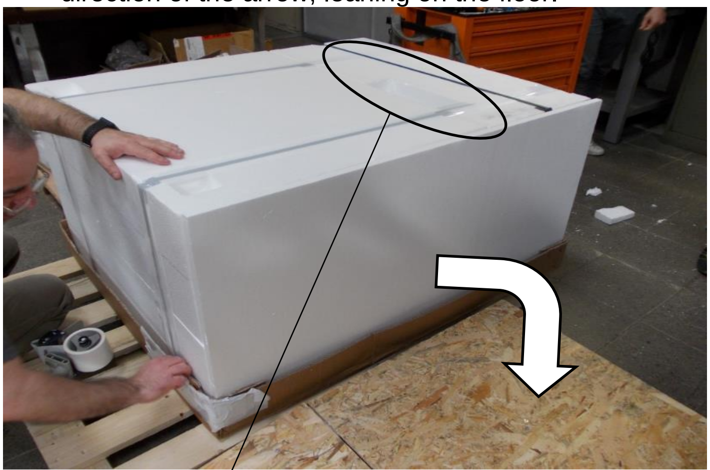
A plywood allows to create a base support in case of need to tilt* the box to perform small movements (e.g. with the help of trolleys to make stairs) or to fit narrows spaces (e.g. doors or elevators). The side on which the overturning of the box is allowed is only the one where the plywood is present, indicated by the absences of the crossed arrows (side D in the image below).



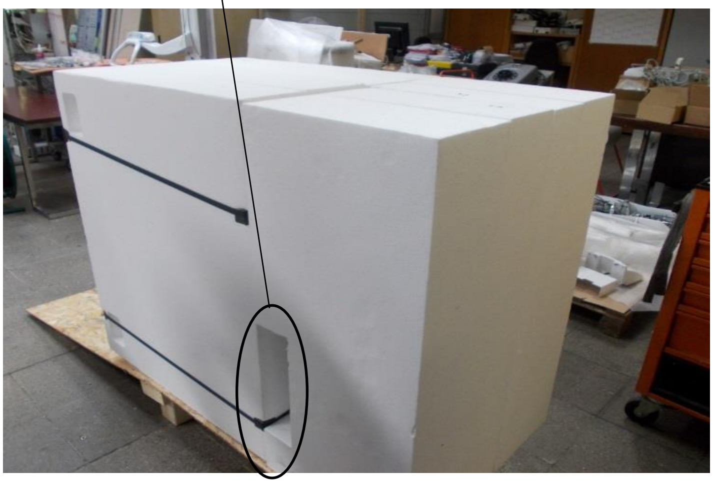
**In case of need to tilt the box on the side of the plywood it is mandatory that the box is completely closed and packaged as from factory, and it is recommended to maintain extreme care in performing the movements in order not to damage the CEPH arm inside.*



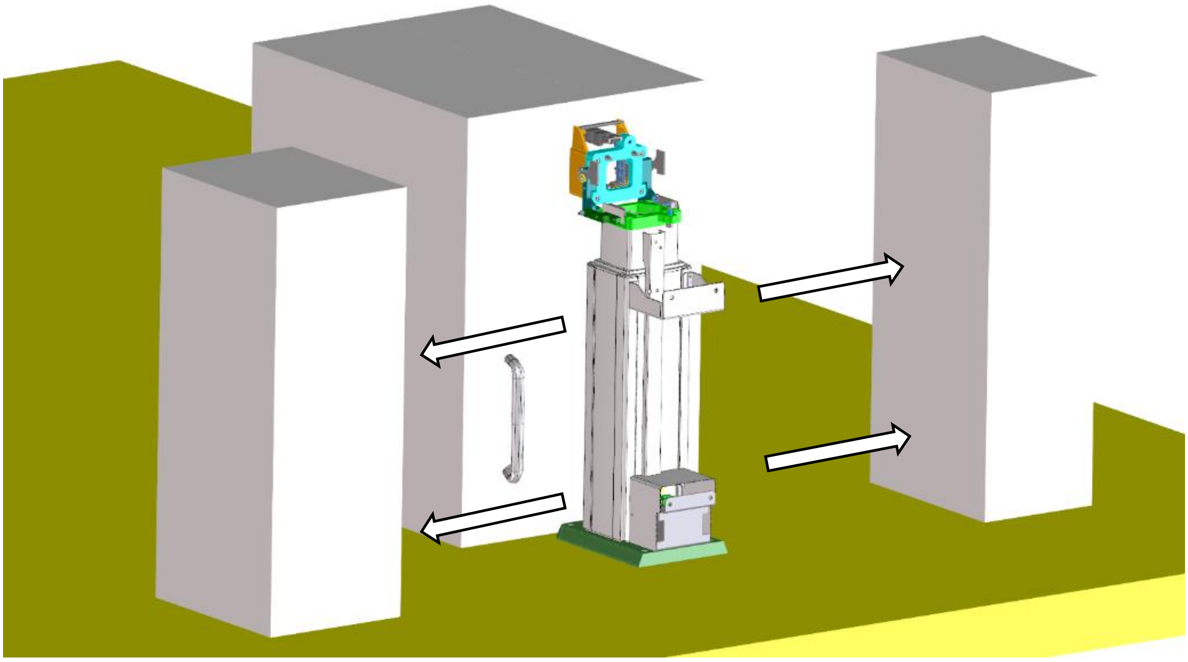
2. Remove the carton box from the packaging of the Pan machine and turn the package in the direction of the arrow, leaning on the floor.



Warning! The handle compartment must be downwards after tilting

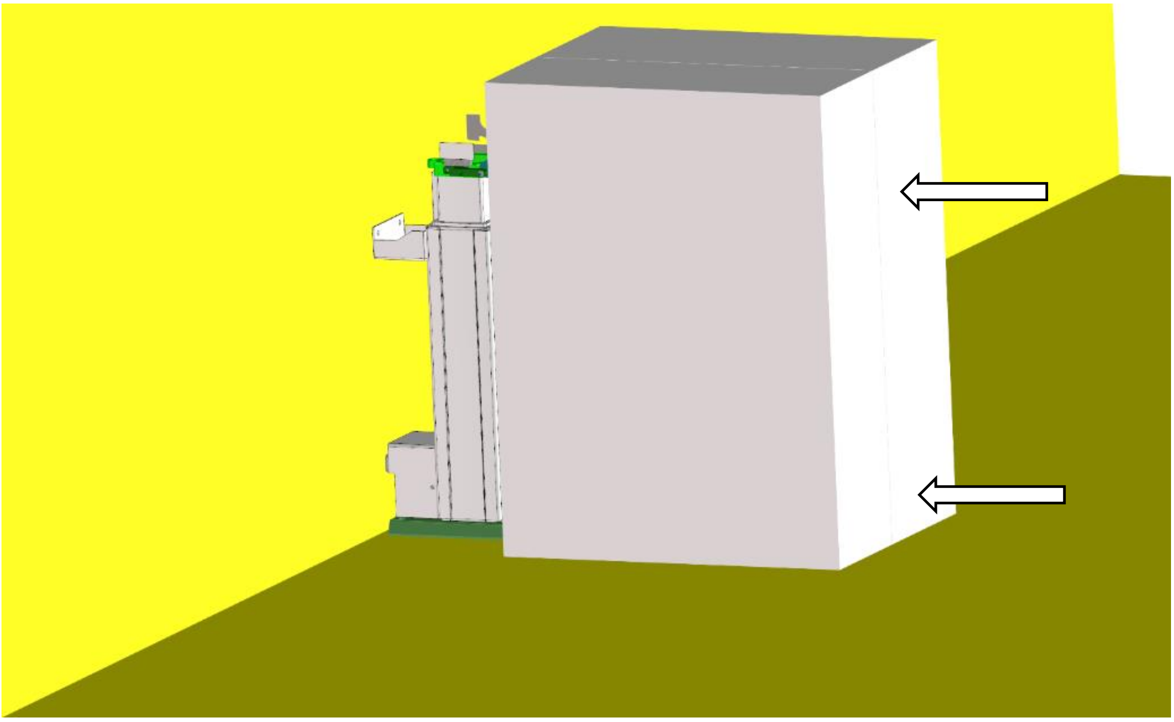


3. Cut the straps and remove the polystyrene rear sections

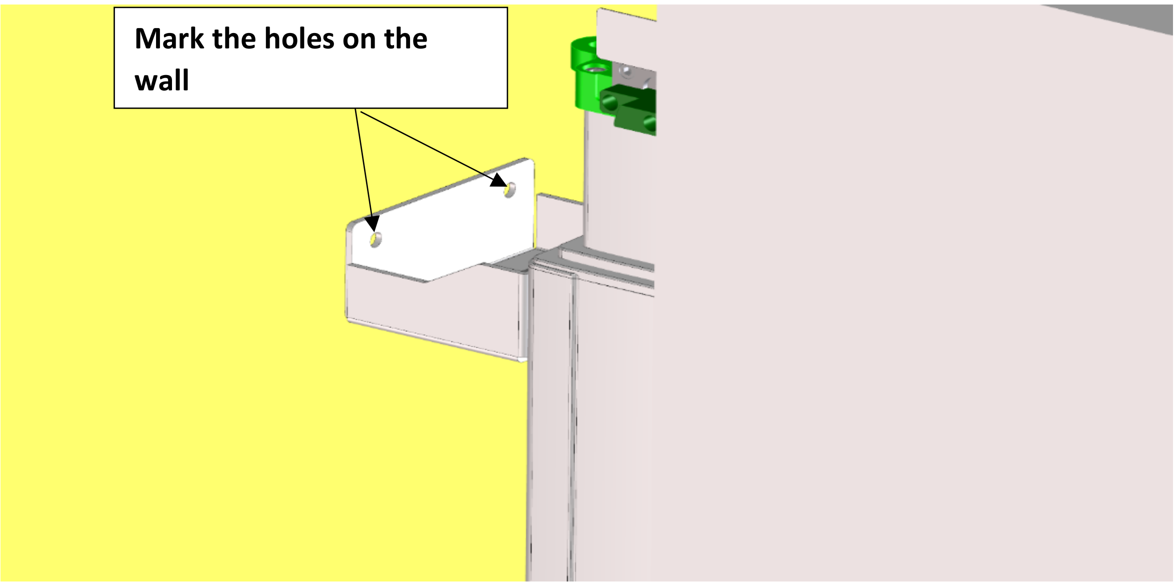


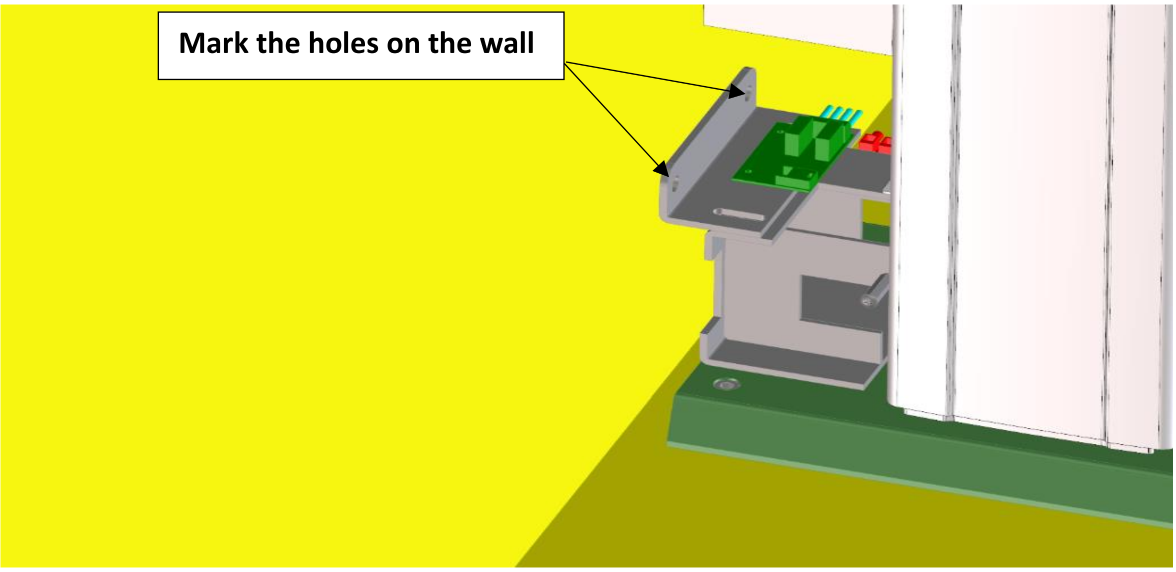
Note
The wall plate 16” (cod. W1200102) for US is inside the filler box (Figure 12).

4. Slide the packaging to the wall in the position where the Unit will be installed

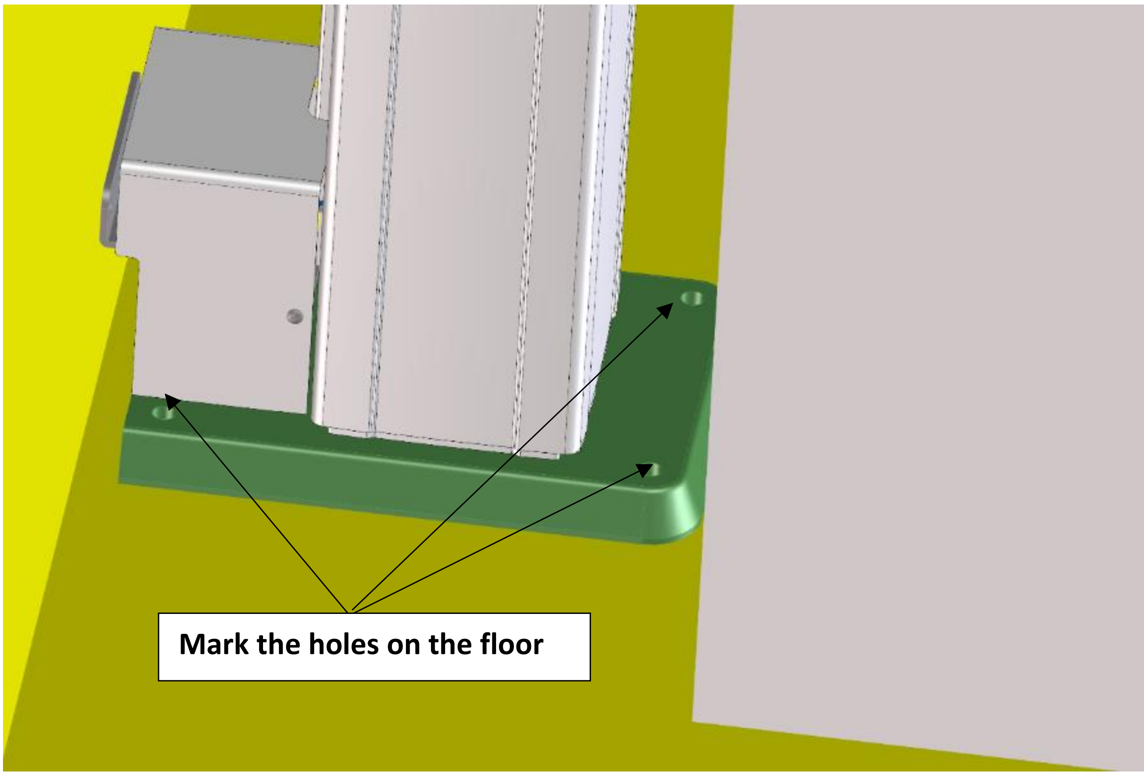


5. Push the package until the upper and lower wall bracket of the system are in contact with the wall, then mark the position of the screw holes on the wall, alternatively, use the appropriate template to mark the holes. Note: the standard fixing includes the upper and lower wall brackets, alternatively you can fix using the upper bracket and the holes in the floor base.

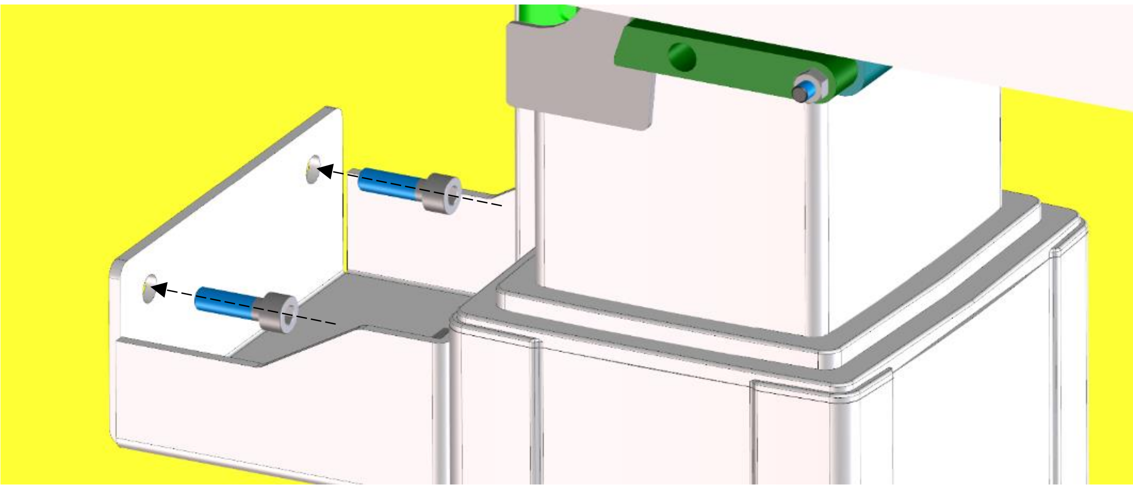


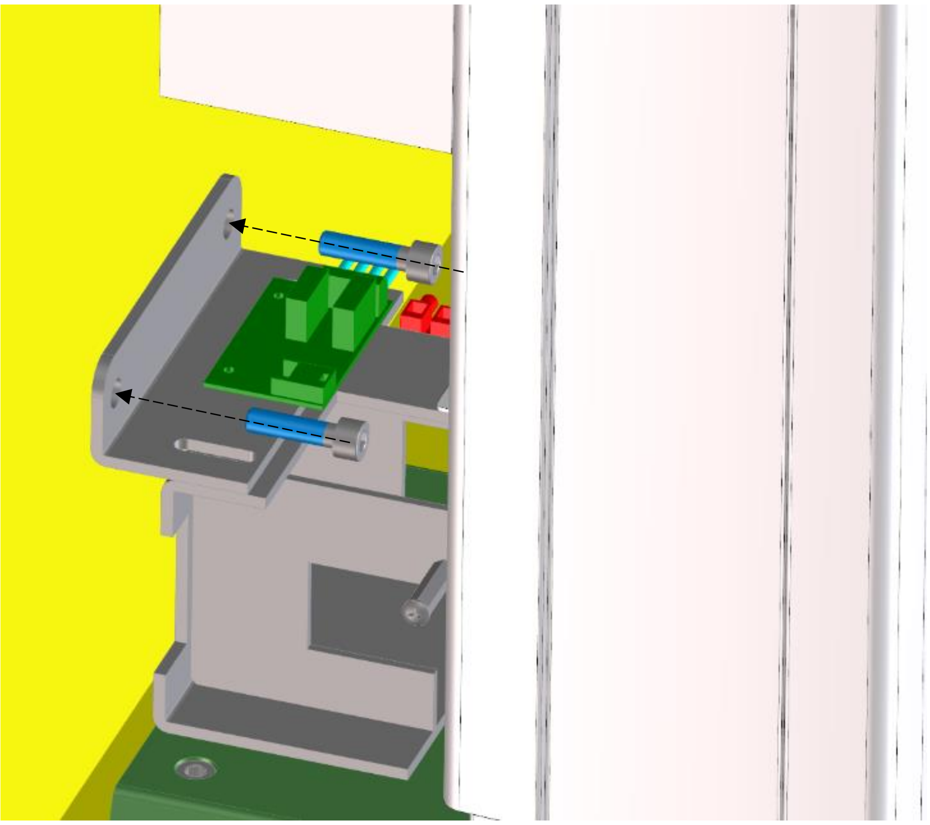


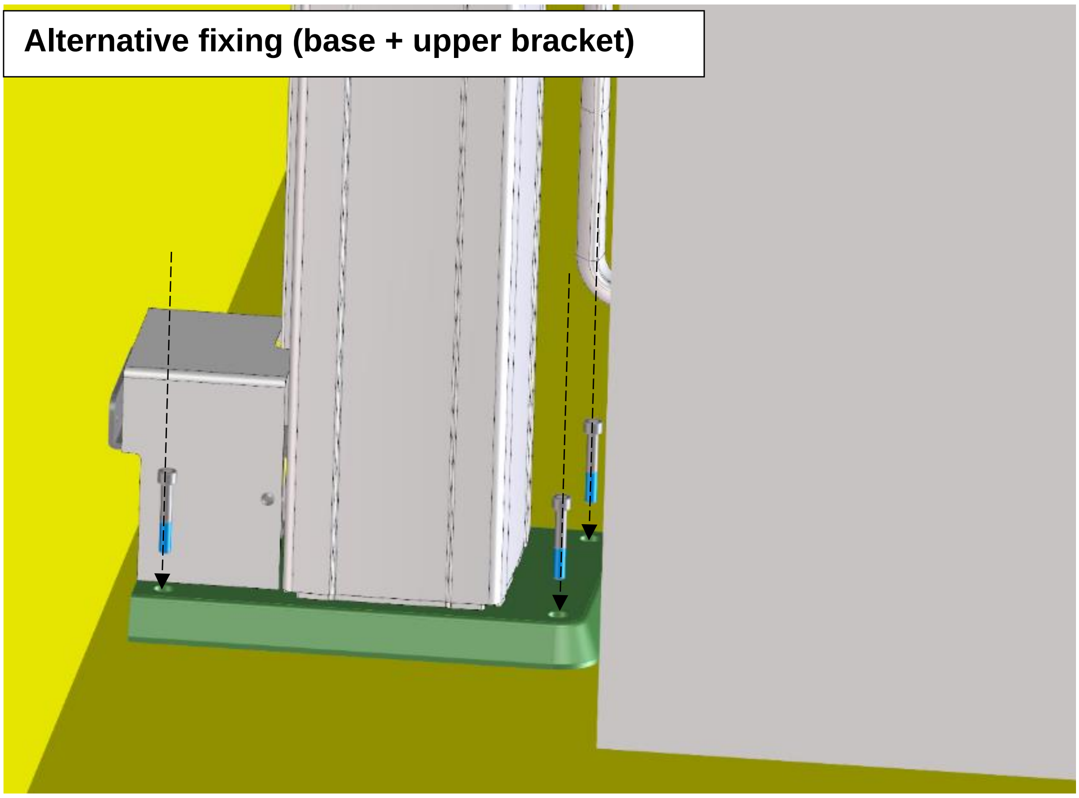
6. If necessary, mark the holes for fixing the base to the floor.



7. Move back the packaging, drill the wall and, if necessary, the floor, put the dowels, reposition the packaging against the wall and secure the wall bracket and the base plate with the screws.

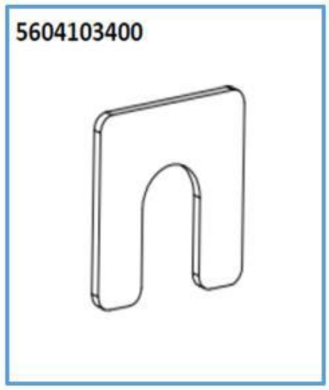




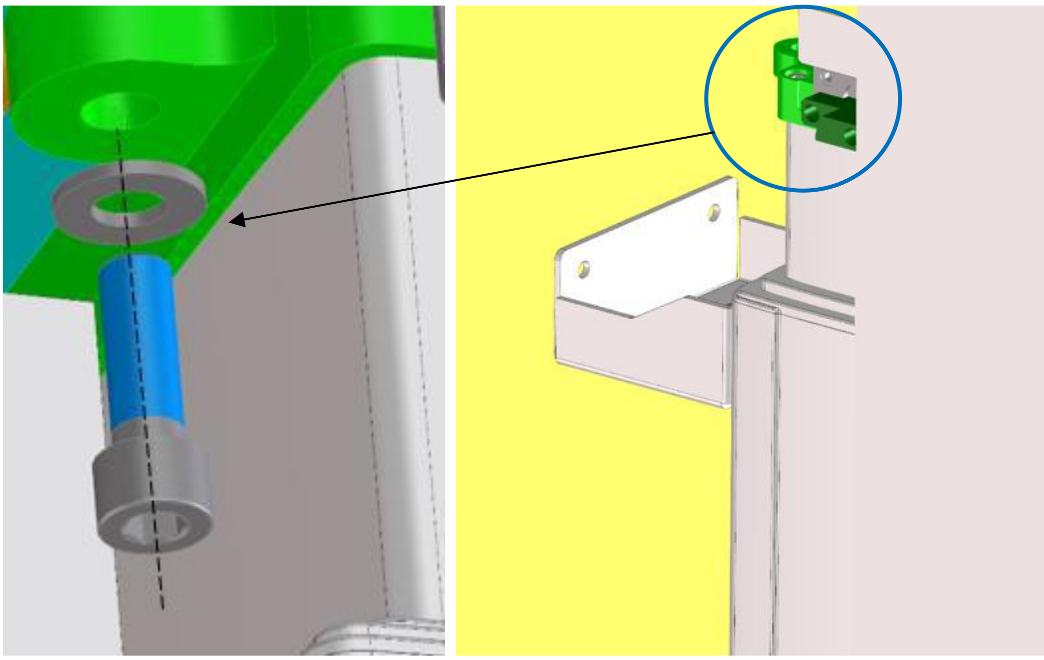

Alternative fixing (base + upper bracket)

Note
The theoretical distance of the CEPH arm from the wall is 11mm. In the presence of irregular wall it's good to prescribe the use of a C washer before attaching the CEPH arm to the machine. One C washer is already glued from factory.
Supplied with I-Max CEPH there are 2 C washers to tilt the fixing of the column and move the CEPH arm away from the wall (each mm on the column moves the CEPH about 1 cm away).

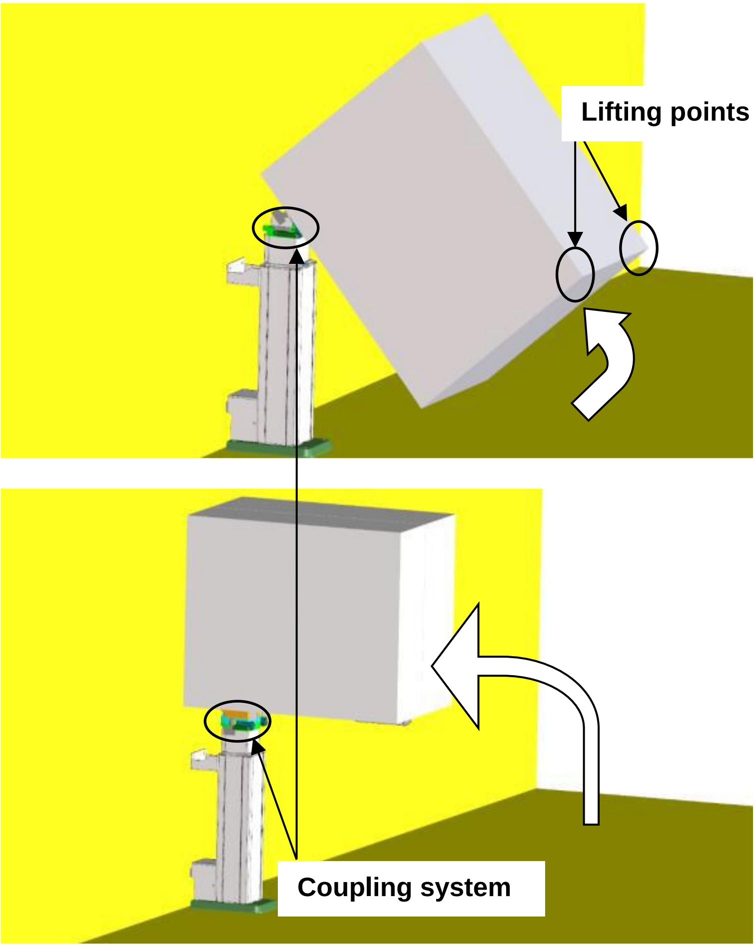
The C shape allows it to be applied even when the column is already screwed to the wall.

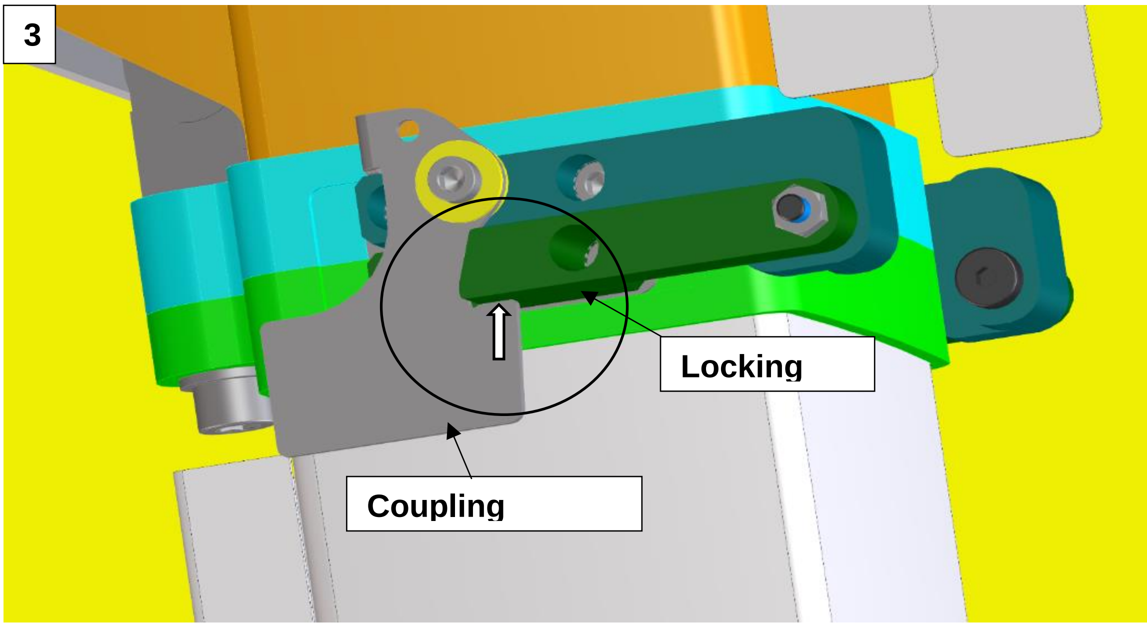


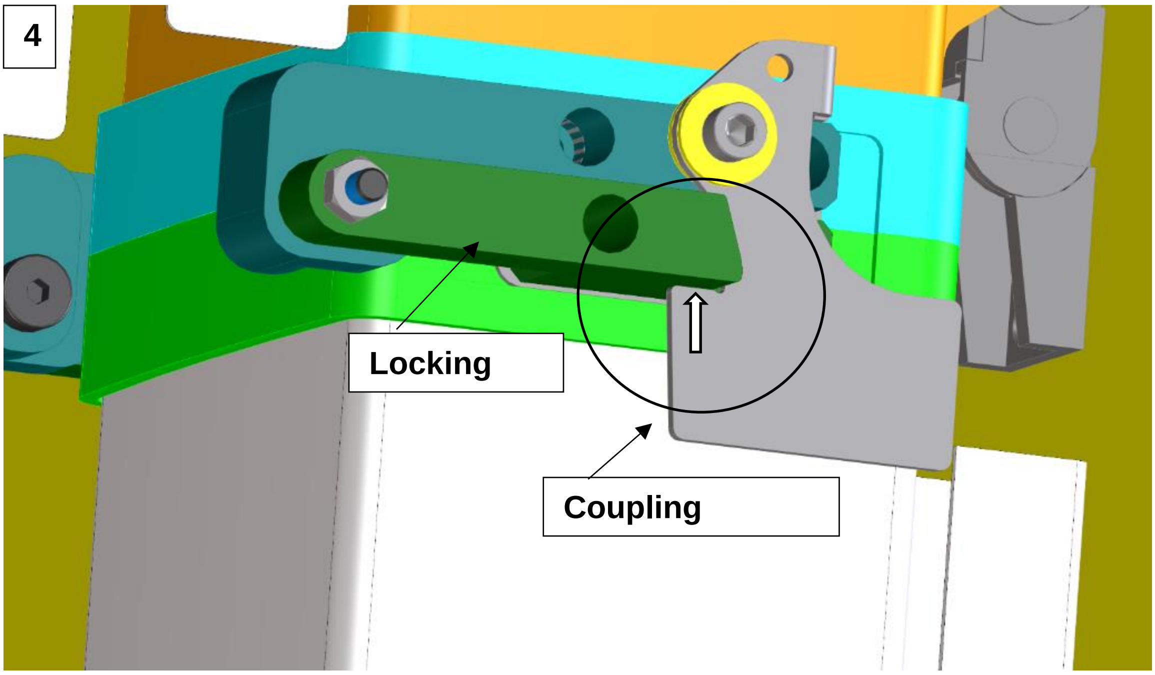
8. Remove the screw behind the column.



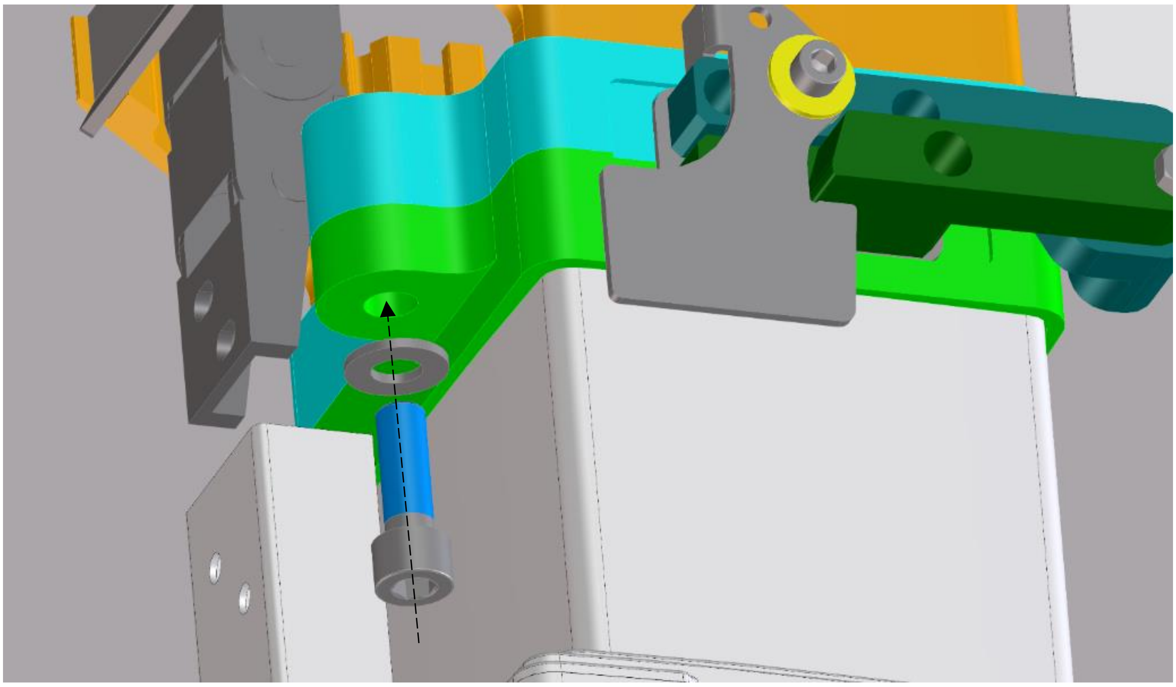
9. Grab the package and lift until the coupling system has engaged the locking bars on both sides, see figure 1-2-3-4).
NOTE : The force necessary to lift the unit is about 20kg, so that a single technician can be enough to install the unit



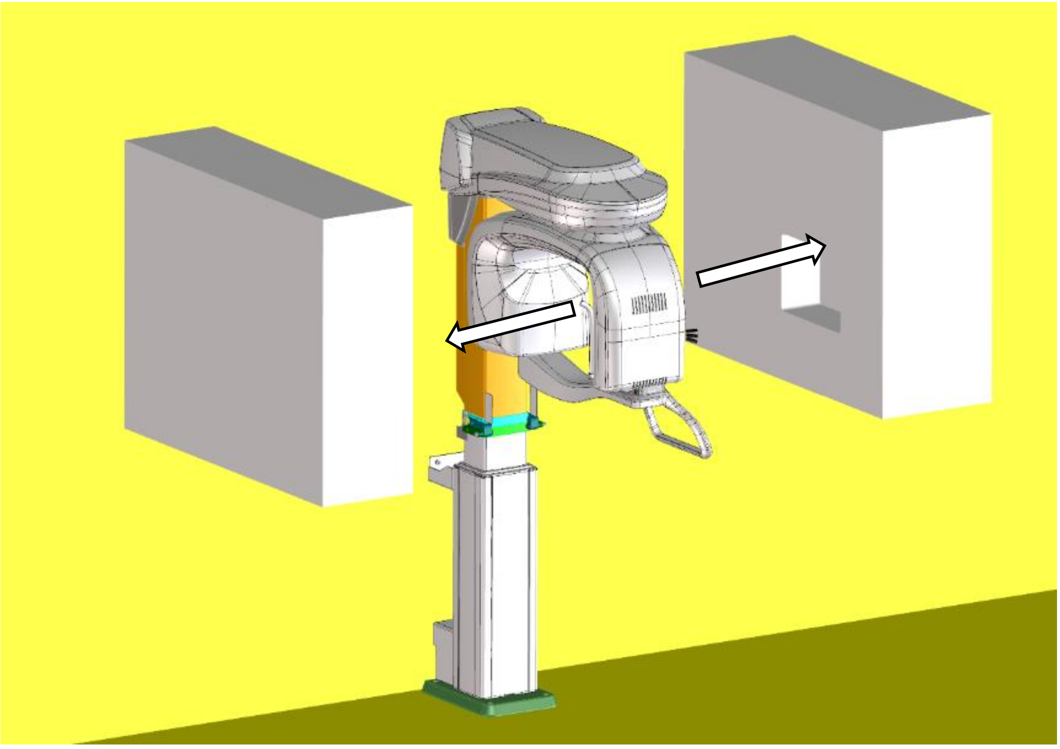

3
Locking
Coupling


4
Locking
Coupling

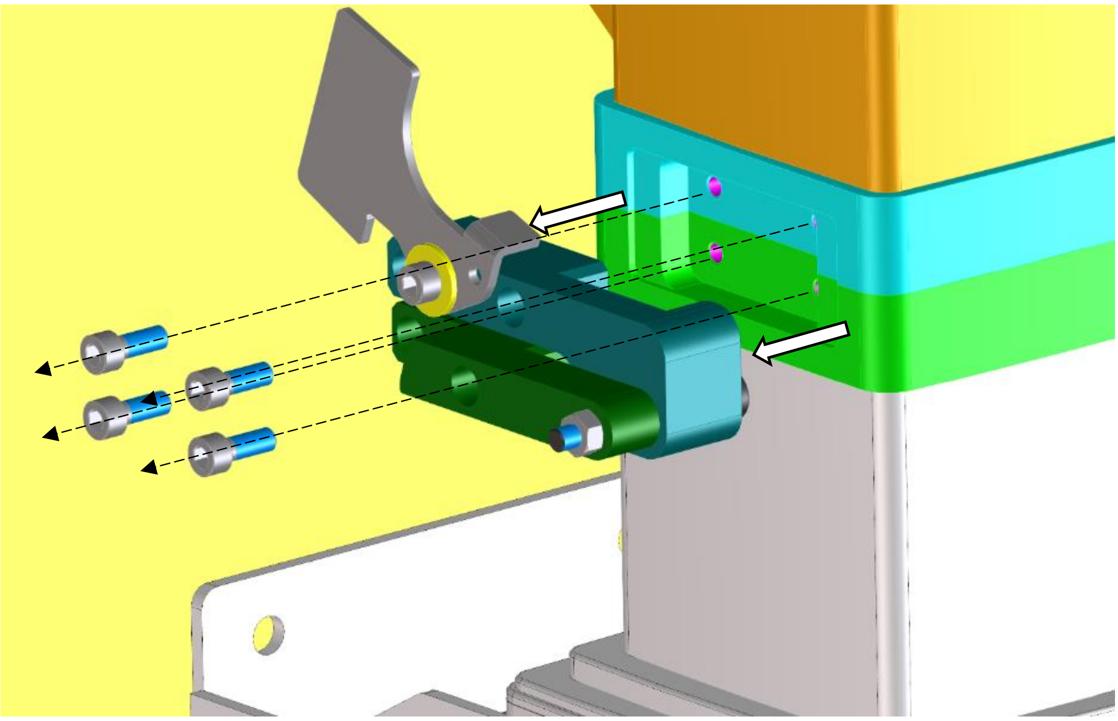
10. Lock the tilting movement of the machine head of the column with the appropriate screw

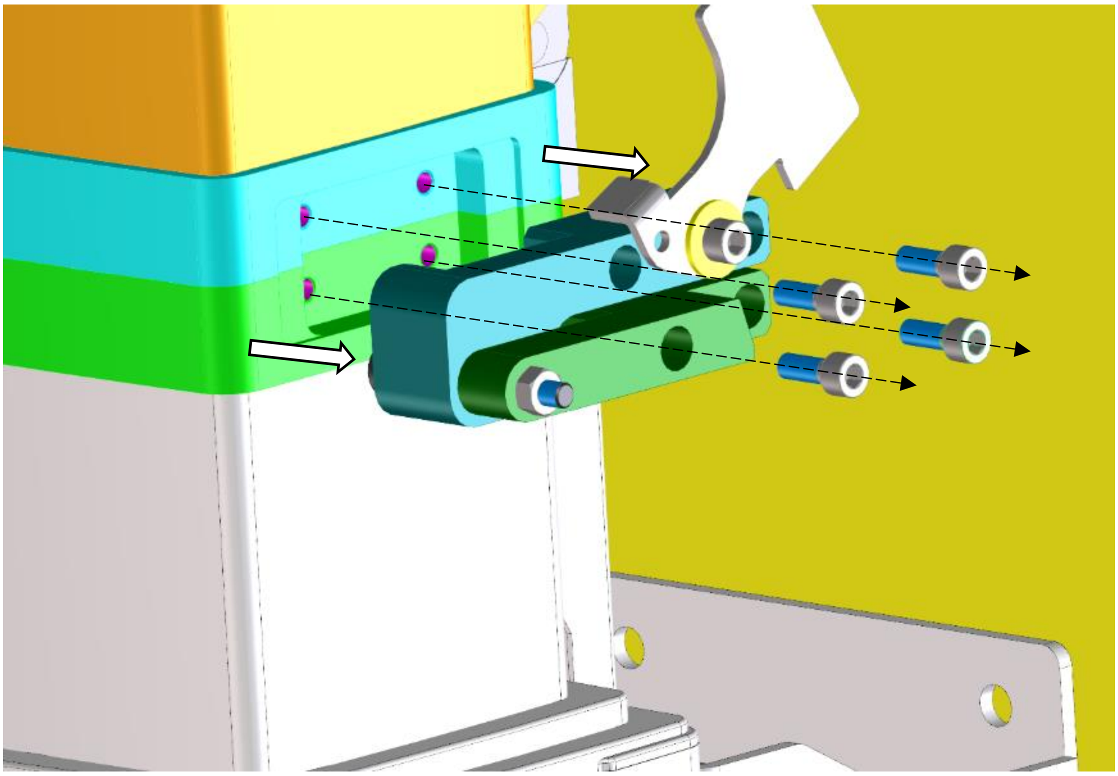


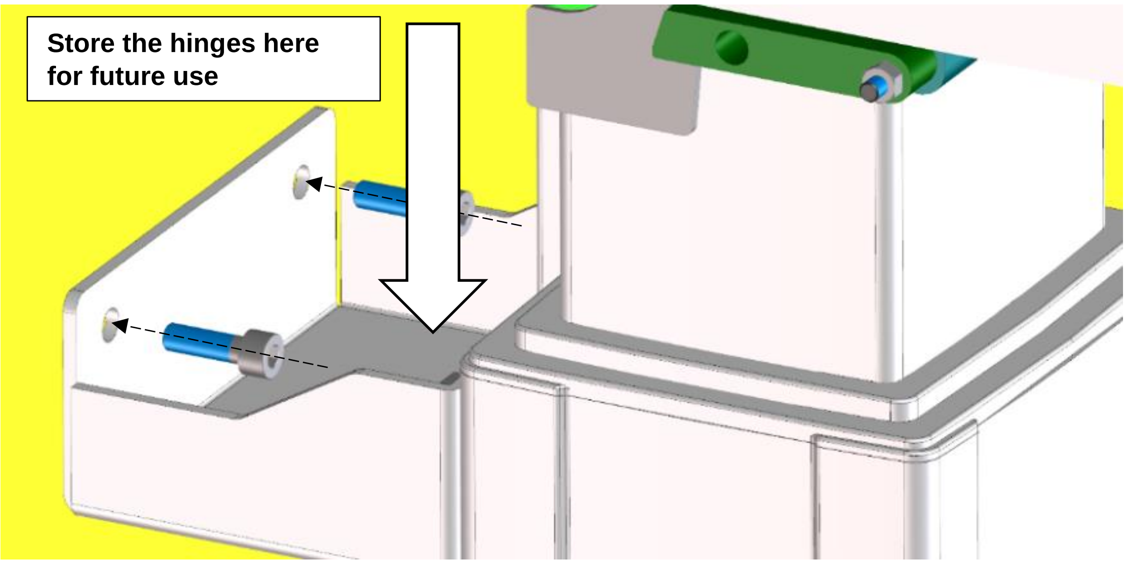
11. Cut the straps that join the two polystyrene elements and remove them. WARNING : inside the polystyrene elements, you can find the accessories of the machine and the wall plate cover)



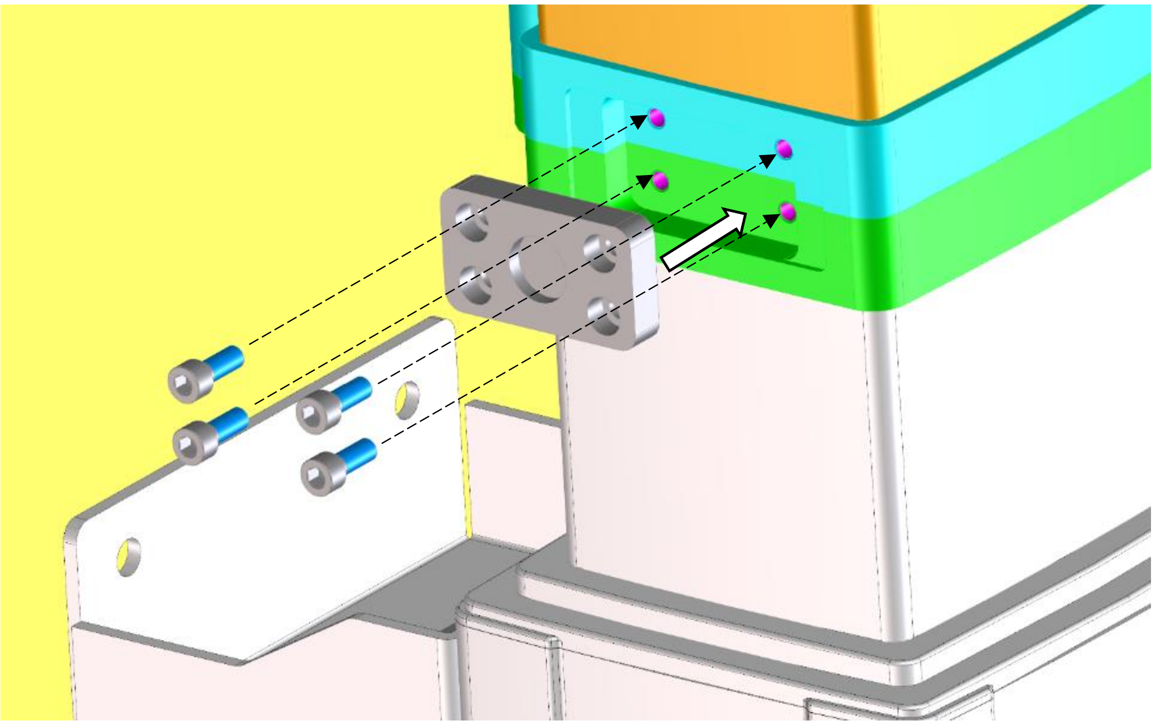
12. Remove the two hinges from the machine and store them in the upper fixing bracket of the column.

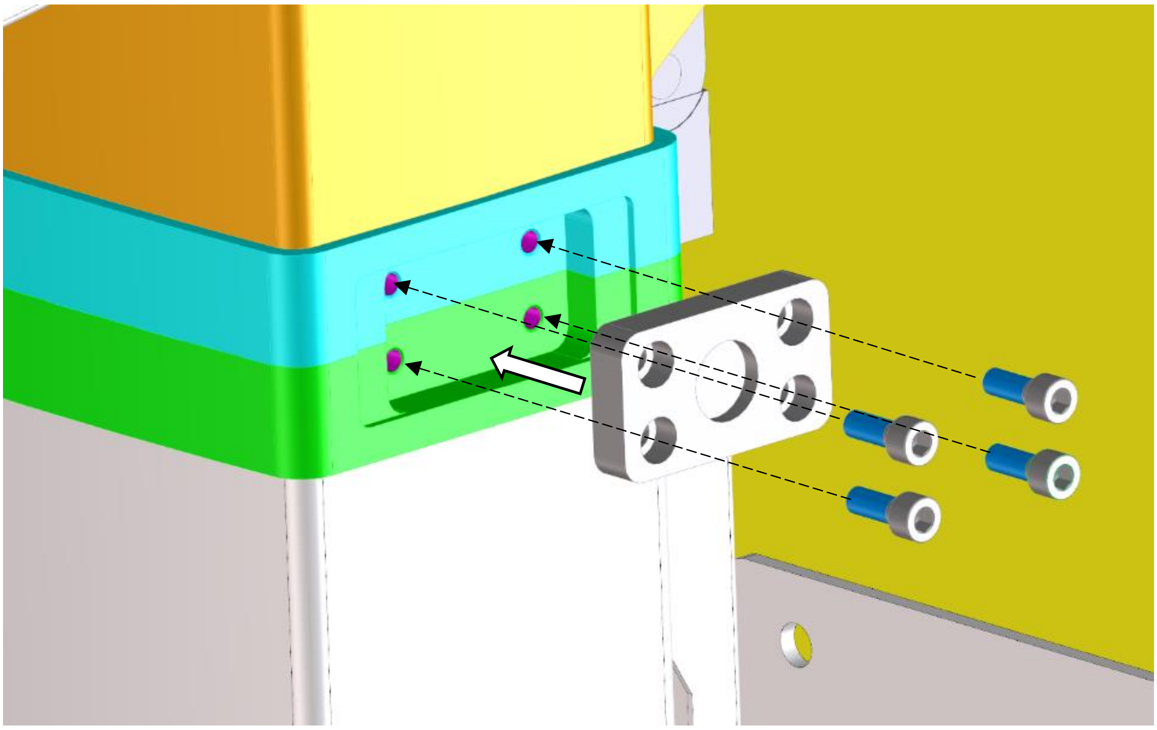




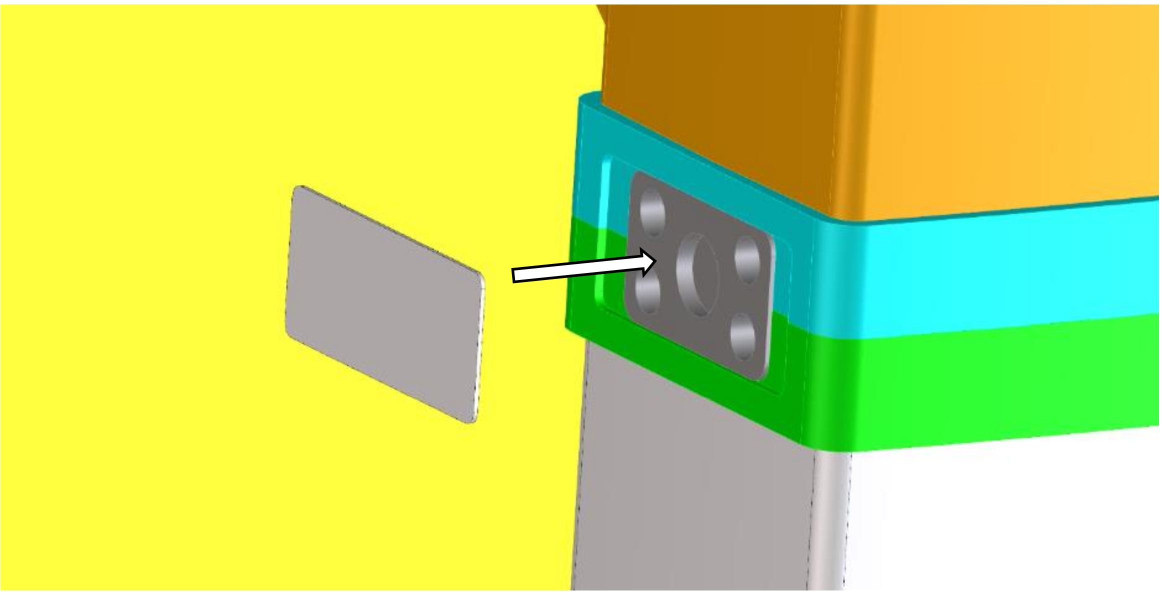


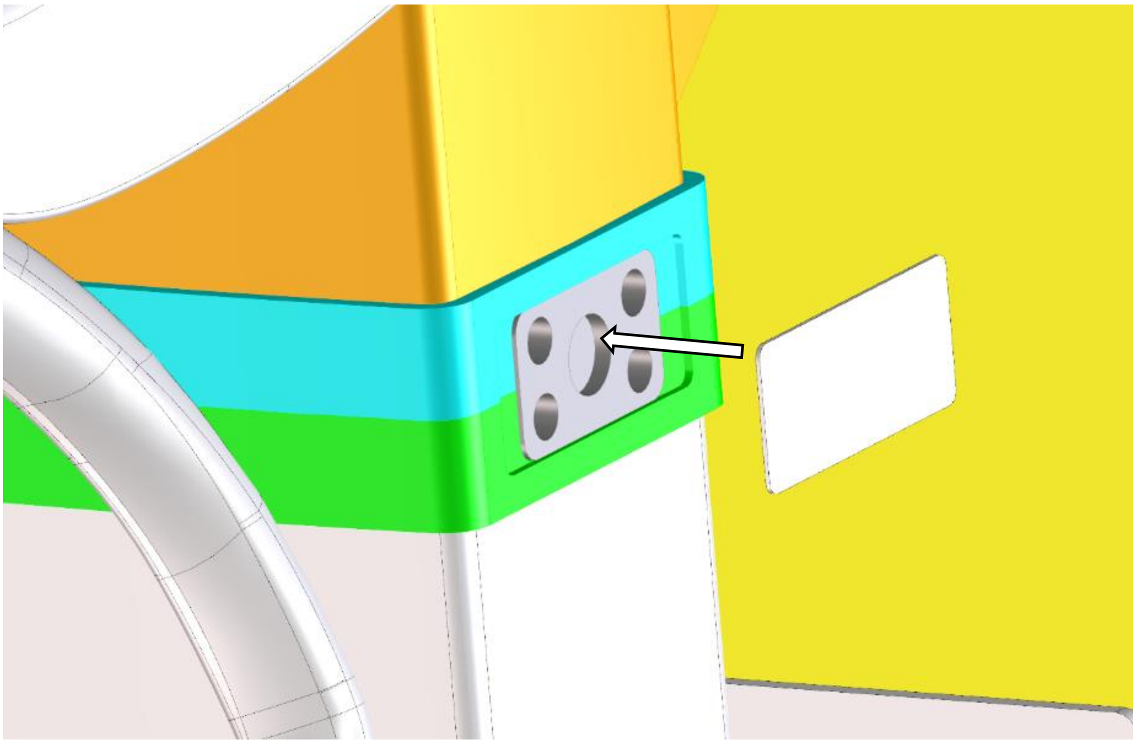
13. Fit the two joint locking plates using the same screws that fix the hinge



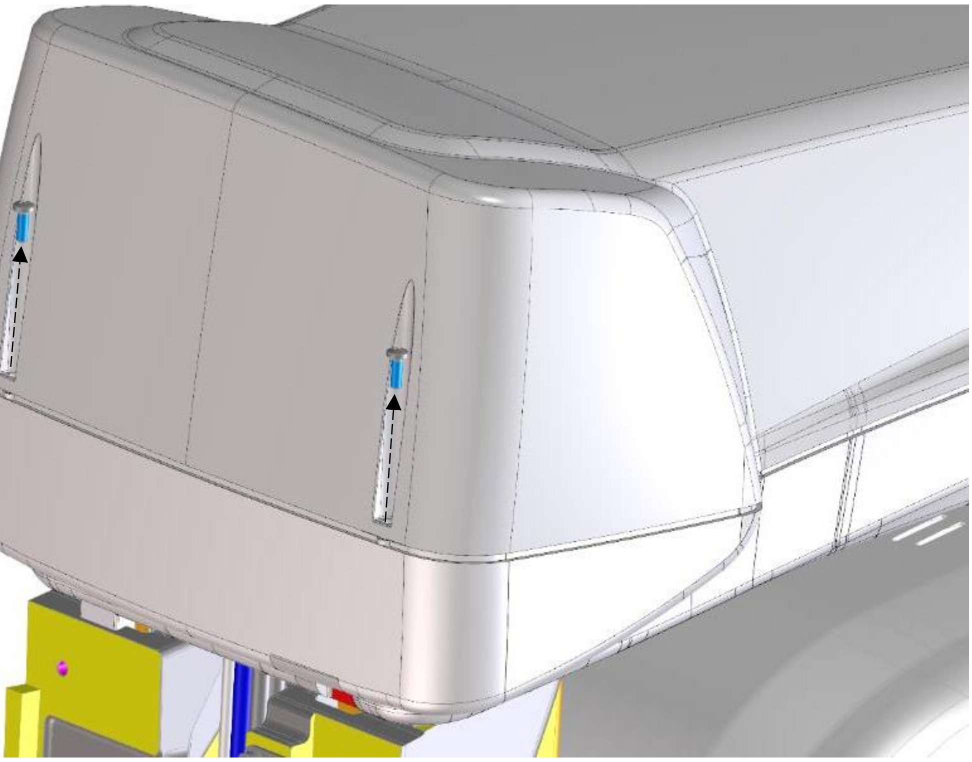


14. Apply the two covers on the locking plates by means of the magnets

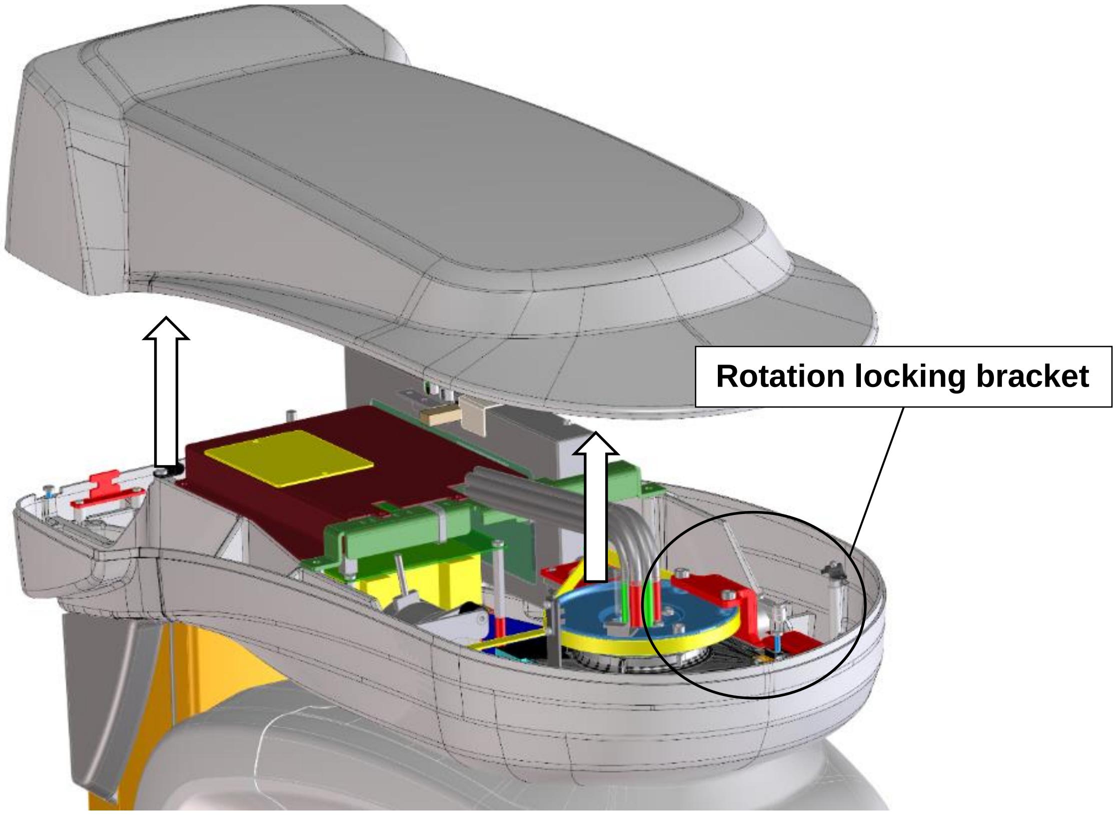


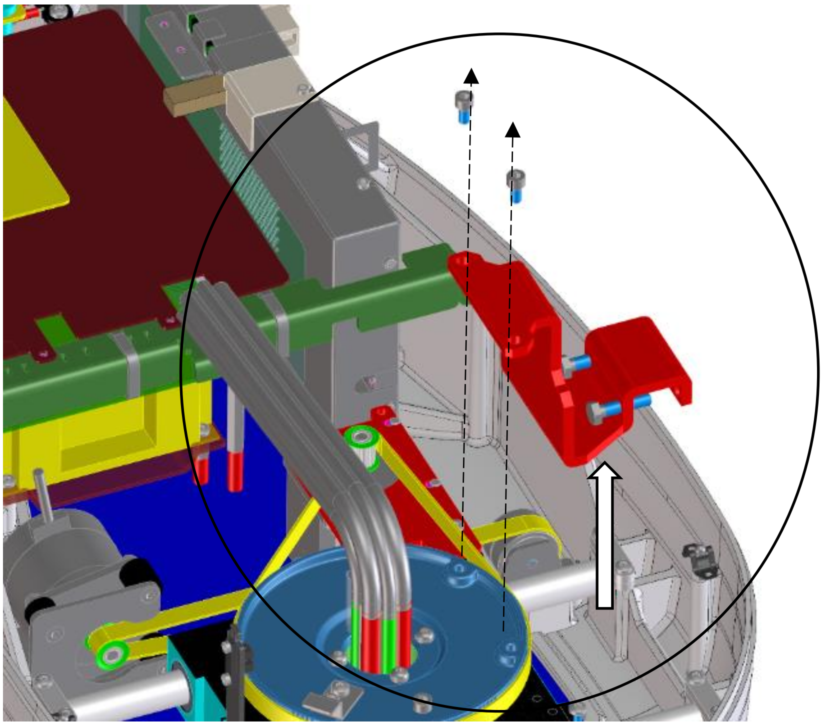


15. Remove the upper machine cover

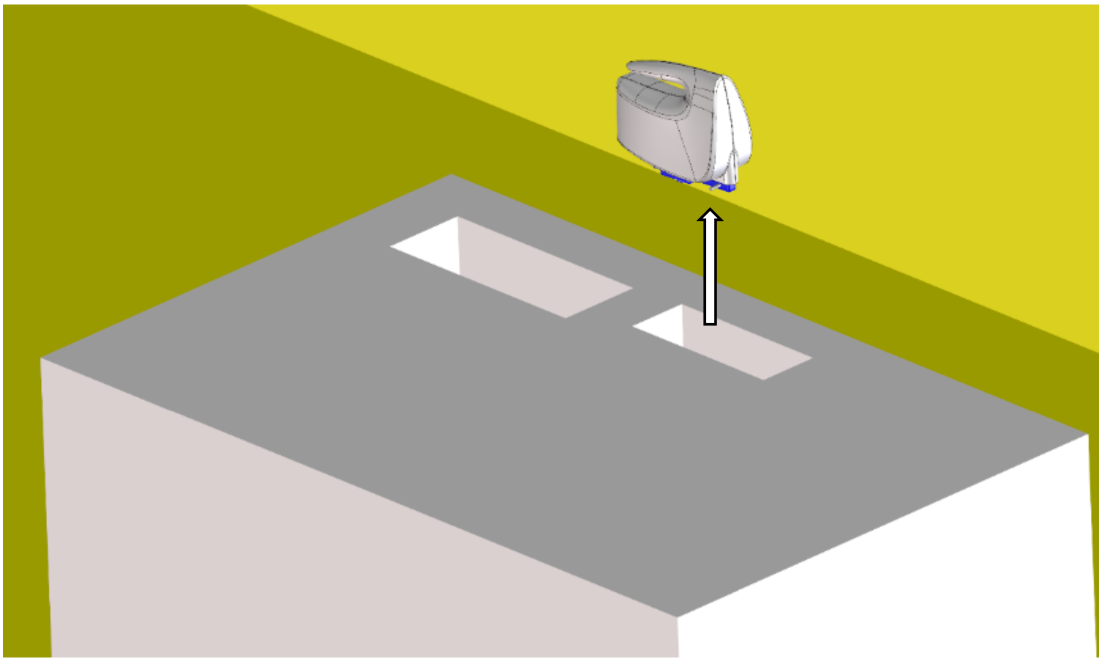


16. Remove the rotation locking bracket **being careful not to hit the optical sensor near here**.

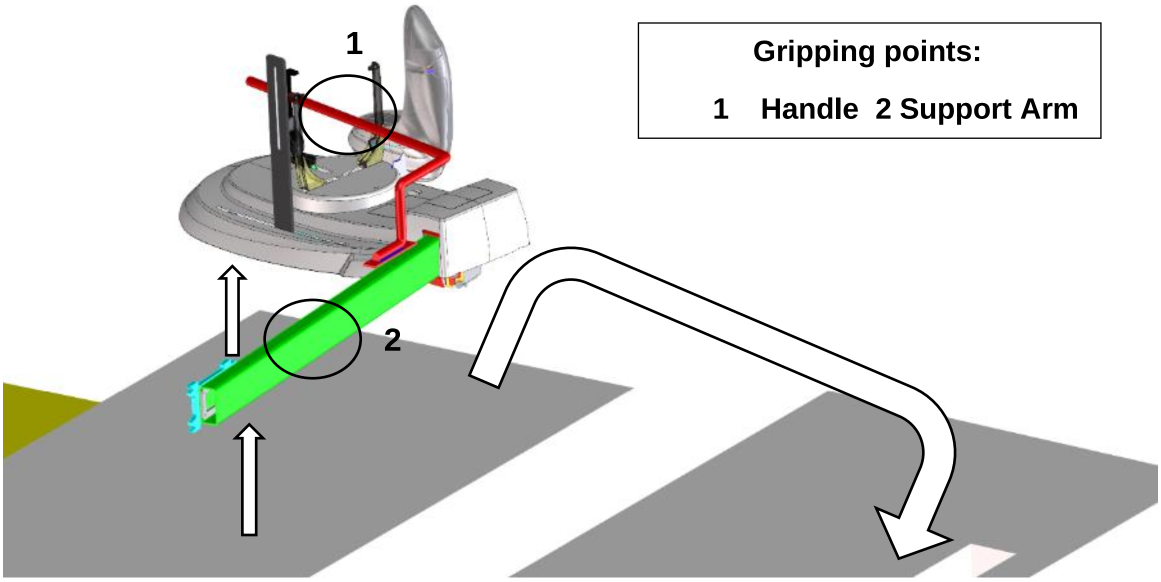




17. Remove the carton box from the CEPH package and remove the 2D sensor from the special seat in the polystyrene packaging.



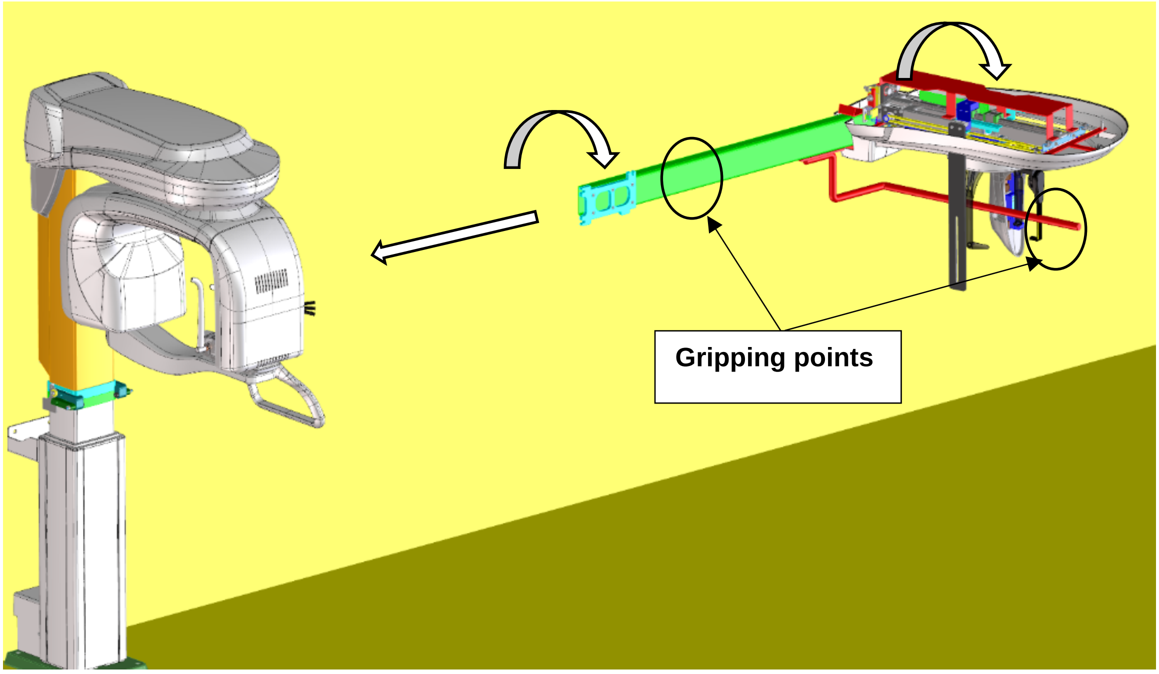
18. Open the packaging and remove the CEPH arm using the handle and the support arm as gripping points. **DO NOT GRAB THE CEPH DEVICE IN ANY OTHER POINT**.
This should be done by two operators.

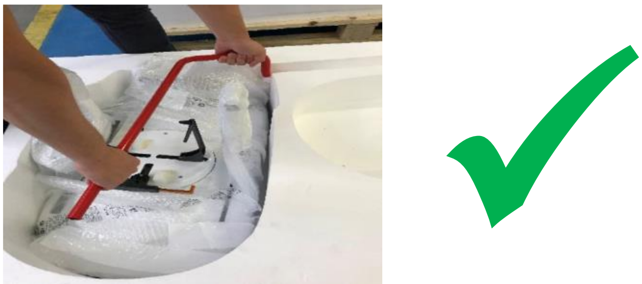


Gripping points:

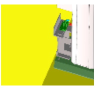
1 Handle 2 Support Arm

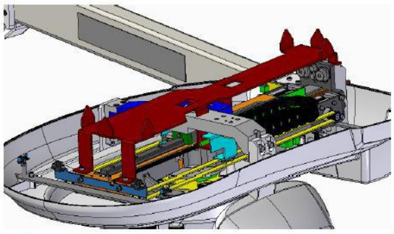
19. Using the handle and the support arm as gripping points, lift and rotate by 180 ° the CEPH arm approaching the rear of the machine. **(Warning! don't grab the arm from CEPH clamps and sensor holder)**





Warning



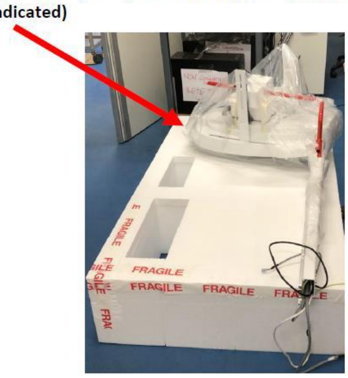


WARNING:

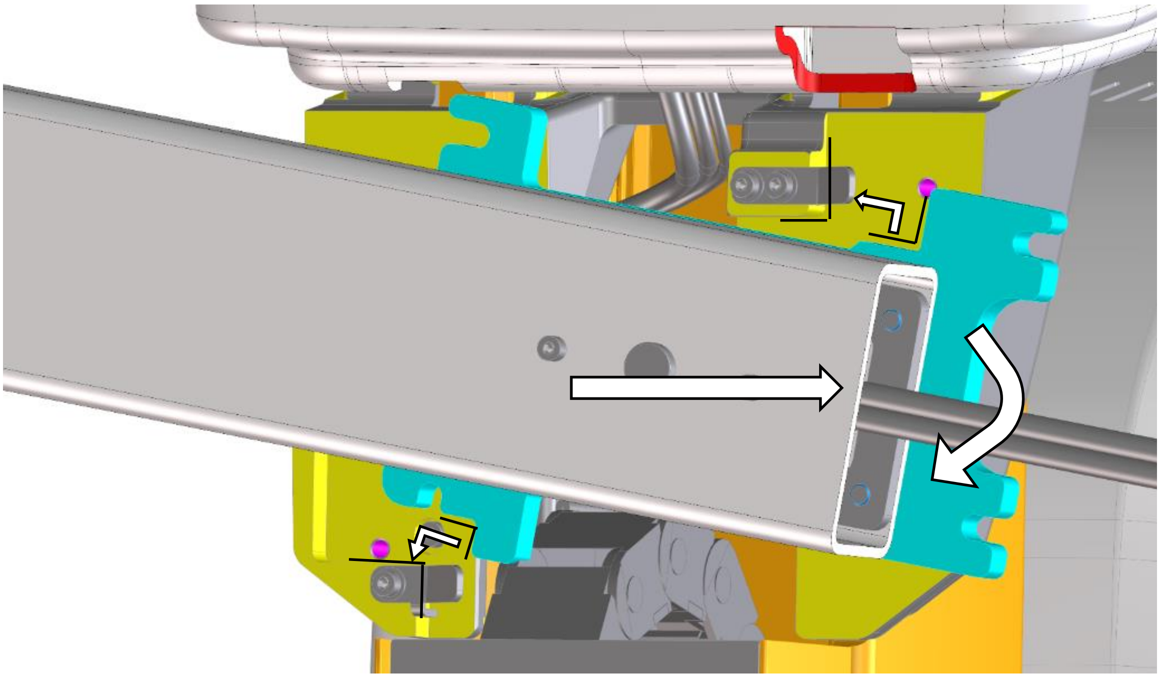
Do not place the ceph arm on the floor.

There are sharp metallic tips in the other side.

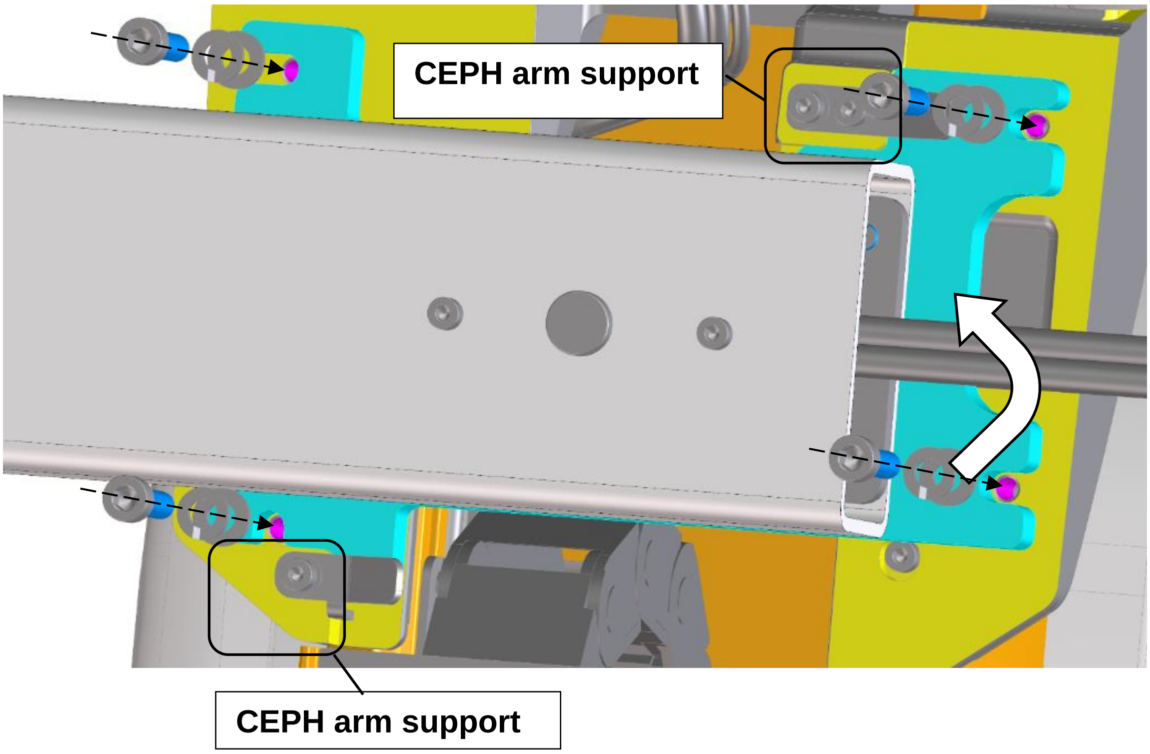
In case use the upper polystyrene packaging as support (as indicated)



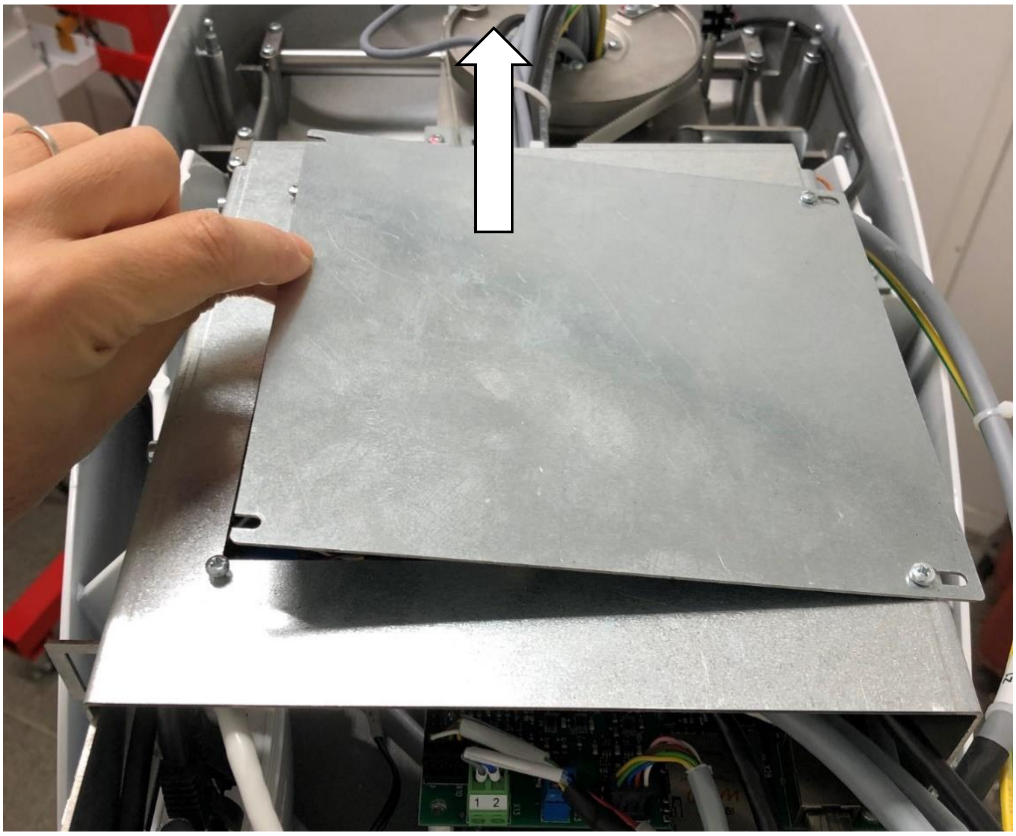
20. Insert the CEPH arm in its seat making the movement described in the following images



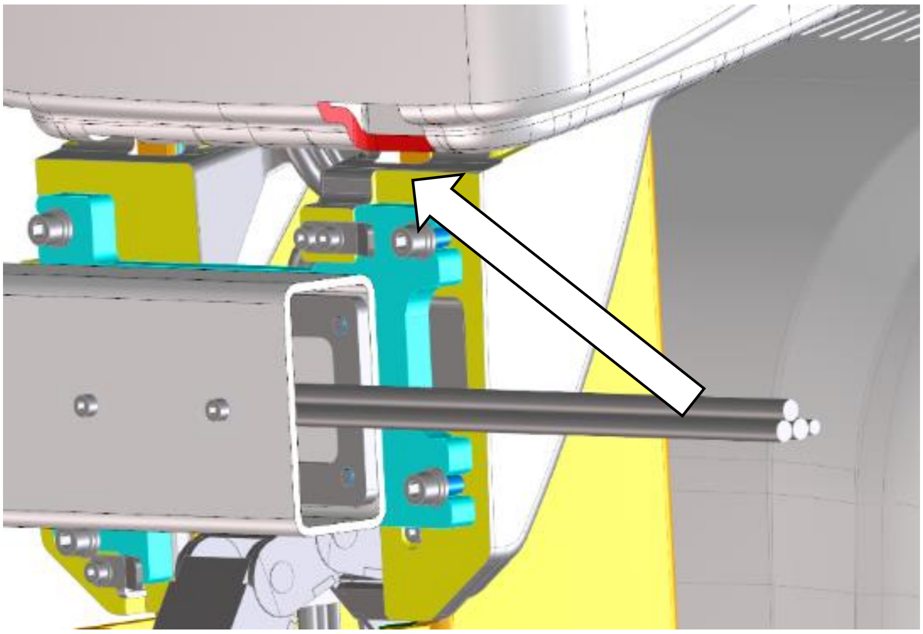
21. Put the CEPH arm in contact with the appropriate supports, then fix very well the CEPH arm to the machine with the screws and washers.



22. Remove the fire protection plate on top of the electronic boards

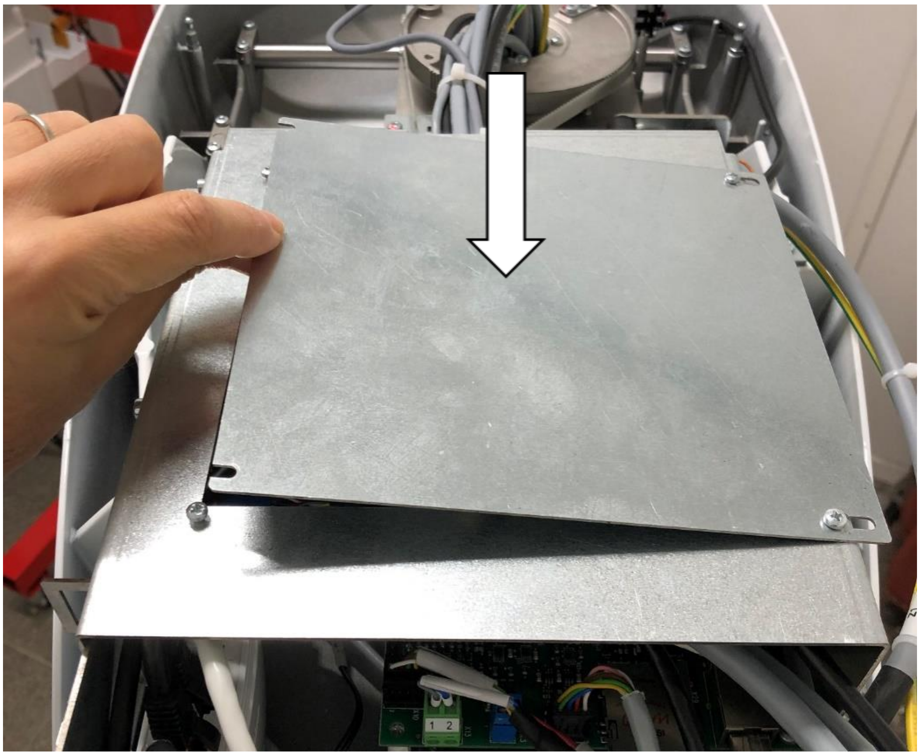


23. Pass the cables through the opening on the upper structure:

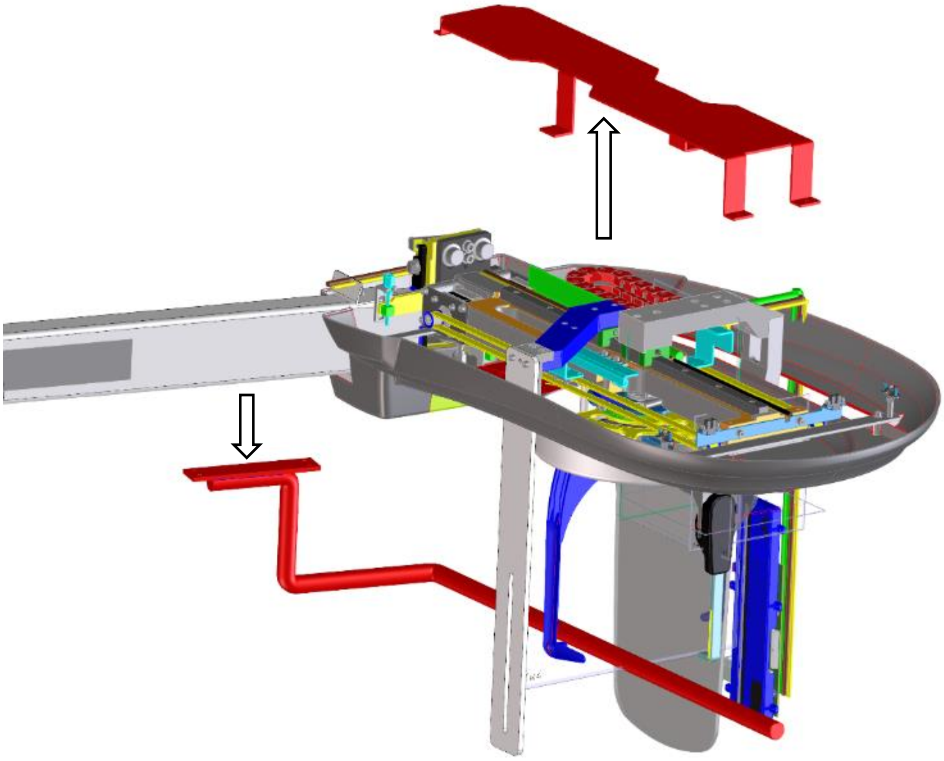


24. Connect the cables inside the fixed arm as follows:
    - X53, X54, X58 to the CCU board (A11)
    - The ethernet cable to the Ethernet switch
    - The ground cable to the main grounding point

25. Reinstall the fire protection plate on top of the electronic boards. If the screws are not well tightened they can create vibrations.



26. Remove the transport handle and the transport protection plate



7.2. Electrical connections

7.2.1. Description of the electrical connections

7.2.1.1. I-Max 3D

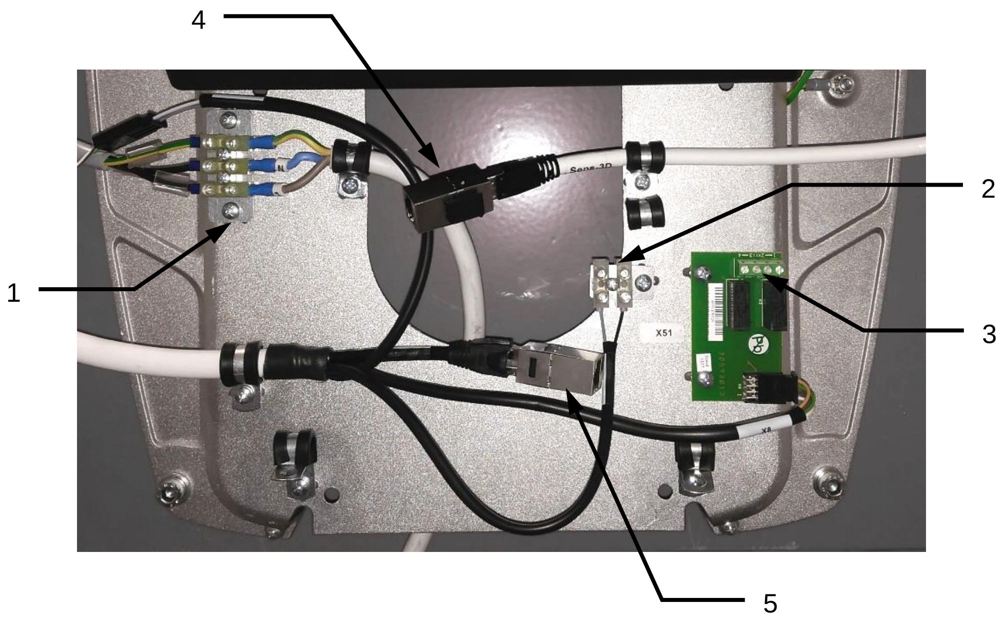


Figure 26

1. **Main Power Supply**: the power supply cable is already connected inside the I-MAX 3D. It is only necessary to connect it to the dedicated power supply line.

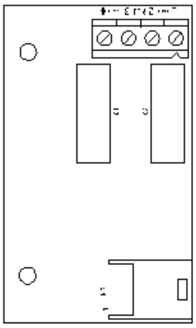
Note
Before to connect main power supply, be sure that the main provided by the Customer is according to specification in terms of voltage, line resistance and safety protections (see paragraph 6.1).

2. **X-Ray button**: a button is provided with the characteristic "dead man's" switch. Connect it to the indicated terminals.

   In case it is require to add a remote X-Ray button, used to perform exam with the operator outside the room, it must be a "dead man's" switch and provide a clean contact. This button must be suitable to prevent unwanted emission.

Warning
It is installer's responsibility to check the characteristics of the remote X-ray button.
No current or voltage must pass through remote control hand switch.
Wrong connections may damage the MCU.

3. **Light signalling**: I-MAX 3D, is set to connect, at the entrance of the X-ray room, the following control and warning devices:
   - READY light (green light 24V - 40W max.): it indicates that the unit is ready to perform the exam (contact N.O.).
   - X-RAYS light (yellow light 24V - 40 W max.): it indicates that the entry in the X-ray room is forbidden, since an exposure is running (contact N.O.).



Lights connection:
X11-1/X11-2 contact closed when unit is ready
X11-3/X11-4 contact closed during X-ray emission

Note
The unit only provides the closing contacts relative to the above mentioned functions. Power voltages for the relevant devices have to be provide from outside, making sure not to exceed the indicated ratings.

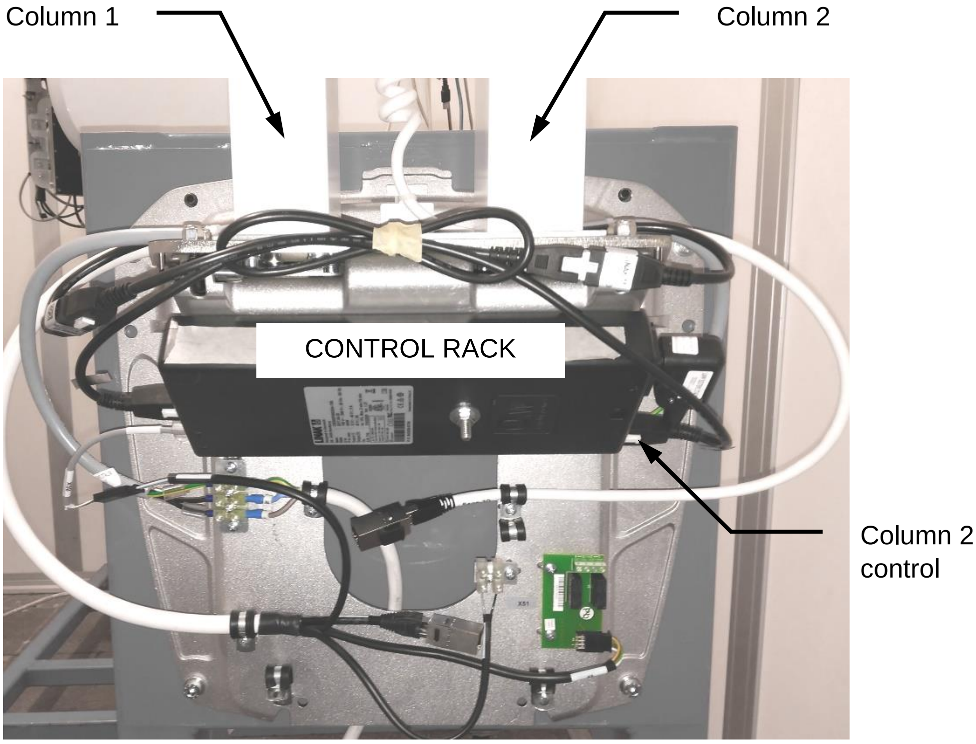
4. **3D Sensor Ethernet**: the upper network connector must be connected to the dedicated Network Interface Card on the PC, via Ethernet cable (≥ CAT 5e). This line brings the data from the 3D Sensor.

5. **DSPU board Ethernet**: the lower network connector must be connected to the dedicated Network Interface Card on the PC, via Ethernet cable (≥ CAT 5e). This line brings the communication between the unit and the PC.

Warning
Never connect the Ethernet cable coming from the computer to other connectors in the unit (i.e. column movement control rack).

Warning
Here following some actions that during installation, maintenance or troubleshooting MUST be avoided as they damage column or control rack:

- Never disconnect cables from the control rack if power supply is ON
- Never switch ON the unit if one of the two columns is disconnected
- Always verify that the columns are connected to the corresponding port in the control rack.

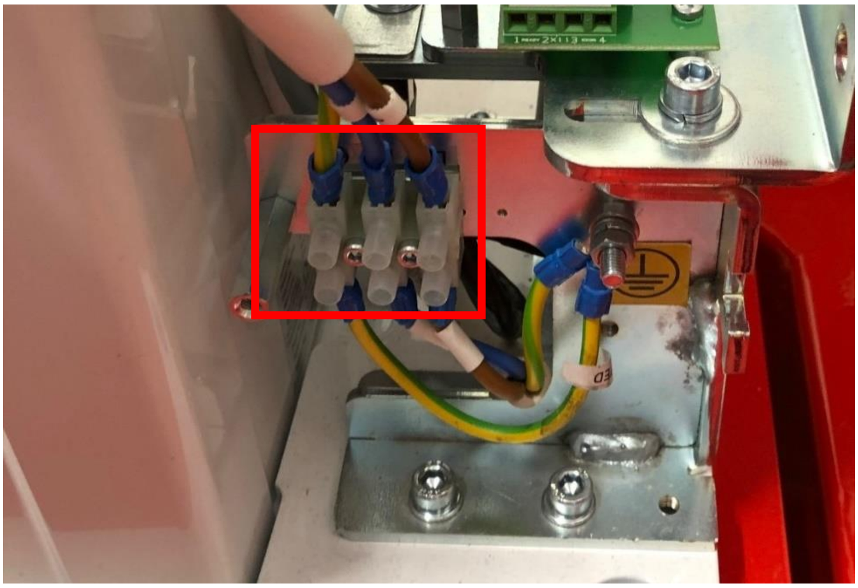


7.2.1.2. I-Max CEPH 3D

All external connections are located in the base of the unit.

Mains Power Supply
The mains line shall be connected to the terminal block on the right side of the unit. The power supply cable is already connected inside the I-Max 3D & I-Max CEPH 3D. It is only necessary to connect it to the dedicated power supply line.

Note
Before to connect main power supply, be sure that the main provided by the Customer is according to specification in terms of voltage, line resistance and safety protections (see paragraph 6.1).



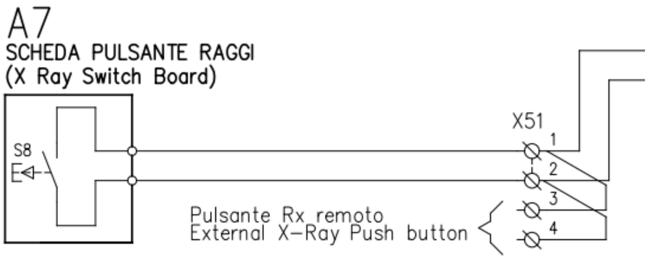
X-RAY buttons:

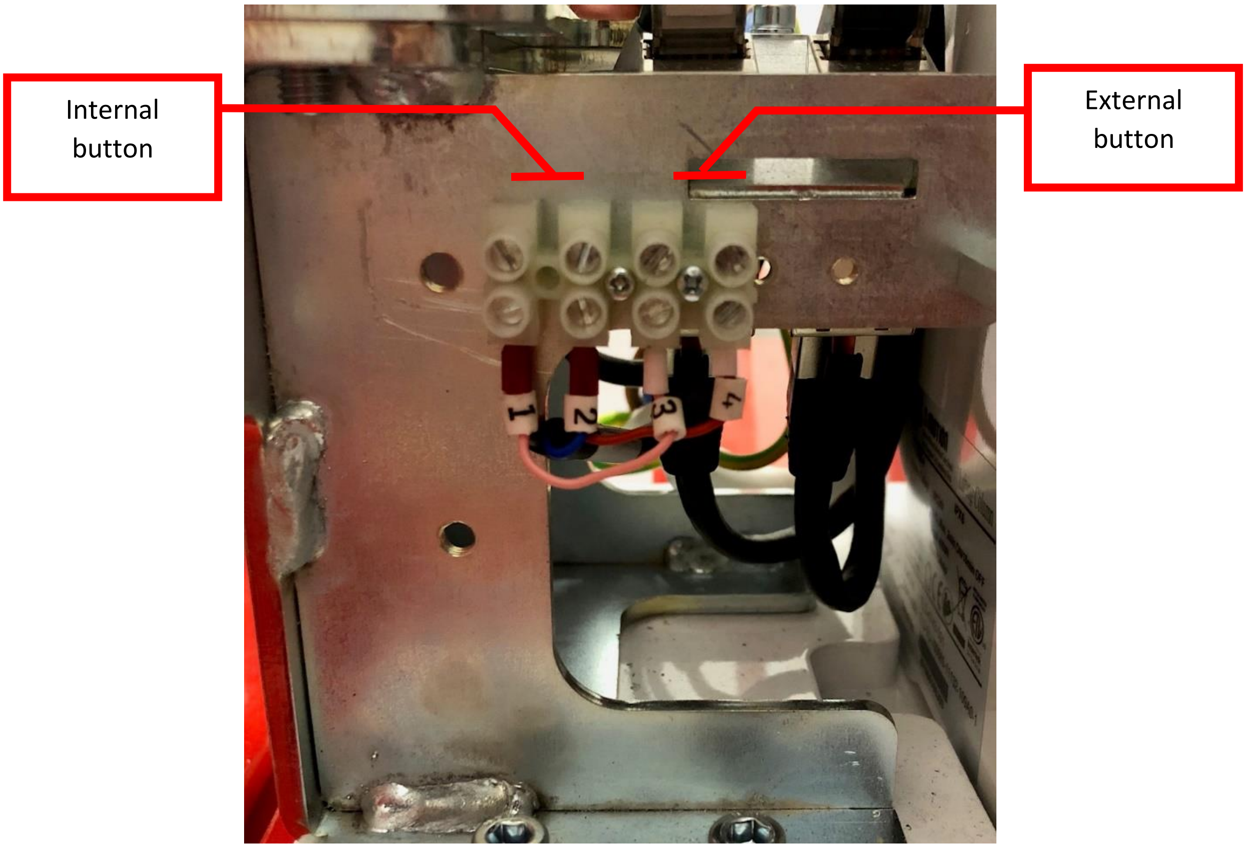
Connections are located on the left side of the unit.

The main x-ray button shall be connected to X51-1 and X51-2.

An external pushbutton can be connected so that the operator can start exposure from outside the exam room. It is mandatory to use a **MOMENTARY pushbutton** in order to guarantee “dead man” operation. The standard X-ray button supplied with the unit has the above characteristic. Contacts X51-3 and X51-4. Only a dry contact shall be connected to this input.

Warning
It is installer’s responsibility to check the characteristics of the remote X-ray button.
No current or voltage must pass through remote control hand switch.
Wrong connections may damage the unit.

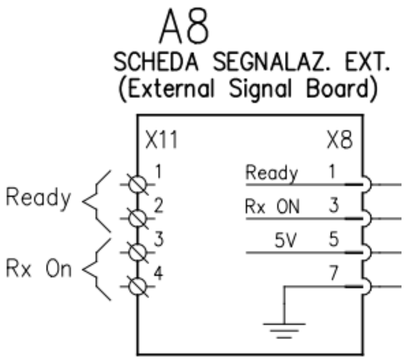




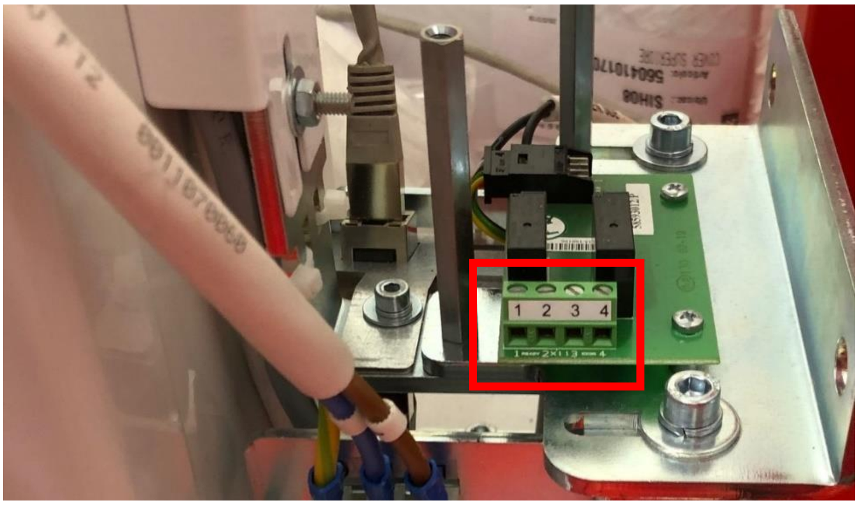
External signaling lights.
Connections are located on the right side of the unit.

- **READY light**: The signal is active when the unit is ready to perform the exam. Normally Open dry Contact, maximum load 24V, 40W. Contacts X11-1 and X11-2
- **X-RAY ON light**: The signal is active during X-Ray emission. Normally Open dry Contact, maximum load 24V, 40W. Contacts X11-3 and X11-4

The unit only provides dry contacts only. Power supply for the relevant devices has to be provided externally, making sure not to exceed the indicated ratings.



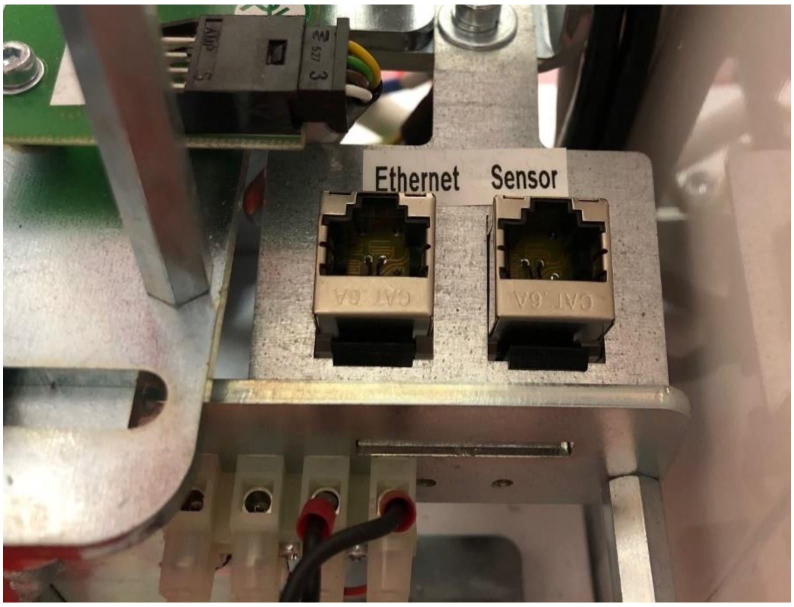
1. X11-1 / X11-2 contact closed when unit is ready
2. X11-3 / X11-4 contact closed during X-ray emission



Warning lights connections, located on the right side of the unit base.

Ethernet connections to the PC.
There are two RJ45 ethernet connections to the host PC.
Connections are located on the left side of the unit.

- **3D detector (labelled “SENSOR”)**: dedicated line for point-to-point connection from the 3D detector to the host PC.
- **CEPH detector and system interface (labelled “ETHERNET”)**: point-to-point connection from the unit to the host PC.



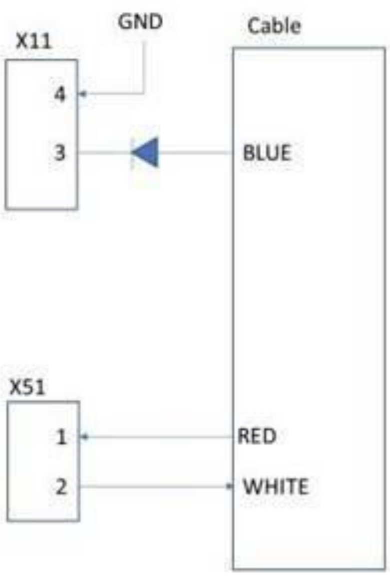
Two Cat 6 cables (each 5m long) are supplied with the unit. In case longer cables are needed, make sure the cables are Cat 6 or better.

Note
The ethernet cables shall be connected **DIRECTLY** the corresponding ethernet ports on the host PC. Connecting the cables to the local area network or to ethernet hubs will compromise the unit functionality.

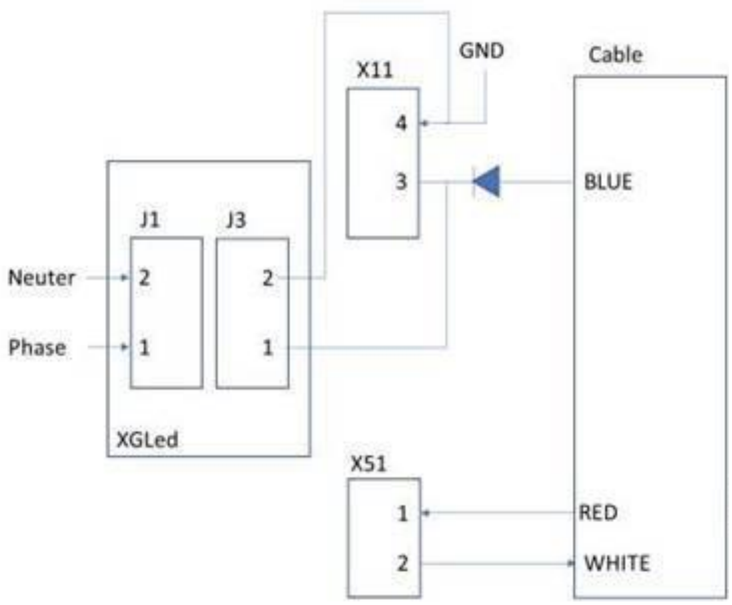
7.2.2. How to connect X-Ray push button ECB (optional)

As optional part you can have a remote X-Ray push button ECB

Below you can find a block diagram to connect the remote x-ray button ECB with the I-Max 3D.



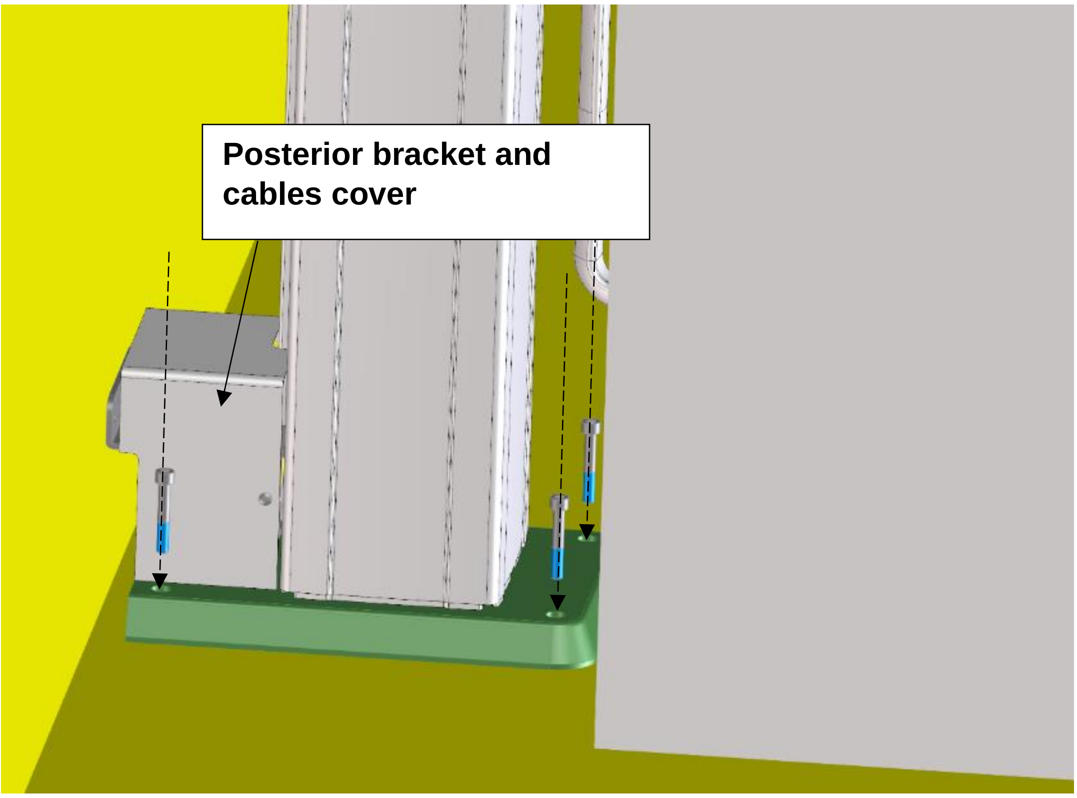
Below you can find the block diagram of connections needed to have ECB and external signal lamp during emission.



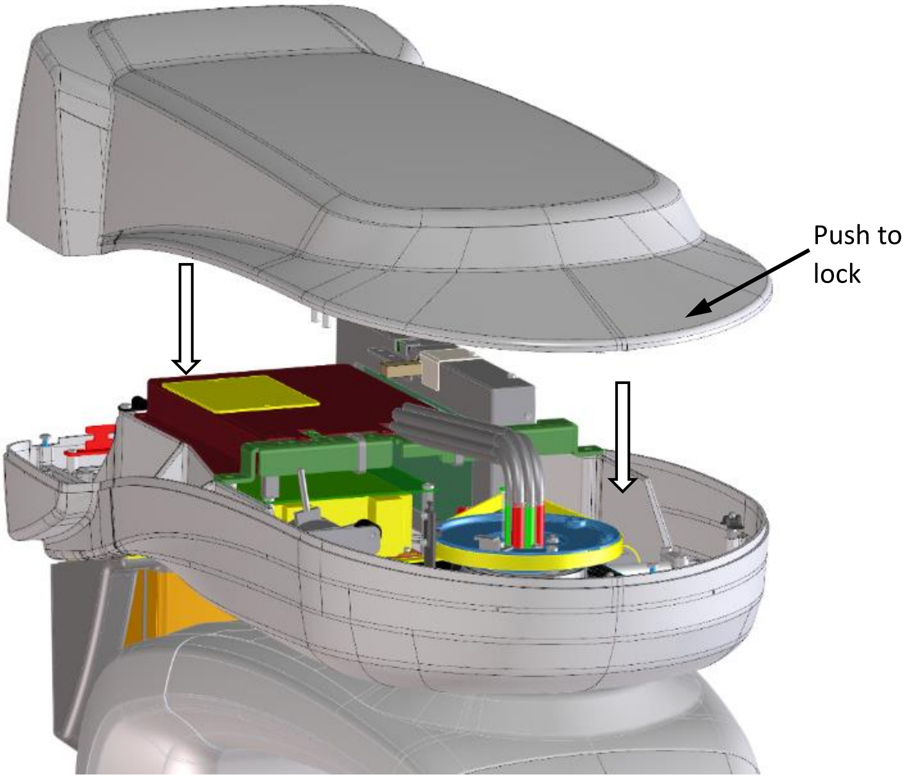
7.3. How to mount the covers

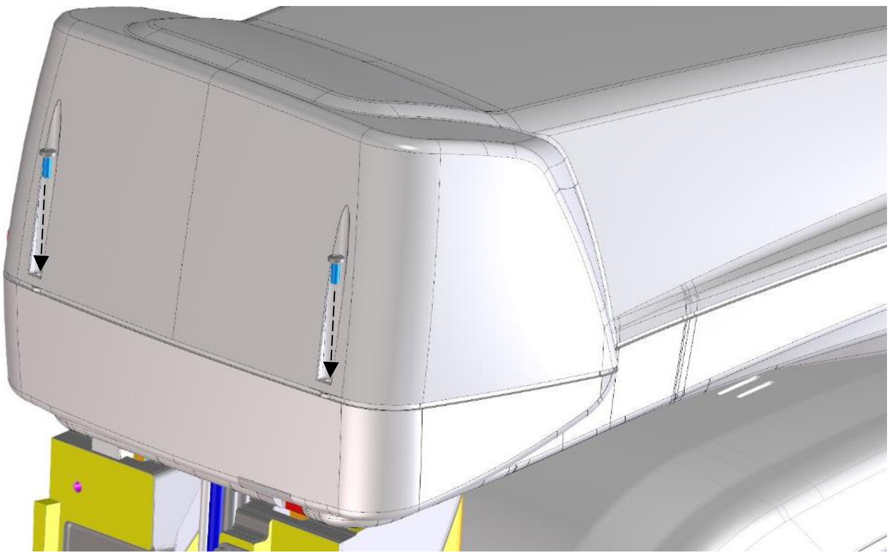
Note
Cover mounting is easier with the unit powered ON, mainly to move lift.

7.3.1. Wall plate cover

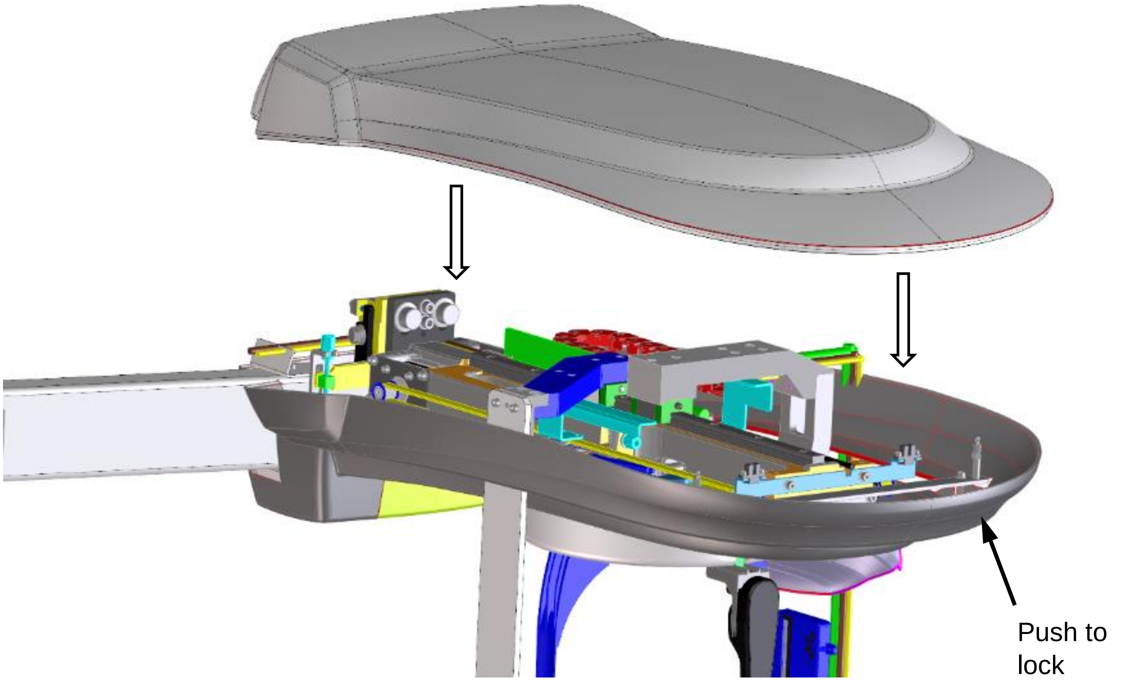


7.3.2. Upper cover

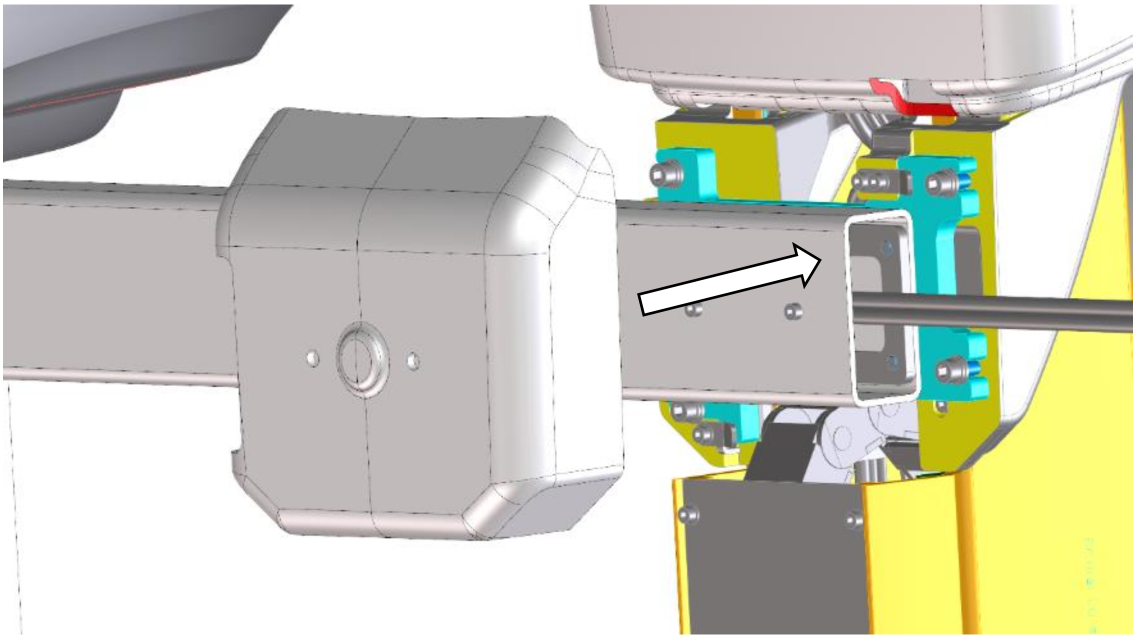




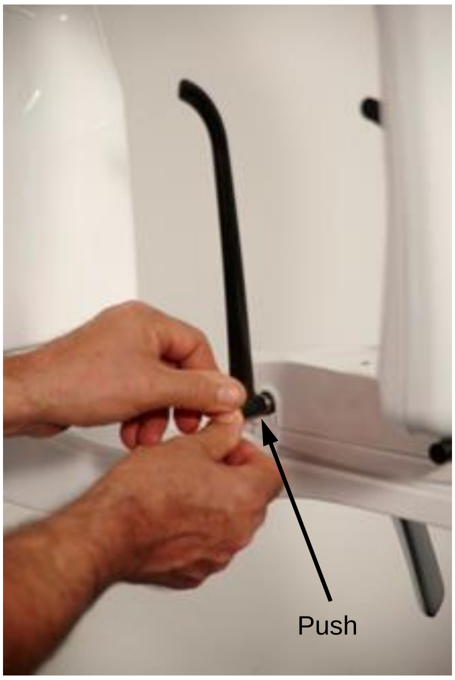
7.3.3. CEPH arm covers



The posterior cover is simply attached by magnets.



7.3.4. Temple supports



Note
The correct assembly of the temple supports is with the convex part on the patient side and the flat part on the external side.

7.4. Unit full installed

I-Max 3D

I-Max CEPH 3D

7.5. How to position the cables

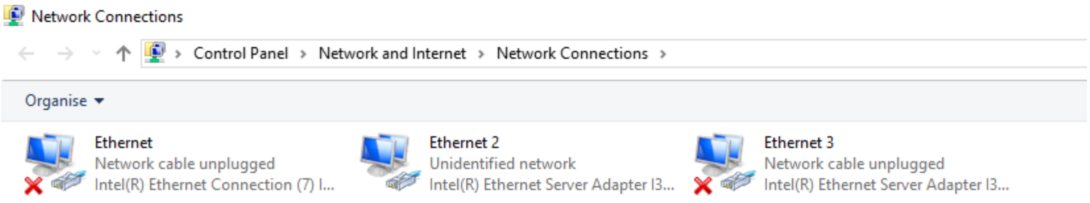
The cables output are from lower side of the I-Max 3D so that it’s possible to position them in a single cable channel on the wall.

7.6. PC configuration

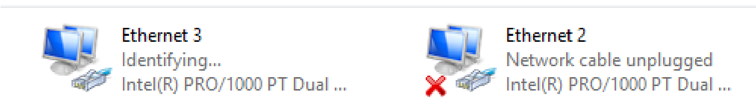
7.6.1. Network Interface card configuration

The equipment is supplied with a dedicated dual port Network Interface Card (NIC). In order to connect the I-Max 3D & I-Max CEPH 3D to the PC it is necessary to configure the properties of the dedicated NIC following the procedure described below.

1. Go to *Control Panel* > *Network and Internet* > *Network and Sharing Center* > *Change adapter settings*. The network adapters are labelled with the NIC model that is either Intel I350-T2 or Intel PRO-1000.

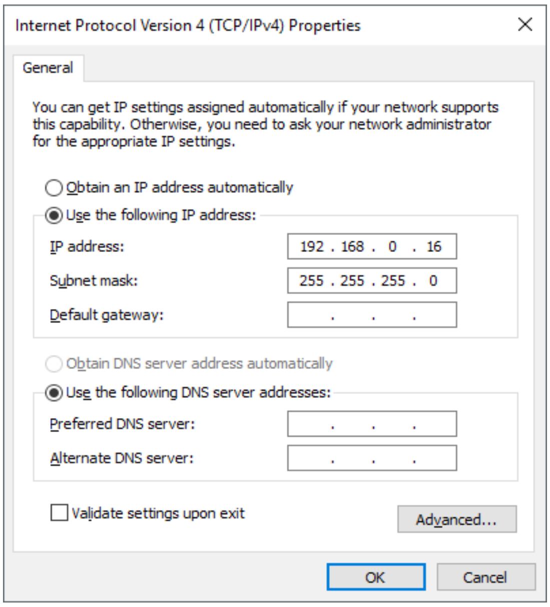


2. Plug the MCU board Ethernet cable i.e. the one connected to the machine port labelled with “Ethernet” to the left port of the NIC.
3. Switch on the unit. The network adapter connected to MCU board will become active.



4. Right click on it and select "Properties".
5. Select the item "Internet Protocol Version 4" and click on "Properties". Configure the IP address as follows:
   - IP address: 192.168.0.16
   - Subnet Mask: 255.255.255.0

   and then click "OK".

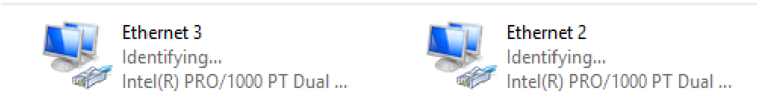


Note

In any case to set the network card IP address avoid using the following values:

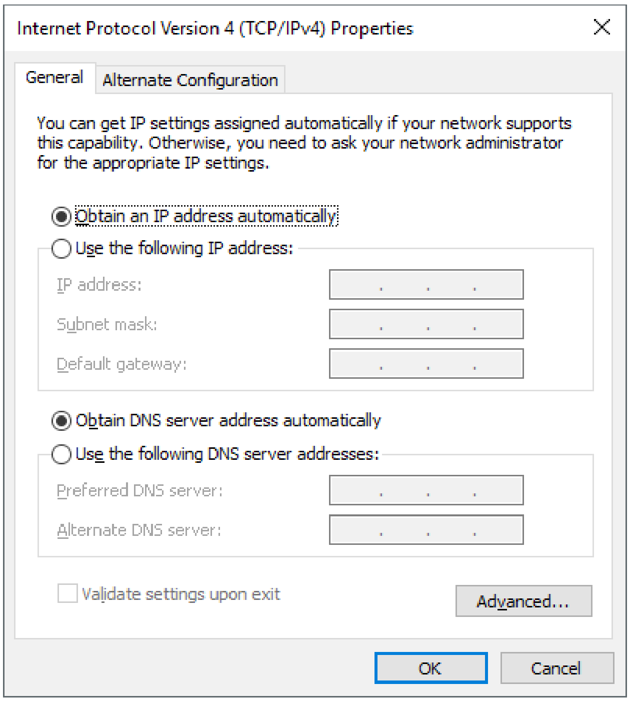
- 192.168.0.10 and 192.168.0.11 that are dedicated to the bootloader of MCU and CCU boards
- 192.168.0.211 dedicated to MCU board.
- 192.168.0.99 dedicated to PAN/CEPH detector
- 192.168.0.100 dedicated to PAN detector

- Plug the 3D Sensor Ethernet cable i.e. the one connected to the machine port labelled with “Sensor” to the right port of the NIC. The second network adapter corresponding to the dual port NIC will become active.



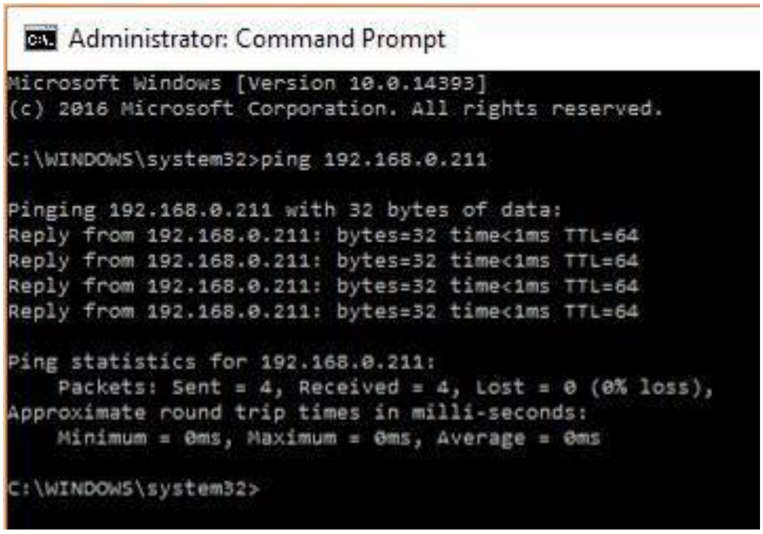
6. Right click on it and select "Properties".

7. Select the item "Internet Protocol Version 4" and click on "Properties". Select "Obtain an IP address automatically".

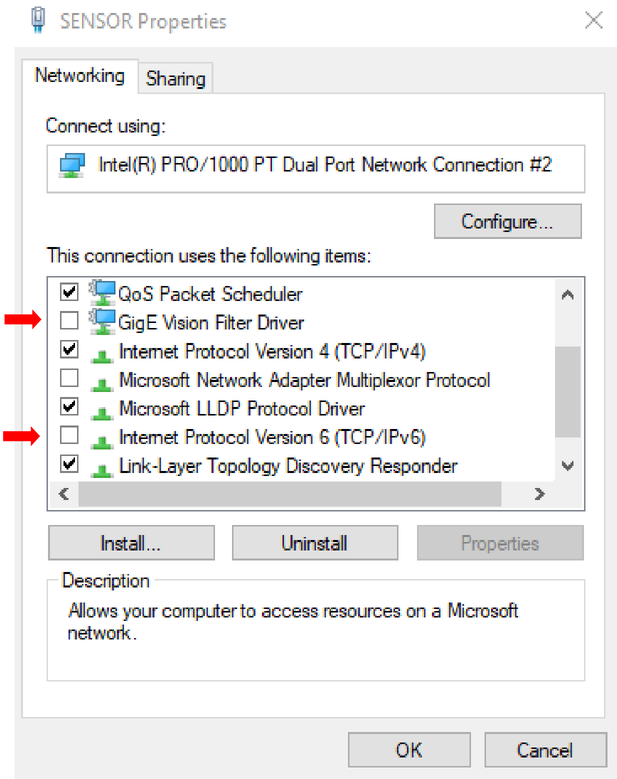


Confirm with OK.

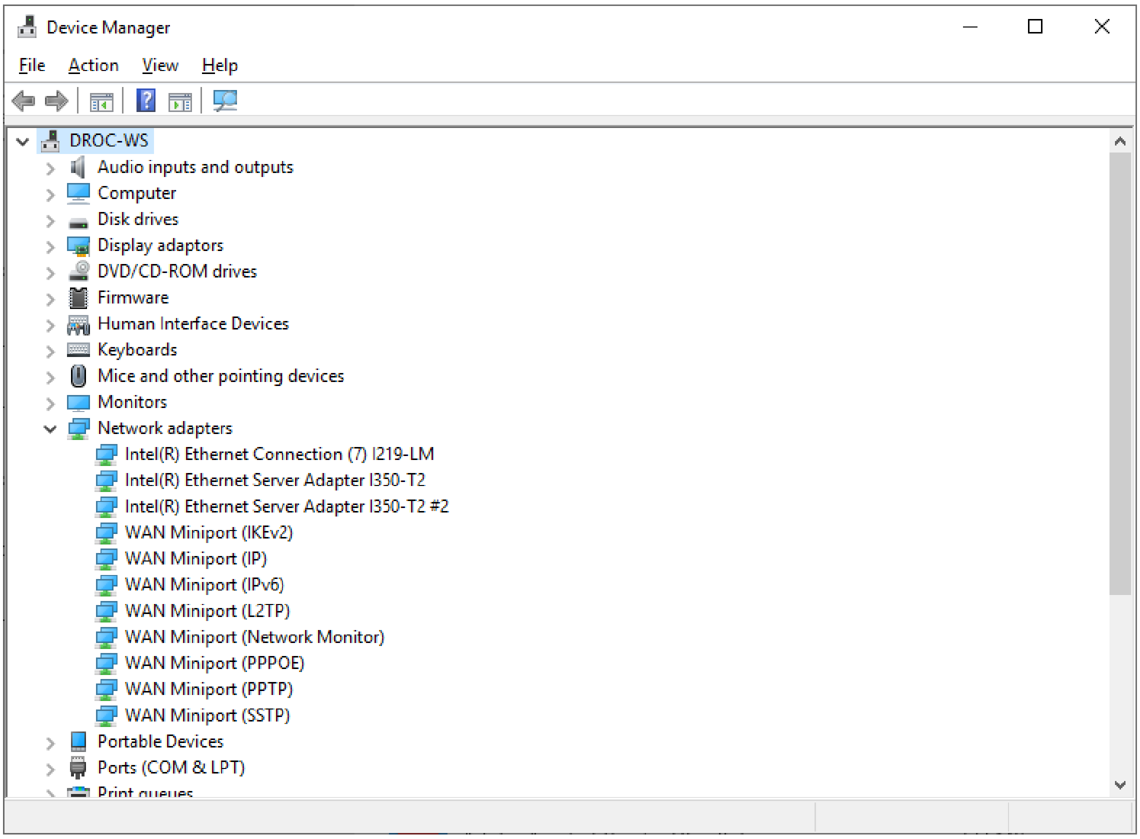
8. To check that the connections are properly configured, with the unit ON, run a command prompt and type "ping 192.168.0.211". Press Enter and verify that the unit reply to the ping as shown in the figure below.



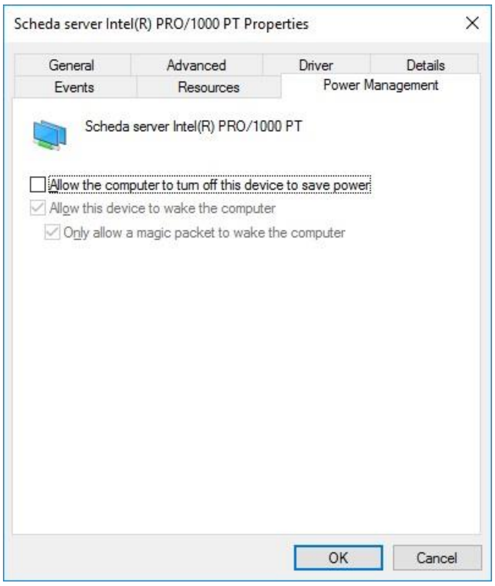
If the ping does not reply, swap the two network cables on the NIC ports and repeat the ping test.
If the problem is still present, unflag the items "GigE Vision Filter Driver" and "Internet Protocol Version 6" from the properties of all the network adapters.



9. Open the Device Manager, double click on "Network adapters" to see the list of devices.



10. Double click on the dedicated dual port NIC (Intel I350-T2 or Intel PRO/1000). Select the "Power Management" tab and unflag the box "Allow the computer to turn off the device to save power".



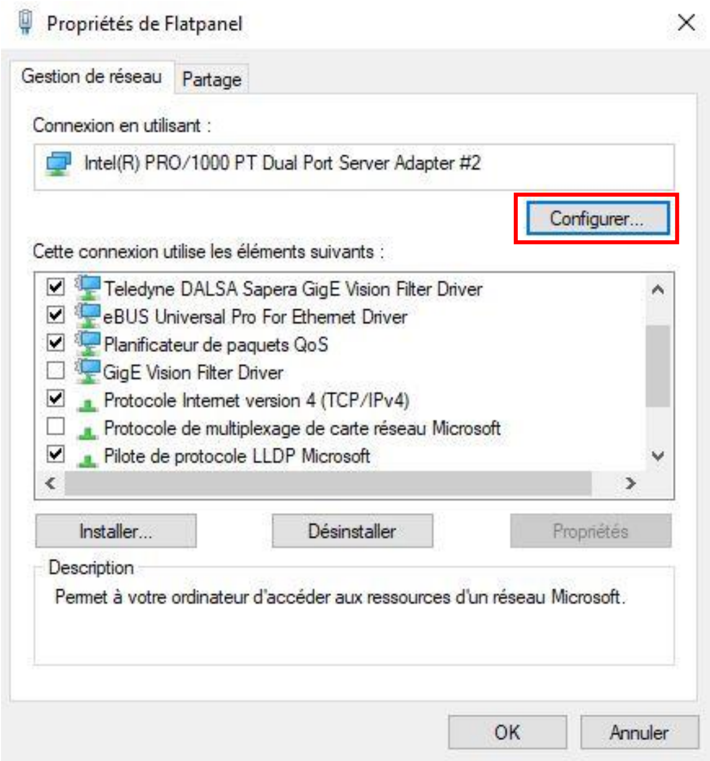
ONLY FOR I-Max CEPH 3D

It is required to set the Interface Card (NIC) connected to the mobile pan/CEPH sensor and host computer with the configuration explained in the following setting procedure:

1. Open the “Network Settings” menu of the Ethernet board connected to the 3D sensor by right clicking on its icon and select “Property”.
2. On the Ethernet board property window click on “Configure…”:

Warning
Do not disable Teledyne DALSA Sapera GigE Vision Filter Driver

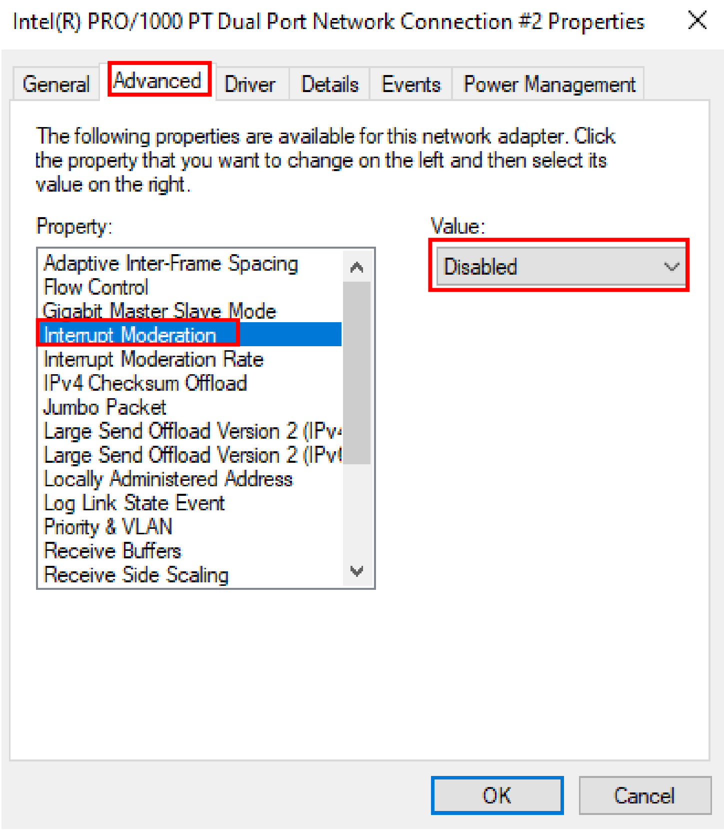
---



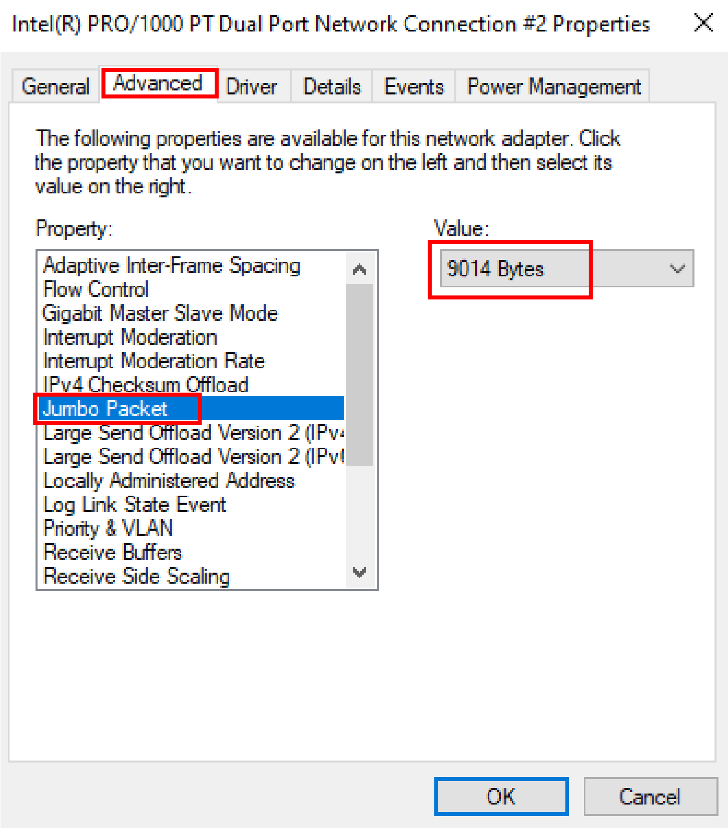
3. Select the “Advanced” sheet on the network board configuration window.

4. Set the following network settings (see Figures below):

- Interrupt Moderation = Disabled

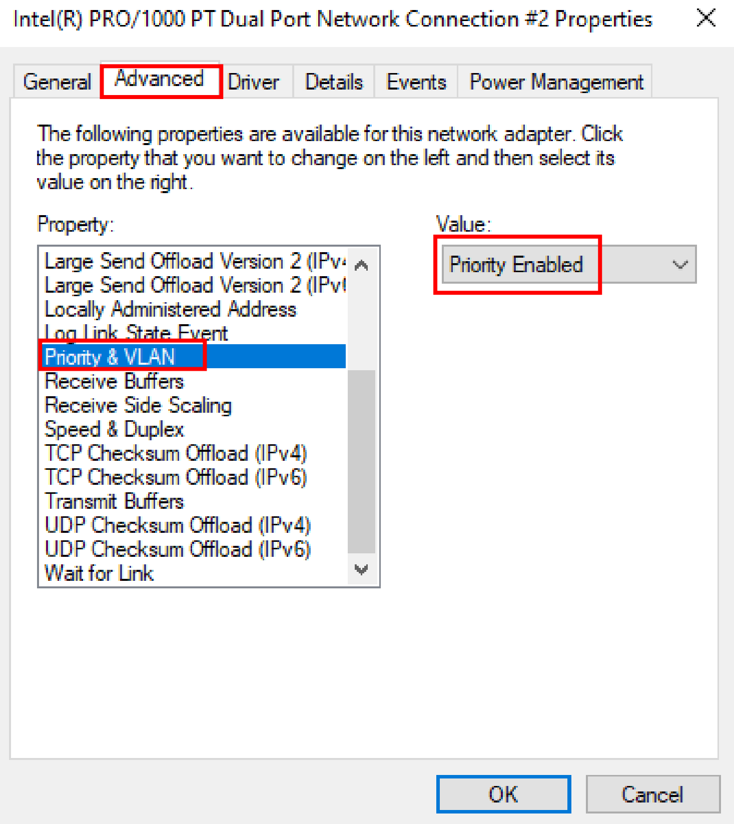


- Jumbo Packet = 9014 Bytes

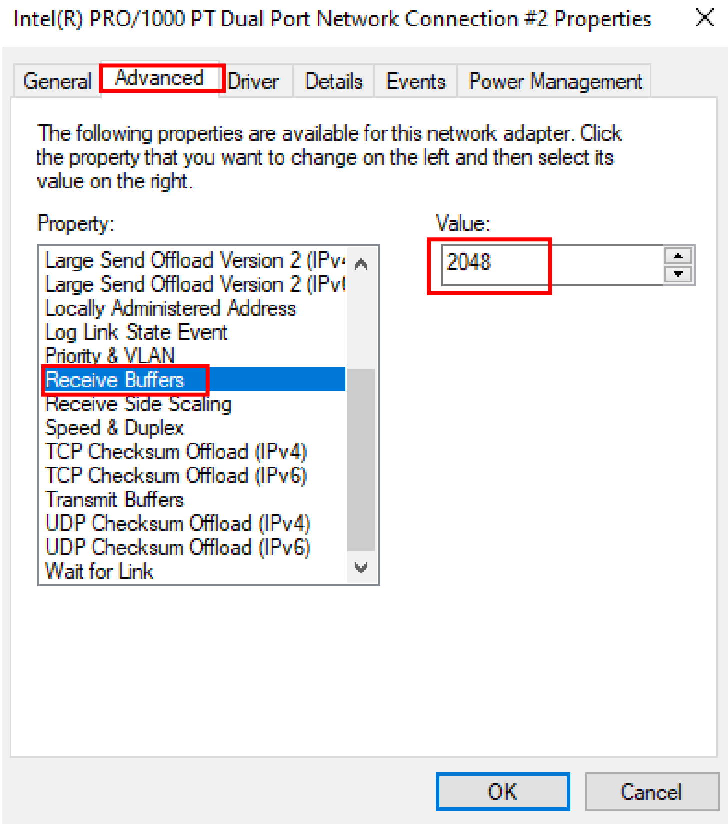


- Maximum Number of RSS Queues = 2 Queues (information not systematic)

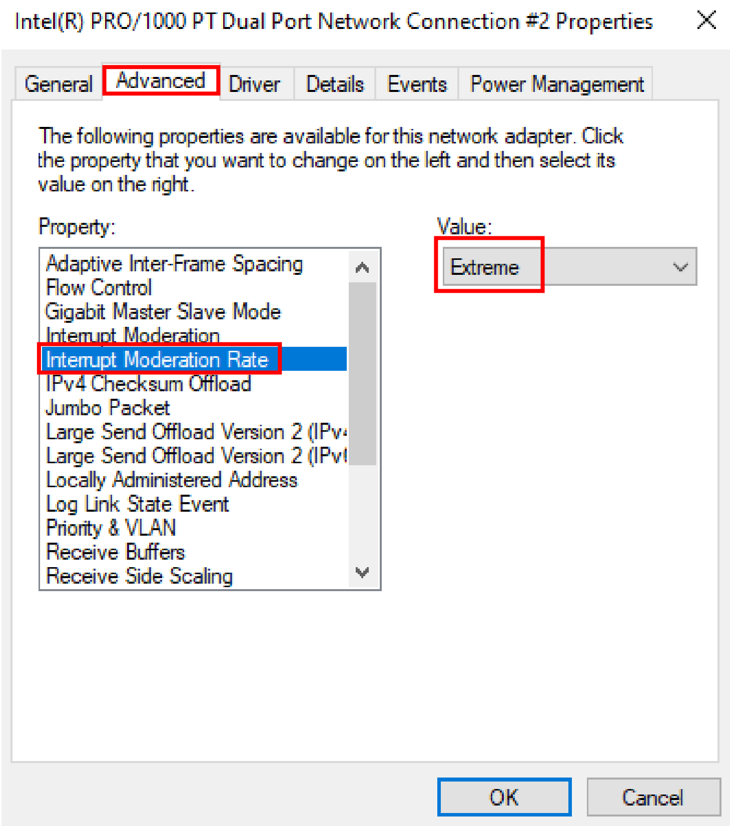
- Priority & VLAN = Priority Enabled



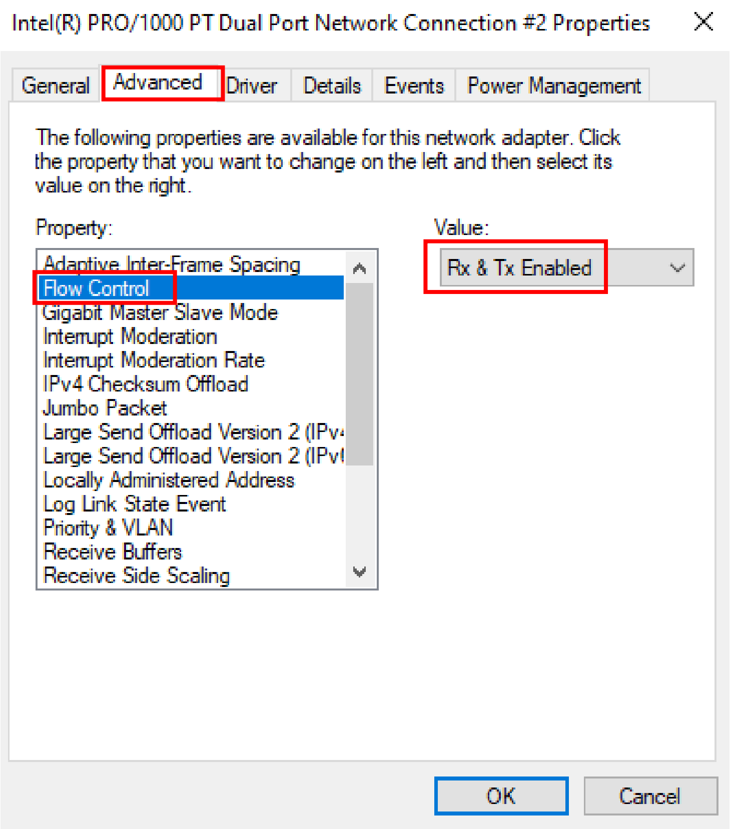
- Receive Buffers = 2048



- Interrupt Moderation Rate = Extreme



- Flow control = Rx &Tx Enabled

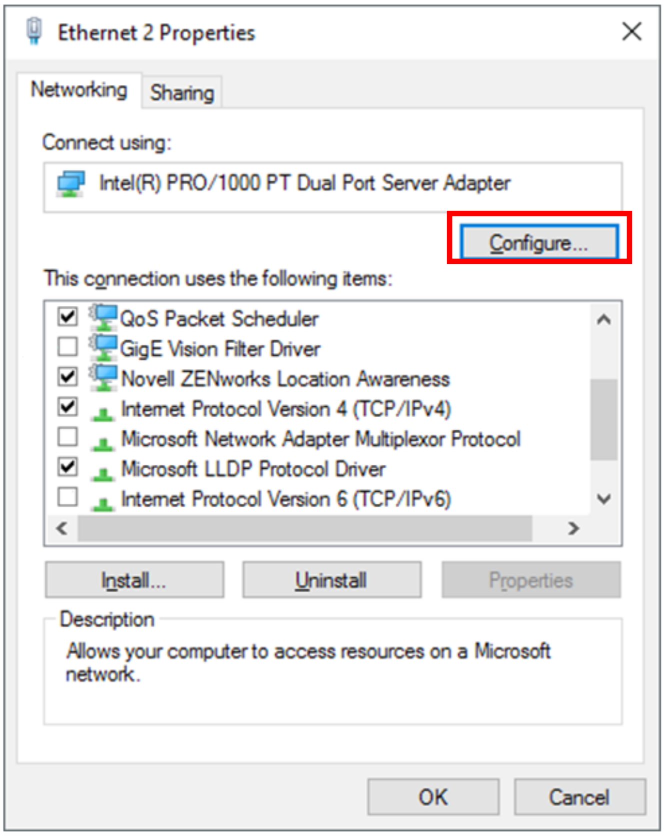


5. Click “OK” and restart the computer.

7.6.2. 3D sensor Network Interface board configuration

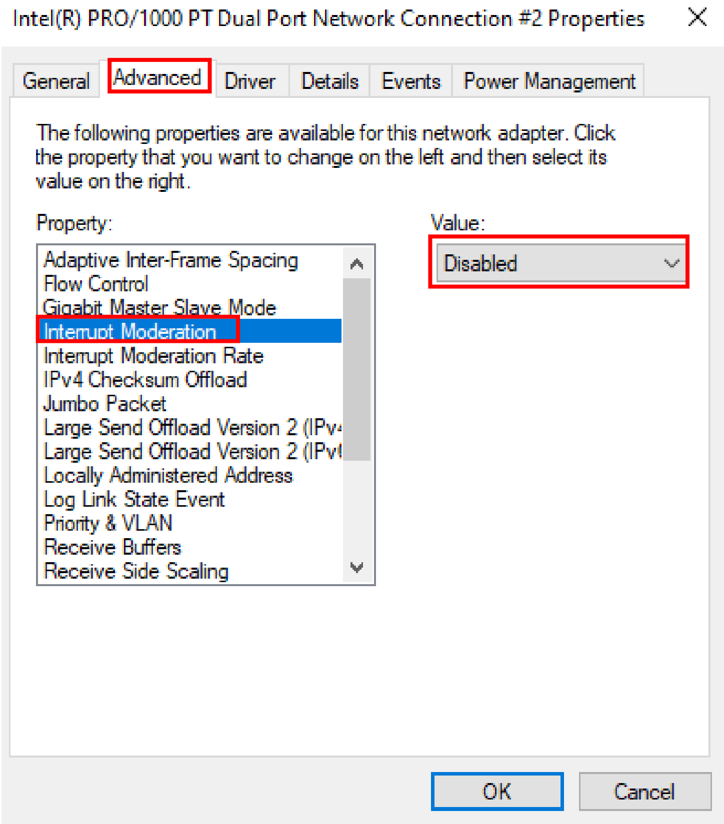
It is required to set the Interface Card (NIC) connected to the 3D sensor with the configuration explained in the following setting procedure:

1. Open the "Network Settings" menu of the Ethernet board connected to the 3D sensor by right clicking on its icon and select "Property".
2. On the Ethernet board property window click on "Configure…":

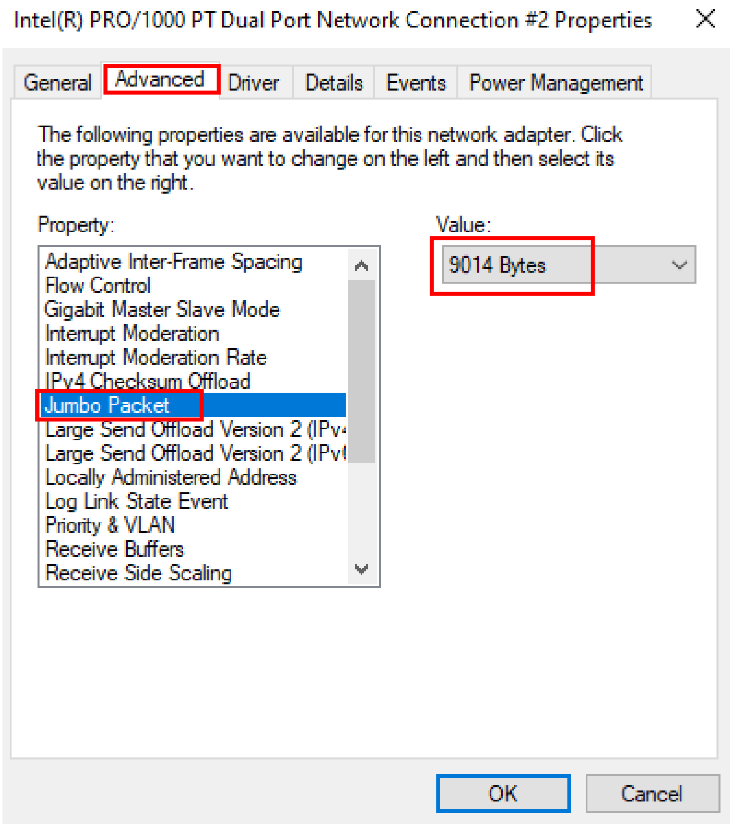


3. Select the "Advanced" sheet on the network board configuration window.

4. Set the following network settings (see Figures below):
   - Interrupt Moderation = Disabled

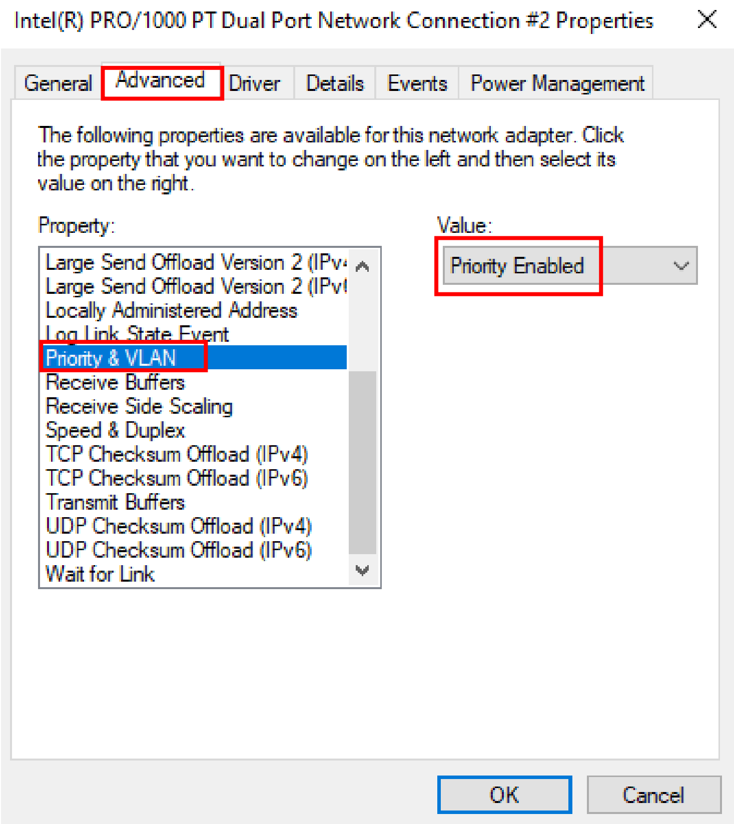


   - Jumbo Packet = 9014 Bytes

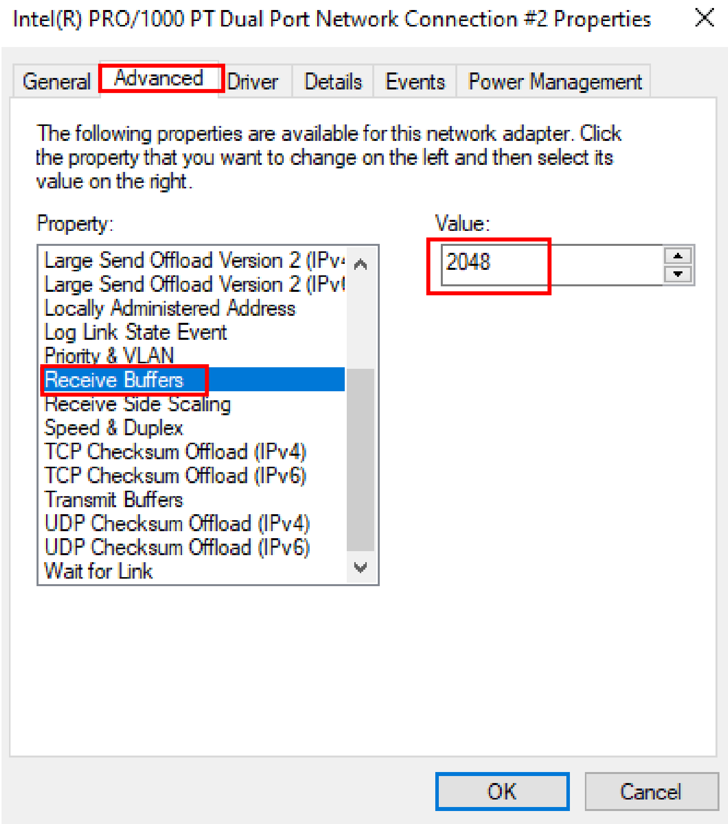


   - Maximum Number of RSS Queues = 2 Queues (information not systematic)

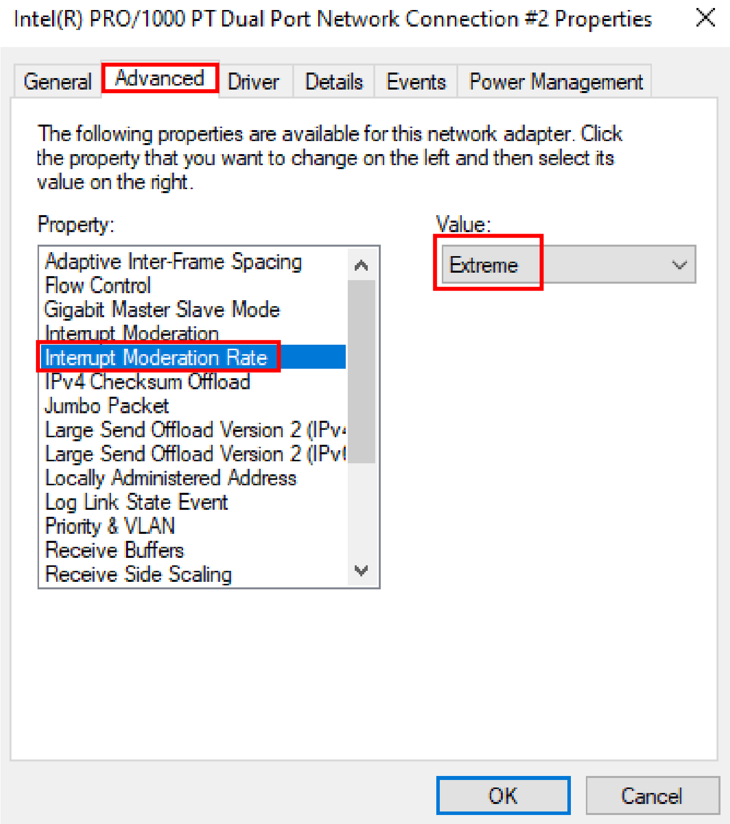
- Priority & VLAN = Priority Enabled



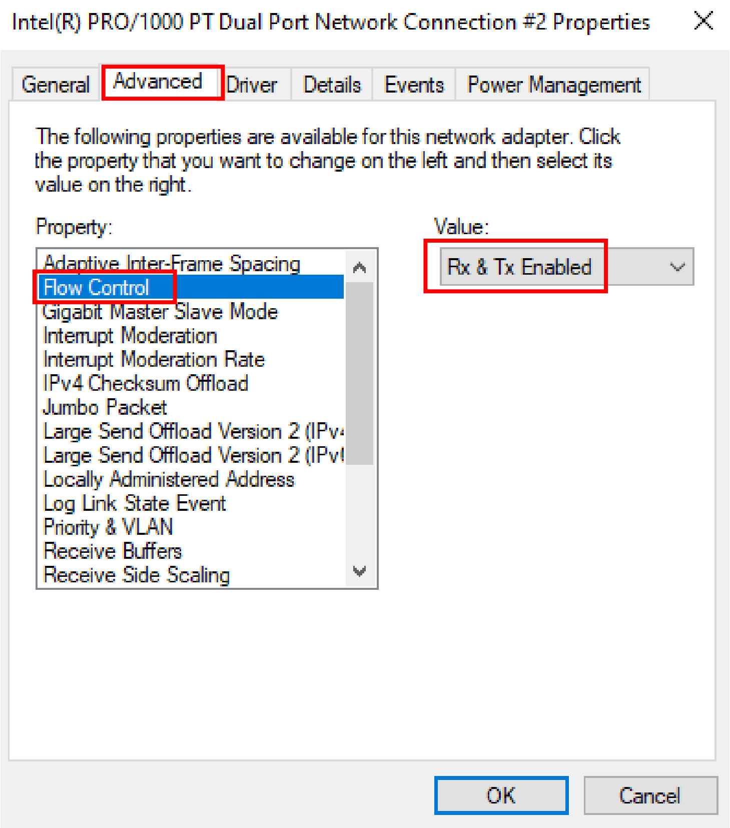
- Receive Buffers = 2048



- Interrupt Moderation Rate = Extreme



- Flow control = Rx &Tx Enabled



5. Click “OK” and restart the computer.

7.7. Software installation

Note
The windows user must have an administrator profile.
QuickVision requires that Windows 10 is already installed on your computer and correctly configured.

1. Close all the running applications.
2. Insert the USB pen drive, open the partition "SETUP" and double click on "Autorun.exe".

Note
For the description of the QuickVision software installation refer to the specific manual.

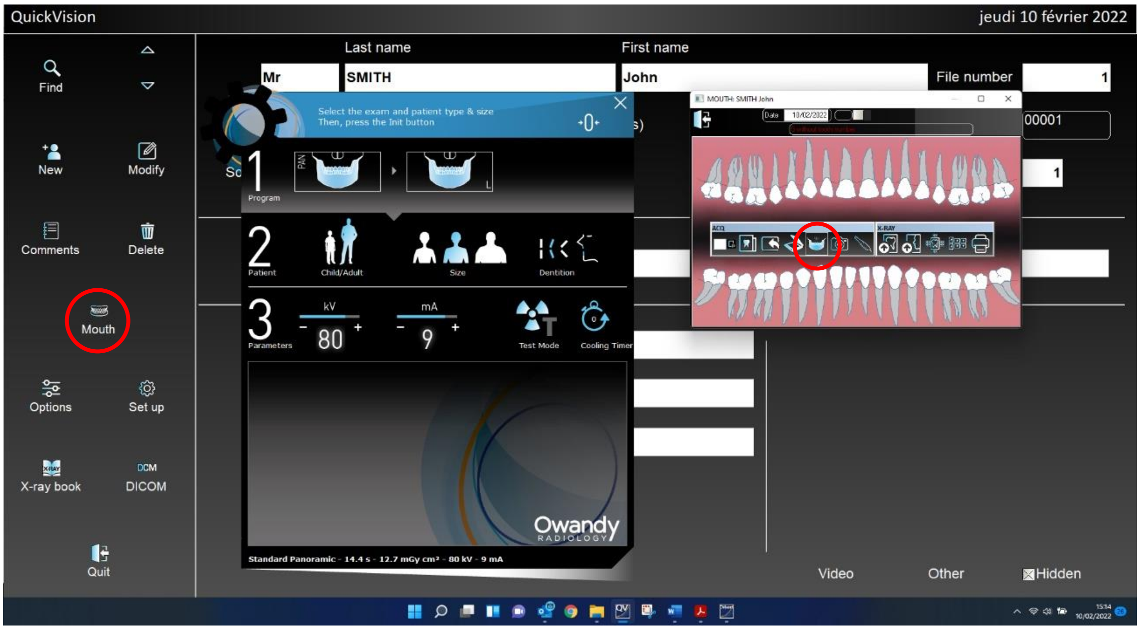
For I-Max 3D

Select “I-Max 3D” then “Black power switch” and follow the wizard.

For I-Max CEPH 3D

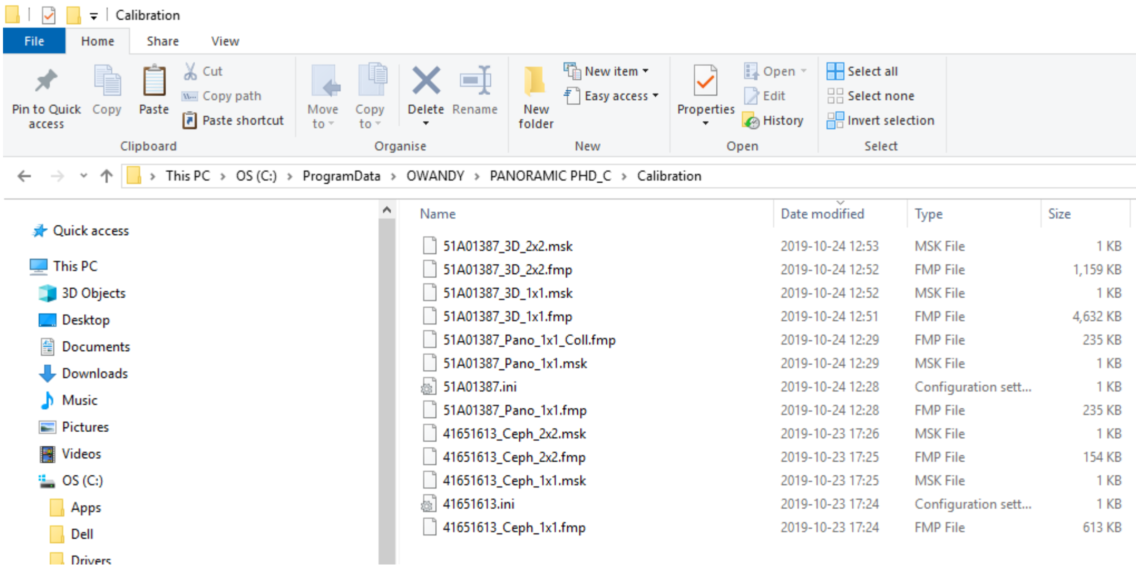
Select "I-Max CEPH 3D" then "Black power switch" and follow the wizard.

3. To check that the installation is correctly completed, open QuickVision, click on "Set up" icon and verify that in the digital panoramic field Owandy I-MAX is selected and click on save icon then click on "Mouth" icon (see arrow) and then on keyboard symbol (see circle) to open Virtual Keyboard of the unit.



7.8. Detector Calibration files installation

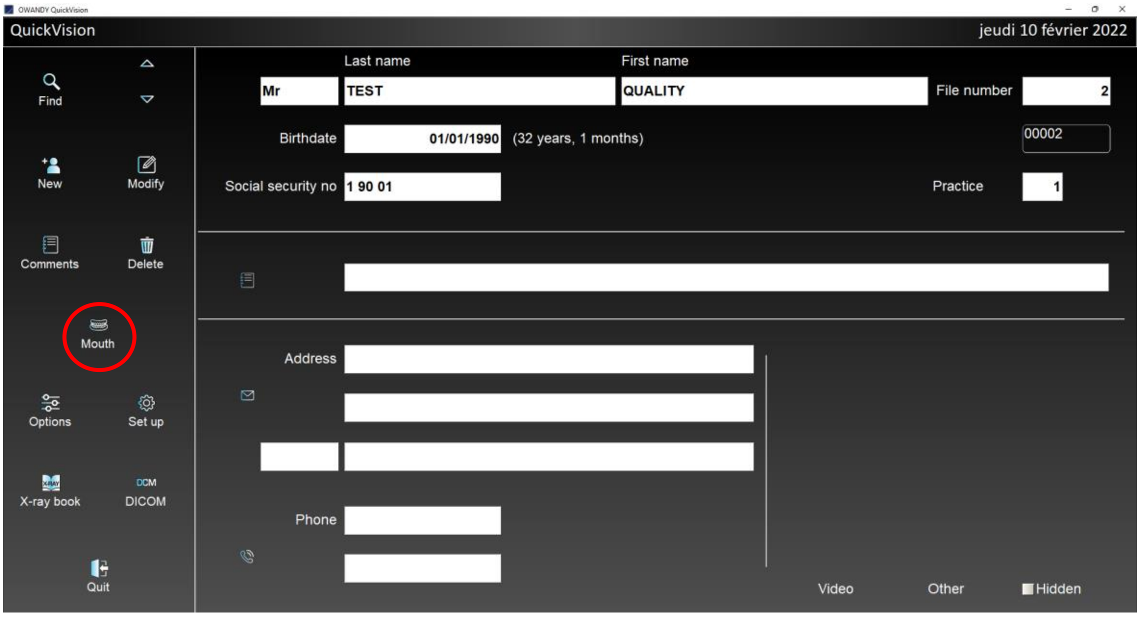
Before starting unit operation, it is necessary to copy all the detector calibration files in the PC.
Insert the USB pen drive containing the detector calibration files and open it.
Open the partition "CALIBRATION" and double click on "Install.bat". In case the automatic copy fails, copy all the files inside the folder "Calibration" in the directory C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration (create the directory "Calibration" if not present).



7.9. Verification of the PANORAMIC function

Warning
X-rays will be emitted during the performance of the following operations. Authorized Technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.

1. Switch ON the unit and when the green LED starts blinking, press >0< button to perform axis reset.
2. Open QuickVision software and open the patient "Quality Test". If not present, create a new patient (Name: "Quality"; Family name: "Test").
3. Select the "Mouth" icon.



4. From the "ACQ" toolbar, select the GUI icon to open the virtual keyboard.

5. Mount the centering tool on the support plate and place it on the chin rest support.

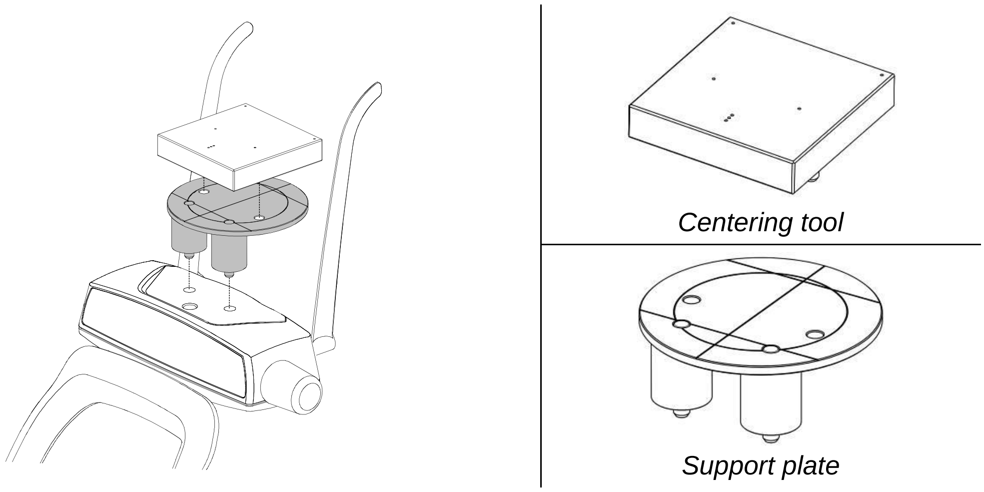
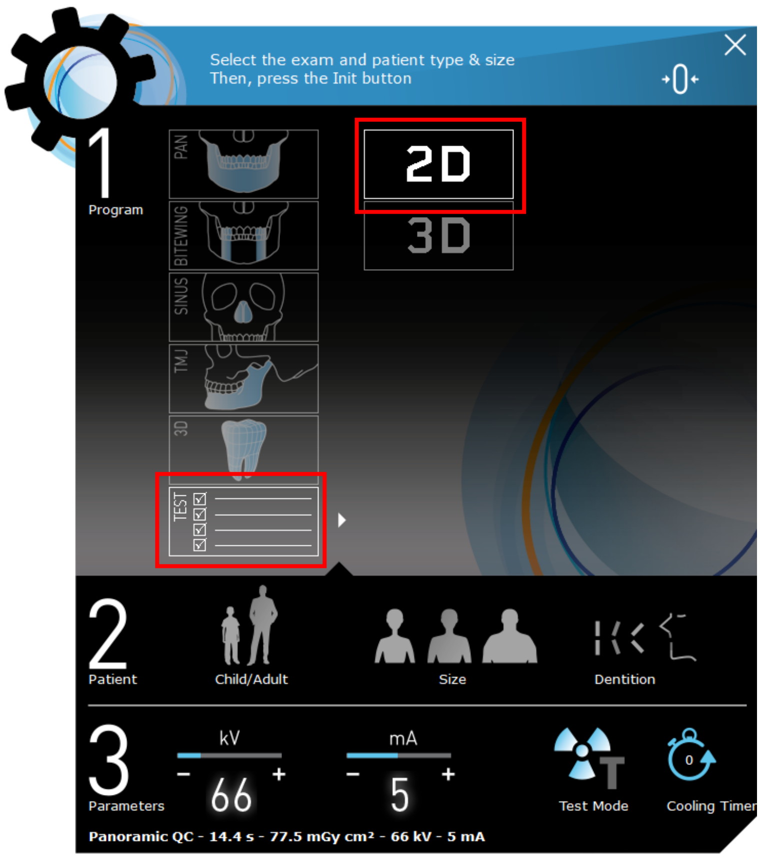


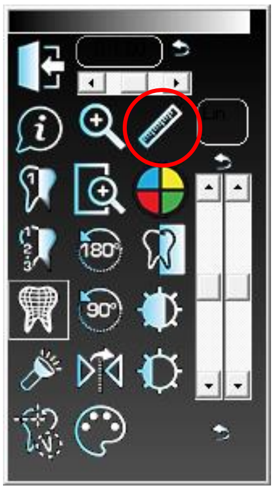
Figure 27: Support plate and centering tool positioning

6. On the main menu of the virtual interface, select "Test" exam, the following image will be displayed:



7. Select "2D" exam.
8. Make an exposure at 66kV, 6.3mA (see User's Manual – chapter 9).

9. Select the "Ruler" icon and measure the distance between the two external spheres; this value must be : 170mm ± 2mm



10. If distance is outside the tolerance range, open **"PhD_C_Test.exe"** service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C) and adjust the Y axis offset (see paragraph 8.4). Repeat the exposure.
11. Measure also the two halves of the image in order to check symmetry. The difference has to be max. 2mm.
12. If distance is outside the tolerance range, perform the following test:
    - Visually check that the rotation offset is properly configured. This can be done by checking the laser alignment with the support plate as described in the User Manual, paragraph "Laser Alignment check"
    - If the rotation offset is correct, open “PhD_C_Test.exe” and adjust the chin rest offset (see paragraph 8.4).

    Repeat the exposure.

Note
If the legislation in your country requires a white border around the image, you can change the collimator offsets (see paragraph 11.2.10).

7.10. Verification of 3D function

1. From the "ACQ" toolbar, select the GUI icon to open the virtual keyboard.

2. Insert the support plate on the chin rest, place the centering cylinder in the middle of the plate.

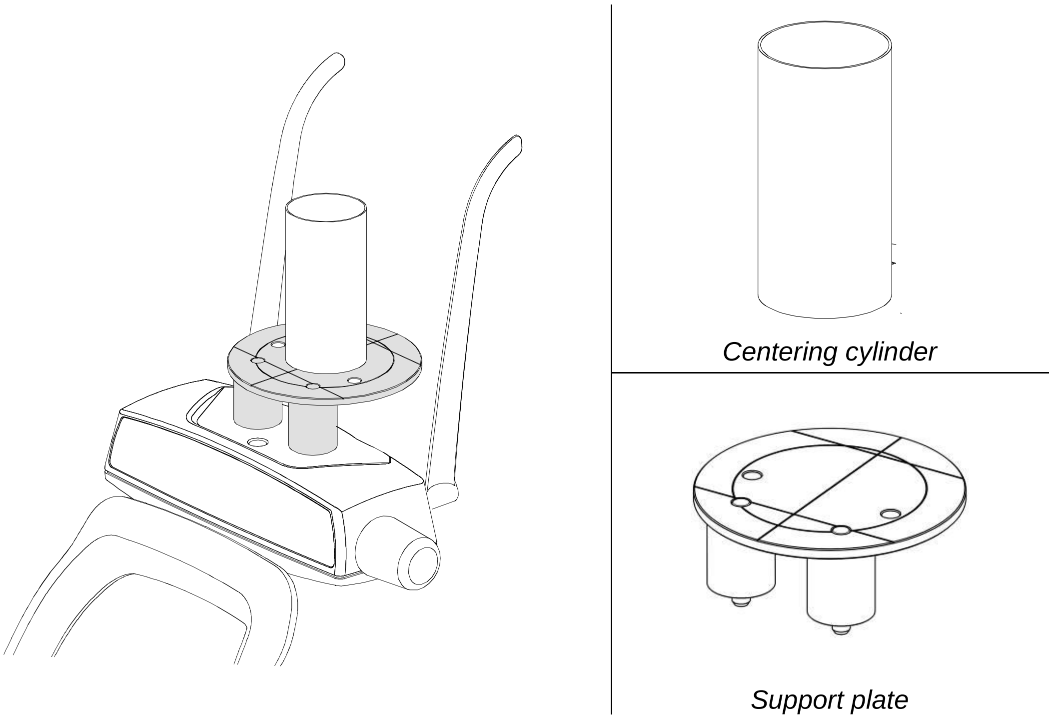
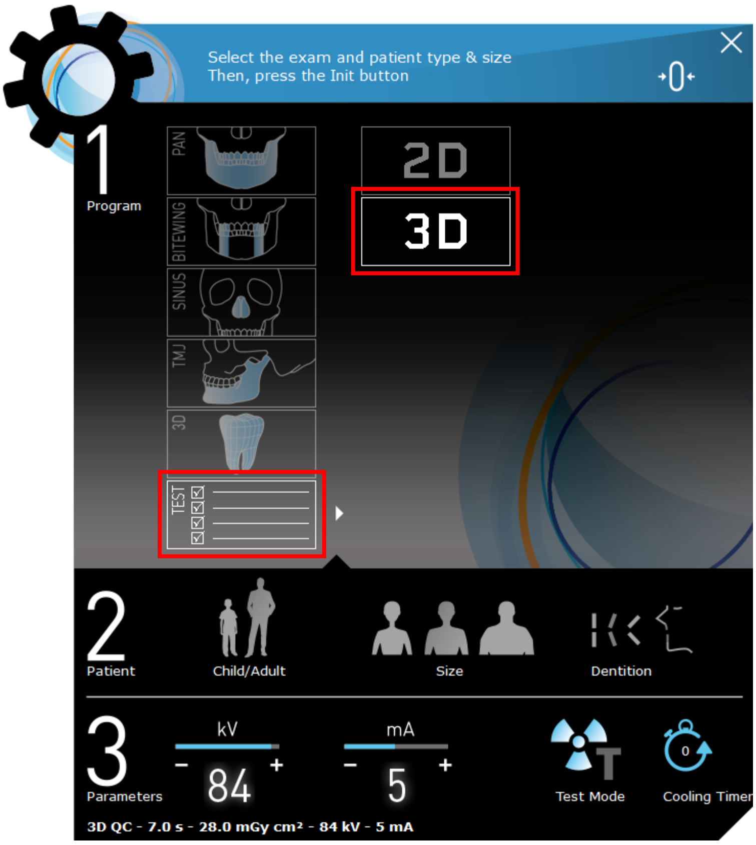
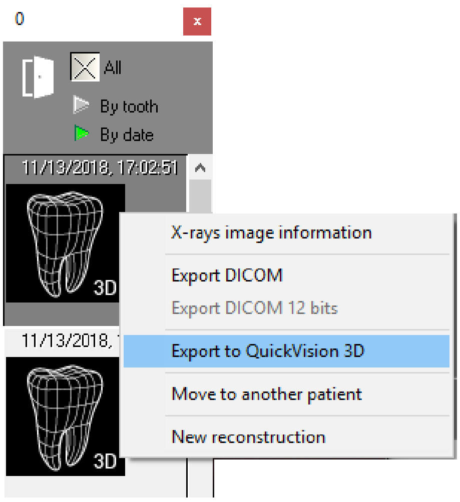


Figure 28: Support plate and centering cylinder positioning

3. On the main menu of the virtual interface, select "Test" exam, the following image will be displayed.



4. Select "3D" exam.
5. Make an exposure at 60kV, 5mA
6. At the end of the acquisition, right click on the exam icon and select "Export to QuickVision 3D".



7. Scroll the slices: the image has to provide a continuous line as shown in the following Figure.

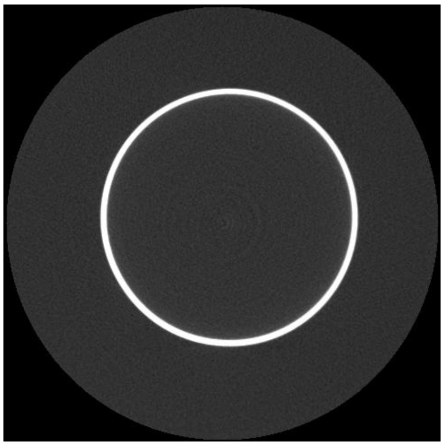


Figure 29

8. In case the reconstruction is not correct (as shown in the following Figure) it will be necessary to follow the procedure described in paragraph 11.2.11.

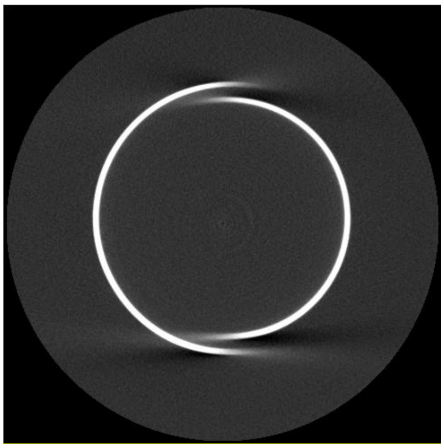


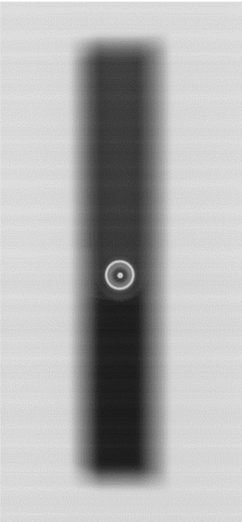
Figure 30

7.11. Verification of CEPH function (only for I-Max CEPH 3D)

For adjustments of CEPH device, see Chapter 11.2.12

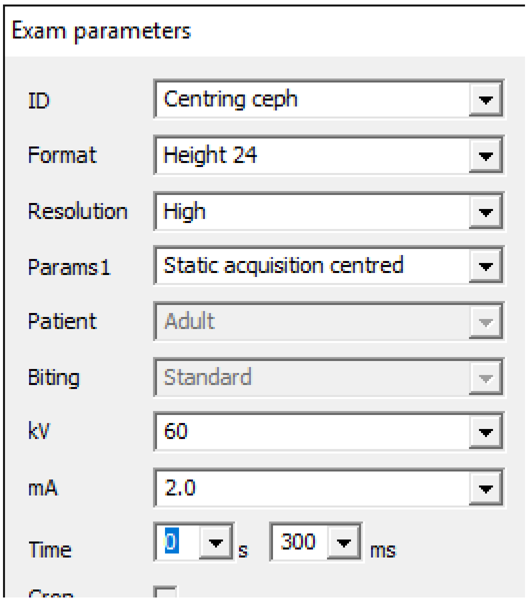
Warning
X-rays will be emitted during the performance of the following operations. Authorized Technicians are therefore recommended to use the greatest caution and to comply with the safety regulations and laws of their country.

1. Switch ON the unit and when the green LED starts blinking, press >0< button to perform axis reset.
2. Open **"PhD_C_Test.exe"** service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C).
3. Rotate the CEPH head support in the lateral position
4. Select the following parameters:
   - ID Centring CEPH
   - Format: Height Custom
   - Resolution: High
   - Param1: View of Primary collimator field
   - 70kV 8mA
5. In the image processing menu select: “Dynamic adjustment”
6. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure
7. Save the image as “Rotation.bmp”

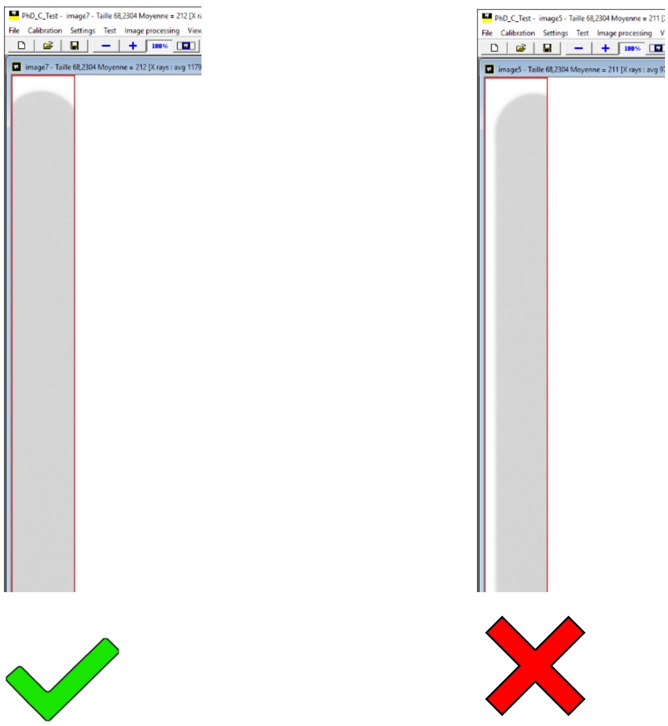


8. Verify that the that the **dot and ring projections are centred to the primary collimator beam** (if not refer to paragraph 11.2.12.1)

9. Then, in Exam parameters window select: ID: Centring CEPH; Format: Height 24; Resolution High; Params1: Static Acquisition Centred; kV; 60; mA: 2; time: 300ms



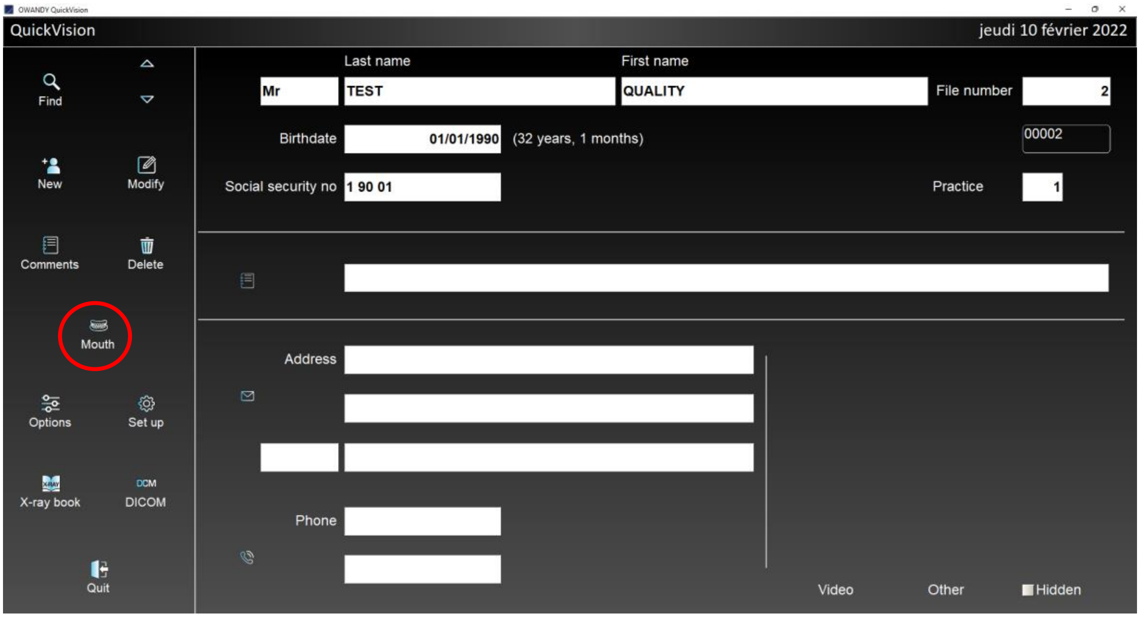
10. Take an X-ray emission and verify that the x-ray field is centred in the sensor area as shown in the following figure



NOTE to better view the sensor area,zoom in by clicking 2 times on the + icon in the program bar

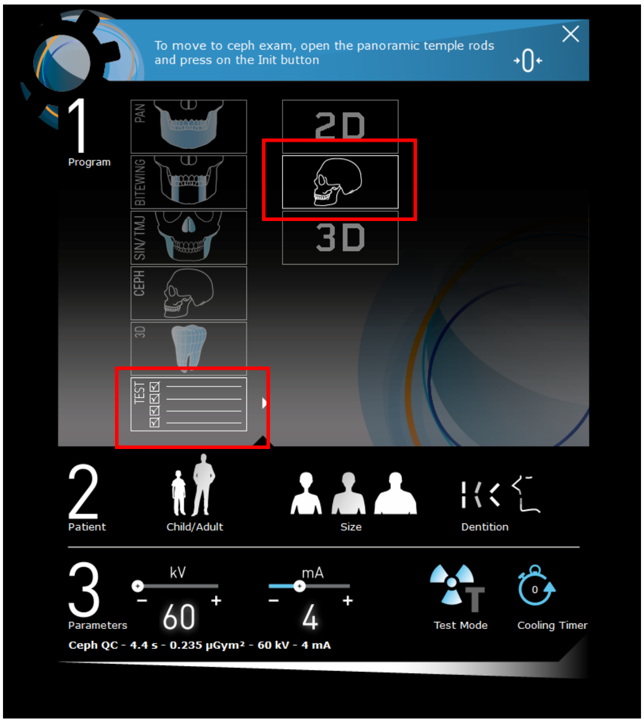
11. If not centered adjust the offset according to paragraph...
12. If the x-ray beam is properly centered open QuickVision software and open the patient "Quality Test". If not present, create a new patient (Name: "Quality"; Family name: "Test").

13. Select the "Mouth" icon.



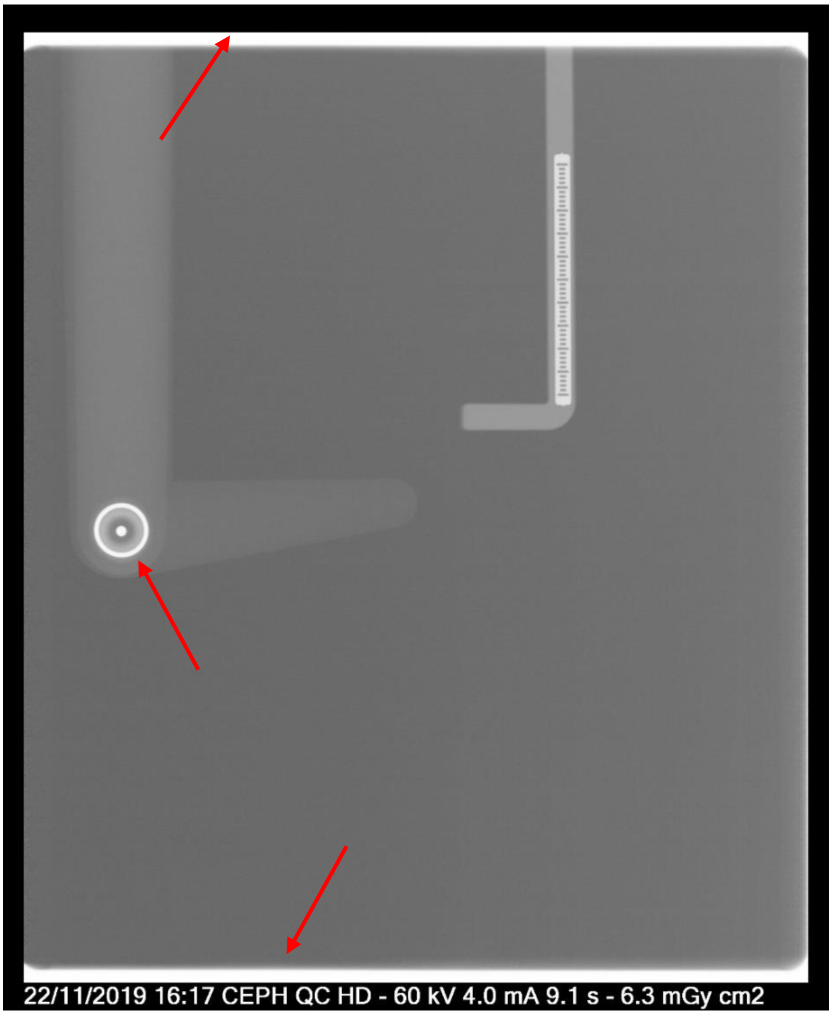
14. From the "ACQ" toolbar, select the GUI icon to open the virtual keyboard.

15. Remove any object (e.g. centering tool) from the chin rest.
16. Rotate the CEPH head support in the lateral position
17. On the main menu of the virtual interface, select "Test" exam, the following image will be displayed.

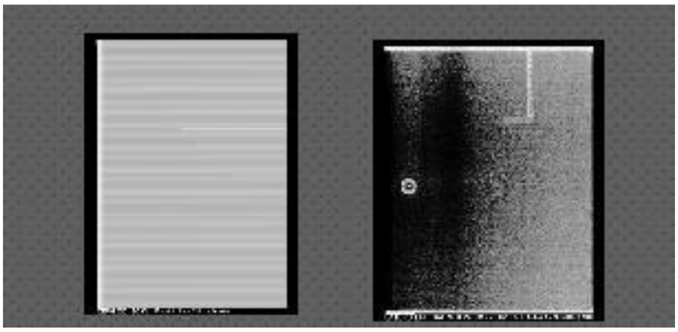


18. Select "CEPH" exam.

19. Prepare the machine to take a CEPH exam.
20. Take an exposure at 60kV, 4mA.
21. In the acquired image using the QuickVision ruler verify:
    - In the ear centering pin: that the misalignment between the inner dot and the outer circle is not more than 1.5 mm
    - that the unexposed upper and lower border is 3mm +/-2mm



22. If distance is outside the tolerance range or the x-ray field is not correctly irradiated, enter the service menu (see chapter 8) to correct the problem.



7.12. Verification of exposure parameters

The exposure parameters (kV, time and dose) can be checked using two different methods:

- **"invasive method"** based on the measurement of the test points on HF board (requires the use of multimeter and oscilloscope for time) This method is tipically used during verification done by technical service engineers

- **"non-invasive method"** based on measurement with Dose meter. This is the typical method used by Physicist to verify periodically the unit

In order to make easier the exposure parameters measurements, I-Max 3D & I-Max CEPH 3D has a dedicated modality that allows X-ray exposure without rotating the arm and without exposure parameters modulation that typically occurs in a standard exam.

7.12.1. Verification of Exposure parameters with invasive method

The exposure parameters (kV, mA and exposure time) can be measured directly on the Generator board (A2); this method has higher accuracy than the so-called non-invasive mode. The system accuracy is guaranteed by this measuring method.

Warning
By removing the HF group covers, internal parts where high voltage is present become accessible.
The Generator board has a working voltage of about 400V.

The exposure parameters can be checked with the following procedure:

1. Turn OFF the system.
2. Remove the cover on the back of the generator and remove the protection grid of the HF board.
3. Identify the test point XJ8.

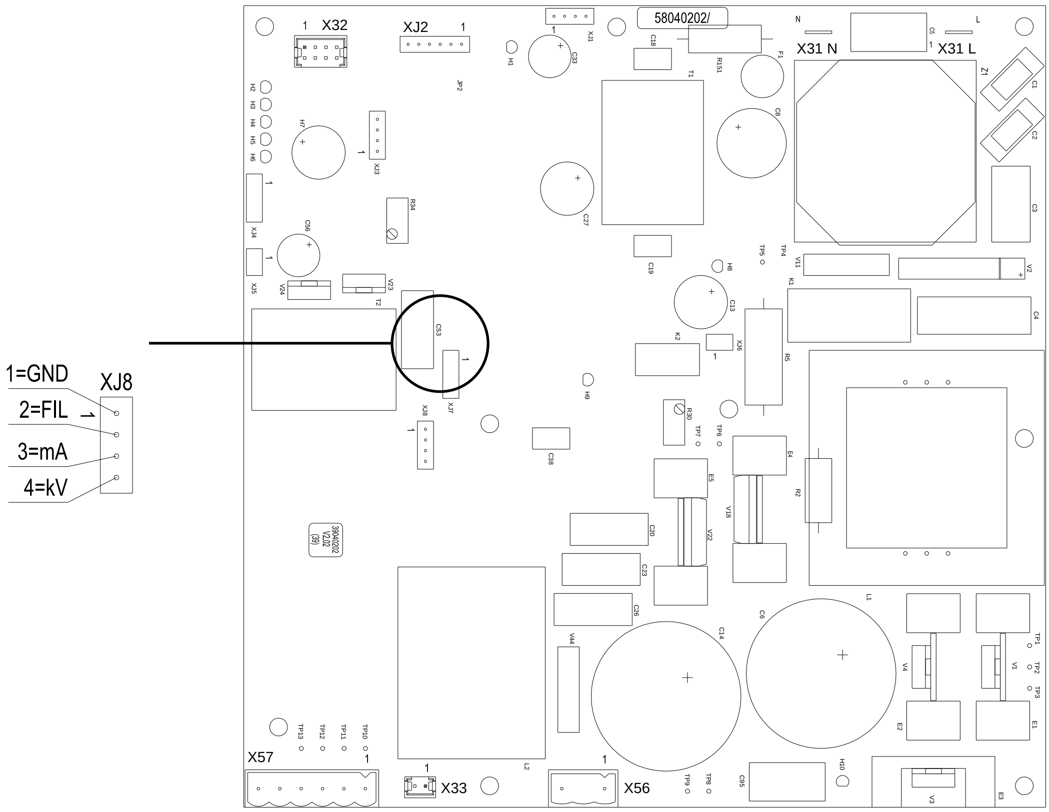
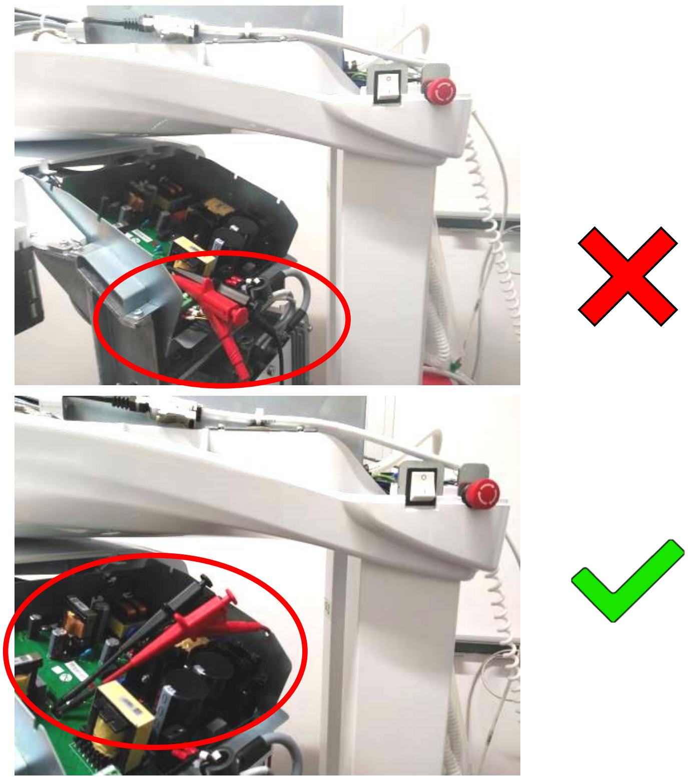


Figure 31

4. Place the clips of the instrument on the relevant pins according to the measurement to be performed as described in the following table, having care to avoid short circuits.

Parameter	Instrument	XJ8 pins
kV	Multimeter or oscilloscope	PIN 1 → GND PIN 4 → kV feedback
mA	Multimeter or oscilloscope	PIN 1 → GND PIN 3 → mA feedback
time	Oscilloscope	PIN 1 → GND PIN 3 → mA feedback

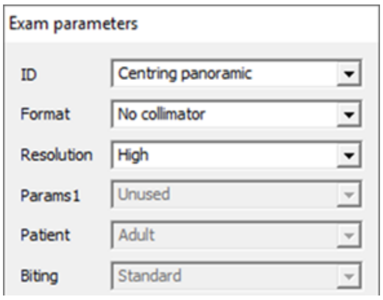
Warning
Beware that the probes do not interfere with columns during the rotation of the arm.



5. Switch ON the system and as soon as the green led starts blinking, press >0< for initialization.

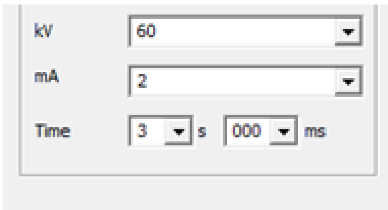
6. Open the PhD_C_Test software (located at C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C) and check that the unit is connected to the PC (the message "MCU is connected" is displayed in the bottom left corner of the program window).

1. From the "Exam parameters" panel select the ID as "Centring 3D". Select format as "W1 - Full 3D 86x90".



Note
The "Centring 3D" choice allows you to carry out the dosimetry test without the rotation of the tube-head arm.

2. In the same panel set the following exposure parameters: 60kV, 2mA, 3s.



Warning
The following operations involve the emission of X-rays, so the Authorized Technician must pay the greatest attention and respect the protection regulations in force in that country.

3. Press the X-ray button to take an exposure and verify that the measured values are in the acceptance limits listed in the Table at point 4.
4. Take a second exposure setting the following parameters: 86kV, 12mA, 3s and verify that the measured values are in the acceptance limits listed in the following table.

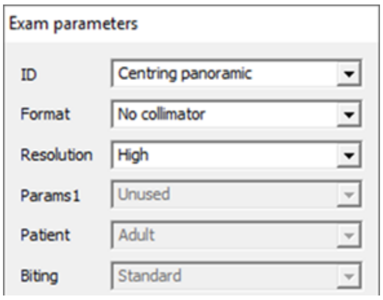
Parameter			**Acceptance range**		
kV	**mA**	**t (s)**	**kV feedback (± 8%)**	**mA feedback (± 10 %)**	**Time (± 5 %)**
60	2	3	2.76 to 3.24 V	0.9 to 1.1 V	2.85 to 3.15 s
86	12	3	3.96 to 4.64 V	3.6 to 4.4 V	2.85 to 3.15 s

5. In case the test fails (results do not match the indicated values), perform the following actions according to which parameter is out of the acceptance range:
   - kV out of range: follow the instructions described at paragraph 9.2.7.2
   - mA out of range: follow the instructions described at paragraph 9.2.7.4
   - time out of range: replace the generator board.

7.12.2. Verification of Exposure parameters with NON invasive method

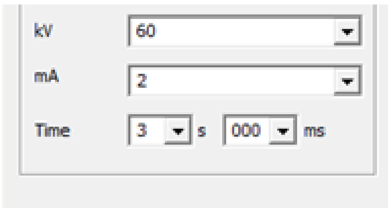
The exposure parameters (kV, time and dose) can also be verified using the so called "non-invasive method".
The exposure parameters can be checked with a non-invasive instrument by performing the following procedure:

1. Place the probe of the dosimeter on the center of the sensor area (black rectangle on the sensor plastic cover).
2. Open the PhD_C_Test software (located at C:\Program Files (x86)\OWANDY\ PANORAMIC PHD_C) and check that the unit is connected to the PC (the message "MCU is connected" is displayed in the bottom left corner of the program window).
3. From the "Exam parameters" panel select the ID as "Centring 3D". Select format as "W1 - Full 3D 86x90".



Note
The "Centring 3D" choice allows you to carry out the dosimetry test without the rotation of the tube-head arm.

4. In the same panel set the following exposure parameters: 60kV, 2mA, 3s.



5. Press the X-ray button to take an exposure and verify that the measured values are in the acceptance limits listed in the Table at point 6.

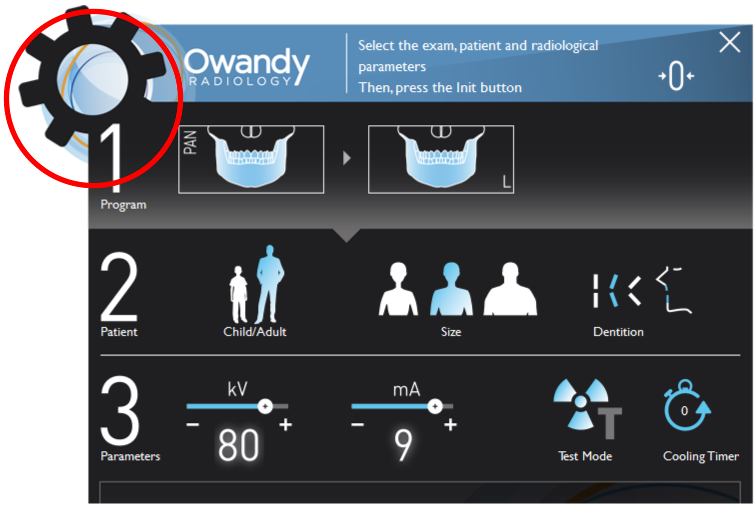
6. Take a second exposure setting the following parameters: 86kV, 12mA, 3s and verify that the measured values are in the acceptance limits listed in the following table.

Parameter			**Acceptance range**	
kV	**mA**	**t (s)**	**kV acceptance limits**	**Time acceptance limits**
60	2	3	55.2 to 64.8 kV	2.85 to 3.15 s
86	12	3	79.1 to 92.8 kV	2.85 to 3.15 s

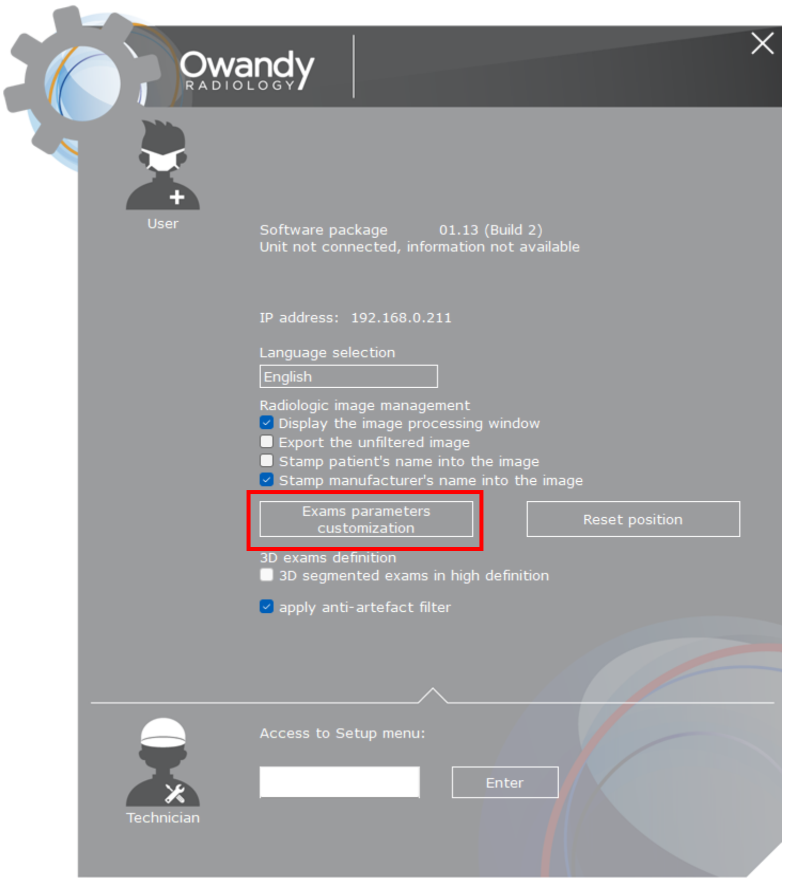
7. In case the test fails (result do not match the indicated values), proceed with the following actions:
   - Check the probe position and repeat the test
   - If the values are still out of range, perform the test using the invasive method as described in paragraph 7.12.1.

7.13. Storing of automatic exposure parameters

The preset exposure parameters of each specific exam can be modified according to the user's needs.
In order to modify the default exposure parameters, from the Main Menu select the symbol GEAR (configuration).

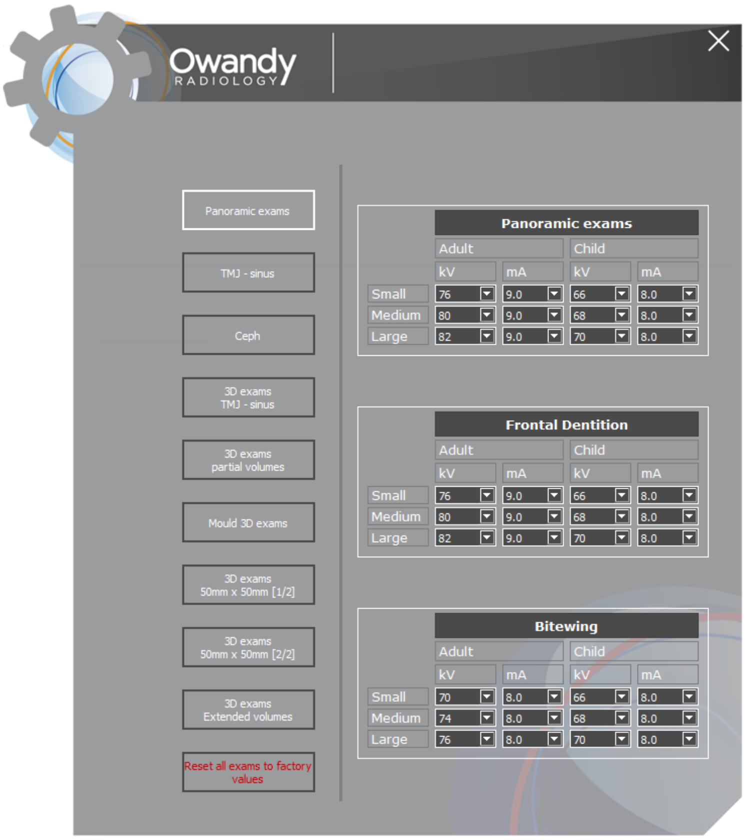


The following window will be displayed:



Select the button "Exam parameter customization".

On the displayed window, use the buttons on the left to select the exam family and the tables to the right to customize the default parameters for each exam type, patient type and size.



At any time, it is possible to restore the factory preset for all the exams, clicking on the button on the bottom of the window "Reset all exams to factory values".

Note
Parameter changes for each exam type, patient type and size are stored on the PC and not saved in the unit. So if you replace your PC, you need to set them up again.

7.13.1. Table of pre-set anatomic parameters

Default exposure values in 2D Panoramic modes				
	Adult Patient (14 seconds)		**Child Patient (12.8 seconds)**	
	kV	**mA**	**kV**	**mA**
Small	76	9	66	8
Medium	80	9	68	8
Large	82	9	70	8

Default exposure values in 2D Sinus mode				
	Adult Patient (9 seconds)		**Child Patient (9 seconds)**	
	kV	**mA**	**kV**	**mA**
Small	68	8	64	8
Medium	72	8	66	8
Large	74	8	68	8

Default exposure values in 2D TMJ mode				
	Adult Patient (10,6 seconds)		**Child Patient (10,6 seconds)**	
	kV	**mA**	**kV**	**mA**
Small	70	8	64	8
Medium	74	8	66	8
Large	78	8	68	8

Exposure values in 3D Full Dentition, 3D Extended Volumes and 3D Airways				
	Adult Patient (7 seconds)		**Child Patient (7 seconds)**	
	kV	**mA**	**kV**	**mA**
Small	84	4	64	6.3
Medium	84	5	66	6.3
Large	84	6	68	6.3

Exposure values in 3D Single Jaw and 3D Maxillary and Mandibular Teeth modes Normal resolution				
	Adult Patient (7 seconds)		Child Patient (7 seconds)	
	kV	mA	kV	mA
Small	84	4	64	6.3
Medium	84	5	66	6.3
Large	84	6	68	6.3

Exposure values in 3D Single Jaw and 3D Maxillary and Mandibular Teeth modes High resolution				
	Adult Patient (7 seconds)		Child Patient (7 seconds)	
	kV	mA	kV	mA
Small	84	8	64	8
Medium	84	10	66	8
Large	84	12.5	68	8

Exposure values in 3D TMJ mode				
	Adult Patient (6,2 seconds)		Child Patient (6,2 seconds)	
	kV	mA	kV	mA
Small	82	5	64	6.3
Medium	82	6	66	6.3
Large	82	7	68	6.3

Exposure values in 3D Sinus mode				
	Adult Patient (7 seconds)		Child Patient (7 seconds)	
	kV	mA	kV	mA
Small	78	8	64	6.3
Medium	78	9	66	6.3
Large	78	10	68	6.3

Exposure values in CEPH LL mode				
	Adult Patient (from 4.4 to 15.1 seconds)		**Child Patient (from 4.4 to 15.1 seconds)**	
	kV	**mA**	**kV**	**mA**
Small	74	8	72	7.1
Medium	76	8	74	7.1
Large	78	8	76	7.1

Exposure values in CEPH AP mode				
	Adult Patient (5.8 or 12.1 seconds)		**Child Patient (5.8 or 12.1 seconds)**	
	kV	**mA**	**kV**	**mA**
Small	76	12.5	74	11
Medium	78	12.5	76	11
Large	82	12.5	78	11

Exposure values in Carpus mode		
	Child Patient (4.4 seconds)	
	kV	**mA**
Small	62	8
Medium	62	8
Large	62	8

Note
The exam parameters set as the default are values to be taken as the starting point. Users can optimise the parameters according to their needs.

Note
The type of biting does not affect the kV and mA values, but it affects the position of the focus layer, by adapting rotation movement to the patient's anatomy.

7.14. Data Backup

At the end of installation process, make sure that the following information and data are safely archived:

- IP address of the I-Max 3D & I-Max CEPH 3D unit
- Setup Parameter Table containing the factory configuration
- Detector calibration files / Software installation CDs or USB pen drive media.

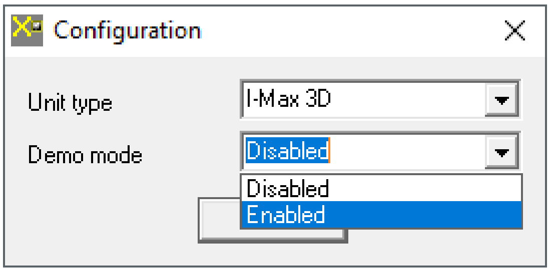
7.15. Exhibition mode setup

The I-Max 3D & I-Max CEPH 3D system (unit and graphical user interface) provides three different demonstration modes in case it is to be used as demo (exhibitions or show room) where the X-ray emissions are not allowed.

7.15.1. Graphical User Interface (G.U.I.) demo (without unit connected)

The following procedure allows the demonstration of the Graphical Unit Interface (G.U.I.) without connection to the unit.

1. Open "PhD_Conf.exe" program in C:\Program Files (x86)\OWANDY\ PANORAMIC PHD_C.
2. On the "Configuration" window select "Demo mode" as "Enabled":



Confirm with "OK".

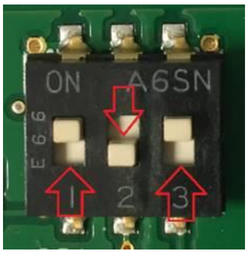
3. Start QuickVision program and open the G.U.I. The user interface (G.U.I.) will work normally without the unit connected.

Note
In order to restore the normal functioning of the unit interface: close the G.U.I., open "PhD_Conf.exe" program and select "Demo mode" as "Disabled"; confirm with "OK" to restore the normal functioning of the interface.

7.15.2. Unit movements demo (without PC connection)

The following procedure allows the simulation of the panoramic exam movements without connection with the PC.
With this setting is possible to perform a single exam simulation or activate an automatic continuous movements program.

Set the MCU DIP-Switches to "Exhibition demo mode": ON-OFF-ON (see paragraph 4.2.4.1)



Note
In this mode the X-ray emissions are disabled and it is not possible to connect the unit to a PC.

7.15.2.1. Single Panoramic or CEPH exam simulation

7.15.2.1.1. I-Max 3D

1. Switch ON the unit.
2. When the keyboard green LED blinks slowly (one pulse per second), press the >0< button and wait the end of the axis reset.
3. Press the >0< button and wait the end of the movements.
4. Press the X-ray button until the end of the panoramic rotation.
5. At the end of the rotation press the >0< button and the unit come back to the start position ready for another panoramic exam simulation.

7.15.2.1.2. I-Max CEPH 3D

1. Switch ON the unit.
2. When the keyboard green LED blinks slowly (one pulse per second), press the >0< button and wait the end of the axis reset.
3. To take a panoramic simulation, press the >0< button and wait the end of the movements. (Make sure that the 3D sensor is closed in 3D panoramic position)
4. Press the X-ray button until the end of panoramic rotation.
5. At the end of the rotation press the >0< button and the unit come back to the start position ready for another panoramic exam simulation.
6. To take a CEPH simulation press the x-ray button + laser button to open the 3D sensor and then rotate it into the CEPH exam position, press the >0< button and wait the end of the movements.
7. Press the >O< button and wait the end of the movements.
8. Press the X-ray button until the end of the CEPH exam simulation
9. At the end the machine returns back to the patient entry position.

10. If you want to perform a new CEPH simulation repeat the steps from 7 to 9. If you want to perform a panoramic exam, close the 3D sensor to panoramic 3D position and then repeat the steps from 3 to 5. Otherwise if you want to start the Automatic program go to next paragraph

7.15.2.2. Automatic continuous movements program (Exhibitions)

1. Switch ON the unit.
2. When the keyboard green LED blinks slowly (one pulse per second), press the >0< button and wait the end of the axis reset.
3. Press together the column up and column down buttons on the keyboard. (Make sure that the 3D sensor is closed in 3D panoramic position).
4. After 5 second release both buttons to start the automatic demo sequence.
5. The unit then keeps on doing a demo sequence of a panoramic roto-translation, a CEPH movement and a column movement.
6. In order to stop the movements, switch OFF the unit.

Note
To stop the column movements, press the red emergency button located on the upper part of the unit, near the power switch.

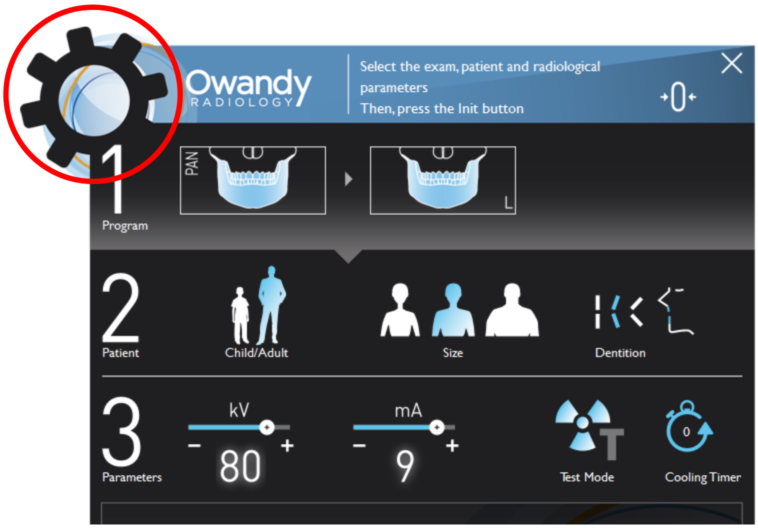
7.15.3. Unit and G.U.I. full demonstration (X-Ray emission permanently disabled)

The following procedure allows a full simulation of the unit and G.U.I. functioning without X-Ray emission (connection the PC required).

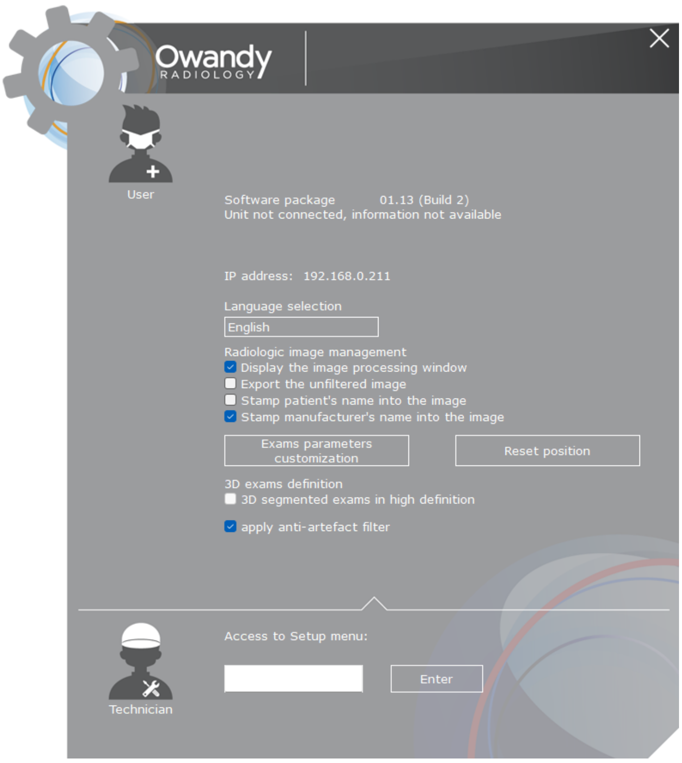
1. Enter service menu (see chapter 8).
2. Select the "Exposition" page (see paragraph 8.2).
3. Check "Disable permanently X-ray emission" box.
4. Click on the gear and save the new configuration in the EEPROM memory.
5. Wait the unit reboot and use the G.U.I. and unit normally; the system will perform the exam without the X-Ray emission.

8. SERVICE PROGRAMS DESCRIPTIONS

In order to access Service Programs, from the main menu select the GEAR symbol (configuration).



The first page of the configuration window shows the SW versions present in the unit. This is useful in case it is required to know the current versions. This page doesn't require any password.



In order to enter in Configuration menu, type the password "TechAccess" in "Access to Setup menu" filed and press Enter.

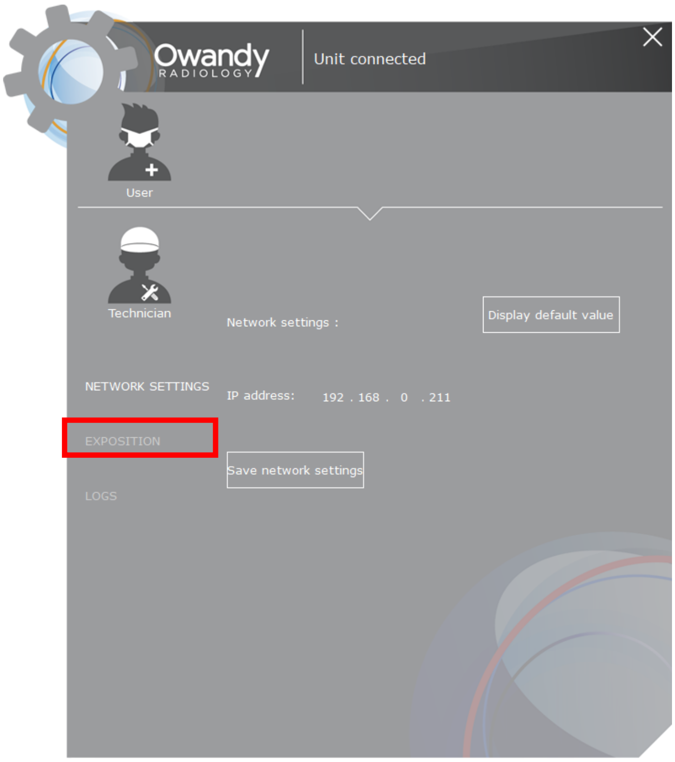
This page is reserved only to authorized technicians: it allows access to the different functional parameters, as following:

- ***Network Setting:*** allows to set the IP address of the unit (see paragraph 8.1)
- ***Exposition:*** allows to disable the x-ray emission permanently (see paragraph 8.2)
- ***Logs:*** this page displays the exam counters (see paragraph 8.3)

Each time a parameter is modified, the unit will provide a confirmation window.

8.1. Network setting

Selecting "Network Setting" it is possible to modify the IP address used to communicate with the I-Max 3D & I-Max CEPH 3D (see paragraph 11.2.9).

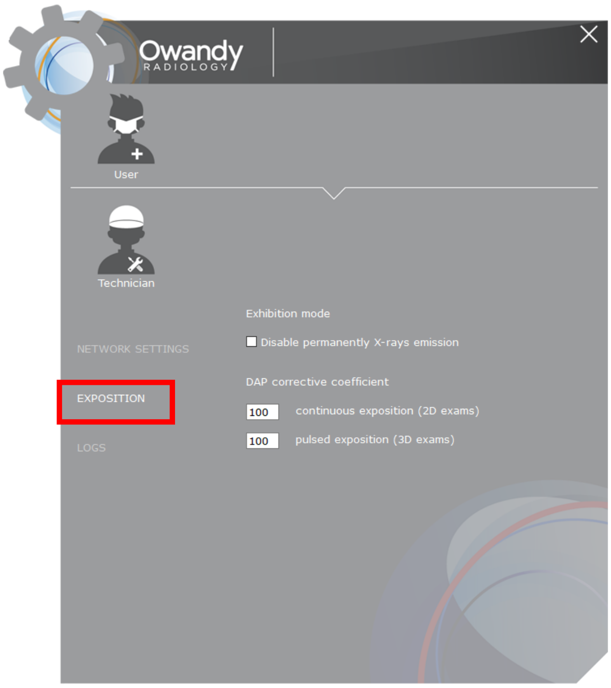


If necessary, change the IP Address according with the one present on the PC (same IP, but last 3 digits different; same Subnet mask).

8.2. Exposition

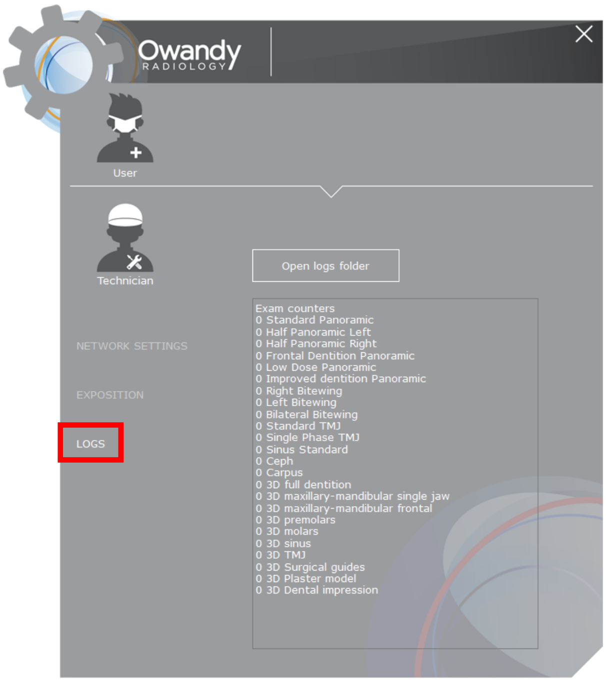
This function allows:

- to disable X-ray emission permanently checking the box to disable X-rays;
- to set a corrective factor – in % - on the displayed DAP dose per area value.



8.3. Logs

In this page it is possible to see the exam counters and access the machine logs folder.



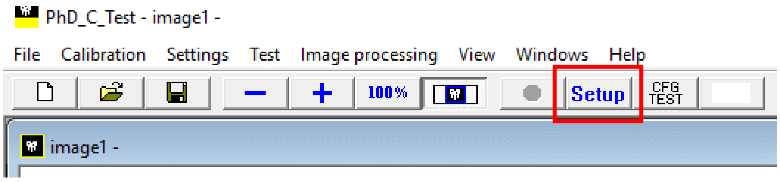
In order to keep the unit logs, refer to paragraph 11.2.1.

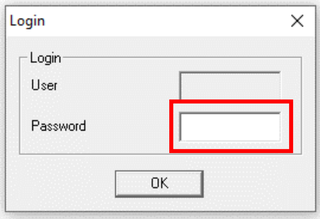
8.4. Machine configuration and setup

In addition to the Service Programs available in the Graphical User interface, other Service Programs and the machine configuration can be be done by running the **"PhD_C_Test"** program located in the directory C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C.

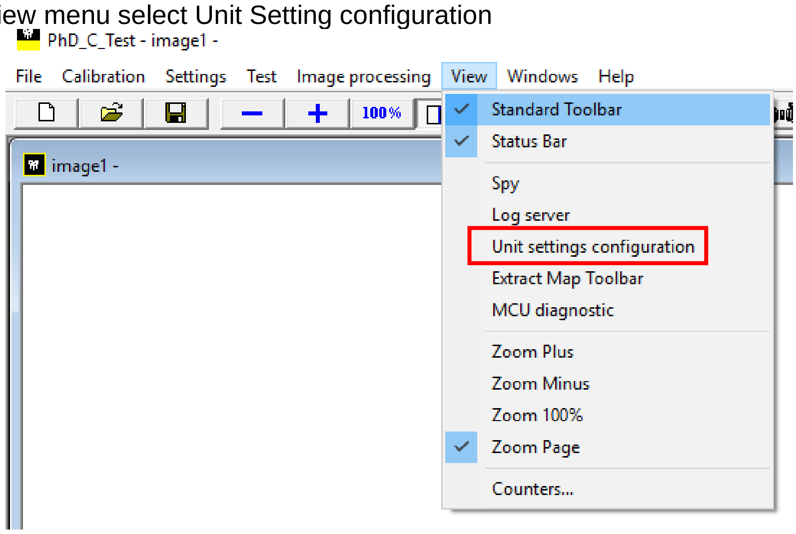
To access the machine configuration:

- Run the software "PhD_C_Test"
- Click on the SET-UP button and in the windows that will open type the password **PhdAccess**





- In the View menu select Unit Setting configuration



- The following window will open; there are several different tabs for different system settings

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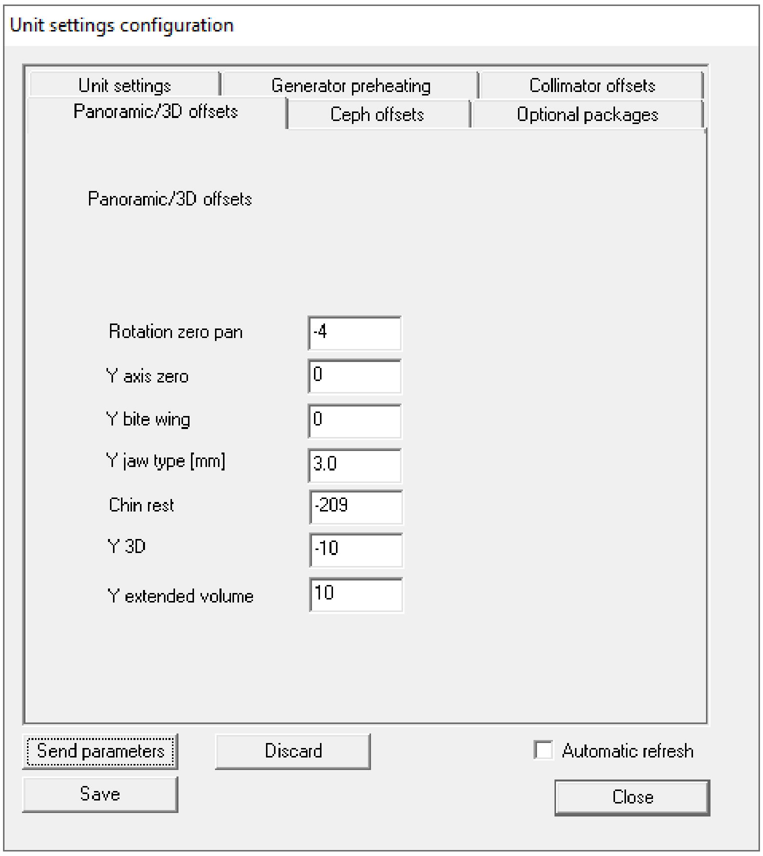
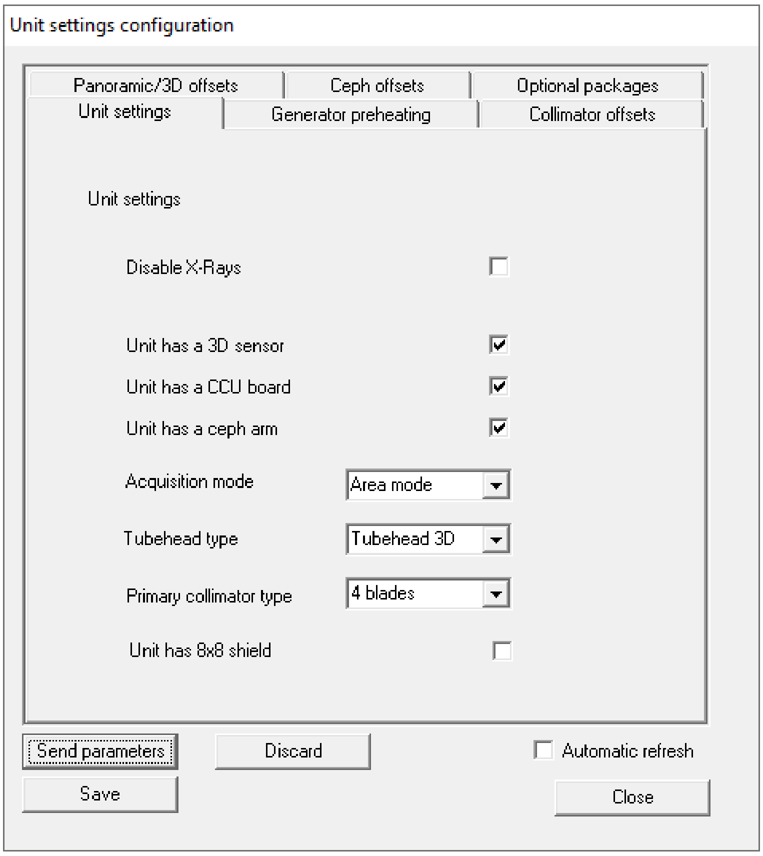
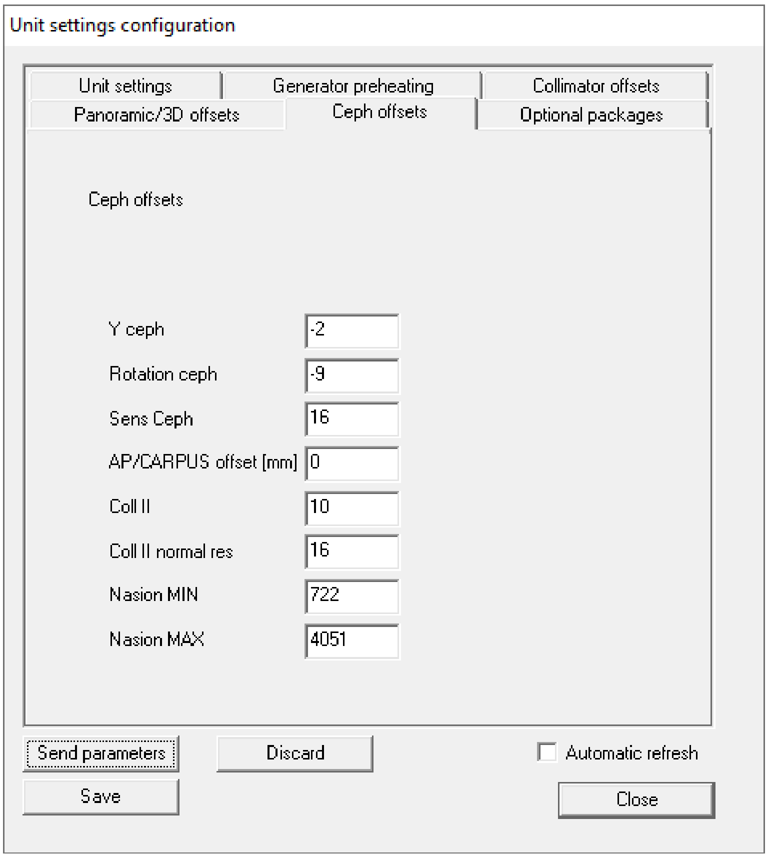
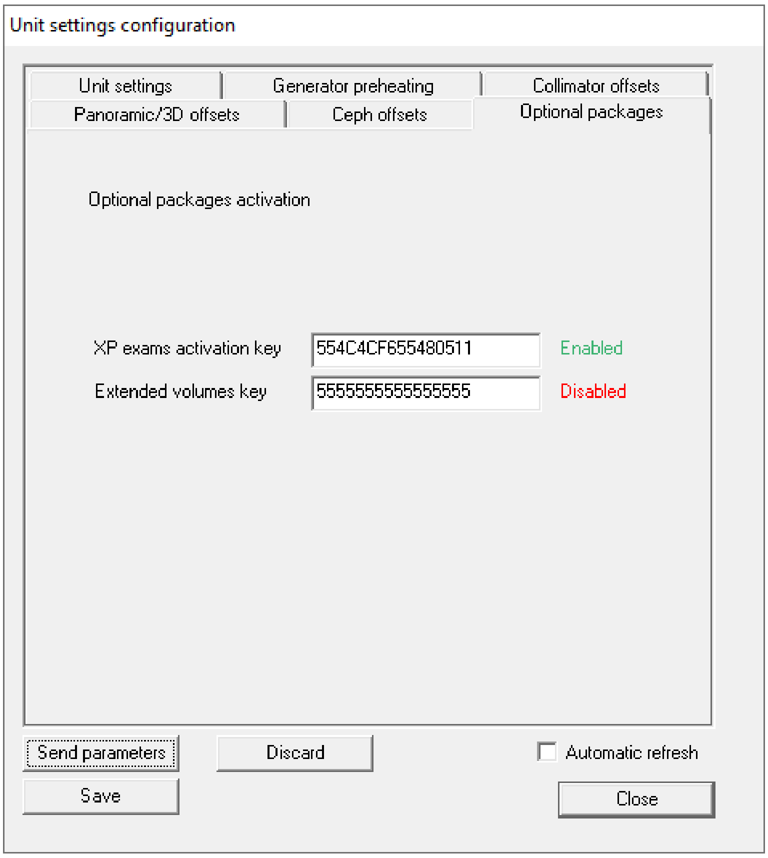
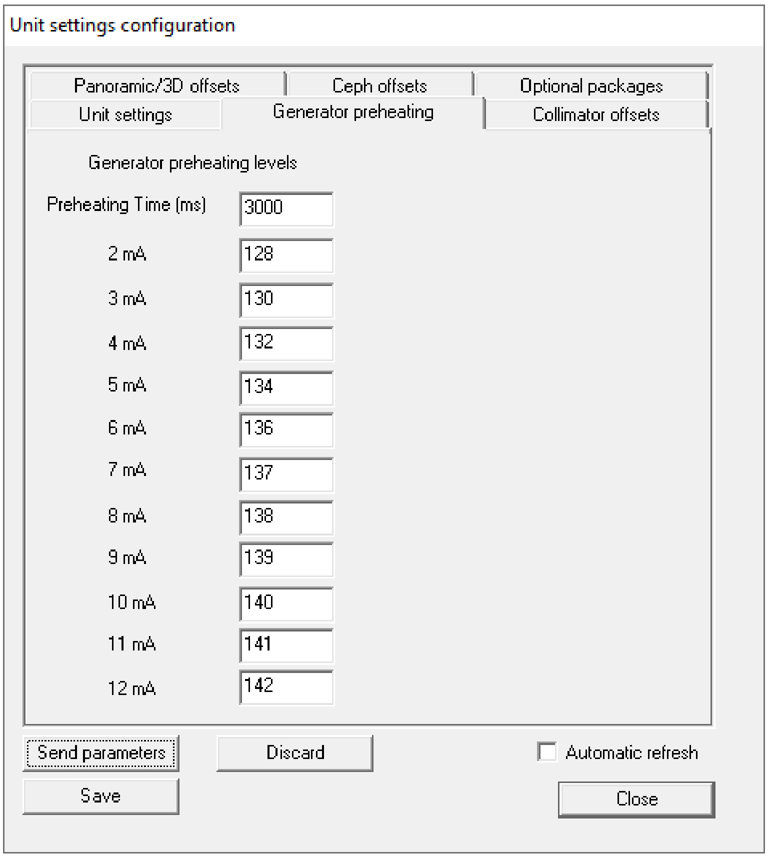
Note
To change a parameter, you must: change the parameter, press “Send parameters” and then “Save”. It is not necessary to exit the SETUP if you want to do a x-ray test exam and if you press “Close” you don’t exit from the SETUP mode. To exit the SETUP mode you must either press the SETUP button or “Phd_C_Test”. When you exit the SETUP the unit will perform a reboot (indicated by the flashing of the keyboard LED) and that all parameters sent and not saved will be discarded.

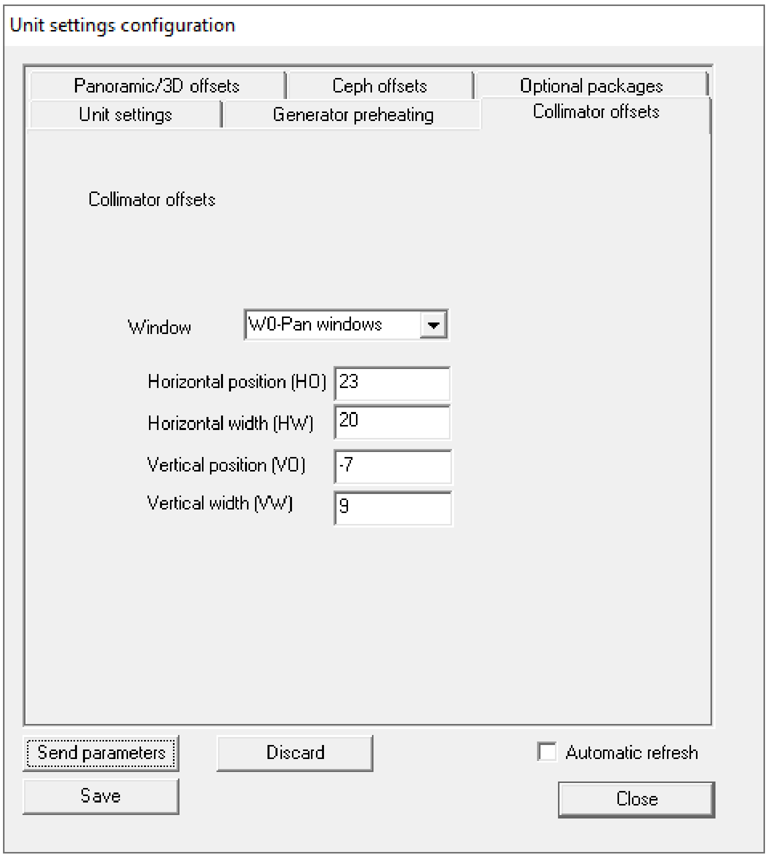



Unit settings configuration
Panoramic/3D offsets
Ceph offsets
Optional packages
Unit settings
Generator preheating
Collimator offsets
Unit settings
Disable X-Rays
Unit has a 3D sensor
Unit has a CCU board
Unit has a ceph arm
Acquisition mode
Area mode
Tubehead type
Tubehead 3D
Primary collimator type
4 blades
Unit has 8x8 shield
Send parameters
Discard
Automatic refresh
Save
Close


Unit settings configuration
Unit settings
Generator preheating
Collimator offsets
Panoramic/3D offsets
Ceph offsets
Optional packages
Ceph offsets
Y ceph
-2
Rotation ceph
-9
Sens Ceph
16
AP/CARPUS offset [mm]
0
Coll II
10
Coll II normal res
16
Nasion MIN
722
Nasion MAX
4051
Send parameters
Discard
Automatic refresh
Save
Close


Unit settings configuration
Unit settings
Generator preheating
Collimator offsets
Panoramic/3D offsets
Ceph offsets
Optional packages
Optional packages activation
XP exams activation key
554C4CF655480511
Enabled
Extended volumes key
5555555555555555
Disabled
Send parameters
Discard
Automatic refresh
Save
Close


Unit settings configuration
Panoramic/3D offsets
Ceph offsets
Optional packages
Unit settings
Generator preheating
Collimator offsets
Generator preheating levels
Preheating Time (ms)
3000
2 mA
128
3 mA
130
4 mA
132
5 mA
134
6 mA
136
7 mA
137
8 mA
138
9 mA
139
10 mA
140
11 mA
141
12 mA
142
Send parameters
Discard
Automatic refresh
Save
Close


Unit settings configuration
Panoramic/3D offsets
Ceph offsets
Optional packages
Unit settings
Generator preheating
Collimator offsets
Collimator offsets
Window
W0-Pan windows
Horizontal position (H0)
23
Horizontal width (HW)
20
Vertical position (V0)
-7
Vertical width (VW)
9
Send parameters
Discard
Automatic refresh
Save
Close

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9. TROUBLESHOOTING

Note
If components have to be replaced or technical support is required, contact OWANDY Technical Service providing the mandatory information listed on paragraph 1.2 and the additional information required by the specific error description.

9.1. LEDs

9.1.1. MCU board A1 LEDs

The following table shows the LEDs that are present on MCU board A1, their functions and the recommended corrective actions in case of defects. To locate the LEDs, refer to the layout of the MCU board A1 (see chapter 12 - drawing 2).

Led	Colour	Working status	Failure status	Main function	Corrective action
H1	Green	ON	OFF	+24V	See paragraph 11.2.3
H2	Green	ON	OFF	+24V Motors and power supply	See paragraph 11.2.3
H3	Green	ON	OFF	+5V	Check cables: X22, X23, X24, X36, X15, X10, X25, X9
H4	Green	ON	OFF	+ 3V Micro controller power supply	
H5	Green	ON	OFF	Laser power supply	Check the laser cables X16 and X18
H6	Green	Flashing / lit weakly	Steady ON/OFF= error on CANbus	Can Bus communication	See Error E670 and E671 (paragraph 9.2.6.1)
H7	Red	Flashing / lit weakly	Steady ON/OFF= error on CANbus	Can Bus communication	See Error E670 and E671 (paragraph 9.2.6.1)
H8 H9 H10	Green	OFF		These three LEDs when blinking indicate the MCU programming status	
H11	Green	OFF=X-ray button not pressed ON=X-ray button pressed	OFF=X-ray button pressed ON=X-ray button not pressed	X-ray button activation	See Errors E360 and E760 (paragraphs 9.2.4.1 and 9.2.7.11)

9.1.2. Generator board A2 LEDs

The following table shows the LEDs that are present on the Generator board, their functions and the recommended corrective actions in case of defects. To locate the LEDs, refer to the layout of the Generator board (see chapter 12, drawing 3).

Led	Colour	Working status	Failure status	Main function	Corrective action
H1	Green	ON	OFF = Failure	+5Vdc	See Error E750 (paragraph 9.2.7.1)
H2	Green	OFF=X-ray button not pressed ON=X-ray button pressed	OFF=X-ray button pressed ON=X-ray button not pressed	X-Ray button activation	See Error E760 (paragraph 9.2.7.11)
H3	Green	Flashing / lit weakly	Steady ON/OFF= error on CAN-bus	CANbus communication	See Error E670 and E671 (paragraph 9.2.6.1)
H4	Green	Flashing / lit weakly	Steady ON/OFF= error on CAN-bus	CANbus communication	See Error E670 and E671 (paragraph 9.2.6.1)
H5	Red	OFF	ON	ON if during exposure there is a: - Filament failure - Backup timer intervention - Bad mA / kV feedback - X-ray button release	See Errors: E751, E753, E754 , E758, E760 (paragraphs 9.2.7.2, 9.2.7.4, 9.2.7.5, 9.2.7.9, 9.2.7.11)
H6	Yellow	OFF during stand-by ON during X-ray	ON during stand-by OFF during X-ray	X-ray emission active	
H8	Green	ON	OFF	Auxiliary power supply	See Error E750 (paragraph 9.2.7.1)
H9	Red	OFF	ON	X-ray exposure too long (backup timer intervention)	See Error E755 (paragraph 9.2.7.6)
H10	Green	ON	OFF	Main power supply	See Error E750 (paragraph 9.2.7.1)

9.1.3. 3D Power Sensor board A10 LEDs

The following table shows the LED that is present on the 3D Power Sensor board (A10), its function and the recommended corrective action in case of defect. To locate the LED, refer to the layout of the A10 board (see chapter 12 – drawing 4).

Led	Colour	Working status	Failure status	Main function	Corrective action
H2	Green	ON	OFF	8/9V 3D sensor power supply	See Error E1402 (paragraph 9.2.10.2)

9.1.4. CCU CEPH Control Board A11 LEDs (only for I-Max CEPH 3D)

The following table shows the LEDs that are present on the CCU CEPH Control Board (A11), their function and the recommended corrective action in case of defect. To locate the LED, refer to the layout of the A11 board (see chapter 12 – drawing 5).

Led	Colour	Working status	Failure status	Main function	Corrective action
H1, H2	Green, Red	Flashing/ lit weakly	Steady ON/OFF= error on CANbus	Can Bus communication	Check cable X9
H3 H4 H5	Green	OFF		These three LEDs when blinking indicate the CCU programming status	
H6	Green	ON	OFF	+24 V input	Check 24V on cable X62. See also Error E750 (paragraph 9.2.7.1)
H7	Green	ON	OFF	+5V	Check 24V on cable X62. If present, replace CCU board
H8	Green	ON	OFF	+3V	Check 24V on cable X62. If present, replace CCU board
H9	Green	ON	OFF	+24 V output to collimator (A12) board	Check 24V on cable X62. See also Error E750 (paragraph 9.2.7.1)

9.1.5. Collimator Driver Board A12 LED (only for I-Max CEPH 3D)

The following table shows the LED that is present on the Collimator Driver Board (A12), its function and the recommended corrective action in case of defect. To locate the LED, refer to the layout of the A12 board (see chapter 12 – drawing 6).

Led	Colour	Working status	Failure status	Main function	Corrective action
H1	Green	ON	OFF	+5 V input	Check 24V on cable X62 of CCU board. See also Error E750 (paragraph 9.2.7.1

9.1.6. CEPH Driver Board A13 LEDs (only for I-Max CEPH 3D)

The following table shows the LEDs that are present on the CEPH Driver Board (A13), their function and the recommended corrective action in case of defect. To locate the LED, refer to the layout of the A13 board (see chapter 12 – drawing 7).

Led	Colour	Working status	Failure status	Main function	Corrective action
H1	Green	ON	OFF	+24 V output	Check 24V on cable X62 on CCU board. See also Error E750 (paragraph 9.2.7.1)
H2	Green	ON	OFF	+24 V input	Check 24V on cable X62 on CCU board. See also Error E750 (paragraph 9.2.7.1)

9.1.7. CEPH sensor power supply board A14 LED (only for I-Max CEPH 3D)

The following table shows the LED that is present on the CEPH Sensor Power board (A14), its function and the recommended corrective action in case of defect. To locate the LED, refer to the layout of the A10 board (see chapter **12** – drawing 8).

Led	Colour	Working status	Failure status	Main function	Corrective action
H1	Green	ON	OFF	+12 Vsensor power supply	Check 24V on cable X62 on CCU board. Check connection X76 to CCU board.See also Error E750 (paragraph 9.2.7.1). Check pogo-pins connections

9.2. Displayed messages

The I-Max 3D & I-Max CEPH 3D operative states and any detected errors are signaled by the different activation of the three keyboard LEDs (see User Manual keyboard description) and by the displayed operational and error messages on the PC interface-G.U.I. (Graphical User Interface):

- **Operational messages**: are instructions which guides the operator in the correct use of the unit.
- **Error messages**: are displayed by the GUI and describe the last occurred error. There are two kind of errors messages:
    1. Messages that require a reset by clicking on OK button on the GUI and by pressing the >0< button on the unit keyboard.
    2. Messages that can only be reset after the turning OFF and ON of the unit.

The error messages are divided into different areas that can be distinguished by the error number; the following table contains the different errors with meanings.

Main MCU board		
Code	**Error description**	**Reference paragraph**
001 / 003	Internal MCU error	**9.2.1**
500 ÷ 505	MCU Ethernet errors	**9.2.5**
MCU EEPROM configuration		
Code	**Error description**	**Reference paragraph**
100 / 101	Configuration area parameter doesn't match the expected one	**9.2.2.1**
102	Wrong version number in configuration area	**9.2.2.2**
103 / 104	Timeout error occurred during an EEprom erase/write operation	**9.2.2.3**
Rotation motor		
Code	**Error description**	**Reference paragraph**
200	Zero position optical sensor of rotation axis always activated	**9.2.3.1**
201	Zero position optical sensor never activated	**9.2.3.1**
202 / 203	Zero position optical sensor of rotation still active after exiting from zero sensor	**9.2.3.1**
204	Unexpected activation of rotation optical sensor	**9.2.3.2**
205	Timeout on rotation	**9.2.3.1**

Y translation motor		
Code	**Error description**	**Reference paragraph**
240	Zero position micro Y always active	**9.2.3.3**
241	Zero position micro Y never active	**9.2.3.3**
243	Timeout on Y axes	**9.2.3.3**

Disk collimator		
Code	**Error description**	**Reference paragraph**
260	Disk collimator timeout	**9.2.3.4**

Chin rest		
Code	**Error description**	**Reference paragraph**
265	Zero position micro chin rest always active	**9.2.3.4**
266	Zero position micro chin rest never active	**9.2.3.4**
268	Chin rest timeout	**9.2.3.4**

Hardware key board (U.I.C.)		
Code	**Error description**	**Reference paragraph**
270 / 271	Hardware key fault	**9.2.3.6**

X-ray Controls		
Code	**Error description**	**Reference paragraph**
360	RX button pressed on start-up or before exam	**9.2.4.1**
362	RX button released during emission	**9.2.4.2**

Sensor ready		
Code	**Error description**	**Reference paragraph**
370	Sensor ready lost during exposure	**9.2.4.3**
371	Sensor not ready	**9.2.4.4**
374	The computer connection drops or times out during exam	**9.2.4.5**
375	Sensor took long in configuration mode (while in preheat)	**9.2.4.6**
376	The CEPH sensor is not detected in CEPH position; The sensor presence has changed from the initial situation	**9.2.4.7**

CANbus		
Code	**Error description**	**Reference paragraph**
380	CANbus invalid reply	**9.2.4.8**

Temperature sensor		
Code	**Error description**	**Reference paragraph**
500 ÷ 503	Temperature sensor reading error	**9.2.5**

CCU Board

Code	Error description	Reference paragraph
600/601/ 605	CCU malfunctioning errors	**9.2.6.1**
602 ÷ 604	CEPH operative errors	**9.2.6.1**
606	Nasion calibration error	**Currently not implemented**
611	Internal CCU error	**9.2.6.1**
623 / 624	CCU eeprom errors	**9.2.6.2**
630 ÷ 635	Sensor movement errors	**9.2.6.8**
640 ÷ 645	Secondary collimator movement errors	**9.2.6.9**
650 ÷ 661	4 blade collimator movement errors	**9.2.6.10**
670 / 671	Can Bus errors	**9.2.6.11**
680	CEPH exam aborted	**Restart the exam**

Generator Board

Code	Error description	Reference paragraph
750	Generator board initialization error	**9.2.7.1**
751	Alarm "overvoltage kV"	**9.2.7.2**
752	Alarm "overload on filament" on Generator board	**9.2.7.3**
753	Alarm "overload anodic current"	**9.2.7.4**
754	Alarm "filament not OK"	**9.2.7.5**
755	Alarm "backup timer"	**9.2.7.6**
756	Alarm "PFC not OK"	**9.2.7.7**
757	Alarm "Brown OUT"	**9.2.7.8**
758	Alarm "NO X-ray"	**9.2.7.9**
759	Alarm "unexpected emission"	**9.2.7.10**
760	Alarm "NO RX button command"	**9.2.7.11**
761	Alarm "NO X-ray emission"	**9.2.7.9**
762	Bad unit status: emission flag detected unexpectedly	**9.2.7.12**
763	kV analog feedback out of range	**9.2.7.13**

Generator Board

Code	Error description	Reference paragraph
764	mA analog feedback out of range	**9.2.7.13**
765	Filament analog feedback out of range	**9.2.7.13**
766	Generator board reset due to a brown out	**9.2.7.8**
767	Generator board reset due to low voltage detection	**9.2.7.8**
768	Generator board reset due to a watchdog timeout	**9.2.7.8**
769	Generator board reset due to a stack overflow	**9.2.7.8**
770	Mismatch between generator board (A2) and MCU board (A1) types (2D / 3D)	**9.2.7.14**

Keyboard		
Code	**Error description**	**Reference paragraph**
850	One or more keycodes are pressed	**9.2.8.1**
852	Button >0< pressed during movements	**9.2.8.2**

PC software user interface (GUI)		
Code	**Error description**	**Reference paragraph**
1201	Setup menu: write data EEPROM failure	**9.2.9.1**
1202	Unespected value detected by the software	**9.2.9.2**
1203	Software allocation failure	**9.2.9.1**
1204	Exposure parameters failure	**9.2.9.2**
1205	Image buffer allocation failure	**9.2.9.2**

PC driver interface (OSP)		
Code	**Error description**	**Reference paragraph**
1401	sensor connection lost during exam	**9.2.10.1**
1402	sensor communication failure	**9.2.10.2**
1403	Software watchdog error	**9.2.10.3**
1404	sensor does not detect X-rays during exam	**9.2.10.4**
1405	sensor frame lost during exam	**9.2.10.1**
1406	Error in sensor frame rate	**9.2.10.1**

9.2.1. Errors with code from E001 to E003

These errors are related to the MCU board and its firmware.

Power OFF the unit and, after 1 minute delay, power it ON again; if the error is displayed again, replace the MCU board and report the error and when it occurred to the technical service.

9.2.2. Errors with code from E100 to E104

These are errors related to the MCU board EEprom memory.

9.2.2.1. E100: Configuration area parameter (CRC-16) doesn't match the expected one / E101: Configuration area parameter (magic number) doesn't match the expected one

These errors are shown when a corrupted configuration area parameter is found by the firmware of the I-Max 3D & I-Max CEPH 3D.

1. Verify that on the MCU board the EEPROM memory is well inserted (Figure 2).
2. If the error is still present, reset the EEPROM memory as listed below:

Warning
All the factory calibrations offset will be lost.
Before performing this procedure, make sure that the equipment parameters table (supplied as paper copy with the unit documentation) with the factory setting offsets is available.

   a. Remove the MCU board metallic cover.
   b. Set the DIP-switch position on OFF-ON-ON (see paragraph 4.2.4.1).
   c. Switch ON the unit. The three keyboard LED blinks three times in sequence.
   d. The two alignment laser blinks three times.
   e. At this stage, if you press the X-ray button until 5 seconds, the EEPROM memory reset will be performed. The correct reset of the EEPROM is indicated by the laser blinking.
   f. Switch OFF the unit and restore the normal mode DIP-switch position (ON-ON-ON).
   g. Restore the MCU metallic cover.
   h. Switch ON the unit, open PhD_C_Test and wait the unit connection.
   i. Enter in SETUP mode (see paragraph 8.4),modify the EEPROM parameter 0x001E from 0 to 1 (see paragraph 11.2.5) and restore the factory setting offsets reported in the equipment parameters table following the procedures present on paragraph 8.4.

3. If the error persists, replace MCU board complete of EEPROM (see paragraph 11.3.2). Manually restoring of the unit configuration data will be requested as explained in the above points.

***Technical Service additional information required**: MCU SD card log (see paragraph 11.2.1.2).*

9.2.2.2. E102: Wrong version number in configuration area

This error is shown when the version number of the configuration area doesn't match the MCU board firmware version.

1. Verify that the code printed on the MCU board match code 5804040600/XX. If it does not match, replace the MCU board with a correct one (see paragraph 11.3.2).
2. Contact OWANDY Technical Service to verify that the MCU firmware version is compatible with the unit configuration. If it is not, upload the MCU firmware with a compatible one (see paragraph 11.1.1).
3. If the problem is still present, reset the EEPROM following the procedure described in paragraph 9.2.2.1, point 2.

Technical Service additional information required*: MCU SD card log (see paragraph 11.2.1.2).*

9.2.2.3. E103: Timeout error occurred during an EEPROM erase operation / E104: Timeout error occurred during an EEPROM write operation

These errors are shown when a timeout occurred during an EEPROM erase or write operation.
Power OFF the unit and, after 1 minute delay, power it ON again and verify the correct functioning of the unit.
If a new error is displayed, refer to the specific error paragraph description to fix the issue.

9.2.3. Errors with code from E200 to E299

These errors codes are concerning problems related to the movement axis of the unit.

9.2.3.1. E200: Zero position optical sensor of rotation always active E201: Zero position optical sensor of rotation never active / E202 and E203: Zero position optical sensor of rotation still active after exiting from zero sensor / E205: Timeout on rotation

These errors are signals a problem on the rotation axis movement.
The position of rotation is controlled by the optical sensor B1, that is activated during the rotation axis reset movement; if this sensor is found active at the start up phase, and it is never sensed de-activated, the E200 message error is displayed, meaning that the sensor itself is broken or that the motor is not running.
In case that it is never sensed activated, the E201 is displayed, and the reasons are the same.
E202 or E203 is displayed when the rotation zero sensor B1 is still active after exiting from axis zero position.
E205 means that the optical sensor is never activated during the rotation axis reset.

In all cases, the optical sensor functionality can be checked placing an opaque thin material in the optical path and using a multimeter, verify that the voltage between pin X22-2 and pin X22-4 on the MCU board is about 5V when the optical path is covered by the thin material and about 0V when the optical path is not covered.

1. If there is no variation and the arm does not move or moves with difficulty or jumps:
   a. check the belt and verify that it is not broken; if the belt is loose, adjust its tension
   b. check cable X18 of motor M3; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver on the MCU.

Note
In the event of a short circuit on the X18 cable, the MCU board fuse F1 may be blown (the 24V power supply LED H2 OFF) and / or the motor driver (on the MCU board) may be damaged: if it is the case, replace the fuse F1 and then the MCU board.

2. If the arm moves but no variation of the signals is detected, replace the optical sensor B1 and if the problem is still present, the MCU board A1.

Technical Service additional information required:
- *Audio / Video with the global view of the unit movement*
- *Audio / Video of the view of the rotation motor group movement (with unit top cover removed)*

If there are still problems regarding the 4-blade collimator, please perform an incremental analysis following the steps listed below:

1. Check the functioning of the collimator motors, checking that there is no motor that does not move visually
2. Check if the offset is correct (refer to par. 7.11)
3. Check the wiring, checking the integrity of the cables connecting the CCU with the driver board
4. Check driver boards and CCU board: on the driver board if the engine driver that does not move overheats is because damaged. In case, replace the board
5. Replaced the interested motor (refer to par. 11.3.9)
6. Replace the whole four blade collimator motor (refer to par.11.3.10)

9.2.3.2. E204: Unexpected activation of zero position rotation sensor

This message means that there was an unexpected activation of the rotation optical sensor B1 during the exam or an another movement. Typically, the problem is due to a contact of the rotation arm with an object or patient shoulder.

1. Verify if the unit had an interference with the patient or an object external to the unit; in this case remove all the object from the unit work space or instruct the patient to do not move during the exam.

Note
In the event of patient collision, it is recommended to perform a TEST examination without X-ray, with the patient in the correct exam position (see User's Manual – "Patient positioning" chapter), before performing another X-ray examination.

2. If the interference is not external to the unit (point 1.): remove the unit top cover, perform a panoramic Test exam and verify if there are interferences in the motor work spaces: remove the objects and repeat the test.

3. If the issue was not solved, refer to the Error E200 ÷ E205 troubleshooting.

9.2.3.3. E240: Zero position sensor for Y axes always active / E241: Zero position sensor for Y axes never active / E243: Timeout of Y axes

These errors are signalling a problem on the Y axis movement. The position of Y axis is controlled by the optical sensor B2, that is activated during the translation axis reset movement.
E240 is displayed when the sensor B2 is found active at the start-up phase and it is never sensed de-activated.
E241 is displayed when the sensor B2 is never sensed activated.
E243 means that the optical sensor B2 is never activated during the translation axis reset.
The above errors may mean that the sensor B2 is broken or that the motor system is not running (MCU driver or motor group fault).

1. If there is no variation and the arm does not move or moves with difficulty or jumps:
   a. check the belt and verify that it is not broken; if the belt is loose, adjust its tension
   b. check cable X19 of motor M4; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver on the MCU.

Note
In the event of a short circuit on the X19 cable, the MCU board fuse F1 may be blown (the 24V power supply LED H2 OFF) and / or the motor driver (on the MCU board) may be damaged: if it is the case, replace the fuse F1 and then the MCU board.

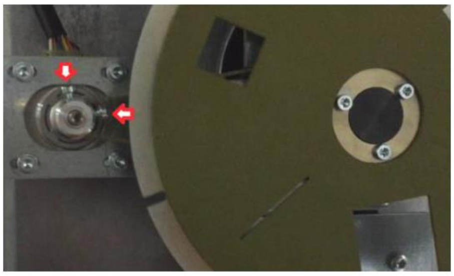
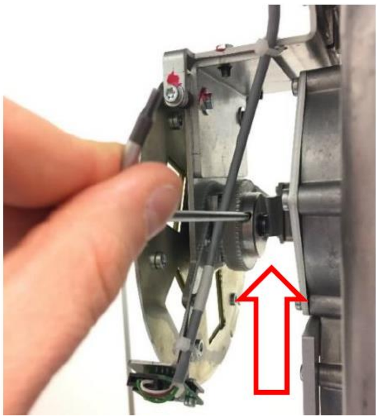
2. If the arm moves but no variation of the signals is detected, replace the optical sensor B2 and if the problem is still present, the MCU board (see paragraph 11.3.2).

Technical Service additional information required:
- *Audio / Video with the global view of the unit movement*
- *Audio / Video of the view of the translation motor group movement (with unit top cover removed)*

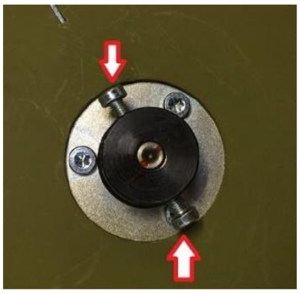
9.2.3.4. E260: Disk collimator timeout (only for I-Max 3D)

This error is displayed if a problem on the disk collimator movement is present. The position of the disk collimator is controlled by the optical sensor B3, that is activated during the disk collimator positioning.
If this error is shown means that the optical sensor B3 is never activated during the collimator positioning.
The error may be caused by the sensor B3 and / or its connections fault or by a malfunctioning of the motor M5 axis system (MCU driver or motor group fault).

1. Verify collimator type setting (see paragraph 11.2.6).
2. If the disk does not move or moves with difficulty or jumps:
   a. if disk collimator is belt type, check the belt and verify that it is not broken; if the belt is loose, adjust its tension
   b. if the belt is not broken or the collimator is without belt type: switch off the unit, move by hand the collimator disk and verify if the motor shaft move accordingly with the disk. If not, tighten the screws indicate by the red arrows in the figures below and repeat the test. If the test is still not ok, replace the collimator

Belt type disk collimator



Without belt disk collimator type

c. If the problem is still present, check cable X34-X64 and motor M5 integrity (short circuit, broken wires or loosen contact on the pins); fix the cable or replace the motor group M5.

Note
In case of short circuit on the X34-X64 cable, the MCU board fuse F1 may be blown (the 24V power supply LED H2 OFF) and/or the motor driver (on the MCU board) may be damaged: if it is the case, replace the fuse F1 or the whole MCU board.

3. If the collimator moves, verify the functionality of the optical sensor B3 signal as explained in the Note below. If the signal is NOT OK, check the optical sensor cable X1-B3-X41 (between the sensor B3 and the 3D Sensor Power board A10) and if it is not ok, fix or replace it. If the signal is still NOT OK, check the cable X25-X38 and if it is not ok, fix or replace it.

Note
The optical sensor B3 functionality can be checked moving by hand the disk collimator in order to cover / not cover the B3 sensor optical path and using a multimeter, signaled that the voltage between the MCU board X25 pin-2 and pin-6 is:
- about 5V when the optical path is covered
- - about 0V when the optical path is not covered.

4. If the error was not solved by the above tests, replace first the MCU board (see paragraph 11.3.2) and then the 3D Sensor Power board (A10).

***Technical Service additional information required**: try to reproduce the error recording an audio-video with a view of the collimator disk motor group movements.*

9.2.3.5. E265: Chin rest zero sensor is always active / E266: Chin rest zero sensor not active when expected / E268: Chin rest timeout

These errors are displayed if a problem on the chin rest axis movement (motor M6) is present. The position of chin rest axis is controlled by the optical sensor B4, that is activated at the chin rest reset axis movement.
E265 is displayed when the sensor B4 is found active at the unit start-up phase, and it is never sensed de-activated.
E266 is displayed when the sensor B4 is never sensed activated.
E268 means that the optical sensor B4 is never activated during the chin rest reset axis movement.
The above errors may be caused by the B4 sensor B4 and/or its connections fault or by a malfunctioning of the chin rest motor M6 system (MCU driver or motor group fault).

1. If the chin rest does not move or moves with difficulty or jumps:
   a. check the motor system integrity and functioning, verifying that there are no mechanical interferences in the chin rest run moving by hand the system, switching off the unit and manually rotate the screw hub (indicated by the red arrows in the following figures):

Screw hub

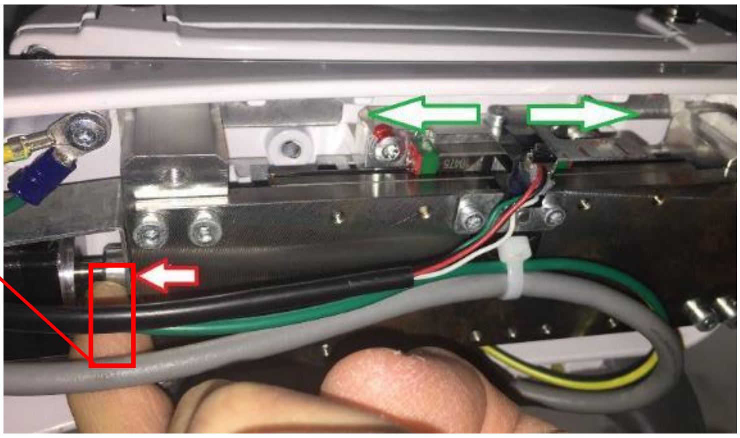


Figure 32

   If there are mechanical problem on the motor linear guide system, fix it or replace the whole chin rest motor linear guide system.

   b. If the mechanical system functioning is ok, check cable X49-X20 and motor M6 integrity (short circuit, broken wires or loosen contact on the pins). Replace the cable or the motor M6.

Note
In case of short circuit on the X49-X20 cable, the MCU board fuse F1 may be blown (the 24V power supply LED H2 OFF) and / or the motor driver (on the MCU board) may be damaged; if it is the case, replace the fuse F1 or the whole MCU board.

2. If the chin rest moves or continues to move against the chin rest end run, verify the functionality of the optical sensor B4 signal as explained in the Note below. If the signal is NOT OK, check the optical sensor cable X1-B4-X24 and if it is not ok, fix or replace it. If cable is OK and sensor signal is still not OK, replace the optical sensor B4.

Note
The optical sensor B4 functionality can be checked placing an opaque thin material in its optical path and using a multimeter, verify that the voltage between the MCU board X24 pin-2 and pin-4 is:
- about 5V when the optical path is covered
- about 0V when the optical path is not covered.

3. If the error was not solved by the above tests, replace the MCU board (see paragraph 11.3.2).

***Technical Service additional information required**: try to reproduce the error recording:*
- *An audio-video with a global view of the chin rest movements*
- *An audio-video with a bottom view of the chin rest motor linear system group movement (removing the chin rest bottom cover).*

9.2.3.6. E270 and E271: Hardware key board fault (U.I.C.)

These errors are shown when the firmware of the I-Max 3D & I-Max CEPH 3D does not sense the presence of the U.I.C. (Unique Identification Code).
The hardware keyboard (Figure 2) is read during unit start-up; if the check is incorrect, the system displays one of the above error number: verify the presence of the key and that is well inserted.
The issue can be generated by a MCU board or hardware key fault.

1. Verify if the hardware key is well inserted on the MCU board: insert the key and verify if the issue is solved.

2. If the issue was not solved, replace the MCU board and then the hardware key.

Note
In case of MCU hardware fault, replace it following the instruction present at paragraph 11.3.2.

Note
In case there is a fault on the hardware key itself, it must be replaced. All the optional features must be re-enabled with proper codes. To request a new hardware key, report to OWANDY the S/N of the equipment and / or the U.I.C code listed on the equipment parameters table (supplied as paper copy with the unit documentation).

9.2.4. Errors with code from E300 to E399

9.2.4.1. E360: RX button pressed on start-up or before exam

This message is displayed if, during the power ON phase or before starting of the exam, one of the connected X-ray button, has been sensed as pressed.

1. Verify if one of the X-ray buttons was intentionally / unintentionally pressed: switch OFF the unit and release the button. Switch ON the unit and verify if the issue is solved.

2. Switch OFF and ON the unit, press the X-ray button and verify that the LED H11 on MCU board (A1) light-up according to the X-ray button activation: if is not ok, verify the connected

X-ray buttons and their connections.

If they are not ok, replace or fix the buttons and verify if the issue is solved. If the error is still present, replace the MCU board (see paragraph 11.3.2).

9.2.4.2. E362: X-ray button released during emission

The above error message is displayed if the X-ray button is unintentionally / intentionally released during an exam; the emission is stopped and all motors released in order to allow the patient's exit.

Verify if the X-ray button has been intentionally / unintentionally released during the exam:

a. If it was intentionally released, press button >0< to reset the error on the unit and close the error window displayed on the GUI.
b. If it was unintentionally released, refer to Error E360.

9.2.4.3. E370: Sensor ready lost during exposure

This error is displayed if the "sensor ready" signal is lost during the exposure.

With the unit powered OFF, proceed as follow:

- Perform the troubleshooting tests listed on Errors E1401 and E1402 (see paragraphs 9.2.10.1 and 9.2.10.2).

Technical Service additional information required*: try to reproduce the error keeping the following logs:*

- *Software logs*
- *MCU SD card log*

(see paragraph 11.2.1).

9.2.4.4. E371: Sensor not ready

This error is displayed when the user tries to perform an exam while the sensor connection has not yet been established.

Clear the error and wait for at least 5 minutes: if the sensor connection is not achieved, refer to troubleshooting of Error E370 (see paragraph 9.2.4.3).

9.2.4.5. E374: The computer connection drops or times out during exam

During the examination, it's checked periodically that the TCP / IP connection with OSP is constantly active, if it closes (e.g. OSP closes the program), the firmware stops everything with this error. It can be an ethernet connection problem between the PC and the sensor.

9.2.4.6. E375: Sensor took long in configuration mode (while in preheat)

During the preheating time, the sensor reports that it's being configured; if at the end of the preheating the sensor is not yet ready, an extra 50% of preheating time is allowed; if in the end, however, the sensor always tells that it's in the configuration phase, this error comes out. It can be a sensor problem and its connections to the PC (sensor power supply is definitely OK).

9.2.4.7. E376: Sensor not in correct position

This error is related on a wrong position of the mobile sensor respect the selected exam or if the sensor presence has changed since the initial situation.
In this latter case, the issue could concern a problem with the pogo-pin alignment or a problem with the relative signal.

Check the pogo-pin alignment.

9.2.4.8. E380: CANBus invalid reply

Bus (CCU-MCU-HF) HW problem or some FW bug.

9.2.5. Error with code from E500 to E505

This range of errors are dedicated to MCU – PC ethernet communication problems due to incompatibility between OSP software and MCU firmware version and/or ethernet hardware issues.

1. check the ethernet connection and the network card settings (see paragraph 7.6.1).
2. Power ON the unit and wait the connection to the PC-GUI. Verify the compatibility between MCU firmware and OSP versions: update/downgrade the FW-SW to a released/compatible configuration.

Note
Contact OWANDY Technical Service to verify that the firmware and software versions are compatible with the unit configuration.

***Technical Service additional information required**: try to reproduce the error keeping the following logs:*
- *Software logs*
- *MCU SD card log*

(see paragraph 11.2.1).

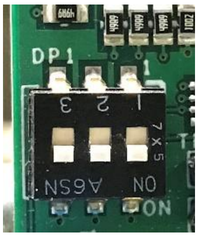
9.2.6. Error with code from E600 to E680

9.2.6.1. E600, 601, 611

These errors are related either to a CCU board malfunction or to a CAN bus problem between MCU board and CCU board.

Note
It may happen that at the end of CCU board firmware upgrade the error E600 is displayed in the PhD_C_Test program. In this case power off the machine and restart the software. If the error is persistent continue the troubleshooting.

1. Check that CCU dip switches are all in the ON position (down), if not place them as in the picture and power off the machine and power it on again.



2. Check the CAN bus cable X9-X9 between CCU board and MCU board: replace or fix it if defective and then verify if the problem is still present.
3. Check the CCU voltage power supply and the CCU leds.

Technical Service additional information required*: try to reproduce the error keeping the following logs:*

- *Software logs*
- *MCU SD card log*
- *CCU SD card log*

9.2.6.2. E602 The flat panel isn't open, but should be

This error is shown when the Flat Panel sensor is not in CEPH exam position while the unit is in a status which requires the sensor to be open in CEPH position. Eg. CEPH exam preparation or execution.
Checks:

1. Check that the sensor has not been accidentally hit by the operator or that is has not intentionally been closed by the operator during a CEPH status. In this case reset the unit and repeat the CEPH positioning
2. Check that the CEPH sensor position is mechanically stable, if it is not call the AS
3. When the sensor is in CEPH position, check that the Hall sensor B13 can reach the magnet positioned on the 3D sensor rotating shaft. Check also that the magnet is present and stable. Test with the multimeter on connector X79-pin4 and GND X79-6 (A12), MUST BE 0V when sensor is in CEPH position and> 3V when in other positions
4. Check that the B13 hall sensor signal is correctly connected to the CCU board through the following connection chain: X79 connector-> A12 collimator board-> cable X77-X59 pins 4->CCU board.

9.2.6.3. E603 The chin rest must be removed in order to start exam

Remove the chin rest from the unit in order to prepare the unit to perform the exam.

9.2.6.4. E604 Flat Panel is open, but should be closed

This error is shown when the Flat Panel sensor is not closed in 3D/pan position while the unit is in a panoramic, 3D or static image status.
Checks:

1. Check that the sensor has not intentionally been opened by the operator. In this case reset the unit and repeat the exam.

2. Check that the CEPH sensor position is mechanically stable, if it isn't calling the AS
3. When the sensor is in 3D/pan position, check that the Hall sensor B12 can reach the magnet positioned on the 3D sensor rotating shaft. Check also that the magnet is present and test with the multimeter on connector X79-pin3 and GND X79-5 (A12), MUST BE 0V when sensor is in pan3D position and> 3V when in other positions.
4. Check that the B12 hall sensor signal is correctly connected to the CCU board through the following connection chain: X79 connector->A12 collimator board->cable X77-X59 pins 2->CCU board.

9.2.6.5. E605 A time out error occurred during CCU motors movement

This error is shown in case the CCU doesn't communicate the end of an axis movement to the MCU within the time out limit
Checks:

Switch off-on the unit, when the green led blinks press the >O< button and verify that during the axis reset the following axis, driven by CCU board, moves correctly:

- Primary collimator
- Secondary collimator
- CEPH sensor

In case one specific axis does not move, refer to the specific error related to that axis:

- Primary collimator->E650-E661
- Secondary collimator->E640-E645
- CEPH sensor->E630-635

9.2.6.6. E606 Flat Panel is open, but should be closed

This error is shown when the Flat Panel sensor is not closed in 3D/pan position while.

9.2.6.7. E623: timeout error during the CCU EEPROM erase operation / E624: timeout error during the CCU EEPROM write operation

These errors are shown for a timeout during the CCU EEPROM erase or write operation.
Power OFF the unit and, after 1 minute delay, power it ON again and verify the correct functioning of the unit, checking the machine configuration and the set-up data.
In case the error is persistent replace the EEPROM.
If a new error is displayed, refer to the specific error paragraph description to fix the issue.

9.2.6.8. E630: Sensor holder zero position optical sensor always active / E631 and E632: Sensor holder zero position optical sensor still active after exiting from zero sensor / E633: Sensor holder zero position optical sensor never active / E634: Timeout on sensor holder movement E635: Sensor holder motor overrun

These errors are signals of a problem on the CEPH sensor movement.

The position of the sensor movement is controlled by the optical sensor B6, that is activated during the sensor holder axis reset; if this sensor is found active at the start-up phase, and it is never sensed de-activated, the errors E630 - E632 are displayed, meaning that the sensor itself is broken or that the motor is not running.
In case that it is never sensed activated, the errors E633 and E634 are displayed.

In all cases, the optical sensor functionality can be checked placing an opaque thin material in the optical path and using a multimeter, verify that the voltage between pin X95-3 and pin X95-5 on the CEPH driver board A13 is about 5V when the optical path is covered by the thin material and about 0V when the optical path is not covered.

If there is no variation and the sensor holder does not move or moves with difficulty or jumps:

a. check the belt and verify that it is not broken; if the belt is loose, adjust its tension

b. check the 24V on the A13 board (led H2) if not present check the cable X53-X87 and the fuse F1.

c. check cable X92 of motor M9; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver on the A13 board.

Note
In the event of a short circuit on the X92 cable, the A13 board fuse F1 may be blown (the 24V power supply LED H2 OFF) and/or the motor driver (on the A13 board) may be damaged: if it is the case, replace the fuse F1 and then the board.

If the sensor holder moves but no variation of the signals is detected, replace the optical sensor B6, its cable and if the problem is still present, the A13 board.

In addition if the movement is just in one verse check also the cable X54-X88 between CCU A11 board and A13 board and finally replace the CCU A11 board.

Technical Service additional information required:

- *Audio / Video with the global view of the unit movement*
- *Audio / Video of the view of the CEPH motor group movement (with unit top cover removed)*

9.2.6.9. E640: Secondary collimator zero position optical sensor always active/ E641 and E642: Secondary collimator zero position optical sensor still active after exiting from zero sensor / E643: Secondary collimator zero position optical sensor never active / E644: Timeout on Secondary collimator movement E645: Secondary collimator motor overrun

These errors are signals of a problem on the secondary collimator movement.

The position of the secondary collimator movement is controlled by the optical sensor B5, that is activated during the sensor holder axis reset; if this sensor is found active at the start up phase, and it is never sensed de-activated, the errors E640 - E642 are displayed, meaning that the sensor itself is broken or that the motor is not running.
In case that it is never sensed activated, the errors E643 and E644 are displayed.

In all cases, the optical sensor functionality can be checked placing an opaque thin material in the optical path and using a multimeter, verify that the voltage between pin X95-4 and pin X95-6 on the CEPH driver board A13 is about 5V when the optical path is covered by the thin material and about 0V when the optical path is not covered.
Check the continuity of the cables up to the CCU with a multimeter. The path is as follows:

B5->X95->A13->X89-pin3 / X58-pin3->CCU

Any interruption of this chain can therefore also lead to the A13 board

If there is no variation and the secondary collimator does not move or moves with difficulty or jumps:

a. check the belt and verify that it is not broken; if the belt is loose, adjust its tension
b. check the 24V on the A13 board (led H2) if not present check the cable X53-X87 and the fuse F1.
c. check cable X93 of motor M10; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver on the A13 board.

Note
In the event of a short circuit on the X93 cable, the A13 board fuse F1 may be blown (the 24V power supply LED H2 OFF) and/or the motor driver (on the A13 board) may be damaged: if it is the case, replace the fuse F1 and then the board.

If the secondary collimator moves but no variation of the signals is detected, replace the optical sensor B5 its cable and if the problem is still present, the A13 board.

In addition if the movement is just in one verse check also the cable X54-X88 between CCU A11 board and A13 board and finally replace the CCU A11 board.

Technical Service additional information required:
- *Audio / Video with the global view of the unit movement*
- *Audio / Video of the view of the CEPH motor group movement (with unit top cover removed)*

9.2.6.10. E650 - E653: Primary collimator movement timeout / E654 - E657: Primary collimator zero position optical always active / E658 - E661: Primary collimator motor overrun

These errors are signals of a problem on the primary collimator axes.
Each axis is identified by a label on the collimator and in the following table the correspondence between error and axis is reported:

Error	FT1 axis	FT2 axis	FT3 axis	FT4 axis
movement timeout	E650	E651	E652	E653
zero always active	E654	E655	E656	E657
overrun	E658	E659	E660	E661

The position of the primary collimator axes is controlled by the optical sensors B7-B9, that are activated during the axes reset; if these sensors are found active at the start up phase, and are never sensed de-activated, the errors E654 - E657 are displayed, meaning that the corresponding sensor is broken or that the motor is not running.
In case that a sensor is never sensed activated, the errors E650 - E653 are displayed.

In all cases, the optical sensor functionality can be checked placing an opaque thin material in the optical path and using a multimeter, verify that the voltage between the following pins: for B7 pin X84-5 and pin X84-3, for B8 pin X84-5 and pin X84-4, for B9 pin X85-5 and pin X85-3 and for B10 pin X85-5 and pin X85-4 on the Collimator driver board A12 is about 5V when the optical path is covered by the thin material and about 0V when the optical path is not covered.
Check the X77-X59 cable.

If there is no variation and an axis does not move or moves with difficulty:

a. check that the correspondent actuator is not broken.
b. check the 24V on the A12 board (check led H6 of CCU A11 board) if not present check

the cable X67-X75 and the fuse F1 on CCU A11 board.

c. check the specific cable among X80-X83 of motor M5-M8; there can be a short circuit or a broken wire; check also for a loosen contact. In case of short circuit, replace the cable, verifying also that no damage has been caused to the motor driver on the A12 board.

Note
In the event of a short circuit on one of the cable among X80-X83, the CCU A11 board fuse F1 may be blown (the 24V power supply LED H6 OFF) and/or the motor driver (on the A12 board) may be damaged: if it is the case, replace the fuse F1 and then the boards.

If the arm moves but no variation of the signals is detected, replace the optical sensor B7-B8 or B9-B10 their cables and if the problem is still present, the A12 board.

In addition if the movement is just in one verse check also the cable X66-X76 between CCU A11 board and A12 board and finally replace the CCU A11 board.

Technical Service additional information required:
- *Audio / Video with the global view of the unit movement*
- *Audio / Video of the view of the CEPH motor group movement (with unit top cover removed)*

9.2.6.11. E670 / E671 Can Bus

Note
This error can be related to the Generator board errors E750 and E761 or a Generator board power supply fault. Therefore, in these cases the CAN-Bus is not able to assure the communication between the unit boards (MCU, CCU and Generator).

This message is displayed when the CAN bus line has been interrupted, due to a hardware or a power voltage problem. Therefore, the communication between the boards (CCU, MCU, Generator) is interrupted.

1. Check the CAN bus cable X9-X9 between CCU board and MCU board: replace or fix it if defective and then verify if the problem is still present.
2. Check the CAN bus cable X15-X32 between MCU board and Generator board: replace or fix it if defective and then verify if the problem is still present.
3. Verify the Generator board status performing the test listed for error E750 (see paragraph 9.2.7.1) and E761 (see paragraph 9.2.7.9).
4. Perform the tests reported by Error E760 (see paragraph 9.2.7.11).
5. Perform the test of the Error E761 (see paragraph 9.2.7.9).
6. If the error is still present, replace first the MCU board (see paragraph 11.3.2) and then the CCU board (see paragraph 11.3.3).

Technical Service additional information required*: try to reproduce the error keeping the following logs:*
- *Software logs*
- *MCU SD card log*
- *CCU SD card log*

9.2.6.12. E680 CEPH exam was aborted

It is an error of CCU origin, it comes out in the event that during a static CEPH the examination is aborted releasing the x-ray button.

9.2.7. Error with code from 750 to 770

Warning
Those errors are related to the X-ray generator.
In case of Error messages E759 and E755, the system must be immediately powered off, because an unexpected emission (E759) can be present or the emission has not been terminated into the expected time.

Warning
On the Generator board (A2) there are dangerous high voltage, 230 VAC / 120 VAC and 400 VDC.
Before accessing the Generator board, it is mandatory to switch OFF the unit, disconnect it from the mains and wait up to 4 minutes in order to allow the discharge of the capacitor (LED H10 on the Generator board steady OFF).

9.2.7.1. E750: Generator board initialization error

This message is signalling that the MCU board is not able to initialize the Generator board (A2). This error can be generated by and hardware failure on the CAN-Bus or on the Generator board main power supply connection.

With the unit switched OFF (at least since 4 minutes), perform the following tests:

1. Check fuse F1 (T1A 250V) on the Generator board: if the fuse is blown, replace it and redo the test.
2. Check integrity of the CAN-Bus cable X32-X15 between MCU board and Generator board: if NOT OK, replace it and redo the test.

If the error is still present after tests 1 and 2, switch ON the unit and proceed as follow:

Warning
During the following tests, pay attention to the dangerous High Voltage on the Generator board.

3. Verify the main power LED H8 on the Generator board:
   a. if the LED H8 is OFF, check with a multimeter that between pins X31-L and X31-N the unit power provide AC voltage is present (eg. 230V or 120V):
      - if the power supply X31-L and X31-N is OK, replace the Generator board
      - if the power supply X31-L and X31-N is NOT OK, check the integrity and proper connection between Line filter Z1 and Generator board; fix or replace the faulty component
   b. if the LED H8 is BLINKING, replace the Generator board
   c. if the LED H8 is ON, replace the Generator board and then the MCU board (see paragraph 11.3.2).

Note
The error E750 (Generator board power supply fault) can be related to the Error E670 / E671, related to a fault on the CAN-Bus line is detected.

9.2.7.2. E751: kV over voltage

This message is displayed when a value higher than expected has been detected on the Generator board (A2).

With the unit switched OFF (at least since 4 minutes), perform the following tests:

1. Check that connector X57 is well connected: connect it and verify if the error is still present.
2. With the connector X57 CONNECTED, using a multimeter, perform the measures listed in the following table:

Parameter	Connection	Value
Feedback kV +	X57-4(GND) and X57-2	13.3kΩ ± 2%
Feedback kV -	X57-4(GND) and X57-3	14.3kΩ ± 2%

3. With the connector X57 DISCONNECTED perform the measures (connector side) listed in the following table:

Parameter	Connection	Value
Insulation between the PINs of the power tube filament	X57-5/6 and X57-4	Infinite
Insulation between primary H.V. winding and GND	X56-1/2 and GND (Tubehead shell)	Infinite
Feedback kV +	X57-4 and X57-2	19.8 ÷ 20.2 kΩ
Feedback kV -	X57-4 and X57-3	19.8 ÷ 20.2 kΩ

IF values measured at point 3 are incorrect, replace the tubehead (see paragraph 11.3.9)
IF values measured at point 2 are incorrect, while values measured at point 3 are correct, replace the Generator board.
IF values measured at point 2 and 3 are correct, the X57 connector is well inserted and its connections to the tubehead are OK, replace the Generator board and then the tubehead.

9.2.7.3. E752: Filament overload

This message is displayed when a filament overload is detected by the Generator board during preheating time or X-ray exposure.

If the error is displayed, contact OWANDY Technical Service.

9.2.7.4. E753: Overload on Anodic current

This message is displayed when an abnormal value of the anodic current has been detected.

With the unit switched OFF (at least since 4 minutes), perform the following tests:

1. Check that connectors X56 and X57 are well connected: connect it and verify if the error is still present.

2. With connector X57 CONNECTED, using a multimeter, perform the measures listed in the following table:

Parameter	Connection	Value
Feedback mA	X57-4(GND) and X57-1	326Ω ÷ 334Ω

3. With the connector X57 DISCONNECTED perform the measures (connector side) listed in the following table:

Parameter	Connection	Value
Feedback mA	X57-4(GND) and X57-1	326Ω ÷ 334Ω

IF values measured at point 2. and 3. are incorrect, replace the tubehead (see paragraph 11.3.9) and the Generator board.
IF value measured at point 2. is incorrect and value measured at point 3. is correct, replace the Generator board.
IF value measured at point 3. is incorrect and value measured at point 2. is correct, replace the tubehead.
IF the tests listed at point 1., 2. and 3. do not solve the error, replace the Generator board and then the tubehead.

9.2.7.5. E754: Broken filament

This message is displayed when there is a fault on the power circuit of the filament, not only the filament itself.

With the unit switched OFF (at least since 4 minutes), perform the following tests:

1. Verify the continuity (max Ohmic value ≤ 0.5Ω) between pins the X57-5 and X57-6: if there is no continuity, replace the tubehead (see paragraph 1).
2. Verify that the pre-heating parameters stored in the MCU EEPROM memory matches the ones listed in the equipment parameters table (supplied as paper copy with the unit documentation) (see paragraph 8.4); correct them and verify if the error is still present.

Note
If the tubehead is a spare part, the new pre-heating values are printed on the tubehead label.

3. If the error was not solved by point 1. and 2., replace the tubehead and then the Generator board.

9.2.7.6. E755: Alarm "Backup timer intervention"

The emission is controlled through a safety backup timer that interrupts the power to the tubehead in case of a fault (hardware or software). The intervention of the backup timer, is signalled also by a lighting on of the red LEDs H5 and H9.

Warning
This error can be safety related. In case of Error messages E755, the system must be immediately powered off and not been used, because an emission has not been terminated into the expected time.

In any case it is mandatory to contact Owandy Technical Service **and not use or switch ON the system anymore.**

9.2.7.7. E756: PFC (Power Factor Control) failure

This message is signaling that the PFC (Power Factor Control) circuit functioning is not correct.

If the error is displayed, contact OWANDY Technical Service.

9.2.7.8. E757: Brown out alarm / E766: Generator board reset due to a brown-out / E767: Generator board reset due to a low voltage detection / E768: Generator board reset due to a watchdog timeout / E769: Generator board reset due to a stack overflow

These messages are displayed when the Generator board microcontroller is reset due to the displayed issue.

If the error is displayed, contact OWANDY Technical Service.

9.2.7.9. E758: Alarm "No X-ray" / E761: Alarm "No X-ray emission"

These errors are displayed when the anodic current has been interrupted during or at the beginning of the emission and may indicate that the Generator board is in a safety status (eg. due to a discharge inside the tubehead, a broken tube or any other tubehead damage).
Error E761 may be displayed / associated with other errors (i.e. E362 and E760) that can explain the main cause of the X-ray interruption occurred during the previous exposure (refers also to the associated error paragraph).

In order to reset these errors:

1. Switch OFF the unit and wait at least 4 minutes.
   a. Switch ON the unit, perform an exposure and verify if the error is still present.
   b. Switch OFF the unit, wait at least 4 minutes and switch it ON again: verify that the pre-heating parameters stored in the MCU EEPROM memory matches the ones listed in the equipment parameters table (supplied as paper copy with the unit documentation) (see paragraph 8.4); correct them and verify if the error is still present.
2. With the unit switched OFF (at least since 4 minutes), verify the proper connection of the connectors X56 and X57; fix them, switch ON the unit and verify if the error is still present.

3. With the unit switched OFF (at least since 4 minutes), perform the following tests:
   a. Verify the primary winding continuity (max Ohmic value ≤ 0.5Ω) on the pins X56-1 and X56-2
   b. Verify the filament continuity (max Ohmic value ≤ 0.5Ω) on the pins X57-5 and X57-6
   c. Verify the mA feedback Ohmic resistance on the pins X57-1 and X57-4, it should be between 326Ω ÷ 334Ω.

   If one of the above tests (a., b. or c.) fails, replace the tubehead (see paragraph11.3.9).
4. If the error is still present, replace both the tubehead and Generator board.

Technical Service additional information required*: try to reproduce the error keeping the following logs:*
- *Software logs*
- *MCU SD card log (see paragraph 11.2.1).*

9.2.7.10. E759: Alarm "Unexpected emission"

Warning
In case of Error message E759, the system must be immediately powered OFF because an unexpected emission can be present.

An unexpected emission has been detected by the Generator board.

1. With the unit switched OFF (at least since 4 minutes), verify the proper connection of the pins X57-1 and X57-4; connect them and verify if the error is still present.
2. With the unit switched OFF (at least since 4 minutes), verify the Ohmic resistance between the TP10 (mA feedback) and GND (TP13), it should be between 326Ω ÷ 334Ω. If it is NOT OK, remove the connector X-57 and repeat the Ohmic test on the connector (tubehead side).
   IF the test is NOT OK, replace the tubehead (see paragraph 11.3.9).
   IF the test is OK, replace the Generator Board.
3. If the error is still present, **it is mandatory NOT use or switch ON the system anymore** and contact OWANDY Technical Service.

9.2.7.11. E760: Alarm "NO RX button command"

This message is displayed when the Generator board (A2) is not detecting the X-ray button during the emission.

If the X-ray button was NOT intentionally released, switch OFF and ON the unit. Wait the keyboard blinks (DO NOT press the >0< button) and perform the following checks:

1. Press the X-ray button and verify that the LED H11 on MCU board (A1) light-up according to the X-ray button activation.
   IF the test is NOT OK, verify the connected X-ray buttons and their connections: replace or fix them and verify if the error is still present. If still present, replace the MCU board (see paragraph 11.3.2).
2. Press the X-ray button and verify that the LED H2 on the Generator board (A2) light-up according to the LED H11 on the MCU board and to the X-ray button activation.
   IF the test is NOT OK, verify the integrity of the cable X15-X32 (Pin 2 = X-ray button signal) between MCU and Generator board: replace the cable if not OK and if the error is still present, replace the MCU board.

3. If the above tests are OK and/or the error is still present, replace the Generator board.

9.2.7.12. E762: "Bad Generator board unit status, emission flag detected unexpectedly

This message is displayed when the MCU detect a wrong status of the Generator board.

If the error is displayed, contact OWANDY Technical Service.

9.2.7.13. E763: kV channel analog feedback out of range / E764: mA channel analog feedback out of range / E765: Filament channel analog feedback out of range

These messages are displayed when Generator board detect a wrong kV, mA or Filament analog level.

If the error is displayed, contact OWANDY Technical Service.

9.2.7.14. E770: Mismatch between the Generator board (A2) and MCU board (A1) types (2D / 3D)

This error is displayed when the Generator board or MCU board is not configured as 3D type.

With the unit powered OFF, wait at least 4 minutes and verify that the codes printed on the two boards matches the following ones:

- Generator board: 5804020200/XX
- MCU board: 5804040700/YY

Replace the wrong board.

9.2.8. Errors with code E850 and E852

These errors indicate a keyboard fault.

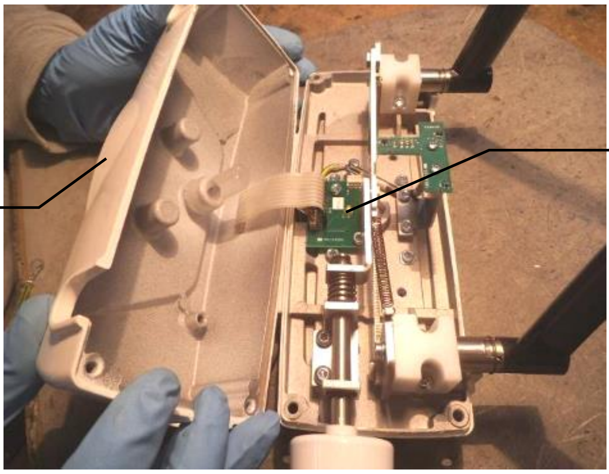
9.2.8.1. E850: One or more buttons pressed during power ON

During the power ON phase, one or more keyboard buttons have been sensed as pressed by the MCU board (A1).

1. With the unit switched OFF, check that no keyboard buttons are pressed: power the unit ON and verify if the error is still present.
2. With the unit switched OFF, disconnect cable X12 on MCU board, power ON the unit, wait the connection with the GUI (about 3 minutes) and verify that error E850 is no more displayed.
   a. If the error is still present, replace the MCU board (see paragraph 11.3.2)
   b. If the error is no more displayed, verify:
      - integrity of the cable X12-X46 between MCU and X46/X47: replace the cable and verify if the error is still present
      - integrity of the cable X46/X47 between X12-X46 and Interface board A5: replace the cable and verify if the error is still present (* see Note)

c. If the above tests are OK, replace the keyboard membrane and then the Interface board (A5) (* see Note).

(*) Note
In order to check / replace these components, it will be necessary to open the keyboard following the chin rest replacement procedure.



9.2.8.2. E852: One key pressed during the movement

During the system movements, the keyboard is inactive, but at the pressure of >0< button all movements are stopped and this message is displayed.
This function allows the user to stop the system movements in case an unexpected system behavior or a collision during the system positioning.

1. Make sure that >0< button was not intentionally/unintentionally pressed during a unit movement: reset the unit and verify if the error is still present.
2. Check that the >0< button is not stuck: replace the keyboard membrane if the >0< button is faulty.
3. If the tests are OK, refer to error E850 (see paragraph 9.2.8.1).

9.2.9. Error with code from E1201 to E1205

These errors are related to the system PC software application issues or the communication with unit's boards.

9.2.9.1. E1201: Failed to write data in EEPROM from Setup menu / E1203: Error detected in software allocation

These messages are displayed when a software error has been detected.

If the error is displayed, contact OWANDY Technical Service.

Technical Service additional information required:
- *Condition/unit state/sequence in which the error occurs/can be reproduced*
- *Software logs (see paragraph 11.2.1.1).*

9.2.9.2. E1202: Unexpected value encountered by the software / E1204: Error detected in exposition parameters / E1205: Error detected in image buffer allocation

These messages are displayed when a Software or Firmware error has been detected.

If the error is displayed, contact OWANDY Technical Service.

Technical Service additional information required:
- *Software logs (see paragraph 11.2.1).*

9.2.10. Error with code from 1401 to 1405

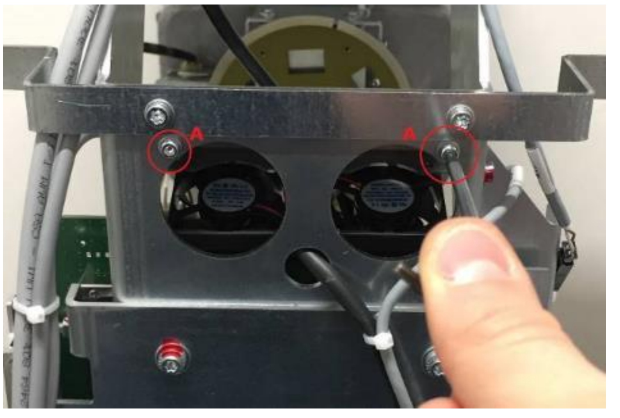
9.2.10.1. E1401: Sensor connection lost during the exam / E1405: Sensor frame lost during exam

This message is displayed if the unit drivers on PC detects less frame than expected during the exam acquisitions.
If the problem happens during a panoramic or a 3D exam it may be related to a communication malfunctioning of the 3D sensor Ethernet connections (cables and PC network interface) or of the 3D sensor.
If the problem happens during a cephalometric exam it may be related to a communication malfunctioning of the CEPH sensor Ethernet connections (cables and PC network interface) or of the CEPH sensor.

1. Check the Ethernet connections (cables, junctions, PC network board) and PC network board settings (see paragraph 7.6.1).

   Check also if the cables and the network board interface are compliance with the mandatory characteristics reported below:
   - The network interface must be Intel I350-T2 dual port
   - The Ethernet cables must be the ones supplied with the unit or CAT 6 cables (or higher category)
   - The 3D sensor must be directly connected to the PC, no Ethernet hub/switch are allowed between the 3D sensor and the PC.

Note
In order to check the Ethernet cable/junctions integrity of the 3D sensor, it is suggested to:

1. Remove the two fans "A" screws to access to the 3D sensor Ethernet connector.
2. 

3. Unplug the Ethernet cable connected to the 3D sensor.
4. Plug a functioning Ethernet CAT 5E (or higher) cable to the 3D sensor and connect it directly to the PC network interface:
   - If the problem, in this configuration, disappears: there may be a faulty Ethernet cable or junction connected between the PC and the 3D sensor
   - If the problem is still present, try to connect the sensor to another network interface Ethernet port (e.g. Invert the “Ethernet” (MCU) and 3D sensor connections setting the right IP address on the network interfaces – see paragraph 7.6.1).
   If the problem is solved, it can be related to the network interface board.

2. Fix the PC network settings or replace the faulty/not compliant components.

   Update the network interfaces board drivers (see paragraph 11.2.4);

   Verify if the error is still present.
3. Configure the Network interface board as required by paragraph 7.6.2 and activate the sensor logs (see paragraph 11.2.1.4).

   Verify if the problem is still present.
4. Set the 3D sensor network with a static IP address (see paragraph 11.2.6)

   Verify if the problem is still present.
5. Perform the tests reported by Error E760 (see paragraph 9.2.7.11).
6. Verify if the following values matches the ones stored in the EEPROM memory (see paragraph 11.2.5):
   - 0x0084 – 3D Std RX on time = 17
   - 0x0085 – 3D Std RX off time = 33
   - 0x0086 – 3D HD RX on time = 17
   - 0x0087 – 3D HD RX off time =
     - 33 (for sensor C12902D-40(X) and for Dalsa 1511)
     - 39 (for sensor C12903D-40G)
   - 0x0088 – 3D SHD RX on time = 17
   - 0x0089 – 3D SHD RX off time = 33

   Correct the values if they do not match and verify if the problem is solved.

7. In case the problem is not on a CEPH exam, perform both a 3D and a panoramic acquisition:
   a. If the problem is systematically present only on 3D acquisitions, verify the integrity of the sensor trigger signal cables:
      - X43-J14 (from 3D Power Sensor board A10 and the 3D sensor)
      - For XMP 3D - X38-X25 (from 3D Power Sensor board A10 and MCU board A1)
      - For XMP 3D CEPH - X38-X61 (from 3D Power Sensor board A10 and MCU board A1)
      - X38-X25 (from 3D Power Sensor board A10 and MCU board A1)
      - X32-X15 (from Generator board A2 and MCU board A1)

      If the cables are OK, replace first the 3D Power Sensor board, then the MCU board and then the Generator board.
   b. If the problem is present both on 3D and panoramic acquisitions, verify if the tubehead connector X56 is well inserted and then perform the tests of the Error E761 (point (see paragraphs 9.2.7.1 and 9.2.7.9).
8. If the problem is on the CEPH sensor check the ethernet cable from the CEPH arm to the ethernet switch and the ethernet cable to the PC. Check also if the detector is well inserted in its holder.

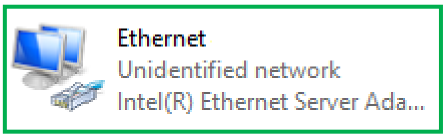
<u>Contact OWANDY Technical Service providing the following additional information:</u>
- *<u>Software logs</u>*
- *<u>CEPH Sensor logs</u>*
- *<u>3D Sensor logs folder (see paragraph 11.2.1)</u>*
- *<u>Last RAW files folder stored (see paragraph 3)</u>*

9.2.10.2. E1402: sensor configuration failure

If this error is displayed during a panoramic or 3D exam it is related to a communication error between the flat panel and the PC software or a 3D Power Sensor board A10 problem.
If it is displayed during a CEPH exam it is related to a communication problem between the CEPH sensor and the PC or to a problem of the boards A11, A13 and A14.

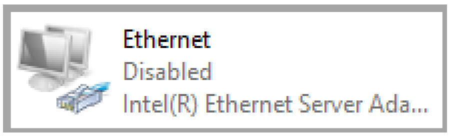
Perform the exam in which the error was displayed in a test mode (without X-ray) and verify, during the movements the status of the Ethernet connection (Control Panel→Network and Internet→Network Connections).

1. IF the Ethernet connection is steady ACTIVE:



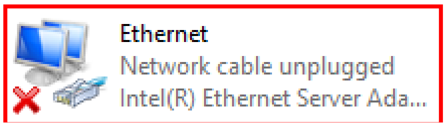
   a. Perform points 1, 2, 3, 4 and 7a of Error E1401 (see paragraph 9.2.10.1).
   b. Activate the sensor logs (see paragraph 11.2.1.4) and perform an acquisition in order to reproduce the error.

2. IF the Ethernet connection is DISABLED:



   Right click on Network board icon and click on "Enable".

3. IF the Ethernet connection is NOT steady ACTIVE:



a. Check the Ethernet connections (cables, junctions, PC network board): replace the faulty components (see point 1 of Error E1401 – paragraph 9.2.10.1).

b. **<u>IN CASE OF HAMAMATSU PANEL</u>**: If the problem occurs during a panoramic or a 3D exam check that the 3D Power Sensor board A10 is ok by checking that the LED H2 on A10 board is ON.

- IF LED H2 is ON: verify the 9V between J99-pin1 and J99-pin6 (3D sensor side). If NOT OK, replace cable X42-J99.
- IF LED H2 is OFF: verify if the 3D Power Sensor board A10 fuse is blown.
  - IF the fuse is blown, verify the integrity of the cable X42-J99, replace the cable (if faulty) and then the fuse.

<u>IN CASE OF DALSA PANEL</u>: If the problem occurs during a panoramic or a 3D exam check that the 3D Power Sensor board A10 is ok by checking that the LED H1 on A10 board is ON.

- IF LED H1 is ON: verify the 12V between X100-pin1 and X100-pin4. If NOT OK, replace the X100 cable.
- IF LED H2 is OFF: check the cable X97-X25 and replace it if faulty. Otherwise replace the A10 board.

<u>IN CASE OF HAMAMATSU SENSORS</u>:

- IF the fuse is NOT blown, verify with a multimeter the 24V between X37-pin1 and X37-pin2 (A10 board side).
  - IF X37 24V is OK, verify the 3D sensor ON signal, driven by CCU: 5V between the X38-pin 1 and X38-pin 7(GND).
    - IF 5V is OK, verify cable X42-J99 (between the A10 board and the 3D sensor): if faulty fix or replace it. If the LED H2 is still OFF, replace the 3D Power Sensor board A10
    - IF 5V is NOT OK, verify the integrity of the cable X38-X61 (between 3D Power Sensor board A10 and CCU board A11) and the cable X9-X9 (between MCU board A1 and CCU board A11)
      - IF the X38-X61 or X9-X9 are NOT OK, fix or replace them
      - IF the X38-X61 or X9-X9 are OK, replace the MCU board A1.
  - IF the X37 24V is NOT OK, disconnect the X37 connector (A10 board side) and verify if between X37-pin1 and X37-pin2 (cable side), there are 24V.
    - IF X37 24V is now OK, replace the 3D Power Sensor board A10
    - IF X37 24V is still NOT OK, verify the cable X11-X37 and perform the 24V power supply verification

IN CASE OF DALSA PANEL:

- IF the fuse is NOT blown, verify with a multimeter the 24V between X97-pin1 and X97-pin3.
  - IF X37 24V is OK, verify the 3D sensor ON signal, driven by CCU: 5V between the X97-pin 4 and X97-pin 3.
    - IF 5V is OK, verify cable X42-J99 (between the A10 board and the 3D sensor): if faulty fix or replace it. If the LED H2 is still OFF, replace the 3D Power Sensor board A10
    - IF 5V is NOT OK, verify the integrity of the cable X38-X61 (between 3D Power Sensor board A10 and CCU board A11) and the cable X9-X9 (between MCU board A1 and CCU board A11)
      - ➢ IF the X38-X61 or X9-X9 are NOT OK, fix or replace them
      - ➢ IF the X38-X61 or X9-X9 are OK, replace the MCU board A1.
  - IF the X97 24V is NOT OK, disconnect the X97 and verify if between X97-pin4 and X97-pin3 (cable side), there are 24V.
    - IF X97 24V is now OK, replace the 3D Power Sensor board A10
    - IF X97 24V is still NOT OK, verify the cable X11-X97 and perform the 24V power supply verification

c. Activate the sensor logs (see paragraph 11.2.1.4) and perform an acquisition in order to reproduce the error.

Contact OWANDY Technical Service providing the following additional information:

- *Software logs*
- *3D Sensor logs folder (see paragraph 11.2.1)*
- *CEPH sensor logs*
- *Last RAW files folder stored (see paragraph 11.2.1.5)*

9.2.10.3. E1403: Software watchdog

This message is displayed if the software did not periodically reset the Ethernet watchdog timer.

It may be related to a wrong machine configuration (e.g. the CEPH option has been disabled).

Refer to paragraph 8.4 to check machine configuration.

Refer also to Error E1402 (see paragraph 9.2.10.2).

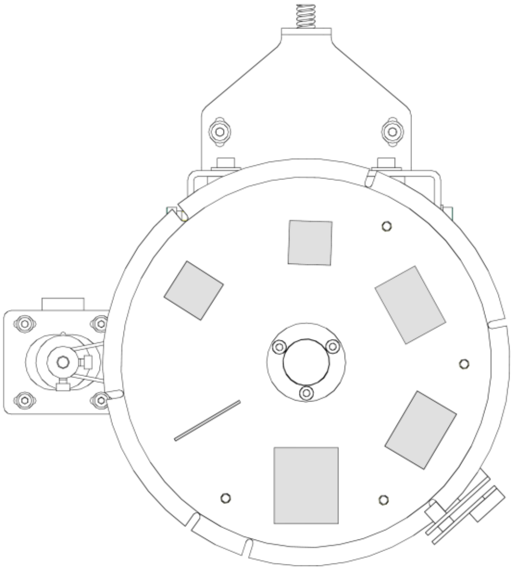
Technical Service additional information required:
- *Software logs*
- *3D Sensor logs folder (see paragraph 11.2.1).*

9.2.10.4. E1404: sensor does not detect X-rays during exam

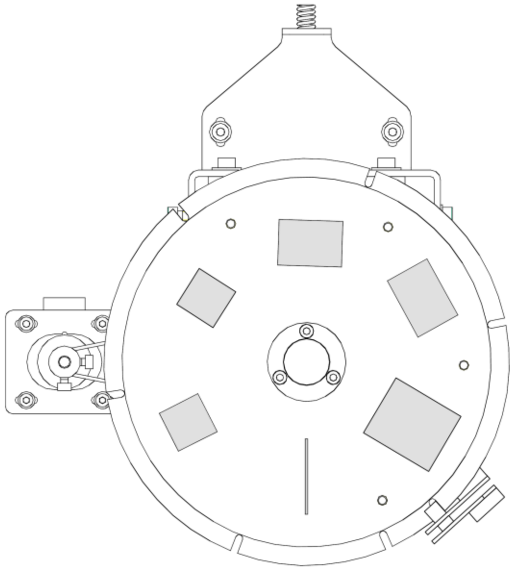
This message indicates that the sensor has not received X-rays during the last exposure.
The problem may be related to the generation of X-rays (generator board or tubehead problem), to a bad positioning of the collimator or a radiopaque object may be in the X-ray field.

9.2.10.4.1. I-Max 3D

1. Remove the tubehead internal cover, select a 3D full dentition exam and verify if the collimator moves accordingly (the biggest collimator window is in front of the X-ray exit, bottom side of the disk collimator). Select a panoramic exam and verify if the collimator is correctly positioned on panoramic window (the narrower window positioned on the bottom side).



3D Full dentition exam collimator position

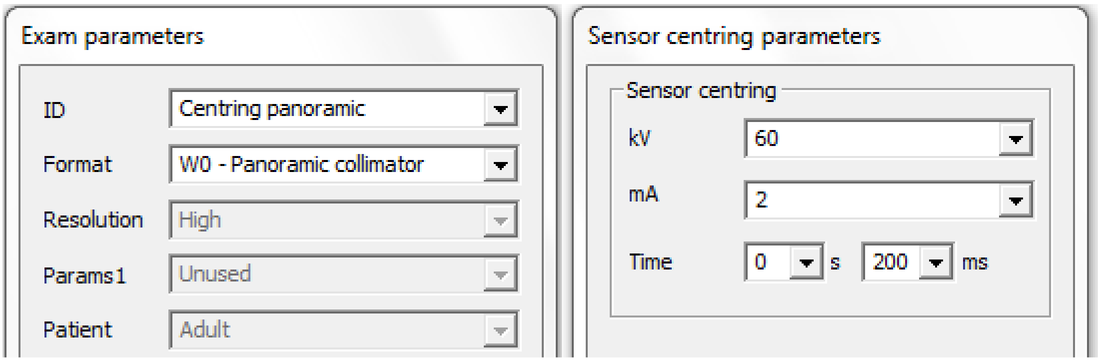


Panoramic exam collimator position

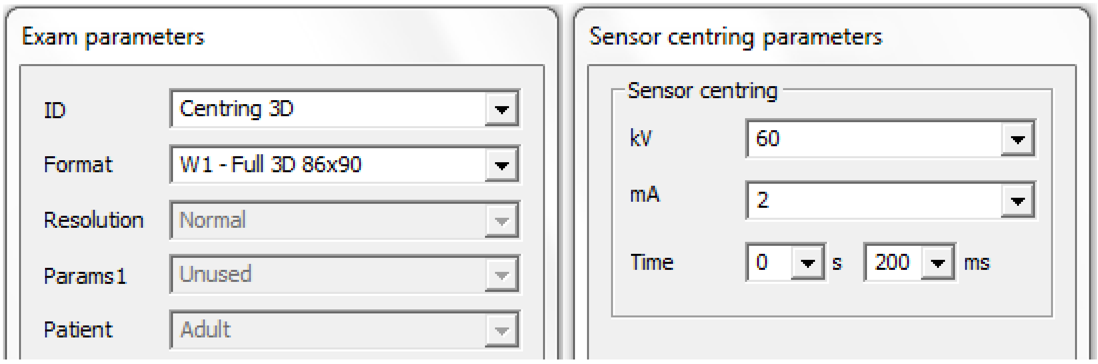
   - If the collimator movements are NOT OK, refer to error E260 (see paragraph 9.2.3.4).
   - If the error is still present, verify the X-ray beam alignment (see paragraph 11.2.10.1.1).
2. Verify if a radiopaque object is present in the X-ray field, remove it and verify if the problem is still present.
3. Verify the collimator offsets stored in the EEPROM (compare them with the ones reported on the set parameters tables provided with the unit documentation).

IF the offsets does not matches, fix them (see paragraph 8.4).

4. Open “PhD_C_Test” program and wait the unit connection; perform two static acquisitions with the following settings:
   - Panoramic area acquisition: select Exam ID “Centering panoramic” and collimator format “W0 – Panoramic collimator”. Select 60kV, 2mA and 200ms



   - 3D full area acquisition: select Exam ID “Centering 3D” and collimator format “85x90 Full – W1”. Select 60kV, 2mA and 200ms



IF the 3D and the panoramic images show that collimator is not well aligned to the sensor, verify the X-ray beam alignment (see paragraph 11.2.10.2.1).
IF both the acquired images are completely white (without X-rays), perform the exposure parameters verifications with non-invasive and then with invasive method (see paragraph 7.13).
If the non-invasive method is NOT OK but the invasive method is OK, replace the tubehead.

Contact Technical Service providing the following additional information:
- Software logs (see paragraph 11.2.1.1)
- Last RAW files folder stored (see paragraph 11.2.1.5)
- Panoramic and 3D static acquisitions

9.2.10.4.2. I-Max CEPH 3D

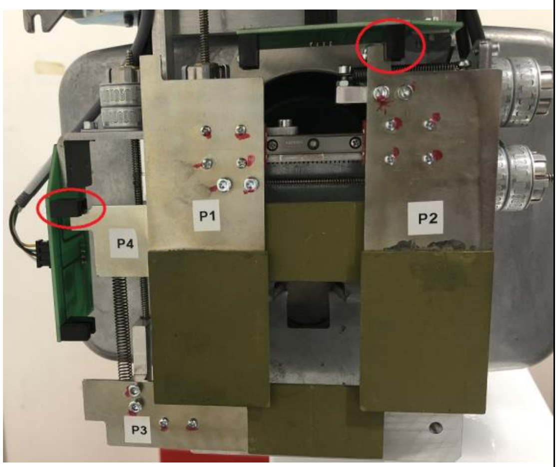
If this error is displayed during a panoramic or 3D exam go to point 2.

1. If the error is displayed during a CEPH exam, perform a CEPH exam test and verify:

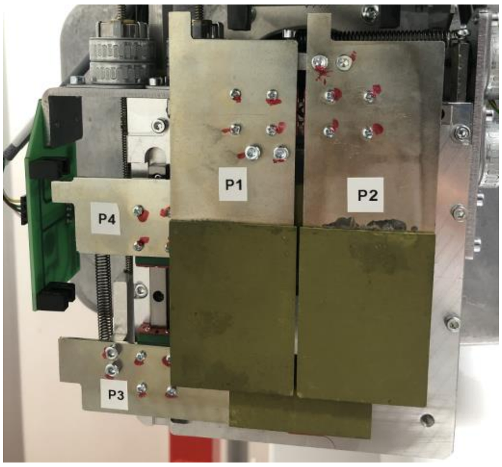
   IF the secondary collimator and the CEPH sensor move accordingly to the exam selected. If they do not move refers to E630-E635 (CEPH sensor problems) or E640-E645 (secondary collimator problems)

   - If the error is still present, verify the CEPH offsets stored in the EEPROM (compare them with the ones reported on the set parameters tables provided with the unit documentation). If they are not the same, correct them and then repeat the CEPH exam test (see paragraph 7.11).
   - If the error is still present, verify if the issue is present also in a panoramic exams.
     - If the issue is not present in a panoramic exam, verify the CEPH axis alignment (paragraph 11.2.12)
     - If the issue is present also in a panoramic exam, go to next point.

2. Remove the tubehead internal cover, open Phd_C_Test application and select the “Centering emission” ID and verify if the collimator moves accordingly (the biggest collimator window is in front of the X-ray exit). “Centring panoramic” ID with “panoramic collimator” format and verify if the collimator is correctly positioned on panoramic window (the narrower collimator window is in front of the X-ray exit).



Centering emission collimator position Note that the P2 and P4 blades are positioned close their light barriers



Panoramic exam collimator position

   - IF the collimator movements are NOT OK, refer to errors E650-E661 (see paragraph 9.2.6.10).
   - If the error is still present, verify the X-ray beam alignment (see paragraph 11.2.10.1).

3. Verify if a radiopaque object is present in the X-ray field, remove it and verify if the problem is still present.

4. Verify the collimator offsets stored in the EEPROM (compare them with the ones reported on the set parameters tables provided with the unit documentation).

   IF the offsets do not matches, fix them (see paragraph 8.4).

5. Perform the X-ray beam alignment check tests described in paragraph 11.2.10.1

6. IF the acquired images are completely white (without X-rays), perform the exposure parameters verifications with non-invasive and then with invasive method (see paragraph

7.12). If the non-invasive method is NOT OK but the invasive method is OK, replace the tubehead.

Contact OWANDY Technical Service providing the following additional information:

- *Software logs (see paragraph 11.2.1)*
- *Last RAW files folder stored (see paragraph 11.2.2)*
- *Panoramic and 3D static acquisitions*

9.3. User Interface (G.U.I.) messages

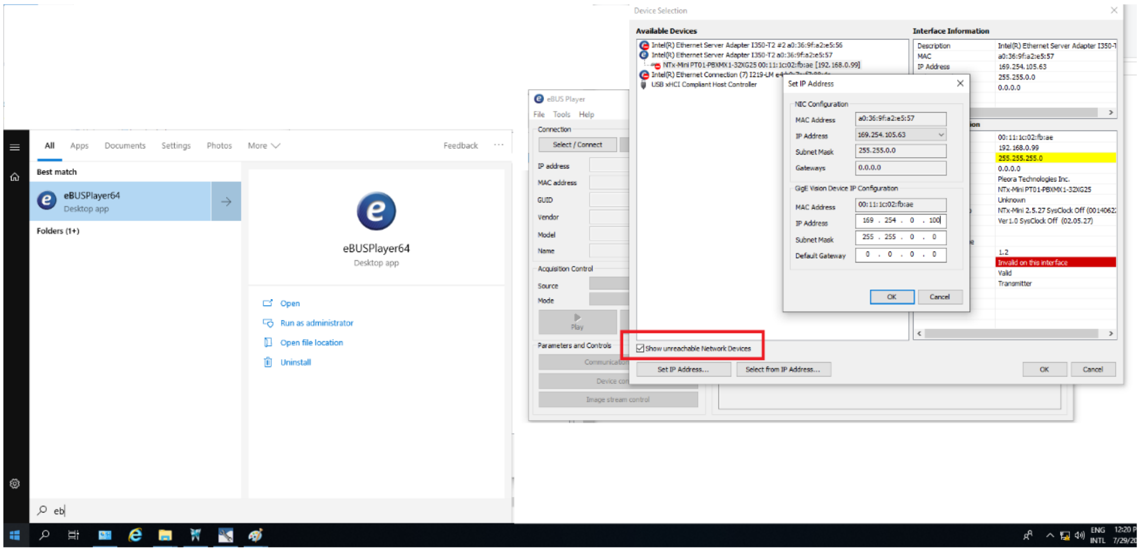
9.3.1. "Unit and computer not synchronized"

1. Can happen if the KV or mA parameters are modified from the G.U.I. to fast.
2. The message may be displayed while the G.U.I. is closing the Service Menu. If the problem persist contact Owandy Radiology Technical Service.
3. If the error appears from the passage from the SETUP in PhD_C_Test to the GUI, reboot the I-Max 3D.
4. If the problem is not the one described in the above points, refer to Error E1404 (paragraph 9.2.10.4).

9.3.2. "Sensor not ready"

Refer to Error E370 (paragraph 9.2.4.3), Error E1402 (paragraph 9.2.10.2) and Error E1401 (paragraph 9.2.10.1).
If the error still present, open "eBUSPlayer64" (search it from the Windows search bar) then:

a. Click on "Select/Connect"
b. Flag "Show unreachable Network Devices"
c. Check in the right part of the window if any error is showing (highlighted in yellow or red)



In this case open the "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C and check if the Flat Panel is in DHCP mode or with a correct static IP (see paragraph11.2.7).

9.3.3. "Software error"

Verify if a raw file of a previous acquisition is still in C:\ProgramData\OWANDY\PANORAMIC PHD_C\acquisition, remove it and verify if the problem is solved.

9.4. System Anomalies

9.4.1. White panoramic image or/and empty volumes

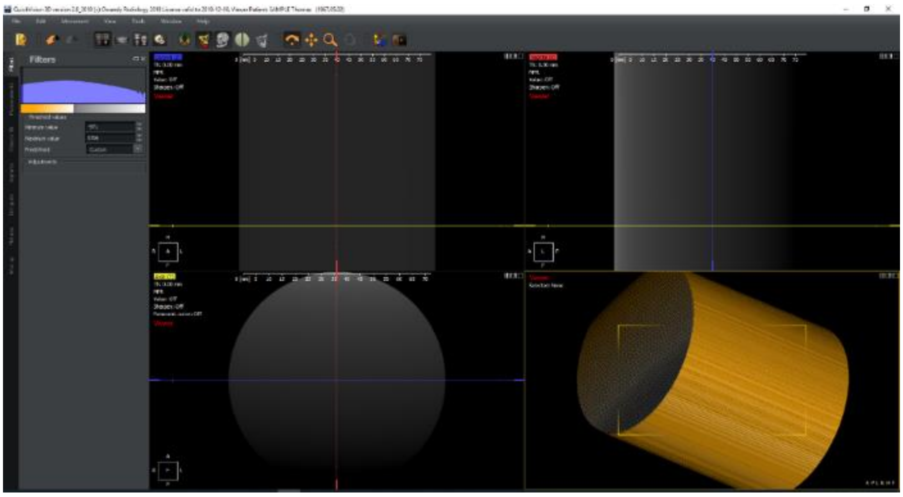
	Panoramic white image
	Empty volume

Figure 33

1. Verify the presence of the correct calibration files (8 files named as the SN of the 3D sensor mounted on the unit) in the calibration folder C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration and that all the calibration options in the image processing menu of the in PhD_C_Test.exe are checked (see paragraph 10.2).
2. Perform tests of Error E760 (paragraph 9.2.7.11).
3. Verify the integrity of tubehead X57 connector, pin 5 and 6.

9.4.2. 3D Bad reconstruction

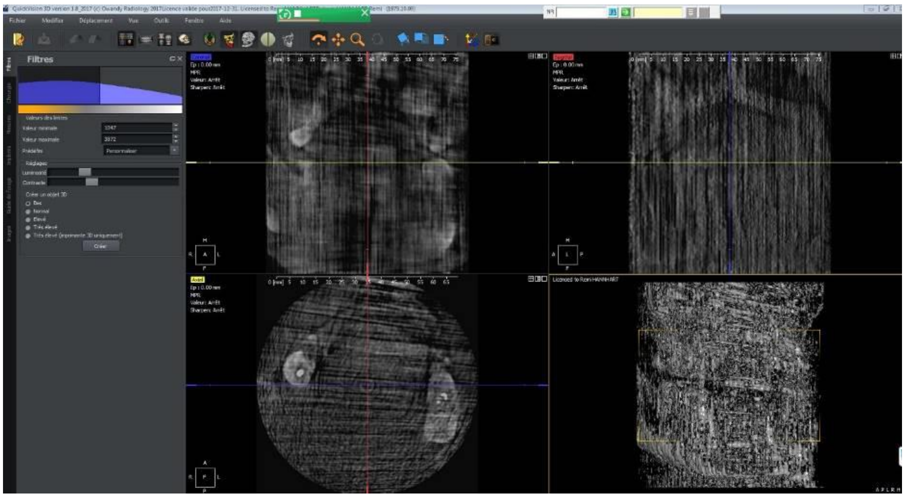
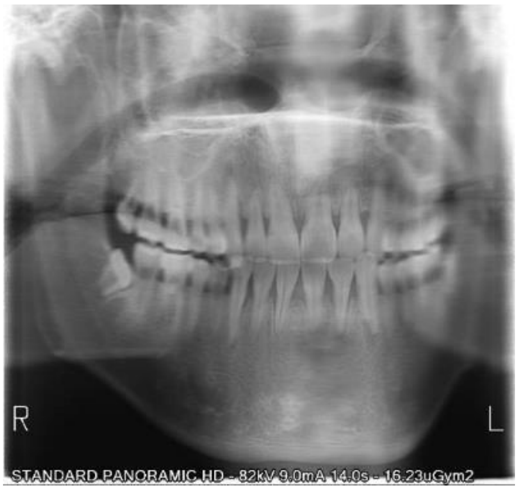


Figure 34

Send the RAW files (see paragraph 3) of these acquisitions to Owandy Radiology Technical Service.

9.4.3. Panoramic acquisition with less frames



✗

✓

Figure 35

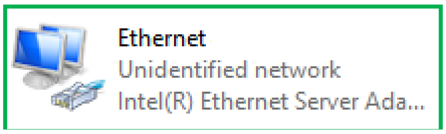
1. The panoramic acquisition above (X) may be indicate an acquisition with less frame than expected. In this case verify the 3D Sensor Ethernet connections (cables, junctions, PC network board). Refer to Error E1401 point 1 (see paragraph 9.2.10.1).
2. If the error is still present, send the acquired RAW file (see paragraph 11.2.2) to Owandy Radiology Technical Service.

9.4.4. Asymmetries on the panoramic images

1. Check the orthogonality of the unit lasers (se User Manual - paragraph 7.3).
2. Perform the verification of the panoramic function (see paragraph 7.9).

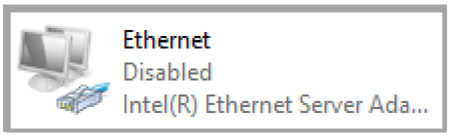
9.4.5. Unit/MCU connection problems

1. Verify if MCU DIP switches are set in normal mode (see paragraph 4.2.4.1).
2. Check the unit power supply (see paragraphs 6.1 and 11.2.3).
3. Verify the unit Ethernet connection status (Control Panel→Network and Internet→Network Connections):
   a. IF the Ethernet connection is steady ACTIVE:

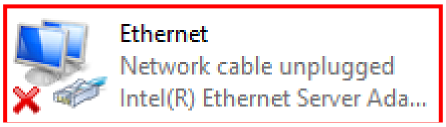
   Verify the correct network interface board configuration (see paragraph 7.6.1).

   b. IF the Ethernet connection is DISABLED:

   Right click on Network board icon and click on "Enable".

   c. IF the Ethernet connection is NOT steady ACTIVE:

   Check the 3D sensor Ethernet connections (cables, junctions, PC network board).

4. Plug a functioning Ethernet CAT 6 (or higher) cable to the MCU and connect it directly to the PC network interface:
   a. If the problem, in this configuration, disappears: there may be a faulty Ethernet cable or junction or the machine ethernet switch connected between the PC and MCU.
   b. If the problem is still present, try to connect the MCU Ethernet cable to another network interface port (e.g. Invert the MCU and 3D sensor connections setting the right IP address on the network interfaces see paragraph – see paragraph 7.6.1).

   If the problem is solved, it can be related to the network interface board.

9.4.6. The column does not move

1. Verify that the safety red switch is released in the top side of the unit.

2. If the problem persists, power off the machine and wait for about 20-30 seconds, then power on again the machine.
3. Verify the main power supply and columns driver board connection (see paragraph 6.1 and 0).
4. Verify the column fuse (see paragraph 11.3.1).
5. Verify that the buttons work: Turn OFF the I-Max 3D. Turn it ON by keeping press a button.
   - If the three LEDs on the keyboard blink quickly, it means that the button is working properly.
   - If only the green LED flashes on the keyboard, it means that the button has not been recognized as pressed by the MCU board (see paragraph 9.2.8.1).

If the problem is still present, contact Owandy Radiology Technical Service.

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10. PERIODIC MAINTENANCE

Note
Maintenance and inspection procedure must be performed without patient positioned in the equipment.

As with all electrical appliances, this unit must be used correctly and maintenance and inspections must be made at regular intervals. Such precautions shall guarantee the safe and efficient function of the appliance.

Warning
Preventive and/or corrective operations must only be carried out by personnel authorized and properly trained on part replacement and maintenance.

The inspections made directly by the operator are the following:

Frequency	Type of check	Method
Daily	Functioning of the indicator lights	Visual inspection
Daily	Check that the cables do not show signs of breaking or wear	Visual inspection
Daily	Check that the unit is not damaged externally in such a way that the safety of protection from radiation is compromised	Visual inspection
Daily	Check that there are no traces of oil on the tube-head	Visual inspection
Daily	Check that arm movement is smooth	Practical inspection
Monthly	Integrity of equipment and labels	Visual inspection
Every 6 Months	QC test	Refer to paragraph 7.5 of User's Manual

Warning
If the operator detects irregularities or failures, he must immediately call Technical Service.

The appliance's performance is checked and, where necessary corrected, during the maintenance activities performed by the Technical Service Department, in accordance with the indications provided in the following chapters.

The periodic maintenance performed by the Technical Service Department comprises the performance of the following additional inspection activities:

Frequency	Type of check	Method
Annually	General visual inspection	Visual inspection
Annually	Grounding of all the conductive parts and cables	Practical inspection
Annually	Condition of the internal and external cables: wear and tear and fastenings	Visual and practical inspection
Annually	Tightening of the primary bolts and screws such as the wall fastening systems, the moving mechanisms and the chin rest arm	Practical inspection
Annually	Correct equipment centring	See paragraphs 7.9, 7.10 and 7.11
Annually	Check technical factors	See paragraphs 7.12.1 and 7.12.2
Annually	Perform sensor calibration	See paragraph 10.2

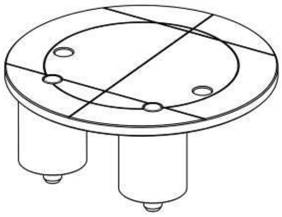
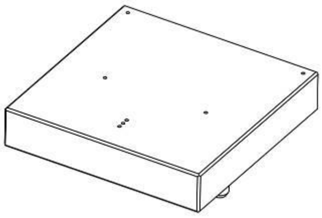
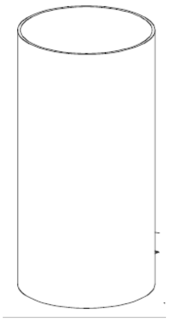
Warning
Only use original spare parts if components need to be replaced.
The relevant replacement instruction is supplied with the spare part.

Note
The Service Engineer has to take special care for all what concerns electrical safety of the device and must make sure of restoring all provisions for electrical safety which may be affected during a service intervention and to solicit the customer to have the electrical safety tests repeated every time the intervention has caused the replacement of important parts or the intervention has significantly affected safety provisions of the device.

Note
Interventions carried out by the Service Engineer must be noted in the Maintenance Record page at the end of the User Manual, with a short description of the actions done.

10.1. Service tools

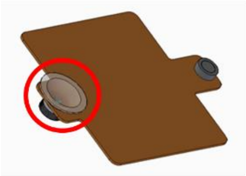
In order to perform a correct system calibration, is necessary the use of the following tools:

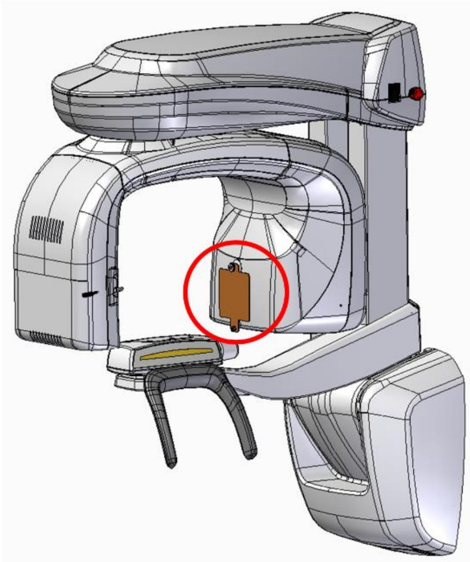
Code	Description	Function
	Support plate	Support for panoramic and 3D centering tools
	Centering tool	Panoramic function adjustment
	Centering cylinder	3D function adjustment
	1.5mm copper filter	Sensor calibration

10.2. Sensors Calibration

1. In order to perform calibration, place a copper filter of 1.5mm in front of the tubehead in such a way as to cover the entire X-ray beam.

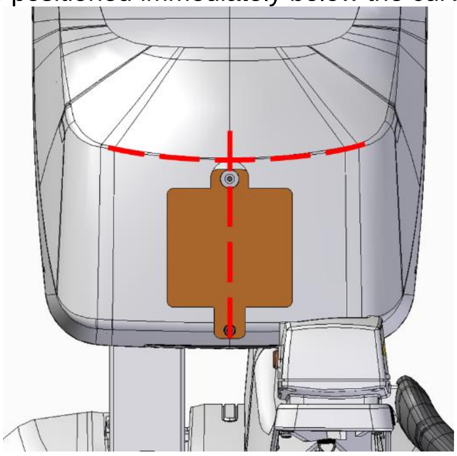
Note
The copper filter has a suction cup that allows it to be placed on the cover



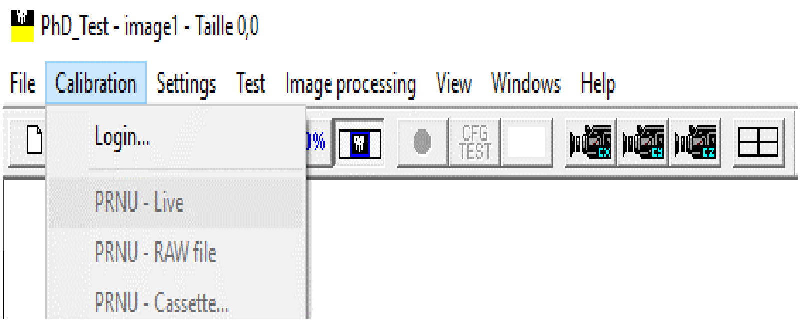


To be positioned properly, the copper filter must be placed by following the references highlighted in red in the picture below:

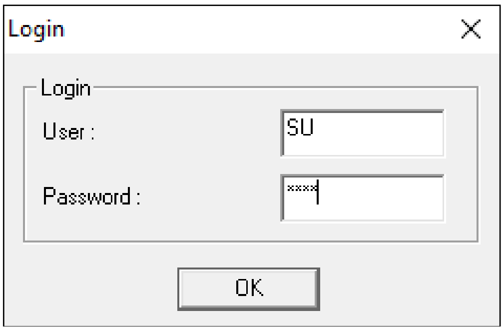
- Horizontally centered with respect to the cover
- The suction cup positioned immediately below the curvature of the cover



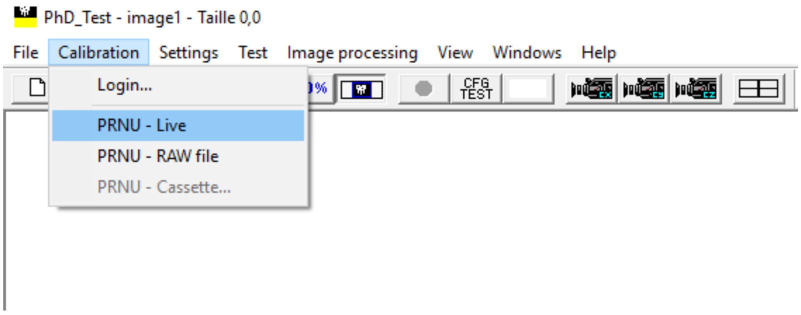
2. Open the "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C).
3. Open the "Calibration" panel from the menu and select "Login".



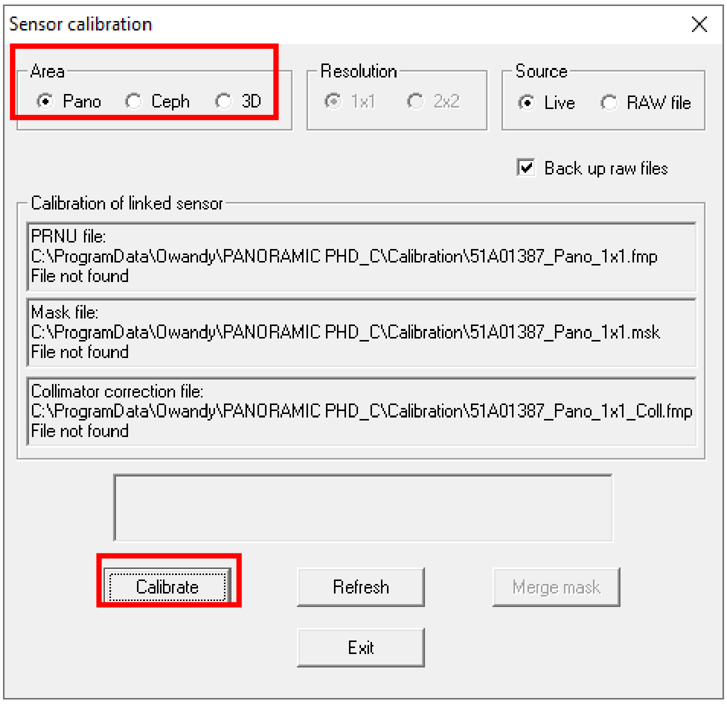
4. In the "User" field type in capital letter "SU". In the "Password" field type the password (see password generation on paragraph 10.2.1).



5. Open the "Calibration" panel and select "PRNU- Live".



6. Make sure that no objects are present in the X-ray field.
7. Select "Pano" in the "Area" panel



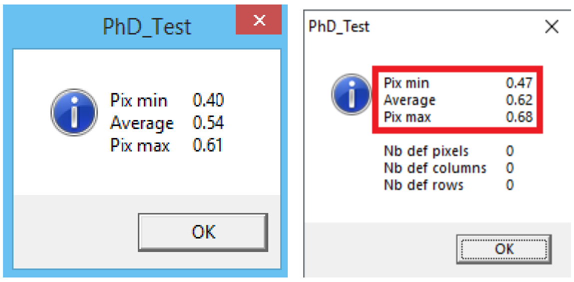
8. Press the button "Calibrate".
9. Each time the calibration window displays the message "Waiting for an acquisition" press the X-ray button until the end of the exposure.

Note
If during calibration, the message "Sensor not ready" or "Time out" is displayed by the "Sensor calibration" window, click on "Calibrate" button and repeat the last performed calibration(Pano, CEPH 1x1 or 2x2,3D 1x1 or 2x2).

Note
During the calibration, when one of the following windows is displayed, verify that the values reported are within the tolerances:

- Pix min: > 0.20
- Pix max: < 0.90

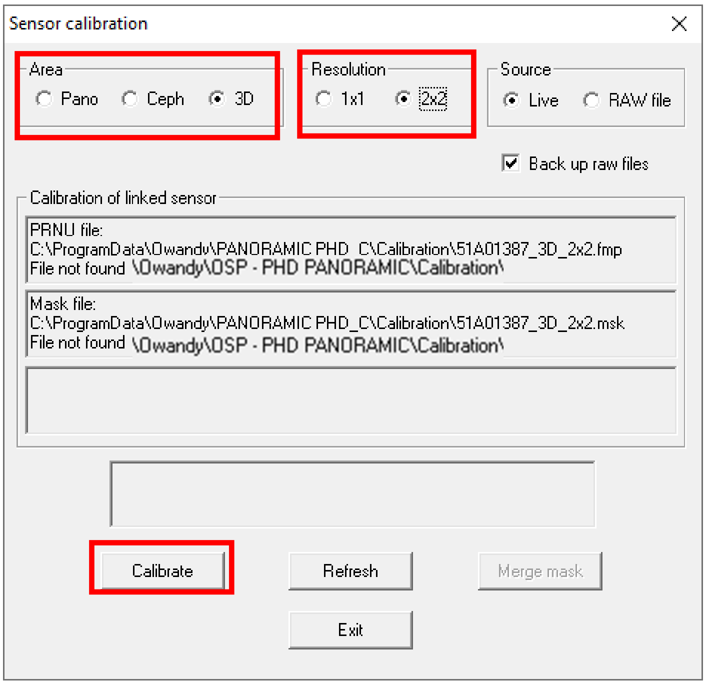
and then press OK.



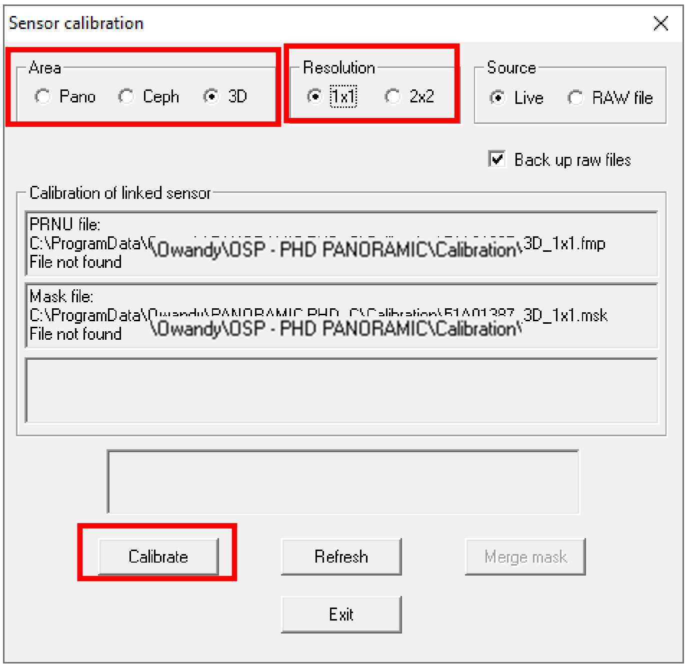
If they are not in the above limits, verify the copper filter positioning and that no objects are present in the X-ray field; repeat the calibration.

10. When the **Panoramic area calibration** is completed, the message "Calibration finished. Remove the 1.5 mm Cu filter " is displayed. This calibration will generate the following files in the folder C:\ProgramData\OWANDY\ PANORAMIC PHD_C\Calibration:
    - [Sensor S/No]_2D_1x1.fmp
    - [Sensor S/No]_2D_1x1.msk
    - [Sensor S/No]_2D_1x1.Coll
    - [Sensor S/No].ini (if not present)

11. Don't remove the copper filter andSelect "3D" in the "Area" panel, "2x2" in the "Resolution" panel.



12. Press the button "Calibrate".
13. Each time the calibration window displays the message "Waiting for an acquisition" press the X-ray button until the end of the exposure.
14. When the 2x2 resolution area calibration is completed, the message "Calibration finished. Remove the 1.5 mm Cu filter" is displayed. This calibration will generate the following files in the folder C:\ProgramData\OWANDY\ PANORAMIC PHD_C \Calibration:
    - [Sensor S/No]_3D_2x2.fmp
    - [Sensor S/No]_3D_2x2.msk
15. Don't remove the copper filter and Select "1x1" in the "Resolution" panel.

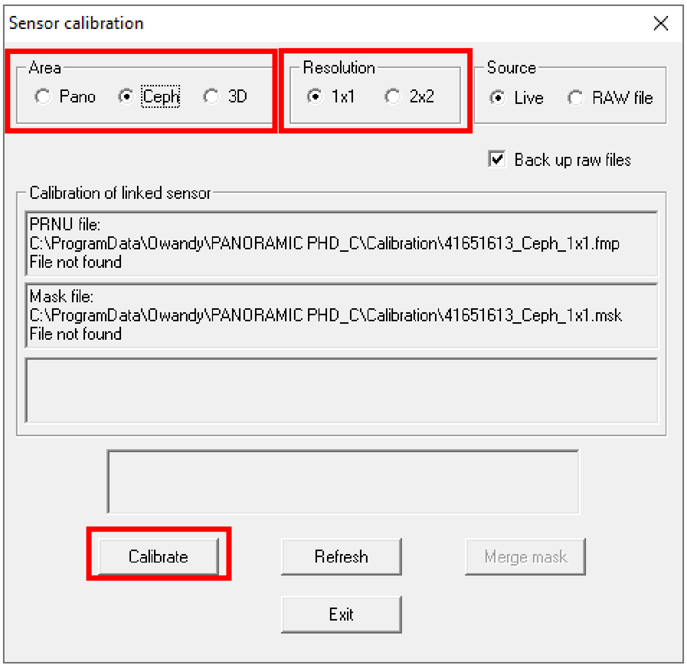


16. Press the button "Calibrate".

17. Each time the calibration window displays the message "Waiting for an acquisition" press the X-ray button until the end of the exposure.
18. When the 3D 1x1 resolution area calibration is completed, the message "Calibration finished. Remove the 1.5 mm Cu filter" is displayed. This calibration will generate the following files in the folder C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration:
    - [Sensor S/No]_3D_1x1.fmp
    - [Sensor S/No]_3D_1x1.msk

THE NEXT PART IS ONLY FOR I-MAX CEPH 3D, if you have a I-MAX 3D go to point 34

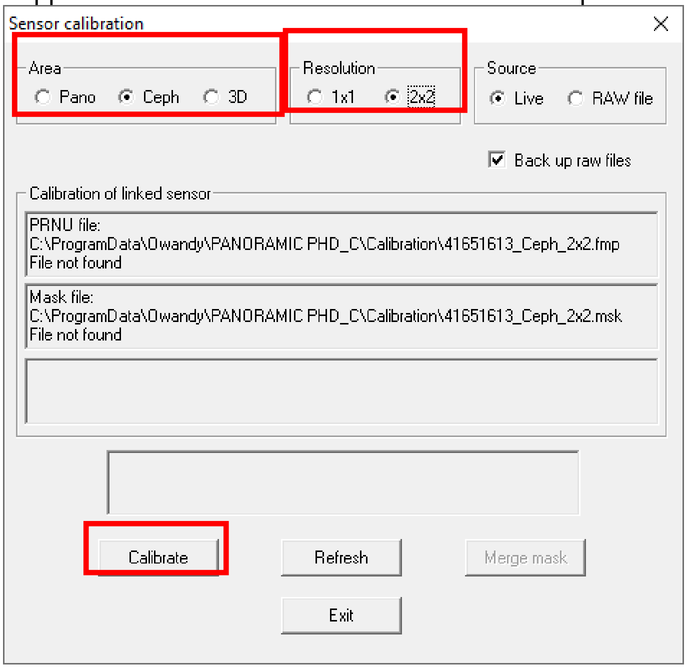
19. Don't remove the copper filter, rotate the CEPH head holder to antero posterior position, fold up the nasion
20. Select "CEPH" in the "Area" panel, "1x1" in the "Resolution" panel.



21. Press the button "Calibrate".
22. Press >O< on the machine on the keyboard, when the machine stop moving and the blue and green leds blink open the 3D detector in CEPH position; the machine goes in calibration position; wait until the machine stops moving;
23. Each time the calibration window displays the message "Waiting for an acquisition" press the X-ray button until the end of the exposure.
24. When the CEPH 1x1 resolution area calibration is completed, the message "Calibration finished. Remove the 1.5 mm Cu filter " is displayed. This calibration will generate the following files in the folder C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration:
    - [Sensor S/No]_CEPH_1x1.fmp
    - [Sensor S/No]_CEPH_1x1.msk
    - [Sensor S/No].ini

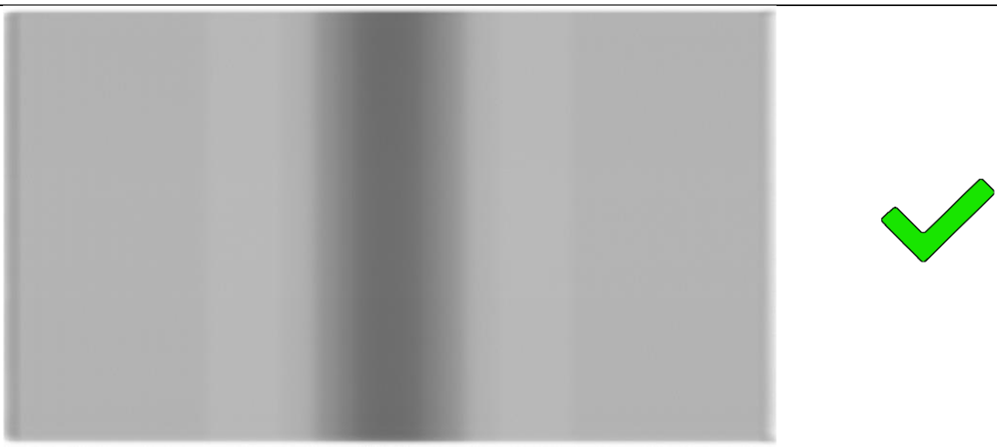
Note
If during calibration, a message "Error while computing the defect mask" is displayed, check that the CEPH head holder is in antero posterior position. Then quit the current calibration procedure and repeat a new calibration by clicking on "Calibrate" button.

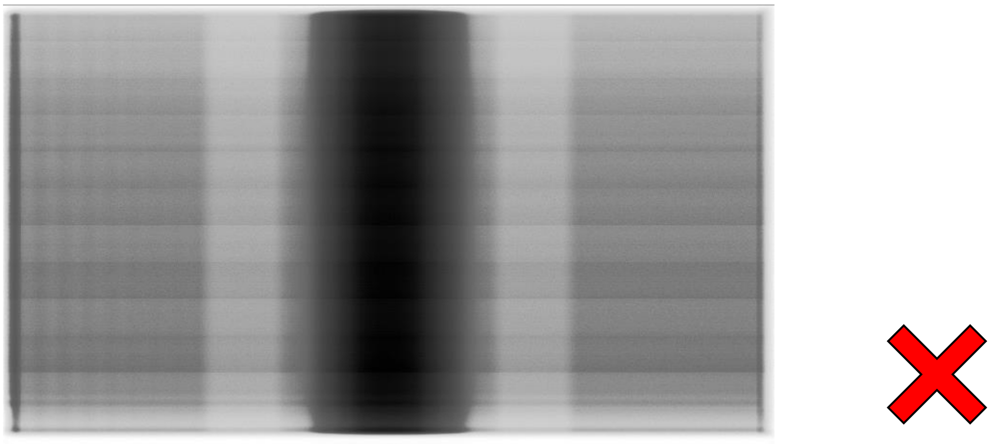
25. Don't remove the copper filter and Select "2x2" in the "Resolution" panel.



26. Press the button "Calibrate".
27. Each time the calibration window displays the message "Waiting for an acquisition" press the X-ray button until the end of the exposure.
28. When the CEPH 2x2 resolution area calibration is completed, the message "Calibration finished. Remove the 1.5 mm Cu filter " is displayed. This calibration will generate the following files in the folder C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration:
    - [Sensor S/No]_CEPH_2x2.fmp
    - [Sensor S/No]_CEPH_2x2.msk
29. When the Panoramic, 3D 1x1 and 2x2, CEPH 1x1 and 2x2 calibrations are completed, click "Exit".
30. Select the following filters from the "Image processing" menu:
    - Dark signal correction
    - PRNU correction if possible
    - Collimator correction if possible
    - Defect pixels correction if possible
31. Close the detector.
32. Remove the copper filter from the tubehead, switch OFF the unit and close the "PhD_C_Test.exe" service program.
33. Switch ON the unit.
34. Open the "PhD_C_Test.exe" service program and make an exposure at 60kV 2.2mA without objects in the X-ray field.

35. Verify that there are no defect lines or inhomogeneous bands on the panoramic image:

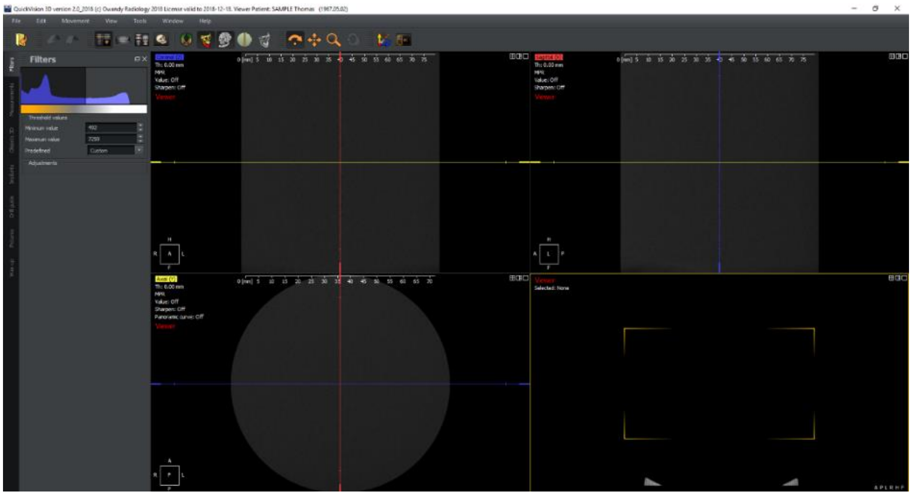


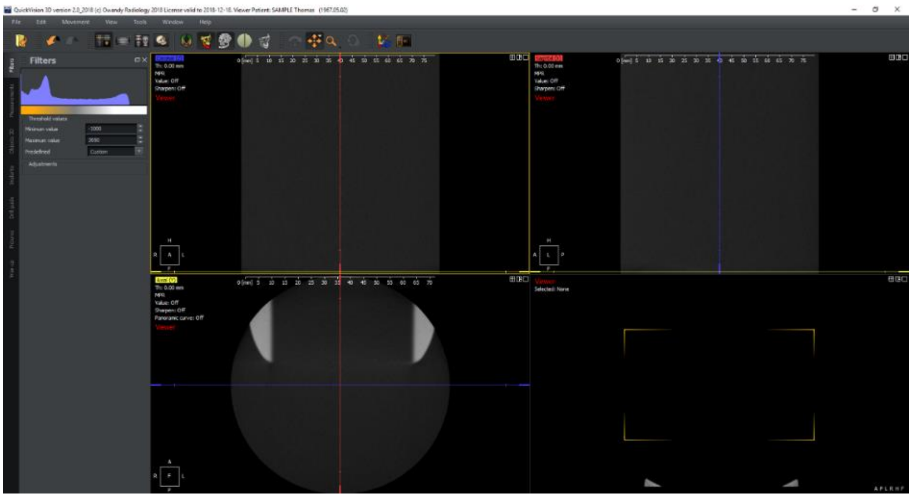


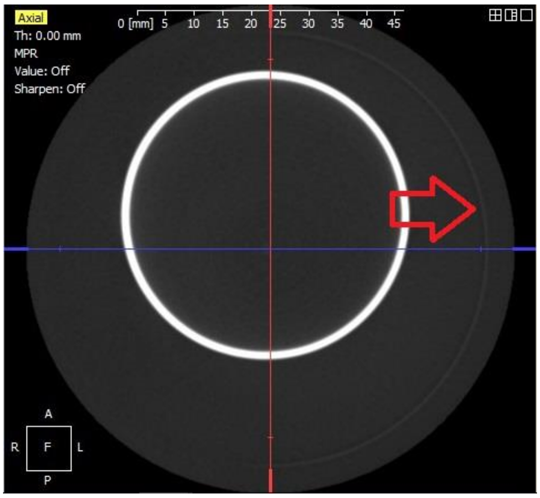
THE NEXT PART IS ONLY FOR I-MAX CEPH 3D, if you have a I-MAX 3D go to point 40

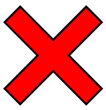
36. Select a ceph30x24LL, High resolution, position the CEPH head holder in latero lateral position, place the nasion in field and take an exposure at 60kV3.2mA without objects in the X-ray field.
37. Verify that there are no defect lines or inhomogeneous bands on the image.
38. Select a ceph30x24LL, Normal resolution, position the CEPH head holder in latero lateral position, place the nasion in field and take an exposure at 60kV3.2mA without objects in the X-ray field.
39. Verify that there are no defect lines or inhomogeneous bands on image
40. Open QuickVision software and open a test patient.
41. Perform the following 3D acquisitions at 60kV 2.2mA using the relevant chin support:
    - 3D Full Dentition
    - Maxillary single jaw 85x50 volume
    - Mandibular single jaw 85x50 volume

42. Open the volumes in QuickVision 3D and scroll all the reconstructed slices along the volume height verifying that there are no artefacts (e.g. rings artefacts):









Example of an artifact (indicated by the red arrow) on an acquisition with the Centering cylinder P/N 5207900900 in the X-ray field

43. If the acquisitions are not OK (**X**):

- Verify the presence of the correct calibration files
    - For I-Max 3D that you have 8 files named as the SN of the sensor mounted on the unit in the calibration folder C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration
    - For I-Max CEPH 3D that you have 13 files named as the SN of the sensors mounted on the unit in the calibration folder C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration
- Verify that all the calibration options are checked in image processing menu (see point 30 above)
- If the acquisitions are still not OK, redo the calibration.

10.2.1. Password generation

Date	Value	Month	Value	Year	Value
1	53	January	a	2003	c
2	56	February	b	2004	d
3	59	March	c	2005	e
4	62	April	d	2006	f
5	65	May	e	2007	g
6	68	June	f	2008	h
7	71	July	g	2009	i
8	74	August	h	2010	J
9	77	September	i	2011	k
10	80	October	j	2012	l
11	83	November	k	2013	m
12	86	December	l	2014	n
13	89			2015	o
14	92			2016	p
15	95			2017	q
16	98			2018	r
17	01			2019	s
18	04			2020	t
19	07			2021	u
20	10			2022	v
21	13			2023	w
22	16			2024	x
23	19			2025	y
24	22			2026	z
25	25				
26	28				
27	31				
28	34				
29	37				
30	40				
31	43				

Example:
- *if the actual day is 22 you have do digit "16"*
- *if month is April you have to digit "d"*
- *if year is 2016 you have to digit "p"*

*Password for this date will be "16dp" but will be displayed "****".*

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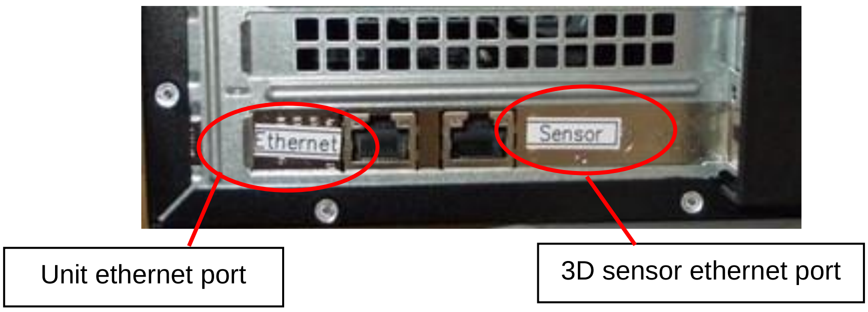
11. CORRECTIVE MAINTENANCE

11.1. Firmware upgrade

Note
To update MCU and CCU boards be sure the ethernet board connected to the machine is properly set as described in paragraph 7.6.1

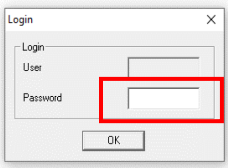
Note
Set the network card IP address of the unit ethernet port in the family 192.168.0.**x** where the x should be different from the following values:

- 192.168.0.**10**
- 192.168.0.**11**
- 192.168.0.**99**
- 192.168.0.**100**
- • 192.168.0.**211**

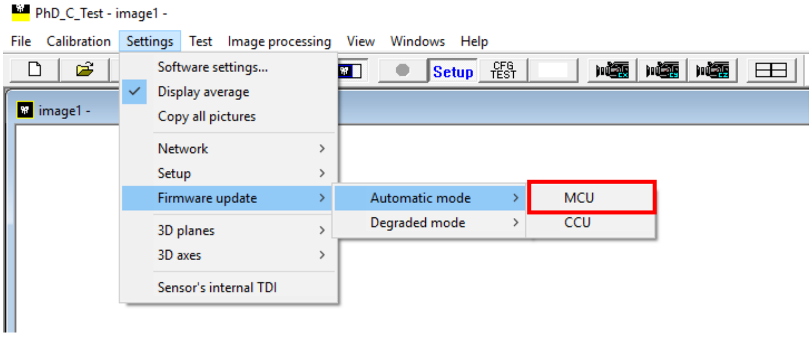


11.1.1. MCU Firmware upgrade

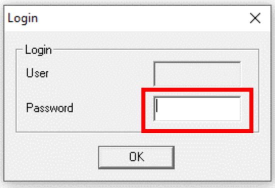
1. Copy in a working directory of the PC the MCU firmware to upload (the file name is in the form MCUet-YYYY-MM-DD-vM.mm.bbb.hex).
2. Power ON the machine. Open "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C).
3. Click on SETUP button and in the Login windows that will open insert the password **PhdAccess** and click OK



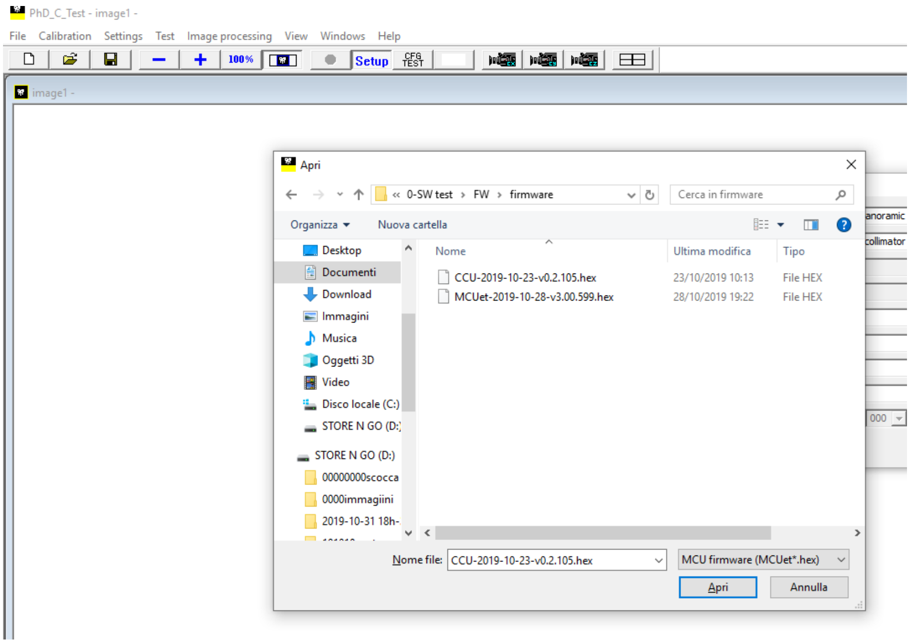
4. From the menu *Settings* select *Firmware update>Automatic mode>MCU*



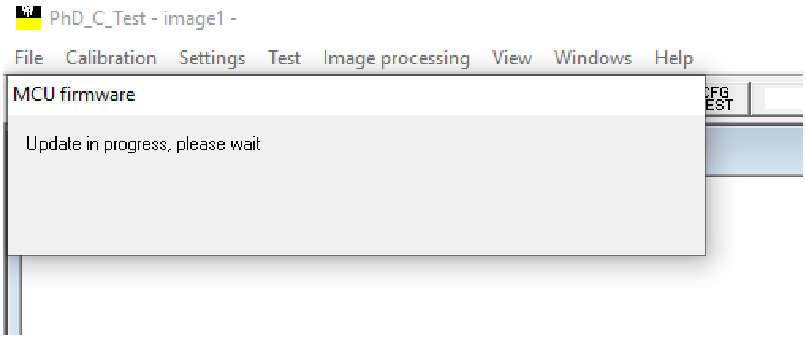
5. in the Login window that will open insert the password **EthUpload** and click OK



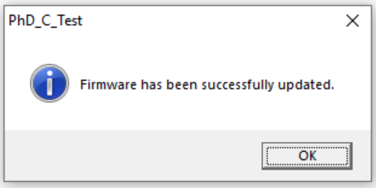
6. Browse the working folder where the firmware to upload has been copied, select it and click Open



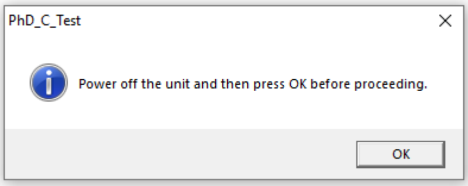
7. The firmware upload will start and the progress will be indicated by the message window. The upgrade progress might take up to two minutes.



8. When the upload process has been completed, the following window is displayed. Click on OK button.



9. Switch OFF the unit.
10. Click on OK button of the information window



11. Switch ON the unit and check on the first page of the GUI service program (chapter 8) the current MCU firmware version.

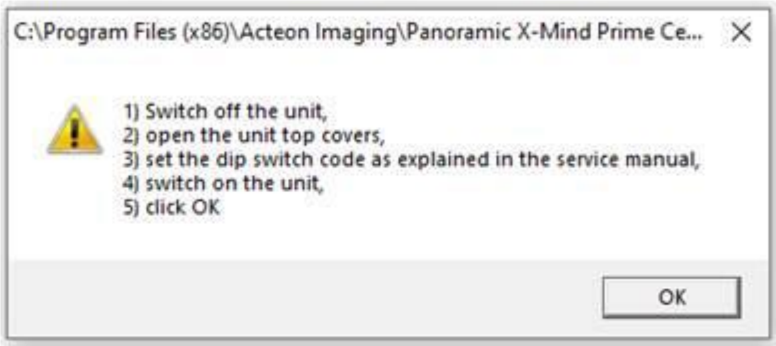
<u>Only in case the firmware upload process fails</u> (at point. 8 of the MCU firmware upgrade procedure), we suggest to perform the following steps

Note
The following procedure has to be performed only in case the automatic mode firmware uploading process failed at least one time before

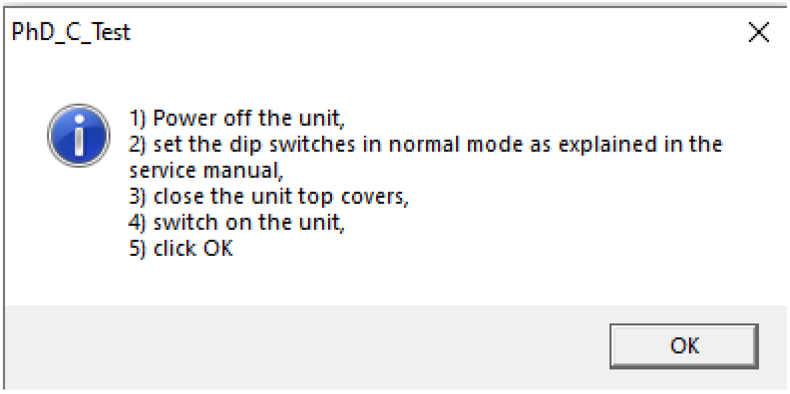
- Switch off the unit
- Close or “PhD_C_test”
- Open “Phd_C_Test” and switch on the unit

  Wait at least 1 minute (the unit it will be probably in an error state: 3 keyboard leds blinks fast)
- In the ”PhD_C_Test” selection bar select: Settings->Firmware update ->**Degraded mode**->MCU
- Insert the password (same of point 5. of the service procedure)

- Select the new firmware MCUet-xxxx.hex file
- Skip the following steps by pressing OK (no need to open the unit covers and set dip switches)

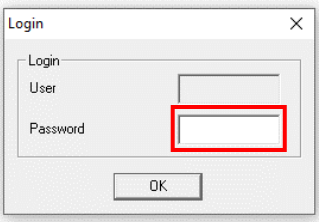


- Wait the end of the uploading process
- Switch off the unit, switch On the unit and click OK to the following window (skip step 2 and 3)

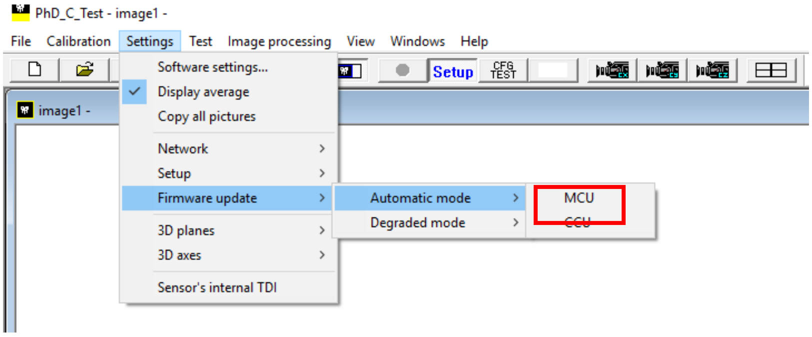


11.1.2. CCU Firmware upgrade (only for I-Max CEPH 3D)

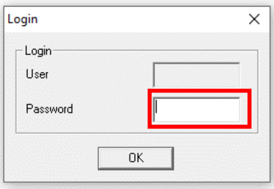
1. Copy in a working directory of the PC the CCU firmware to upload (the file name is in the form CCU-YYYY-MM-DD-vM.mm.bbb.hex).
2. Power ON the machine. Open "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C).
3. Click on SETUP button and in the Login windows that will open insert the password PhdAccess and click OK



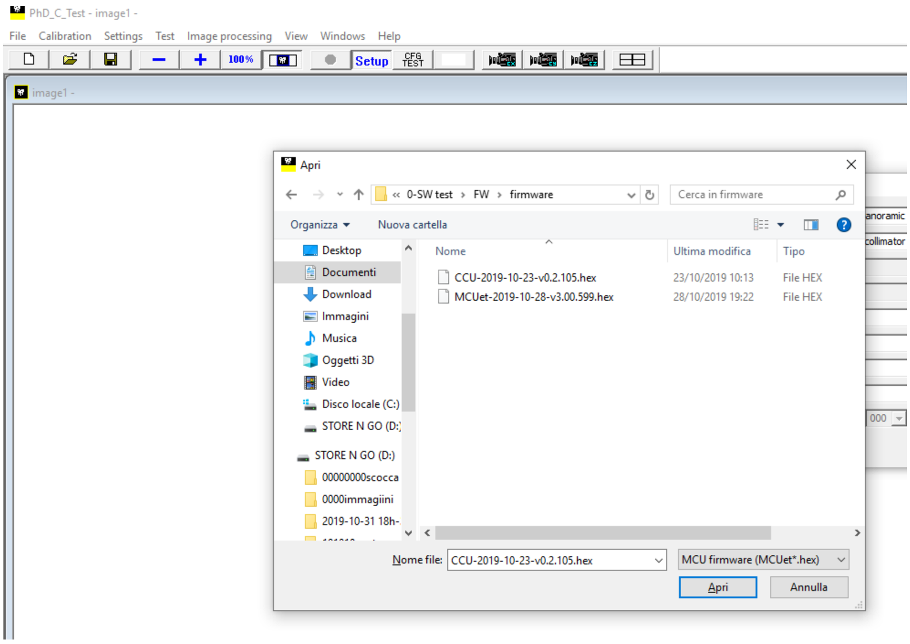
4. From the menu *Settings* select *Firmware update>Automatic mode>CCU*



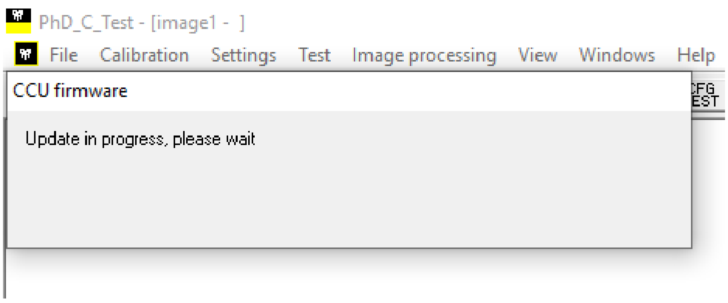
5. in the Login windows that will open insert the password **EthUpload** and click OK



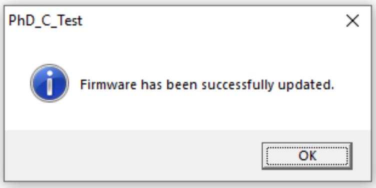
6. Browse the working folder where the firmware to upload has been copied and select it and click Open



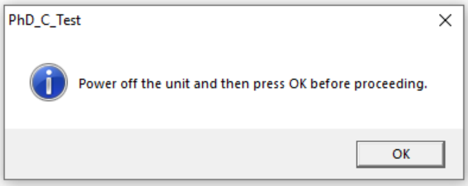
7. The firmware upload will start and the progress will be indicated by the message window. The upgrade progress might take up to two minutes.



8. When the upload process has been completed, the following window is displayed. Click on OK button.



9. Switch off the unit
10. Click on OK button of the information window

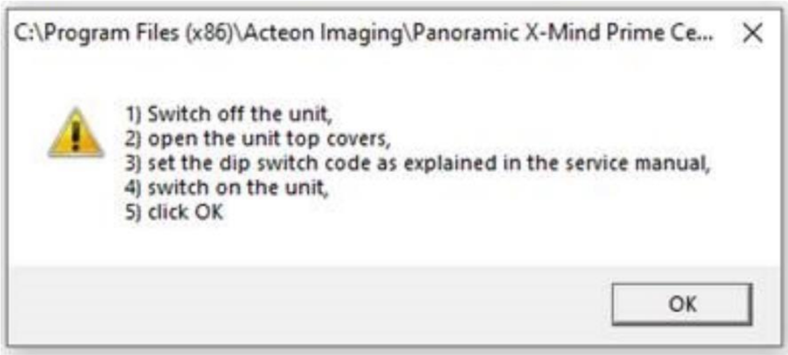


11. Switch ON the unit and check on the first page of the GUI service program (chapter 8) the current MCU firmware version.

Only in case the firmware upload process fails (at point. 8 of the CCU firmware upgrade procedure), we suggest to perform the following steps

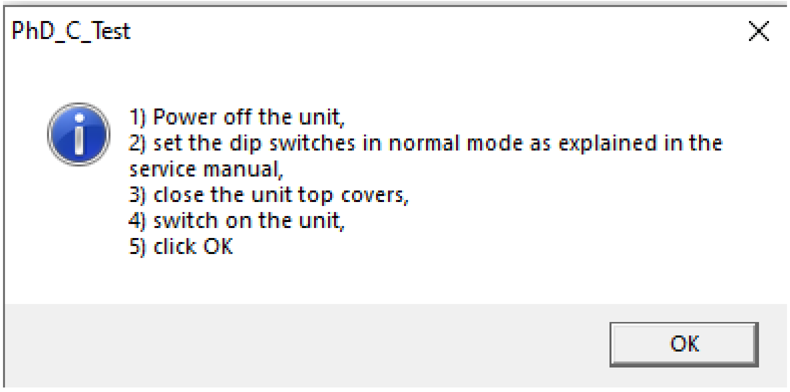
Note
The following procedure has to be performed only in case the automatic mode firmware uploading process failed at least one time before

- Switch off the unit
- Close PhD_C_test
- Open Phd_C_Test and Switch on the unit
- Wait at least 1 minute (the unit it will be probably in an error state: 3 keyboard leds blinks fast)
- In the PhD_C_Test selection bar select: Settings->Firmware update ->**Degraded mode-**>CCU
- Insert the password (same of point 5. of the service procedure)
- Select the new firmware CCU-xxxx.hex file
- Skip the following steps by pressing OK (no need to open the unit covers and set dip switches)



Wait the end of the uploading process

- - Switch off the unit, switch On the unit and click OK to the following window (skip step 2 and 3)



11.2. Checks, settings and adjustment

11.2.1. Logs files recover

The I-Max 3D & I-Max CEPH 3D firmware and software record some of the events that occurs during the unit functioning, stored in files called "Logs". These files have to be provided to the Owandy Radiology Technical Service as required by the different error descriptions.
The following table lists all the logs file names and their path location, while the paragraph below explains the procedures for activating and collecting them.

	File name	**Path location**	**Active by default**
Software package	*LogsServer_yyyy.mm.dd.log*	C:\ProgramData\OWANDY\LogServer\Logs	**Yes**
MCU	*eeprom.dump* *mcu.log*	[SDCARD]:\mcu\Logs	**NO**
CCU*	*ccu.log*	SDCARD]:\ccu\Logs	**NO**
3D Sensor[1]	*dcam_yyyy.mm.dd-hh.mm.ss.log* *GigE_yyyy.mm.dd-hh.mm.ss.log*	C:\ProgramData\OWANDY\LogServer\Logs in the sub-folders *"Logs_dcam" and "Logs_GigE"*	**NO**
CEPH and 3D Sensor*[2]	-	*C:\Program Files (x86)\Teledyne DALSA\Sapera\Bin\logview.exe*	**Yes**

** Only for I-Max CEPH 3D*

[1] *in case of Hamamatsu panels C12902D-40 or C12903D-40G*
[2] *in case of Dalsa 1511*

11.2.1.1. Software package (OSP) logs

These logs record the events that occurs during the OSP (installed on the PC) execution.
These logs are always active by default after any I-Max 3D & I-Max CEPH 3D OSP installation.

The logs file are stored in the folder path: C:\ProgramData\OWANDY\LogServer\Logs.
In this folder, every day a .log file named LogsServer_yyyy.mm.dd.log is store (where yyyy=year, mm=month and dd=day).

11.2.1.2. MCU logs

Note
The SD card MUST has the following characteristics:
- Capacity ≤ 32Gb
- Formatted as FAT32.

This log record the events that occurs during the MCU firmware execution, even if the unit is not connected to the computer.

1. Insert an SD card in the MCU SD card reader.
2. Switch ON the unit.
3. Wait at least 30s (10 minutes if sensor power on issues occur, related to sensors overheating) or use the unit normally, or reproduce the error/problem to be logged.
4. Switch OFF the unit.
5. Read the SD card. The "Logs" folder contents the following files:
   - *eeprom.dump*
   - *mcu.log*

The main information listed in the "imax.log" file are:

Log	Description
MCU version numbers	MCU Firmware (SW) version
DIP switch code	MCU DIP-Switches position (see paragraph 4.2.4.1) 0 = Normal mode
S/N	MCU hardware key number (U.I.C.)
Acquisition mode	Area mode / DTDI
Tubehead type	2D/3D
machine offsets	
MCU IP = 192.168.0.211 Netmask = 255.255.255.0	MCU Ethernet IP and Netmask addresses
XP-PACK option	XP exam option ENABLED or DISABLED
XCU version numbers	Generator board Firmware (SW) version
CCU version numbers	CCU board Firmware (SW) version
Sensor temperature	

11.2.1.3. CCU logs (only for I-Max CEPH 3D)

Note
The SD card MUST has the following characteristics:
- Capacity ≤ 32Gb
- Formatted as FAT32.

This log records the events that occurs during the CCU firmware execution, even if the unit is not connected to the computer.

1. Insert an SD card in the CCU SD card reader.
2. Switch ON the unit.
3. Wait at least 30s (10 minutes if sensor power on issues occur related to CEPH sensor overheating) or use the unit normally, or reproduce the error/problem to be logged.
4. Switch OFF the unit.
5. Read the SD card. The "Logs" folder contents the following files:
   - *ccu.log*

The main information listed in the"imax.log" file are:

Log	Description
CCU version numbers	CCU Firmware (SW) version
Nasion potentiometer readout	
DIP switch code	CCU DIP-Switches position (see paragraph4.2.4.1) 0 = Normal mode
Position of the imaging detector	

11.2.1.4. 3D Sensor logs for Hamamatsu panels

These logs record the events that occur in the communication between the PC network interface, the 3D sensor drivers, the OSP and the 3D sensor.

Note
Before activating the 3D sensor logs, check that the network interface board dedicated to the 3D sensor is configured properly (see paragraph 7.6.2).

1. In the folder path C:\ProgramData\OWANDY\PANORAMIC PHD_C open the "PhD_C.ini" file with a text editor (e.g. Notepad).
2. Activate the 3D sensor logs by setting the following variables to "1" (instead of "0"):

```
SENSOR_PAN3D_MANUFACTURER_TRACES=0
; 0 if you want to hide the pano/3D sensor manufacturer information
; 1 if you want to show the pano/3D sensor manufacturer information
SENSOR_PAN3D_GIGE_MANUFACTURER_TRACES=0
; 0 if you want to hide the pano/3D sensor GigE manufacturer information
; 1 if you want to show the pano/3D sensor GigE manufacturer information
```

3. Save and close the "PhD_C.ini" file.
4. If possible, reproduce the error/problem to be logged, otherwise use the unit normally.

Note
If the problem is not reproducible, it's allowed to keep the log tracing active during the normal functioning of the unit.

The log files are saved in the folder path C:\ProgramData\OWANDY\LogServer\Logs in two different subfolders:
- "Logs_dcam" → dcam_yyyy.mm.dd-hh.mm.ss.log
- "Logs_GigE" → GigE_yyyy.mm.dd-hh.mm.ss.log

(where yyyy=year, mm=month and dd=day, hh=hours, minutes, seconds).

11.2.1.5. CEPH sensor log (only for I-Max CEPH 3D) and 3D detector for 1511 Dalsa panel

This log records the events that occur in the communication between the CEPH sensor and OSP software.

Note
Before recording the log, check that the network interface board connected to the CEPH sensor -the one labelled as "Network" - is configured properly (see paragraph7.6.1).

To save the log:

1. In the folder C:\Program Files (x86)\Teledyne DALSA\Sapera\Bin\ run the program logview.exe
2. Then try to replicate the issue and save the log file selecting in the File menu the option saves all messages.

Note
If the issue is rare open logview.exe, select the menu Options -> View GUI settings and set 50000 in *Maximum messages shown* box.

---

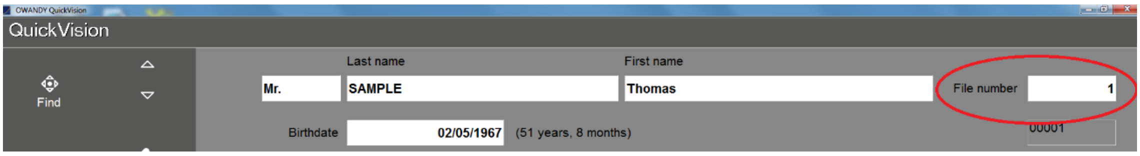
3. In addition in the folder C:\Windows\SysWOW64 retrieve the file logs.dat.

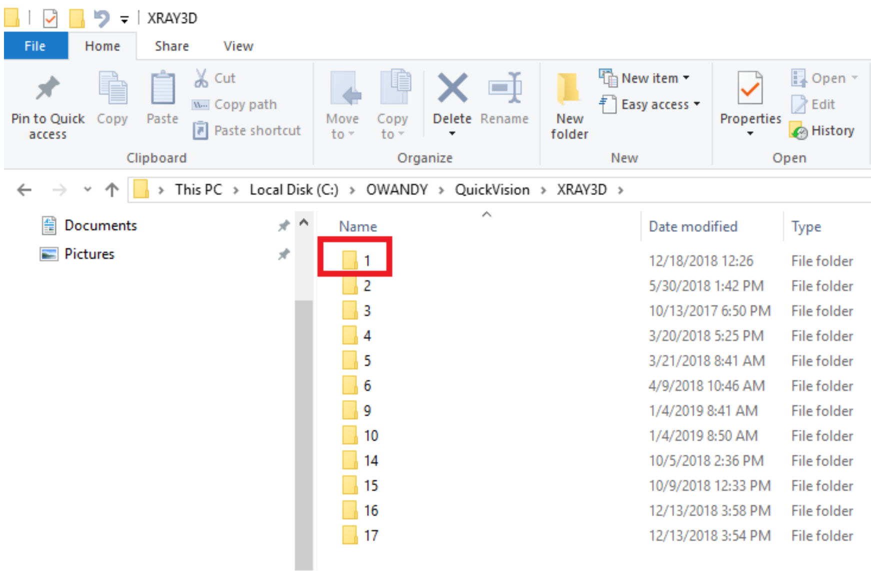
11.2.2. RAW files recovery

In case of image quality or sensor problems, it is required to send these raw folders to Owandy Radiology Technical Service.

The raw folders of the last ten acquired exams (2D, 3D, CEPH and static) are stored in C:\ProgramData\OWANDY\PANORAMIC PHD_C\AcquisitionSave folder. The sub-folders are organized in folders named with time and date of the ten acquisitions.

All the raw folders of the **3D exams** acquired through QuickVision software are stored in the 3D X-rays QuickVision data base. The data base folder path is visible by clicking on the QuickVision "About" button (refer to QuickVision User Manual).
Typical/default path is C:\OWANDY\QuickVision\XRAY3D organized in sub-folders named as the patient "File number".





In each patient subfolder are present all the acquisitions of that specific patient.
Each acquisition generate two folders (with the same prefix), one contains the reconstructed DICOM slices and the other, with the suffix "-Raw" contains the RAW data.

Acquisition Nr.1
Acquisition Nr.2
Acquisition Nr.3

The raw folders of **2D exams** are not by default stored on the PC. They are temporarily saved in the "AcquisitionSave" folder (see above).

11.2.3. 24V Power supply check

Warning
The switching power supply can have dangerous voltage.
Wait for at least 5 minutes before carrying out any action.

Before performing the following procedure, verify the main fuse integrity (see paragraph 11.3.1.1) and the main power supply line (see paragraph 4.2.3 and chapter 12 – General Diagram).

Verify if the MCU LED H1 is ON

1. If MCU H1 is OFF, remove the cable X1 and verify the 24V between X1-pin1 and X1-pin2.
   - IF X1 24V is NOT OK, fix or replace the cable X1 and then the switching power supply G1.
   - IF X1 24V is OK, unplug the connector X11 and verify if the MCU LED H1 light up:
     - IF MCU H1 is still OFF, replace the MCU board A1

- IF MCU H1 is now ON, verify the integrity and the insulation between pin1 and pin2 of cable X11-X37. If the problem is still present, replace the 3D sensor power board.

2. If MCU H1 is ON, verify if the MCU LED H2 is ON.

Note
If the LED H1 is ON the 24V to the 3D sensor power board is correctly supplied by the MCU connector X11. In this case, if there are still problems related to the 3D sensor connection, check the cable X11-X37 and then refer to Error E1402 (see paragraph 9.2.10.2).

---

a. IF MCU LED H2 is OFF, verify that fuse F1 is not blown:

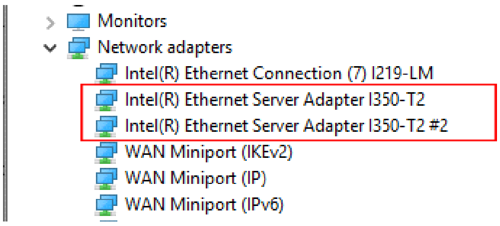
- IF fuse F1 is blown, replace it and verify if the error is still present (* see Note below).
- IF fuse F1 is NOT blown, disconnect the motors connectors (X18, X19, X20 and X34) and verify if the LED H2 lights up:
  - IF MCU H2 is still OFF, replace the MCU board A1
  - IF MCU H2 is now ON, connect one at a time the motors connectors and verify which ones are the origin of the problem. (* see Note below).

(*) Note
Before replacing, a burned fuse or any other parts verify that there are no short-circuit on motors (M3, M4, M5, M6) and theirs cables as described in the troubleshooting of the Errors E200 ÷ E205 (paragraph 9.2.3.1), E240 ÷ E243 (paragraph 9.2.3.3), and E265 ÷ E268 (paragraph 9.2.3.4). Verify also that there are no short-circuits on cables X8-J8 and X11-X37.

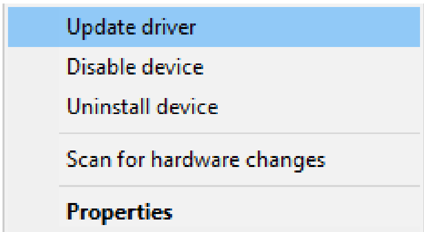
11.2.4. Network interface board drivers upgrade

In case of problems with 3D sensor Ethernet connections (Errors E1400÷1405, E371, E370 and persistent sensor not ready message) or with the I-Max 3D & I-Max CEPH 3D connection, a verification of the network board driver update is suggested:

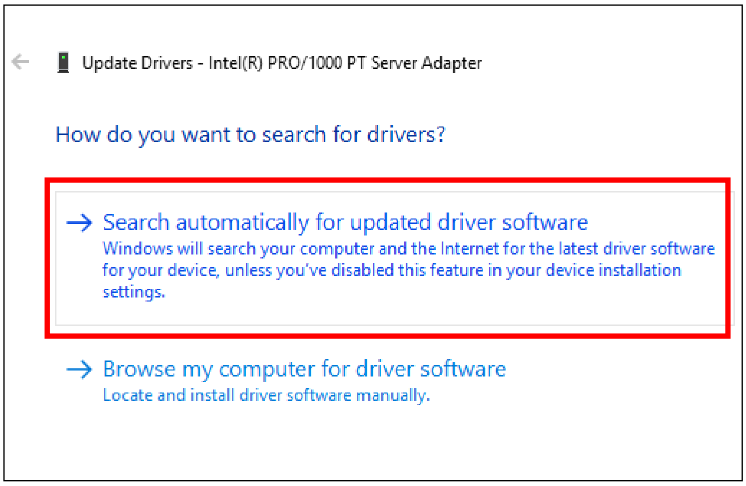
1. Connect the PC to Internet.
2. Open the system "Device Manager" (Control Panel→System and Security→System).
3. Click on Network adapters and right click on all the boards names connected to the unit:

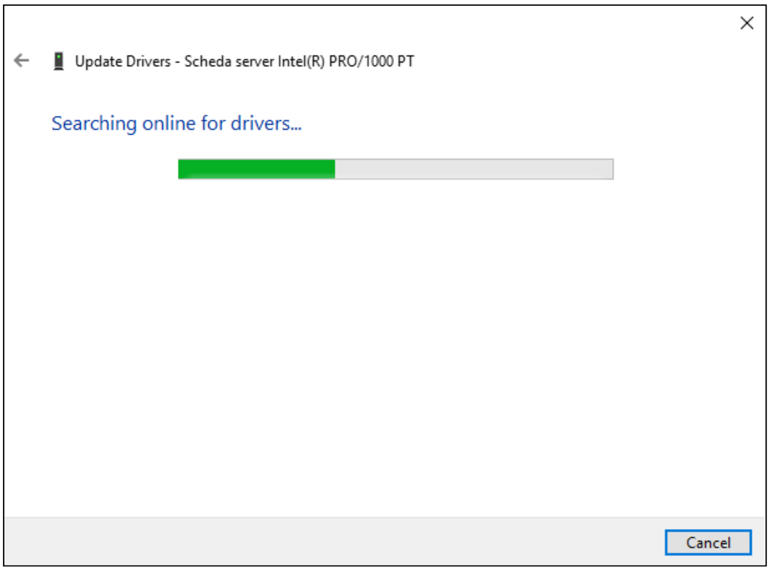


4. Click on Update driver:

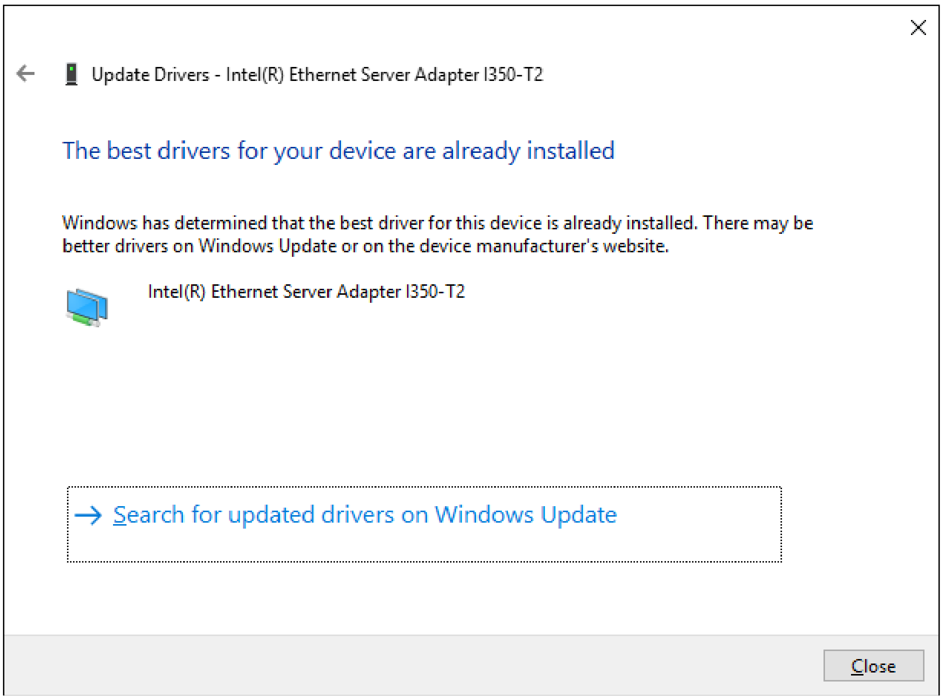


5. Click on "Search automatically for updated driver software":

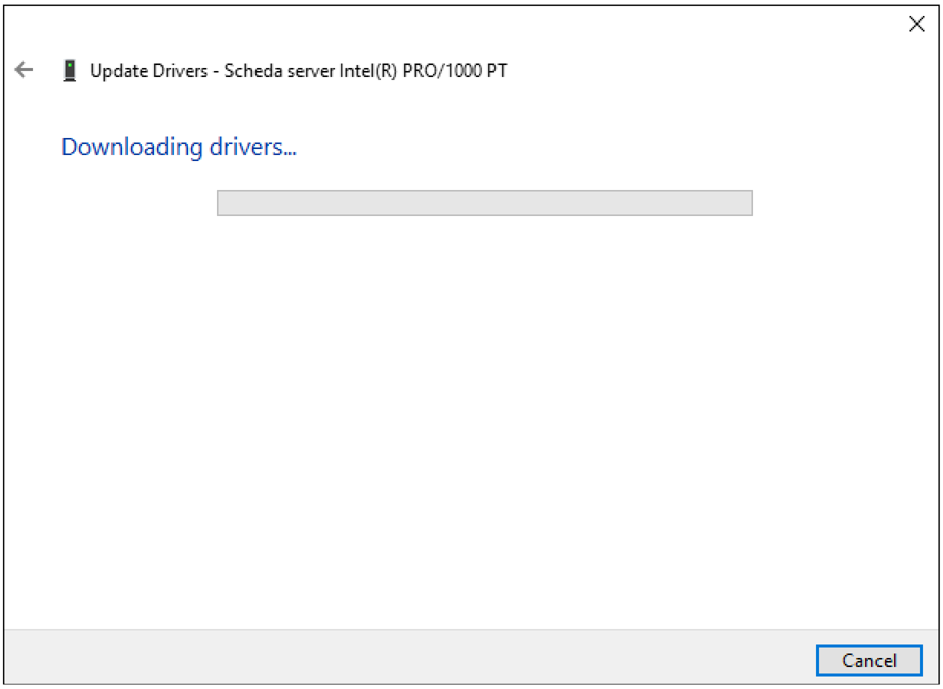


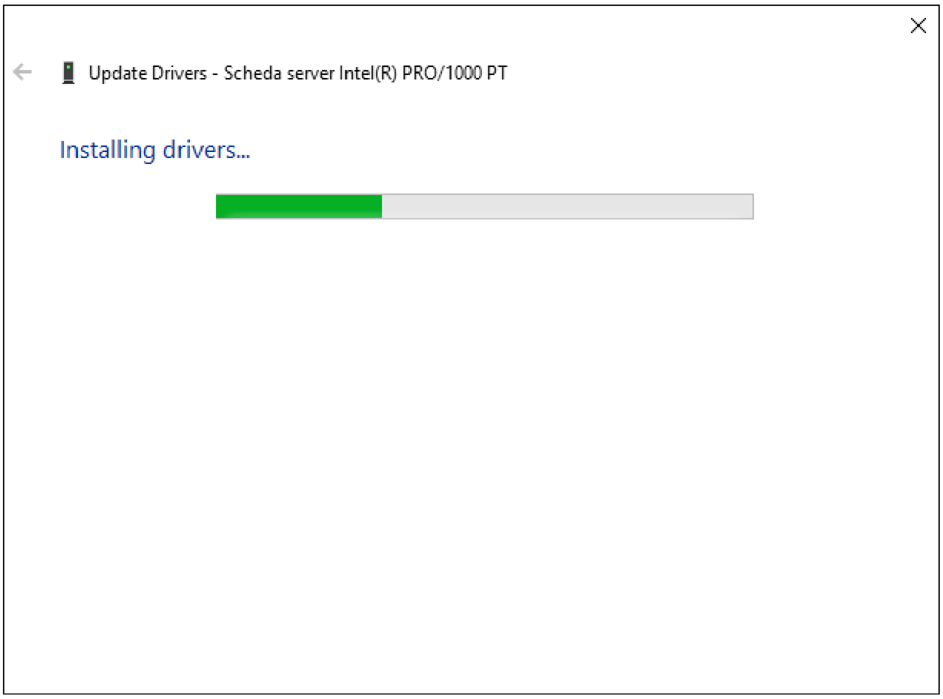


6. If the installed drivers are already updated the following window will be displayed:

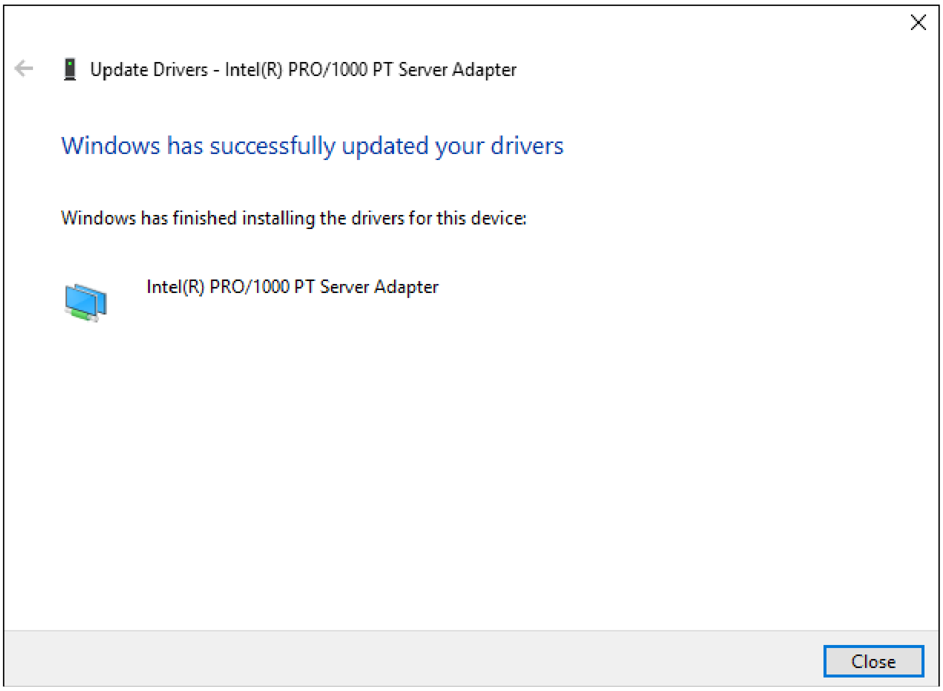


Otherwise, if the search found a driver to be updated, the following windows will be displayed:





7. The update process is finished when the following message is displayed:

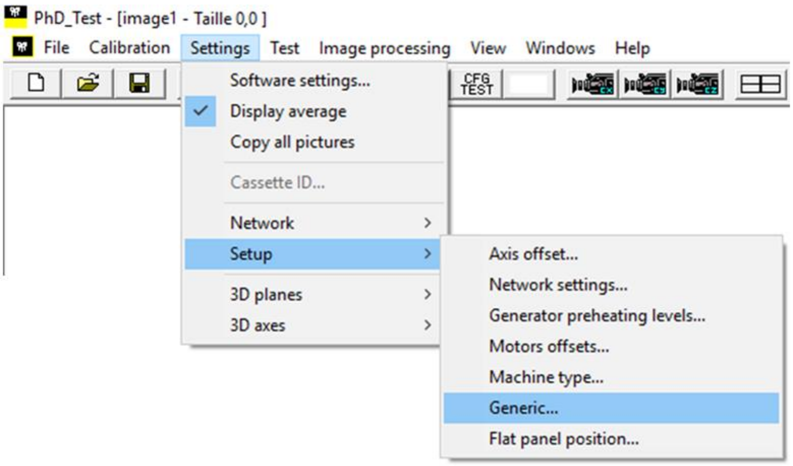


8. Repeat the above procedure on all the PC network interface boards.

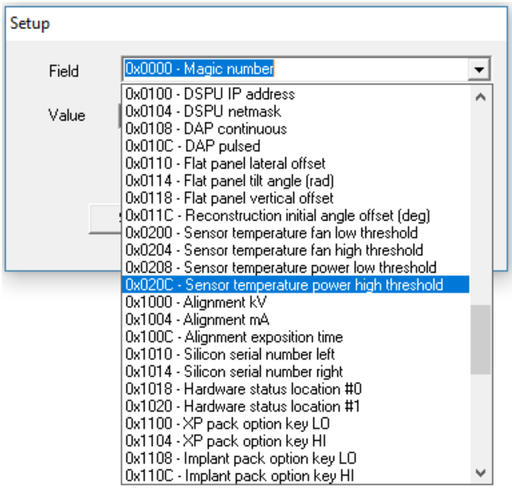
11.2.5. EEPROM Memory values verification and modification

Note
DO NOT CHANGE ANY EEPROM VALUES DIFFERENT FROM THE ONES REQUIRED BY THIS MANUAL (eg. required by a troubleshooting or Errors procedures).
An incorrect and improper modification of an EEPROM value may affect the correct functioning of the unit. The service technician is responsible for the following operations.

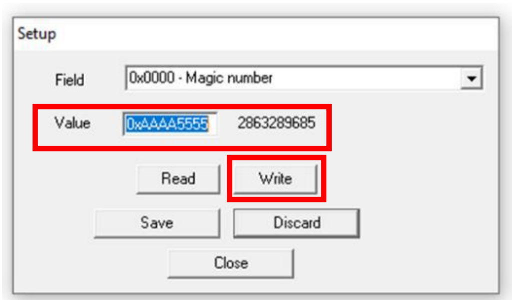
1. Switch ON the unit and when the green keyboard LED blinks slow press the >0< button.
2. Open the "PhD_C_Test.exe" (folder path: C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C) and wait the unit connection wait the unit connection and enter in SETUP mode.
3. Click on the menu Settings→Setup→Generic:



4. In the "Setup" window select the field needed value: 0x#### - [name of the EEPROM variabiles]:



The EEPROM stored values will be displayed in the "Value" field. If the value number is not correct, manually write the correct DECIMAL number in the white "Value" field and then press the button "Write":

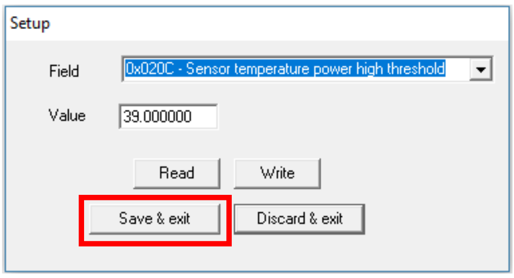


Note

If in the "Value" field the number is preceded by the prefix "0x", means that that it is expressed in hexadecimal base. In this case refer to the DECIMAL values reported on the right of the field:

If the value must be changed, write in the white filed the correct DECIMAL number and then press the button "Write".

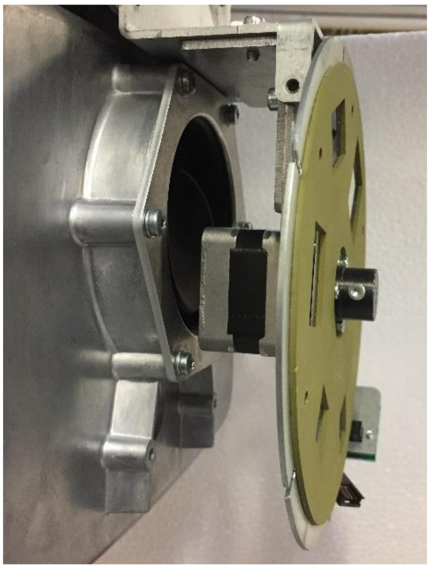
5. Press “Write”, then “Save& exit” button and wait the unit reboot (green LED blink slow)



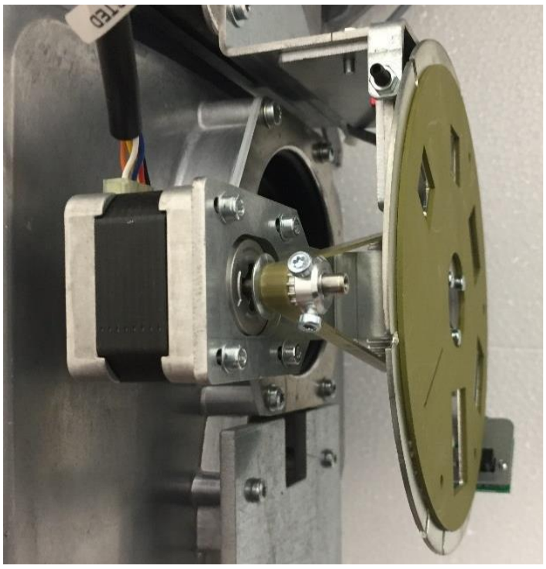
6. Wait the blue keyboard LED blink.

11.2.6. Disk collimator type settings

Perform the following procedure if the collimator type has to be change from “NORMAL to BELT” or from “BELT to NORMAL”.

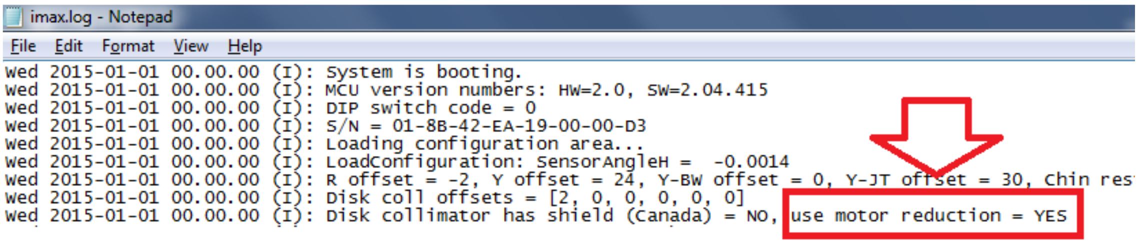


NORMAL TYPE
“Motor reduction = NO”



BELT TYPE
“Motor reduction = YES”

1. Set the MCU DIP-switched as ON-ON-OFF (see paragraph 4.2.4.1).
2. Switch ON the unit: the three keyboard LEDs will light ON in sequence. Wait until the green LED blinks slowly.
3. Press the X-ray button and then the LASER button. The collimator type will change from belt to normal (or normal to belt) and the 2 lasers will blink.
4. Switch OFF the unit and set the DIP-switches in NORMAL mode (ON-ON-ON).
5. Switch ON the unit and perform an axis reset by pressing the >0< button.
6. If Error E260 is displayed, switch OFF the unit, insert an SD card in the MCU board, switch ON the unit and wait until the green keyboard LED blinks slowly.
7. Switch OFF the unit and open (with a txt reader) the SD card log (mcu→log→mcu.log):
   - If the parameter “use motor reduction” is equal to NO, repeat the above procedure
   - If the parameter “use motor reduction” is equal to YES and the E260 is still present, refers to Error E260 (see paragraph 9.2.3.4).

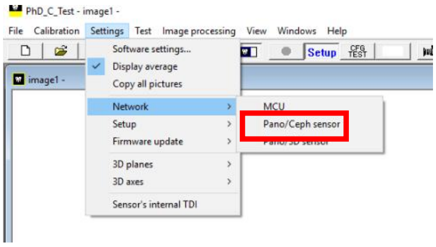


imax.log - Notepad
File Edit Format View Help

```
Wed 2015-01-01 00.00.00 (I): System is booting.
Wed 2015-01-01 00.00.00 (I): MCU version numbers: HW=2.0, SW=2.04.415
Wed 2015-01-01 00.00.00 (I): DIP switch code = 0
Wed 2015-01-01 00.00.00 (I): S/N = 01-8B-42-EA-19-00-00-D3
Wed 2015-01-01 00.00.00 (I): Loading configuration area...
Wed 2015-01-01 00.00.00 (I): LoadConfiguration: SensorAngleH =  -0.0014
Wed 2015-01-01 00.00.00 (I): R offset = -2, Y offset = 24, Y-BW offset = 0, Y-JT offset = 30, Chin res
Wed 2015-01-01 00.00.00 (I): Disk coll offsets = [2, 0, 0, 0, 0, 0]
Wed 2015-01-01 00.00.00 (I): Disk collimator has shield (Canada) = NO, use motor reduction = YES
```

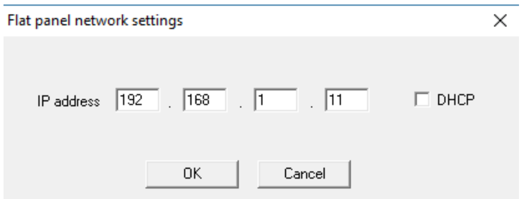
11.2.7. 3D Sensor static IP address setting

1. Switch ON the unit and when the green keyboard LED blinks slow press the >0< button.
2. Open the "**PhD_C_Test.exe**" (folder path: C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C) and wait the unit connection.
3. Click on the SET-UP button and in the windows that will open type the password **PhdAccess**
4. Click on the menu Settings→Network→Pano/3D sensor:

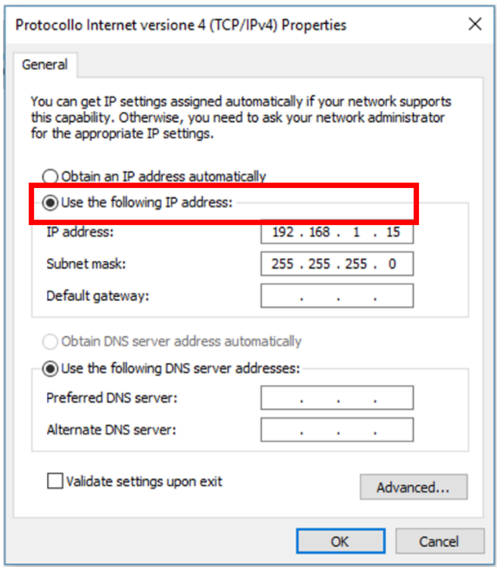


5. Unflag "DHCP" mode box:

6. Write a compatible static IP address in the IP address fields (different from MCU one – see paragraph 11.2.9.1).



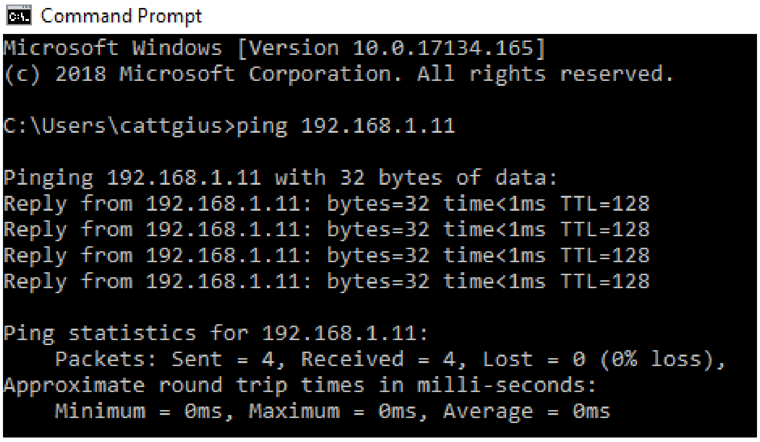
7. Click On OK button and close "PhD_C_Test" program.
8. Set the network board connected to the 3D sensor with a valid static IP address:



E.g.: in the case reported in the image above, the last number must be different from 11

9. Switch the unit OFF and then power it ON again.

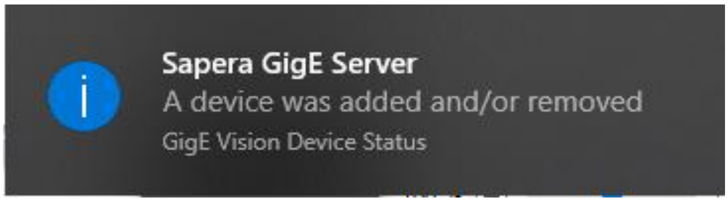
10. To check that the connection is properly configured, run a command prompt and type "ping [3D sensor IP address]" (e.g. ping 192.168.1.11). Press Enter and verify that the unit reply to the ping as shown in the figure below:



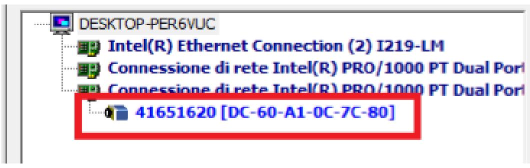
11. IF the sensor does not reply, refer to Error E1402.

11.2.8. CEPH sensor IP address modification (only for I-Max CEPH 3D)

1. Check that the network card connected to the CEPH sensor - i.e. the one connected to the machine port labelled with “Ethernet” - is configured with a static IP in the family of the current sensor IP. The factory default is: IP address:192.168.0.16, Subnet Mask: 255.255.255.0 (refer to paragraph 7.6.1)
2. Switch ON the unit
3. Wait until connection with the sensor presence is recognized by the PC, i.e. when this message is displayed by windows:

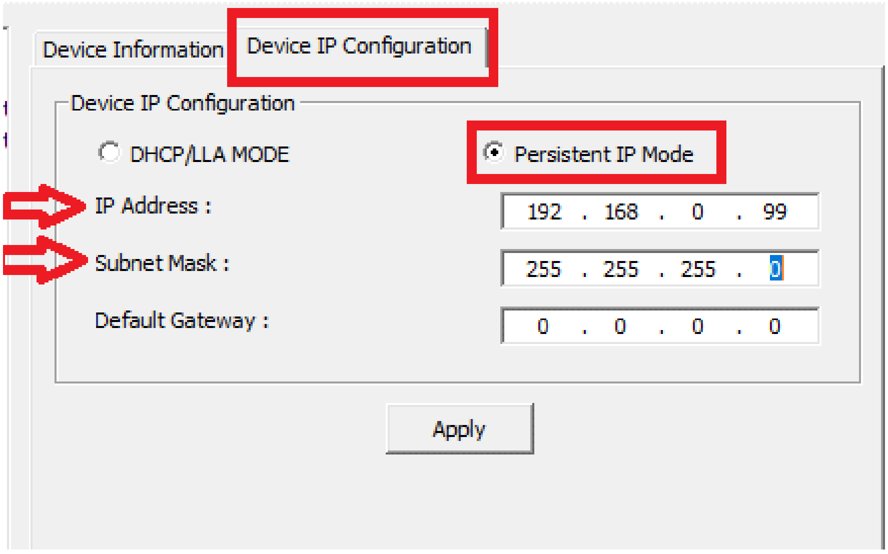


4. Start the program “CorNetConfigApp.exe” present on desktop (C:\Program Files (x86)\Teledyne DALSA\Network Interface\Bin)
5. In the left side select the item with the S/N of the sensor (check that it is matching with the S/N present on your sensor)

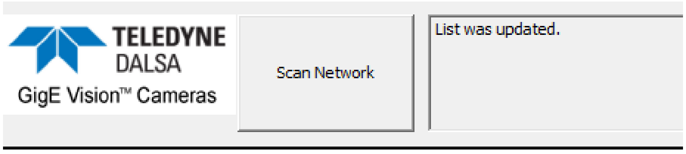


6. In the right side of the menu select the window “Device IP Configuration”. Select “Persistent IP Mode”
7. In the field “IP Address” set the static IP to apply to the sensor (the default is 192.168.0.99)
8. In the field “Subnet Mask” set the value. (the default is 255.255.255.0)

9. Click on Apply



10. Wait the end of the process.

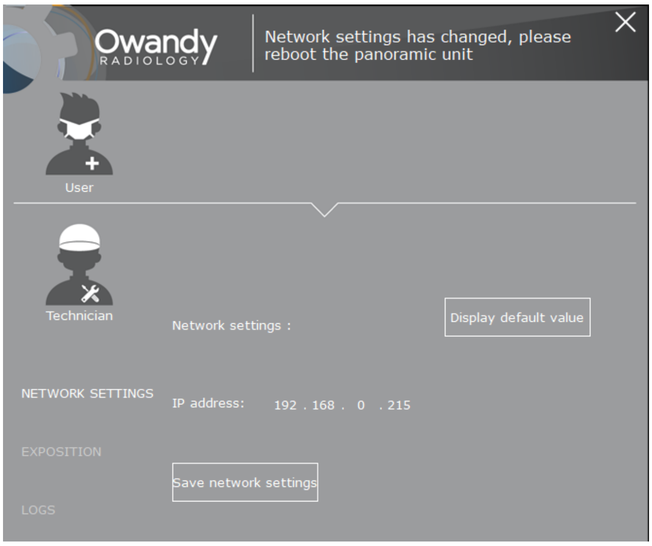


Note
If the sensor IP family has been changed to connect again to the machine also MCU IP address (refer to paragraph 11.2.8) and PC network ethernet card are to be changed

11.2.9. MCU IP address modification and factory reset

11.2.9.1. MCU IP address modification

1. Enter service menu (see chapter 8).
2. Select the "Network Settings" page (see paragraph 8.1).



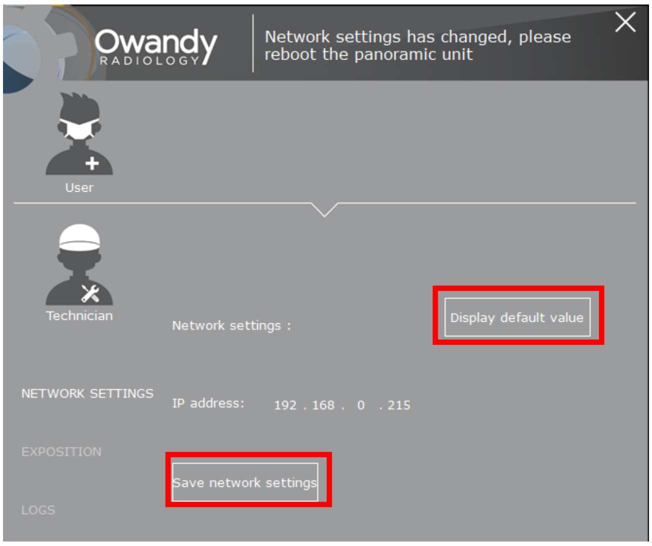
3. Change the IP address; click on Save IP address.
4. Change the Network interface board IP with a valid one (see paragraph 7.6.1).
5. Power OFF the unit and power it ON again and check the connection.

Note
You can verify the current MCU IP address by the MCU SD card log (see paragraph 11.2.1.2).

11.2.9.2. MCU IP address factory reset

Follow the procedure below to restore the factory MCU IP address 192.168.0.211.

1. Switch OFF the unit.
2. Press column UP and column DOWN keyboard buttons switch ON the unit and keep pressed column UP and column DOWN keys until the keyboard green LED blinks.
3. Switch the unit OFF and then power it ON again.
4. Set a compatible IP address on the Network interface board IP (eg. 192.168.0.16, see paragraph 7.6.1).
5. Enter service menu (see chapter 8).
6. Select the "Network Settings" page (see paragraph 8.1).



7. Click on "Display default value" button and then on "Save IP address" button.
8. Wait the unit connection.
9. Exit the service menu by clicking on the gear.

Note
You can verify the current MCU IP address by the MCU SD card log (see paragraph 11.2.1.2).

11.2.10. Primary collimator alignment

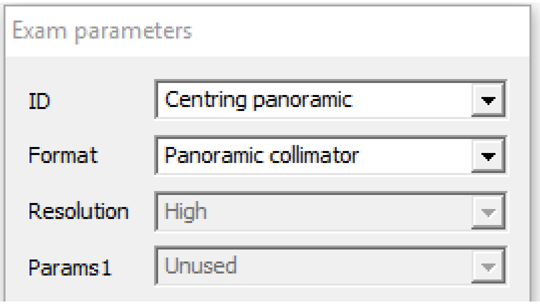
11.2.10.1. Primary collimator beam alignment check

In order to make an exposition without rotating the arm it is necessary to use the software "**PhD_C_Test**" you can find in the directory C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C. This function is useful to verify and adjust the x-ray beam alignment on the digital sensor and also to measure exposure parameters (see par. 9.7). This function is required in case of tubehead or digital sensor replacement.

11.2.10.1.1. I-Max 3D

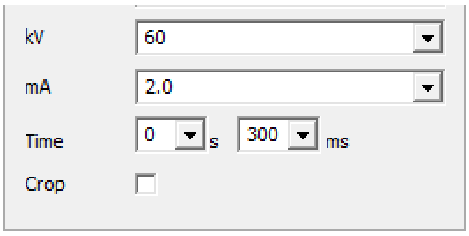
Note
Before acquiring and image remove any object from the x-ray beam field including the chin support and the panoramic temple clamps

1. Open "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C)
2. From the "Exam parameters" window select the exam ID "Centring panoramic" and the Format "Panoramic collimator".

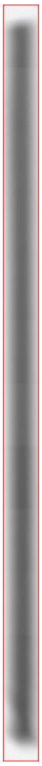


Note
In order to make a static exposition with the 3D collimation select the exam ID "Centring 3D" and the Format "W01 - 86x90 full 3D".
While the recommended IDs for the measurement of exposure parameters with non-invasive method are “Centering emission” or "Centring 3D" with “No Collimator” Format

3. Set the exposure parameters from the "Exam parameter" window.

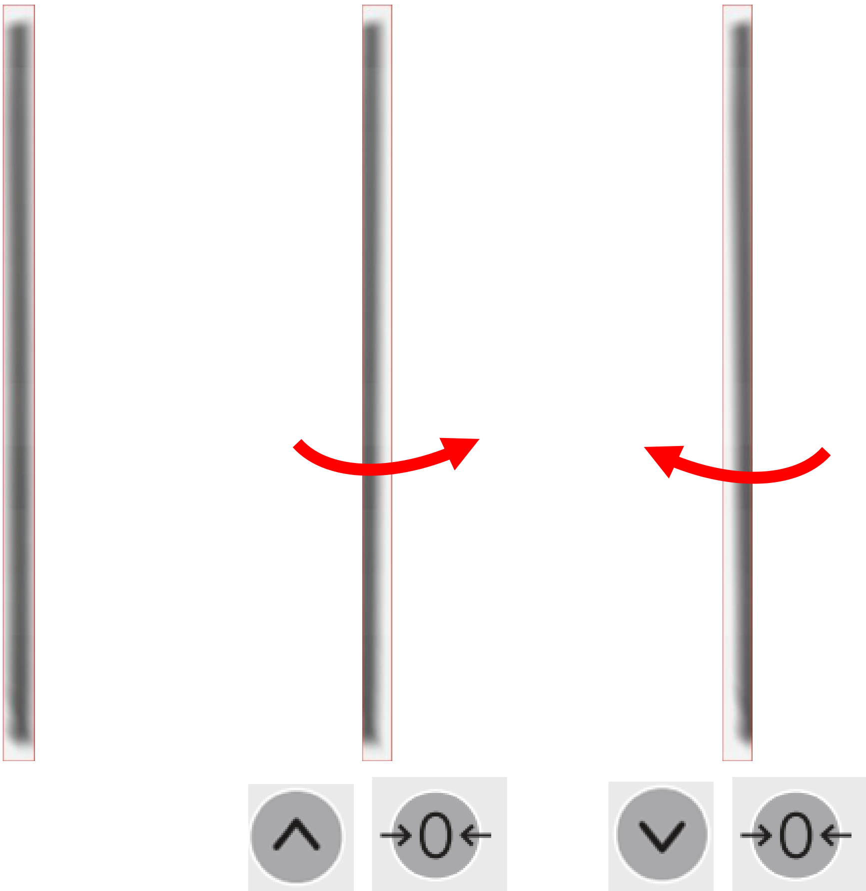


4. Once the green led on the keyboard gets solid, press the X-ray button to make an exposition. The acquired image will be displayed. If the image is saturated, lower the exposure parameter and perform again the acquisition.



The x-ray beam **correctly aligned:** a white border is visible on each side of the image

5. Use the UP/DOWN keys to adjust the collimation according to the figure below. Once the UP/DOWN key is pressed the laser turns on, so press >0< and wait for the blue led before performing another exposure.



The x-ray beam is correctly aligned if a white border is visible on each side of the image

In order to move the x-ray beam to the right of the image press UP + >0<

In order to move the x-ray beam to the left of the image press DOWN + >0<

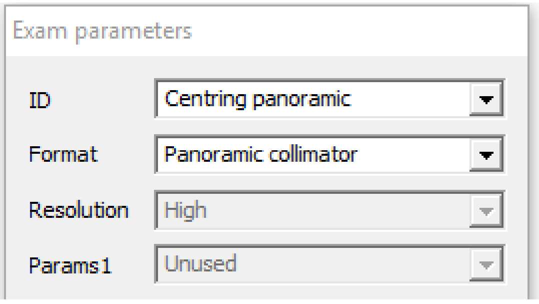
6. If needed, the images can be saved by clicking the button "Save" . To save the image in bitmap format, put ".bmp" at the end of the file name while saving.

11.2.10.1.2. I-Max CEPH 3D

Note
Before acquiring and image remove any object from the x-ray beam field including the chin support and the panoramic temple clamps.

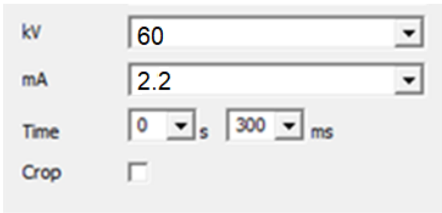
- **Panoramic collimator checks**

1. Open "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C)
2. From the "Exam parameters" window select the exam ID "Centring panoramic" and the Format "Panoramic collimator".



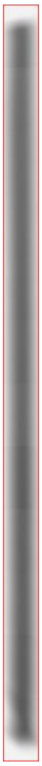
Note
In order to make a static exposition with the 3D collimation select the exam ID "Centring 3D" and the Format "W01 - 86x90 full 3D.
While the recommended IDs for the measurement of exposure parameters with non-invasive method are “Centering emission” or "Centring 3D" with “No Collimator” Format

3. Set the exposure parameters from the "Exam parameter" window

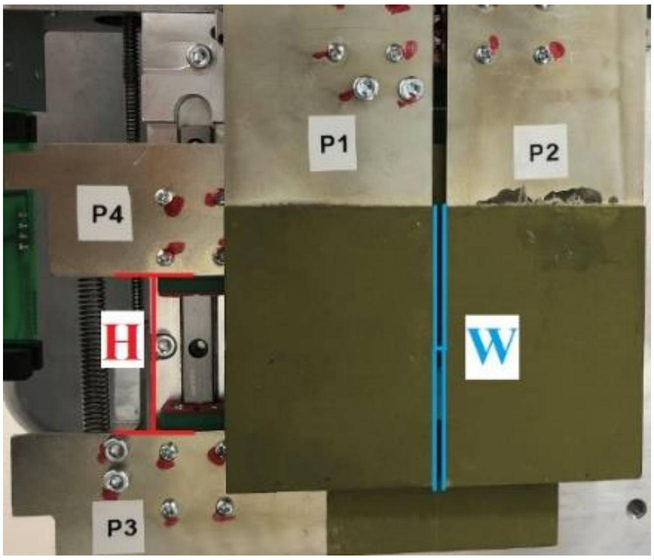


4. Once the green led on the keyboard gets solid, press the X-ray button to make an exposition. The acquired image will be displayed.
5. If needed, the images can be saved by clicking the button "Save" . To save the image in bitmap format, put ".bmp" at the end of the file name while saving.

6. With the panoramic collimator format selected, **verify that**:
   - In the panoramic acquisition **a white border is visible on each side of the image**
   - In the panoramic acquisition the irradiated area is **not tilted** and **centered** in the acquisition area
   - The width of the panoramic collimator window (distance between leads edge of P1 and P2) is **W=1mm +/-0.2mm**
   - The maximum distance between the iron part of the P3-P4 blades is **H≤ 32mm**



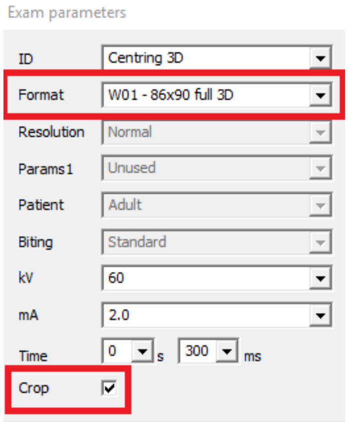
*The x-ray beam **correctly aligned**: a white border is visible on each side of the image*



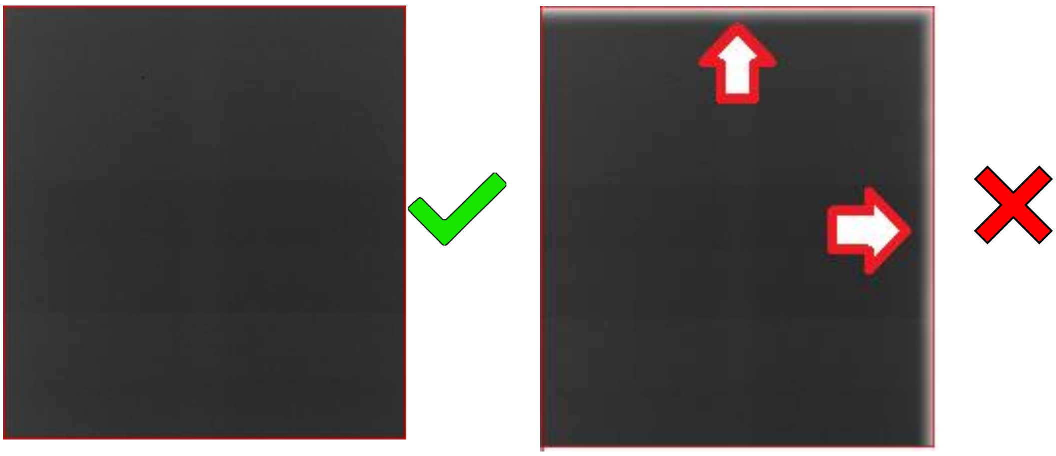
Collimator Width and Height physical measurement

- **<u>3D collimator checks</u>**

1. In the “Exam parameters” window set the “Centring 3D” ID
2. Set the crop option and 60kV 2mA 300ms:



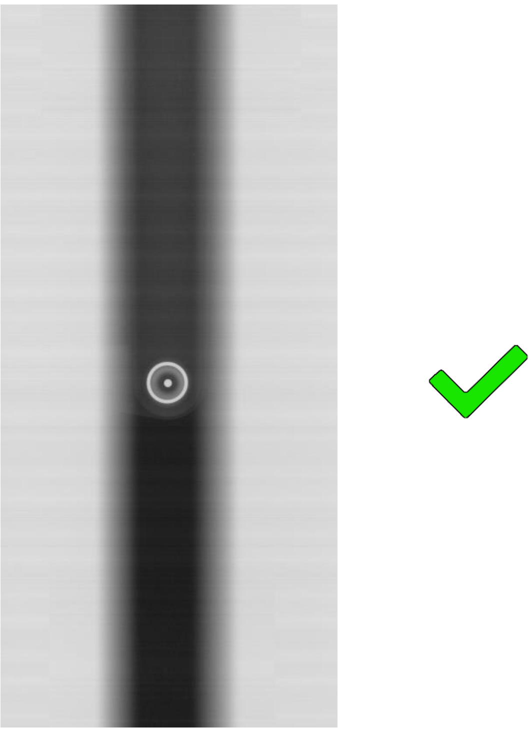
3. Acquire one image for each of the following 3D window formats:
    - W01 – 86x80 full 3D
    - W02 – 86x50 Mand
    - W03 – 86x50 Maxil
    - W04 – 50x50 Maxil
    - W05 – 50x50 Mand
4. In each of the above acquisitions verify that the red edge borders are fully well irradiated

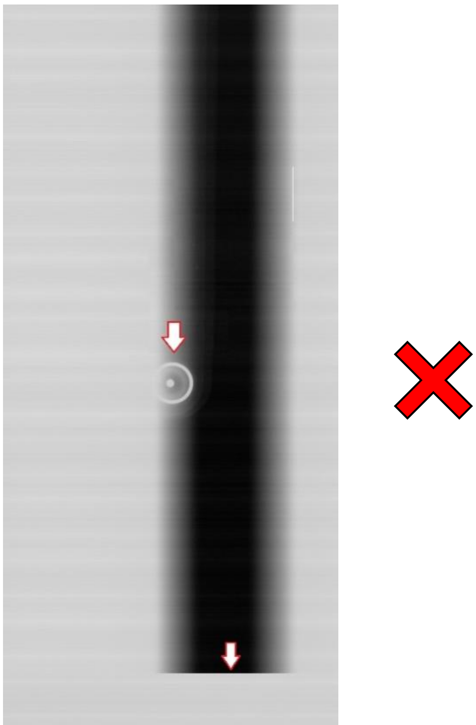


- **<u>CEPH collimator checks</u>**

1. In the “Exam parameters” window set the “Centring CEPH” ID and the following options:
    - Format: Height 24
    - Resolution: High
    - Param1=”View of primary collimator field”
    - 70kV 8mA
2. In the image processing menu set the option “Dynamic adjustment”
3. Rotate the CEPH head support in the lateral position
4. Prepare the unit to acquire a CEPH exam
5. Acquire the centring CEPH exam by pressing the X-ray button

6. In the acquisition verify that:
   - The dot and the outer circle are inside of the main exposed area
   - The top and bottom border of the acquired area are fully exposed
   - The width of the CEPH collimator window (distance between leads edge of P1 and P2) is **W=2mm +/-0.2mm**



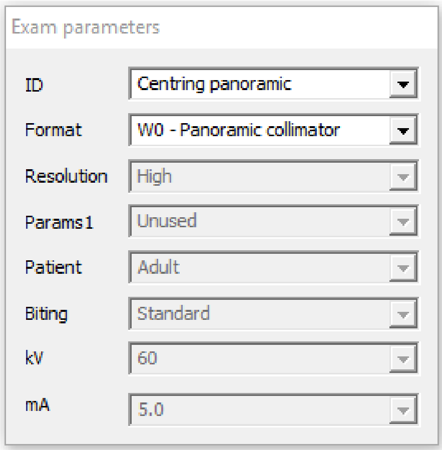


11.2.10.2. Primary collimator beam alignment adjustment

11.2.10.2.1. I-Max 3D

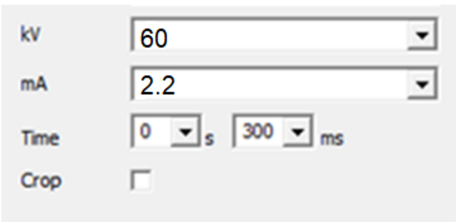
Warning
In case of tubehead replacement or digital sensor replacement the x-ray beam should be aligned using mechanical regulations: do not perform the following instructions.
Perform the following operations <u>only in case of collimator replacement, collimator light barrier or motors replacement or if the above verification checks failed</u>

1. If the collimator position has to be adjusted, enter the SET-UP mode, open “Unit setting configuration” window and select “Collimator offsets” tab (refer to paragraph 8.4)
2. From the “Exam parameters” window select the exam ID “Centring panoramic” and the Format “W0 – Panoramic collimator”.



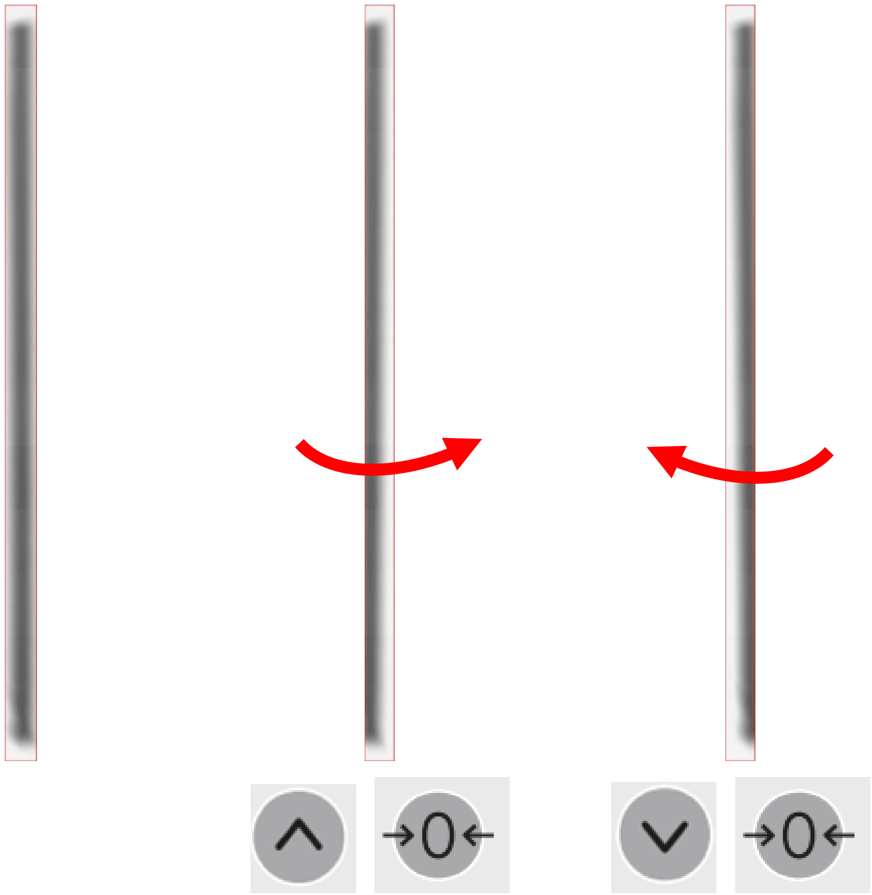
Note
In order to make a static exposition with the 3D collimation select the exam ID “Centring 3D” and the Format “W1 – Full 3D 86x90”.
This is recommended for the measurement of exposure parameters with non-invasive method.

3. Set the exposure parameters from the “Sensor centring parameters” window.



4. Once the green led on the keyboard gets solid, press the X-ray button to make an exposition. The acquired image will be displayed. If the image is saturated, lower the exposure parameter and perform again the acquisition.

5. Use the UP/DOWN keys to adjust the collimation according to the figure below. Once the UP/DOWN key is pressed the laser turns on, so press >0< and wait for the blue led before performing another exposure.



The x-ray beam is correctly aligned if a white border is visible on each side of the image

In order to move the x-ray beam to the right of the image press UP + >0<

In order to move the x-ray beam to the left of the image press DOWN + >0<

6. If needed, the images can be saved by clicking the button “Save”. To save the image in bitmap format, put “.bmp” at the end of the file name while saving.

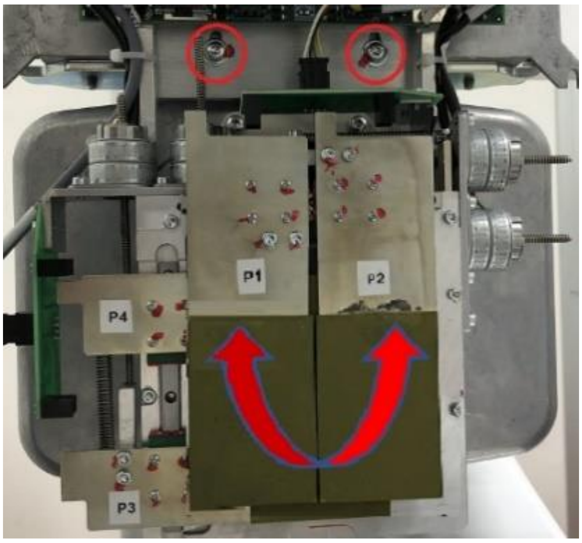
11.2.10.2.2. I-Max CEPH 3D

Warning
In case of tubehead replacement or digital sensor replacement the x-ray beam should be aligned using mechanical regulations: do not perform the following instructions.
Perform the following operations <u>only in case of collimator replacement, collimator light barrier or motors replacement or if the above verification checks failed</u>

1. If the collimator position has to be adjusted, enter the SET-UP mode, open “Unit setting configuration” window and select “Collimator offsets” tab (refer to paragraph 8.4)
2. Select “W0-Pan windows” if you want to adjust the panoramic collimation windows

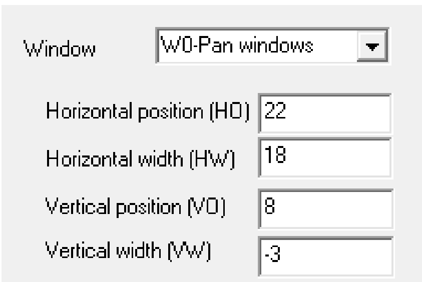
Note
Perform first the Panoramic collimator adjustment (as explained below) and then proceed with the exact sequence oft he operations reported in the following paragraphs

3. If the irradiated area in the panoramic acquisition is tilted with respect to the sensor area, adjust the collimator rotation through its fixing screws indicated by the red circles in the image below.



Collimator fixing-regulations for tilting adjustment

4. If the tilt of the irradiated area is ok, but the position is not: modify the offsets following the conventions reported below and then press on send parameter, save



5. Once an offset value has been changed, before acquiring a new static image, press the >o< button on the keyboard in order to perform a collimator reset and apply the new

parameters to the to the collimator position.

COLLIMATOR OFFSETS (HO, HW,VO,VW) CONVENTIONS

- The **horizontal position (HO)** offset allows to move the window on the right or left of the acquisition area without modifying the window width (P1 and P2 blades distance remains unchanged)

OFFSET	EFFECT ON ACQUIRED IMAGE
HO [+]	Move the collimator window on the LEFT of the sensor acquired area
HO [-]	Move the collimator window on the RIGHT of the sensor acquired area

- The **horizontal width (HW)** offset allows to increase/ decrease the collimator width by moving only the P1 collimation blade

OFFSET	EFFECT ON ACQUIRED IMAGE
HW [+]	INCREASE the window width by moving the P1 blade on the Left of the sensor acquired area without moving the P2 blade
HW [-]	DECREASE the window width by moving the P1 blade on the Left of the sensor acquired area without moving the P2 blade

- The **vertical position (VO)** offset allows to move the window towards the Top/Bottom border of the acquisition area without modifying the window height (P3 and P4 blades distance remains unchanged)

OFFSET	EFFECT ON ACQUIRED IMAGE
VO [+]	Move the collimator window DOWN
VO [-]	Move the collimator window UP

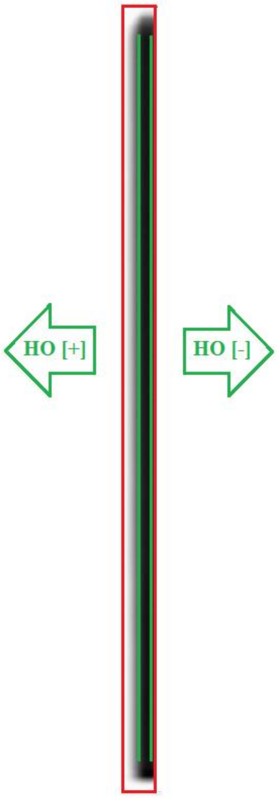
- The **vertical width (VW)** offset allows to increase/ decrease the collimator height by moving only the P3 collimation blade

OFFSET	EFFECT ON ACQUIRED IMAGE
VW [+]	INCREASE the window height by moving the P3 blade on towards the bottom edge of the sensor acquired area without moving the P2 blade
VW [-]	DECREASE the window width by moving the P3 blade towards the top edge of the sensor acquired area without moving the P4 blade

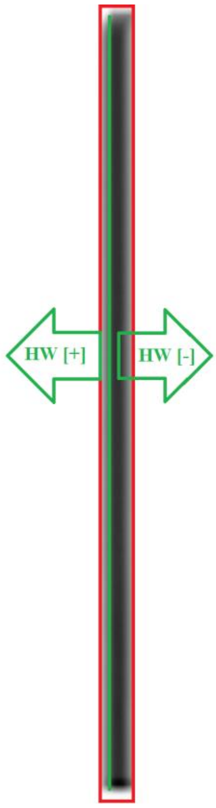
- **<u>Pixel-Offset Conversion</u>**

1 offset ≃ 2 pixel (0.240mm) if ID= “Centering panoramic” (Resolution= High)
1 offset ≃ 1 pixel (0.240mm) if ID= “Centering 3D” (Resolution= Normal)

*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.

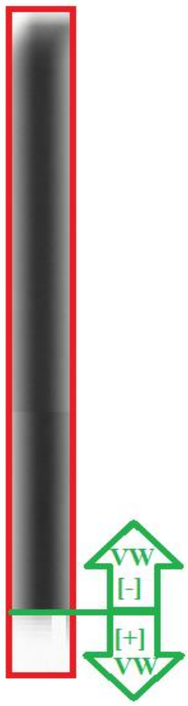


Horizontal Offset (HO) convention



Horizontal Width (HW) convention

Vertical Offset (VO) convention



Vertical Width (VW) convention

6. Repeat the tests prescribed by paragraph 11.2.10.1 “Panoramic collimator checks“
7. Once the panoramic collimator has been correctly adjusted, in the tab “Collimator offsets” of the “Unit setting configuration” window assign to the “W4 - 3D windows” the same HO, HW, VO and VW offsets values assigned to the “W0 – Pan windows”
8. Repeat the tests prescribed by paragraph 11.2.10.1

Note
If the collimator has been replaced or adjusted the sensor calibration of Pano and 3D area (resolution 1x1 and 2x2) must to be performed (refer to paragraph 10.2)

Note
Perform the following part of the paragraph only in case the “CEPH collimator checks“ , prescribed by paragraph 11.2.10.1, failed

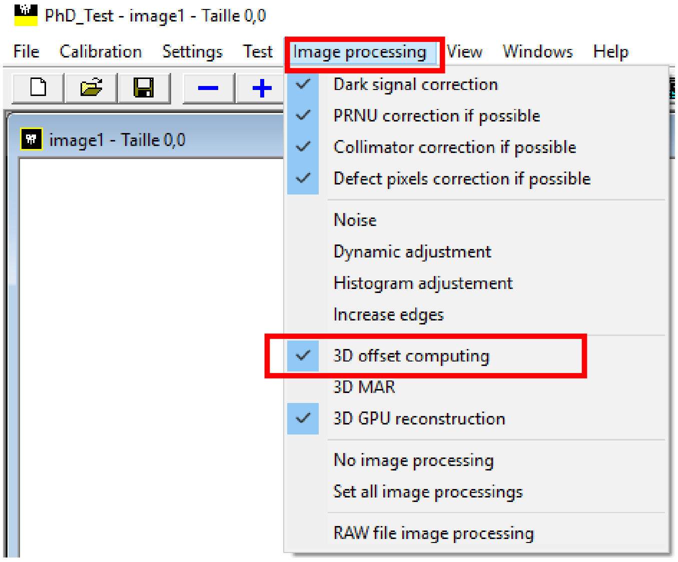
9. In the tab “Collimator offsets” of the “Unit setting configuration” window assign to the “W6 - CEPH windows” the same HO, HW, VO and VW offsets values assigned to the “W0 – Pan windows”
10. Repeat the tests prescribed by paragraph 11.2.10.1 in „CEPH collimator checks“part
11. If the tests failed again refer to the CEPH alignment paragraph 11.2.12.

Note
After any changes to the offset values, update the paper copy of the equipment parameters table in Appendix A with the new values.

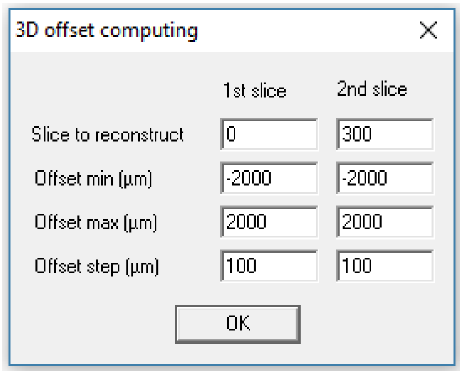
11.2.11. 3D Recostruction adjustment

In order to adjust the 3D reconstruction and remove possible artefacts, it is necessary to use the software "Phd_C_Test" you can find in the directory C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C.

1. Once you start the software, select on the menu "Image processing" the modality "3D offset computing".



2. On the window that opens set the following parameters:



3. Insert support plate on the chin rest, and place the centering cylinder in the middle of the plate.

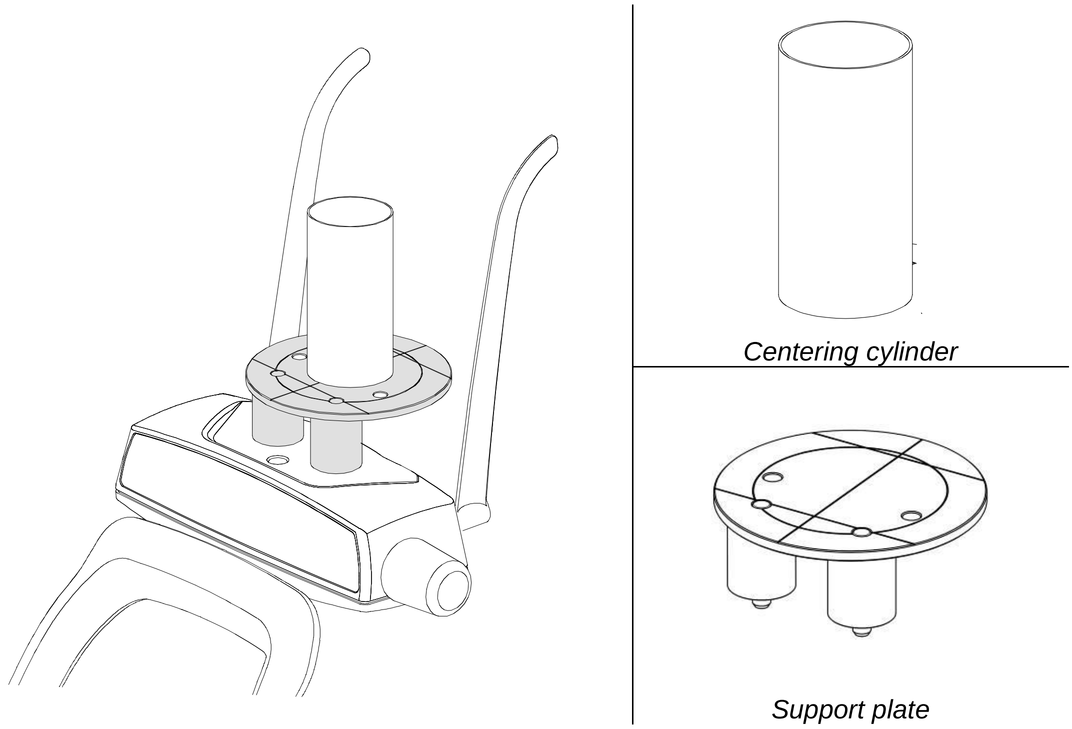
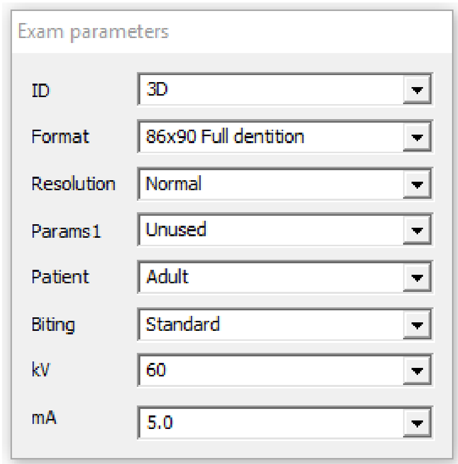


Figure 36: Support plate and centering cylinder positioning

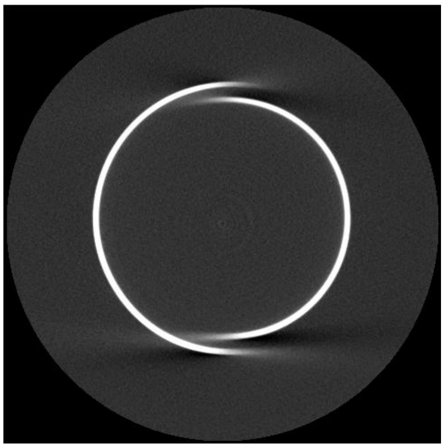
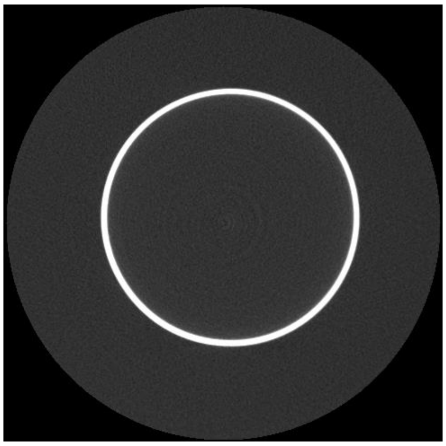
4. In "PhD_C_Test" program, from the "Exam parameters" window select the exam ID "3D" and the Format "86x90 Full dentition". Set the parameters to 60kV-5mA.



5. Press >0< button on the unit keyboard and wait until the chin rest support is positioned. Press >0< button again to complete the unit positioning.
6. Press the X-ray button to perform the acquisition.
7. Open the files located in C:\ProgramData\OWANDY\PANORAMIC PHD_C\Centring with an image viewer: the name of these files contains two values: OFFSET_HORIZONTAL_Z and OFFSET_HORIZONTAL_UM.

8. Among the files named OFFSET_HORIZONTAL_Z=000 look for the file in which the reconstructed circle is the most continuous (see right image) and write down the corresponding value OFFSET_HORIZONTAL_UM contained in the name of the file.

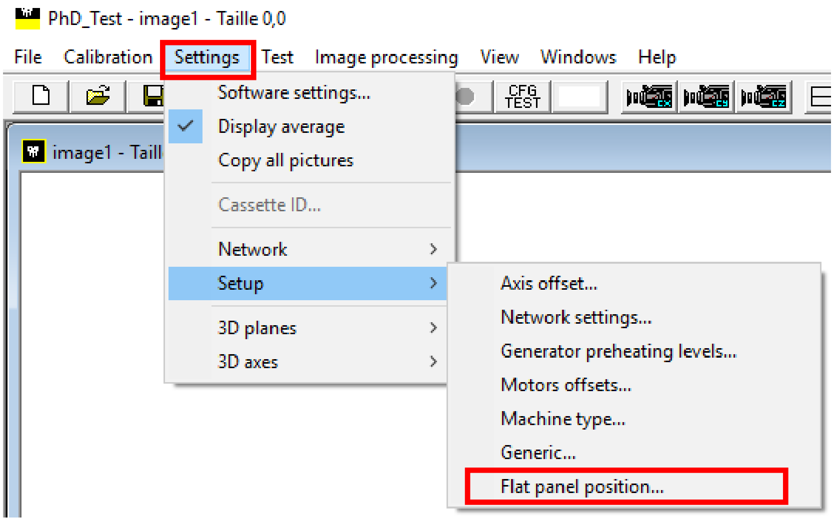
   *e.g.: OFFSET_HORIZONTAL_Z=000 - OFFSET_HORIZONTAL_UM=**600**.bmp*

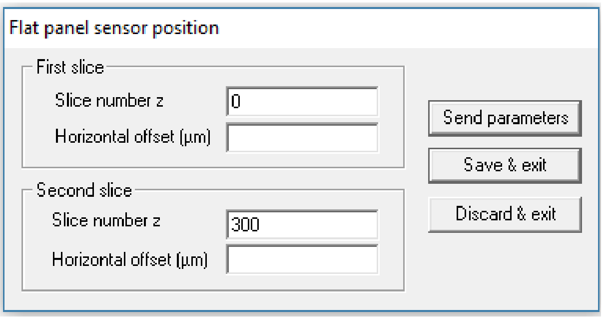
9. Repeat the operation for the files named OFFSET_HORIZONTAL_Z=300 and take note of the OFFSET_HORIZONTAL_UM value.

   *e.g.: OFFSET_HORIZONTAL_Z=000 - OFFSET_HORIZONTAL_UM=**800**.bmp*

10. In "PhD_C_Test" program go to menu "Settings" and select "Flat panel position".



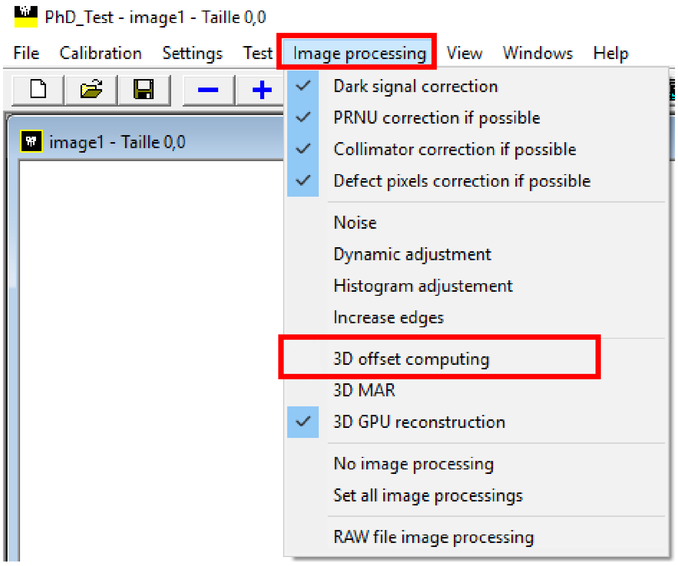
11. In the panel "First slice" insert the values Slice number z = 0 and Horizontal offset (µm) = HORIZONTAL_OFFSET_UM previously chosen for slice number 0. In the panel "Second slice" insert the values Slice number z = 300 and Horizontal offset (µm) = HORIZONTAL_OFFSET_UM previously chosen for slice number 300.



12. Click on "Send parameters".

13. Click on "Save & exit".

14. Disable in the menu "Image processing" the "3D offset computing" and reboot the I-Max 3D & I-Max CEPH 3D.



15. Verify that the offset is properly applied following the instructions at paragraph 9.6.3.

11.2.12. CEPH Axis alignment

Warning
All the following sub-paragraphs of this chapter are organized in checks and adjustments procedures.
Before making any adjustment (mechanical regulation or offsets modification), it's mandatory to ensure that the checks required by the previous sub-paragraphs are within the prescribed tolerances. If they are not in the tolerances, first perform the adjustments prescribed by the previous sub-paragraphs

Warning
If during the following paragraph an offsets adjustment is required:

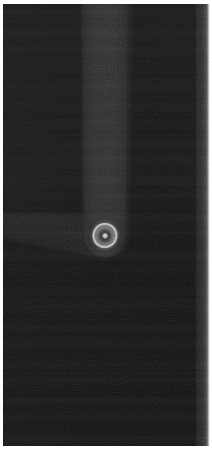
- refer to chapter "Machine configuration and setup" chapter 8.4
- After the changes update the paper copy of the equipment parameters table (supplied as paper copy with the unit documentation) with the new offset values (see Appendix A at paragraph 14)

11.2.12.1. CEPH ear rods adjustment

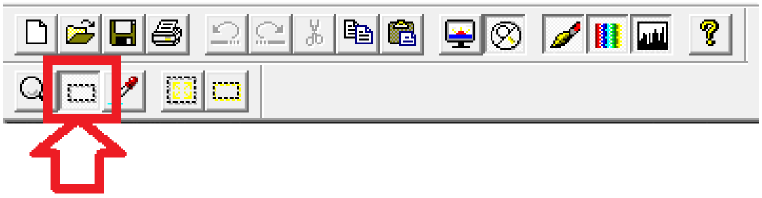
Checks

1. Rotate the CEPH head support in the lateral position
2. Open "PhD_C_Test.exe" service program
3. And select the following parameters:
   - Format: No collimator
   - Resolution: High
   - Param1: View of Primary collimator field
   - 70kV 8mA
4. In the image processing menu select: "Dynamic adjustment"

5. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure
6. Save the image as “Rods.bmp”



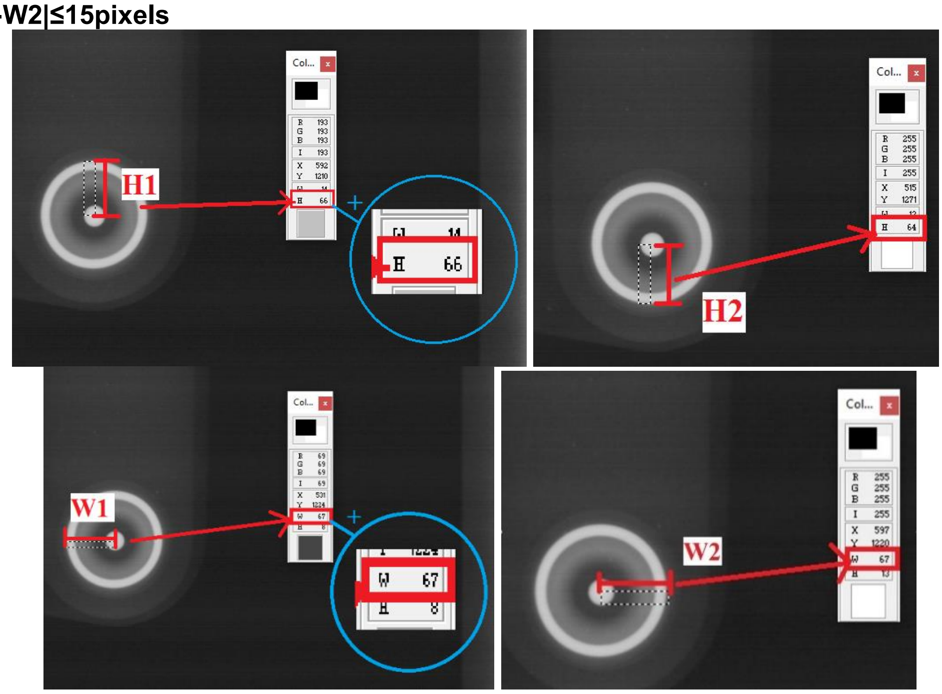
7. Open the image in  SyMage software application (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C\SyMage)
8. In the menu bar select the “Rectangle Selection” tool



9. Verify that the that the misalignment between the centres of the inner dot and the outer circle is not more than 15 pixel (0.099mm/pixel) both in vertical and horizontal directions:

   |H1-H2|≤15pixels

   |W1-W2|≤15pixels



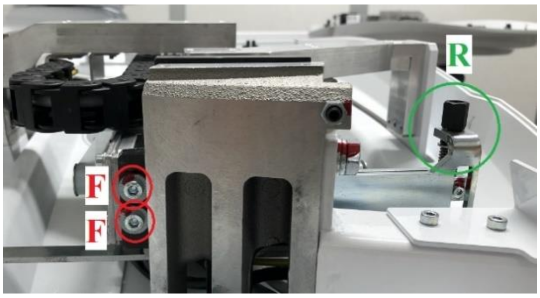
Adjustments

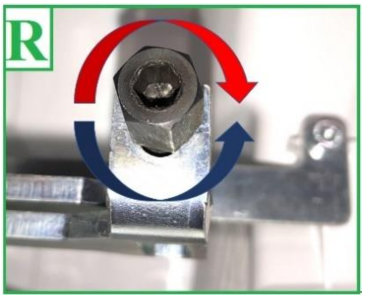
- **Vertical ear rods corrections:**

Warning
The vertical regulation of the ear rods will affect also the projection of the secondary collimator on image plane, which will vary the upper and lower not exposed borders position. Therefore after this adjustment repeat the tests images requested by paragraph 7.11

---

1. Remove the CEPH upper cover (refer to paragraph 7.3.3)
2. Lose the fixing screws F and act on regulation screw R according the table below
3. Tighten the fixing screws F and acquire again a check image
4. Iterate the procedure until the required tolerance on |H1-H2| measure is reached





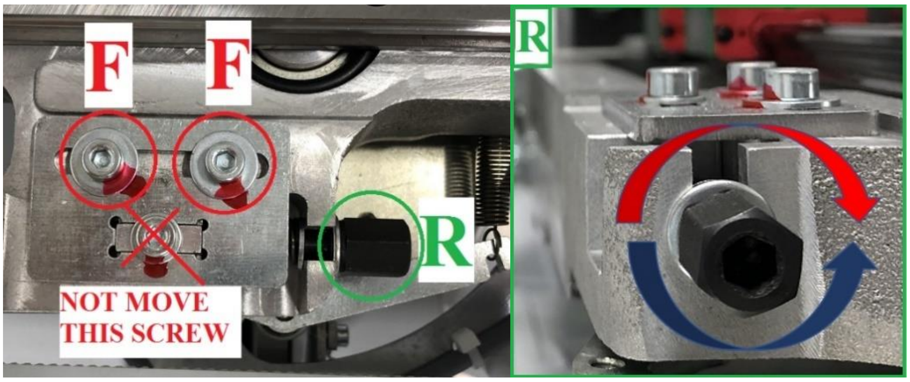
ACT of regulation screws	Effect on measure of H1-H2
R [clockwise]	INCREASE segment H1 on the acquired image, move RING UP
R [anti-clockwise]	DECREASE segment H1on the acquired image, move RING DOWN

<u>R screw turn-pixels “conversion”</u>
1 complete screw R turn→ add/remove 7 pixels to the measure of |H1-H2| on acquired image

<u>Furthers checks after the adjustment</u>
If the vertical regulation has been modified perform all the checks required by paragraph 7.11.

- **<u>Horizontal ear rods corrections:</u>**

1. Remove the CEPH upper cover (refer to paragraph 7.3.3)
2. Lose the fixing screws F and act on regulation screw R according the table below
3. Tighten the fixing screws F and acquire again a check image
4. Iterate the procedure until the required tolerances of |W1-W2| are reached.



ACT of regulation screws	Effect on measure of H1-H2
R [clockwise]	INCREASE segment W1 on the acquired image, move RING on the LEFT of the acquired image
R [anti-clockwise]	DECREASE segment W1 on the acquired image, move RING on the RIGHT of the acquired image

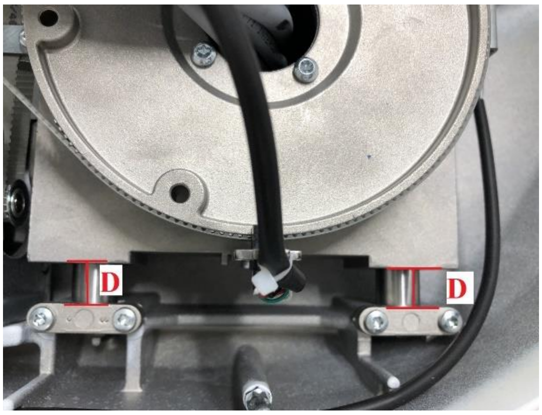
<u>R screw turn-pixels "conversion"</u>
1 complete screw R turn→ add/remove 14 pixels to the measure of |W1-W2| on acquired image

11.2.12.2. Y CEPH offset

<u>Checks</u>

1. Verify if the numerical value of the "Y CEPH offset" stored in the unit EEPROM memory (see paragraph 8.4) is the same one reported by the equipment parameters table (supplied as paper copy with the unit documentation). If it's not the same correct it.
2. Remove the unit upper covers (see paragraph 13.7), select a "CEPH" exam, prepare the unit to take a CEPH exam, once the unit is positioned and ready to make an exposure (green keyboard LED steady ON) and verify that the distance between the slide of the Y axis and the back run limits (D in the following figure) is:

   D=13mm± 2mm



Adjustments

> **Warning**
> The Y CEPH offsets regulations will affect the position of the projection of the primary collimator on the CEPH image plane. Therefore after the Y axis adjustment it's recommended to perform all the CEPH checks requested by the following paragraphs (in the exact numeric sequence).

If an adjustment is required modify the Y CEPH offset according to the following convention:

OFFSET	Effect on measure of segment D
Y CEPH [+]*	INCREASE the segment D length
Y CEPH [-]*	DECREASE the segment D length

*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.

Offset Conversion
1 offset ≃ 0.2mm measured on the Y axis

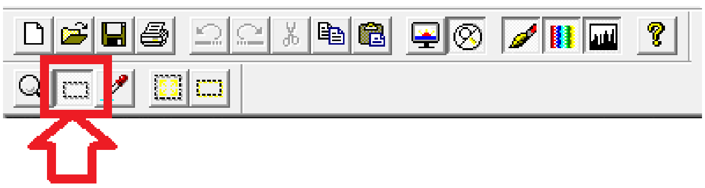
Furthers checks after the adjustment
If the offset has been modified perform all the checks of the following paragraphs following the numeric sequence.

11.2.12.3. Primary collimator W6-CEPH window

> **Warning**
> Before proceeding with following points perform the primary collimator alignment checks/adjustments requested by paragraph 11.2.10

Checks

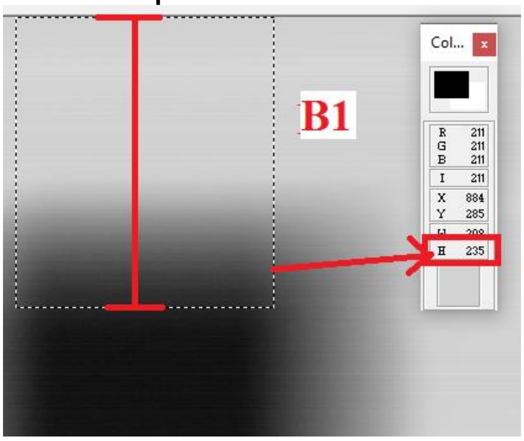
1. Rotate the CEPH head support in antero-posterior (AP) position
2. Open "PhD_C_Test.exe" service program
3. Select the following parameters:
    - Format: Height Custom
    - Resolution: High
    - Param1: View of Primary collimator field
    - 70kV 8mA
4. In the image processing menu select: "Dynamic adjustment"
5. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure
6. Save the image as "Primary custom.bmp"
7. Open the image in SyMage software application (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C\SyMage)
8. In the menu bar select the "Rectangle Selection" tool

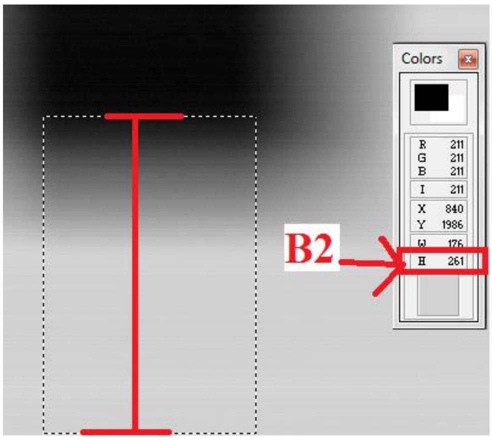


9. Verify that the that the upper (B1) and lower (B2) not exposed borders are (measured in High resolution 0.099mm/pixel):

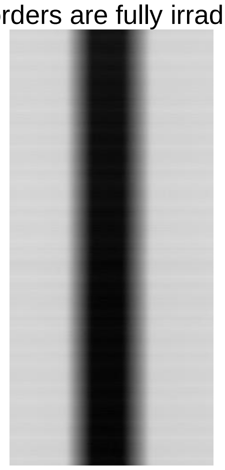
B1>210pixels

B1>210pixels





10. Select the following parameters:
    - Format: Height 24
    - Resolution: High
    - Param1: View of Primary collimator field
    - 70kV 8mA
11. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure
12. Save the image as “Primary-full.bmp”
13. Verify that the upper and lower borders are fully irradiated.



Adjustments

If the B1 and B2 measures are not in the prescribed tolerances and/or the upper and lower borders are of the Primary-fully.bmp image are not fully irradiated:

1. Enter the SET-UP mode, open “Unit setting configuration” window and select Collimator offsets” tab (refer to paragraph 8.4)
2. Adjust the W6-CEPH window “Vertical position – VO” and “Vertical width - VW ” according to the following conventions:

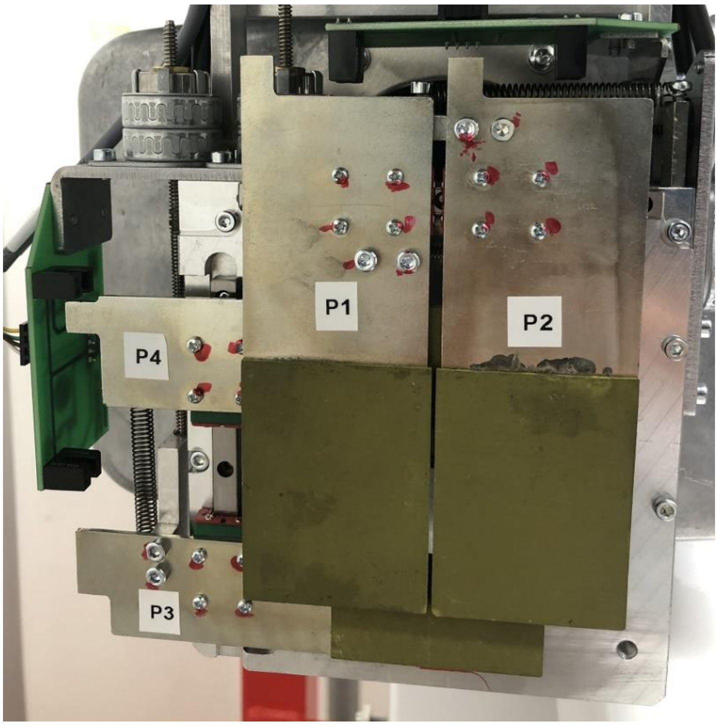
The **vertical position (VO)** offset allows to move the window towards the Top/Bottom border of the acquisition area without modifying the window height (P3 and P4 blades distance remains unchanged)

OFFSET	EFFECT ON ACQUIRED IMAGE (measure of B1 and B2)
VO [+]*	Move the collimator window DOWN Increase B1 and decrease B2 of the same distance
VO [-]*	Move the collimator window UP Decrease B1 and increase B2 of the same distance

The **vertical width (VW)** offset allows to increase/ decrease the collimator height by moving only the P3 collimation blade

OFFSET	EFFECT ON ACQUIRED IMAGE (measure of B1 and B2)
VW [+]*	REDUCE B2 by moving the P3 blade towards the bottom edge of the sensor acquired area without moving the P2 blade
VW [-]*	INCRESE B2 by moving the P3 blade towards the top edge of the sensor acquired area without moving the P4 blade

*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.



Primary collimator blades numbering

- **Pixel-Offset Conversion**

1 offset ≃ 6 pixel (0.099mm) if ID= “Centering CEPH” (Resolution= High)

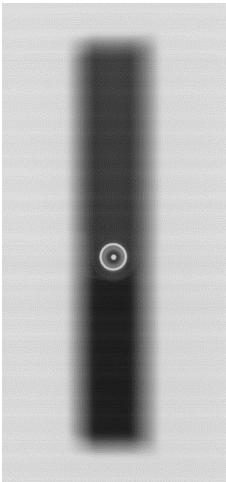
Note
After any changes to the offsets values, update the paper copy of the equipment parameters table (supplied as paper copy with the unit documentation) with the new offset values (see Appendix A paragraph 14)

Furthers checks after the adjustment
If the offset has been modified perform all the checks of the following paragraphs following the numeric sequence.

11.2.12.4. Rotation CEPH offset

Checks

1. Rotate the CEPH head support in the lateral position
2. Open "PhD_C_Test.exe" service program
3. Select the following parameters:
   - Format: Height Custom
   - Resolution: High
   - Param1: View of Primary collimator field
   - 70kV 8mA
4. In the image processing menu select: “Dynamic adjustment”
5. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure
6. Save the image as “Rotation.bmp”



7. Verify that the that the dot and ring projections are centred to the primary collimator beam

Adjustments

If the ring-dot are not centred to the primary X-ray beam perform the following procedures:

1. Verify if the numerical values of the "W6-CEPH window" collimator offsets "HO, HV,VO,VW" stored in the unit EEPROM memory (see paragraph 8.4) are the same ones reported by the equipment parameters table (supplied as paper copy with the unit documentation). If they are not the same correct them.
2. Verify if the numerical value of the "Rotation CEPH offset" stored in the unit EEPROM memory (see paragraph 8.4) is the same one reported by the equipment parameters table (supplied as paper copy with the unit documentation). If it's not the same correct it.

Warning
Before proceeding with following points perform the panoramic primary collimator alignment checks requested by paragraph 11.2.10.2.2)

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3. If an adjustment of the Rotation CEPH offset is required modify its values according to the following convention:

OFFSET	Effect on position of x-ray beam
Rotation CEPH [+]*	Move the X-ray beam on the RIGHT of the ear rods/ image
Rotation CEPH [-]*	Move the X-ray beam on the LEFT of the ear rods/ image

*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.

Offset Conversion
1 offset ≃ 37pixel (3.7mm) measured on the image (Resolution:High)

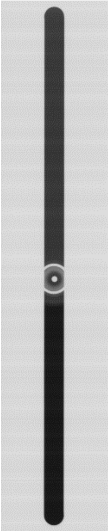
Furthers checks after the adjustment
If the offset has been modified perform all the checks of the following paragraphs following the numeric sequence.

11.2.12.5. Secondary collimator offset

Checks

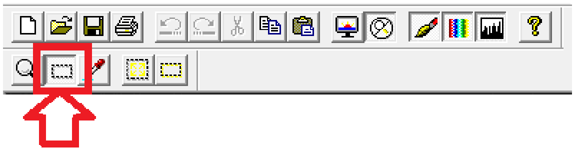
1. Rotate the CEPH head support in lateral position
2. Open "PhD_C_Test.exe" service program
3. Select the following parameters:
   - Format: Height 24
   - Resolution: High
   - Param1: View of sec. collimator field
   - 70kV 8mA
4. In the image processing menu select: "Dynamic adjustment"
5. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure

6. Save the image as “Secondary.bmp”

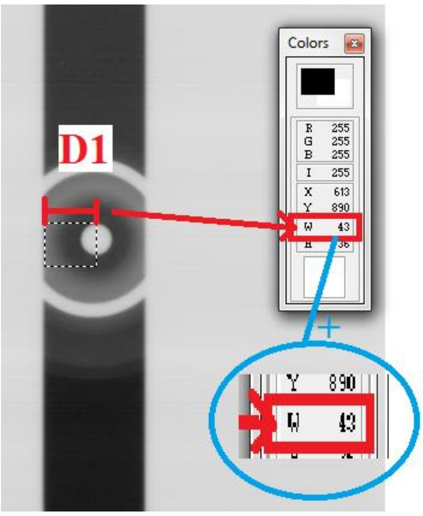


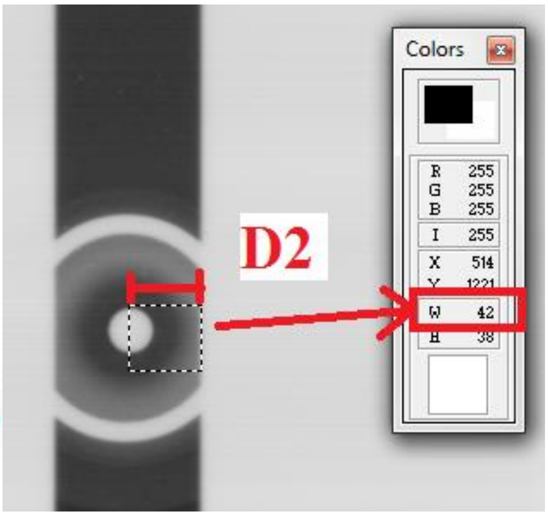
7. Open the image in  SyMage software application (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C\SyMage)

8. In the menu bar select the “Rectangle Selection” tool



9. Verify that the that the dot of the CEPH support is positioned in the center of the exposed area and the difference between D1 and D2 is in the following tolerance
|D1-D2| ≤ 4 pixels





Adjustments

If an adjustment is required modify the "Coll II" offset according to the following convention:

OFFSET	Effect on measure of segments D1 and D2
Coll II [+]*	INCREASE the segment D1 length on the image
Coll II [-]*	DECREASE the segment D1 length on the image

*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.

Offset Conversion
1 offset ≃ 3 pixel of shift of the secondary collimator position measured on the acquired image

Furthers checks after the adjustment
If the offset has been modified perform the checks/adjustments required by "Sensor CEPH offset" chapter 11.2.12.6.

11.2.12.6. Sensor CEPH offset

Checks

1. Rotate the CEPH head support in lateral position
2. Open "PhD_C_Test.exe" service program
3. Select the following parameters:
   - Format: Height 24
   - Resolution: High
   - Param1: Static acquisition centred
   - 70kV 8mA
   - 300ms
4. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure
5. Save the image as "Static-ceph.bmp"

6. Take an X-ray emission and verify that:

- **There aren't not exposed borders on the sides of the acquired area (on the right and left)**
- **The dot of the CEPH patient support is centred to the sensor area**

Adjustments

If an adjustment is required modify the "Sens CEPH" offset according to the following convention:

OFFSET	Effect on the image acquisition (position of projections of dot and secondary collimator)
Sens CEPH [+]*	Move the dot/Ring the LEFT of the image; Remove a not exposed edge on the LEFT of the image
Sens CEPH [-]*	Move the dot/Ring the RIGHT of the image; Remove a not exposed edge on the RIGTH of the image

*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.

Offset Conversion
1 offset ≃ 2 pixel of shift of the secondary collimator position measured on the acquired image

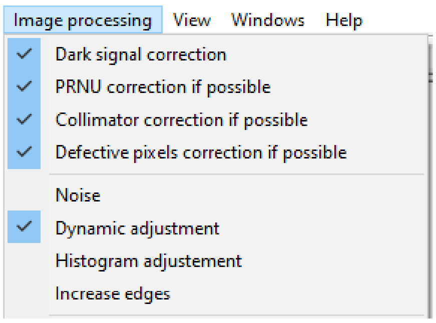
Furthers checks after the adjustment
If the offset has been modified perform the checks required by "Verification of CEPH function" chapter 7.11

11.2.12.7. Secondary collimator – CEPH Sensor tilting check and adjustment

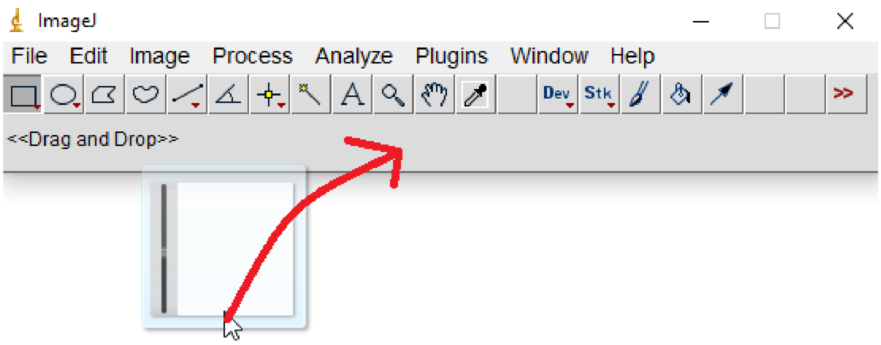
A not perfect parallelism between the secondary collimator and the sensor acquisition area may cause slight lines along the whole or partial height of the image similar to those reported in the paragraph 11.2.13

Checks

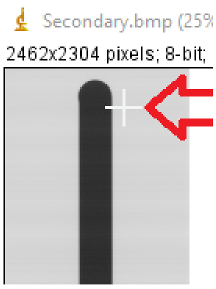
1. Open PhD_C_Test (technical Tool) service program
2. Wait the unit connection
3. Select the following exam: o Exam ID: CEPH
   - Format: No collimator
   - Resolution: High
   - Param 1: View of sec. collimator field
   - kV: 70
   - mA:8
4. Verify that the Image processing options selected are like the following:



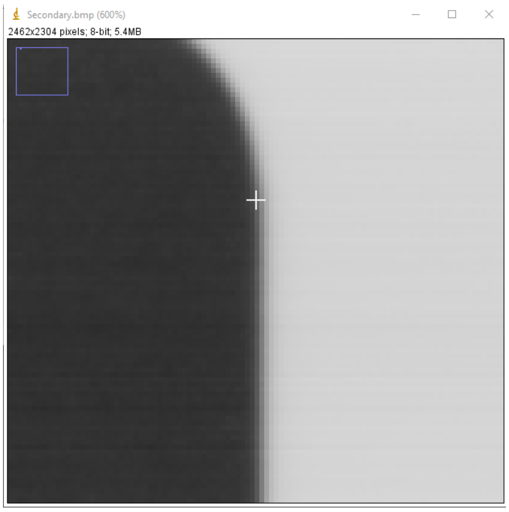
5. Prepare the unit to acquire the above selected image
6. Acquire the image and save it as “Secondary.bmp”
7. Run ImageJ software (download it from Internet: e.g. http://wsr.imagej.net/distros/win/ij153-win-java8.zip)
8. Import (drag and drop) the CephHigh.bmp image in the ImageJ bar.



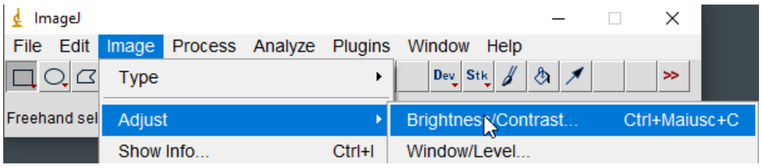
9. With the mouse cursor point the top irradiated area of the secondary collimator projection



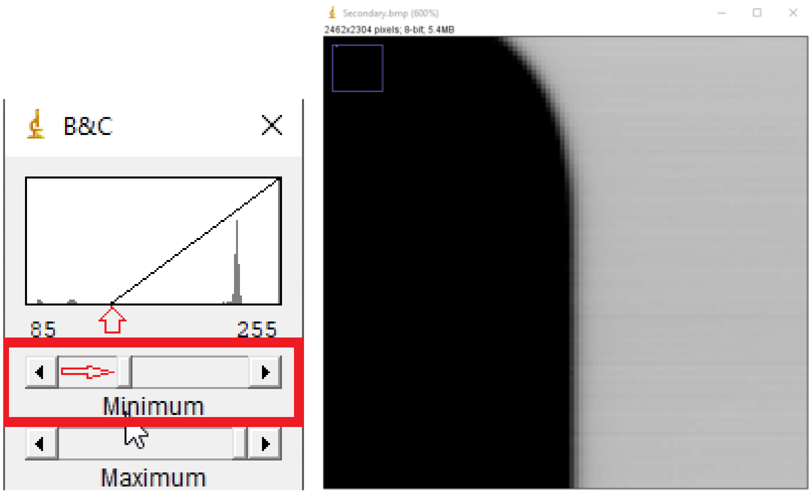
10. Zoom-in on the left edge by pressing “+” on the keyboard



11. Click on Image→Adjust and open the Brightness/Contrast… tool

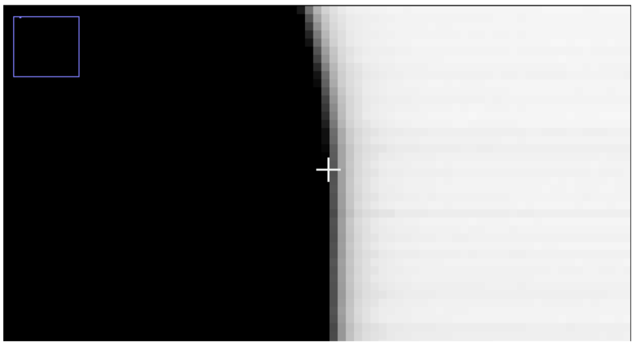


12. Adjust the “Minimum” level with the cursors, in order to enhance the contrast of the edge and obtain and image where the edge between the irradiated and the collimated areas are clearly defined

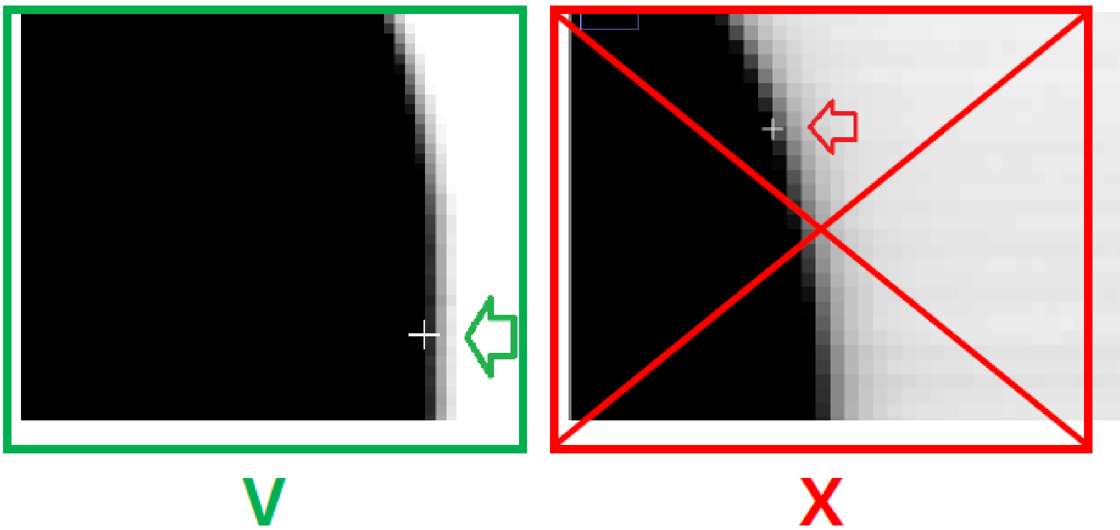


13. Select the straight-line tool in the ImageJ tool set

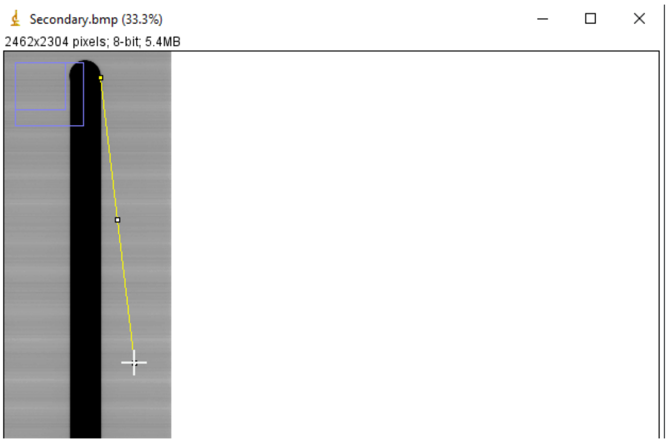
14. With the cursor point the edge of the secondary collimator



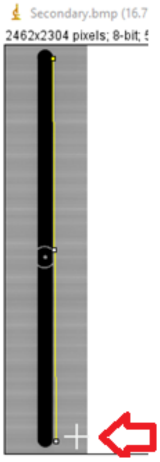
Note. Rel ease the cursor on the straight part of the secondary collimator shadow and not close the circular edge.



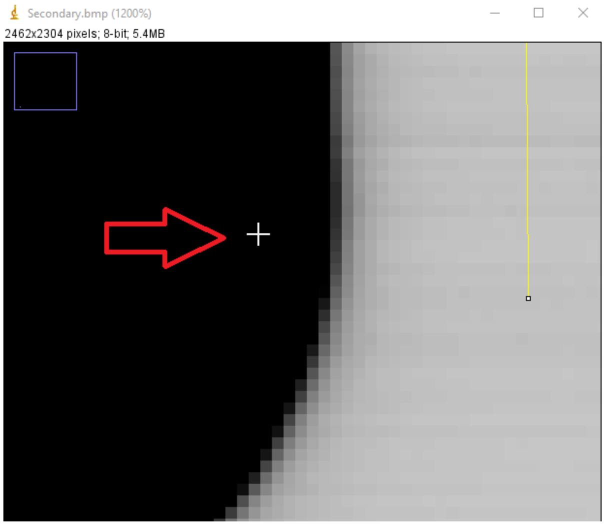
15. While the cursor is in this exact position, click with the mouse and keeping the left mouse button pressed press the keyboard button “-” in order to zoom-out the image



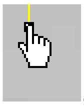
16. Keeping the left mouse button pressed, place the cursor close to the bottom right edge of the secondary collimator shadow and release the mouse button Note. The cursor has to be close to the bottom edge not in the exact position



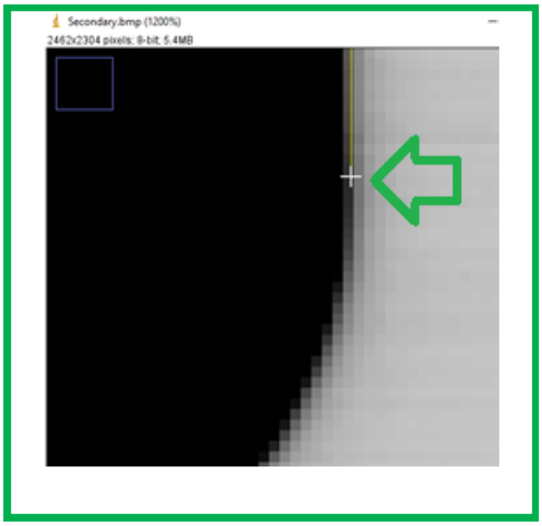
17. Place the cursor (do not click with the mouse) close to the bottom edge of the secondary collimator and then press the keyboard button “+” in order to zoom-in this image area

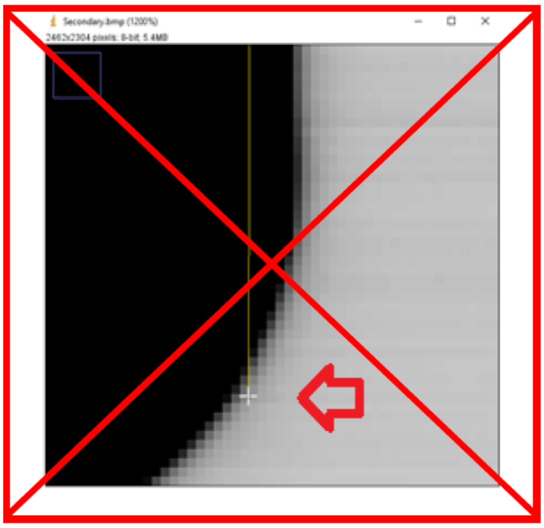


18. Place the cursor on the white box under the yellows straight line

19. When the hand symbol appears , press the left mouse button and keeping it pressed place the cursor on the exact position of the bottom edge of the secondary collimator shadow.

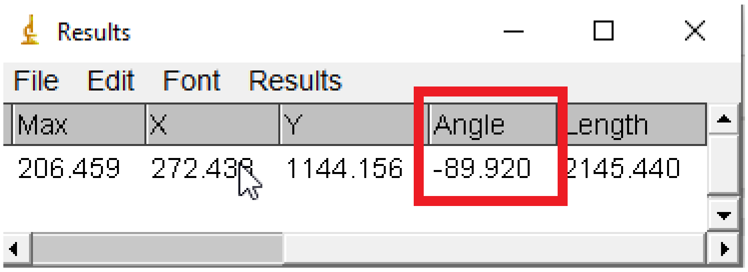
    Note. Release the cursor on the straight part of the secondary collimator shadow and not close the circular edge.





V X

20. Verify the tilting angle of the secondary collimator by pressing Ctrl+M on the keyboard. The angle will be displayed in the ImageJ "Result" window under the column named "Angle"



21. Verify that the secondary collimator- CEPH sensor relative Angle (measured above) is within the following tolerance

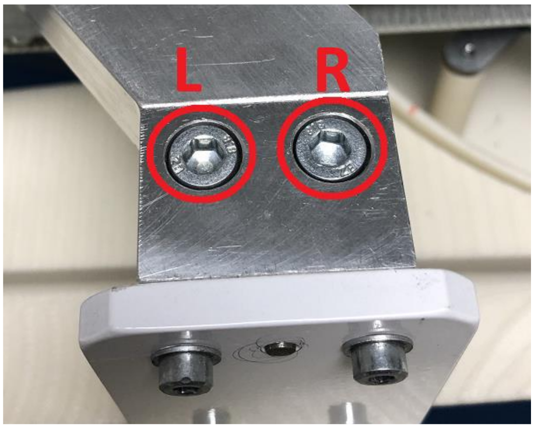
<table><tr><td>Tolerance</td><td>|Angle|=90° ±0.1°</td></tr></table>

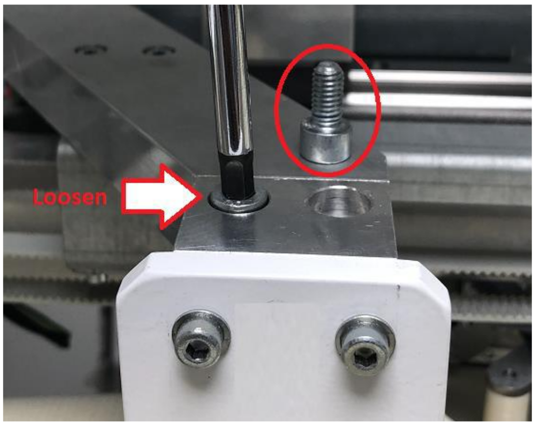
Adjustments

If the measured angle is out of the prescribed tolerances, the mechanical tilting of the secondary collimator has to be corrected as described below:

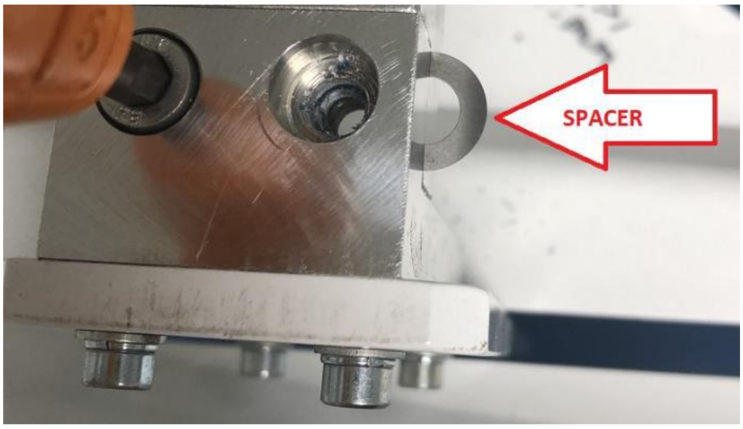
1. Open the CEPH group top cover
2. Completely unscrew the screw on the side where the spacers-washers must be added according to the conventions reported by Table 1 below (right screw-R or left screw-L) and loosen the screw on the other side

Note
The following images will report only the case in which the washers has to be added to the right(R) side of the secondary collimator (case |Angle|<90°), operate on the opposite side if the measure angle does not fit this specific case as prescribed by Table 1



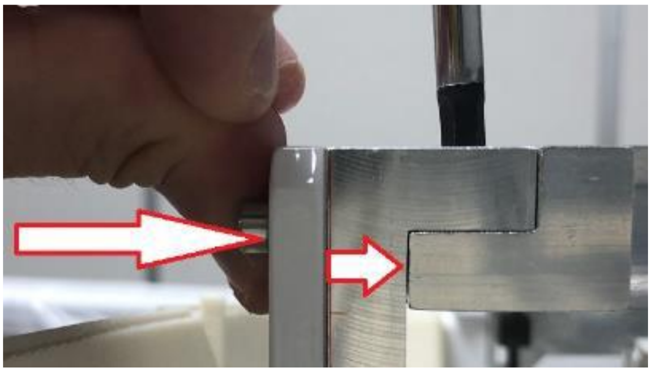


3. Insert the spacers washers in the required side

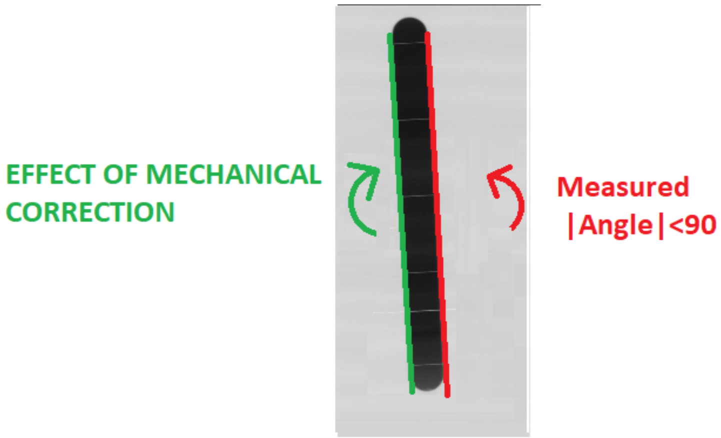
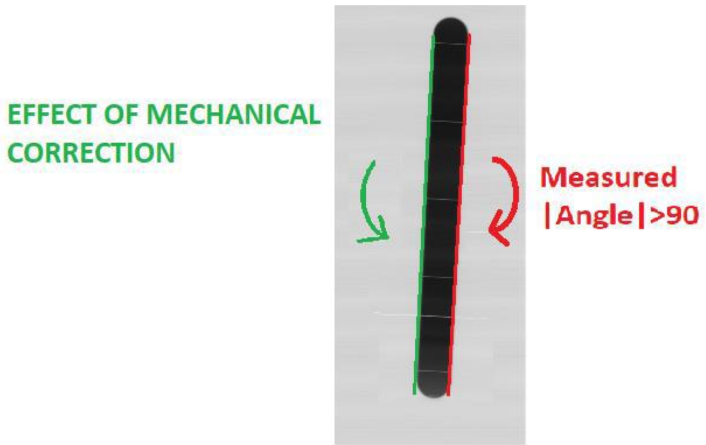


4. Using a thin tool, align the washers holes to the screw hole

5. Insert the removed screw
6. Tighten both the screws taking care to recover the mechanical play in the direction indicated in the following image



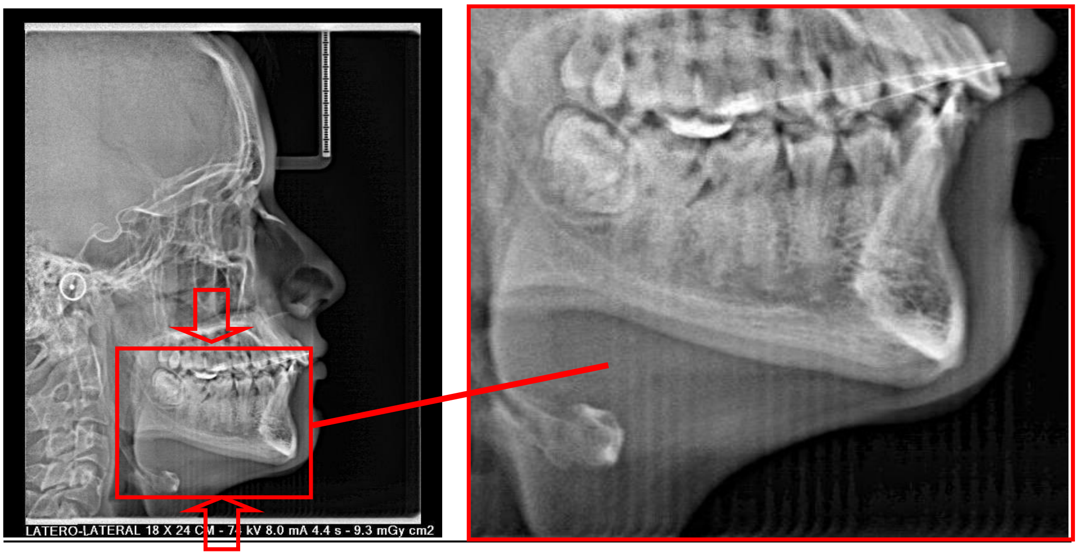
7. Iterate the process in order to verify the effectiveness of the correction.
8. Once the measured angle is within the prescribed tolerance verify the absence of vertical lines on CEPH images following the vertical line correction procedures (see paragraph 11.2.13)

Secondary Collimator tilting correction	
ADDED SPACERS POSITION	**EFFECT OF THE SECONDARY COLLIMATOR TILTING MECHANICAL CORRECTION ON ACQUIRED IMAGE**
Insert the washers spacers on the **RIGHT** of the Secodary collimator 	**INCREASE** the absolute value of the measured |Angle| 
Insert the washers spacers on the **LEFT** of the Secondary collimator 	**REDUCE** the absolute value of the measured |Angle| 
Spacers width- **Angle conversion**	0.1mm washer spacer ≈ 0.16° 0.05mm washer spacer≈0.08°

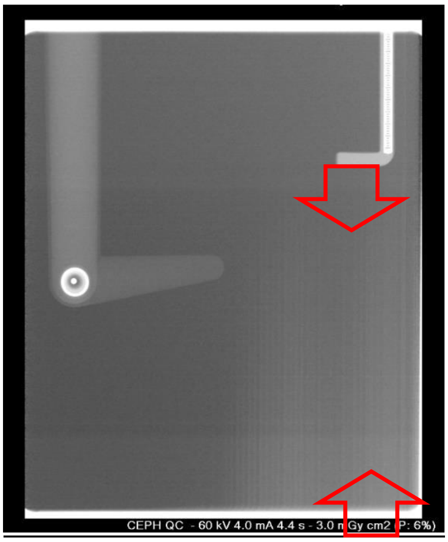
11.2.13. How to remove slight vertical lines on HD and HS CEPH images

After the final installation, some units present slight vertical lines on CEPH images like the ones reported in the following example:

Patient Acquisition



QC CEPH Acquisition



CORRECTION:

Note1. Since the HS (High Speed, Normal Resolution) offsets are based on HD (High Definition, High Resolution) set of offsets, it is recommended to adjust/verify first the HD images before performing the HS- Vertical Lines check and adjustment

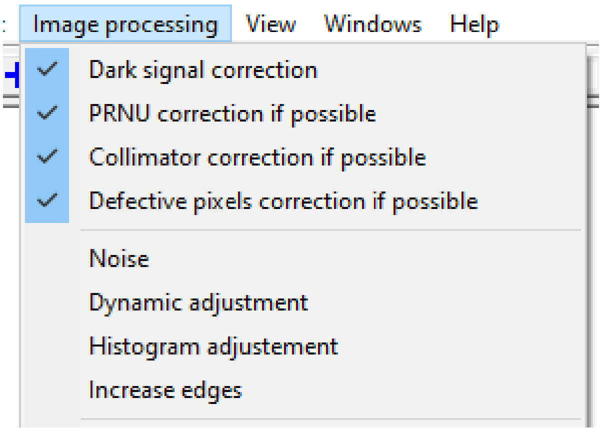
HD High Definition-Vertical Lines

Before performing this procedure make sure that:

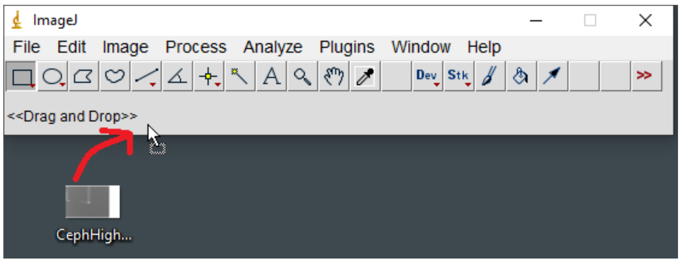
- Primary collimator is well aligned to the hear rods (see “Rotation CEPH offset” checks paragraph 11.2.12.4)

Checks

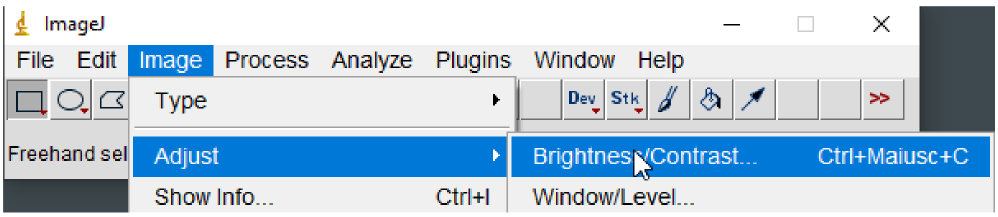
1. 1Open PhD_C_Test (technical Tool) service program
2. Wait the unit connection
3. Select the following exam:
   - Exam ID: CEPH
   - Format: 30x24 LL
   - Resolution: High
   - kV: 60
   - mA:2.2
4. Verify that the Image processing options selected are like the following:



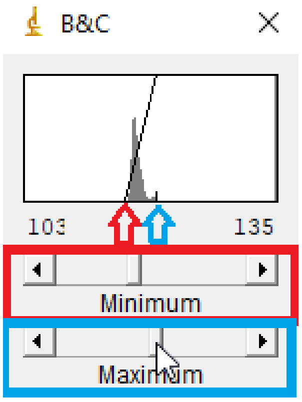
5. Place the unit ear rods in LL position and prepare the unit to acquire the above image
6. Acquire the image and save it as “CephHigh.bmp”
7. Run ImageJ software (download it from Internet: e.g. http://wsr.imagej.net/distros/win/ij153-win-java8.zip)
8. Import (drag and drop) the CephHigh.bmp image in the ImageJ bar.



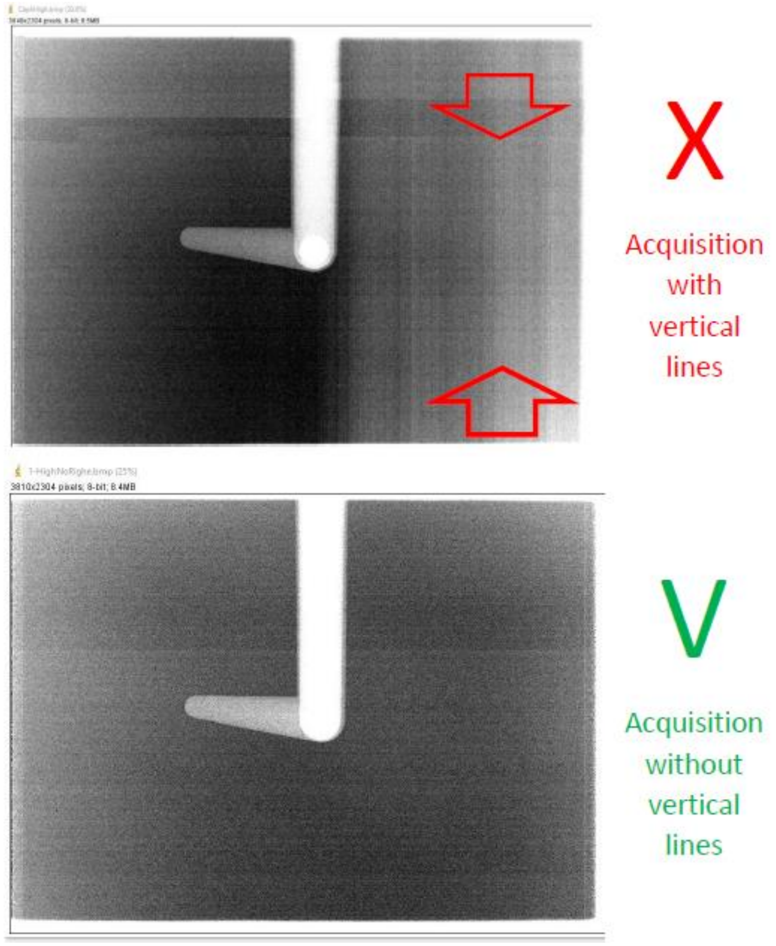
9. Click on Image→Adjust and open the Brightness/Contrast… tool



10. Adjust the “Minimum” and “Maximum” levels with the cursors, in order to fit the minimum and maximum components of the peak displayed in the histogram reported in the B&C window, as reported in the following image.

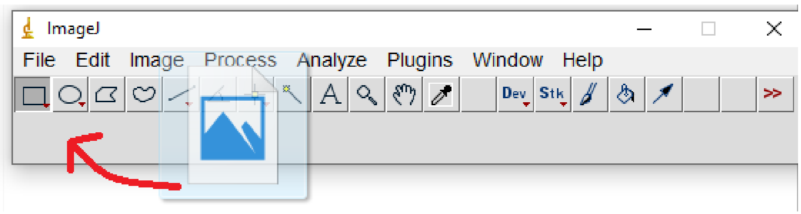


11. Verify if in the acquired image are present vertical lines and where they are located

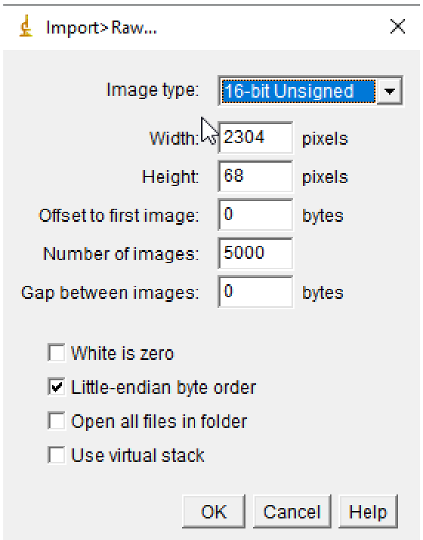


12. If in the acquisition are present vertical lines like the ones displayed in the above images open the raw files in ImageJ as explained in the following points:

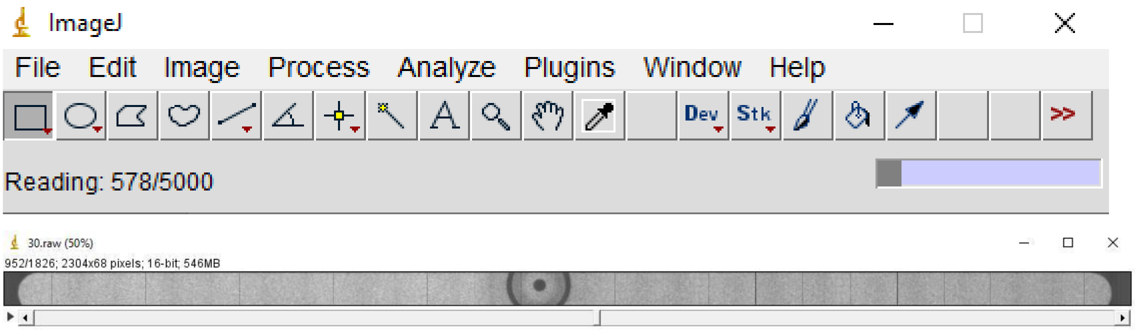
- Go to C:\ProgramData\OWANDY\PANORAMIC PHD_C\AcquisitionSave
- Select and open the folder of the last acquisition, e.g. The folder named 2019-09-13 16h-56m-15s, is the folder of the acquisition of the 13th September 2019 at 4:56pm and 15secods.
- Import (drag and drop) the “30.raw” file in the ImageJ bar.



- In the ImageJ “Import>Raw…” window set the following settings and then press OK

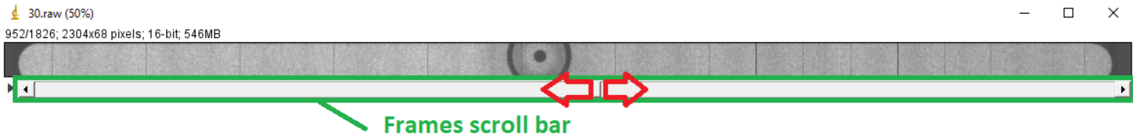


- Wait for the end of the uploading process

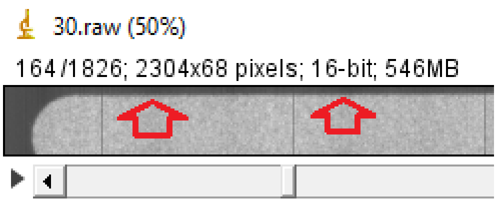
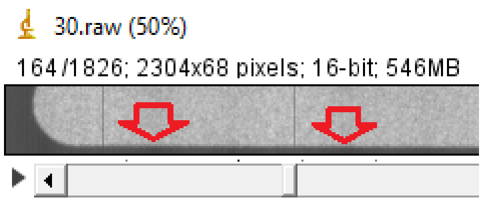


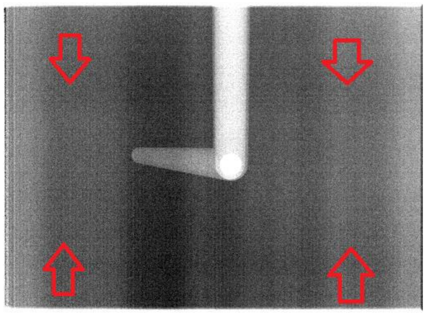
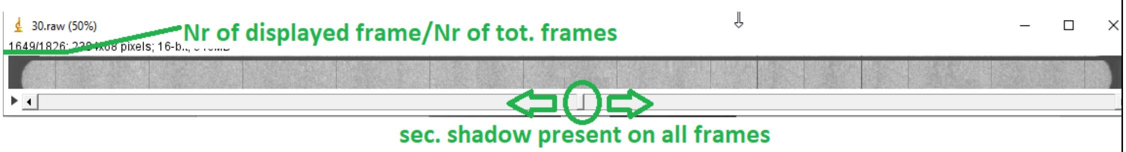
Note
In case the displayed frames are not well visible like the image above (too dark or too light) adjust the bright and contrast levels as explained at points 9 and 10 of this paragraph.

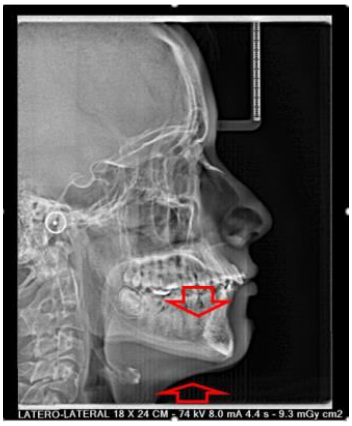
13. Scroll the frames bar from the left to the right to identify the frames where the secondary collimator shadow enters the sensor acquisition area

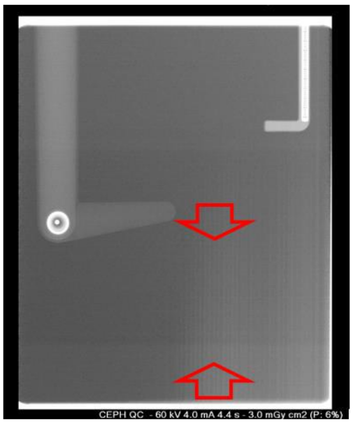


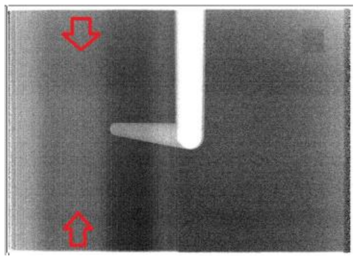
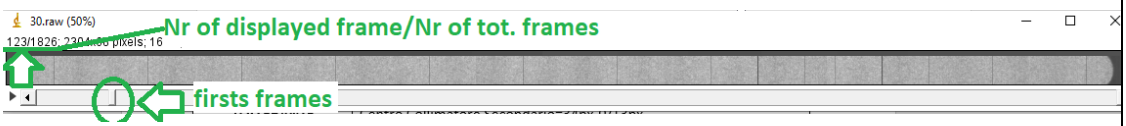
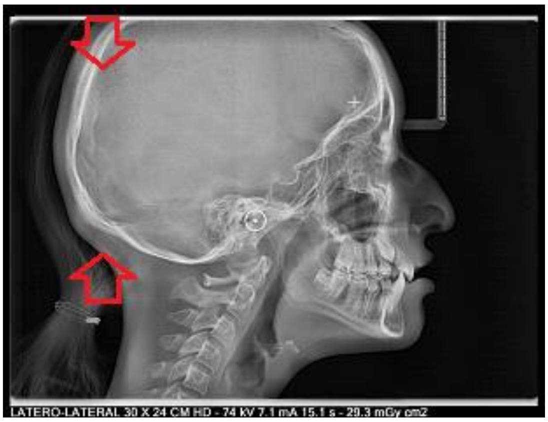
The secondary collimator shadow can enter in the sensor acquisition area from the top or bottom border of the frame.

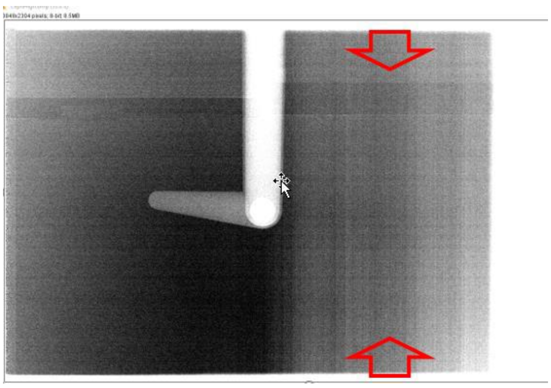
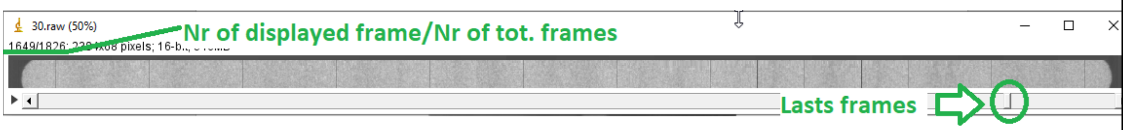
<table>
<tr><th>Shadow on top frame border</th><th>Shadow on bottom frame border</th></tr>
<tr><td></td><td></td></tr>
</table>

<table>
<tr><td>NOTE</td><td>In some cases the vertical lines may be present only on one side of the image. In these cases if the vertical lines on the final image are noticed only on the first part of the image acquisition (patient nose side) the secondary collimator shadows has to be searched in the first frames otherwise if the vertical lines are located in the end of image acquisition (back of patient head side) the secondary collimator shadow has to be searched in the lasts frames.</td></tr>
<tr><td colspan="2">Examples of vertical lines on whole image acquisition</td></tr>
<tr><td colspan="2">
PhD_C_Test (technical Tool) 30x24LL Acquisition</td></tr>
<tr><td colspan="2"></td></tr>
</table>

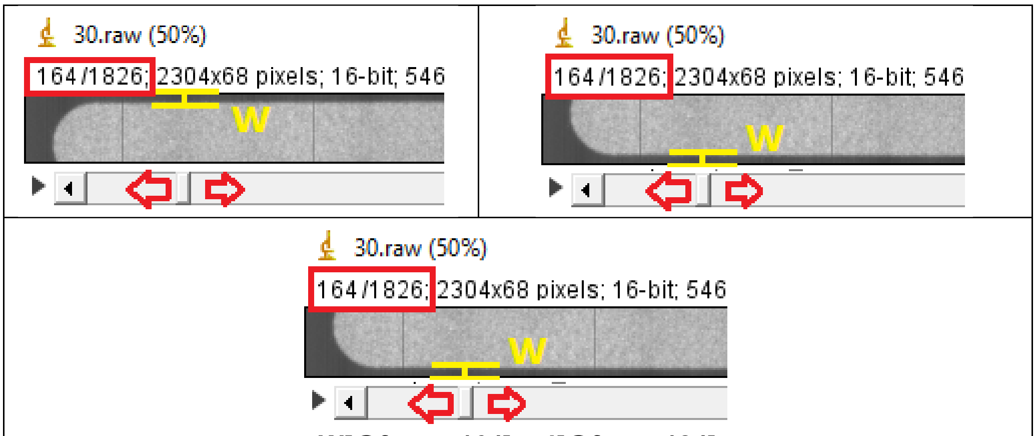
<table>
<tr><td colspan="3">Examples of vertical lines on first part of the acquired image (patient nose side)</td></tr>
<tr>
<td>

Patient QuickVision acquisition</td>
<td>

QC CEPH QuickVison acquisition</td>
<td>
PhD_C_Test (technical Tool) 30x24LL Acquisition</td>
</tr>
<tr><td colspan="3">
</td></tr>
<tr><td colspan="3">Examples of vertical lines on the end part of the acquired image (back side of patient head)</td></tr>
<tr>
<td>

Patient QuickVision acquisition</td>
<td colspan="2">
PhD_C_Test (technical Tool) 30x24LL Acquisition</td>
</tr>
<tr><td colspan="3">
</td></tr>
</table>

14. Zoom-in (press “+” on keyboard) in order to maximise the shadow view and scroll the frames with the scrolling bar in order to identify the frame where the shadow width (segment “W”) is larger.

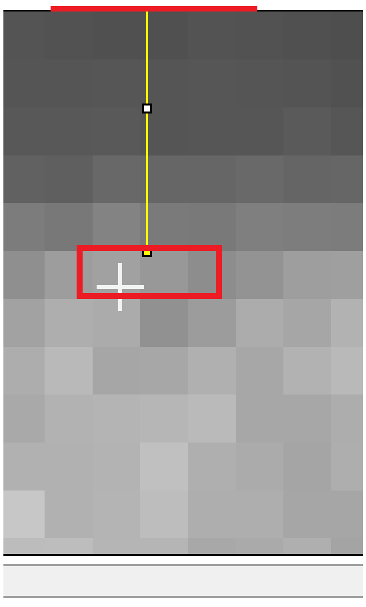


W[@frame 164]>w’[@frame184]

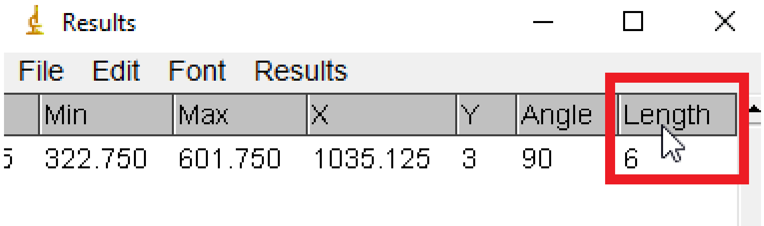
Eg. In the above example the frame where the shadow width is larger is the frame number 164

15. Select the frame in which the shadow width is larger
16. Select the straight-line tool in the ImageJ tool set

17. Draw a straight line (LEFT click and press SHIFT ⇧) between the first pixel well irradiated area and the closer border (top or bottom border, depending on shadow position) of the frame area

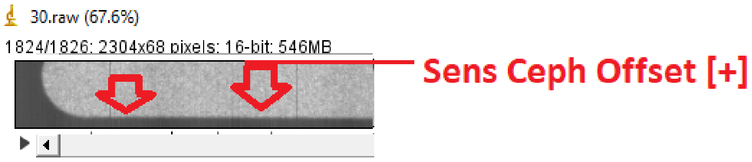
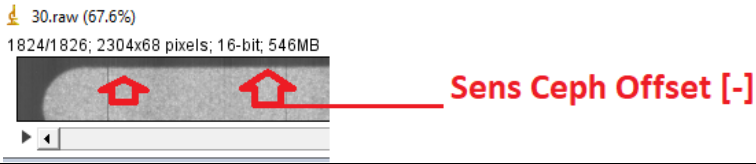


18. Verify the line length by pressing Ctrl+M on the keyboard. The length (expressed in pixel) will be displayed in the ImageJ “Result” window under the column named “Length”

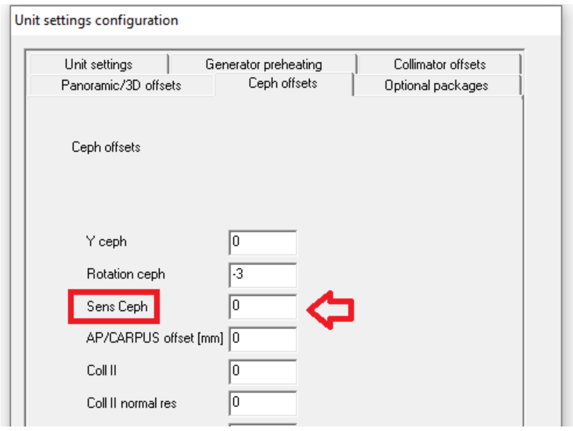


Adjustments

Minimize the secondary collimator shadow on the frame, changing the Sens CEPH offset value following the criteria reported in the following table:

HD-Vertical Lines correction	
OFFSET	**EFFECT ON ACQUIRED FRAME**
Sens CEPH [+]*	Reduce the secondary collimator shadow if it is located on BOTTOM side of the frame 
Sens CEPH [-]*	Reduce the secondary collimator shadow if it is located on TOP side of the frame 
Pixel Offset Conversion	1 Offset Step = 2 pixel

**Note: The symbols [+] and [-] indicate respectively to increase and decrease the offset value already stored in the Unit Setting configuration window:*



Iterate the process in order to verify the effectiveness of the correction.

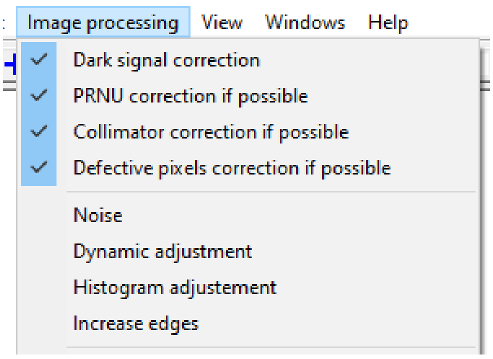
If It is not possible to correct the lines with the adjustment of the Sens CEPH offset, **verify the secondary collimator-sensor parallelism** (see paragraph 11.2.12.7) and then repeat this procedure.

HS High Speed-Vertical Lines

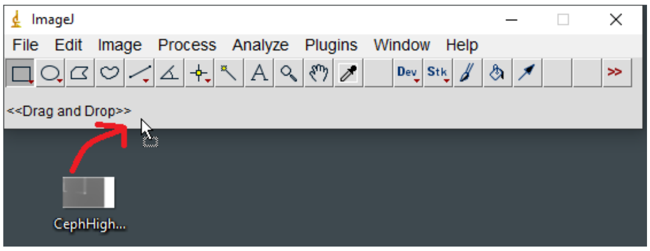
Checks

Note
Since the HS (High Speed, Normal Resolution) offsets are based on HD (High Definition, High Resolution) set of offsets, it is recommended to adjust/verify first the HD images before performing the HS- Vertical Lines check and adjustment

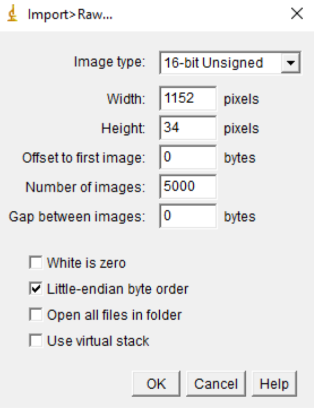
1. Open PhD_C_Test (technical Tool) service program
2. Wait the unit connection
3. Select the following exam:
   - Exam ID: CEPH
   - Format: 30x24 LL
   - Resolution: Normal
   - kV: 60
   - mA:2.2
4. Verify that the Image processing options selected are like the following:



5. Place the unit ear rods in LL position and prepare the unit to acquire the above image
6. Acquire the image and save it as “CephNormal.bmp”
7. Run ImageJ software (download it from Internet: e.g. http://wsr.imagej.net/distros/win/ij153-win-java8.zip)
8. Import (drag and drop) the CephNormal.bmp image in the ImageJ bar

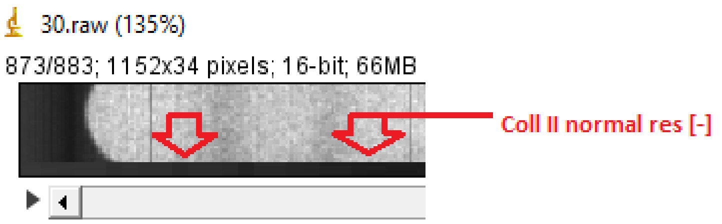
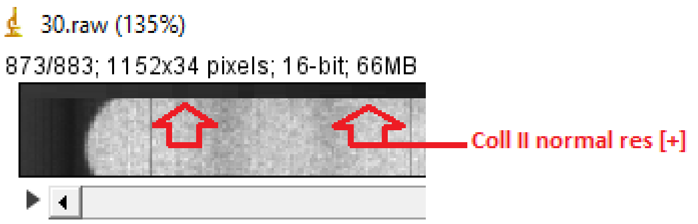


9. Perform the steps of the “HD High Definition-Vertical Lines -checks-” from step 10 to 18 using the following setting in the “Import>Raw…” window instead of the values reported by step 12 of the HD procedure.

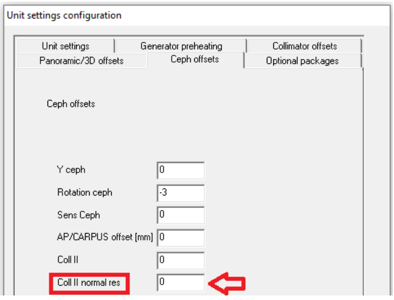


Adjustments

Minimize the secondary collimator shadow on the frame following the criteria reported in the following table:

HS-Vertical Lines correction	
OFFSET	**EFFECT ON ACQUIRED FRAME**
Coll II normal res [-]*	Reduce the secondary collimator shadow if it is located on BOTTOM side of the frame 
Coll II normal res [+]*	Reduce the secondary collimator shadow if it is located on TOP side of the frame 
Pixel Offset Conversion	1 Offset Step = 1 pixel

**Note: The symbols [+] and [-] indicate respectively to increase and decrease the offset value already stored in the Unit Setting configuration window:*



11.3. Parts replacement

11.3.1. Fuses replacement

Before replacing fuses, turn the unit OFF and disconnect it from the mains (by turning OFF the mains power supply breaker dedicated to the unit).
Replace the broken fuse with one of the same specification.

11.3.1.1. Main fuses

The main fuses F1 and F2 are located on the top side of the unit.
The fuse F1 cuts the mains supplied to the switching power supply (G1) in case of overcurrent.
The fuse F2 cuts the mains supplied to the motor column driver (G2) in case of overcurrent.

Fuses type:

- F1: 6.3x32 F fuse. Refer to chapter 5 - Technical Characteristics - for the value
- F2: 6.3x32 F fuse. Refer to chapter 5 - Technical Characteristics - for the value.

11.3.1.2. MCU board (A1) fuse

The MCU board fuse F1, in case of overcurrent, cuts the 24V supplied to the motors (M3, M4, M5, M6).

Note
It does not cut the 24V supplied to the 3D sensor power board (A10).

Fuse type: 2 A FF (125V)

Refer to chapter 12 – drawing 2 - for fuse position.

11.3.1.3. Generator board (A2) fuse

The Generator board fuse F1, in case of overcurrent, cuts the Generator board main power supply.

Fuse type: 1 A T (250V) TR5

Refer to chapter 12 – drawing 3 - for fuse position.

11.3.1.4. 3D Power sensor board (A10) fuse

The 3D Power sensor board fuse cuts the 8-9V supplied by the board A10 to the 3D sensor in case of overcurrent.

Fuse Type: 2 A FF (125V)

Refer to chapter 12 – drawing 4 - for fuse position.

11.3.2. MCU board replacement

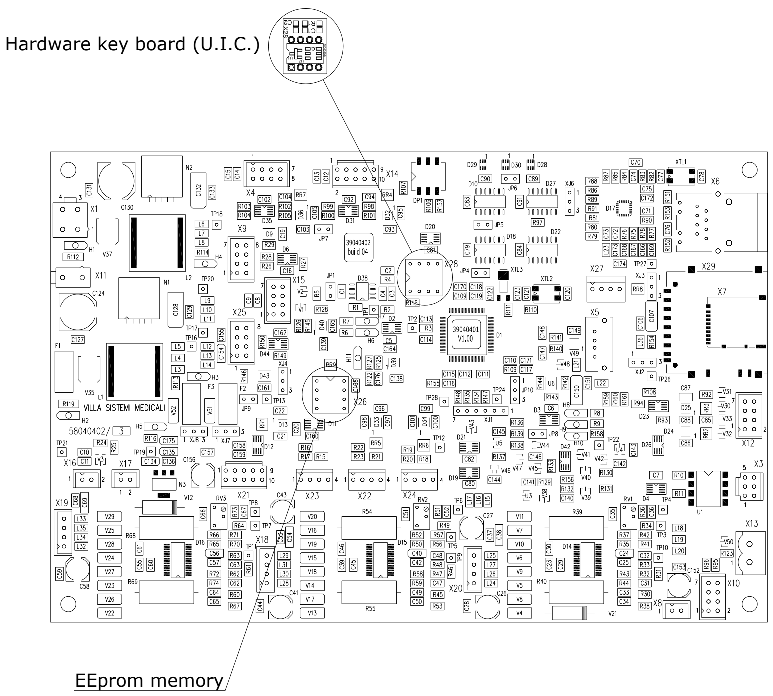
Warning
The board shipped as replacement carries the Hardware key and the EEPROM not configured.

To make the system working, the Hardware key must be retrieved from the failed board and positioned on the new board. This component includes the U.I.C. (Unique Identification Code) which determines the enabling codes for the radiological exams.

Moreover on the EEPROM the system configuration data are stored; remove the EEPROM from the new board and replace it with the one present on the failed board. In case the old EEPROM was not functioning, it will be necessary to mount the not configured EEPROM and restore manually the configuration data present on the equipment parameters table supplied with the Service Manual following the procedure present on chapter 8 - "Service programs description".

If you have a plug on the X9 connector, remove it and plug in it to the new board.

Note
At the end of the replacement, restore the metallic cover and the ground connection. Both parts has to be recovered from failed board.



11.3.3. A11 CCU board replacement (only for I-Max CEPH 3D)

Replacement of this board doesn’t require any adjustment. Take care of cable connections.

In case of replacement of CCU board rev.0 with a CCU board with rev.≥1, remove the blue protection cable on X58 connector.

11.3.4. A2 Generator board replacement

Replacement of this board doesn’t require any adjustment. Take care of cable connections
Refer to par. 11.3.9 steps 1-4 for more information.

Note
If the I-Max 3D has to be raised or lowered from its current position:

- turn the I-Max 3D off:
- disconnect the cable X31 from the generator board
- place the dip switches in demo mode ON-OFF-ON (see paragraph 4.2.4.1)
- • Turn ON the device and move it up or down

11.3.5. A12 Collimator driver board replacement (only for I-Max CEPH 3D)

Replacement of this board doesn’t require any adjustment. Take care of cable connections.

11.3.6. A13 CEPH driver board replacement (only for I-Max CEPH 3D)

Replacement of this board doesn’t require any adjustment. Take care of cable connections

11.3.7. A14 CEPH sensor board replacement (only for I-Max CEPH 3D)

Replacement of this board doesn’t require any adjustment. Take care of cable connections

11.3.8. CEPH sensor replacement (only for I-Max CEPH 3D)

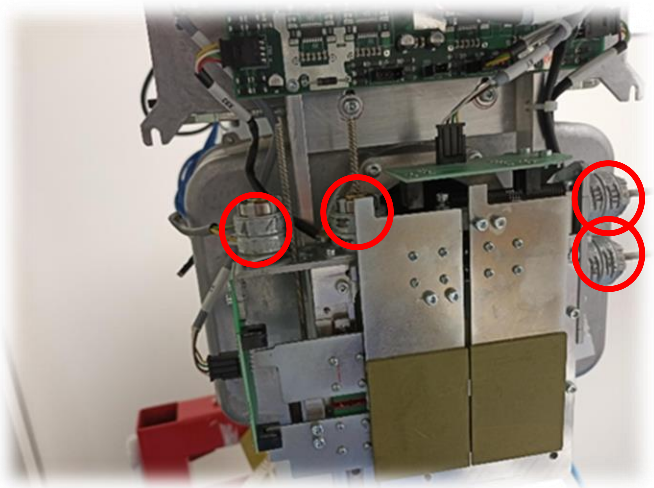
Once replaced the CEPH sensor, make a complete centering check as described in par. 7.9

11.3.9. Four Blades Collimator motors replacement

To replace single motors of the four blades collimator, refer to the XMP-IM-XGA 4 BLADE MOTOR REPLACEMENT KIT (spare parts code 6604060700).
The kit contains the following components:

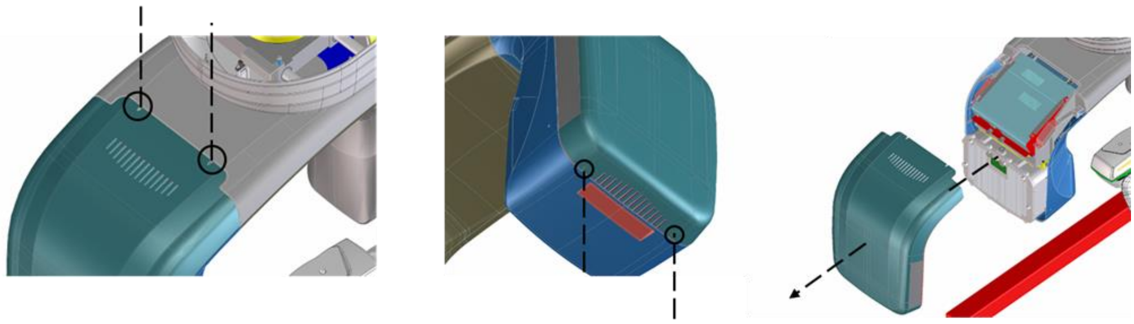
- 4 Blade Collimator Motor Cabled3 (code 6204060300)
- Datab. Label 20x36,5 mmDAT- (code 2300925700)
- Screw TCEI M3x5 UNI 5931-8.8 (code 2100020001)
- Instruction Replacement 4 Blade Collimator Motors (code 3904907500)

In order to to correctly replace any defective motors (highlighted in red in the picture below) of the four blade collimator, it is important to remove all the necessary covers in order to get access to the collimator.



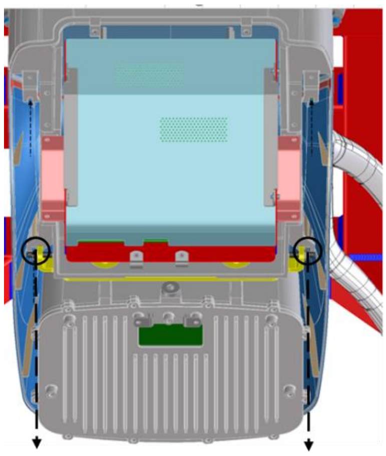
To do so, remove the tubehead’s covers to have access to the four blades collimator:

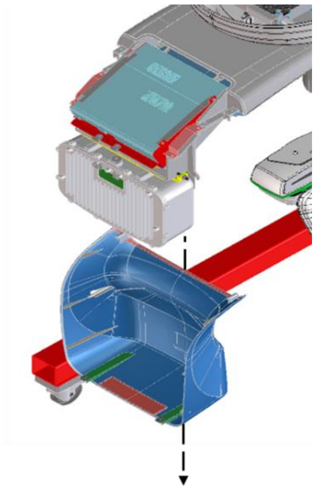
- Loosen the 4 screws circled in black and then remove the external cover



- Remove the 2 screws circled in black and then remove the internal cover

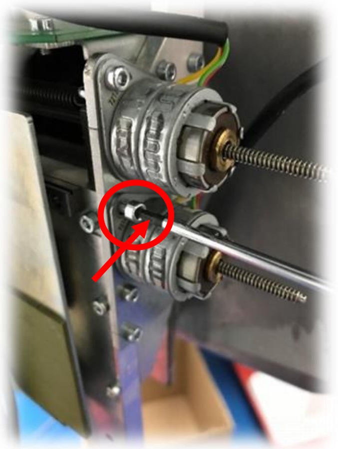
[3] The single motor can be used for replacement motors M5 M6 M7 M8 (X80-X81-X82-X83)





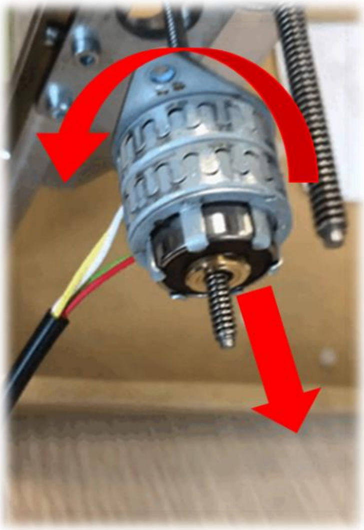
Once the covers have been correctly removed, proceed with the motor replacement following the steps listed below:

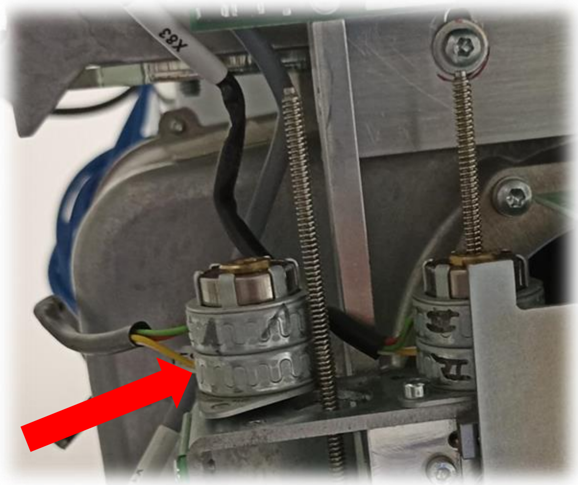
- Disconnect the motor from the A12 collimator board
- Remove the TCEI M3x5 screws that fix the motor to its bracket using a 2.5 Allen Wrench as shown in the picture below[4]



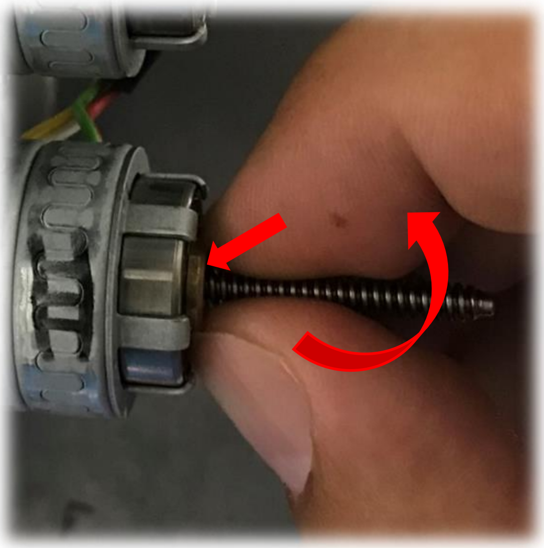
- The motor can be removed from its lead screw by rotating it counterclockwise as shown below

[4] The figure is merely illustrative because the screw is not hexagonal and it is not used an allen wrench. Please refer to the figure only to see the position of the affected screws





Whenever the base of the motor does not allow the motor to rotate due to the interference with the adjacent motor and/or with the screws of the metal support, it is possible to rotate the motor by hand or with long-nose pliers only the central part of the motor to extract it just enough to rotate the motor entirely. This reduces the chances of twisting the lead screw.

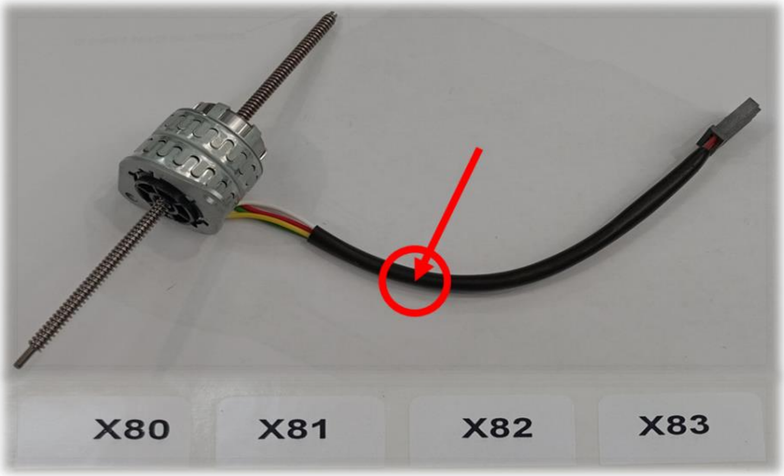


- Replace the motor with the new one following backwards the previously listed points

If it is necessary to replace more than one motor, please repeat the above listed steps for each concerned motor.

After replacing all the interested motors, verify the correct centering of the device.
To do so, please refer to the par. 11.3.10.1.

To complete the replacement procedure, place the proper label on the cable of the replaced motor (refer to the picture below).



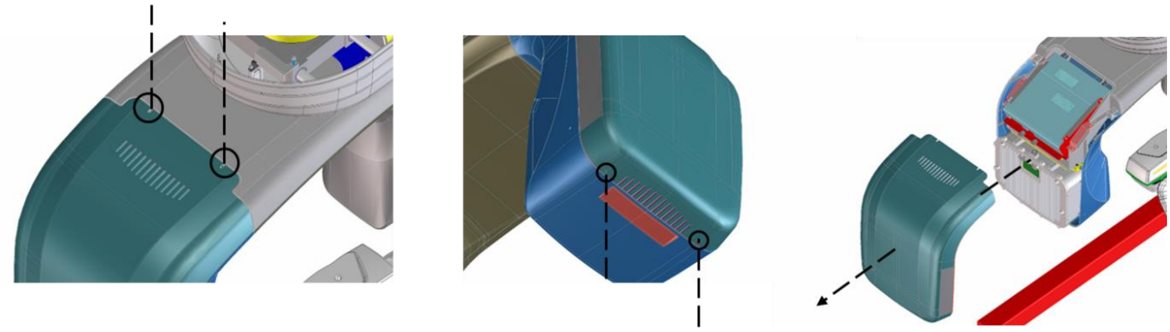
Lastly, reassemble every cover that has been previously removed.

11.3.10. Four Blades Collimator replacement

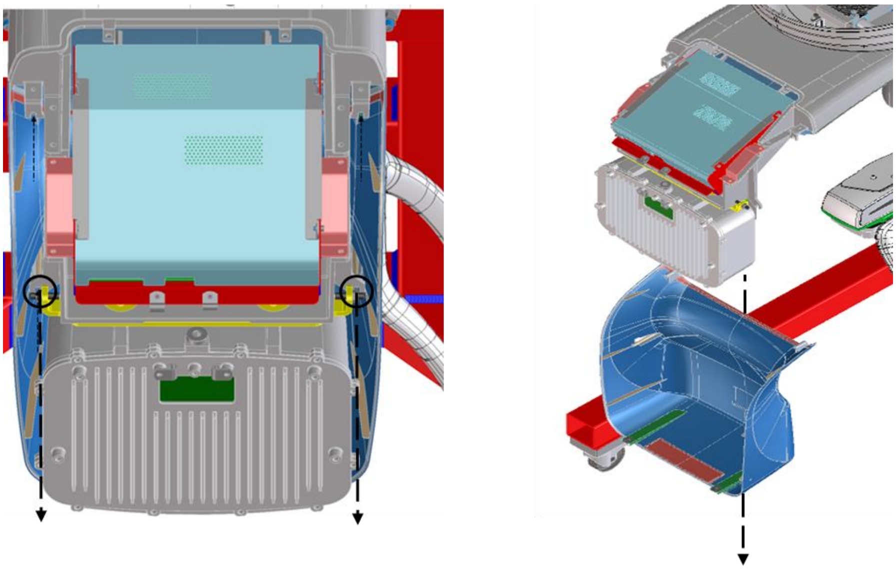
The kit for the replacement contains the following components:

- Four blades collimator assy
- Collimator Driver Board A12
- 1,5m copper filter
- Nr.4 TCEI M3x8 screws
- Nr.2 pieces of mylar
- Nr.4 spacers (or nr.12 spacers with lower height)

Remove the tubehead's covers as shown in the pictures below to have access to the four blades collimator.



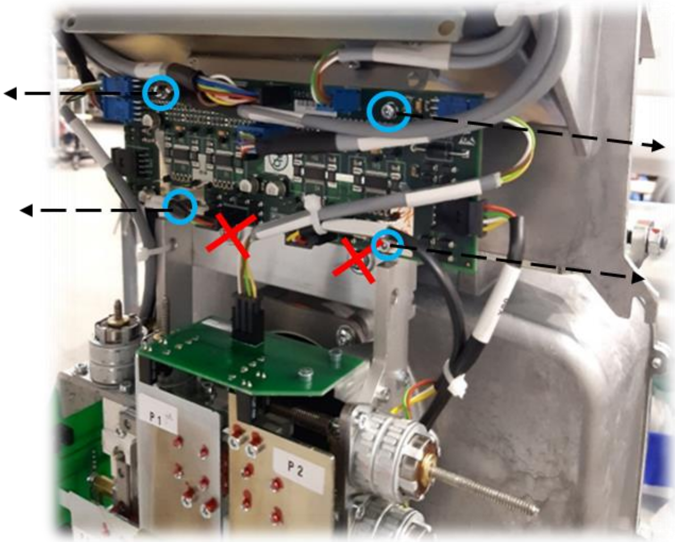
Loosen the 4 screws circled in black and then remove the external cover



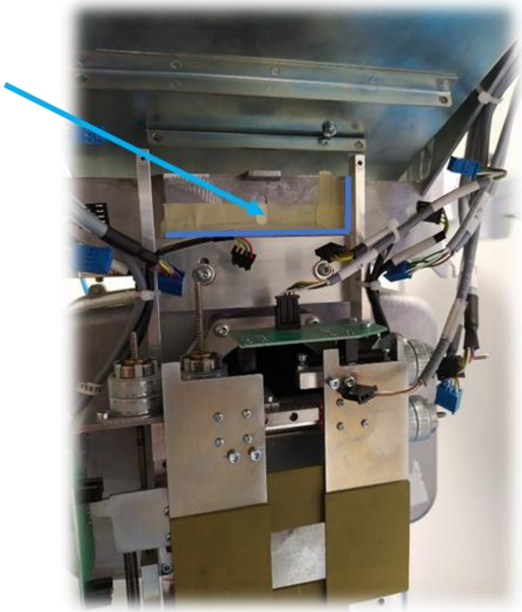
Remove the 2 screws circled in black and then remove the internal cover

Remove all the cables on the "Collimator Driver Board A12" and then remove the board unscrewing the 4 screws in light blue as shown in the picture below

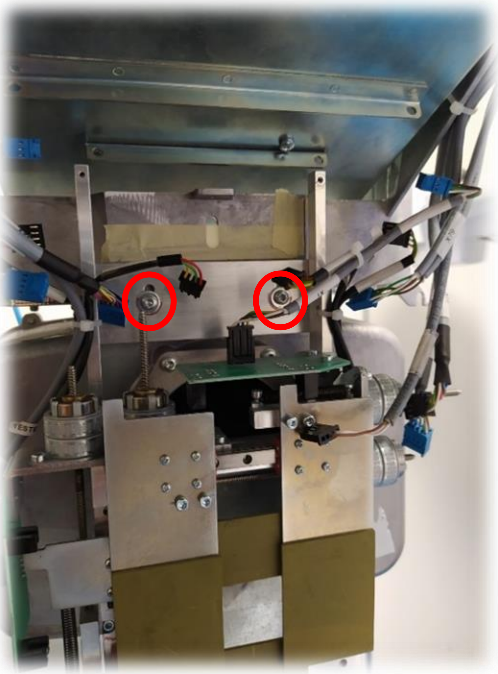
Warning
Don't remove yet the torx screws with red cross



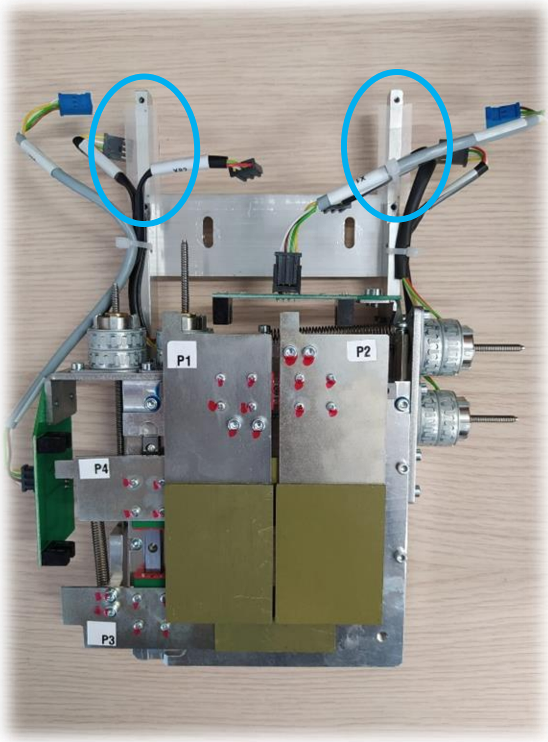
At this point put a tape behind the four blades collimator assy and take with a marker a horizontal and vertical reference.



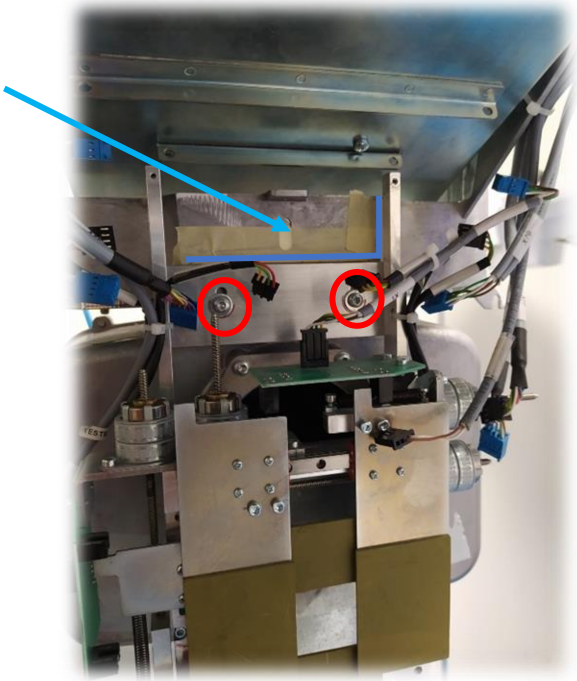
Now you can remove the four blades collimator assy unscrewing the 2 torx screws.



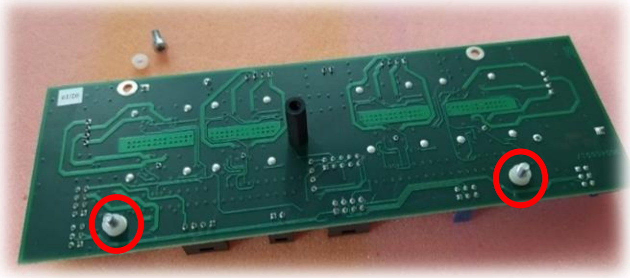
To install the new four blades collimator, Put the 2 pieces of mylar as figure below to prevent any possible contact between the Collimator Driver Board A12 and the metal frame.



Mount the new 4-blades collimator using the previously marked references, taking care to keep as much horizontality as possible as in the old primary collimator



Take the new Collimator Driver Board A12 and fix on each corners the 4 screws with the spacers

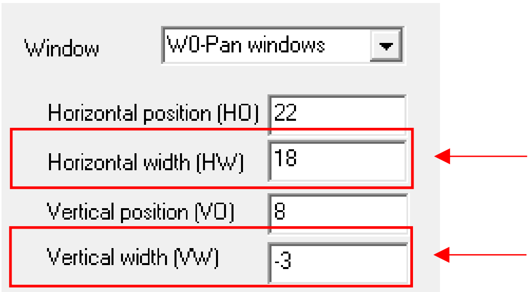


Then mount the Collimator Driver Board A12 in its seat and plug in all the cables

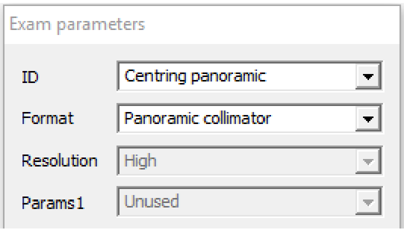
11.3.10.1. Verification of the beam centering

- PAN COLLIMATOR CHECKS

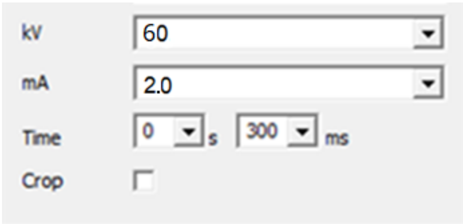
1. Switch ON the unit and when the green LED starts blinking, press >0< button to perform axis reset.
2. Open “PhD_C_Test”.
3. Enter in the SET-UP mode (psw: PhdAccess), open “Unit setting configuration” window, select “Collimator offsets” tab and insert for “Window” “W0-Pan windows” the values HW and VW provided with the spare part



4. From the "Exam parameters" window select the exam ID "Centring panoramic" and the Format "Panoramic collimator".



5. Set the exposure parameters from the "Exam parameter" window.

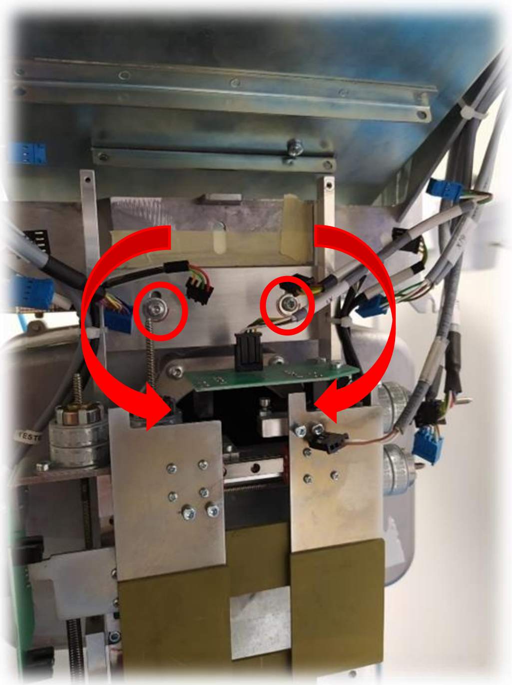


6. Once the green led on the keyboard gets solid, press the X-ray button to make an exposition. The acquired image will be displayed.
7. If needed, the images can be saved by clicking the button "Save" . To save the image in bitmap format, put ".bmp" at the end of the file name while saving.

8. With the panoramic collimator format selected, verify that in the panoramic acquisition a white border is visible on each side of the image

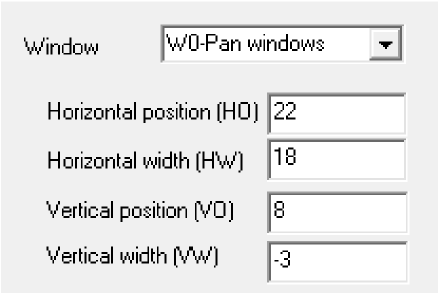
The X-Ray beam correctly aligned: a white border is visible on each side of the image

9. If the tilt of the irradiated area is not OK: loosen the screws and adjust the inclination of the collimator; then restart from the point 1 of this paragraph.



10. If the tilt of the irradiated area is ok and the collimator position must be adjusted, open "Unit setting configuration" window and select "Collimator offsets" tab

11. Select "W0-Pan windows" and modify the offsets H0 and V0 following the conventions reported in and then press on send parameter, save

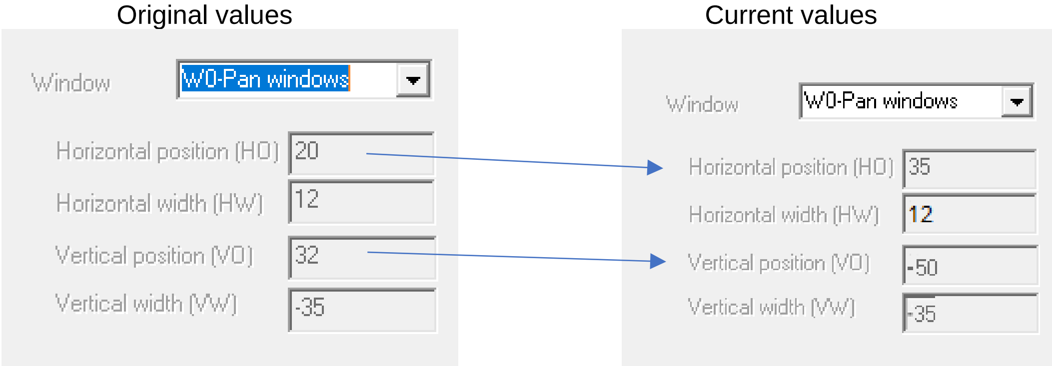


12. Once an offset value has been changed, press send and save button and then, before acquiring a new static image, press the >0< button on the keyboard to perform a collimator reset and apply the new parameters to the to the collimator position.

Note
If the image is completely unexposed, do the centering in 3D window (see 3D COLLIMATOR CHECKS below) or in CEPH window, in case of 2D equipment, (see CEPH COLLIMATOR CHECKS below) and then come back to PAN window to make fine adjustment returning the delta between current and original value from window W4 or W6 to window W0 (see NOTE below).

13. Repeat the tests prescribed from the point 5 of this paragraph.

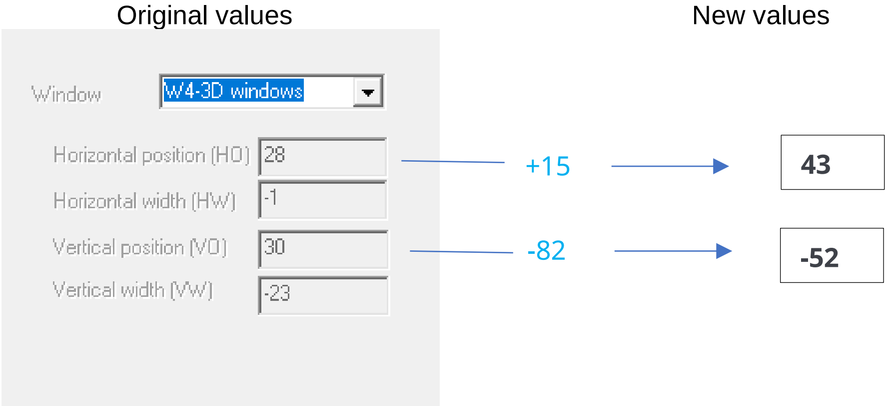
Note
Once the W0-pan window is collimated, report the offset change [(current HO - original HO) and (current VO - original VO)] for the W4-3D and W6-CEPH windows.
e.g.
Original values   Current values

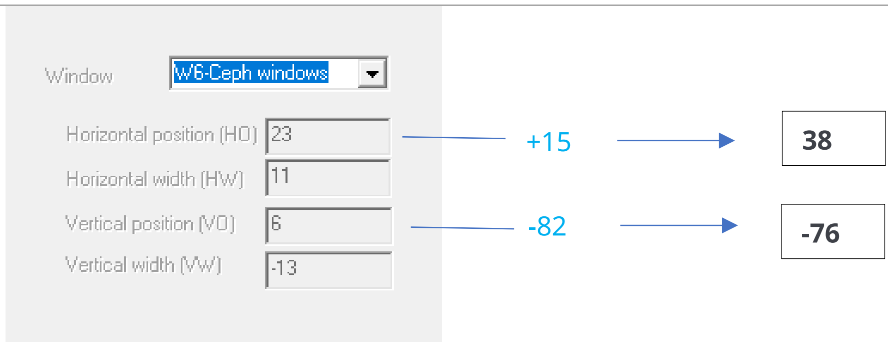


The differences between the current values and the original values are:

- HO → 35-20=15
- VO → (-50)-(32)=

So you have to report the differences above in the other windows
Original values   New values





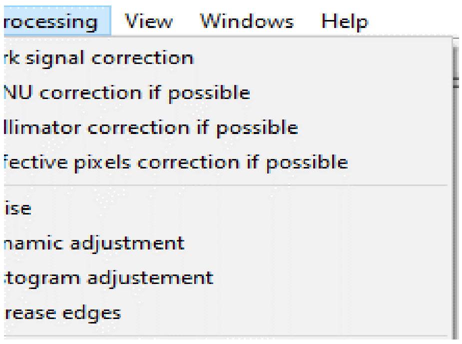
- CEPH COLLIMATOR CHECKS

1. Rotate the CEPH head support in the lateral position

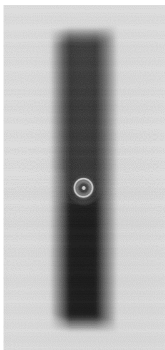
2. Open "PhD_C_Test.exe" service program

3. Select the following parameters:
   - ID: Centering ceph
   - Format: Height Custom
   - Resolution: High
   - Param1: View of Primary collimator field
   - 70kV 8mA

4. In the image processing menu select: “Dynamic adjustment”

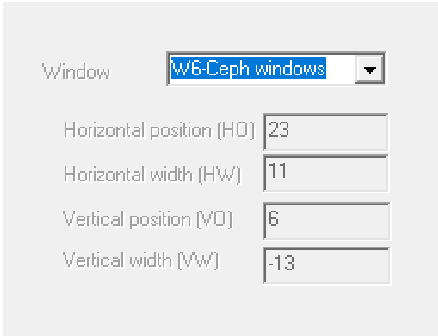


5. Prepare the unit to take the CEPH exam and then press the X-Ray button until the end of the exposure.



6. Verify that the dot and ring projections are centred to the primary collimator beam

7. If the rods aren’t about in the middle of the exposed area, modify the offsets HO following the conventions reported in Table 1 and then press on send parameter, save. If the unexposed areas in the upper part and in lower part are different, adjust the offset VO following the conventions reported in Table 1 and then press on send parameter, save.



Note
If you don't see the exposed area, move the HO offset up or down until you see the exposed area on the sensor.

Note
If this centering was done because the exposed area in “W0-Pan windows” was not visible, go back to the paragraph PAN COLLIMATOR CHECKS.

COLLIMATOR OFFSETS (HO,VO) CONVENTIONS

- The horizontal position (HO) offset allows to move the window on the right or left of the acquisition area without modifying the window width (P1 and P2 blades distance remains unchanged)

OFFSET	EFFECT ON ACQUIRED IMAGE
HO [+]	Move the collimator window on the LEFT of the sensor acquired area
HO [-]	Move the collimator window on the RIGHT of the sensor acquired area

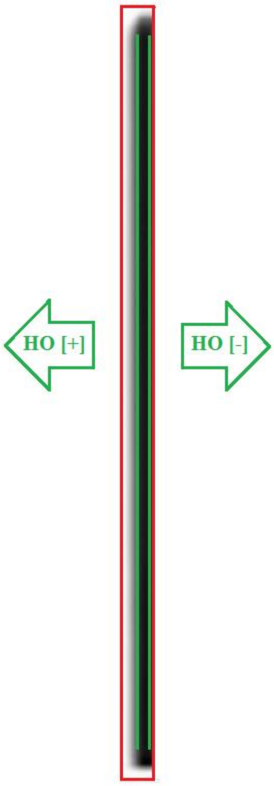
- The vertical position (VO) offset allows to move the window towards the Top/Bottom border of the acquisition area without modifying the window height (P3 and P4 blades distance remains unchanged)

OFFSET	EFFECT ON ACQUIRED IMAGE
VO [+]	Move the collimator window DOWN
VO [-]	Move the collimator window UP

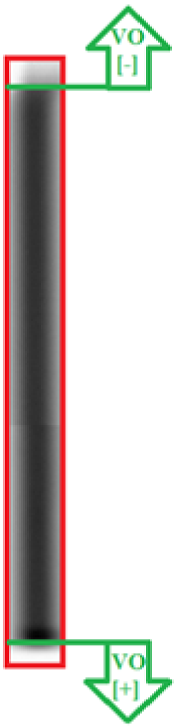
Table 1

- Pixel-Offset Conversion

1 offset ≃ 2 pixel (0.240mm) if ID= “Centering panoramic” (Resolution= High).
*Note: The symbols [+] and [-] mean, respectively, an increase and a decrease of the offset value.



Horizontal Offset (HO) convention

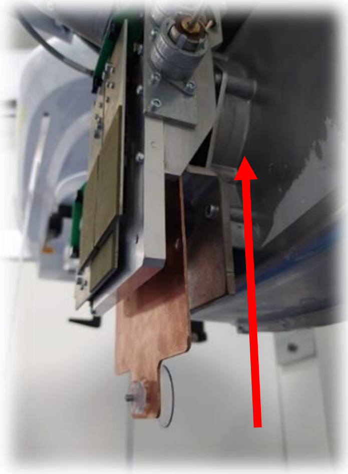


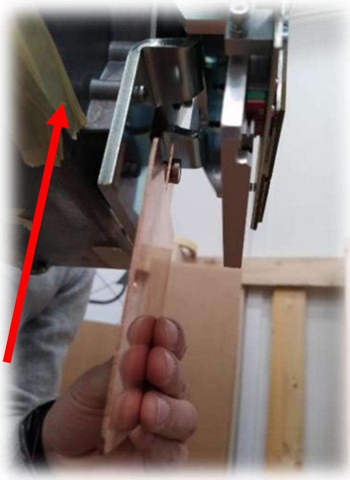
Vertical Offset (VO) convention

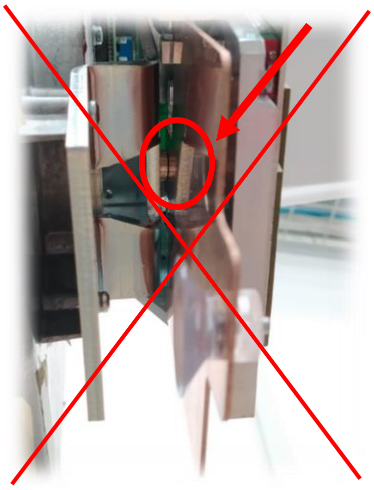
11.3.10.2. Calibration Files

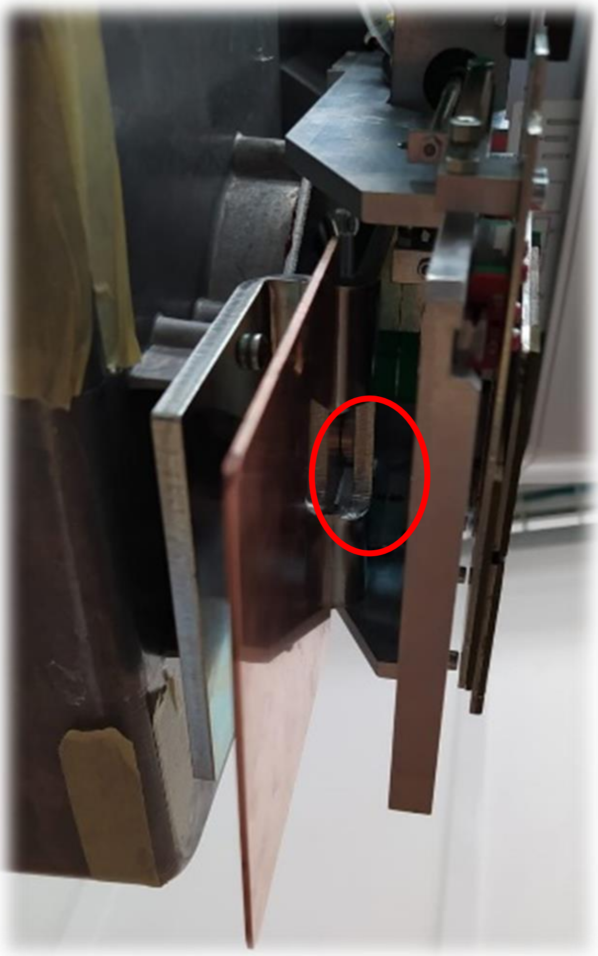
In case of a replacement of the four blades collimator we recommend generating new calibration files for the PAN and CEPH position (refers to par 7.9 and 7.11)

To perform calibration, place a 1,5mm copper filter as figure below to cover the entire X-ray beam.









11.3.11. 3D sensor replacement

Note
Before a 3D sensor replacement, it is MANDATORY to:

- Properly set the network interface board (see paragraph 7.6.2).
- Activate the sensor logs (see paragraph 11.2.1.4) and try to reproduce the error
- Provide the sensor logs* (see paragraph 11.2.1.4) to Owandy Radiology
- If the sensor has to be replaced due to an image quality problem, provide to Owandy Technical Service the .raw files of the complained acquisitions (see paragraph 3)

**The logs MUST be record with the Network board set as described by paragraph 7.6.2*

Note
The following operations must be performed by two persons.

1. Make sure to switch OFF the device
2. Disconnect cables J99 and J15 shown in the picture below

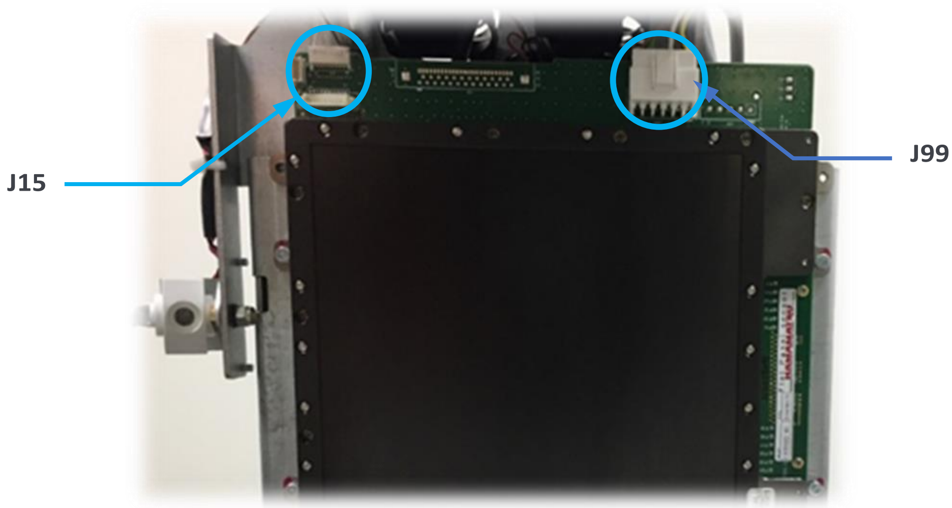


Figure 1: *X-MIND Prime 3D: 3D sensor with cables J15 and J99 highlighted*

Warning
Connector J15 is VERY FRAGILE, remove it using GREAT CARE

3. First operator holds the sensor with both hands, while the second operator unscrews the four screws highlighted in red in the pictures below

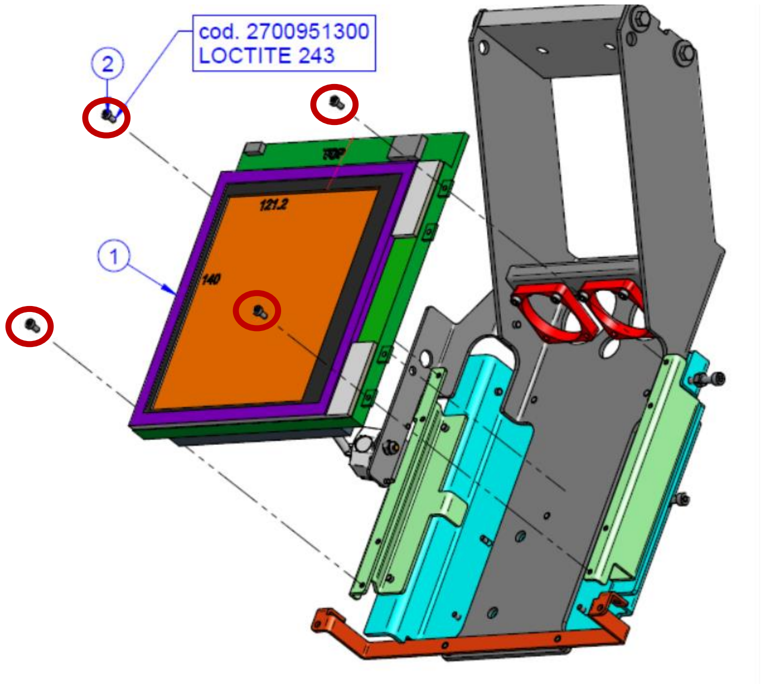


Figure 2: *3D sensors with the screws to be unscrewed higlighted in red in the case of 3D sensor H1 and H2*

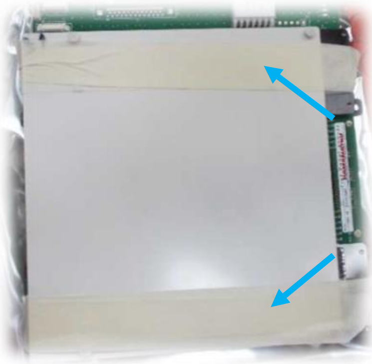
Note
The screws to be removed for the Hamamatsu 3D sensors H1 and H2 there are TCTX M3x06

4. The second operator removes the Ethernet cable
5. Remove the defective sensor and carefully place it on a flat surface paying close attention not to damage it
6. Connect the Ethernet cable to the new sensor BEFORE placing it on the unit
7. Place the new sensor on the unit and tighten the four previously removed screws
8. Connect the J15 and J99 cables to the new sensor

   Reassemble the 3D Sensor Internal Cover that has been previously removed

Note
Do not reassemle the 3D Sensor External Cover until completion of subsequent centring operations

9. Carefully place the defective sensor inside the box of the spare sensor:
   a. Apply the special protection over the sensor sensitive area with adhesive paper tape all around



b. Put the sensor into the envelope with its ethernet connector downward as shown in the picture below

Warning
When inserting the envelope with the sensor, make sure to put it in its appropriate compartment of the box as shown in the picture below

c. Once inserted, apply the cardboard shell checking that the highlighted slots are downwards

d. Close the box and apply the shipping information

Warning
Do not add any other object inside the box or in contact with the flat panel!
In case of damaged, it will be fully invoiced.

Once the new sensor has been correctly mounted, it is necessary to perform a verification of the following parameters according to the order shown below.

10. Verify the X-ray beam alignment (see paragraph 11.2.10.1).
11. Perform sensor calibration (see paragraph 10.2).
12. Verify the 3D lateral offset (see paragraph 11.2.11).
13. Perform a Panoramic QC test (see paragraph 7.9)

11.3.12. Tube head replacement

1. Switch OFF the unit.
2. Remove the tubehead external and internal cover.
3. Remove the Generator board metallic cover:

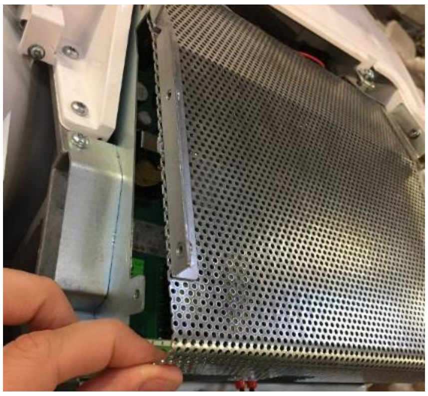


Figure 37

4. Unscrew the cables fixing clamps "A" and then disconnect X57 and X56 connectors from Generator board. Unscrew the 4 generator board support screws "B":

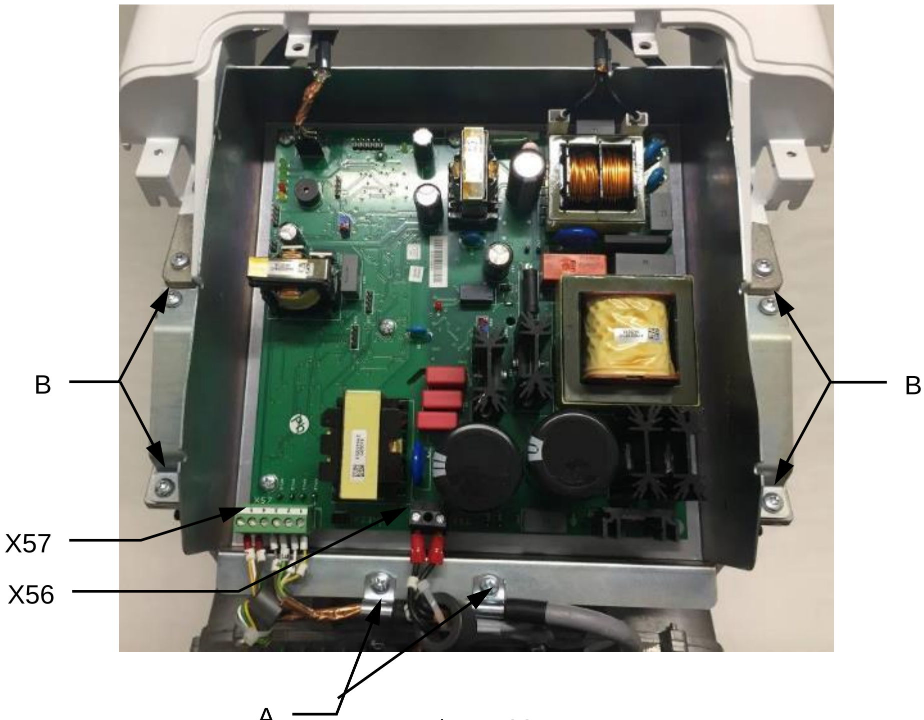


Figure 38

5. Pull up the generator board.

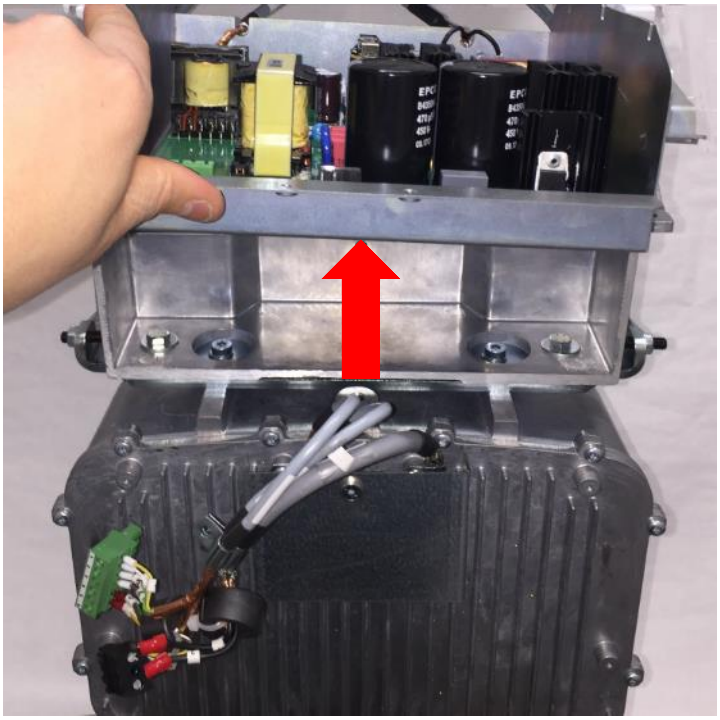


Figure 39

Note
The presence of a second operator is required during the following steps.

6. While the first operator hold the tubehead with two hands, the second unscrew the generator board screws "C".

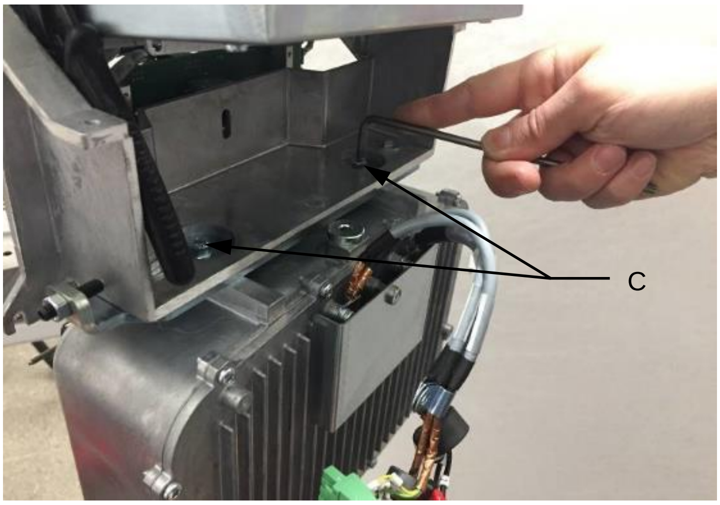


Figure 40

7. Mount the new tubehead, taking care to push it with one hand in the direction of the sensor while tightening the screws "C" (Figure 40).

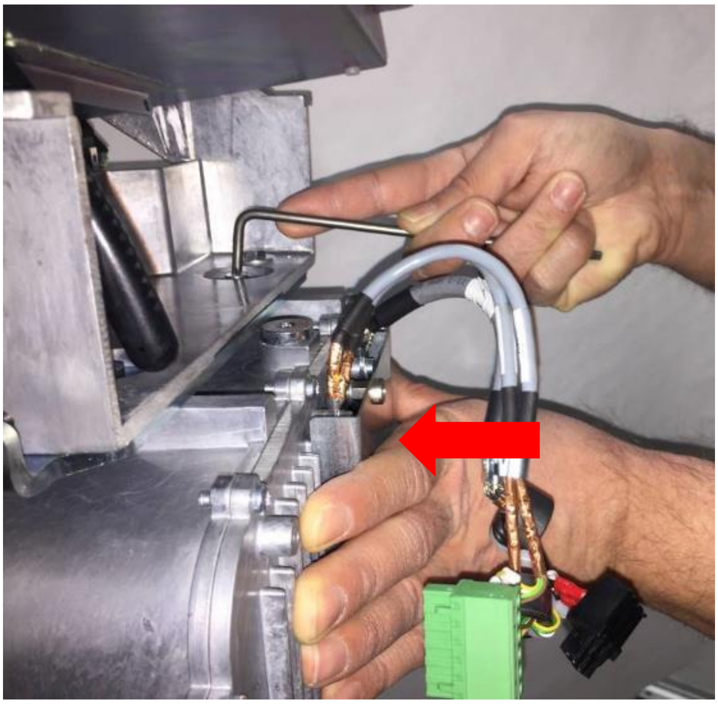


Figure 41

8. Connect X56 and X57 connectors and fix the cables fixing clamps "A" (Figure 38).
9. Mount the generator board metallic cover and tighten its fixing screws.
10. Switch ON the unit and wait the G.U.I. connection.
11. Insert the preheating values reported on the label of spare tubehead in the EEPROM memory (see paragraph 8.4).

Warning
Wrong settings of preheating parameters may damage X-ray tube.

---

12. Perform the X-ray beam centering verification (see paragraph 11.2.10).

13. In case the beam is not centered to the sensor, loosen the screws "C" (Figure 40) and act on screws "D" and "E" (Figure 43) following the convention reported below:
    - Screw "E" to move the X-ray beam on the right (on the image)
    - Screw "D" to move the X-ray beam on the left (on the image)

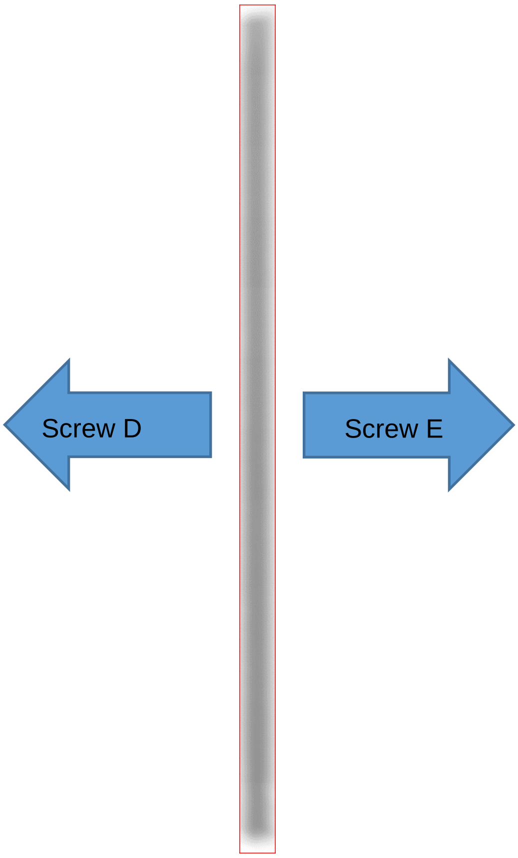
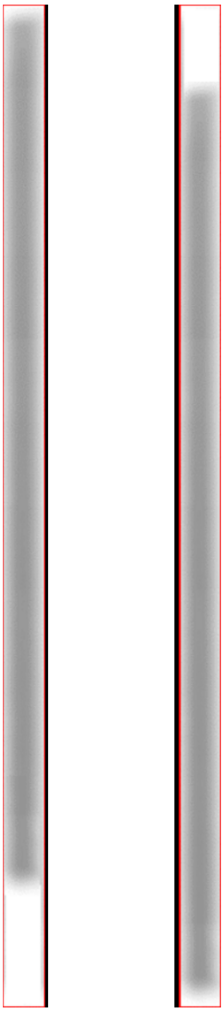


Figure 42

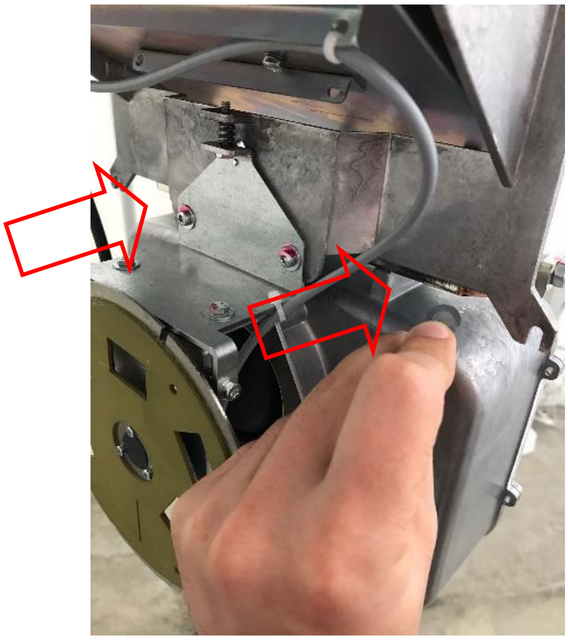
Note
In order to act on a screw (D or E) on one side, loosen the other screw on the opposite side.

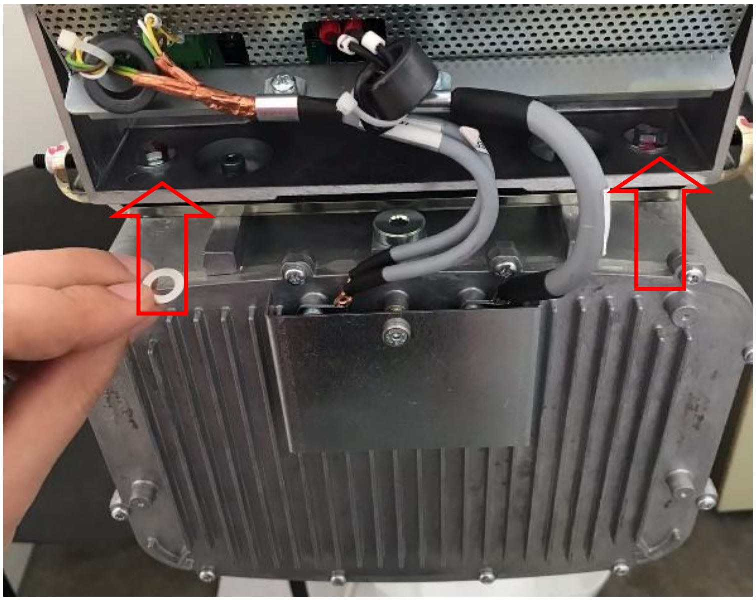
Figure 43

14. Tighten screws "C" and repeat the static acquisition.
15. In case the sensor is not completely exposed in the upper or lower part



- For **I-Max 3D** insert 2 washers (supplied with the spare part) in the internal part to lower the x-ray beam (Figure 295) and in the external part to raise the x-ray





- For I-Max CEPH 3D modify the VO and VW offsets (see paragraph 11.2.10.2.2)

16. Once X-ray beam has been well centred, tighten all the screws.
17. Mount the tubehead internal cover.

18. Mount the tubehead external cover paying attention to insert first the lower pins of the cover in the guide present in the tube head internal cover and then fix the upper part of the covers.

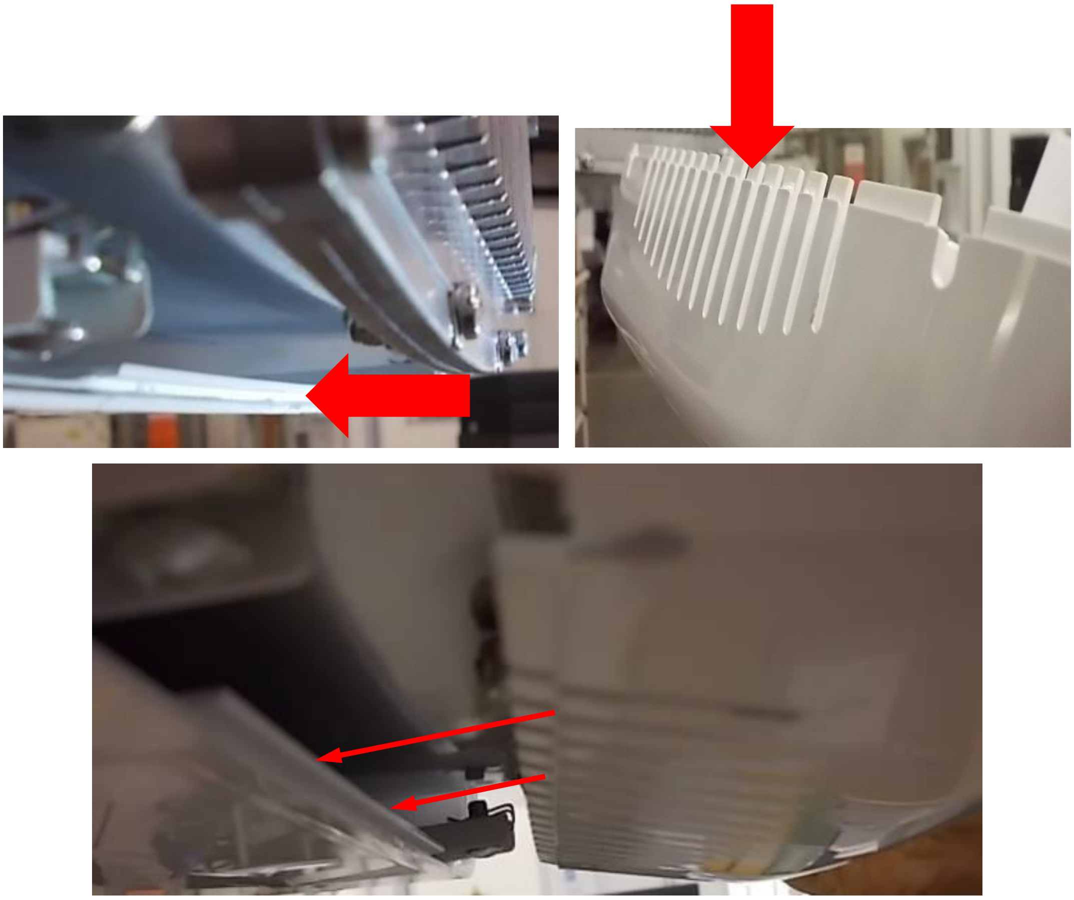


Figure 44

19. Perform the sensor calibration and verification (see paragraph 10.2).
20. Perform a panoramic symmetry verification (see paragraph 7.9).

11.3.13. Column replacement

Column replacement requires the complete dismounting of the unit. It is suggested to take a complete package to perform in the proper way this activity.

11.3.13.1. I-Max 3D

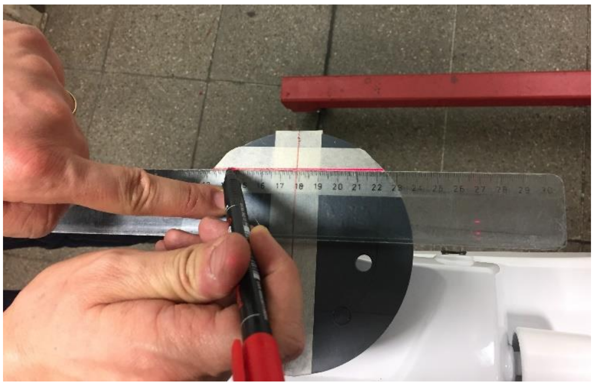
1. Remove the upper cover and the fixing plate cover. Remove cover from MCU board.
2. Set DIP-switch 3 to OFF (1 and 2 ON) in order to enter in Service Mode (see paragraph 4.2.4.1).
3. Turn ON the unit.

Note
In service mode NEVER press up/down column keys as they change rotating position.

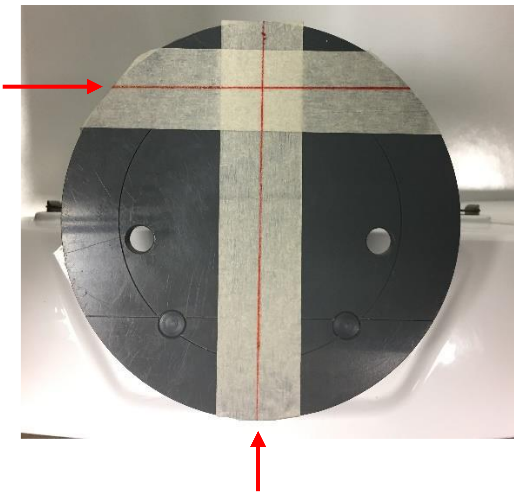
---

4. Position the panoramic tool on chin support.
5. Turn ON laser and press >0< button on the keyboard until sagittal laser is on the middle of tool. Use adhesive tape and mark the laser position (using a pen).

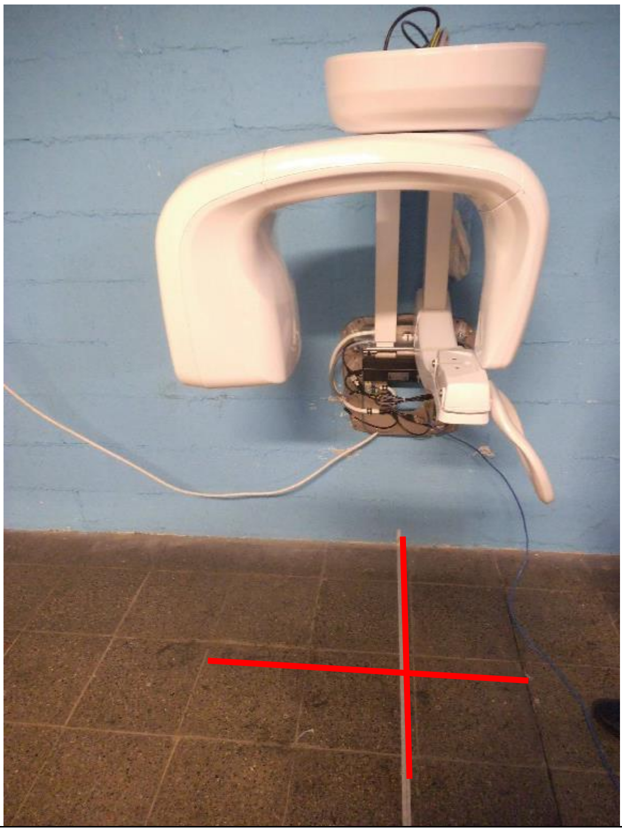
6. Put adhesive tape between the extremities of the tool.
7. Press >0< button on the keyboard until sagittal laser is parallel to chin support arm. On adhesive tape mark the laser position (using a pen).



Rotation references are present on the tool and it has to be used as reference to position the unit in the same position.

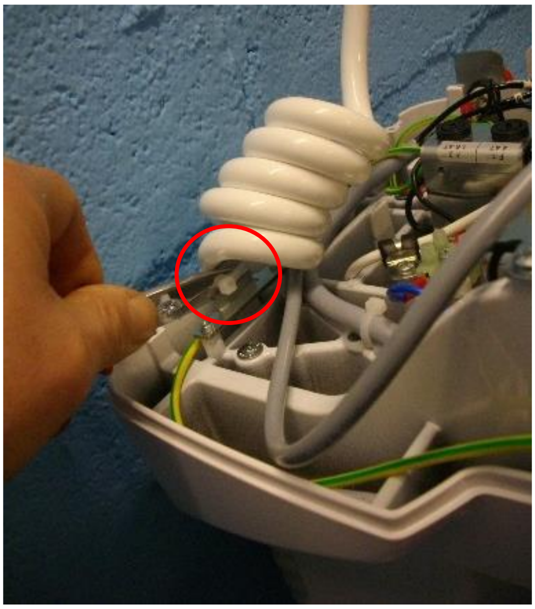


Note
In case it is not available the tool, it is possible to make references on the floor. Turn ON laser, press >0< button on the keyboard.
Put adhesive tape on the floor corresponding to the laser position and mark laser position using a pen.
Press >0< button on the keyboard until the laser is in 90° position and mark the other axes.

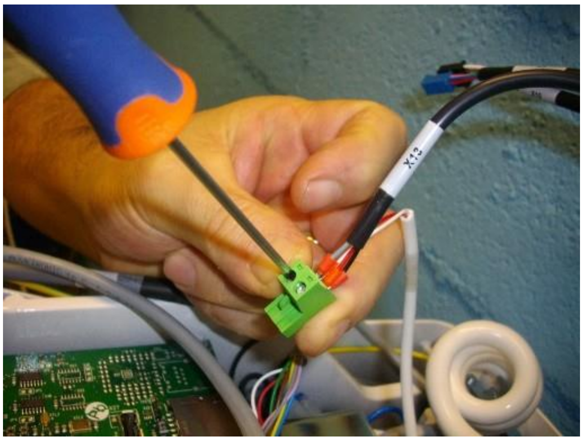


8. Turn OFF the unit and disconnect main power supply.
9. Rotate manually the rotating arm and fix it to the frame as shown in the image using the provided fixing plate.

10. Cut strips and disconnect the cables X3, X10, X13 and the ethernet cable from MCU board.



11. Remove connector from cable X13 (it may include exposure button).



12. Pass the cable out from the top side of the unit.

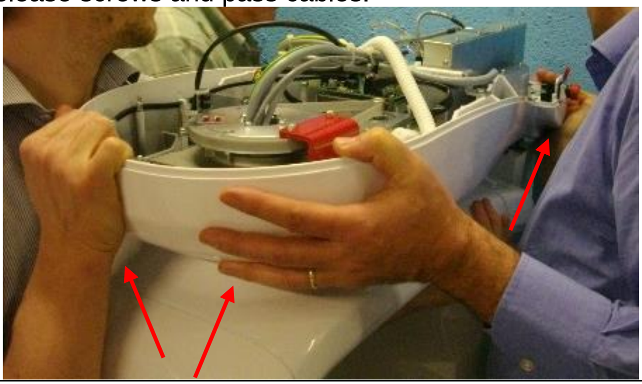
13. Cut lower strip.

14. Disconnect power cables and chin arm cables from top side of the unit.

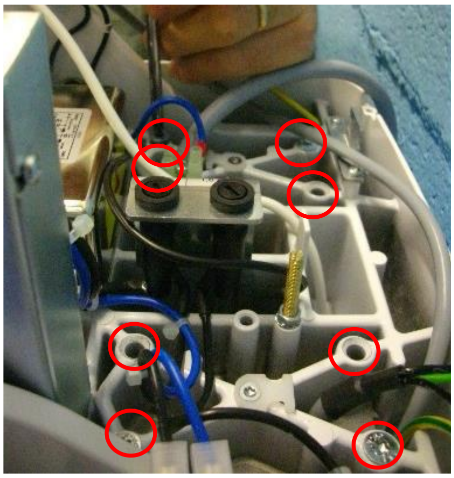
15. Disconnect the exposure button in case it has been connected in the upper side.

Note

Two persons are necessary to lift the head. Put the hands on front and back side. One person has to release screws and pass cables.



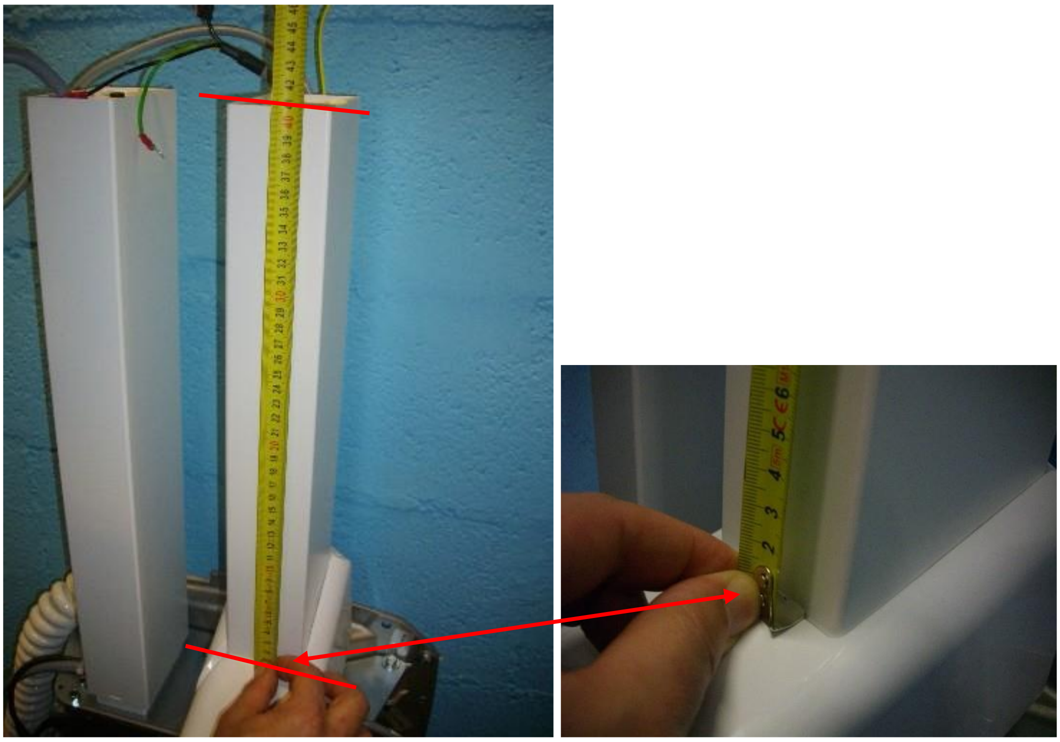
16. Remove the 8 fixing screws.



17. Pass the cables out of rotating head.

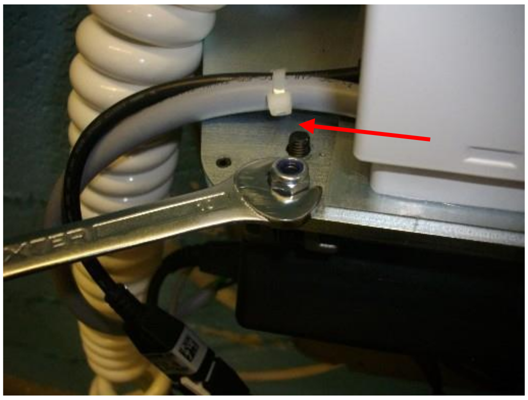
18. Position head on a protected surface in order to avoid damages.

19. Take the reference of chin support arm before to remove it, measuring the distance between top of the column and chin support arm. Typical value is 40.9 cm.



20. Disconnect lift motors control cables and power supply from fixing plate.

21. In order to remove the columns plate, loosen the nuts of the hinges fixing the plate in both sides.



22. Move up the pin used to block the hinge pin in both sides. Slide out the hinge pin in both sides.


23. Remove the safety pins. In this phase, support the assy.

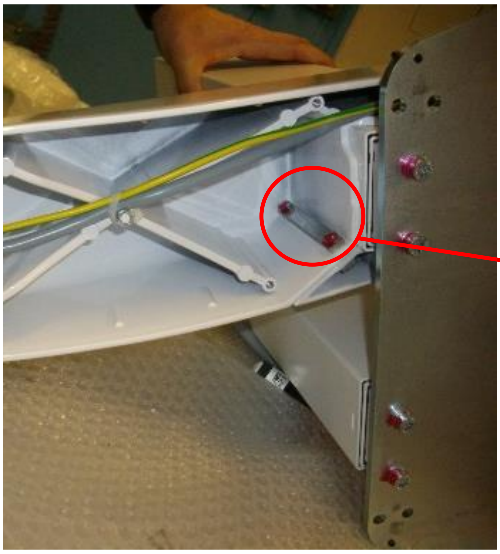
24. Release the fixing pin to remove the columns assembly.

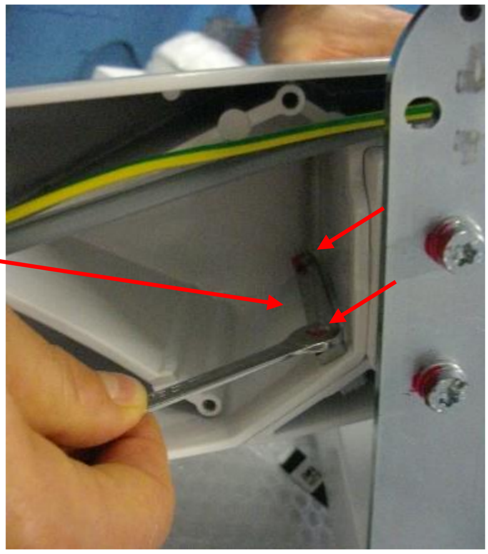
25. With the group on a desk, remove the adhesive plate and pass the cables out of the column.

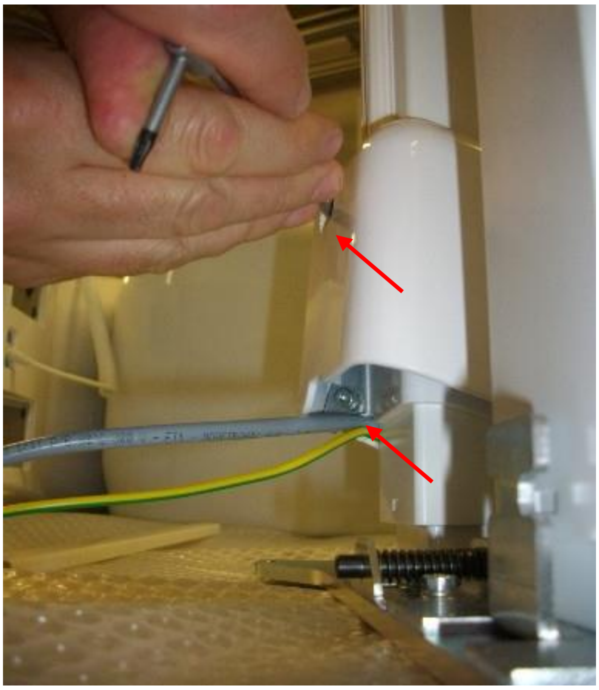
26. Remove the lower cover from chin support.

27. Loosen the two nuts inside the chin support arm.

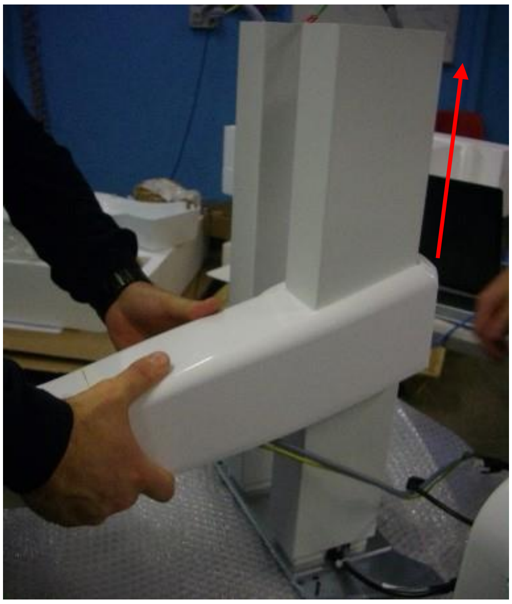




28. Loosen the two screws in the back side of the arm

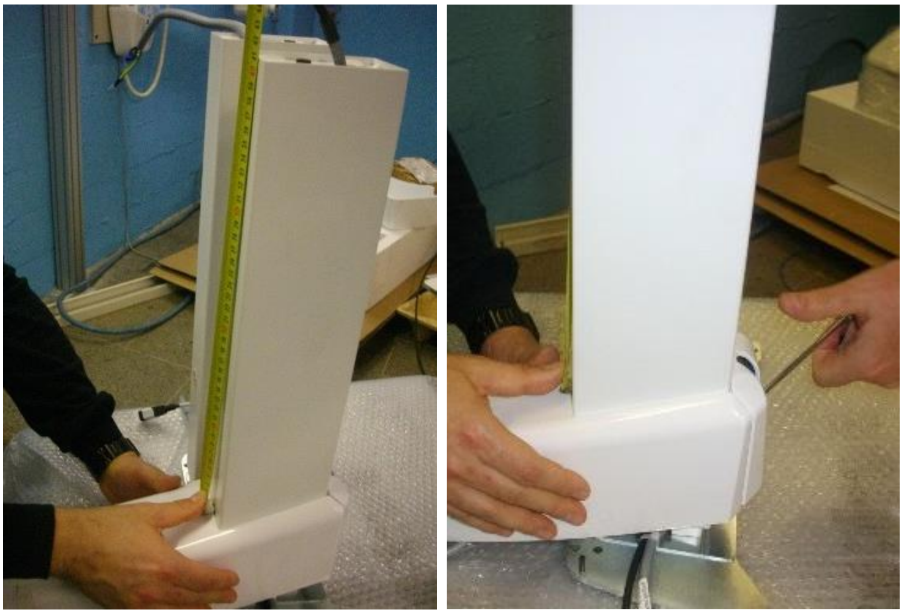


29. Slide the arm out of the column.



30. Remove the control box from the wall plate.

31. Position the arm on right side of the spare column, measuring the distance between top side and arm. Fix it to the column.

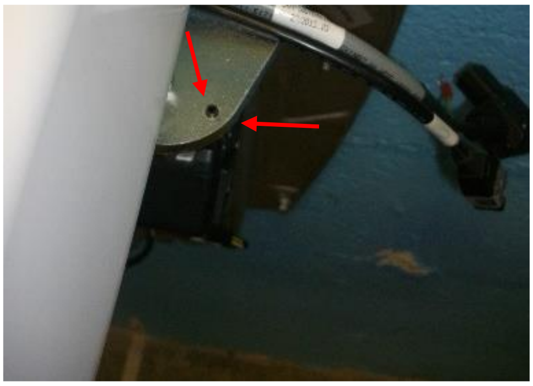


32. Close the arm lower cover.

33. Mount the new control box.

34. Position the new group and pass the cables in the back side of the arm, without mounting the adhesive channel.

35. Mount the hinge and push down the safety pin using a hammer.



36. In order to easily mount the cable, tilt the column group and fix the cable with the terminal strip.

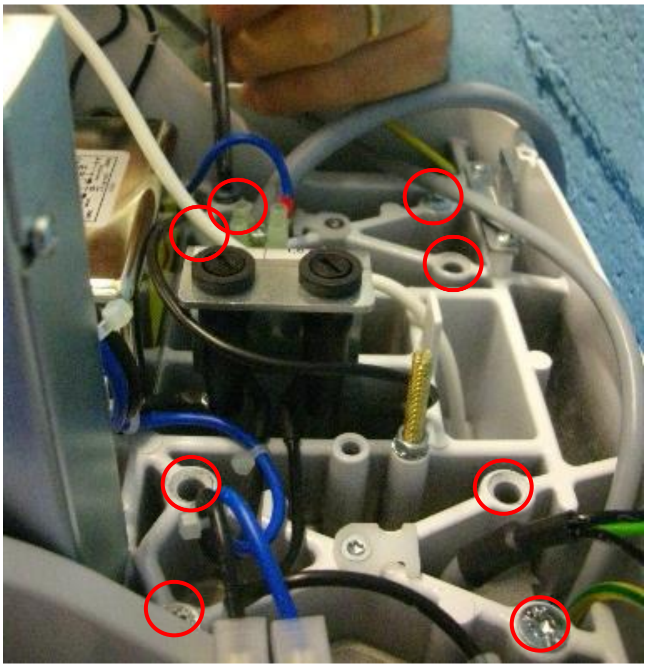
37. Once fixed the cable, insert and fix the safety pin; tighten the hinges.

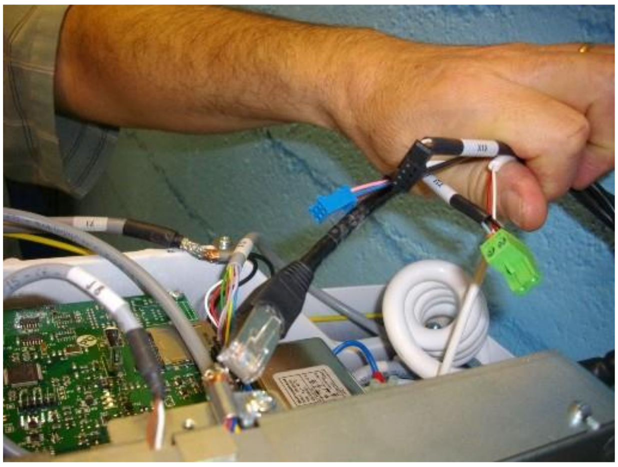
38. Insert the cables from new column in the head.

39. Position the head on the columns

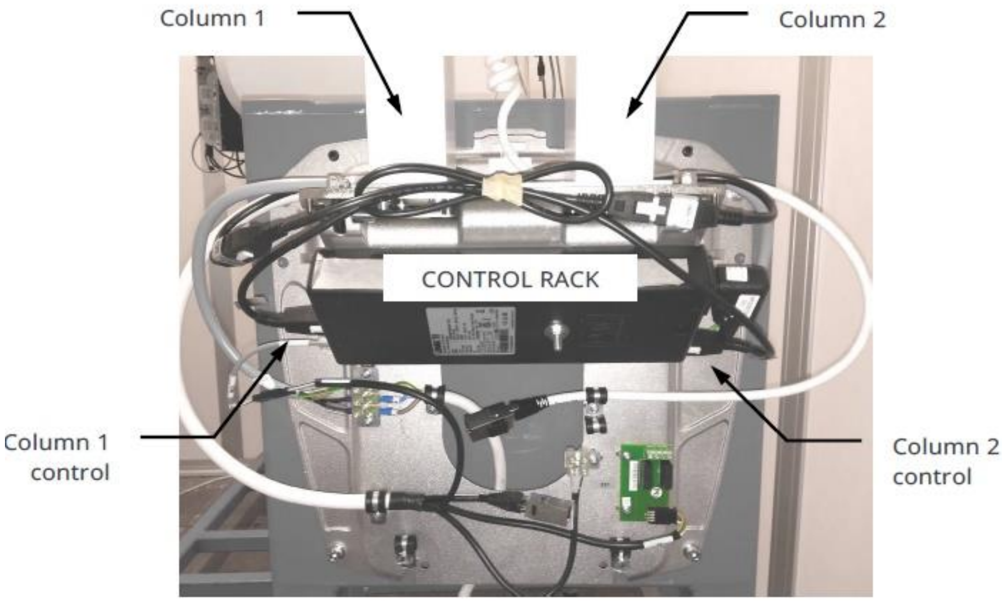
40. Put the screws on the column top side and fix them without tightening completely



41. Insert the spiral cable on top side of the head and connect all the cables (see points 10, 14 and 16 above).



42. Connect motor cables to the control box: left side motor must be connected to port 1 (left side of control box), and right side motor to port 2 (right side of control box) (Figure 334 and Figure 335).



43. Remove the rotating arm fixing plate

44. Turn ON the unit in Service mode.
45. Turn ON the laser and press >0< button on the keyboard to rotate the unit.
46. Use the references taken before replacement (centering tool or references on the floor) to verify head position.

    Loosening the 8 column fixing screws (Figure 308) it is possible to rotate head until the laser corresponds to the references in both positions. Once position is reached, tighten the screws.
47. Turn OFF the unit.
48. Set DIP-switch 3 to OFF to set the unit in normal mode (see paragraph 4.2.4.1).
49. Turn ON the unit and check up/down movement.

Note
In service mode NEVER press up/down column keys as they change rotating position.

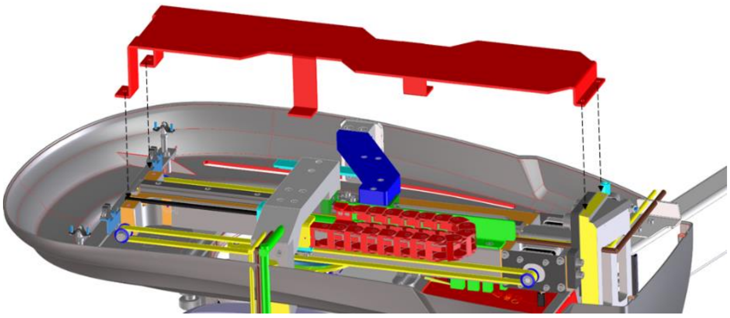
---

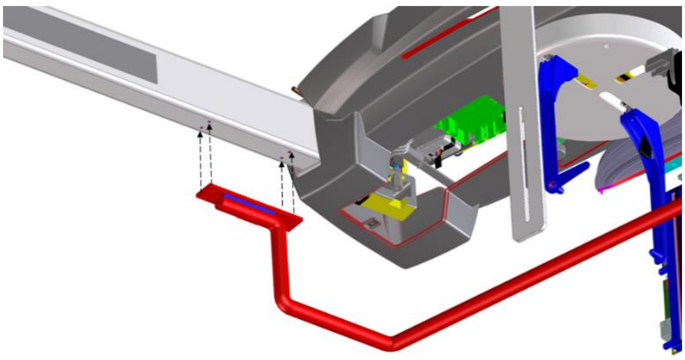
50. Make exposure and verify the image quality as described in paragraph 7.10.

11.3.13.2. I-Max CEPH 3D

Column replacement requires the complete dismounting of the unit. It is suggested to take a complete package to perform in the proper way this activity.

1. Remove the CEPH arm upper cover
2. Install the CEPH arm protection plate and CEPH arm handle (these tools have been removed during installation of the unit)

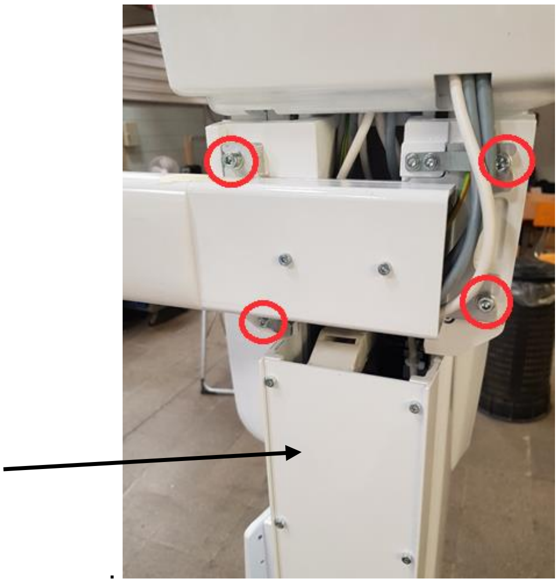




3. Fix secondary collimator and sensor arms to the protection plat and remove the pan/CEPH sensor from the unit.

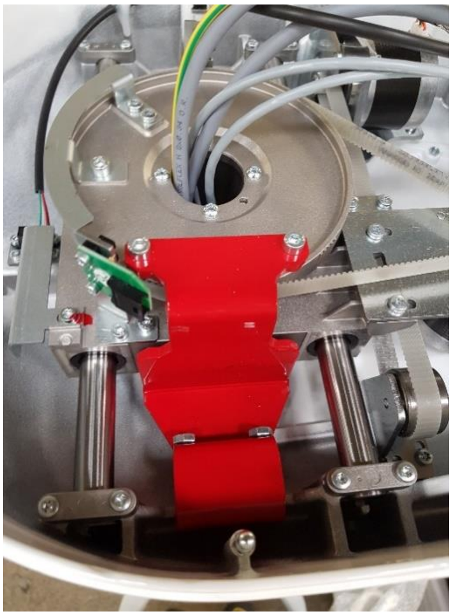
4. Remove the upper cover of the unit and the MCU cover to access the connectors
5. Disconnect cables coming from CEPH arm

6. Remove the screws of the following image and open the back cover



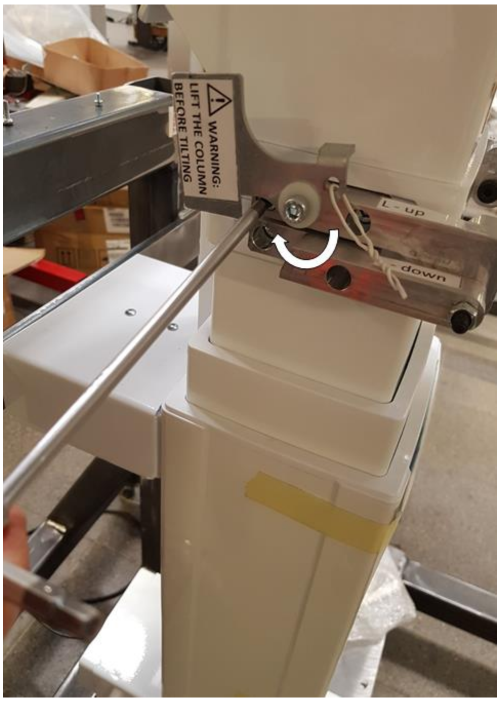
7. Remove the CEPH arm and position it up-side down, if possible inside the original package

8. Fix the rotating arm installing the support provided with the unit (that was removed during installation)

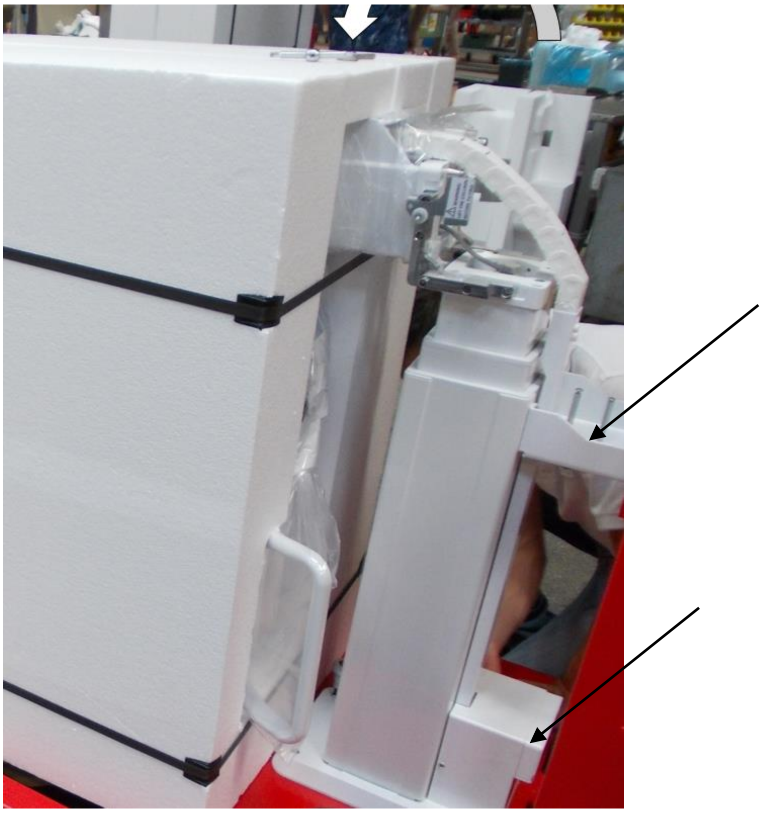


9. Protect the unit with plastic film and install the package. Fix it using adhesive tape

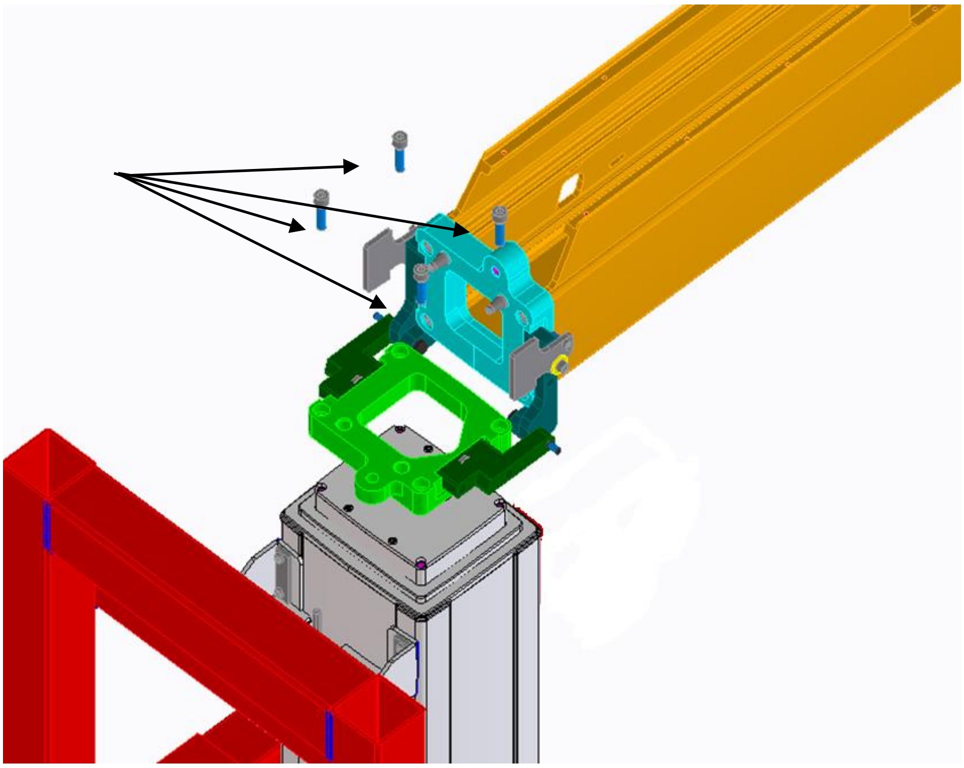
10. Remove fixing screws.



11. Tilt down the upper part of the unit. Disconnect cables and remove the back plates from the column



12. Remove the top side screws and the cable channel



13. Replace the column and the T Motion control box (in the tilted part of the column).
14. Once replaced, it is necessary to repeat the complete installation as for par. 7
15. Repeat all the verification before to use the unit with patients as for par.7.7

11.3.14. Chin support replacement

1. Remove the upper cover. Remove cover from MCU board.
2. Set DIP-switch 3 to OFF (1 and 2 ON) in order to enter in Service Mode (see paragraph 4.2.4.1).
3. Switch ON the unit and wait until the green LED blinks.

Note
In service mode NEVER press up/down column keys as they change rotating position.

4. Unplug the "broken" cable X12 and connect the X12 of the new chin support. Use its keyboard for the next step.

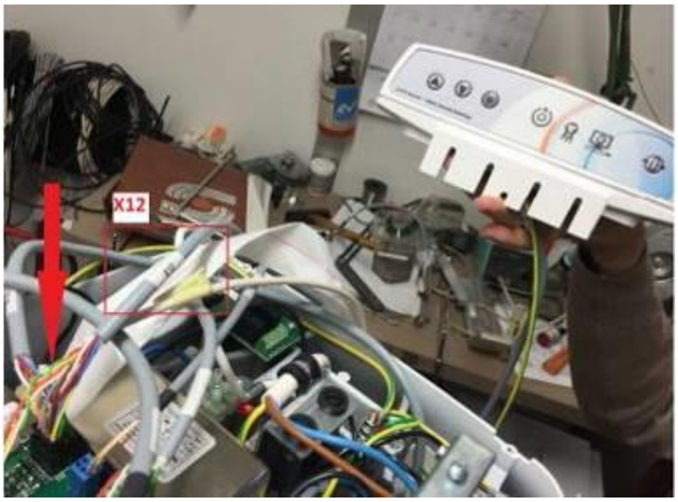


Figure 45

5. Press the >0< button
6. Position the panoramic tool on chin support.
7. Turn ON laser and press >0< button on the keyboard until sagittal laser is on the middle of tool. Use adhesive tape and mark the laser position (using a pen).

Figure 46

8. Put adhesive tape between the extremities of the tool.
9. Press >0< button on the keyboard until sagittal laser is parallel to chin support arm. On adhesive tape mark the laser position (using a pen).

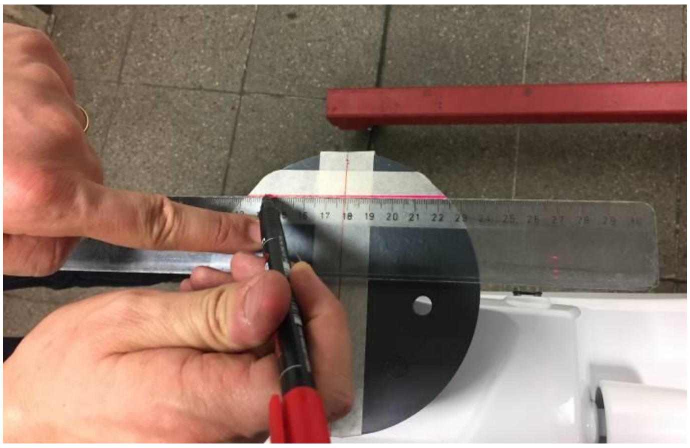


Figure 47

Rotation references are present on the tool and it has to be used as reference to position the unit in the same position.

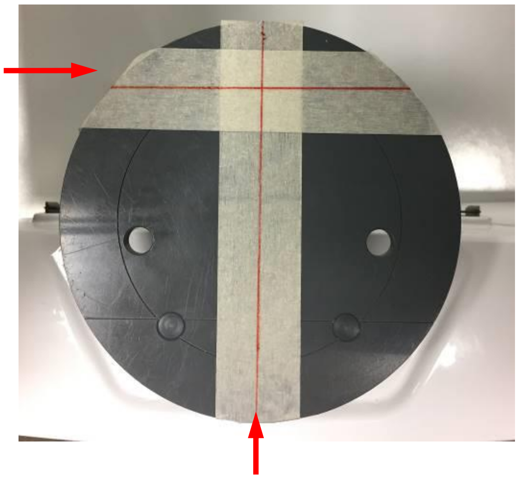


Figure 48

10. Unplug the X12 cable and the ground.

Figure 49

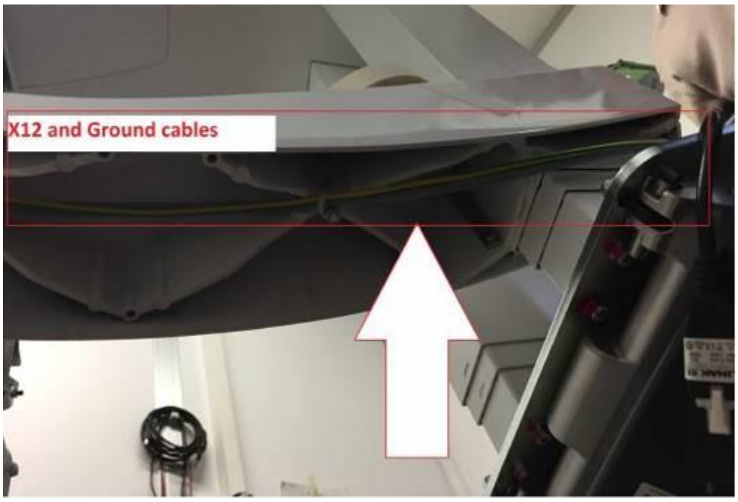


Figure 50

11. Unscrew the two screws under the arm.

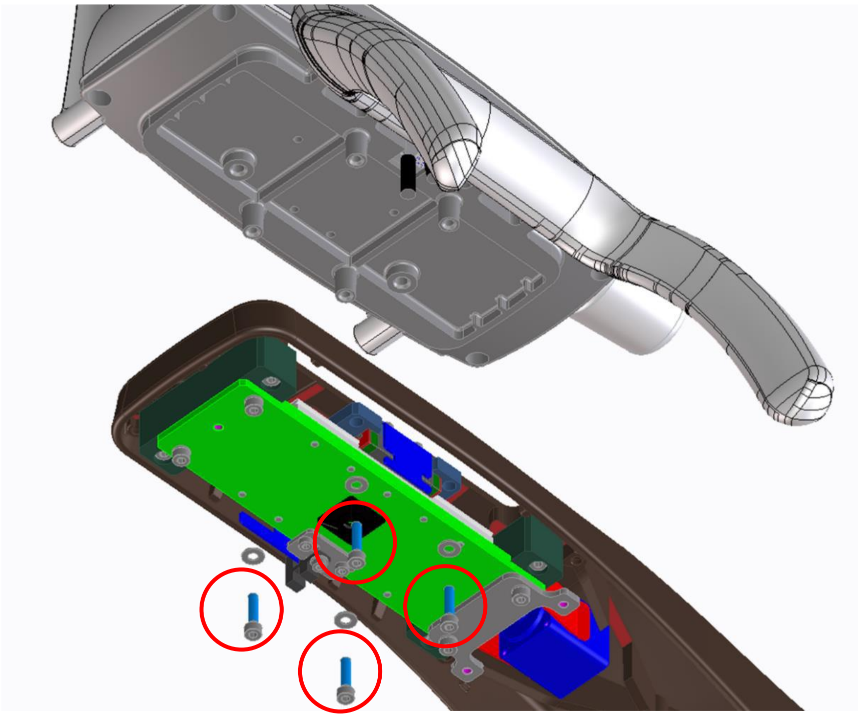
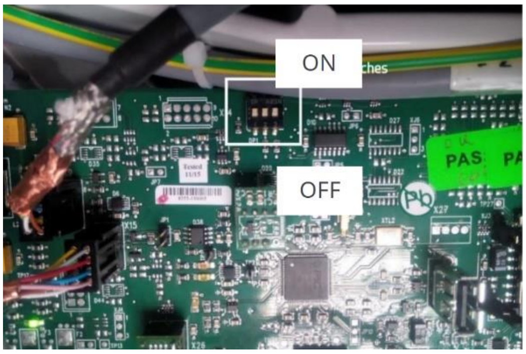


Figure 51

12. Remove the group "key board-handle".
13. Position the new group.
14. Turn ON the unit in Service mode.
15. Turn ON the laser and press >0< button on the keyboard to rotate the unit.
16. Verify that the sagittal laser is projecting on the reference on the tape and than lightly tighten the screws under the arm. Verify that the horizontal line is on the horizontal line on the tape.
17. If both the sagittal and horizontal line are aligned, hard tighten the screws.
18. Turn OFF the unit.
19. Set DIP-switch 3 to OFF to set the unit in normal mode (see paragraph 4.2.4.1).
20. Turn ON the unit.
21. Make exposure and verify the image quality as described in paragraph 7.9.

11.3.15. Disassemble upper chin support

1. Remove the upper cover. Remove cover from MCU board.
2. Set DIP-switch 3 to OFF (1 and 2 ON) in order to enter in Service Mode.



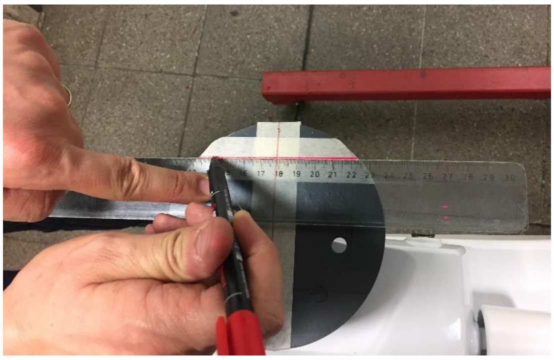
3. Turn ON the unit.

Note
In service mode NEVER press up/down column keys as they change rotating position.

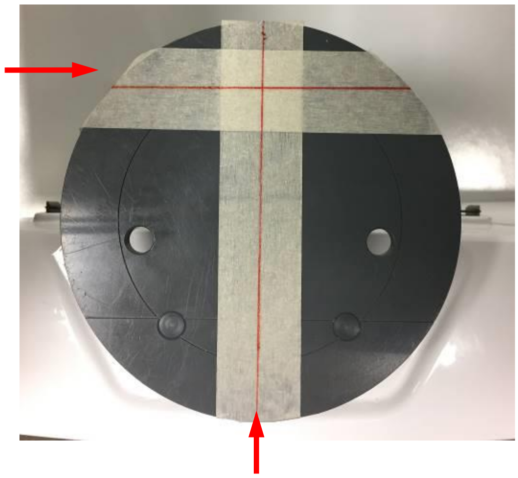
---

4. Position the panoramic support plate on chin support.
5. Turn ON laser and press >0< button on the keyboard until sagittal laser is on the middle of tool. Use adhesive tape and mark the laser position (using a pen).

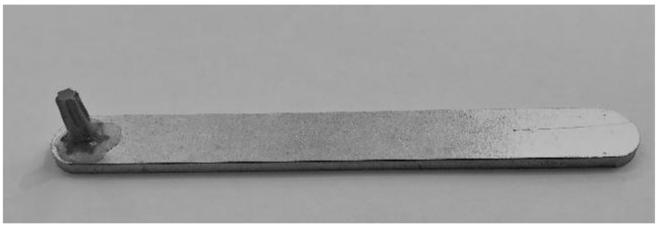
6. Put adhesive tape between the extremities of the tool.
7. Press >0< button on the keyboard until sagittal laser is parallel to chin support arm. On adhesive tape mark the laser position (using a pen).



Rotation references are present on the tool and it has to be used as reference to position the unit in the same position.

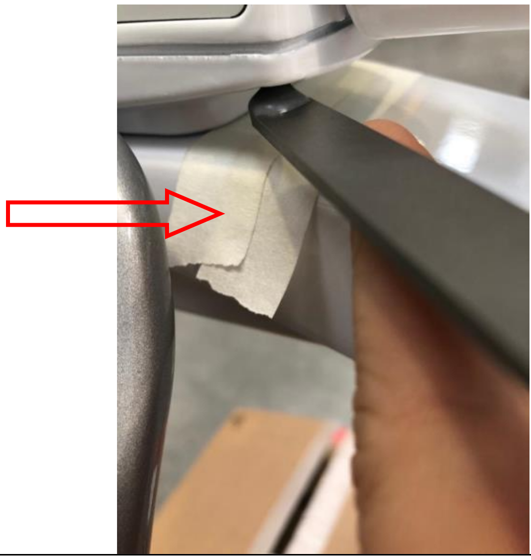


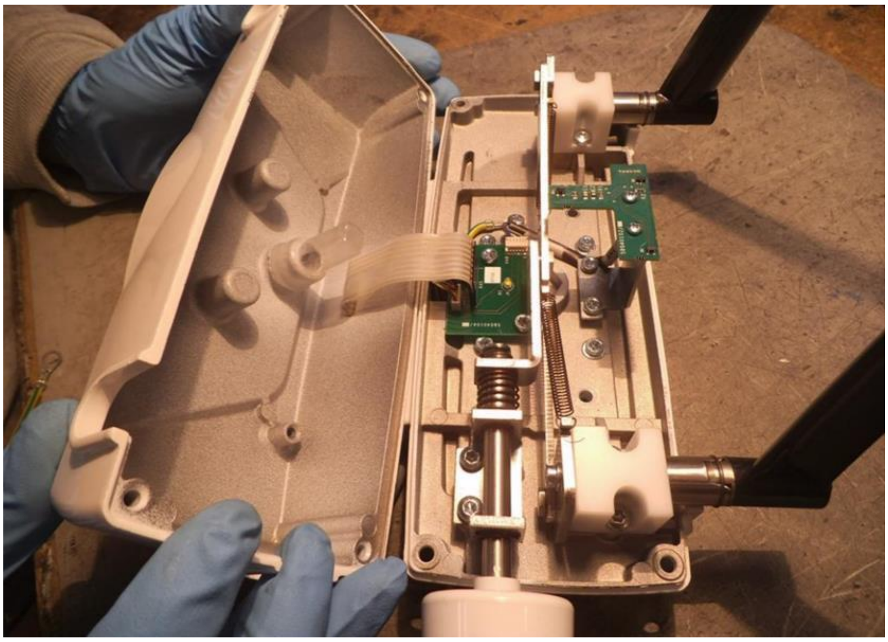
8. Turn OFF the unit.
9. Take the wrench TORX T20 provided with the spare part



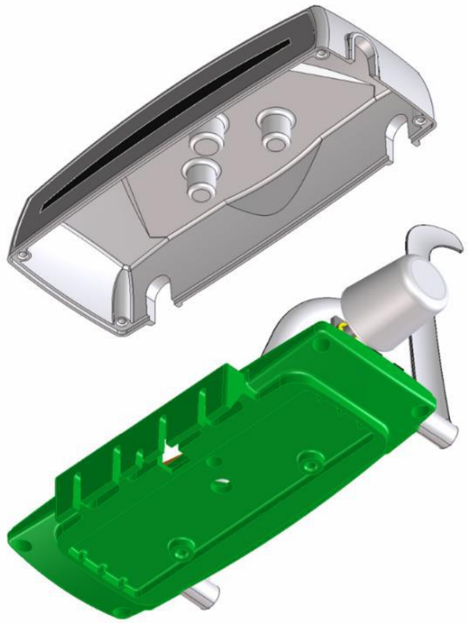
10. Identify the four torx screws and unscrew first the two external ones. At this point the first step is to lose the two internal screws and then to remove them in a second step. Now you can remove the upper cover.

Note
To avoid to damage the fixed arm painting, you can apply adhesive tape under the screw holes.



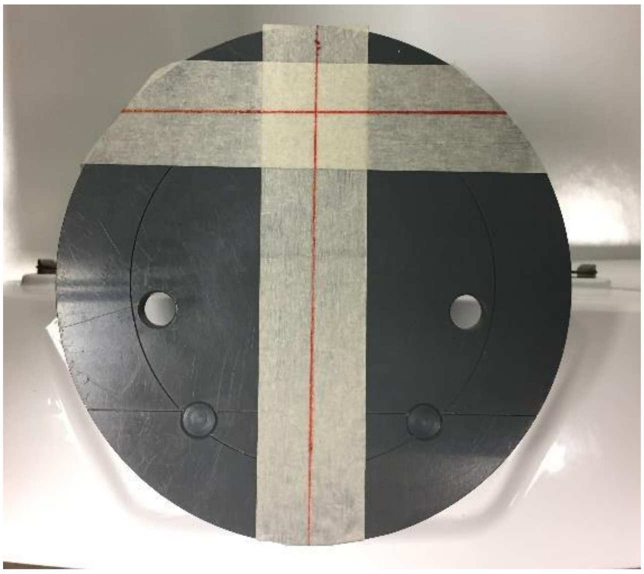


11. Remount the upper cover and point the screws loosely

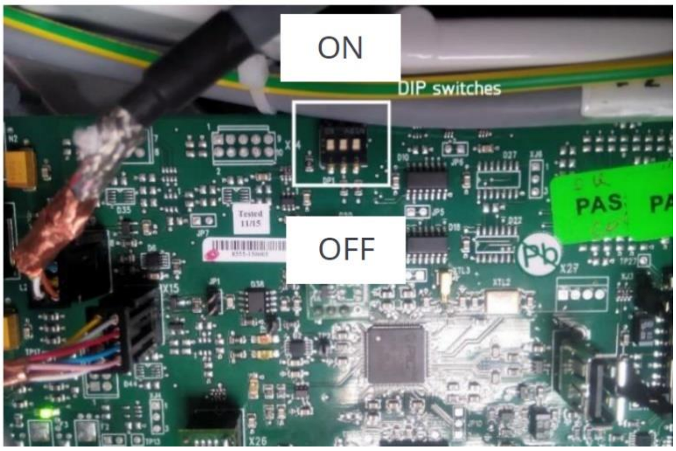


Warning
Be careful not to create a double thread by screwing back the screws.

12. Position the panoramic support plate with the laser reference on chin support



13. Turn on the unit, be sure to line up the laser in sagittal and coronal planes as explained in point 5 and 7 and tighten the screws.
14. Set the DIP switch in normal mode: ON – ON – ON and remount the metallic cover on the MCU board and the upper cover of the unit.

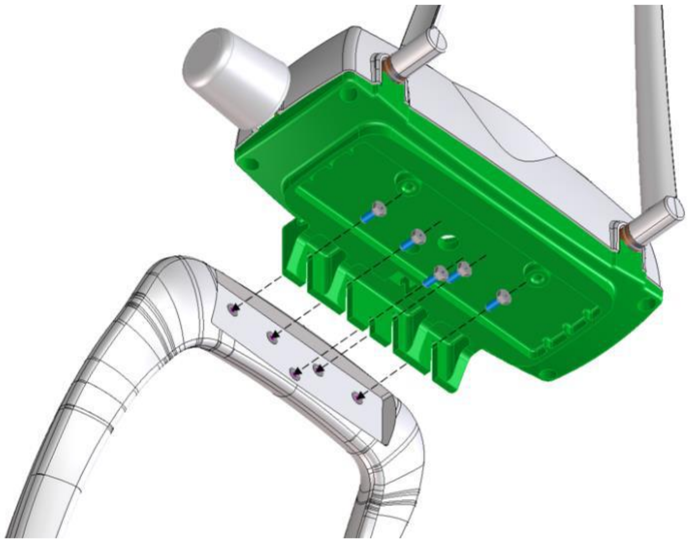


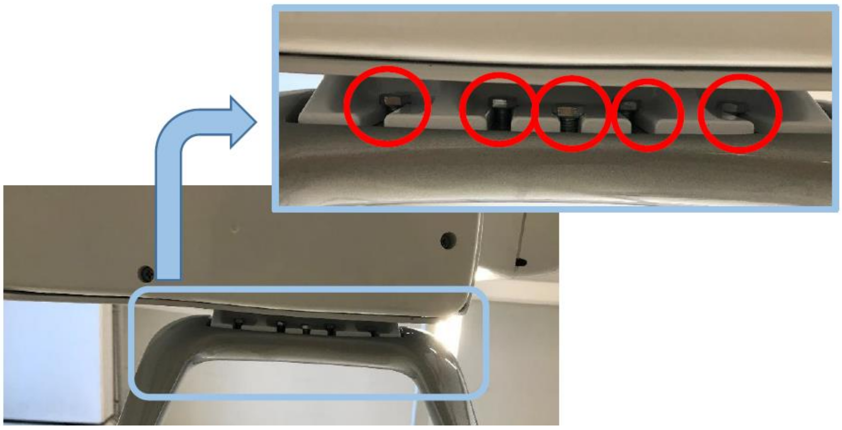
15. Turn ON the unit.
16. Make exposure and verify the image quality as described in paragraph 7.10

11.3.16. Patient handle replacement instruction

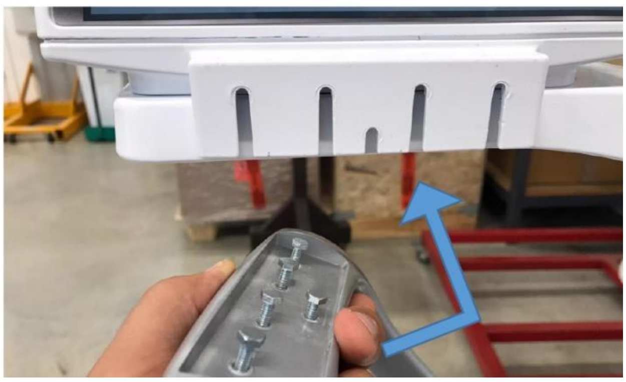
1. To remove a broken patient handle you need a 7mm wrench

You don't need to remove all chin support assy from the unit's arm, but only to loosen the 5 screws between the patient handle and the chin support.





2. Now you can point the screws into the spare part and mount the new handle



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12. SCHEMATICS AND DRAWINGS

1. **I-Max 3D & I-Max CEPH 3D-CEPH General diagram**
2. **MCU-CPU board A1 layout**
3. **Generator board A2 layout**
4. **3D sensor power board A10 layout**
5. **CCU board A11 layout**
6. **Collimator driver board A12**
7. **CEPH drivers board A13**
8. **CEPH sensor power supply board A14**

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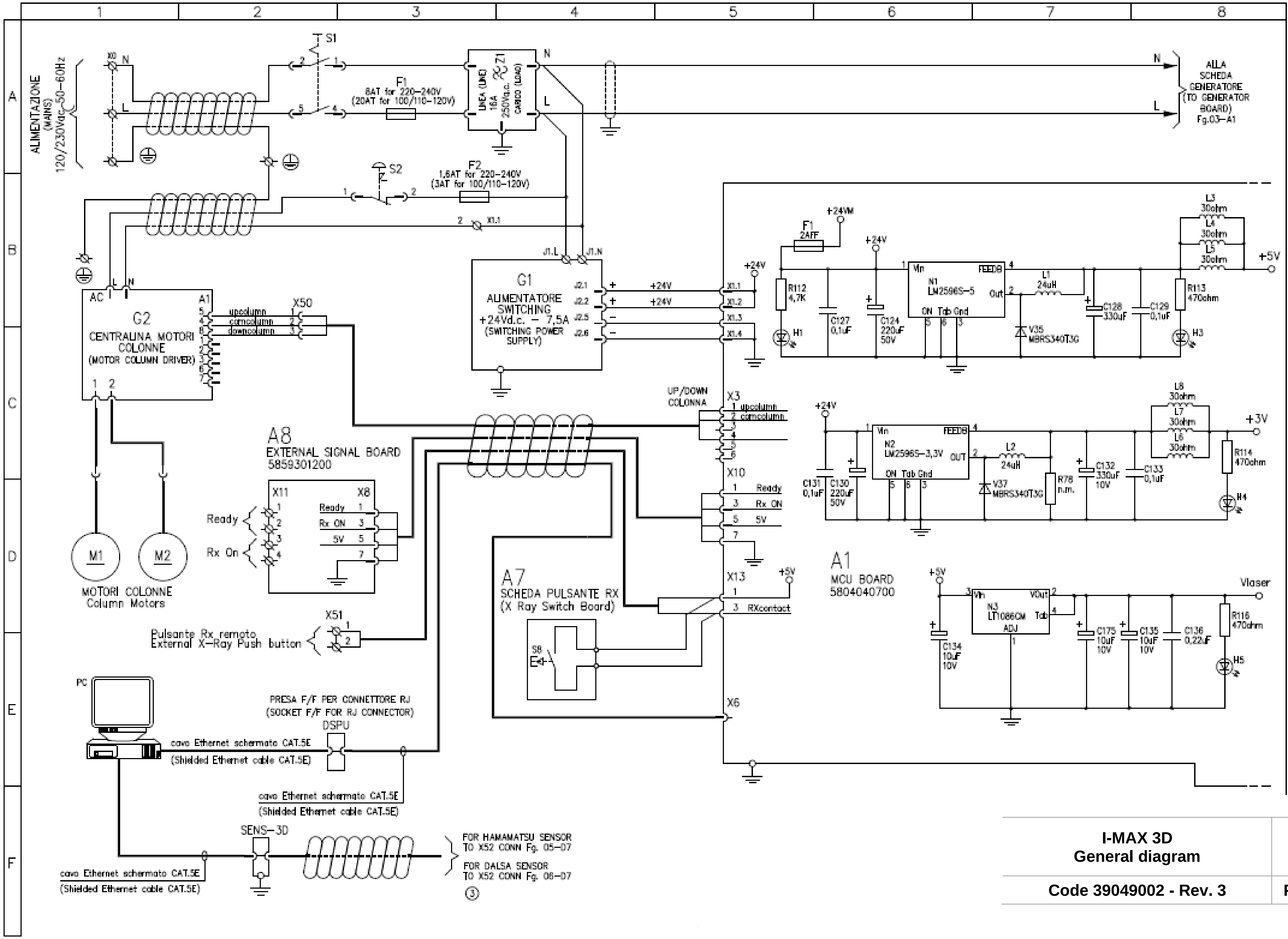

I-MAX 3D General diagram	1
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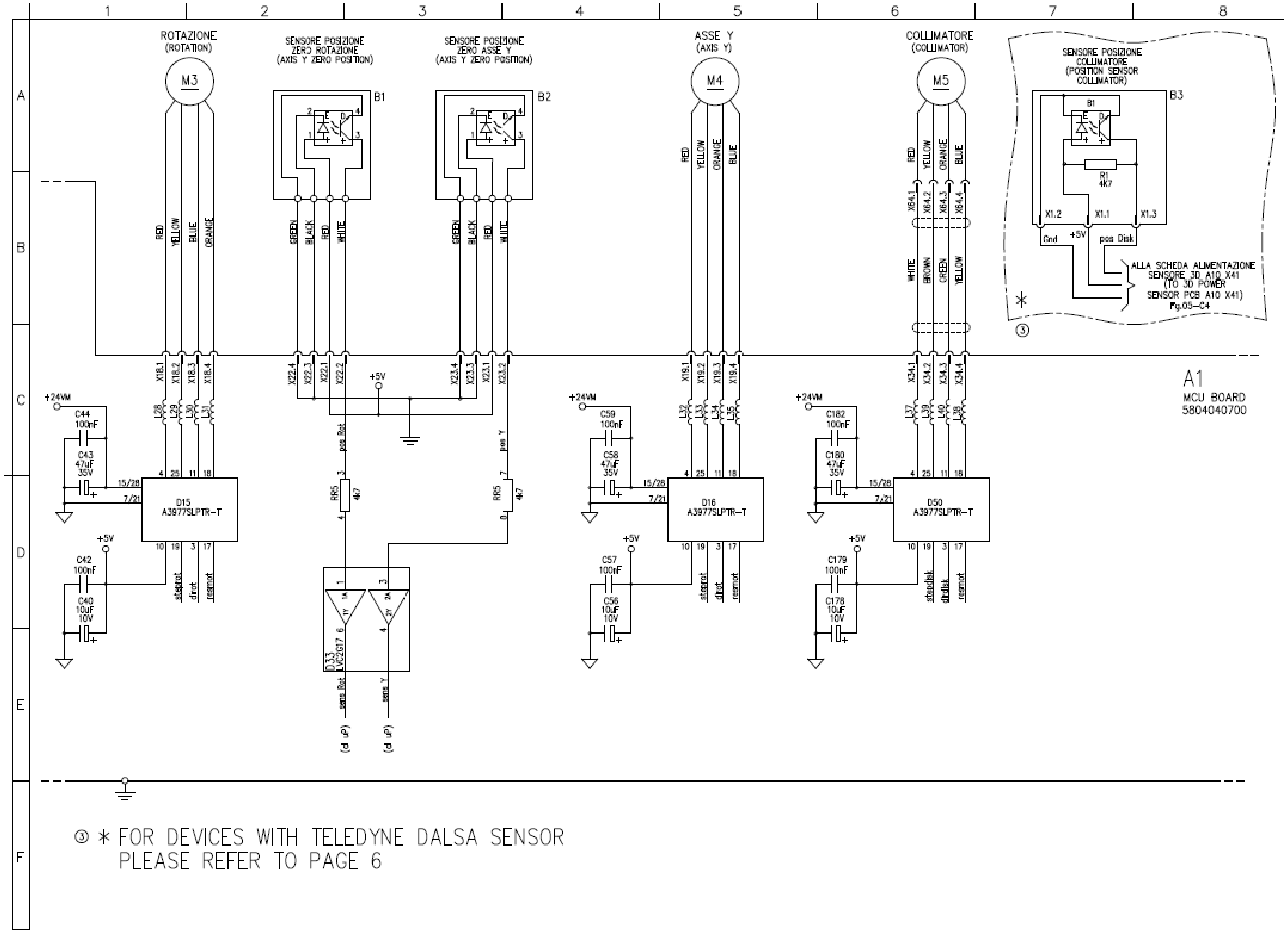

I-MAX 3D General diagram	1
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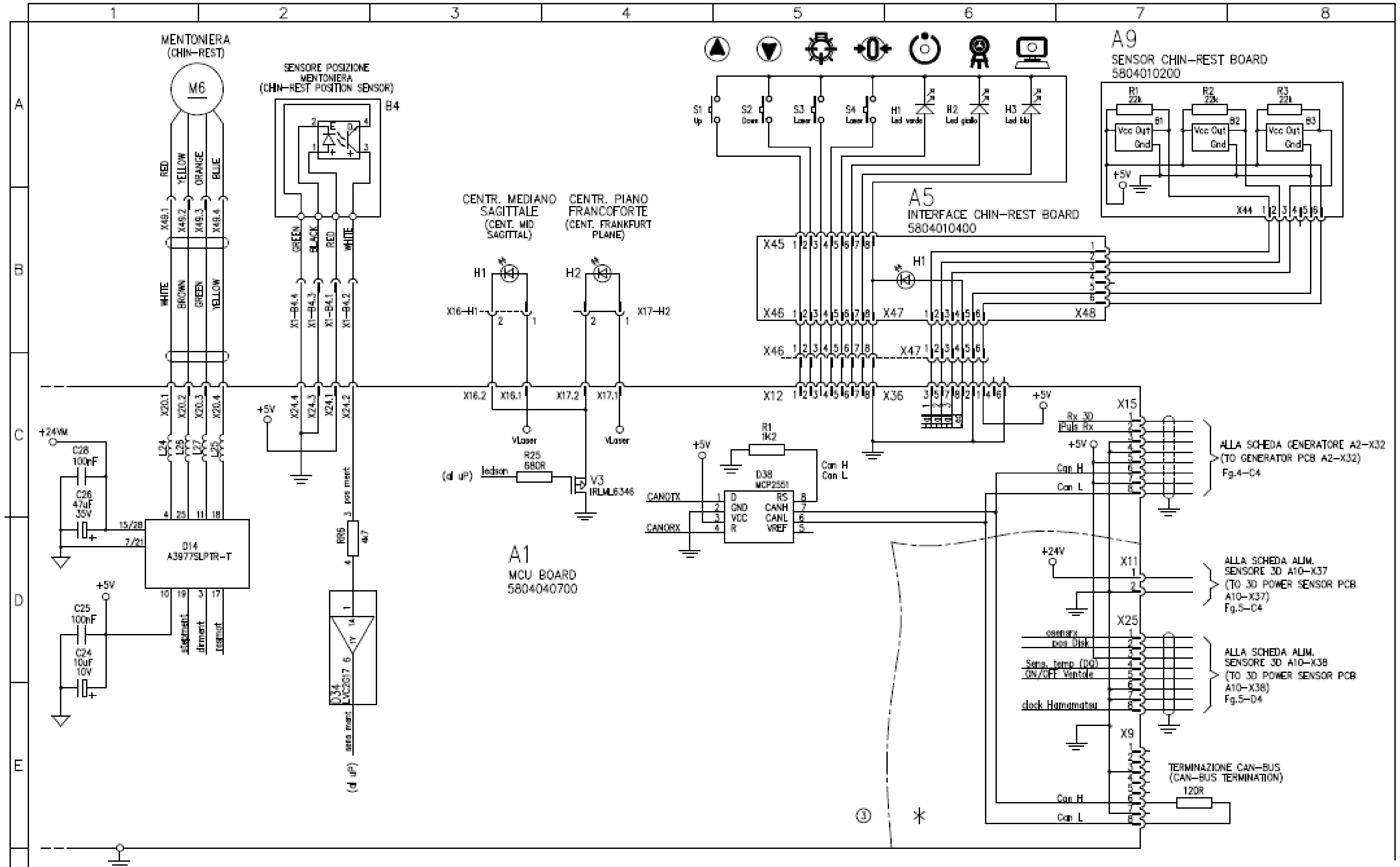

③ * FOR DEVICES WITH TELEDYNE DALSA SENSOR
PLEASE REFER TO PAGE 6

I-MAX 3D General diagram	1
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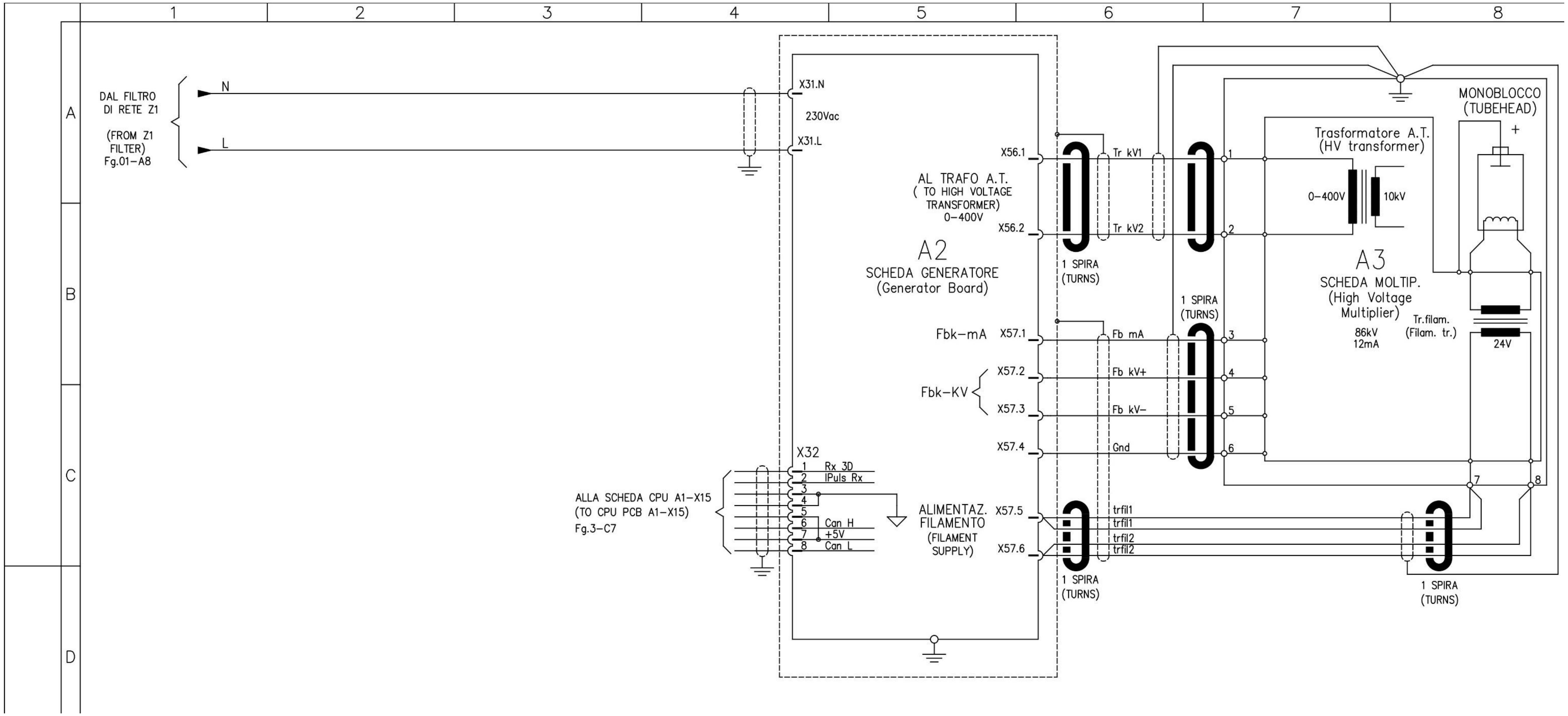

I-MAX 3D General diagram	1
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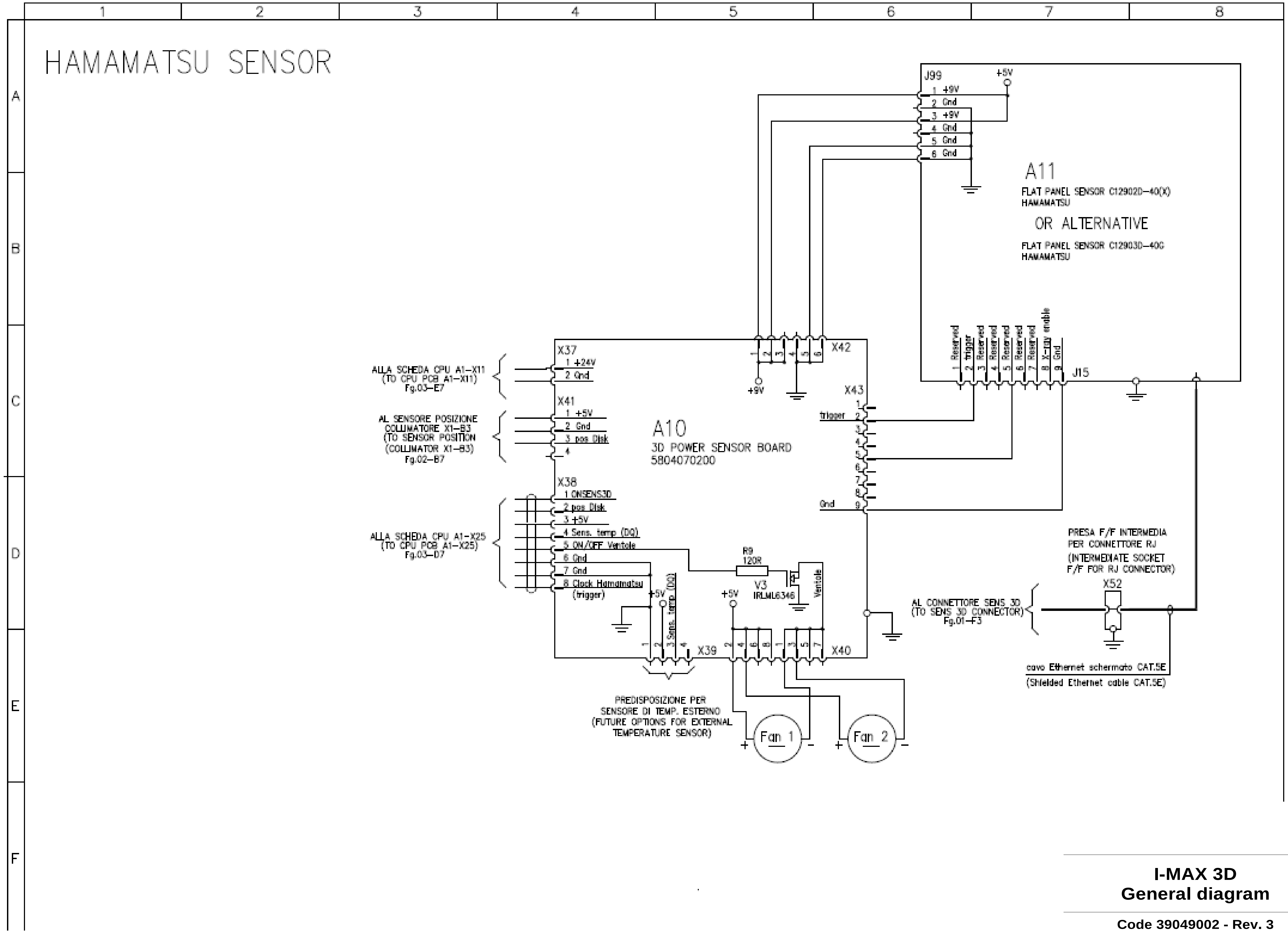

I-MAX 3D General diagram	1
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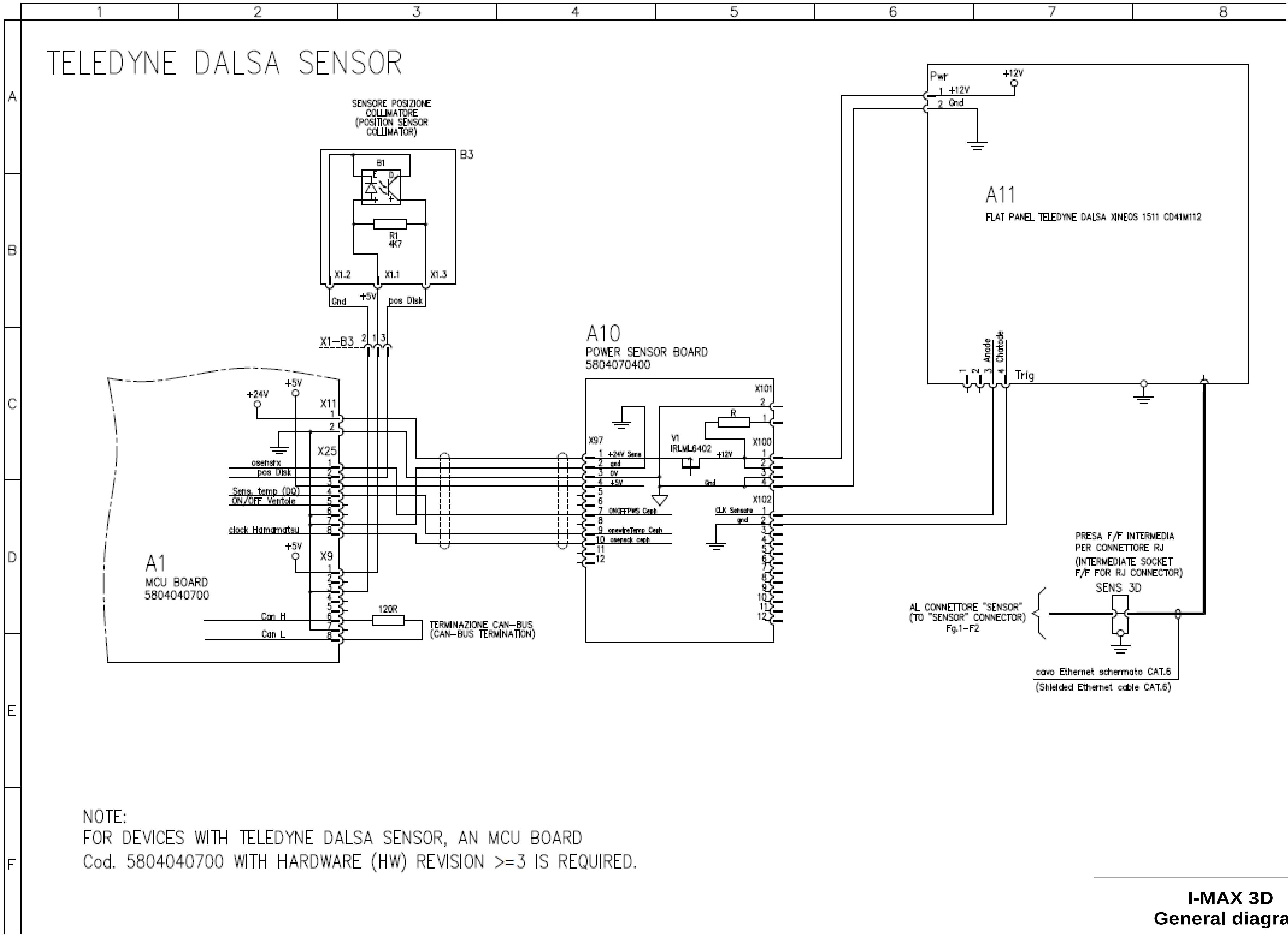

NOTE:
FOR DEVICES WITH TELEDYNE DALSA SENSOR, AN MCU BOARD
Cod. 5804040700 WITH HARDWARE (HW) REVISION >=3 IS REQUIRED.

I-MAX 3D General diagram	1
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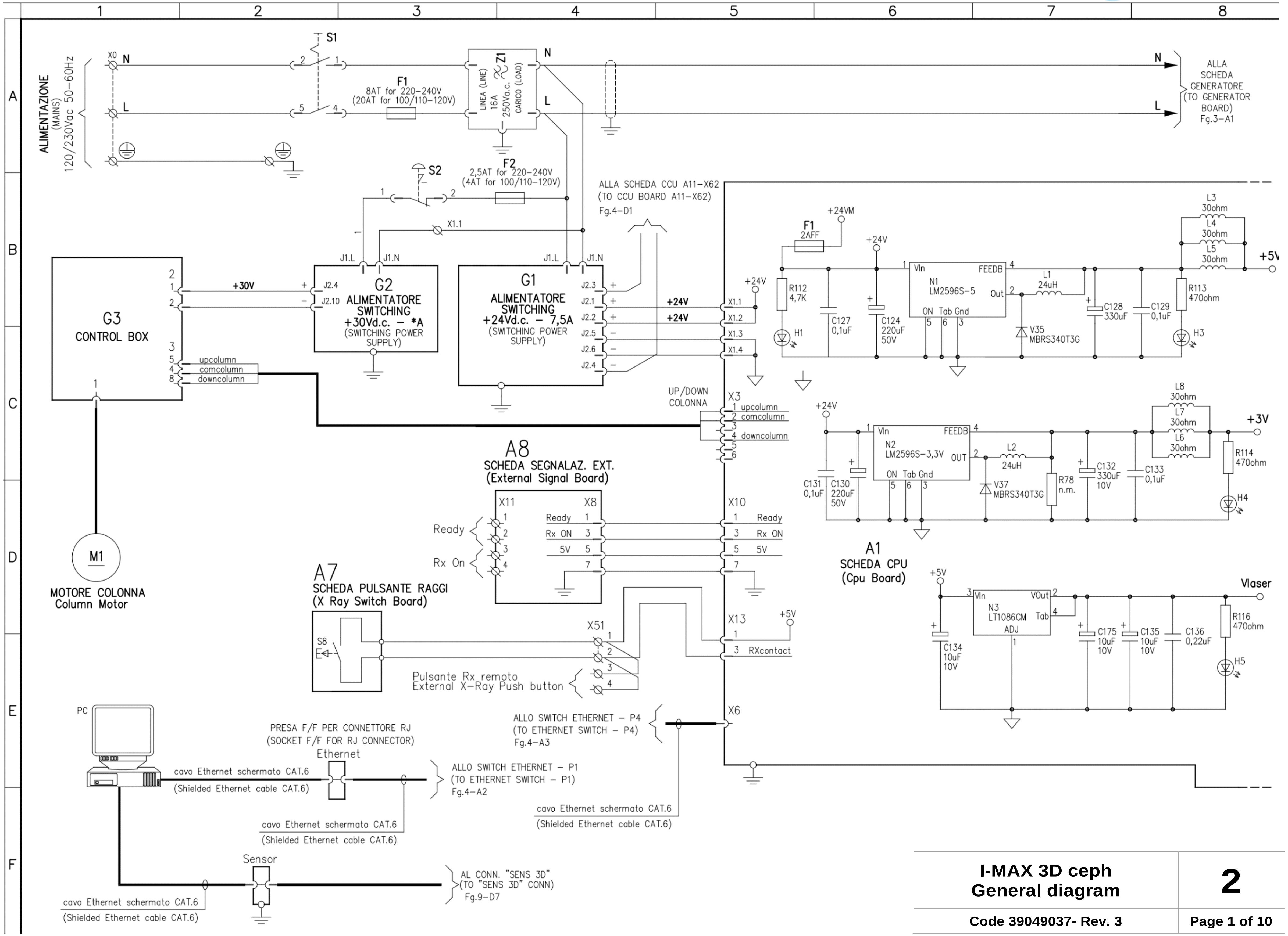

I-MAX 3D ceph General diagram	2
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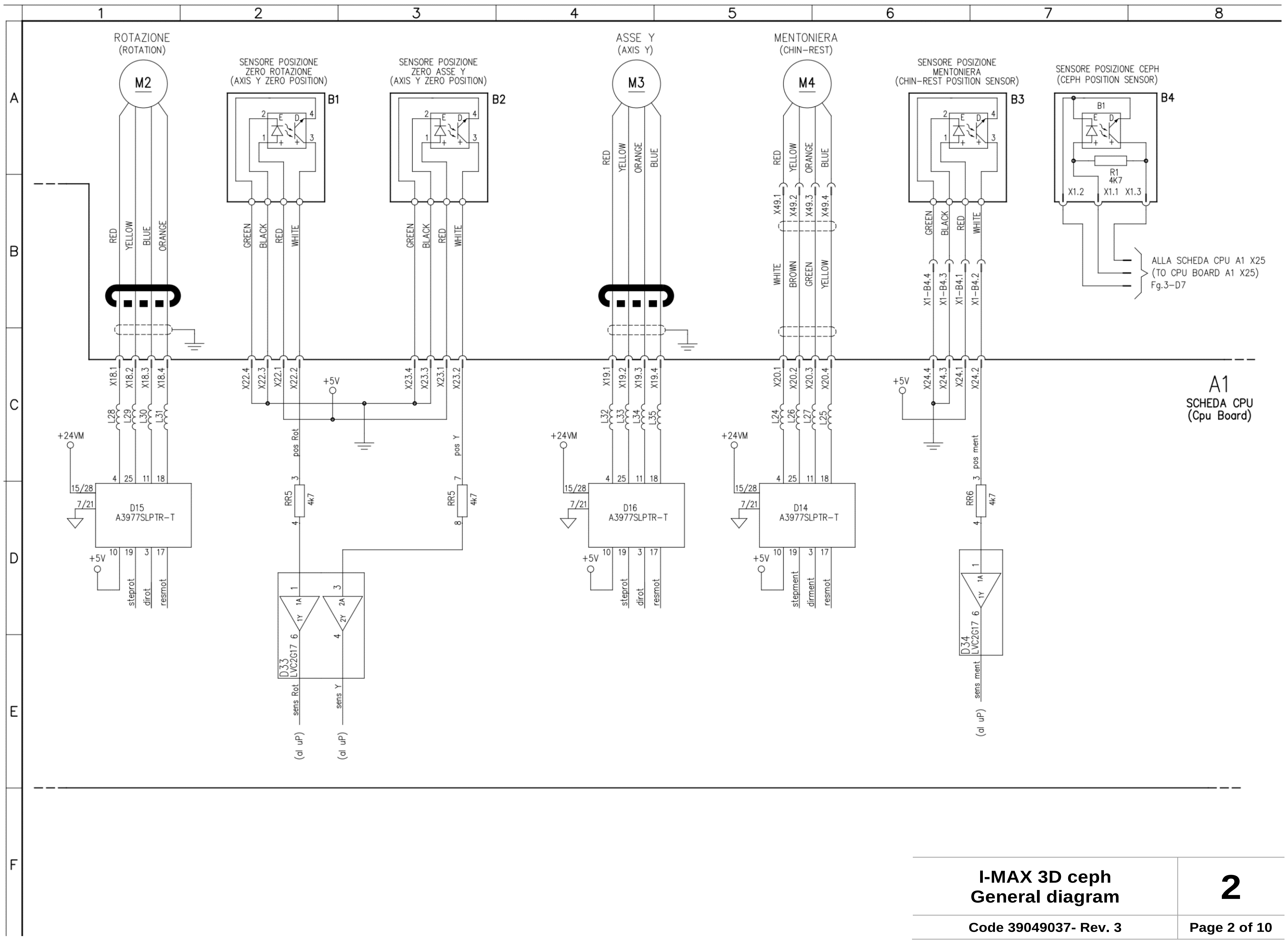

I-MAX 3D ceph General diagram	2
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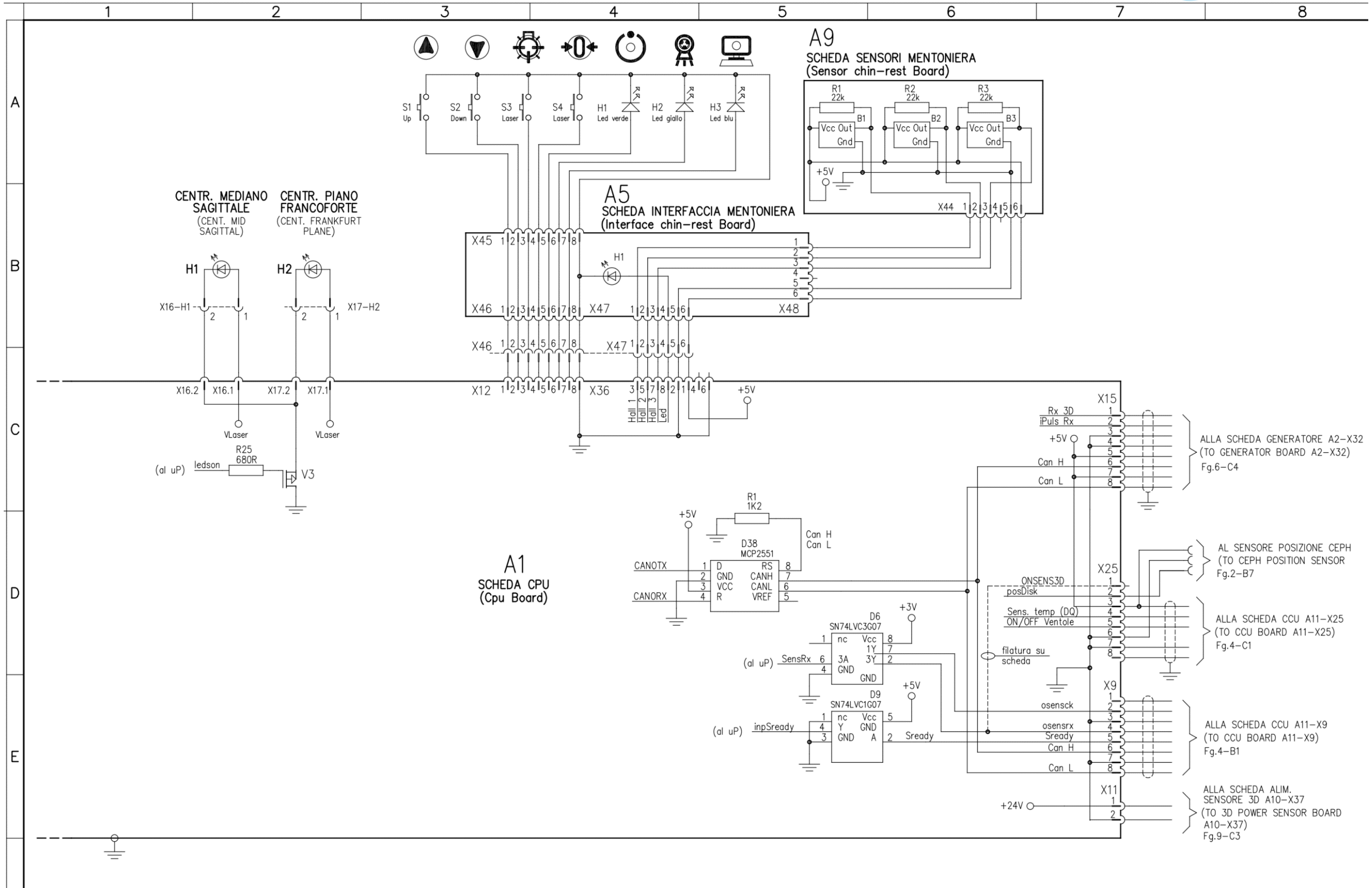

I-MAX 3D ceph General diagram	**2**
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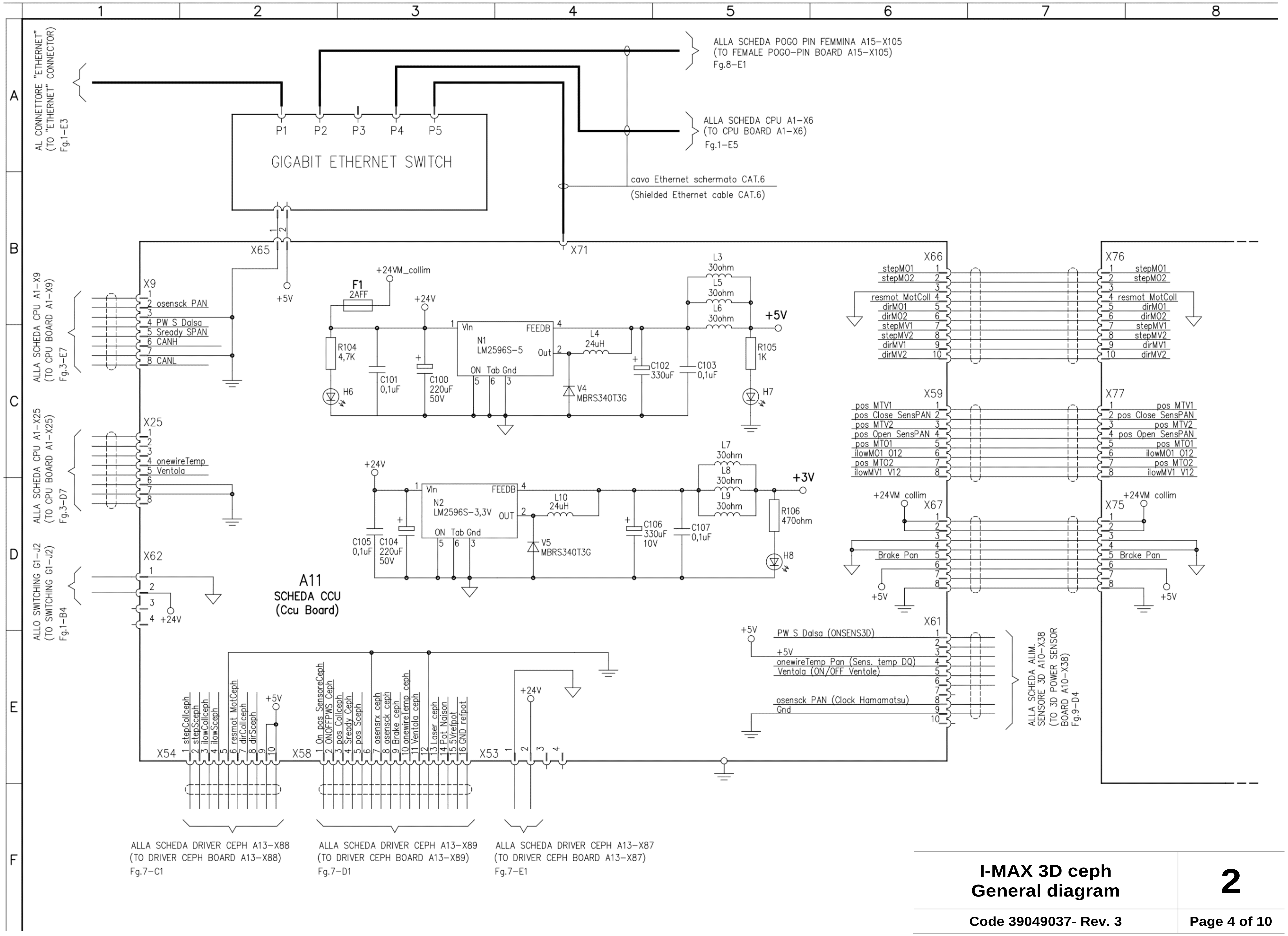

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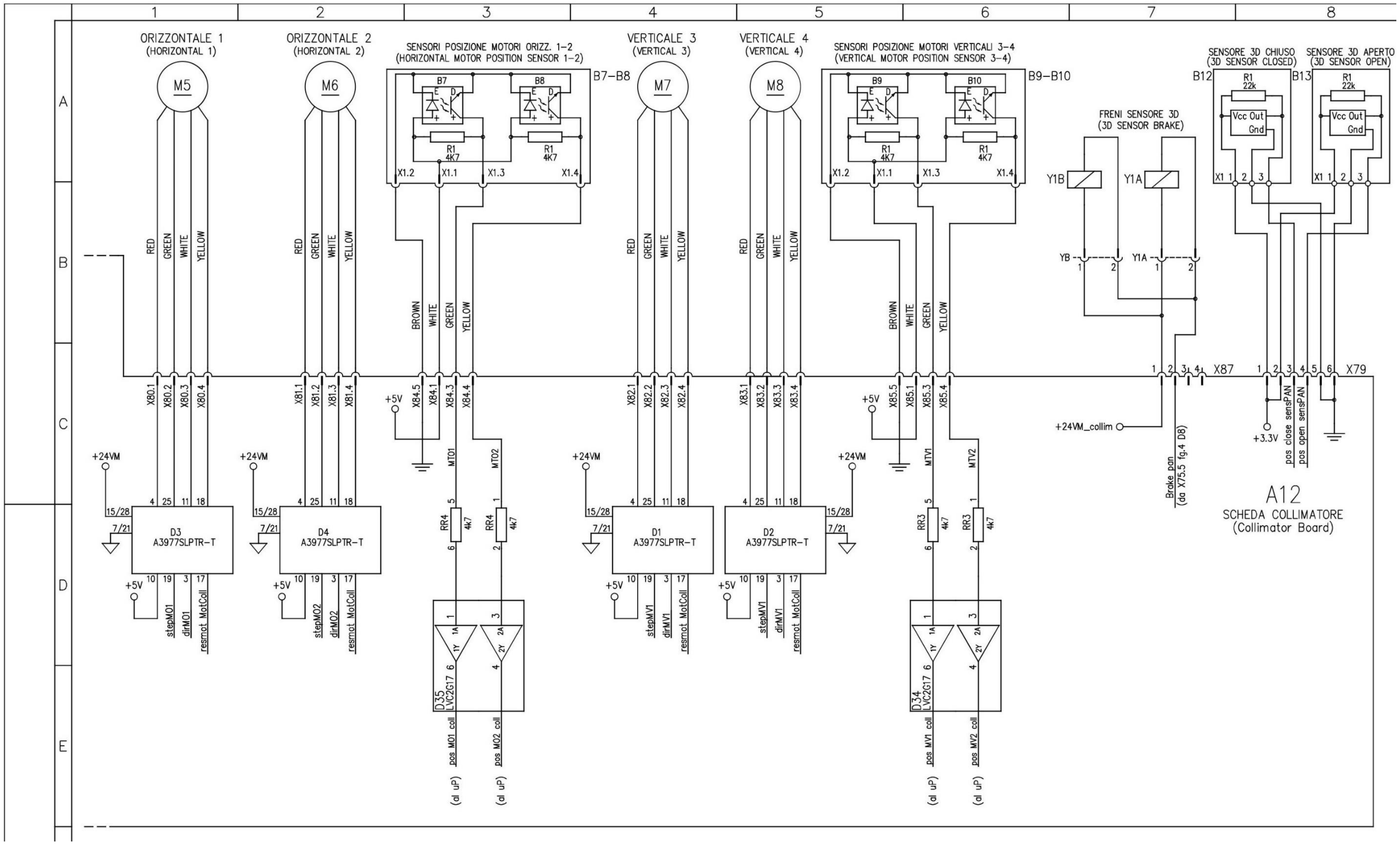

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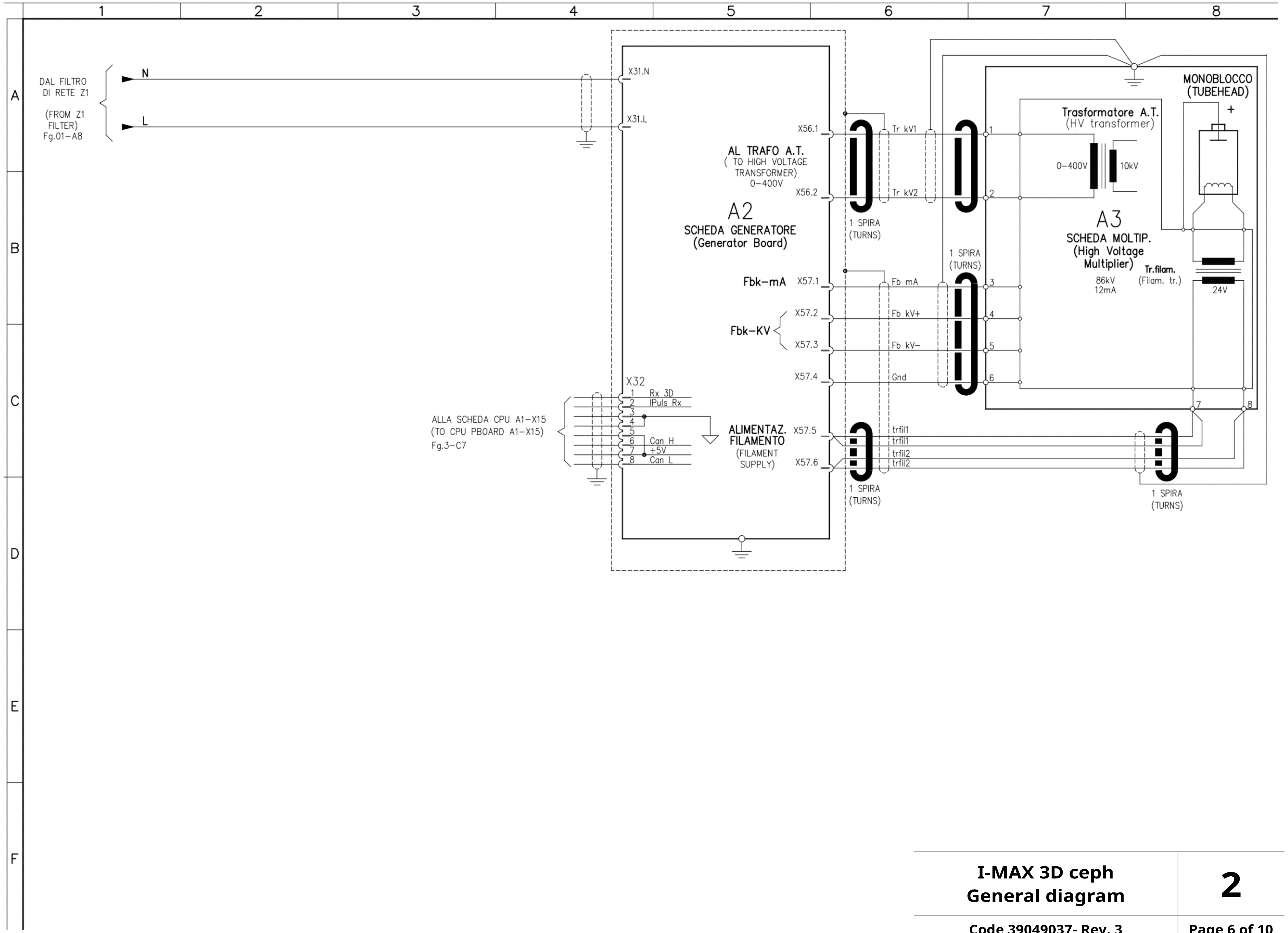

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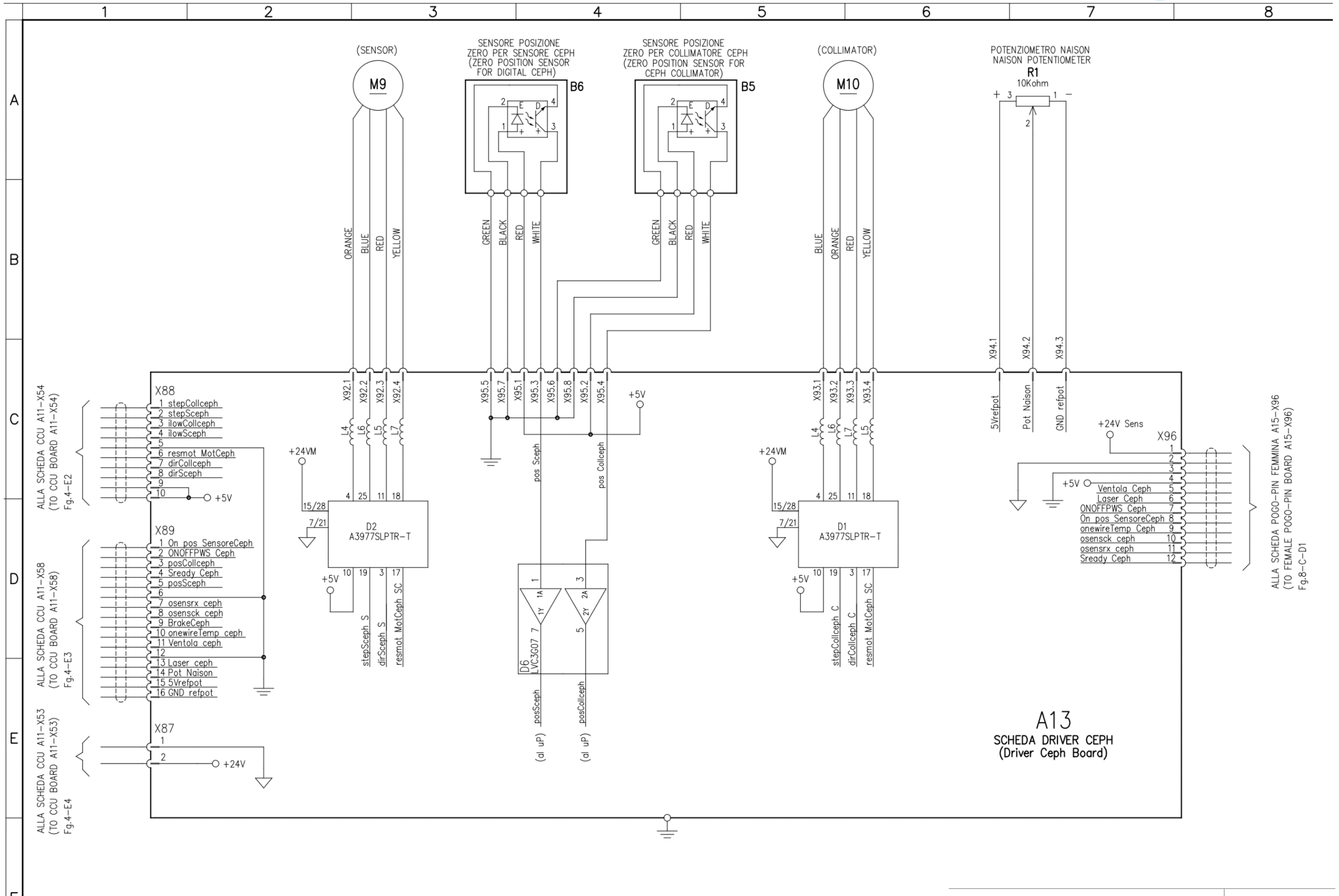

I-MAX 3D ceph General diagram	2
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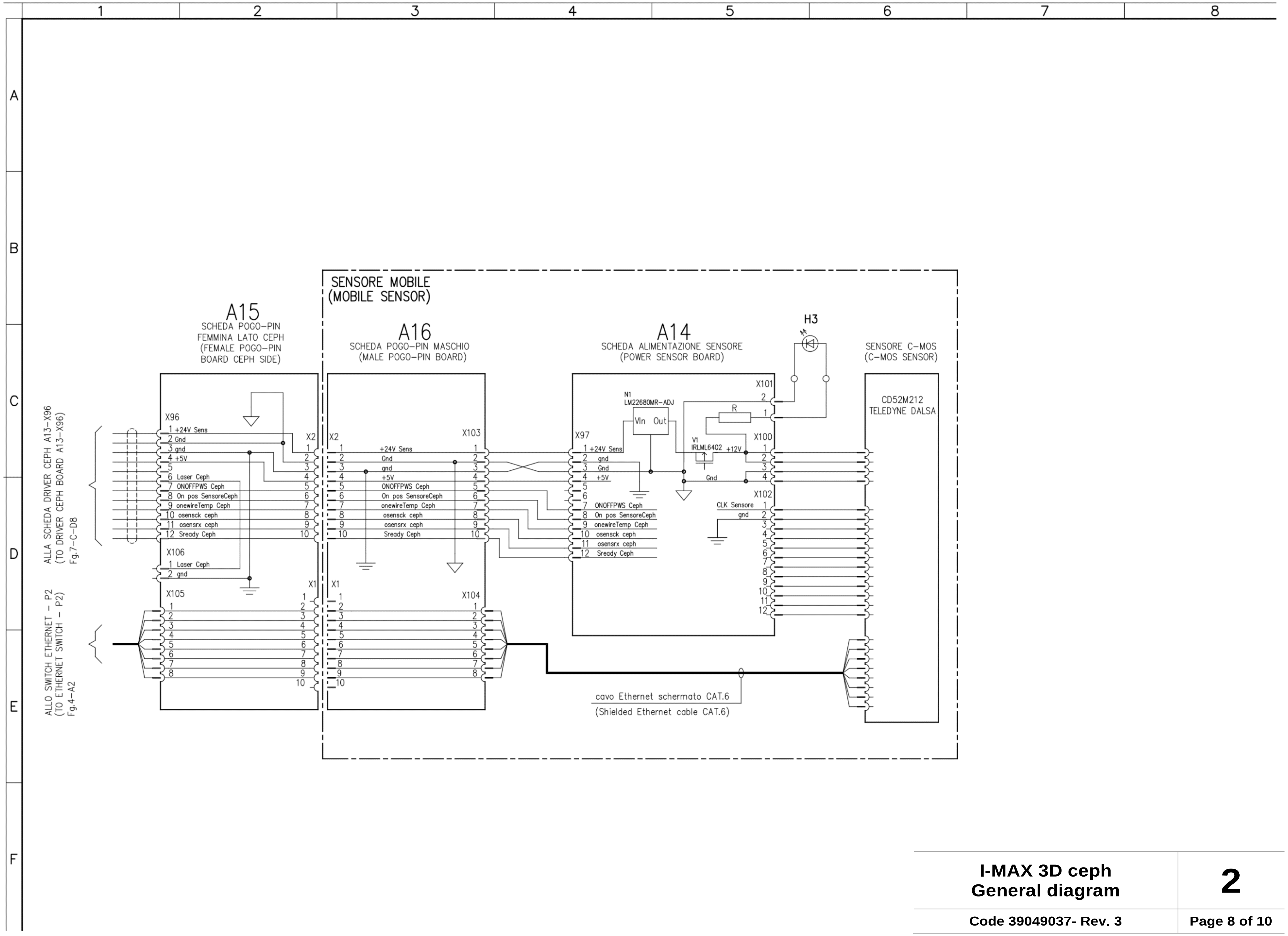

I-MAX 3D ceph General diagram	2
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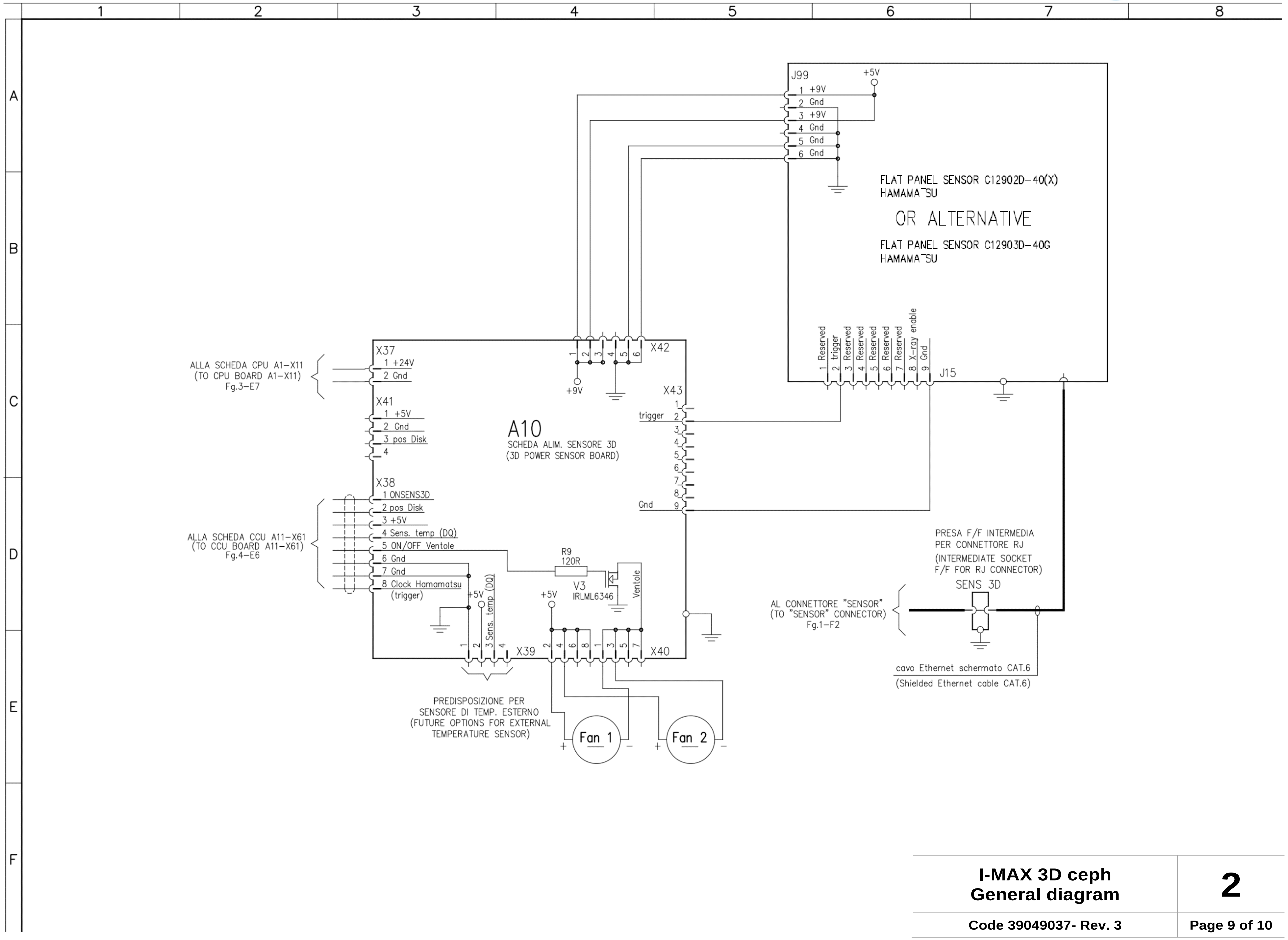

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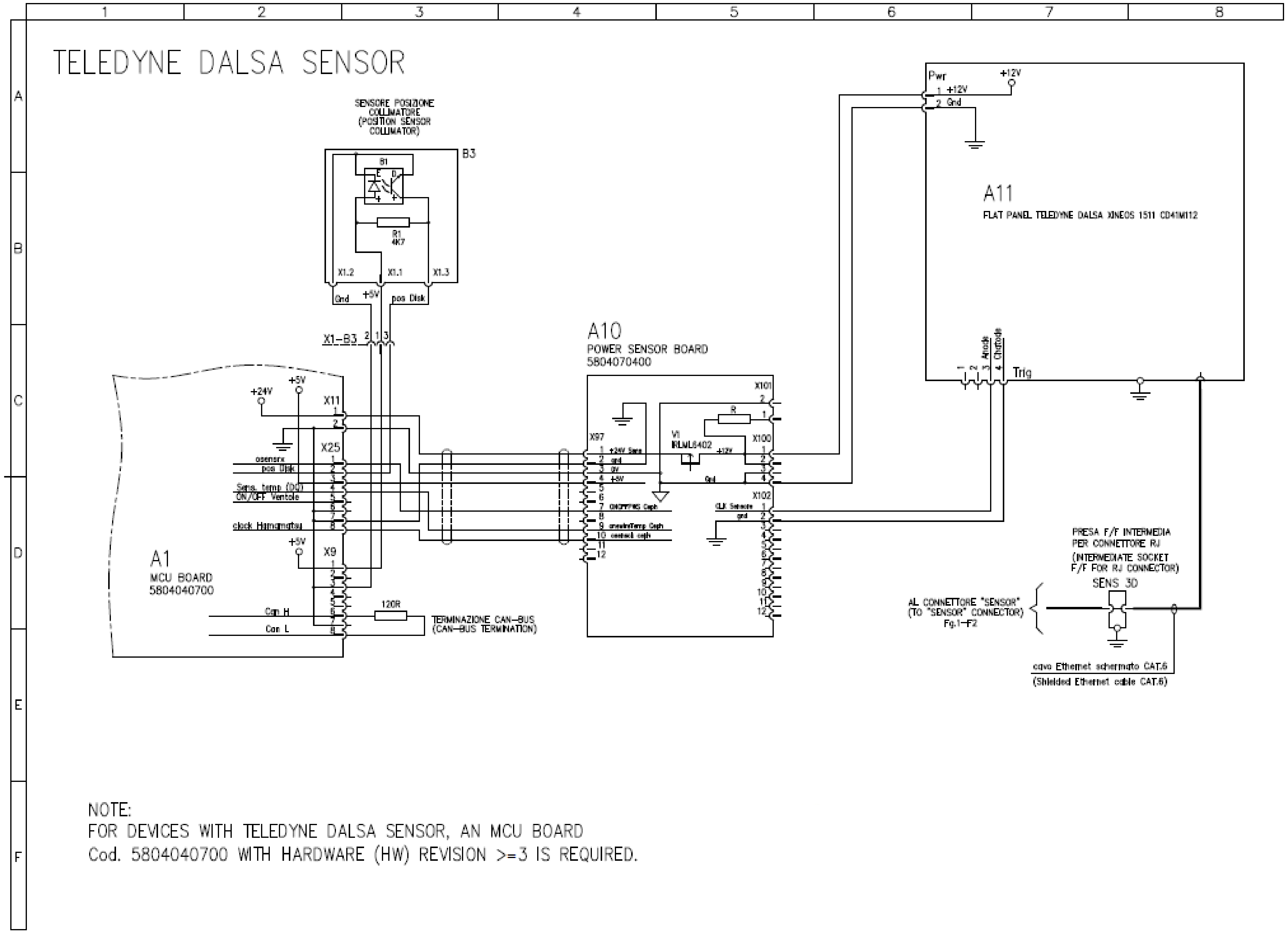

I-MAX 3D ceph General diagram	2
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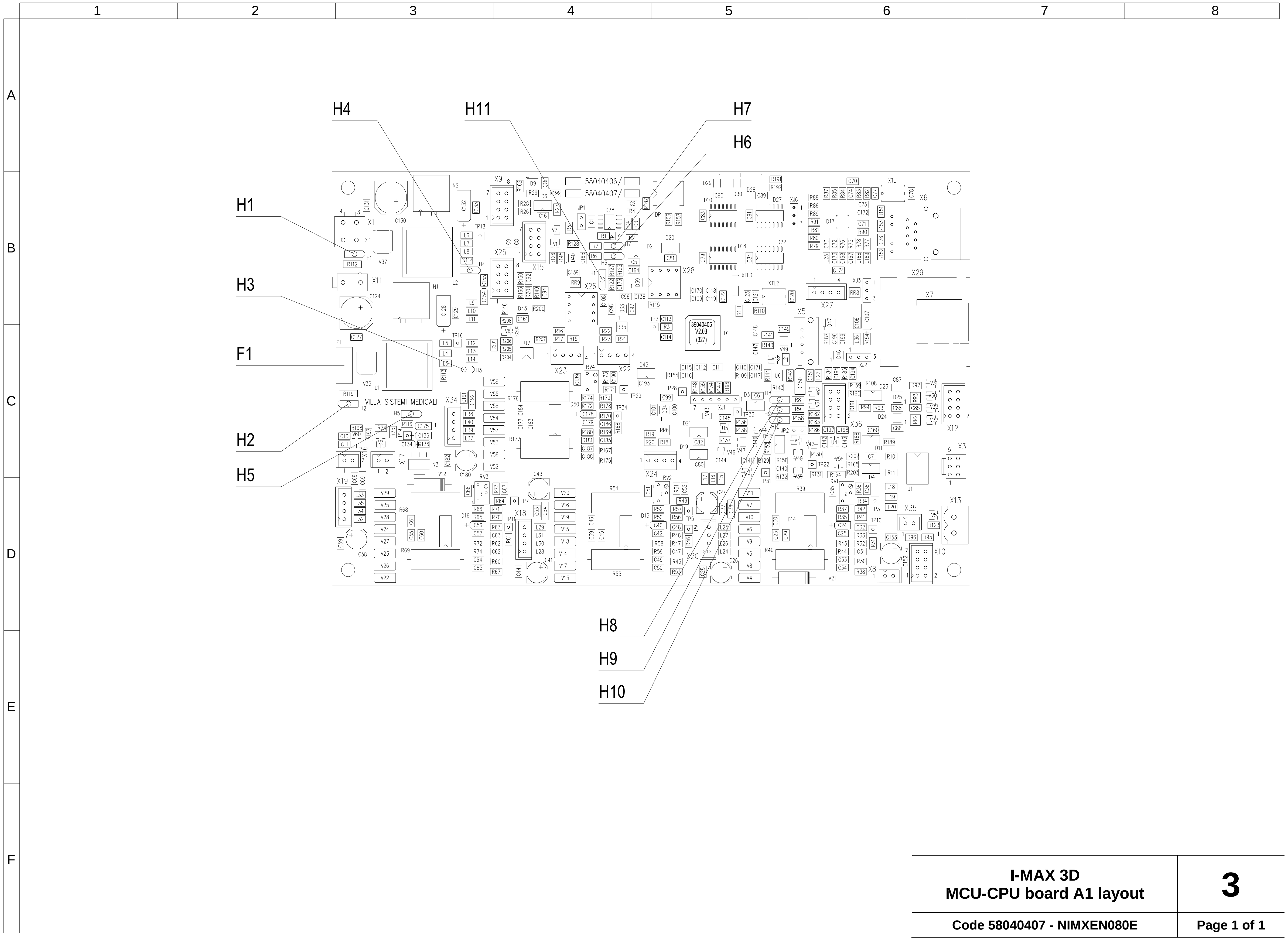
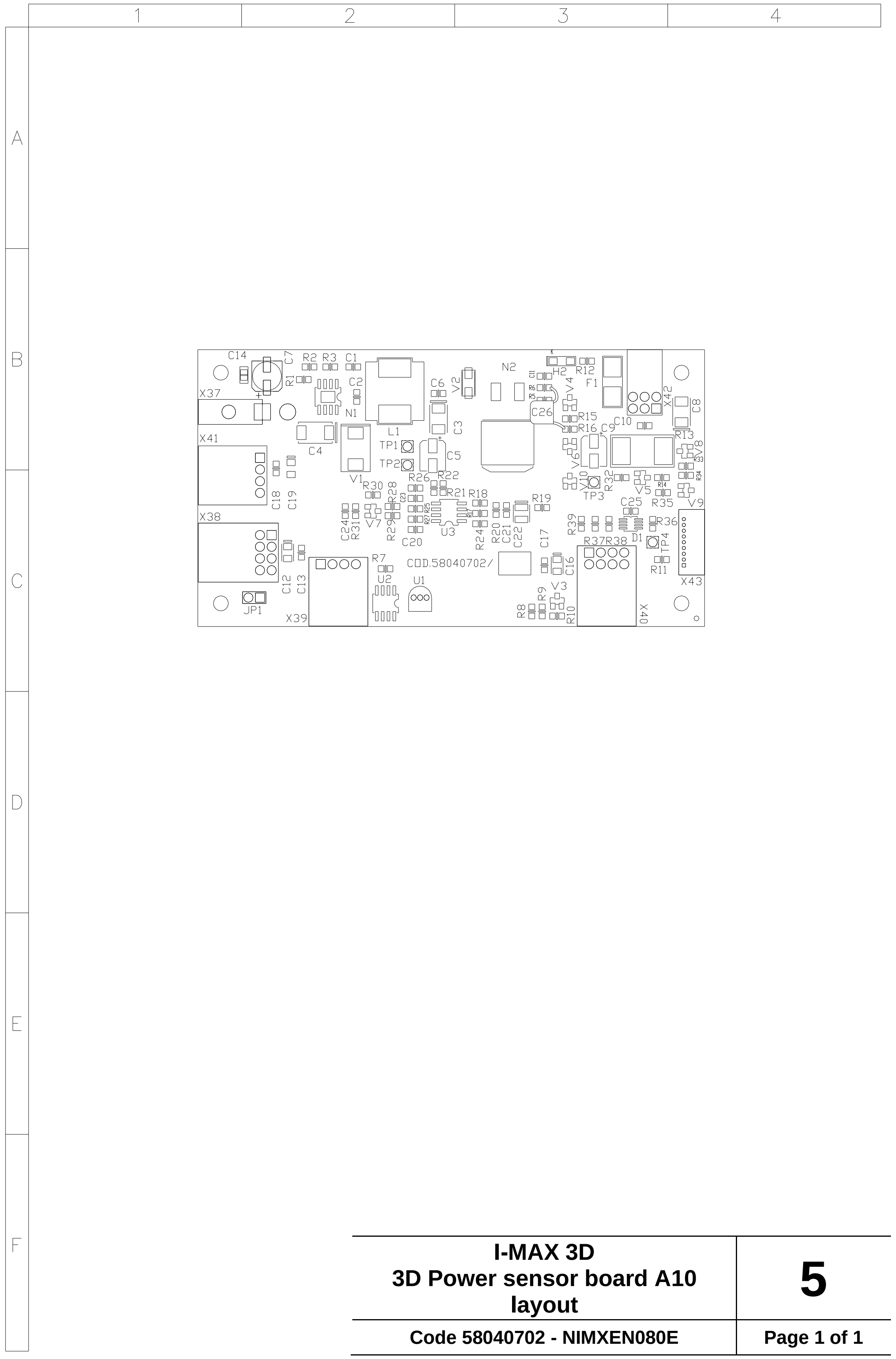
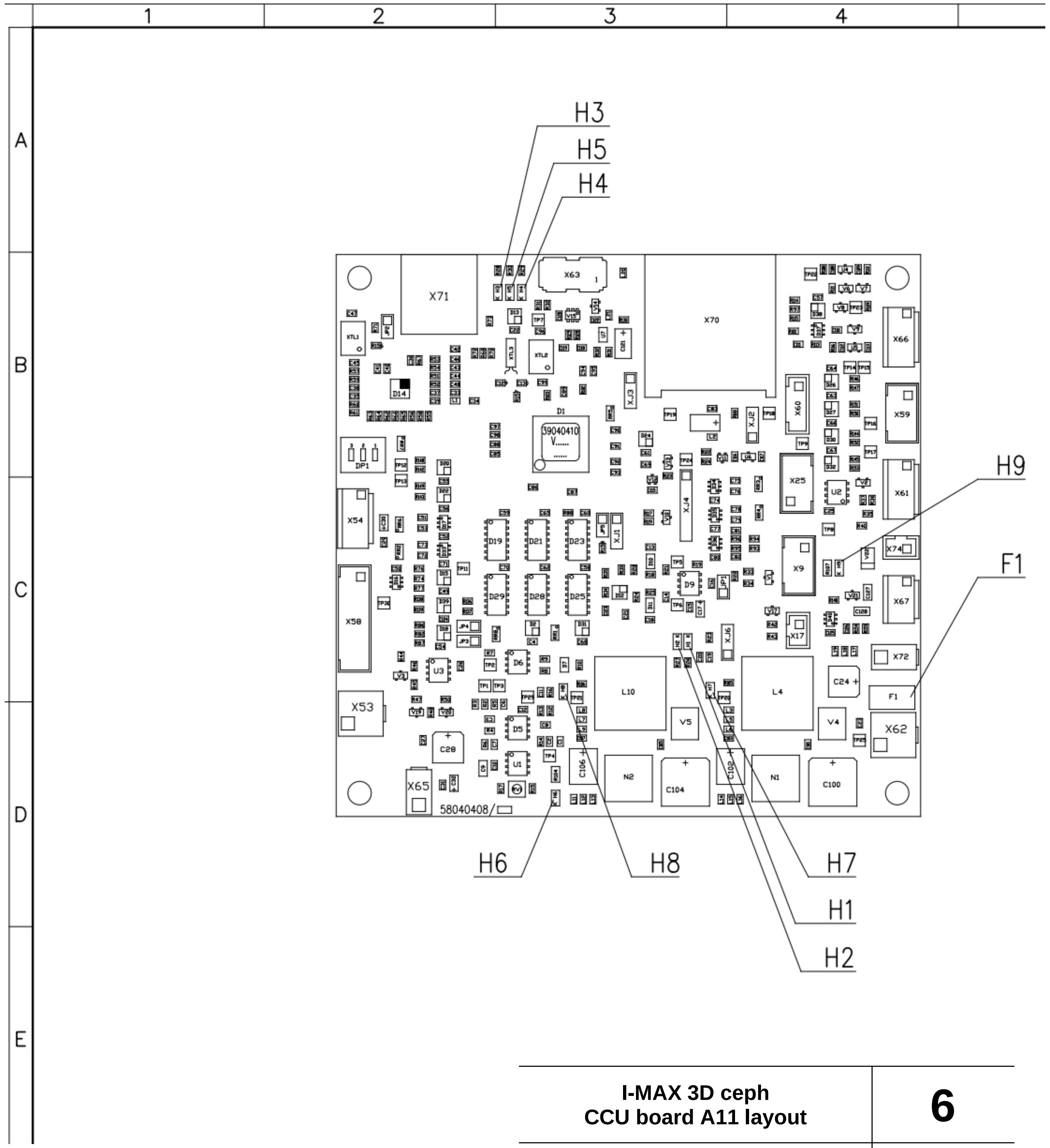


I-MAX 3D MCU-CPU board A1 layout	3
Code 58040407 - NIMXEN080E	Page 1 of 1

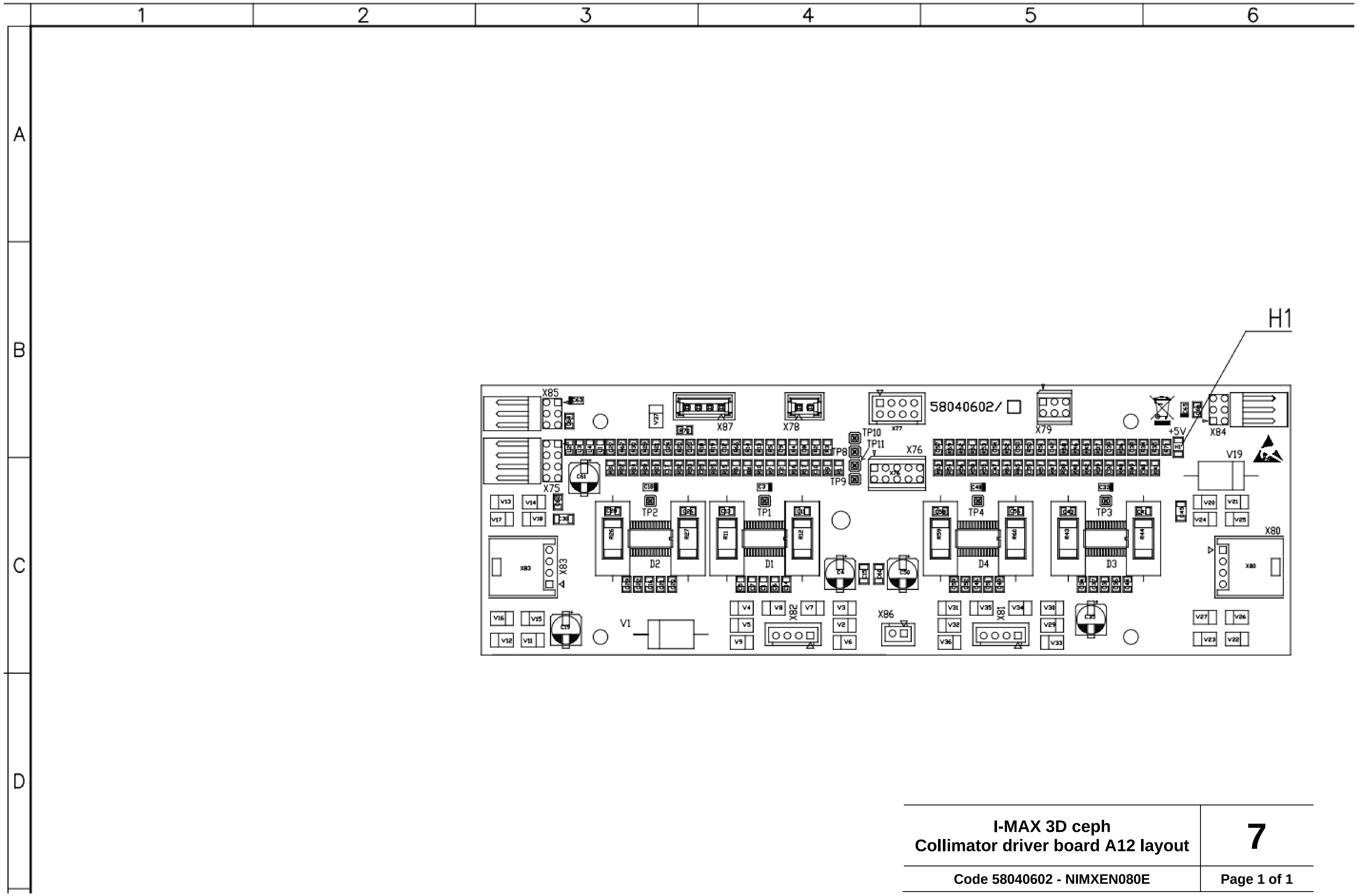
I-MAX 3D **Generator board A2 layout**	**4**
Code 58040202 - NIMXEN080E	**Page 1 of 1**



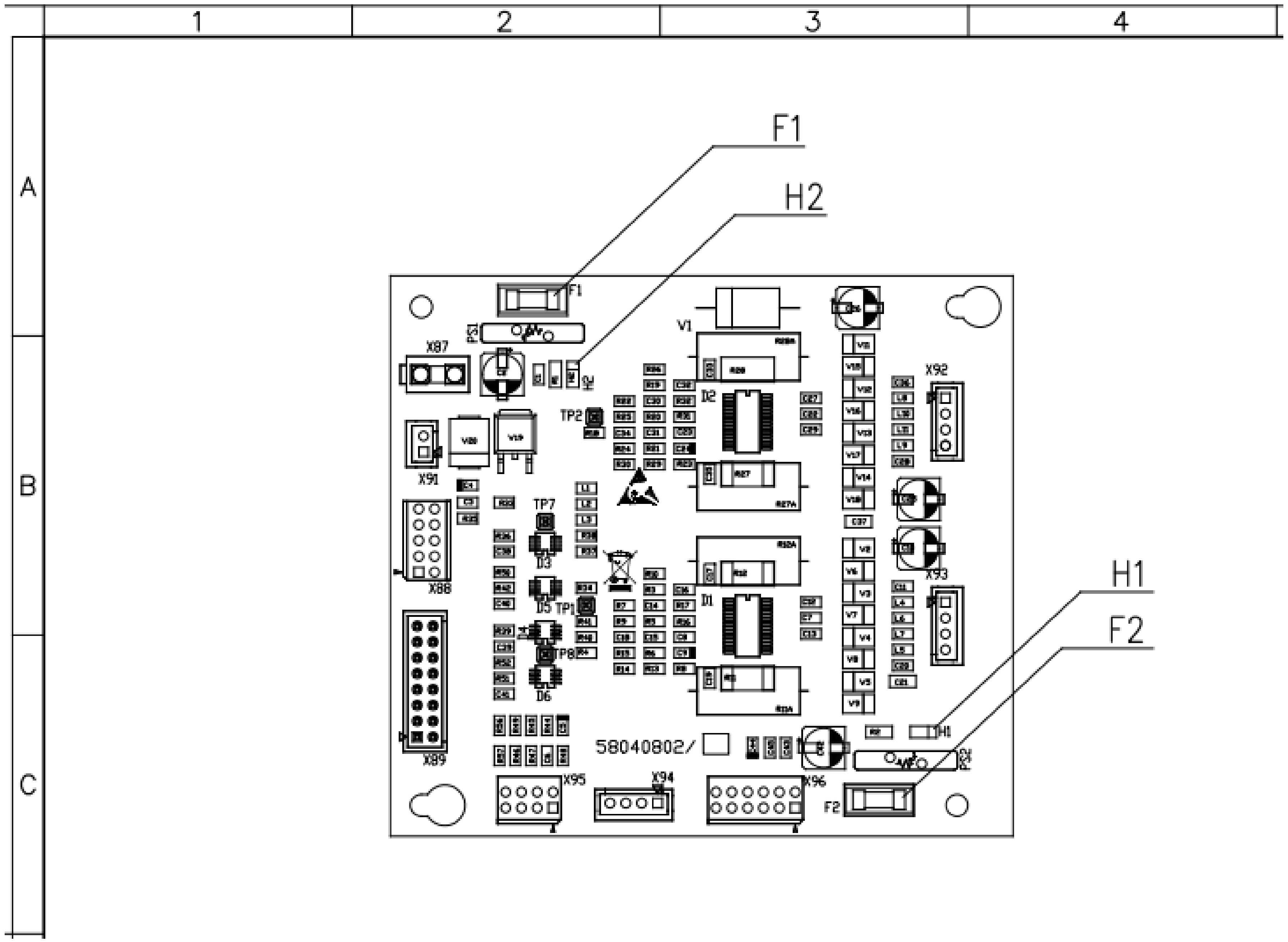
I-MAX 3D 3D Power sensor board A10 layout	5
Code 58040702 - NIMXEN080E	Page 1 of 1



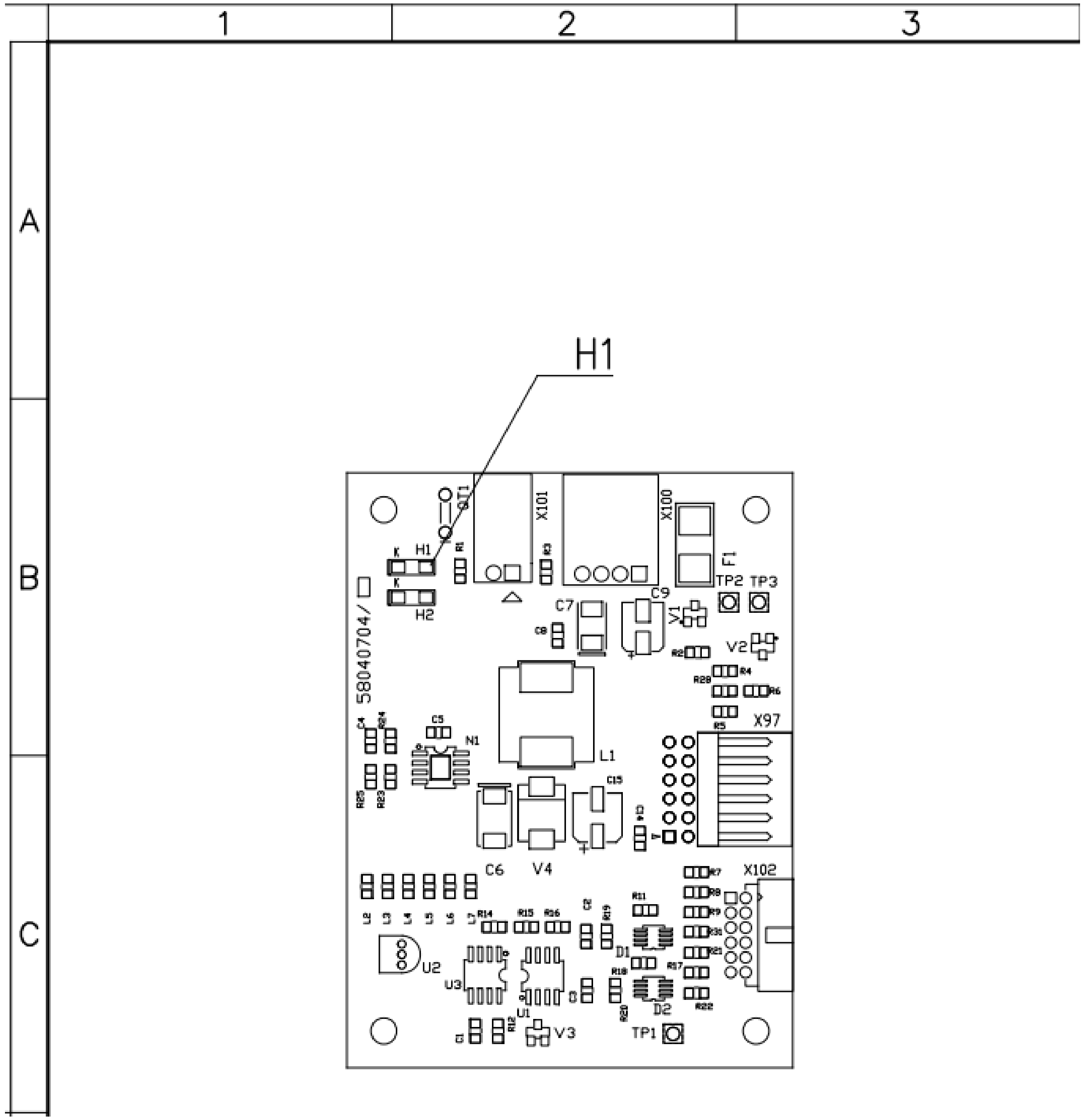
I-MAX 3D ceph CCU board A11 layout	6
Code 58040408 - NIMXEN080E	Page 1 of 1



I-MAX 3D ceph Collimator driver board A12 layout	7
Code 58040602 - NIMXEN080E	Page 1 of 1



I-MAX 3D ceph CEPH driver board A13 layout	8
Code 58040802 - NIMXEN080E	Page 1 of 1



I-MAX 3D ceph CEPH Sensor power board A14 layout	9
Code 58040704 - NIMXEN080E	Page 1 of 1

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13. SPARE PARTS

13.1. Top side of the unit

13.2. Rotating arm

13.3. Collimator

13.4. Chin support

13.5. UP/DOWN Column

13.6. TOP side / Rotation arm cables

13.7. Covers

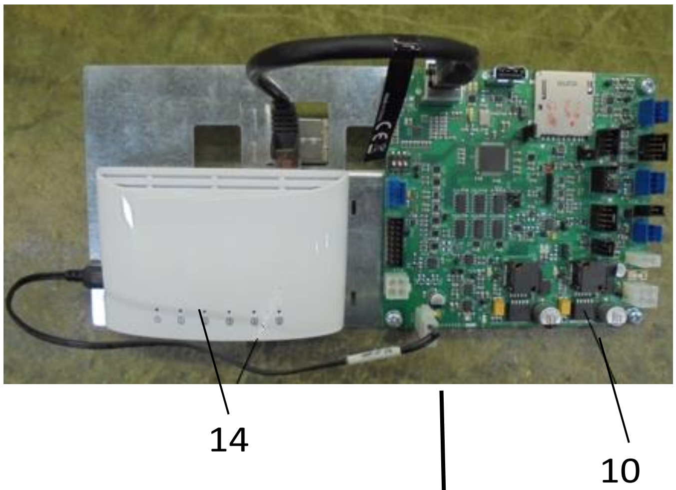
13.8. CEPH Arm and Mobile Sensor

13.9. Accessories and Service tools

13.1. Top side of the unit

13.1.1. Electrical and mechanical part

Ref.	Order code	Description	Note
1	6604041000 *(old code: 6204041000)*	Light sensor assy Y axis	
2	6604040900 *(old code: 6204040900)*	Light sensor assy rotation	
3	6604041200	Y axis motor assy	
4	6690807000 *(old code: 4990807000)*	Y movement belt	
5	6604040701 *(old code: 5804040700)*	3D MCU Board ETH	
6	6692824900 *(old code: 4492824900)*	Power Supply Board G1	
7	6691421400 *(old code: 4291421400)*	Emergency push button	
8	6691422000 *(old code: 4291422000)*	ON/OFF Switch	
9	6692212200 *(old code: 4192212200)*	Main filter	
10	6604040800 *(old code: 5804040800)*	CCU board	
11	6604041100	Rotation motor assy	
12	6690806900 *(old code: 4990806900)*	Rotation belt	
13	6604042300 *(old code: 6104042300)*	Fuse kit wide range	
14	6695456700 *(old code: 4695456700)*	5 port Gigabit Switch	
15	6604060400 *(old code: 5804060400)*	Optical sensor board for Collimator	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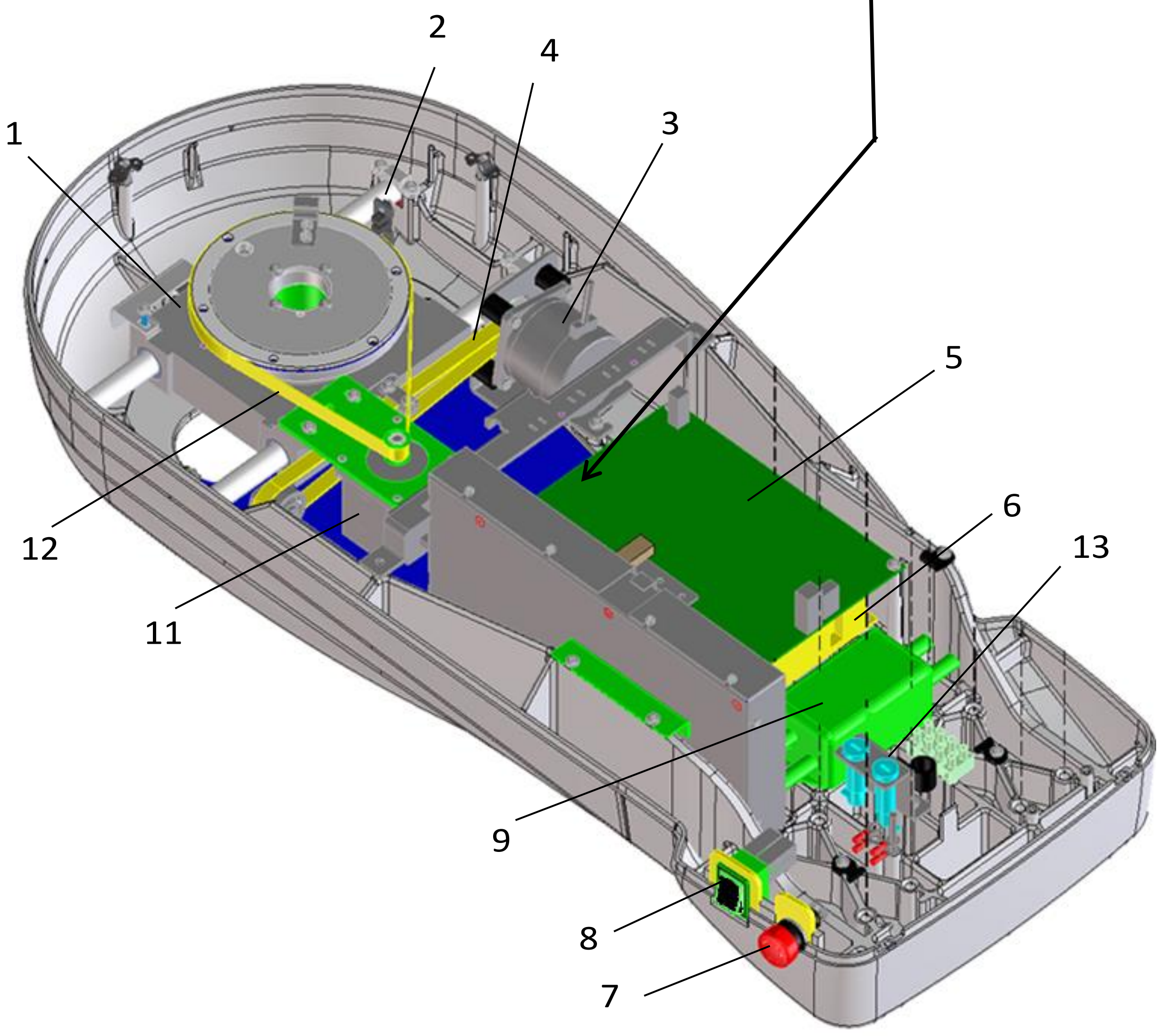
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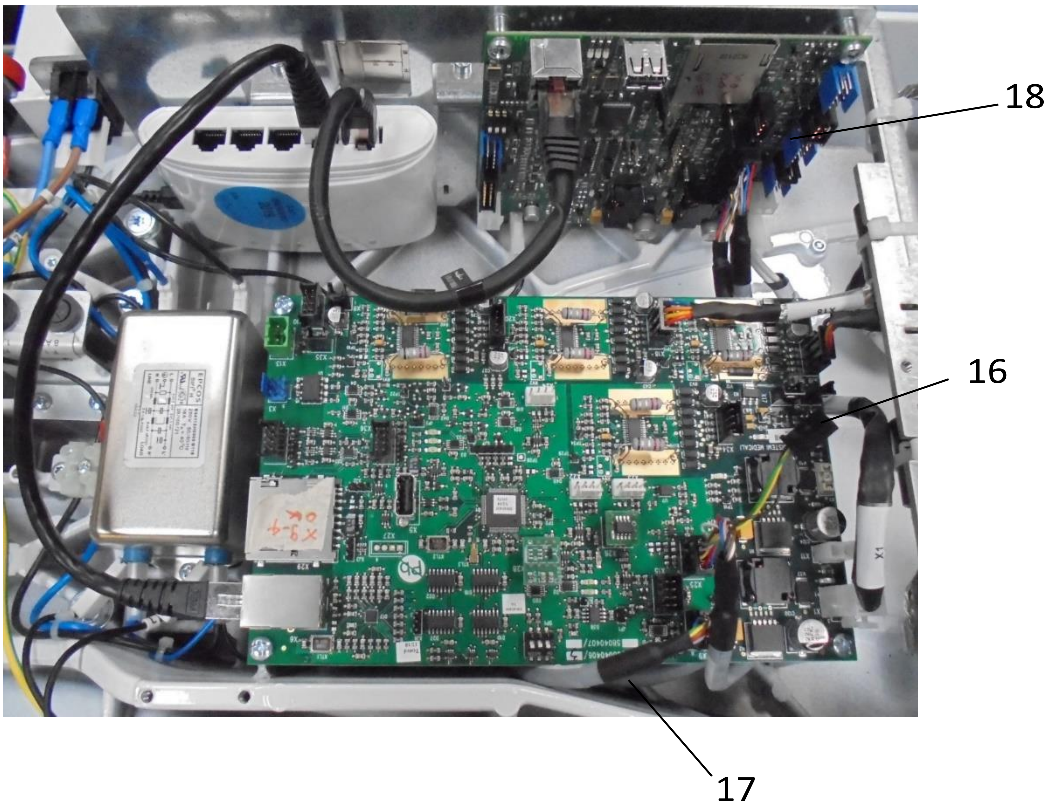
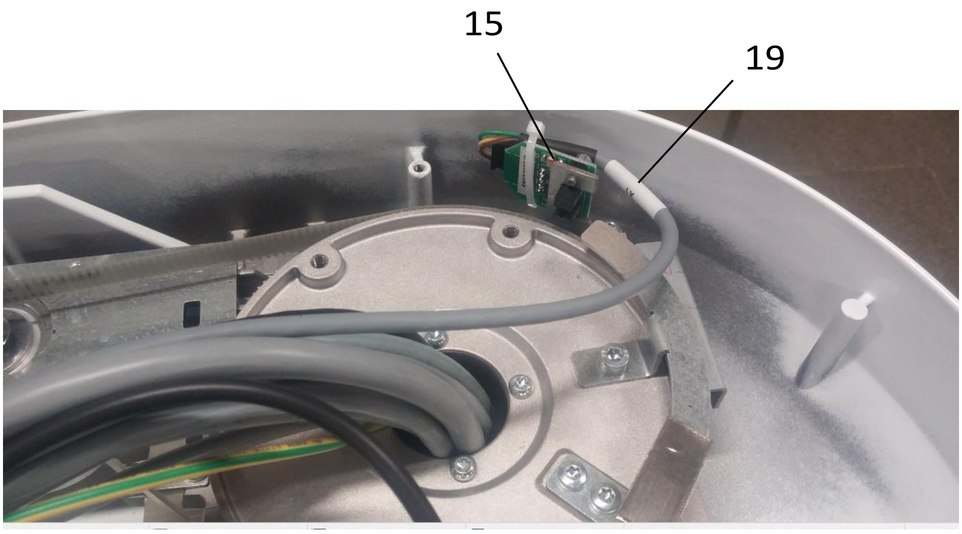
13.1.2. Cable

16	6604042301 *(old code: 6204042300)*	MCU board power supply cable X1-X62 /J2
17	6604042400 *(old code: 6204042400)*	Canbus CPU Ceph board cable X9/X9
18	6604042500 *(old code: 6204042500)*	One wire CPU Ceph board cable X25/X25
19	6604043100 *(old code: 6204043100)*	Optical sensor cable X25 / X1

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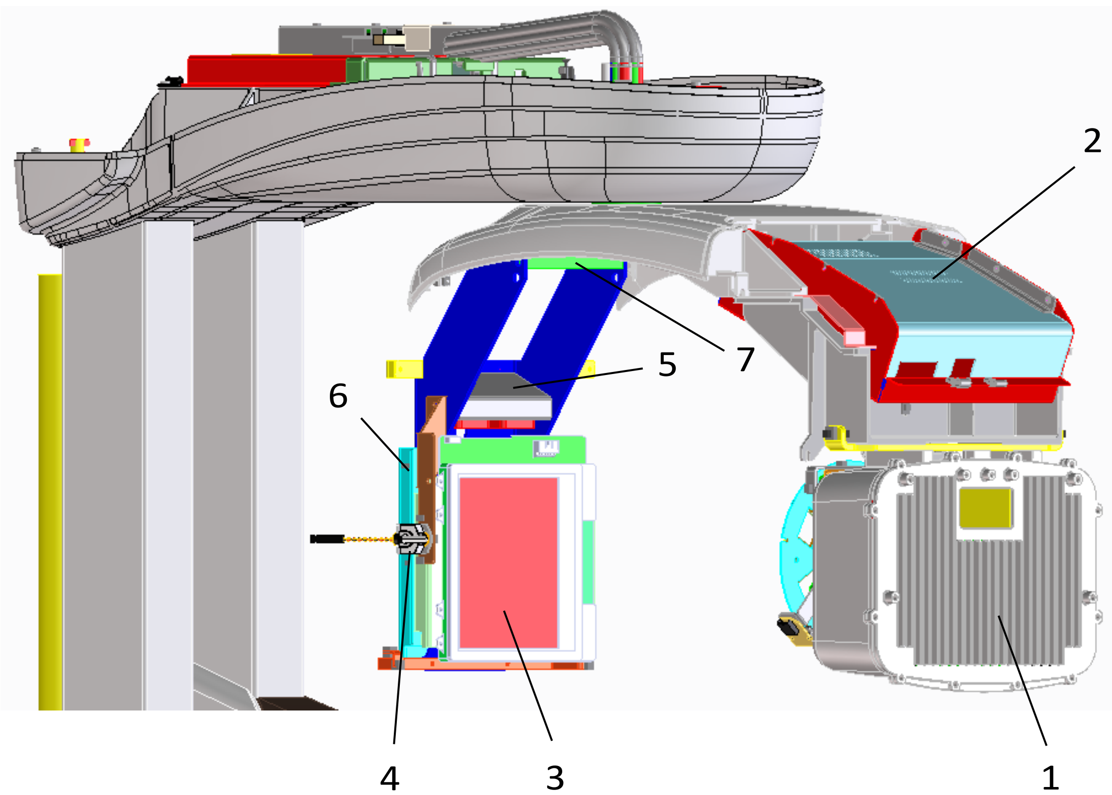
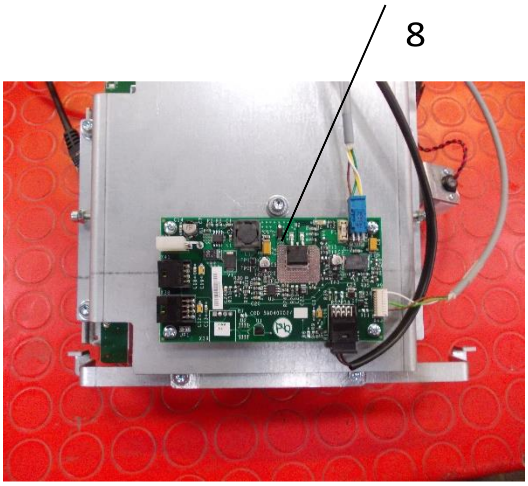
13.2. Rotating Arm

Ref.	Order code	Description	Note
1	6604001500 (old code: 8404000200)	Tubehead assy	
2	6604000800 *(old code: 5804020200)*	HF Generator Board	
3	6604070100	3D Sensor	
	including	6604070200 *(old code: 6204070200)* Sensor Signal Cable X43 / J15	
4	6604020000	Sagittal laser assy	
5	6604070300	3D sensor fan assy	
6	6604070101 *(old code: 6204070100)*	Sensor Power Cable X42 / J99	
7	6604020400	3D Frankfurt laser assy	
8	6604000900 *(old code: 5804070200)*	3D digital sensor power board	
12	6604070900 *(old code: 6204070900)*	Sensor brake assy	
13	6604020300 *(old code: 6204020300)*	Hall sensors with cable	

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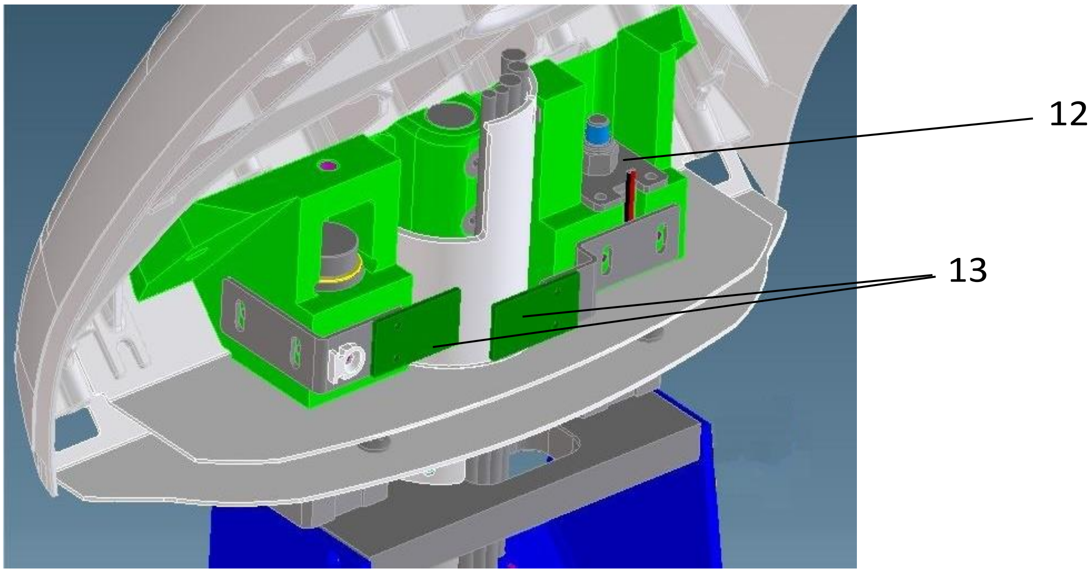
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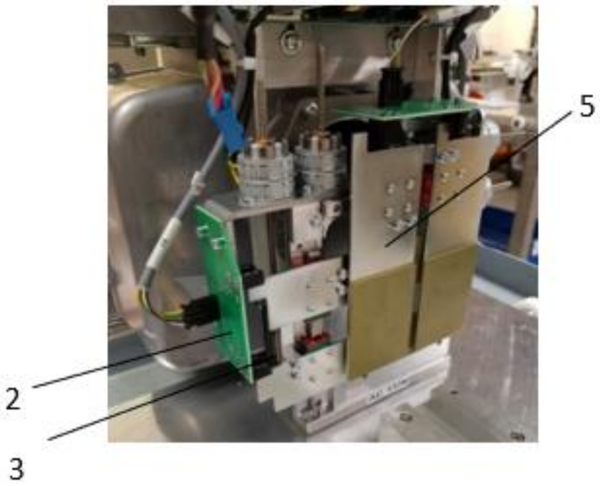
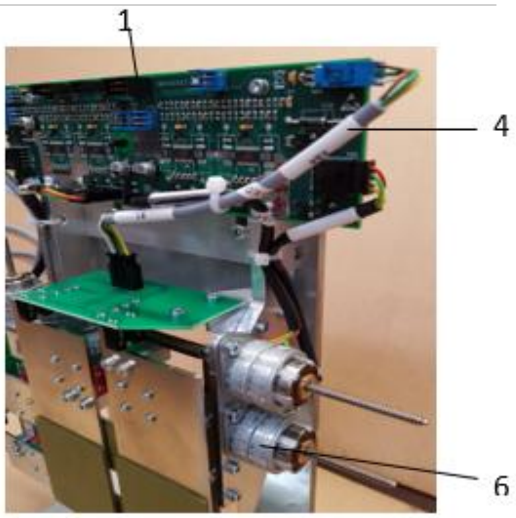
13.3. Collimator

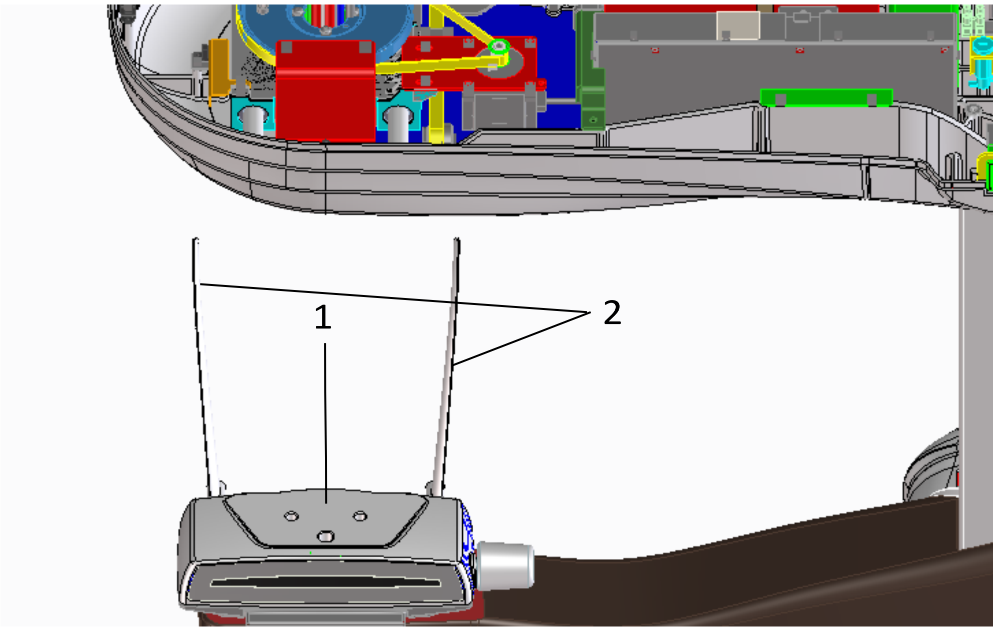
1	6604060200 *(old code: 5804060200)*	Collimator driver board
2	6604060400 *(old code: 5804060400)*	Optical sensor board for collimator
3	6604060100 *(old code: 6204060100)*	Horizontal sensor motor cable
4	6604060201 *(old code: 6204060200)*	Vertical sensor motor cable
5	6604060402	Four blades collimator assy (include the whole collimator)
6	6604060700	4 Blade Motor Replacement kit (Include a single cabled motor that can be used to replace one of the four motors indifferently)

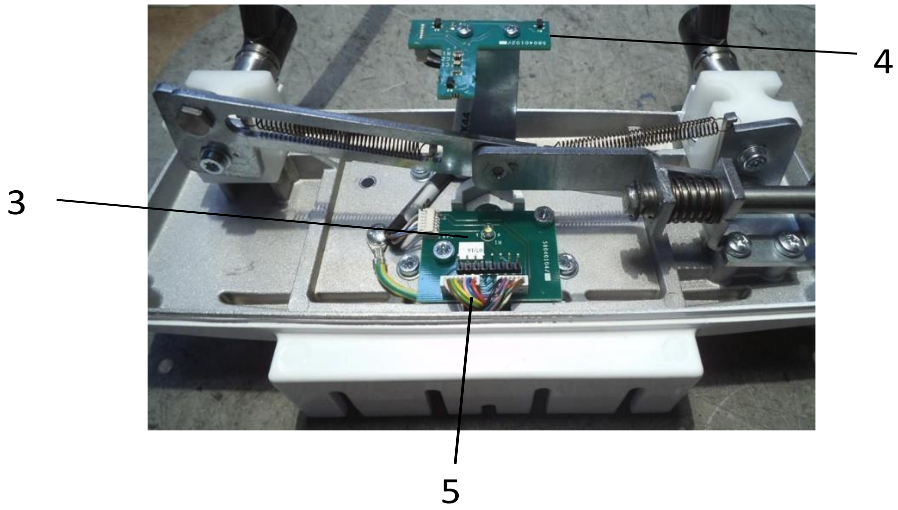




13.4. Chin support

Ref.	Order code	Description	Note
1	6604010500	Chin support assy	
	6604012200	Keyboard assy	
2	6604010312	Temple clasp right & left	
3	6604012500 (old code: 5804010400)	Interface chin rest board A5	
4	6604012600 (old code: 5804010200)	Sensor chin rest board A9	
5	6604010401 (old code: 6204010400)	Keyboard cable X46-X47	

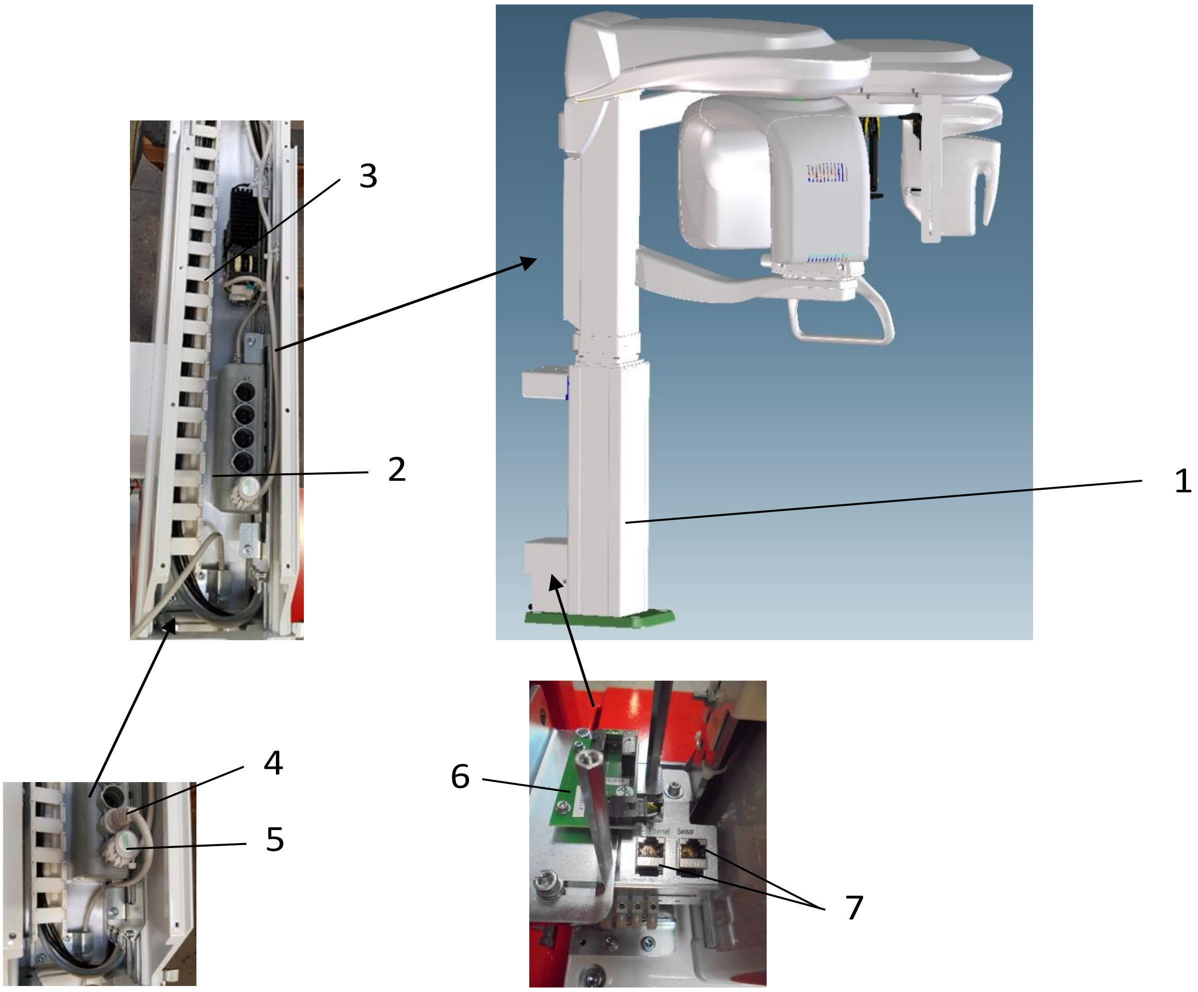




13.5. UP/DOWN Column

13.5.1. Electrical and mechanical part

Ref.	Order code	Description	Note
1	6691100205 *(old code: 4391100205)*	Lifting Column Timotion	
2	6692825200 *(old code: 4492825200)*	TiMotion control box G3	
3	6692825100 *(old code: 4492825100)*	G2 Power supply	
4	6604101800 *(old code: 5004101800)*	Timotion Lifting Column Cable	
5	6604101900 *(old code: 5004101900)*	Control box signal cable	
6	6604040700 (old code: 5859301200)	External signal board	
7	6691851000 *(old code: 4591851000)*	F/F RJ45 CAT 6 Adapter	



13.5.2. Cables

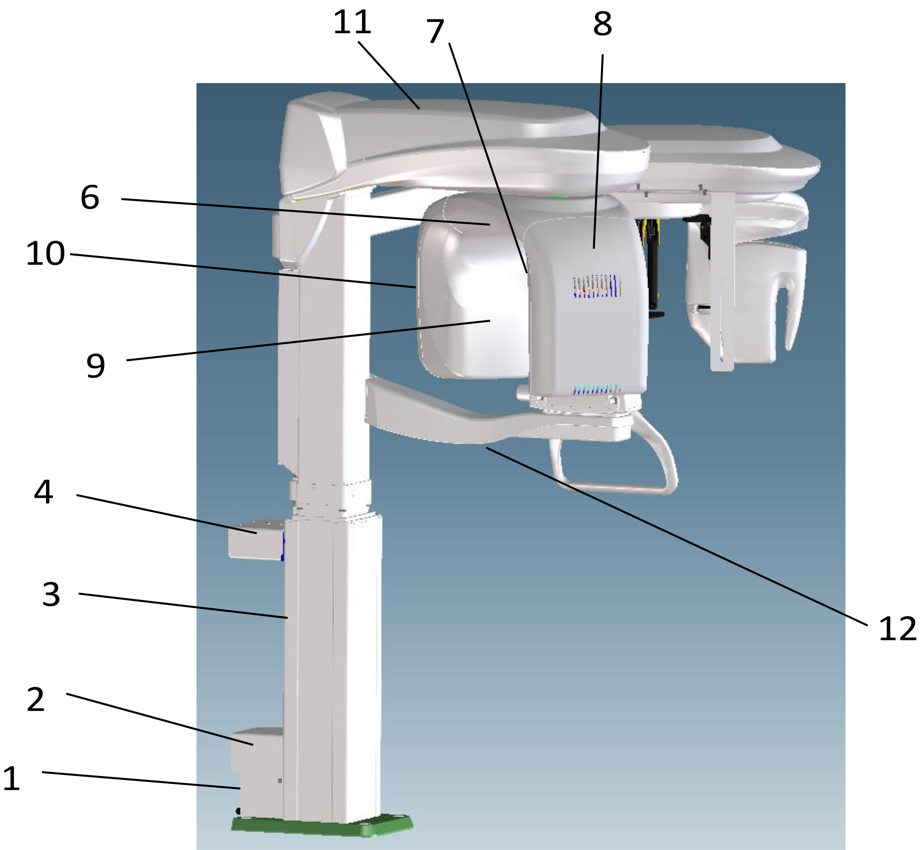
Ref.	Order code	Description	Note
1	6604090800 (old code: 6104090800)	X-ray push button with cable	
2	6604011401 *(old code: 6204011400)*	Keyboard Cable X12-X36-X24 / X46-X47-X1B4	
3	6604011500 *(old code: 6204011500)*	Chin rest motor cable X20 / X49	
4	6604101202 *(old code: 6204101200)*	Power switching cable G2 Cable J1 /X1.1 – S2.1	
5	6604101000 *(old code: 6204101000)*	Power Supply Cable Inside Column	
6	6604101101 *(old code: 6204101100)*	Signal & RX cable X8-X51 / X10-X13	
7	6607080201 *(old code: 5007080200)*	Cable Ethernet DR. CAT6 S/FTP L=3mt RJ45	

13.6. Top side / Rotating arm cables

Ref.	Order code	Description	Note
2	6604040500 *(old code: 6204040500)*	Laser 1 cable X16	
3	6604040600 *(old code: 6204040600)*	Laser 2 cable X17	
4	6604040101 *(old code: 6204040100)*	HF board power supply cable Z1 / X31	
5	6604040201 *(old code: 6204040200)*	HF board signals cable X15 / X32	
6	6604041800 *(old code: 6204041800)*	Power Sensor 3D board cable X11 / X37	
7	6604042600 *(old code: 6204042600)*	Collimator signal cable X59/X77	
8	6604042700 *(old code: 6204042700)*	Collimator power cable X67/X75	
9	6604042800 *(old code: 6204042800)*	Collimator motor signal cable X66/X76	
10	6604043000 *(old code: 6204043000)*	Signal pan sensor cable X61/X38	
11	6607090101 *(old code: 5007090100)*	Ethernet cable CAT 5E	

13.7. Covers

Ref.	Order code	Description	Note
1	6604101405 *(old code: 5604101405)*	Rear base cover	
2	6604101505 *(old code: 5604101505)*	Base cover	
3	6604101605 *(old code: 5604101605)*	Duct (positioned behind the column)	
4	6604101705 *(old code: 5604101705)*	Upper cover Wall fixing bracket	
5	6604103305 *(old code: 5604103305)*	Column Side Cover	
6	6604022005	Rotating arm lower cover	
7	6604022205	Sensor internal cover	
8	6604023021	Sensor external cover	
9	6604022405	Tube head internal cover	
10b	6604022121	Tube head external cover	
11	6604042005	Upper cover	
12	6604090205 *(old code: 5404090205)*	CEPH Chin Rest Arm Bottom Closer	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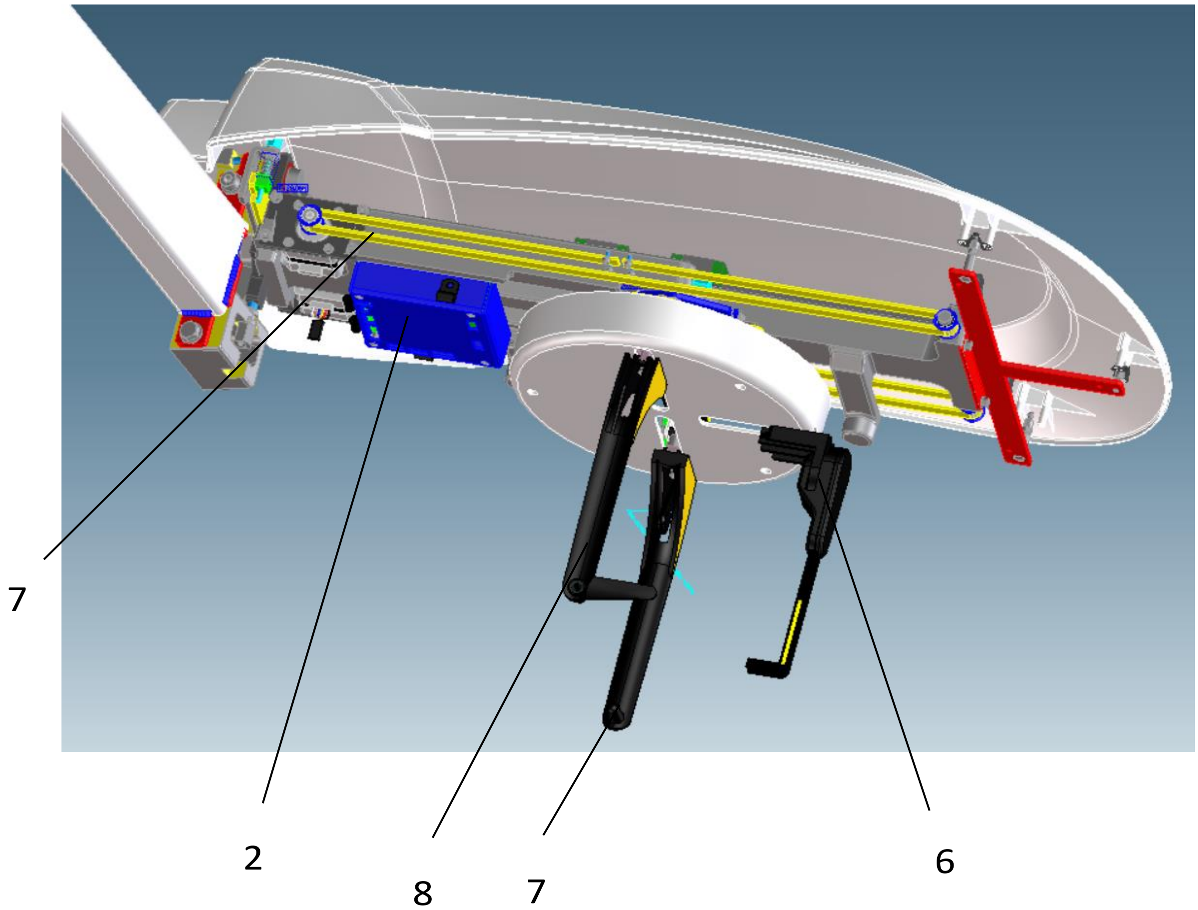
13.8. Ceph arm & Mobile Sensor

13.8.1. Electrical - mechanical part & cables

Ref.	Order code	Description	Note
1	6604080300 *(old code: 6104080300)*	CEPH Sensor Motor Cabled	
2	6604080201 *(old code: 5804080200)*	CEPH driver board	
3	6604080500 *(old code: 6204080500)*	Nasion potentiometer with cable X94	
4	6604080600 *(old code: 6204080600)*	Sensors Motors Cabled *(optical sensor)*	
5	6690804801 *(old code: 4990804800)*	Open belt 10 T2.5 roll 1.025m	
6	6607080703 (old code: 6104081000)	Nose rest group	
7	6604080900 (old code: 6104080900)	Right head support Assy CEPH	
8	6604081000 (old code: 6104081000)	Left head support Assy CEPH	
9	6690806900 (old code: 4990806900)	Rotation Belt	
10	6604070401 (old code: 5804070600)	Fixed part sensor connection	
11	6604070601 (old code: 4990804800)	A15 - Fixed Pogo-pin board	
	6604080800 (old code: 6204080800)	Signal ceph cable X58 / X89	
	6604080901 (old code: 6204080900)	Signal motor ceph cable X54 / X88	
	6604081001 (old code: 6204081000)	Power ceph cable X53 / X87	
	6604080700 (old code: 6204080700)	Signal sensor ceph cable X96 / X96	
	6607080201 (old code: 5007080200)	Cable Ethernet DR. CAT6 S/FTP L=3mt RJ45	
	6604081300 (old code: 6104081300)	Hand support plate for carpus exam	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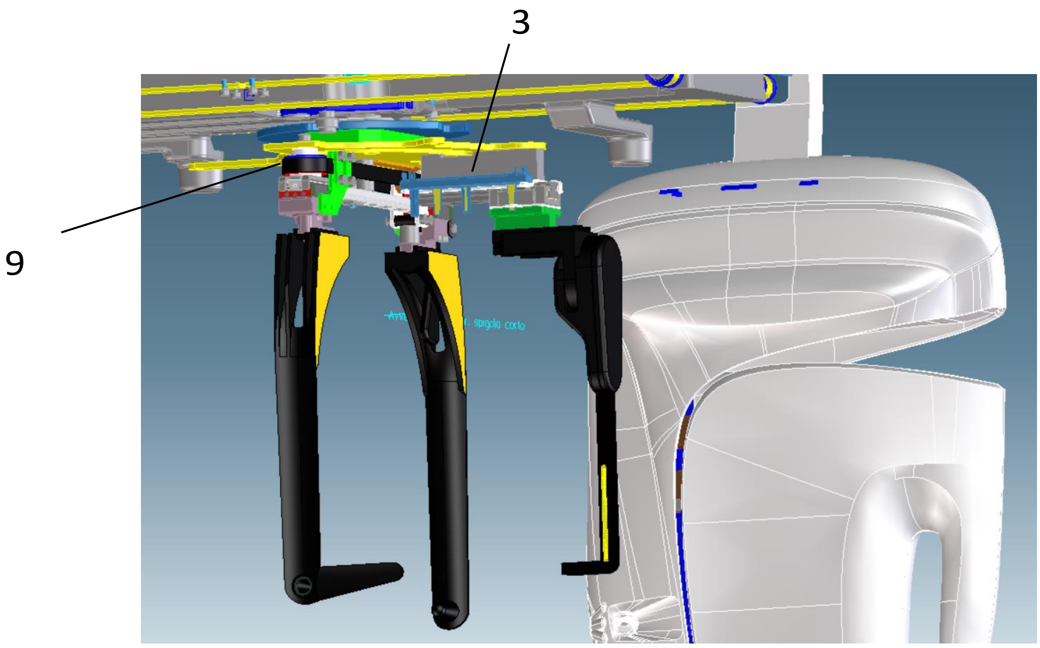
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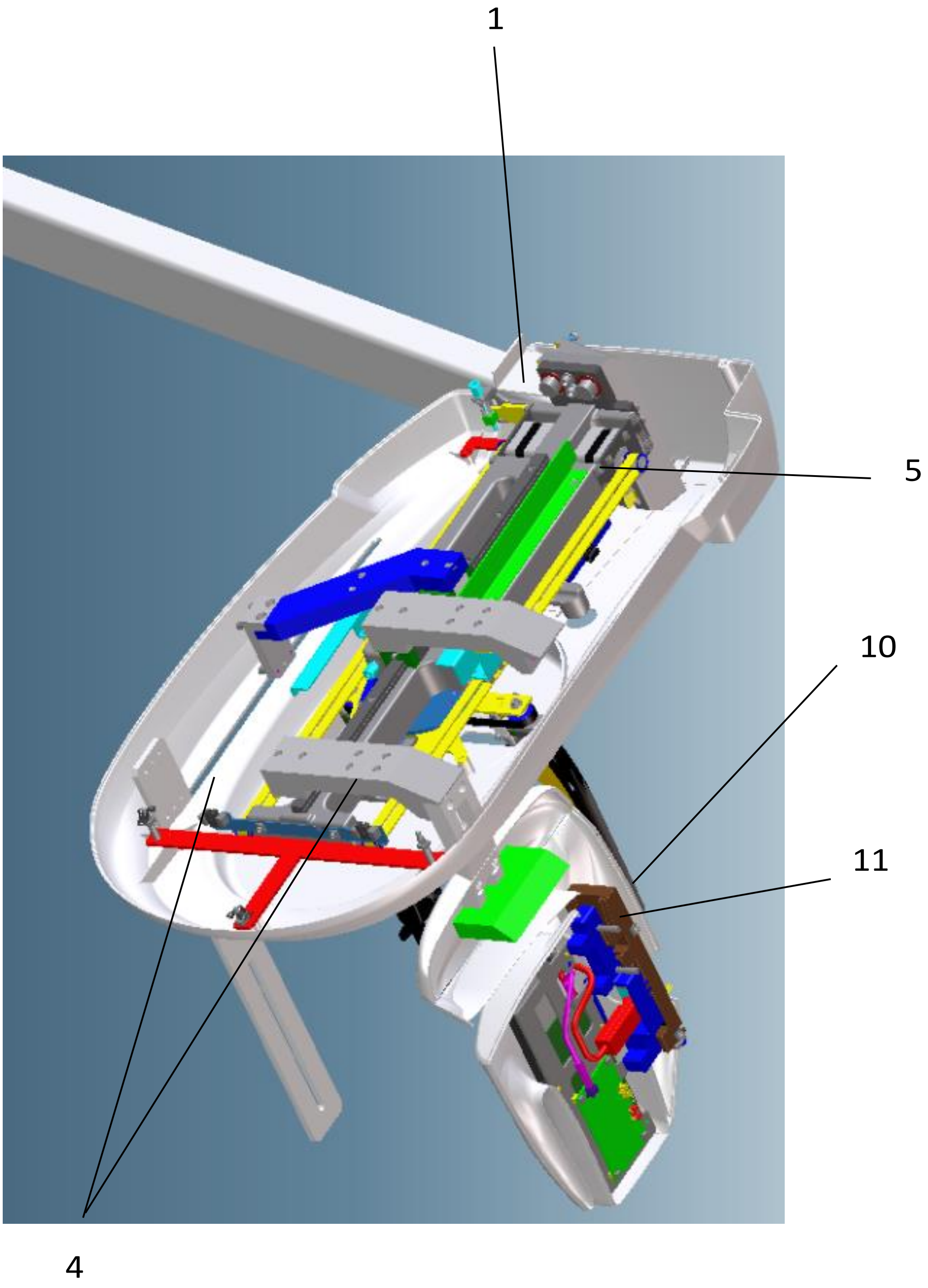
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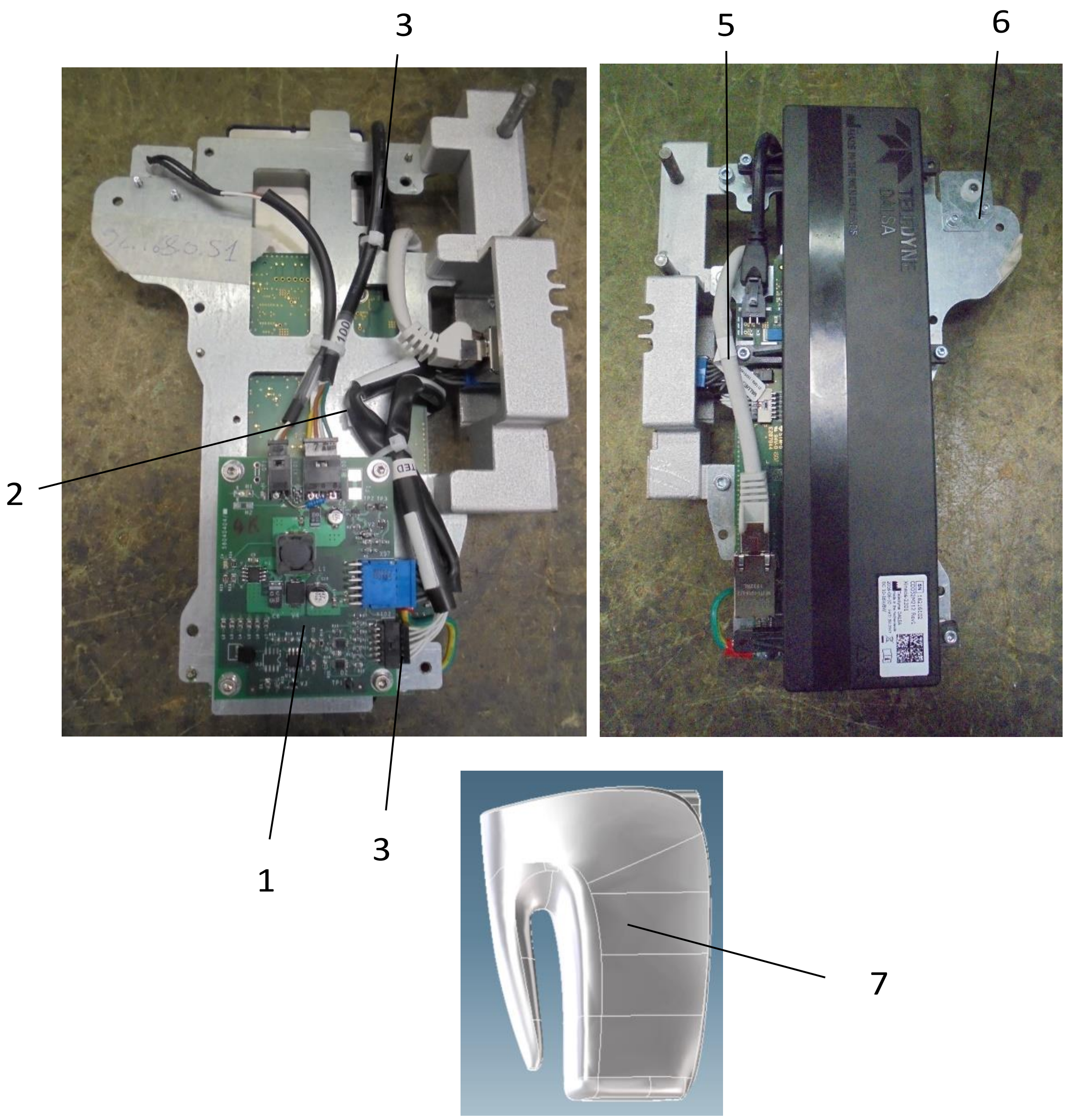
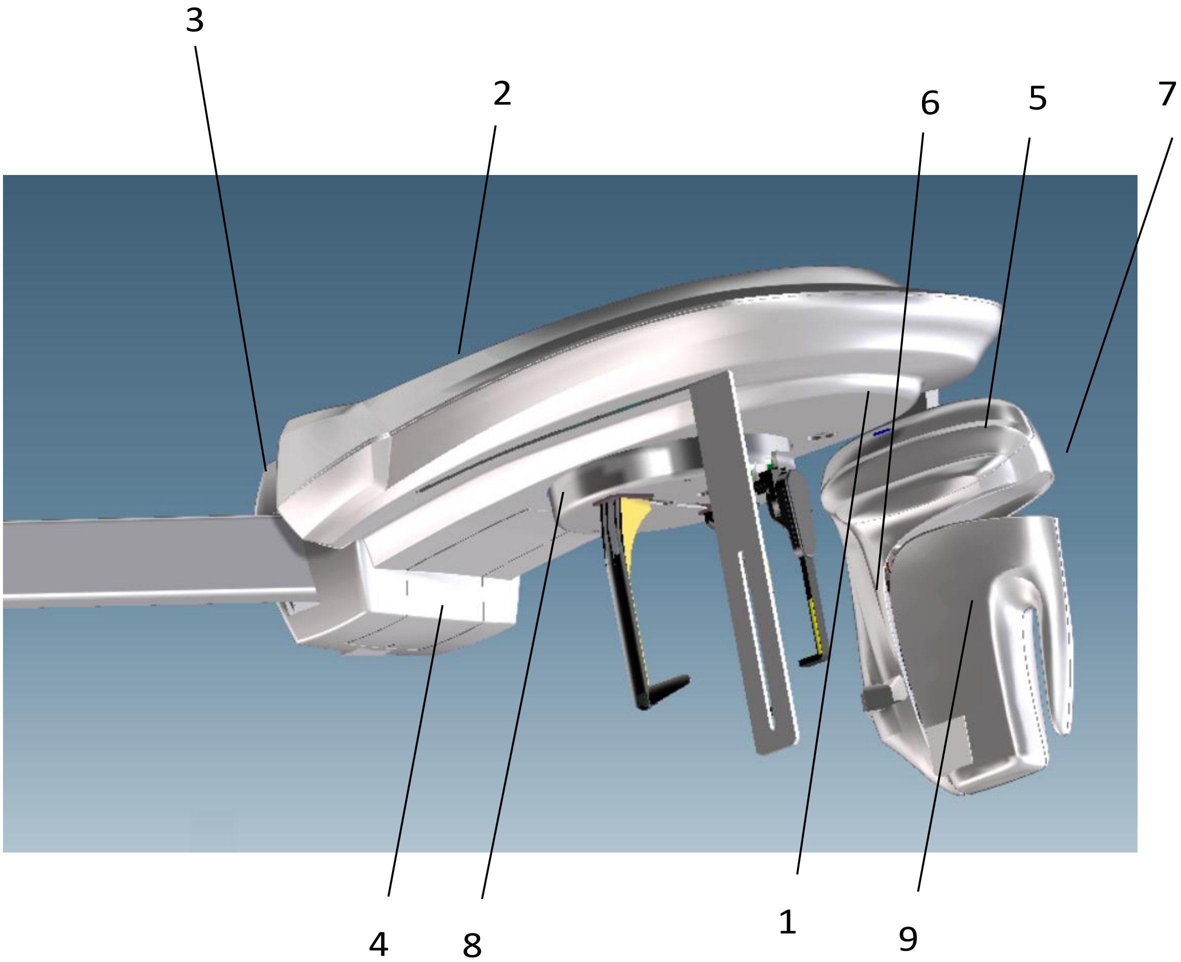
13.8.2. Mobile Sensor

1	6604070402 *(old code: 5804070400)*	A14 Power sensor board
2	6604070403 *(old code: 6204070400)*	Power & signal pogo pin-sensor cable X103 / X97
3	6604070500 *(old code: 6204070500)*	Signal sensor cable X102 / Sync
4	6604070602 *(old code: 6204070600)*	Power sensor cable X100 / Pwr
5	6604070102 *(old code: 5004070100)*	Ethernet cable CAT 6 Inside Mobile Sensor
6	6604070801 *(old code: 6104070800)*	Sensor led assy
7	6604070600 (old code: 7104070400)	PAN/CEPH Mobile Sensor (*for sensor replacement)*



13.8.3. Covers

1	6604080200 *(old code: 5404080205)*	Ceph lower cover
2	6604081100 *(old code: 6104081100)*	Ceph upper cover
3	6604081200 *(old code: 6104081200)*	Ceph rear arm cover
4	6604080305 *(old code: 5404080305)*	Ceph CS cover
5	6604080405 *(old code: 5404080405)*	Ceph sensor cover
6	6604070701 *(old code: 5404070700)*	Ceph fix cover – 1 -
7	6604070802 *(old code: 5404070800)*	Ceph fix cover – 2 -
8	6604080605 *(old code: 5404080605)*	Head rest rotation cover
9	6604070201 *(old code: 5404070200)*	Sensor cover 1
9b	6604070201 (*old code*: 5404070200)	Sensor cover Owandy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13.9. Accessories and Service Tools

Ref.	Order code	Description	Note
--	6607090100	PAN centering bites (50 pcs)	
--	6607110700 *(old code: 6107110700)*	Disposable bite protective sleeves (100 pcs)	
--	6604011505	Panoramic standard chin support	
--	6604011705	Panoramic chin support (reduced height)	
--	6604010500 (*old code*: 5407098108)	Chin support kit with: a) Panoramic Standard Chin Support b) Maxillary-Sinus Chin Support c) Panoramic Chin Support (Reduced Height) d) Edentolous e) PAN Centering Bites (10 pcs) f) TMJ Positioner	
--	6604011605 (old code: 6604011619)	Maxillary-Sinus chin support	
--	6607099800 (old code: 6604011800)	TMJ positioner	
--	6607110800 (old code: 6107110800)	TMJ positioner protective sleeves (60 pcs)	
--	6695190000 (includes: 5207900900 6195170100 6195170200)	Service tool kit	
--	6604081500 (old code: 6104081500)	Ear protection pack (300 pcs)	
--	6607090100	Copper filter for Calibration 1,5 mm	
--	6604070100	3D Sensor H1 (C12902D-40)	
--	6604070150	3D Sensor H2 (C12903D-40G)	

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14. APPENDIX

14.1. Appendix A: Setup parameters table

The following table lists those adjustment parameters stored in the unit during factory testing and that must be re-entered into the non-volatile memory in case of replacement of the MCU board (A1). This is due to the fact that the new MCU board, provided as a spare part, has been factory tested from the functional point of view, but contains only default parameters which are not related to the unit where it will be installed.
Entering of the listed parameters can be performed through the service programs (see chapter 8).

Note
The information listed in the table are the technical parameters set during factory testing. Preferences set by the user (e.g. exposure parameters different than the default ones) are not listed.

The table also has columns with blank cells. These cells must be filled in when, during installation or during the life on the unit, any of the listed parameters will be modified (e.g. after replacing a motor or a positioning sensor).

I-Max 3D

Unit code: ____

Unit S/N: ____

U.I.C.: ____

Parameter		**Factory setting**	**New setting**	**New setting**	**New setting**	**New setting**
Date						
Rotation axis motor offset						
Y axis motor offset						
X Chin rest						
Bitewing Y offset						
Y Jaw type [mm]						
3D Reconstruction parameter	Lateral Off. 0					
	Lateral Off. 300					
	Y 3D					
	Y EXT Vol [mm]					
Collimator offsets	W0					
	W1					
	W2					
	W3					
	W4					
	W5					
Tubehead pre-heating values	2mA					
	3mA					
	4mA					
	5mA					
	6mA					
	7mA					
	8mA					
	9mA					
	10mA					
	11mA					
	12mA					

I-Max CEPH 3D

Unit code: ____________________________________

Unit S/N: ____________________________________

U.I.C.: ____________________________________

Parameter		Factory setting	New setting	New setting	New setting	New setting
Date						
Panoramic Exams						
Rotation axis motor offset						
Y axis motor offset						
X Chin rest						
Bitewing Y offset						
Y Jaw type [mm]						
3D Exams						
Bitewing Y offset						
Lateral Offset z=0						
Lateral Offset z=300						
Y axis 3D						
Y axis Extended volume [mm]						
CEPH Exams						
Rotation axis motor offset						
Y axis motor offset						
X CEPH sensor motor offset						
AP-Carpus Offset [mm]						
Secondary collimator motor						
Secondary collimator normal resolution						
Nasion potentiometer calibration	Min					
	Max					

<table>
<tr><th colspan="2">Parameter</th><th>Factory setting</th><th>New setting</th><th>New setting</th><th>New setting</th><th>New setting</th></tr>
<tr><td colspan="7">Primary collimator offsets</td></tr>
<tr><td rowspan="4">W0 Panoramic windows</td><td>H0</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>HW</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>VO</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>VW</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">W4 3D windows</td><td>H0</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>HW</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>VO</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>VW</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">W6 CEPH windows</td><td>H0</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>HW</td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>VW</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">HO=Horizontal offset, HW=Horizontal width, VO=Vertical offset, VW=Vertical width</td></tr>
<tr><td colspan="7">Tubehead preheating values (Filament levels)</td></tr>
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