Owandy RADIOLOGY

EN • SERVICE MANUAL

NIMXEN050H • January 2024

i-max PRO

MAKES LIFE EASIER

NEW PANORAMIC UNIT GENERATION

2D VERSION

Language of original document: English.

CE 0051

Revision history Manual code NIMXEN050H

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P	05.02.2016	-	Document approval.
0	29.12.2016	-	Document update for new cables layout
1	18.04.2018	from 144 to 163	Schematics and drawings update. Spare Parts update. (Ref. Compliant D18008, Compliant D17116)
2	10.07.2019	All	General document revision. Troubleshooting improvement. Compliance to IEC60601-1:AM1. (Ref. RDM 8905, RDM 8994)
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0D	11.04.22	5, 18, 19 28 30 From 206 to 214	Updated laser labels Updated exposure times Updated laser characteristics Updated spare parts codes on *SPARE PARTS section*
0E	23.06.22	2 8 20 20, 161, 200 21 29 31 33 73 75 80 86 88 90 93	- Warning advice for the correct choose of the user manual depending on whether it is a black/white power switch - Removed cable CAT.5E L = 10 m and updated code for the 5 m cable - Removed par. 4.1 Identification labels and laser labels - Updated main tasks of the MCU board - Updated MCU board scheme - Updated MCU board DIP switches table - Update digital sensor characteristic in the table of par. 5 Technical characteristics - Updated PC mnimum requirements - Update image of reduce height chin rest support at par. 5.4 - Change path and images of the par. Detector calibration files installation - Replaced Standard Panoramic - Adult with Panoramic QC - Replaced from point 6 on of the par. Verification of the exposure parameters with invasive method copying it from CEPH version service manual - Updated exposure values of the table - Update par. 7.5 - replaced name and path directory at point 1 and figure of the par. 7.11.1 (copy from CEPH version) - Updated par. 7.11.2.2 (copy from CEPH version) - Updated par. 8 (copy from CEPH version) and second figure

		104, 105, 106	- Updated error messages in the table - Updated errors paragraphs
		108	- Updated MCU board code
		130	- Updated par. 9.4 (copied from CEPH version)
		137	- Added par. 10.2 Sensor Calibration
		146	- Updated par. 11.1 Firmware upgrade (copied from CEPH version)
		152	- Updated table par. 11.2.1
		155	- Updated par. 11.2.2 (copied from CEPH version)
		197	- Updated general scheme - Removed every reference to DSPU - Update spare parts codes
0F	24.11.22	16	- Updated section concerning the cleaning the outer surfaces
		27	- Update image of the tubehead
		28	- Added alternative x-ray generator at the table
		38	- Added the alternative x-ray generator curves
		47	- Added a warning advice
0G	28.04.23	--	Updated images, cover image for I-MAX PRO
		--	Update spare parts codes for I-MAX PRO
0H	08.11.23	25	Fixed data at chapter 5 Technical Characteristics
		28, 38	Replaced wording Skan-X with CEI
		111	Added error 1200 to chapter 9.2
		251	Updated chapter 13 spare parts
		--	Added chapter 7.3.1.1 to illustrate what changes should be made to the wall plate cover in the event of cable interference from below
		--	Added chapter to Ordinary Maintenance to check correct tensioning of R and Y motor belts and pulley-motor alignment

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Contents

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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 unit.

Warning

- The I-MAX 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 Radiology SAS.

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 OSP/VSPects of the patient and/or operator.

Note
The present manual is for I-MAX **with black power switch**.

If your device has a **white power switch**, refer to service manual **NIMXEN050D**

1.2. How to contact technical service

For any technical queries please contact the following:

- Telephone number +33(0)1 64 11 18 40
- Fax number +33(0)1 64 11 18 10
- E-mail: export@owandy.com

If a technical service intervention is required it is mandatory to provide Owandy Radiology Technical Service the following information:

- Unit Serial Number
- Unit firmware&driver version: MCU, HF(XCU), OSP, QuickVision (see chapter 8)
- Other software version used with I-MAX
- 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.

2. SAFETY INFORMATION

Warning
Please read this chapter thoroughly.

Owandy Radiology SAS 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 SAS cannot be held liable for:

- Use of I-Max 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 Owandy Radiology SAS.
Only authorised personnel may remove the covers and/or have access to live components.

Owandy Radiology SAS provides specific training for service engineers.
One copy of User and Service Manual are always provided with the unit.

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 other than those indicated herein.
Before performing any maintenance operation, disconnect the unit from the power supply.
I-MAX is an electric medical device and so can only be used under the supervision of suitably qualified medical personnel, with necessary knowledge of X-ray protection.
The user is responsible for compliance with legal requirements as regards ownership, installation and use of the equipment.
This device has not been designed for use in environments where vapours, anaesthetic mixtures flammable with air, or oxygen and nitrous oxide, may be present.
Do not let water, or other liquids, penetrate the device, as this could cause short circuits and corrosion.
Before cleaning the device, make sure the main power supply has been disconnected from the equipment. When pushing the ON/OFF button of the equipment, it must not come on.
Wherever necessary, use appropriate accessories, such as leaded aprons, to protect the patient from radiation.
While performing the X-ray, no-one, apart from the operator and the patient, must remain in the room.
I-MAX has been built for continuous operation with an intermittent load; so the described use cycles must be observed, to enable the device to cool down.
I-MAX must be switched off while using electrosurgical devices or similar apparatus.

Warning
For safety reasons, the patient support arm must not be abnormally overloaded, for example by leaning on it. The traction on the handle must be less than 16 kg.

Warning
To avoid the risk of electric shock, the equipment must only be connected to a mains supply with earthing.

Clean and disinfect, when necessary, all parts that may come into contact with the patient.
The centring bite or the bite protective sleeve must be replaced after each exam.
To avoid permanent damage to the unit, never try to rotate the moving arm manually when the unit is switched on.
In the case of Error 362 or Error 760, movement is possible to let the patient exit.

Note
When the unit is switched on, do not move the rotating arm.

2.1.1. Precautions while using laser centring devices

For patient positioning, I-MAX 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 are parts of class 1.

A warning label (see picture below) is affixed to I-MAX 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.

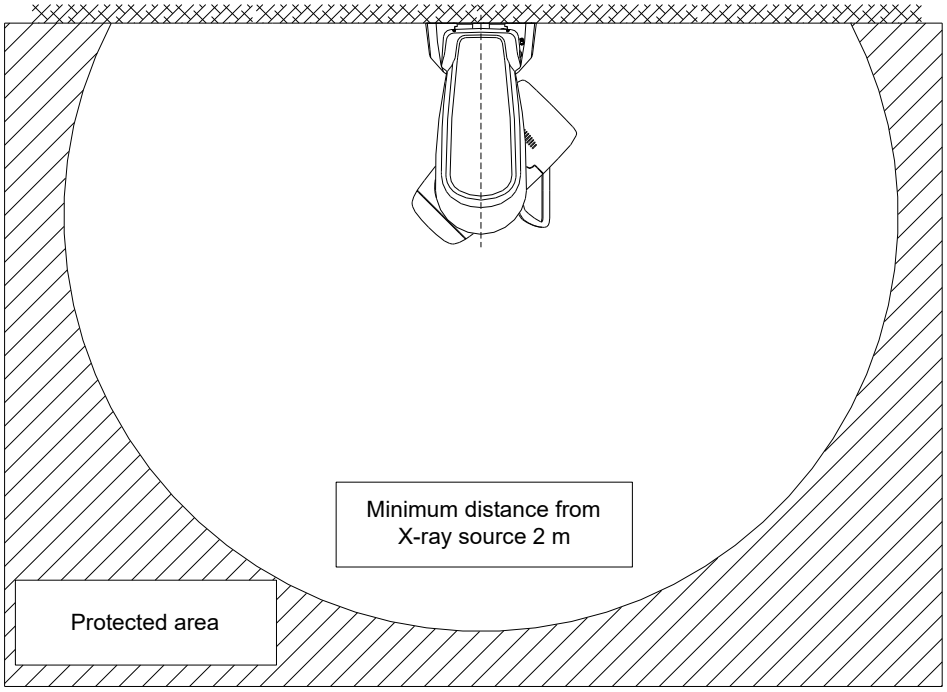

Figure 1

2.3. Electromagnetic information

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.5E L=5 m - code 6607090100 (*old code 5007090100)*

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 should not be used adjacent to or stacked with other equipment; if adjacent use is necessary, I-MAX 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 

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

2.3.1. Electromagnetic emissions

In accordance with the IEC 60601-1-2 Ed4 standard, I-MAX 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 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 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 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 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, 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 I-MAX requires continued operation during power mains interruptions, it is recommended that I-MAX 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 might be exposed to Cybersecurity threats.
I-MAX 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 the 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.
- 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 sticks or CD/DVD media before using them to check that they are free of viruses, malware or any dangerous software
- Avoid installation of an unknown or untrusted software since it may undermine the 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 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
□	ON; device connected to the mains
	Laser
	Dangerous voltage
	Product identification code
	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)
	X-Ray emission (the corresponding yellow LED is on)
	Electronic instructions for use symbol for medical devices, according to EN ISO 15223-1: 2016

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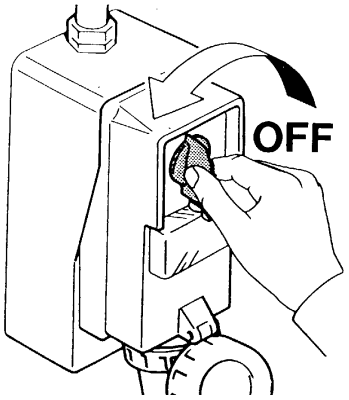
3. CLEANING AND DISINFECTION

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.

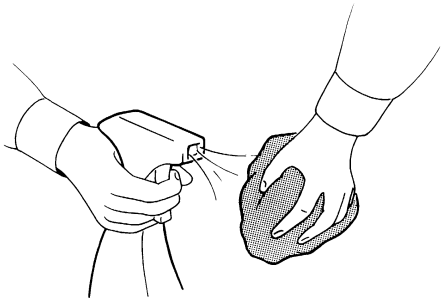
For ordinary cleaning it is recommended to apply a small dose of a mild detergent to clean the painted surfaces, accessories and connection cables and then wipe with a dry cloth. Do not use corrosive, abrasive solvents such as alcohol, benzene or trichloroethylene.

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 must be replaced after each exam.
Thoroughly clean the chin support, resting handles and temple clamps group whenever they are used.
The chin support, resting handles and temple clamps group 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.

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4. DESCRIPTION

4.1. Functions, models and versions

I-MAX, manufactured by Owandy Radiology SAS, is a complete panoramic X-ray system.
Here following the list of the type of 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 70kV, in 2kV steps and anodic current from 2 mA to 7.1 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 Half-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.
- Low 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).
- Ortho Rad Panoramic, 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
- Bilateral Bitewing (Left and Right), which sequentially performs both bitewings, showing them on the same image.

Note
The code entered in I-MAX to enable optional exams is protected by a unique Identification Code (UIC); in the event the UIC is not present or is faulty, error E270 or E271 will be shown.
The UIC is simply an identifier of the single I-MAX unit; in order to enable optional functions, Owandy Radiology SAS must be requested to activate the code, which derives from the Unique Identification Code or from the device serial number.

4.2. Block diagram

This paragraph provides a brief description, at block diagram level, of the I-MAX. Aim of this paragraph is to provide a brief description of the system. More details about the electronic circuits which compose the system can be obtained by analyzing the schematics provided in chapter 12.

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)
- Motors (rotation and Y axes)
- Zero position sensors
- X-ray button
- External signal board (A6)
- Lift motors control rack (G2)
- Generator board (A2) ---> (Tubehead)
- Overlay
- Digital sensor

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

4.2.1. 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) and a 24Vdc 8,4A switching mode power supply (located under the MCU board) G1 which supply 24 Vdc to the MCU board, that generates the different voltages to the unit.

- Main power supply drives also the up/down motors (M1 and M2) through the motor column driver board (G2) located in the lower part of the unit. Safety switch S2 located in the top side of the unit (red button). In case switch is pressed, the up/down movement is inhibited.
- Main power supply is also provided to the Generator Board A2 used to generate High voltage to the tube head.

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.

4.2.2. 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.

MCU includes also the configuration and calibration data and the HW key including the data of XP exams.
EEprom memory includes the programming data. Hardware key board includes the XP data.

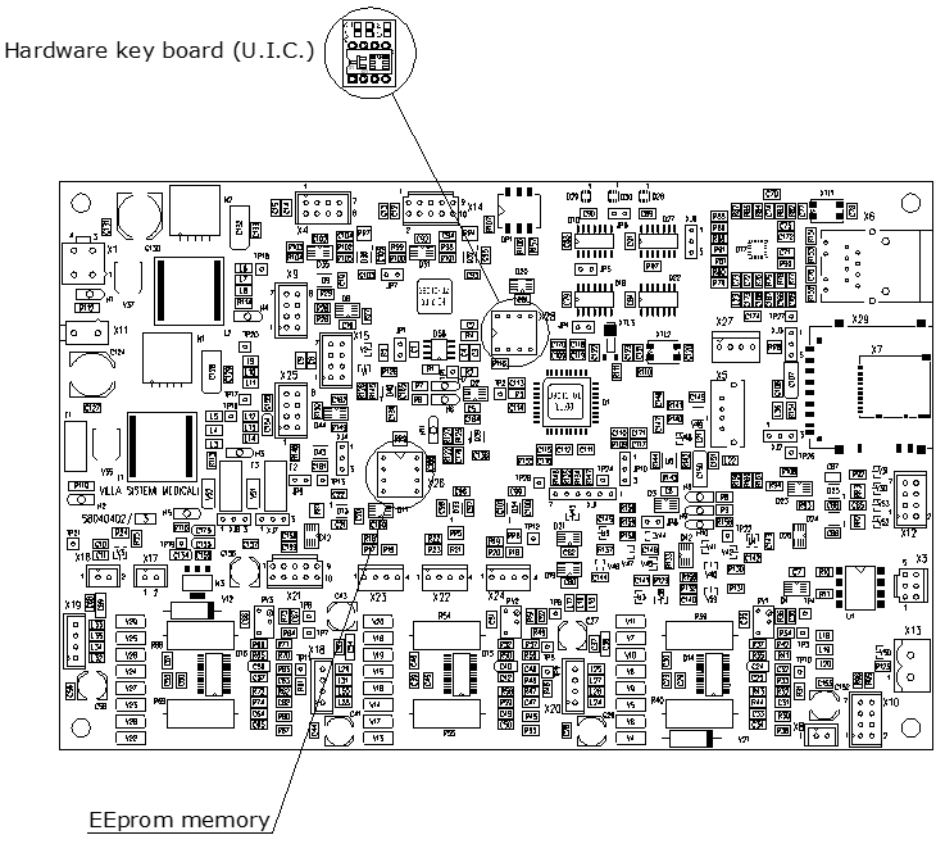


Figure 2

4.2.2.1. 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 7.11.2)
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 11.2.1.3)*

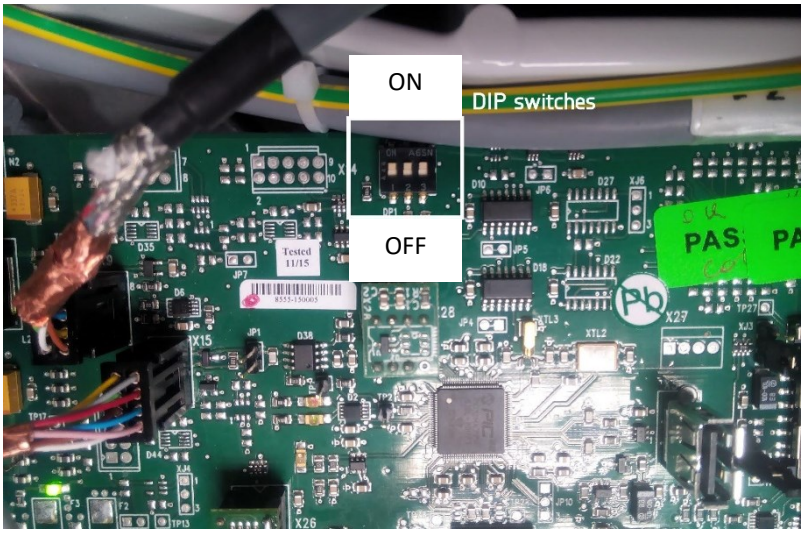


Figure 3

4.2.3. Generator Board (A2) and Tubehead

The Generator board and the tubehead are located on the rotating arm, very close to each other. The power supply voltage is directly provided by the mains line.

Generator board includes a µprocessor that communicate with the main MCU board (A1) through the CAN BUS 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 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 (Canon D-058) 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.

4.3. Keyboard - Description and functions

Figure 4 shows a general view of I-MAX control Interface.

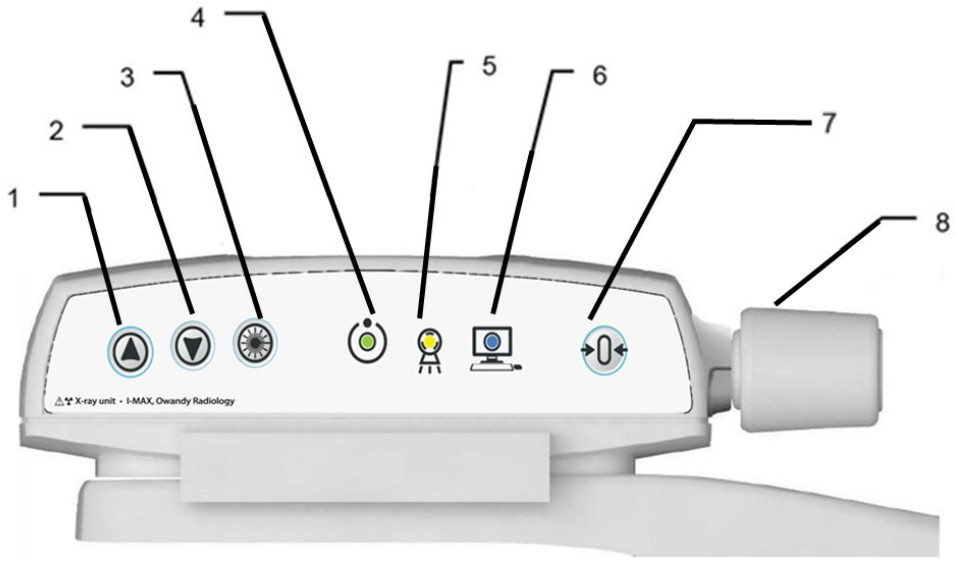


Figure 4: Keyboard

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 clOSP/VSPs closing/release knob.	

5. TECHNICAL CHARACTERISTICS

General features	
Type	I-MAX
Manufacturer	OWANDY RADIOLOGY SAS 2 rue des Vieilles Vignes 77183 Croissy-Beaubourg - FRANCE
Class	Class I with type B applied parts according to IEC 60601-1 classification. 
Protection degree	IPX0 standard device
Line voltage	99-132V 198-264 V
Rated line voltage	110-120V 220-240V
Line frequency	50/60Hz
Maximum line current	7A @ 110V 50/60Hz 3.5 A @ 240V 50/60Hz
Technical factors for maximum line current	70kV, 7.1mA
Power consumption	1.1kVA @ 110V 50/60Hz 1.0kVA @ 240V 50/60Hz
Protection fuse (F1)	10 A T 250V 6.3x32 mm 10kA@125V 4 A T 250V 6.3x32 mm 200A@250V
Column protection fuse (F2)	3 A T 250V 6.3x32 mm 10kA@125V 1.6 A T 250V 6.3x32 mm 100A@250V
Line apparent resistance	0.4 max (99-132 V) 0.5 max (198-264 V)
Rated output voltage (kVp)	60 - 70kVp, with 2 kVp steps
Anodic current	2 - 7.1mA, 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)
Total filtration	≥ 2,5 mm Al eq. @ 70 kV ref. IEC 60601-1-3 Par. 7.1

Exposure times	
Panoramic exam (PAN)	14 s Adult / 12.8 s Child
Half-panoramic exam	7.7 s Adult / 7.1 s Child
Ortho Rad Panoramic exam	11.5 s Adult / 11.5 Child
Low dose panoramic exam	11.6 s Adult / 10.4 s Child
Frontal dentition	4.1 s Adult / 4.1 Child
Bitewing Right, Bitewing Left	3.1 s Adult / 3.1 Child
Bitewing Right & Left	6.2 s Adult / 6.2 Child
TMJ mouth closed/open	10.6 Adult / 10.6 Child
TMJ single phase	5.3 Adult / 5.3 Child
Sinus P/A projection	9 Adult / 9 Child

Exam modes		
Exam selection	• Automatic selection for Adult and Child, 3 Sizes • 3 biting modes (Panoramic exam) • Manual selection	
Panoramic exam	• Standard panoramic • Half-panoramic L/R • Ortho Rad panoramic • Low 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	
Image magnification	**Geometric magnification**	**Magnification after software correction**
Adult / Child standard Panoramic	1 : 1.23 (constant over dentition part)	1 : 1 (*)
TMJ open/closed mouth	1 : 1.20 (nominal)	1 : 1 (*)
Sinus	1 : 1.22 (nominal)	1 : 1 (*)

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

Tube-head characteristics	
Model	MP05 or MPV05
Manufacturer	OWANDY RADIOLOGY SAS 2 rue des Vieilles Vignes 77183 Croissy-Beaubourg - FRANCE
Maximum tube voltage	70 kV
kVp accuracy	± 8 %
Maximum anodic current	7.1 mA
Anodic current accuracy	± 10 %
Duty cycle	1 : 16
Reference loading conditions related to maximum energy input to the anode	1125mAs/h @ 70 kVp
Nominal power	0.50 kW (70 kV - 7.1 mA)
Total filtration	≥ 2.5 mm Al eq. @ 70 kV
HVL (Half value layer)	> 2.5 mm Al eq. @ 70 kV
Transformer insulation	Oil bath
Target angle and reference axis	See Figure 5
Cooling	By convection
Leakage radiation at 1 m	< 0.5 mGy/h @ 70 kV - 7.1 mA - 3s duty cycle 1/16
Tube-head maximum thermal capacity	310kJ

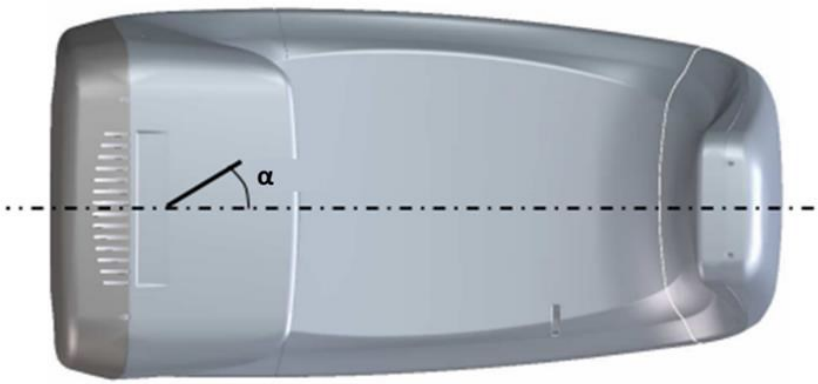


Figure 5: Tube-head target angle α[1](anode tilt) (view from the bottom)

[1] The different values of the angle ***anode tilt*** are shown in the table below

X-ray tube characteristics			
Manufacturer	Canon	CEI	CEI
Type	D-058	OPX/105-12	OX 80-0.5
Nominal focal spot	0.5 EN 60336	0.5 EN 60336	0.5 EN 60336
Inherent filtration	At least 1.0 mm Al eq. @ 70kV	0.8 mm Al eq. @ 70kV	0.5 mm Al eq.@70 kV
Anode tilt	12.5°	12°	13°
Anode material	Tungsten	Tungsten	Tungsten
Nominal maximum voltage	70 kV	110 kV	80 kV
Filament max current	3 A	4 A	2.8 A
Filament max voltage	3.6 V	6.7 V	2.5 V
Anode thermal capacity	13 kJ	30 kJ	10 kJ
Anode thermal capacity during continuous operation	300 W	300 W	250 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	Class1 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

Digital sensor

Detector type	CMOS flat panel
Sensible Area (H x L) PAN Sensor	152 x 6.7 mm2
Pixel dimensions	99 µm 198 µm (2x2 binning)
Number of pixel (H x L)	1536 x 68 (non-binning mode)
Grey levels	16384 (14 bit)
Resolution (spatial frequency at CTF=5%)	5 lp/mm (non-binning mode)

Mechanical characteristics

Focal spot to image receptor distance	50 cm (20")
Telescopic motorised column run	66 cm (26")
Maximum total height Note For the wall mount model this value refers to the recommended installation height	219 cm (86")
Weight	62 kg base version
Column base (optional)	6 kg

Working conditions

Minimum room size (please refer to the Service Manual)	120 x 115 cm
Recommended room size (please refer to the Service Manual)	160 x 150 cm
Maximum working temperature range	+ 10° ÷ + 40°
Relative working humidity (RH) range	30% ÷ 75%
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
Monitor characteristics: the PC and the monitor are not supplied with the equipment. In order to properly view images taken with I-MAX, the PC monitor must have the following minimum characteristics:

- Resolution: 1600 x 1024 pixels
- Colour depth: 16M of colour
- Contrast: 500:1
- Luminosity: 200cd/m^2

Note
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.

5.1. PC requirements

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

In the following paragraphs are listed the minimum PC characteristics.

5.1.1. PC minimum characteristics

- Processor intel core i5 2.66 GHz quad core
- Hard drive 512 GB
- Operating system windows 10 – 64 bit
- Mother board with at least one free express slot (min. X4) to be dedicated to the Gbps network interface card intel I210 single port (NIC provided with the equipment)

5.2. 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.

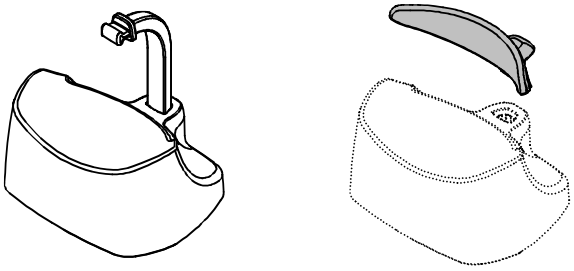
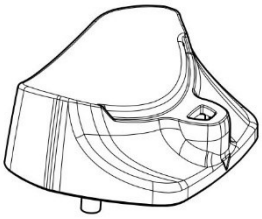
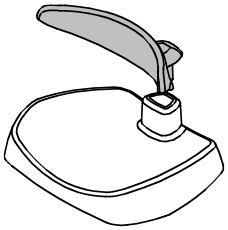
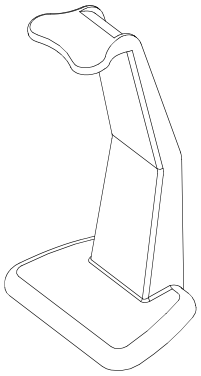
5.3. I-MAX – PC communication

The communication between I-MAX and computer is carried out with a LAN connection based on a TCP/IP protocol.
In order to properly operate the unit follow carefully the instructions reported in the Service Manual at paragraph 7.6
The system is provided with an Ethernet cat 5e cable in order to permit the PC connection. In case of replacement, a cable of the same or superior category has 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 data causing distortion and artefacts on the images can occur.

Note
I-MAX is not intended to transmit or receive information to/or from other equipment through network/data couplings, but with the computer where the unit GUI is activated.

5.4. Separate parts supplied with I-MAX

I-MAX 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	
Bites, bite protective sleeves and TMJ positioner 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, 3rd edition.
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.

5.5. Reference standards

Medical electrical equipment for extra-oral dental radiography I-MAX 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.

CFR 21
Code Federal Regulation. Sub Chapter J.

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

Classifications

I-MAX is an electrical medical X-ray device classified as class I type B according to EN 60601-1, with continuous operation at an intermittent load.

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

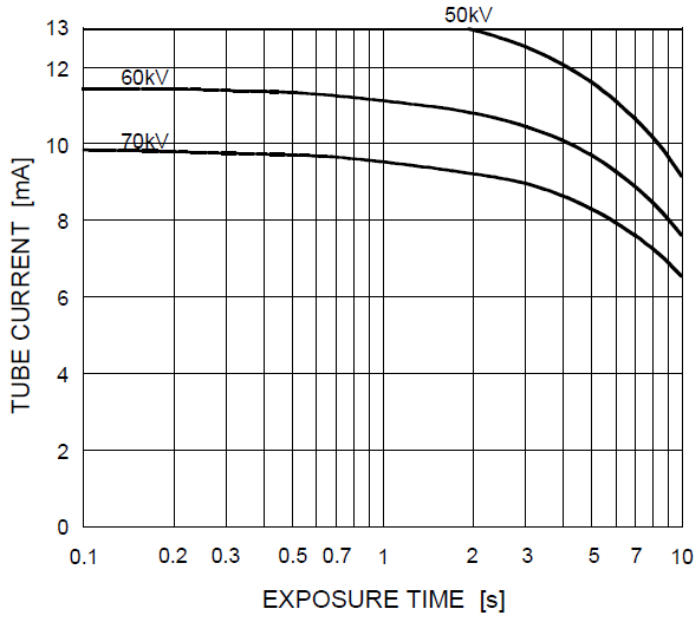
According to Canadian MDR, the equipment belongs to class II.

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

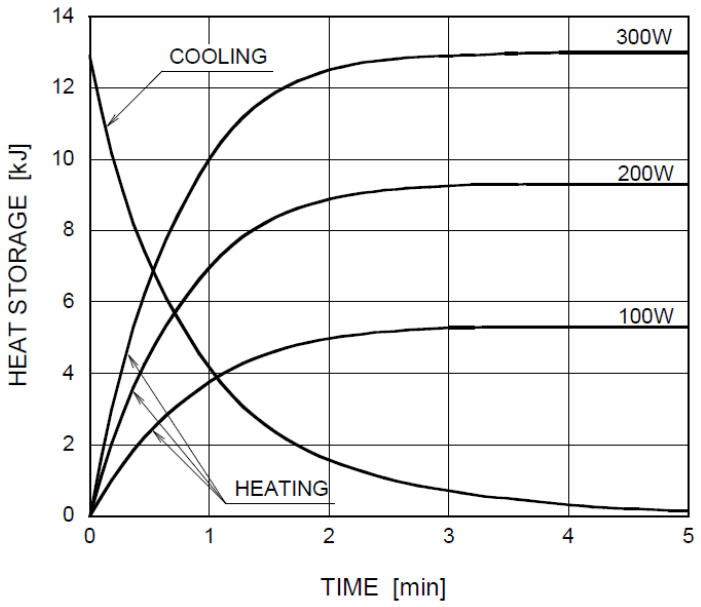
5.6. Tube loading curves, anode heating and cooling curves

Tube "Canon D-058" (0.5 IEC 336)

Tube loading curves

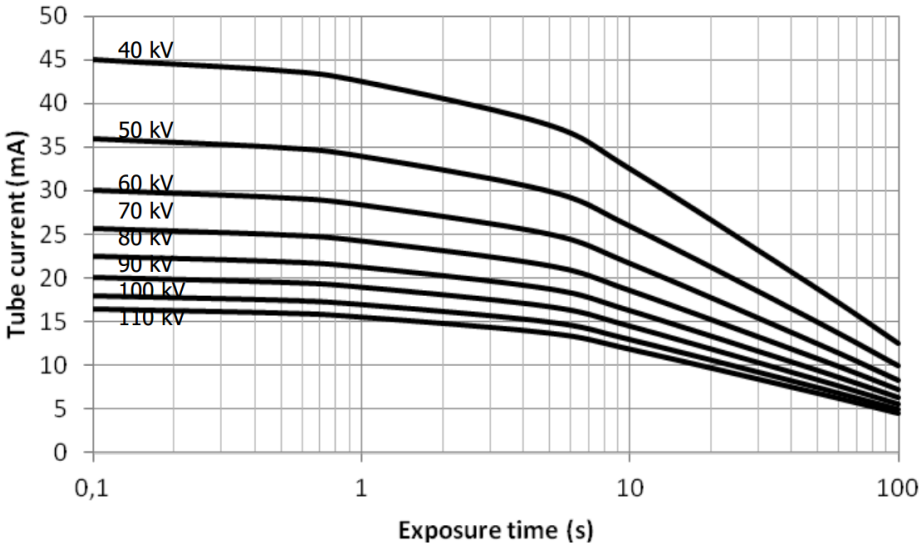


Anode heating and cooling curves

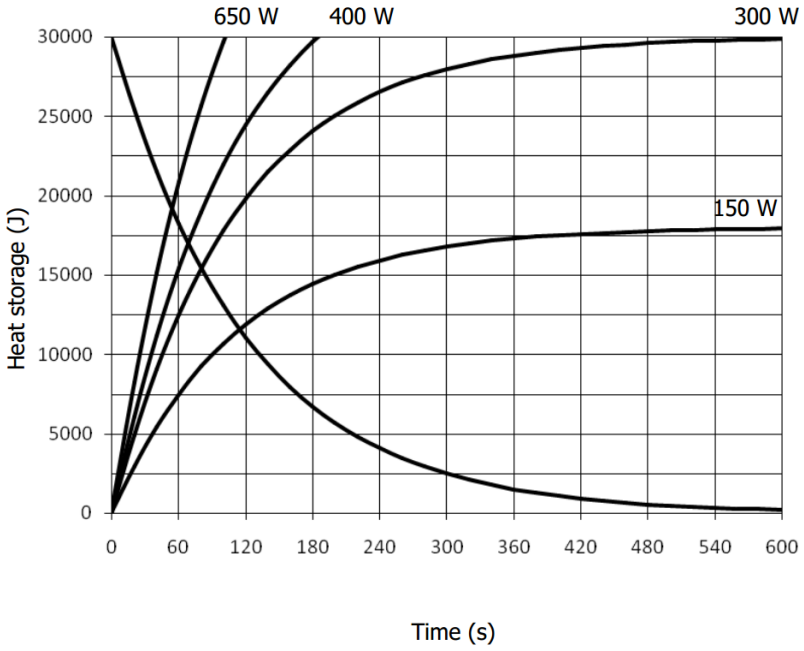


Tube "Canon D-058" (0.5 IEC 336)

Tube loading curves

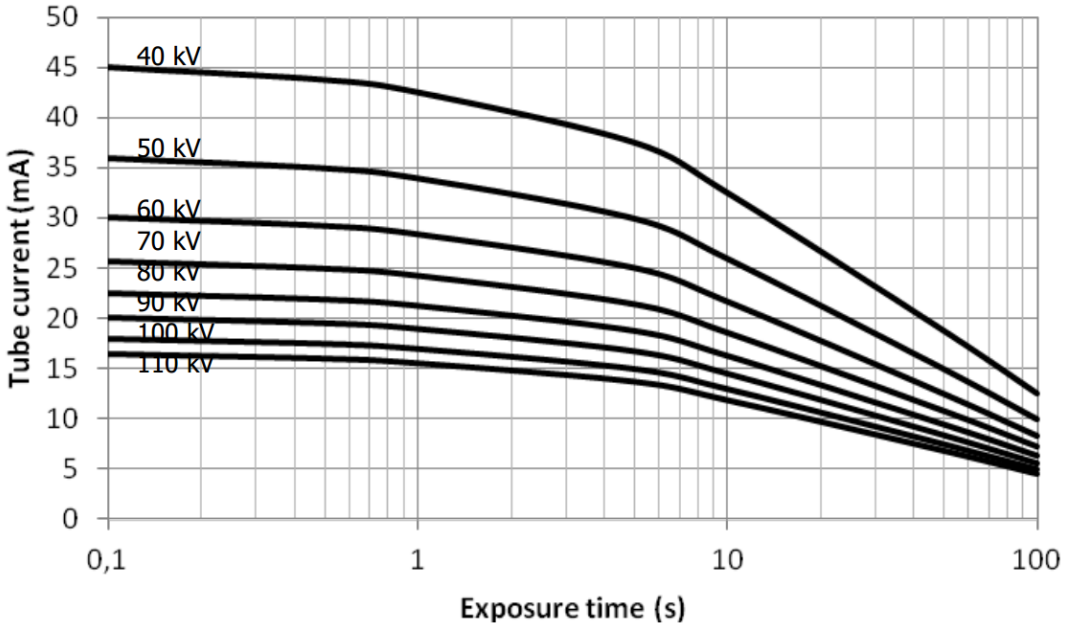


Anode heating and cooling curves

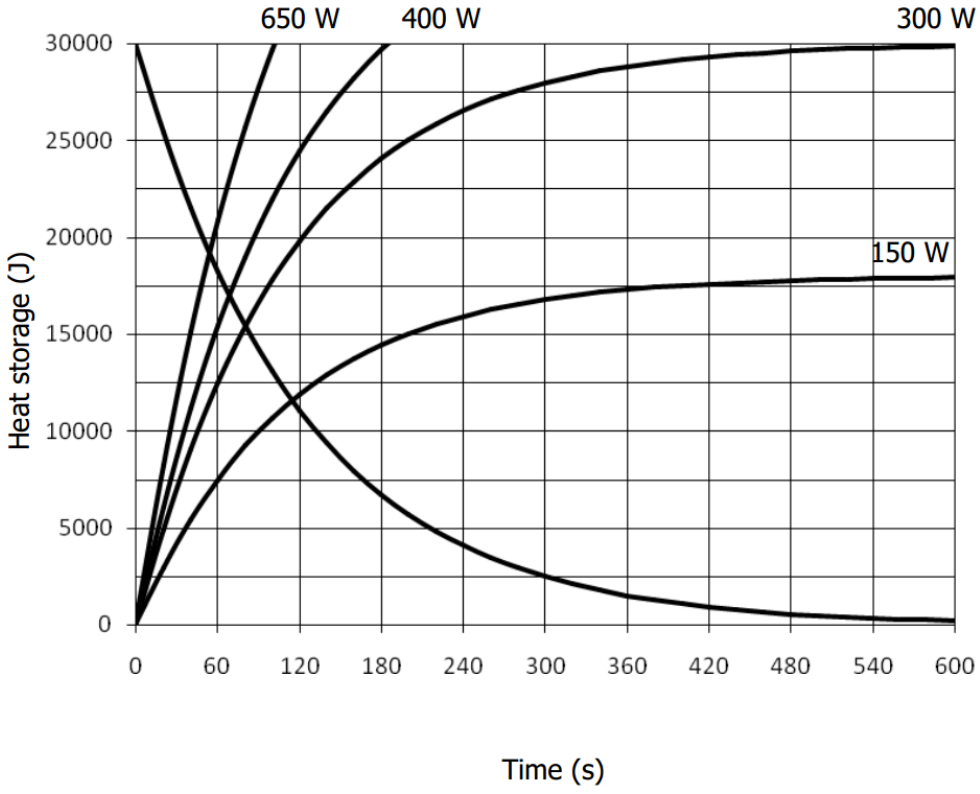


Tube "CEI OX 80-0.5" (0.5 IEC 336)

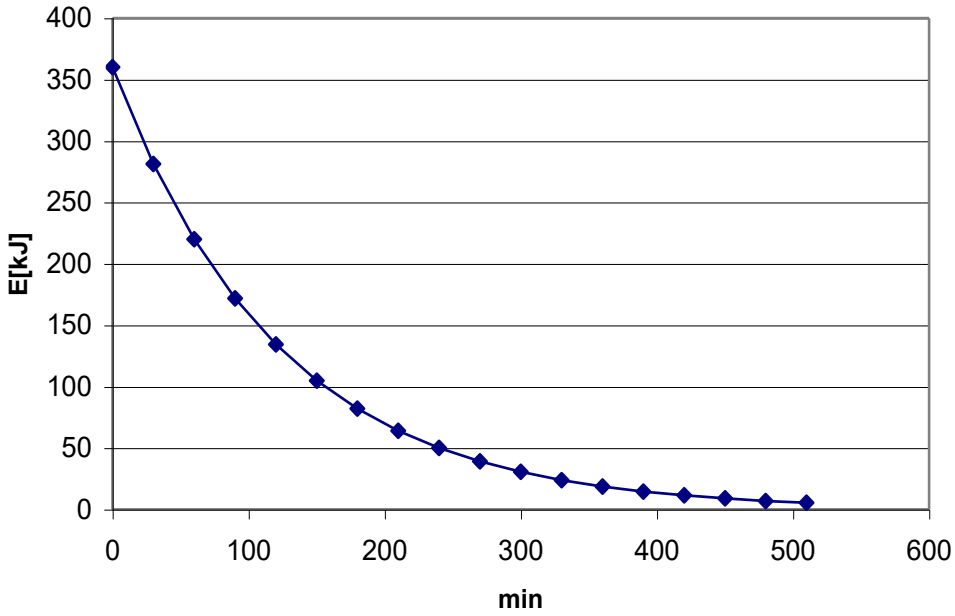
Tube loading curves



Anode heating and cooling curves



Tube head cooling curve


400
350
300
250
200
150
100
50
0
E[kJ]
0
100
200
300
400
500
600
min

5.7. Note on constant magnification for dental arch and TMJ (mouth open/closed) exams

Note
I-MAX 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 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.

5.8. Dimensions

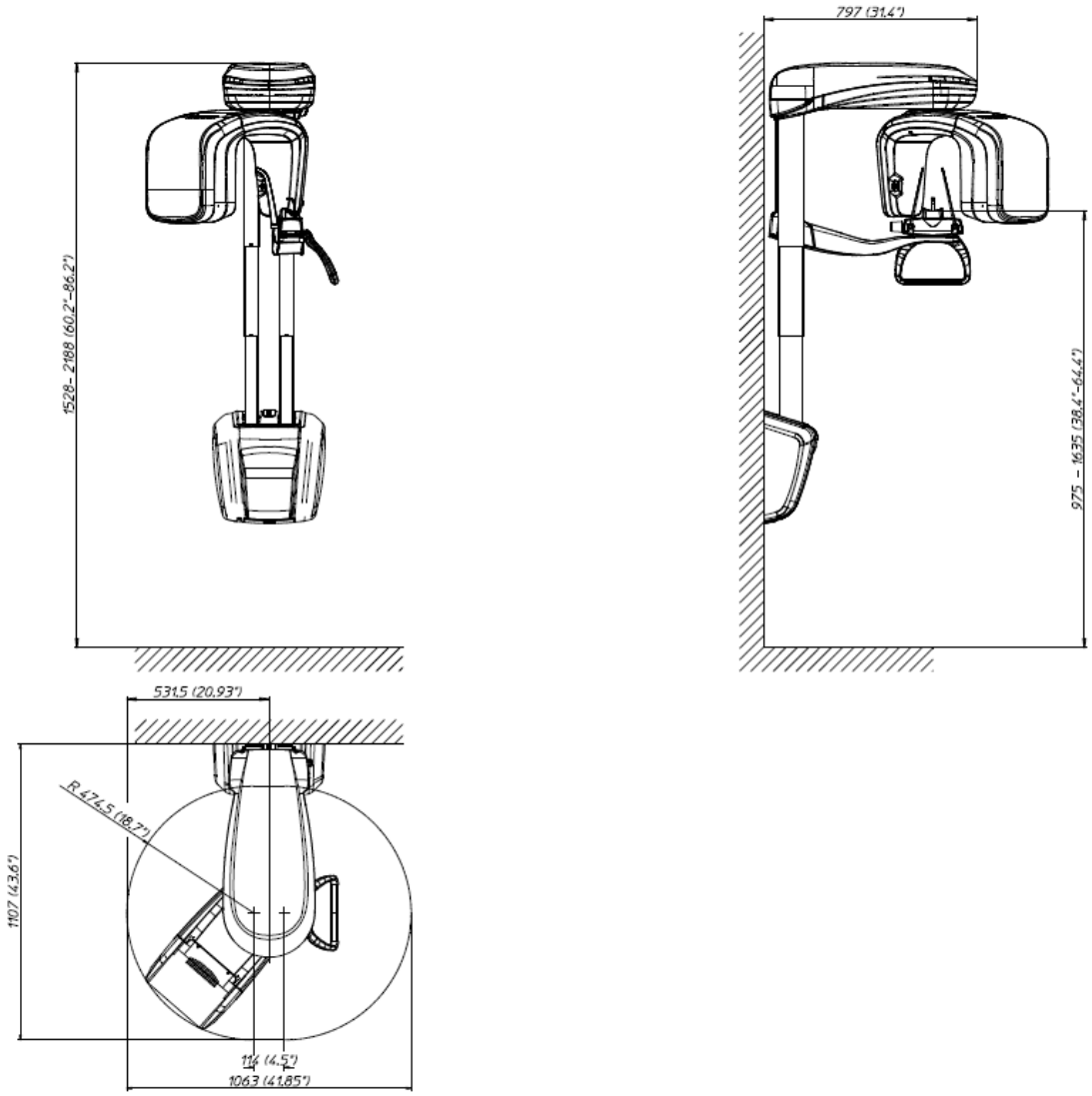


Figure 6: I-MAX dimensions - Wall mounted version

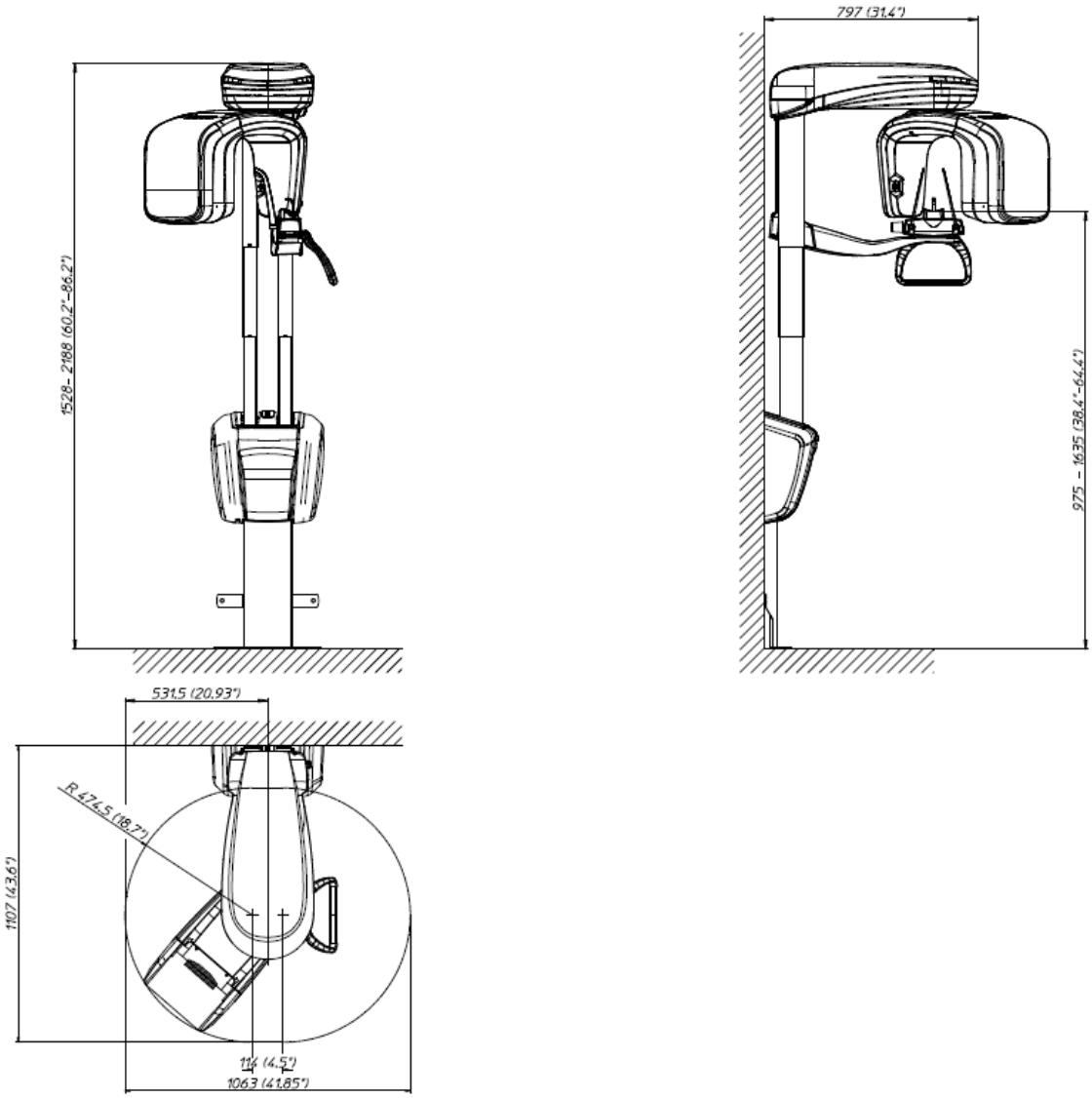


Figure 7: I-MAX dimensions - Wall mounted with floor support version

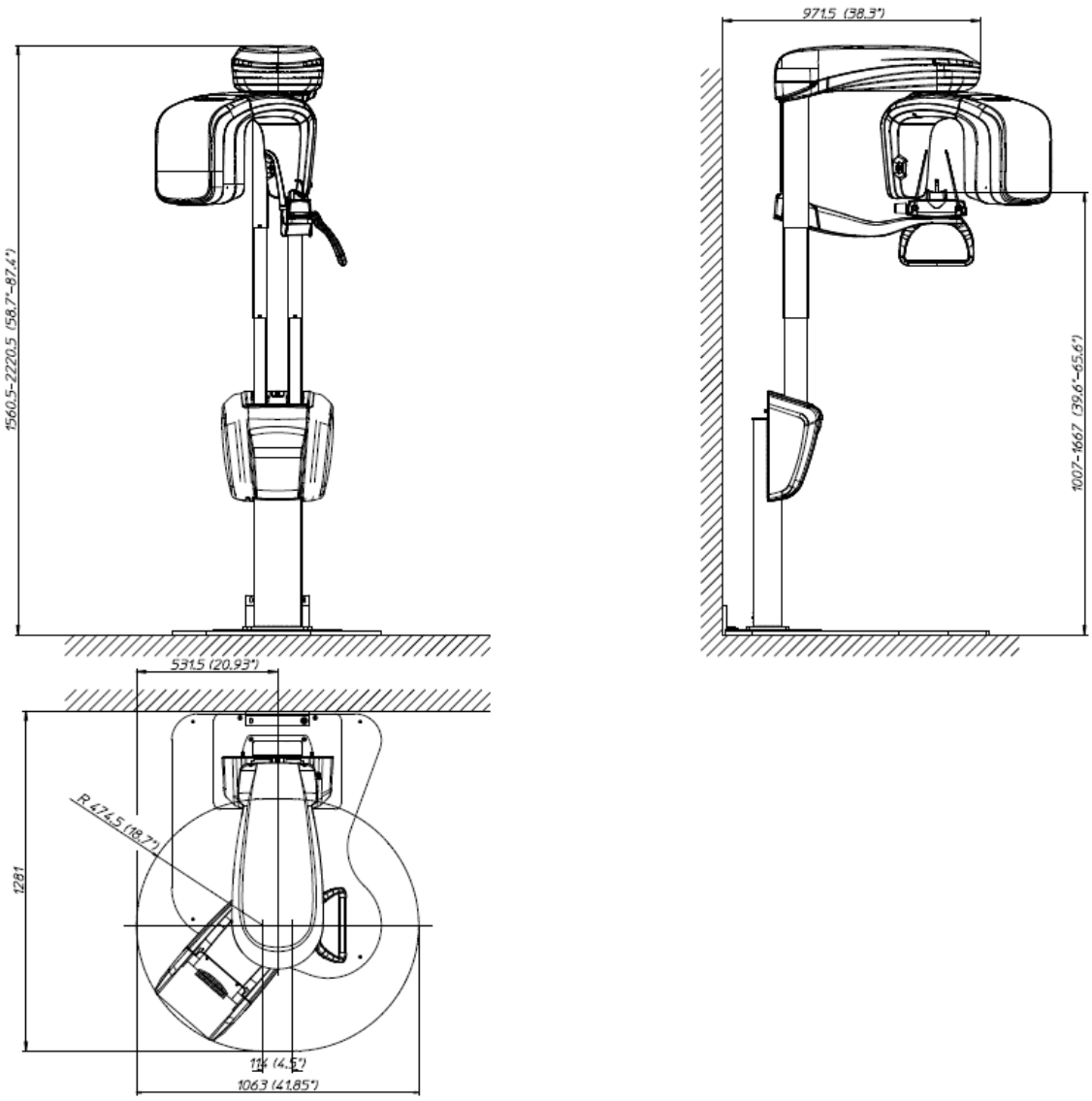


Figure 8: I-MAX dimensions - Floor mounted version

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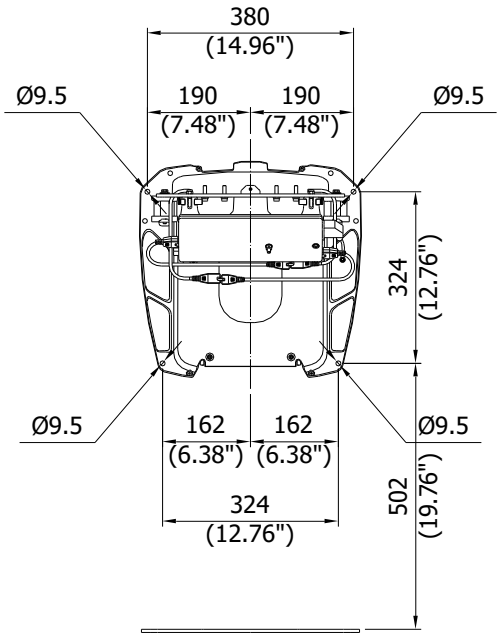
6. PRE-INSTALLATION

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.
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.

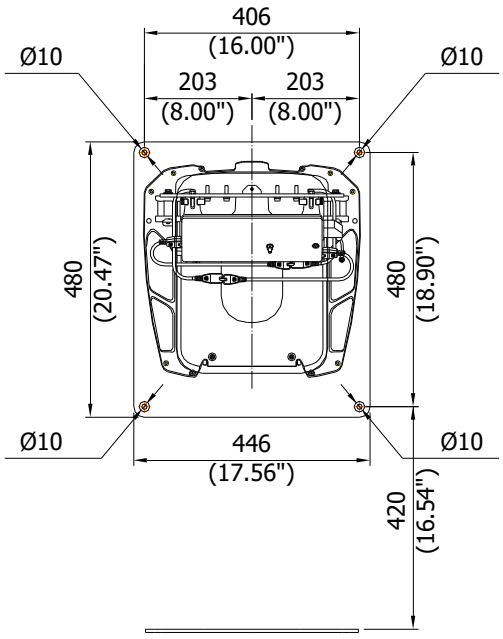
The requirements for a correct installation of I-MAX are:

- minimum height of the room: 2.5 m (8.20') and a surface variable according to the configuration of I-MAX to be installed
- a certain distance from heating devices
- the entries in the room, for the transport of the unit, must have a minimum width of 80 cm (31.50").

Note
Also if package can be used as tool to install the I-MAX, 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.



Standard version



Double stud version (16")

Warning
In its standard versions, I-MAX 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.

6.1. Electrical setting up

- Single-phase grounding supply: 220-240 V ~
  110-120 V ~
- Frequency 50/60 Hz
- Power consumption 0.8 kVA (at 230 V)
  0.8 kVA (at 115 V)
- Current consumption 3.5 A (at 230 V)
  7 A (at 115 V)
- Apparent line resistance 0.5 Ω max (for 220-240 V version)
- Line voltage regulation < 3 % at 99 V (for 110-120 V version)

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 supply. 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 supply conductors must have a 1,5 mm^2 (16 AWG) section.
The general grounding must comply with the rules in force; a wrong quality of the grounding could be dangerous for the operator's safety and cause a bad function of the electrical devices.

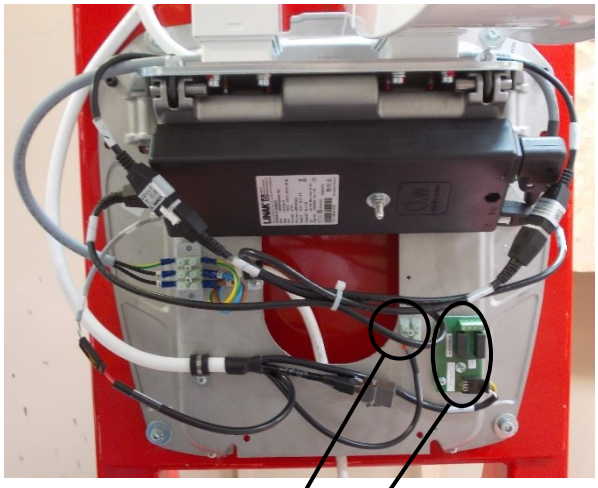
Note
Power supply cable is already connected inside the I-MAX.

Note
I-MAX, IS SET TO connect, at the entrance of the X-ray room, the following control and warning devices:

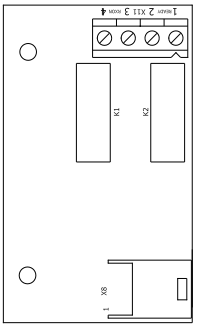
- READY light: Green light (24V 40W max.), it signals that the unit is ready to perform the exam (contact N.O.)
- X-RAYS light: Yellow light (24V 40 W max.) it signals the entry in the X-ray room is forbidden, since an exposure is on the run (contact N.O.)

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.

- Remote X-RAYS button: "Dead man switch" remote control, enables to perform the exam at a distance, the operator can stand outside the X-ray emission area. This button must be suitable to prevent unwanted emission. The standard X-ray button supplied with the unit has the above characteristic.



Remote X-rays button connection



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

6.2. Packaging

I-MAX 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.

6.3. Space requirements

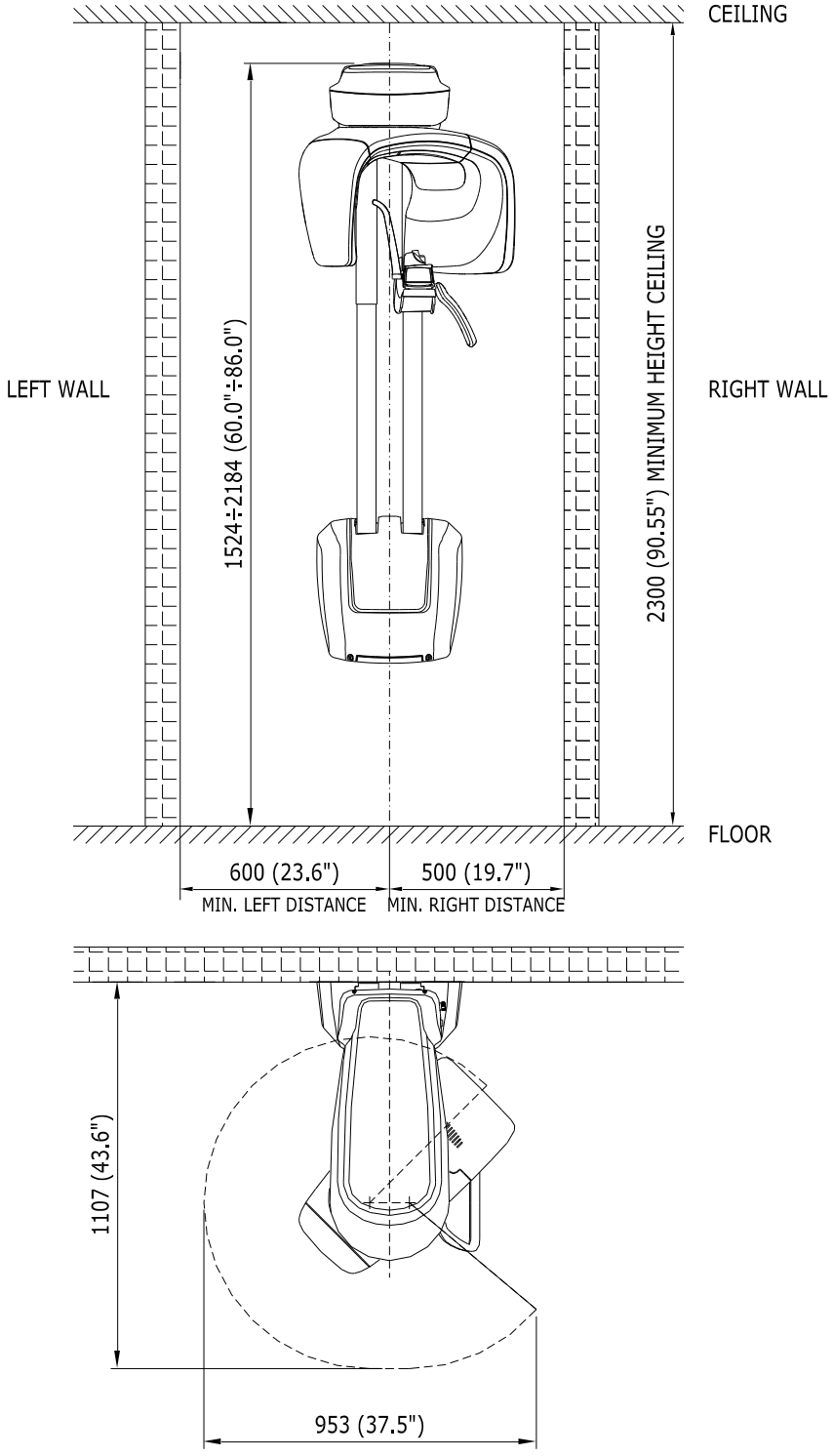
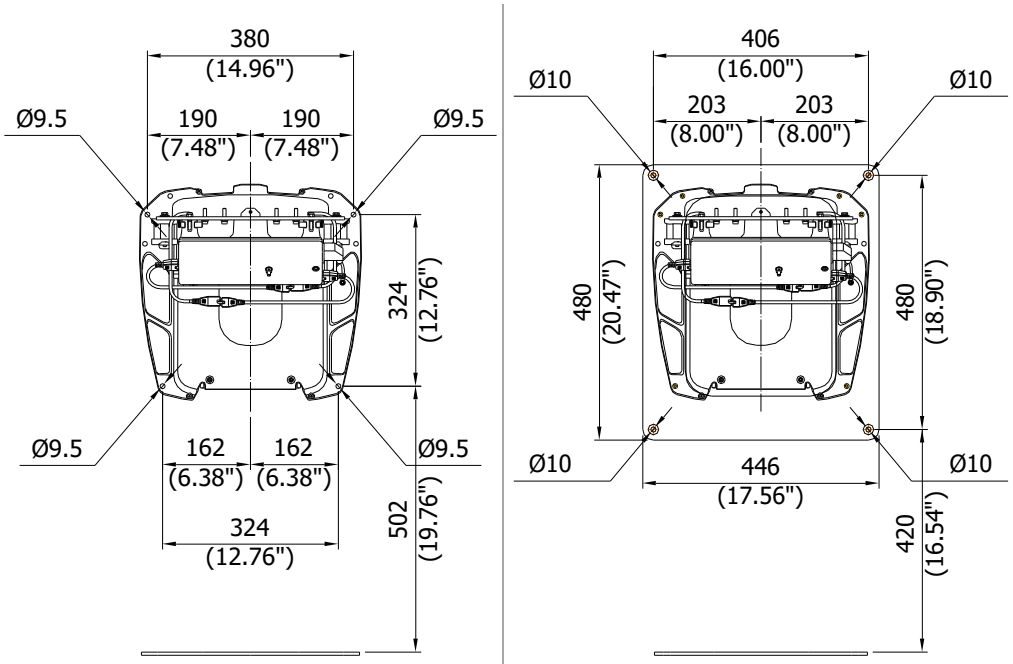


Figure 9

7. INSTALLATION

Note
I-MAX 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
Also if package can be used as tool to install the I-MAX, 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 10.



Standard version *Double stud version (16")*

Figure 10

Warning
In its standard versions, I-MAX 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/. 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.

7.1. Mechanical installation

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

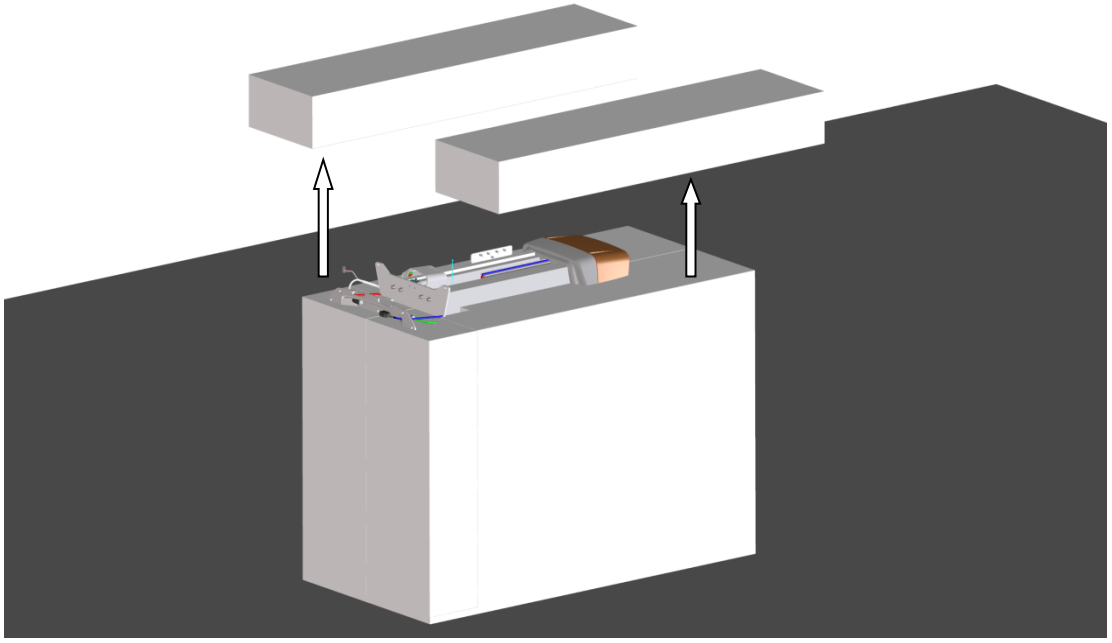


Figure 11

2. Remove the front polystyrene section.

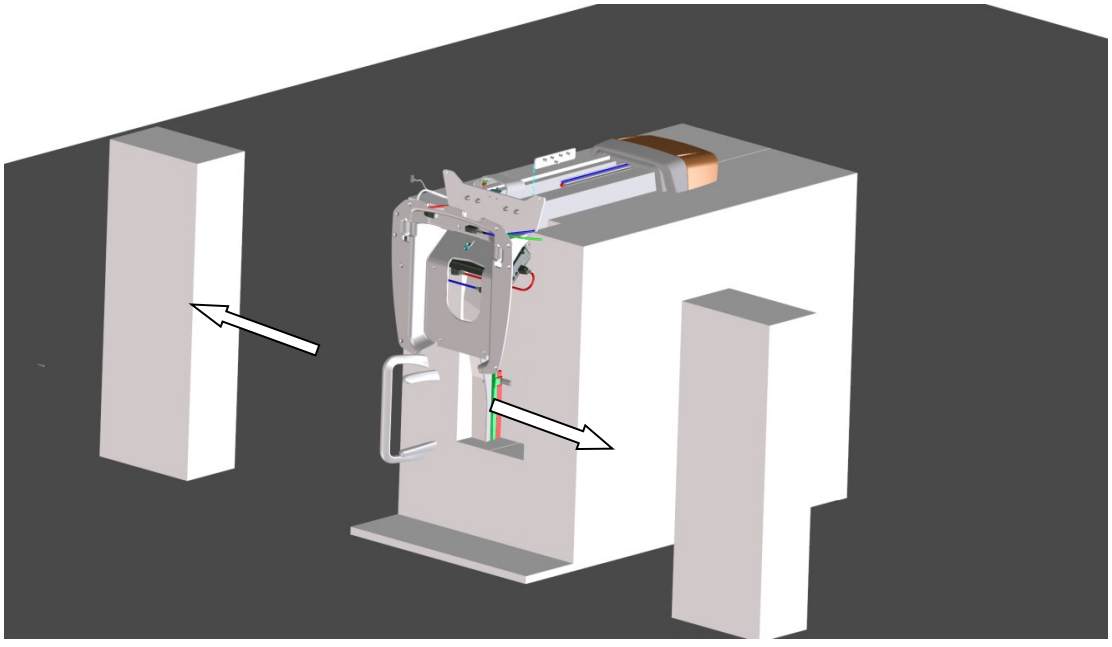


Figure 12

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

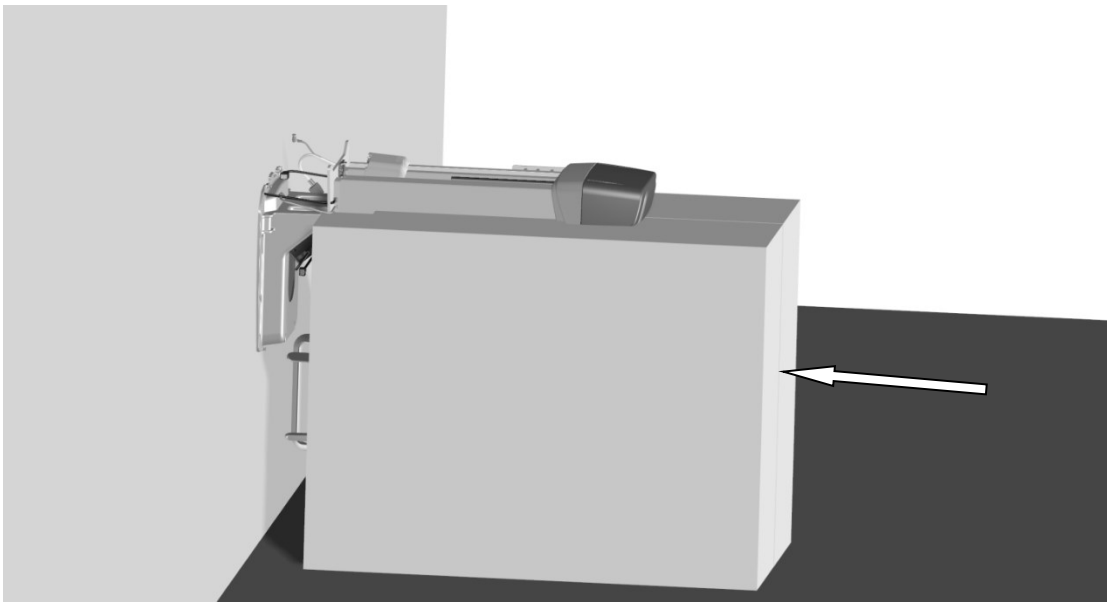


Figure 13

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

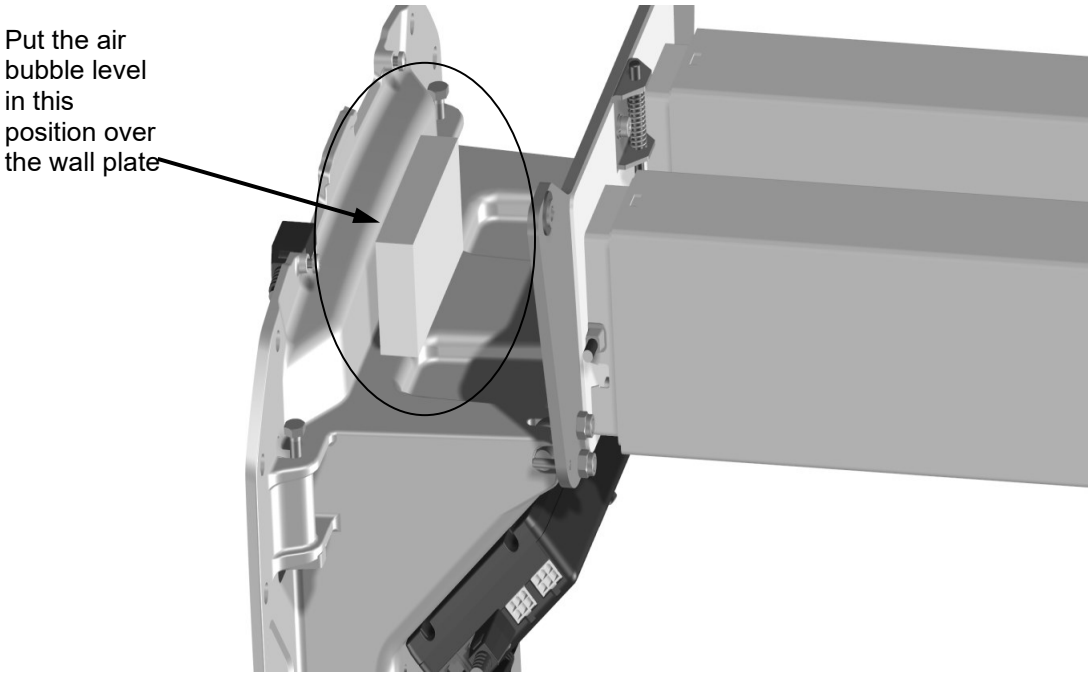


Figure 14

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…).

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

Figure 15

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

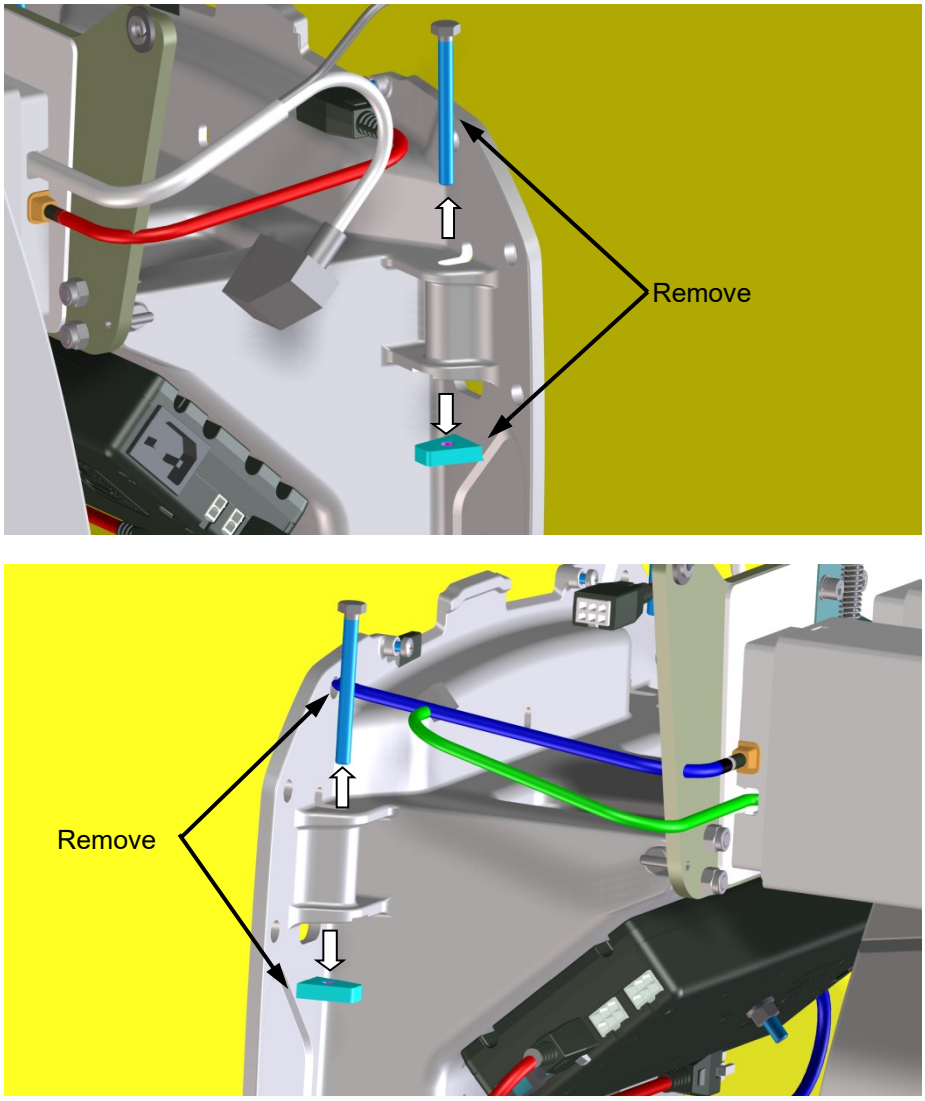


Figure 16

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 is about 20kg, so that a single technician can be enough to install the unit.

Figure 17

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

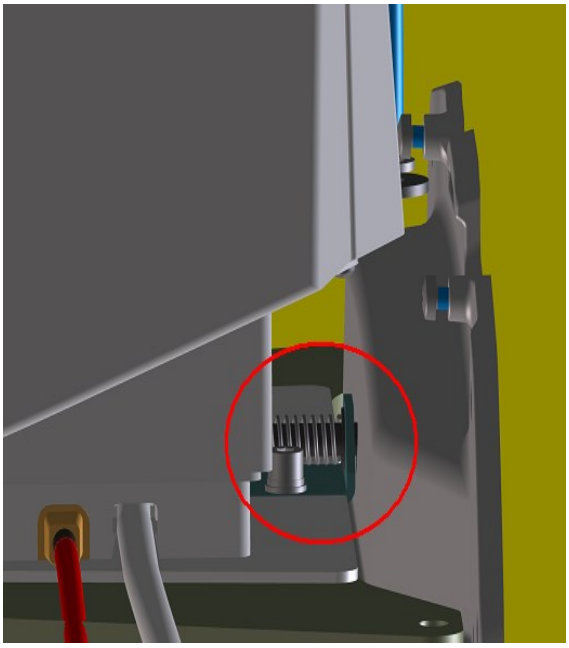


Figure 18

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

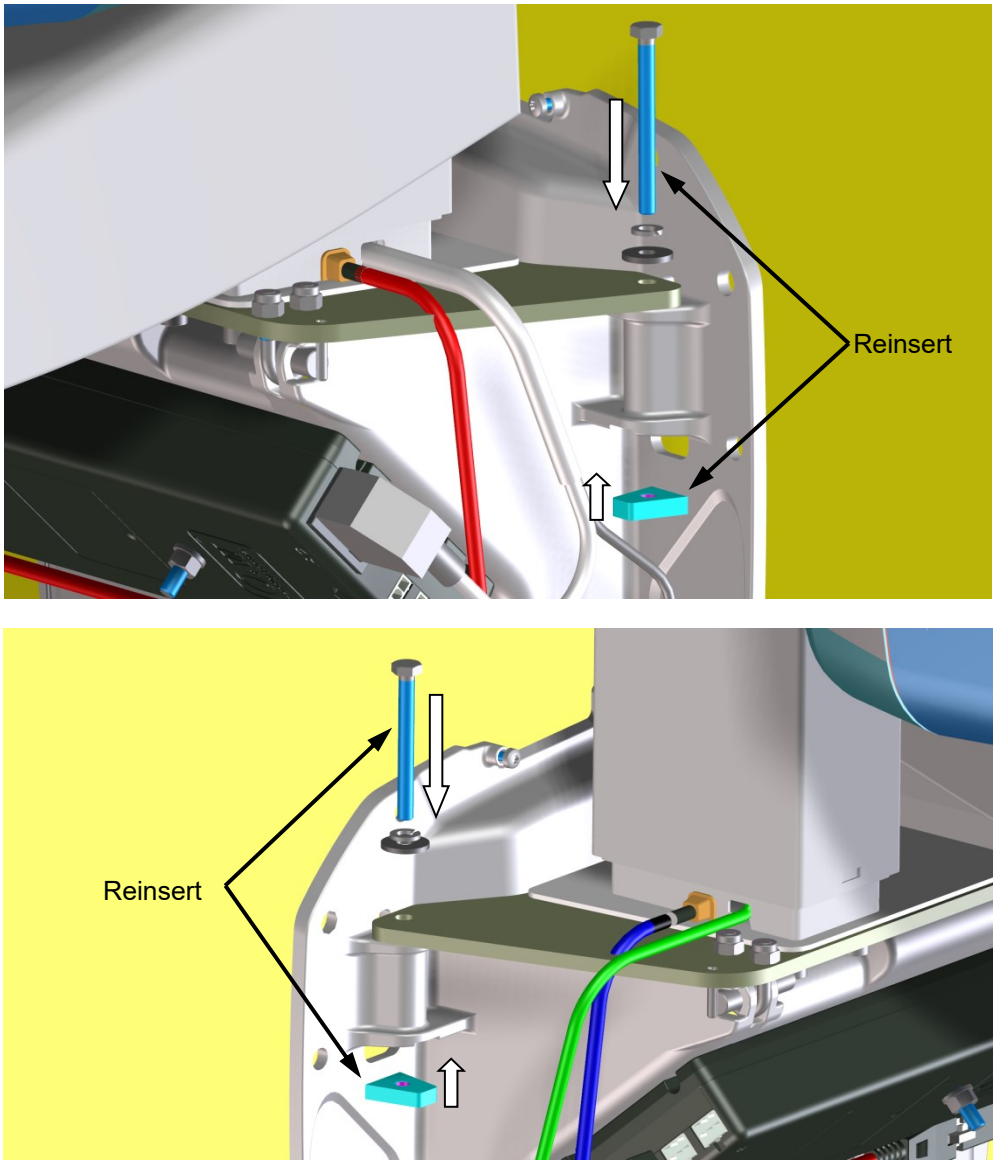


Figure 19

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

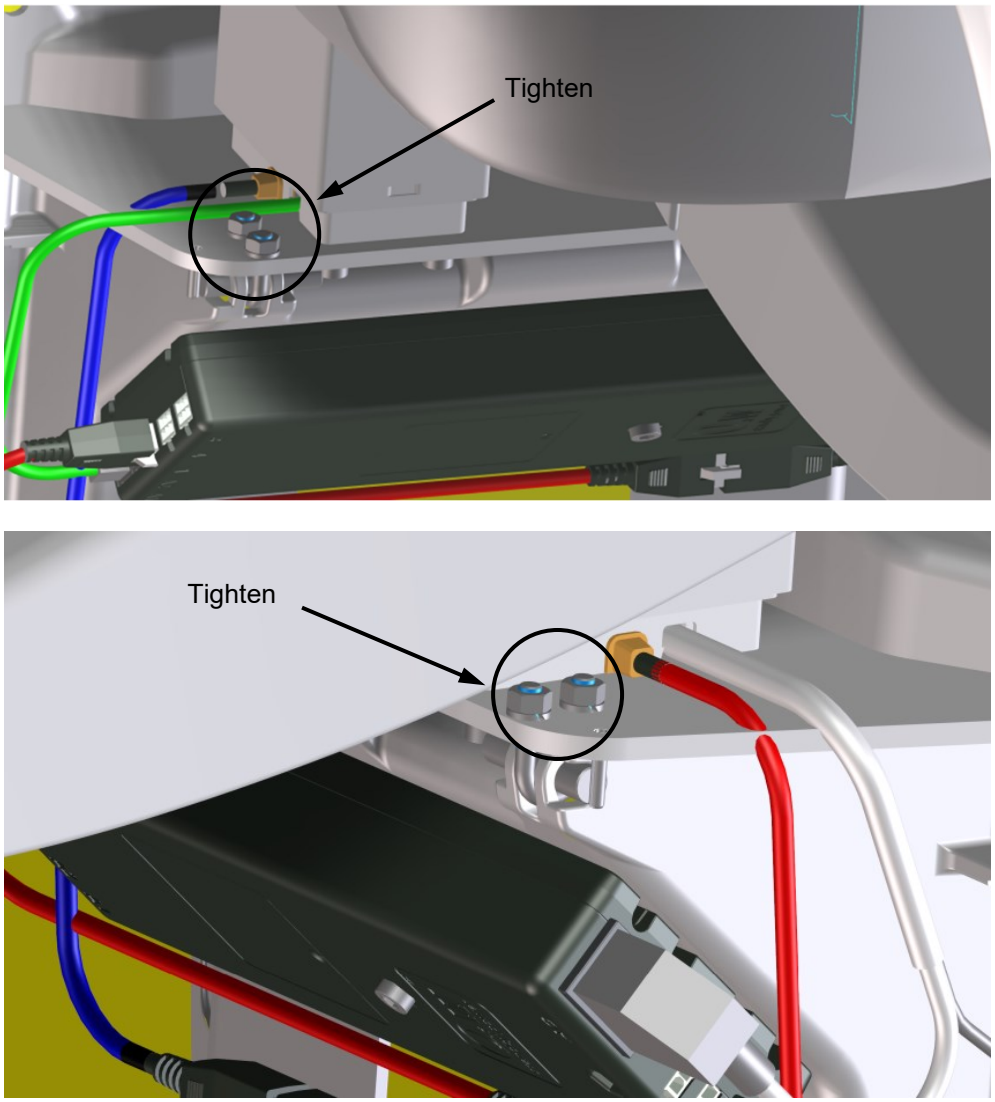


Figure 20

Warning
In case of dismountling 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.

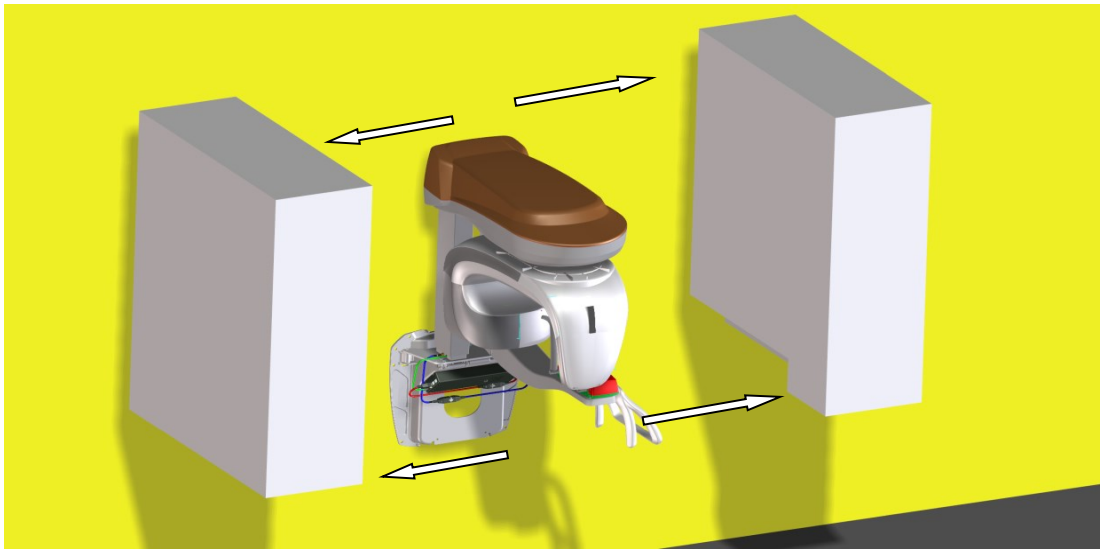


Figure 21

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.

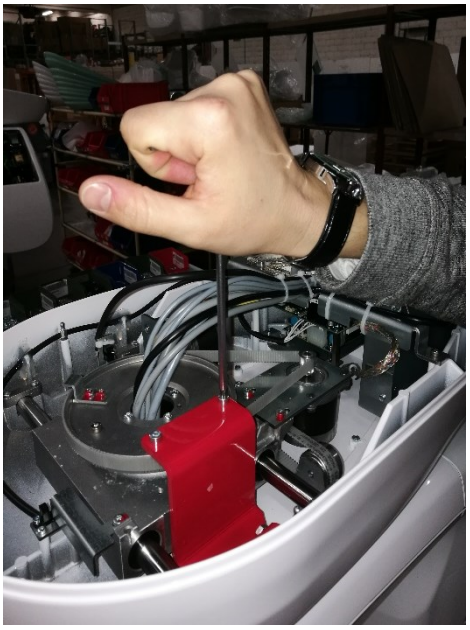


Figure 22

7.2. Electrical connections

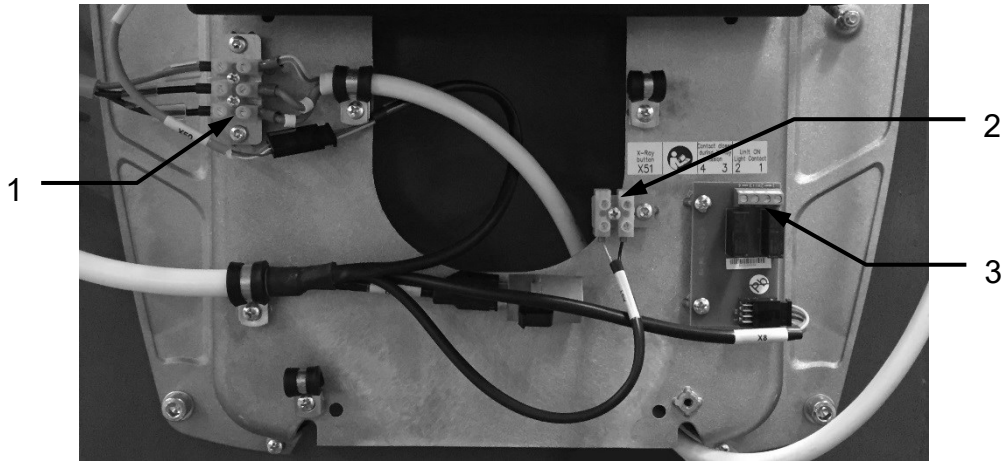


Figure 23

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

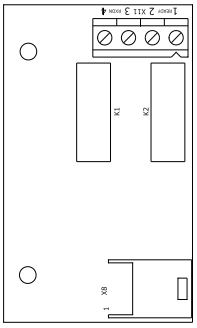
Note
Before to connect main power supply, be sure that the main provided by the Customer is according to specification in terms of voltage, line resistance and safety protections (see paragraph 6.1).

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, 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 indicate that the unit is ready to perform the exam (contact N.O.).
   - X-RAYS light (yellow light 24V - 40 W max.): it indicate that the entry in the X-ray room is forbidden, since an exposure is running (contact N.O.).



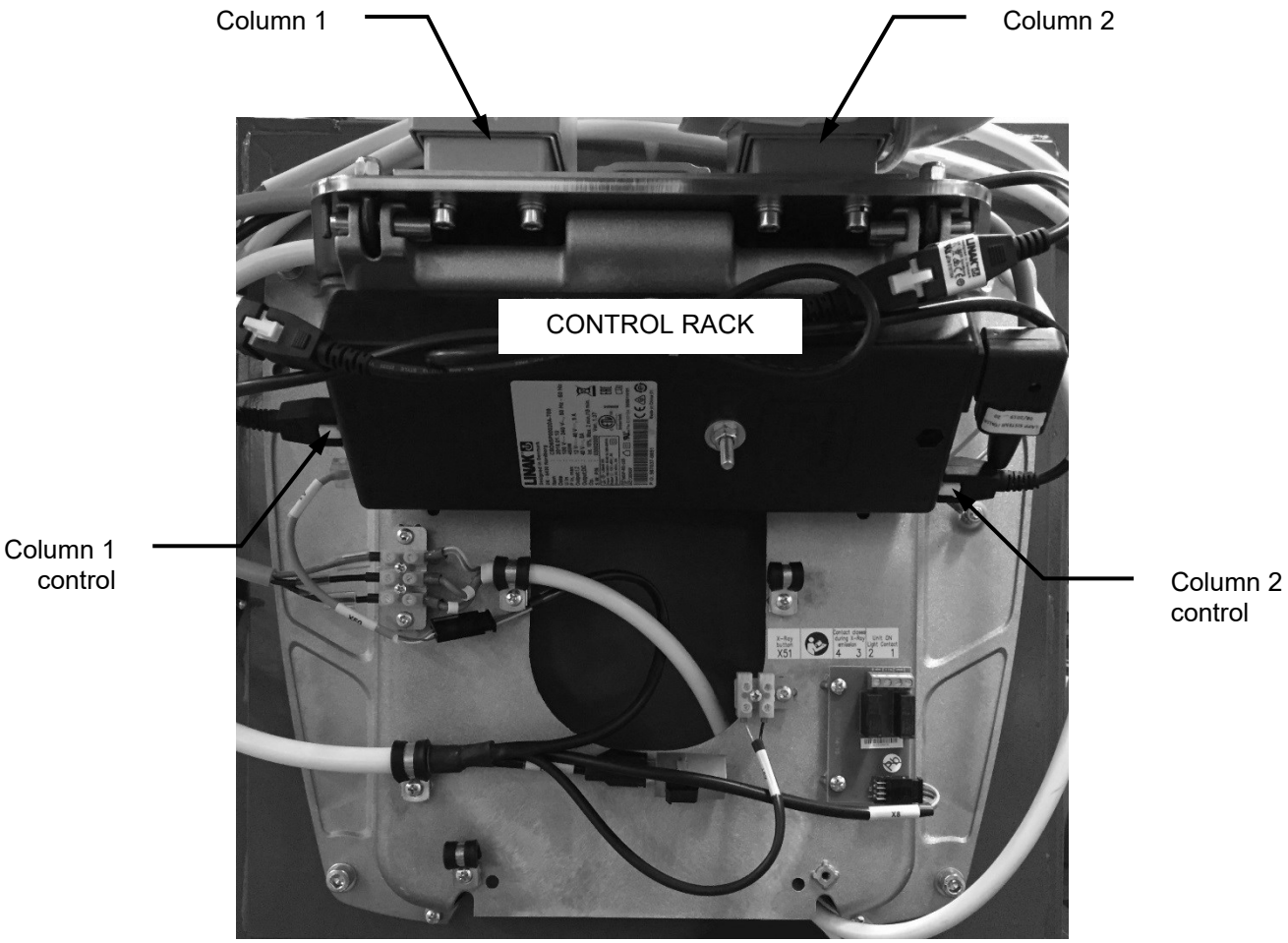
Lights connection:
X11-1/X11-2 contact closed when unit is ready
X11-3/X11-4 contact closed during X-ray emission

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.

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.



7.3. 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

Figure 24

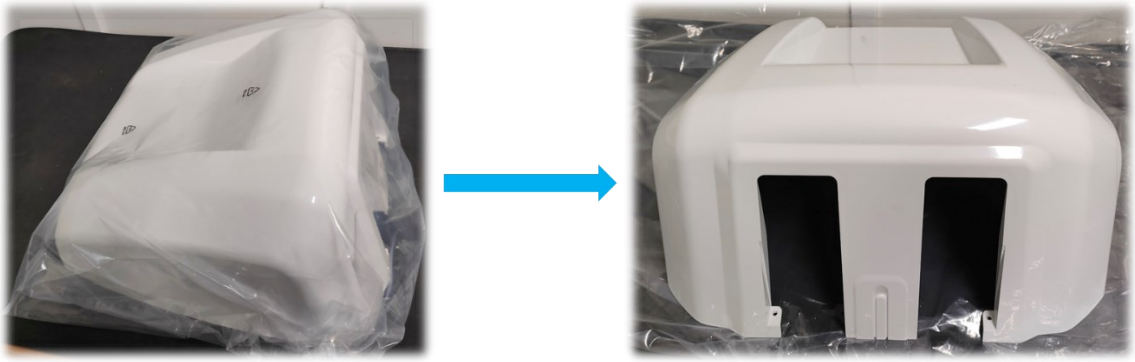
7.3.1.1. Wall plate cover modification

Note
The following instruction should be followed and applied only if any interference issue between cables and wall plate should occur

If any difficulties in routing power, Ethernet and remote button cables from the wall interface plate should occur, the cover can be modified to run cables from underneath it.

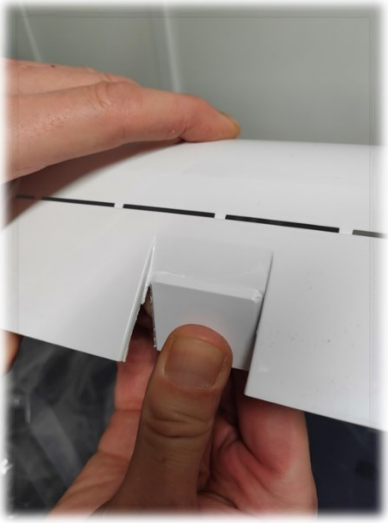
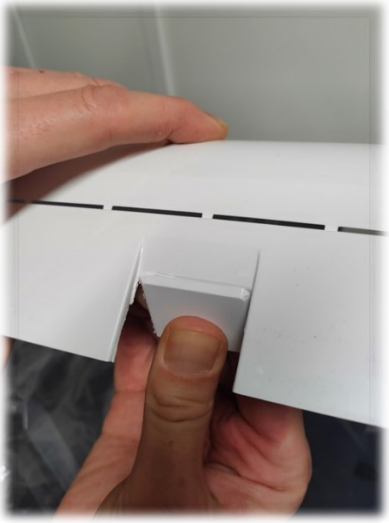
To do so, please carefully refer to the below listed steps:

1. Take out the cover from the packaging and place it on a flat surface.



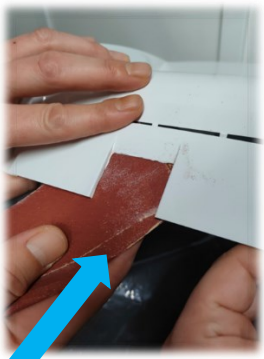
2. With the help of a box cutter, cut along the two lines of the smaller hole highlighted in the figure.

3. Push the newly cut piece inwards to detach it completely from the cover, thus creating the hole.

4. With the help of a piece of sandpaper, carefully file the edges of the newly created hole.



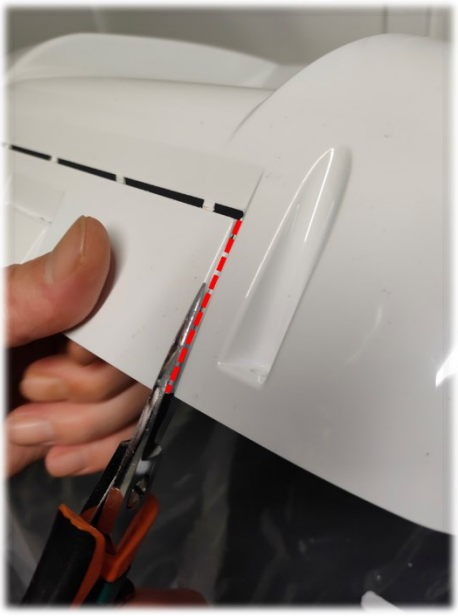
Note
Be sure to remove any sharp edges or defect present also on the inside-side of the newly created hole

5. Remove any residuals of sandpaper and then mount the cover on the wall plate verifying if the issue has been solved.

Note
If the issue persists, please refer to the next steps

6. If there should still be interference issue between cables and wall plate, then, with the help of a box cutter, proceed to cut along the two lines of the bigger hole highlighted in the figure.

7. Use a cutter to cut the plastic parts on the top edge and, if necessary, also use it for the side edges.

8. Remove imperfections with the cutter.


9. With the help of a piece of sandpaper, carefully file the edges of the newly created hole.



10. Remove any residuals of sandpaper and then mount the cover on the wall plate verifying if the issue has been solved.

7.3.2. Upper cover

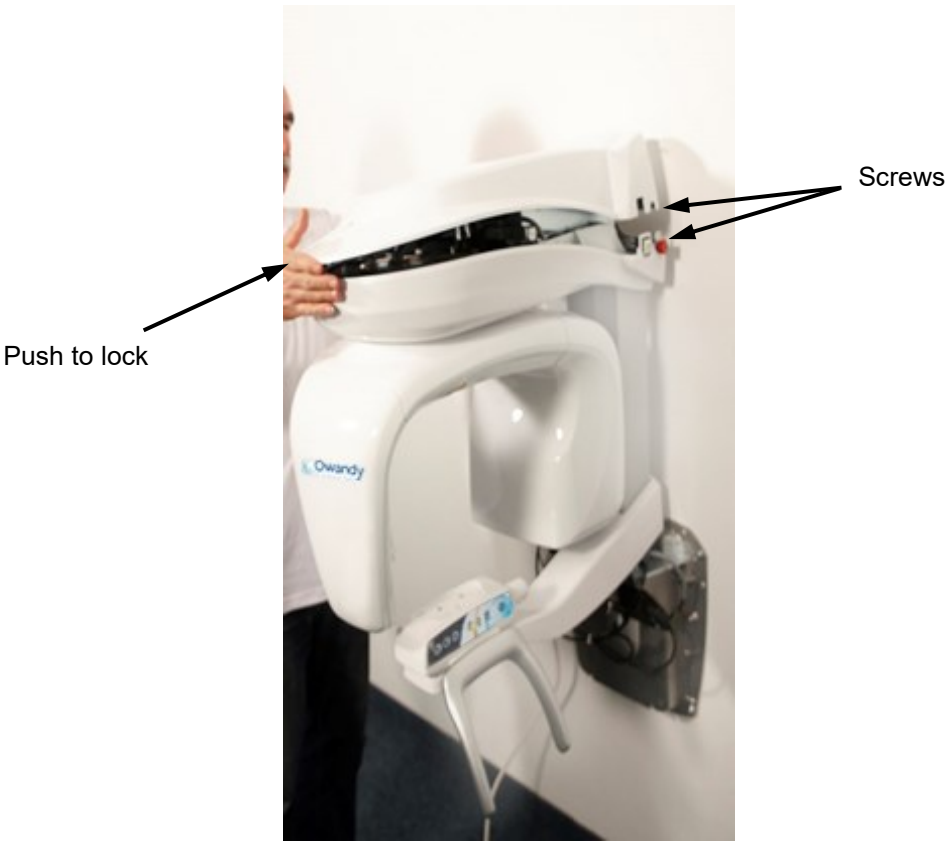


Figure 25

7.3.3. Temple supports

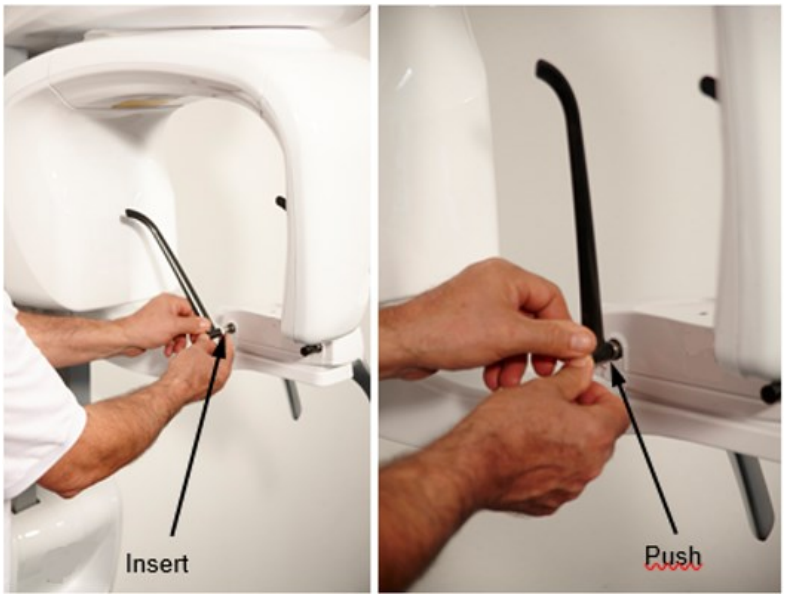


Figure 26

7.4. How to position the cables

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

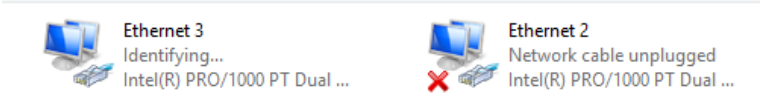
7.5. Network Interface board configuration

7.5.1. Network Interface board configuration

In order to connect the I-Max to the PC it is necessary to configure the properties of the dedicated Network Interface Card in the PC following the procedure described below.

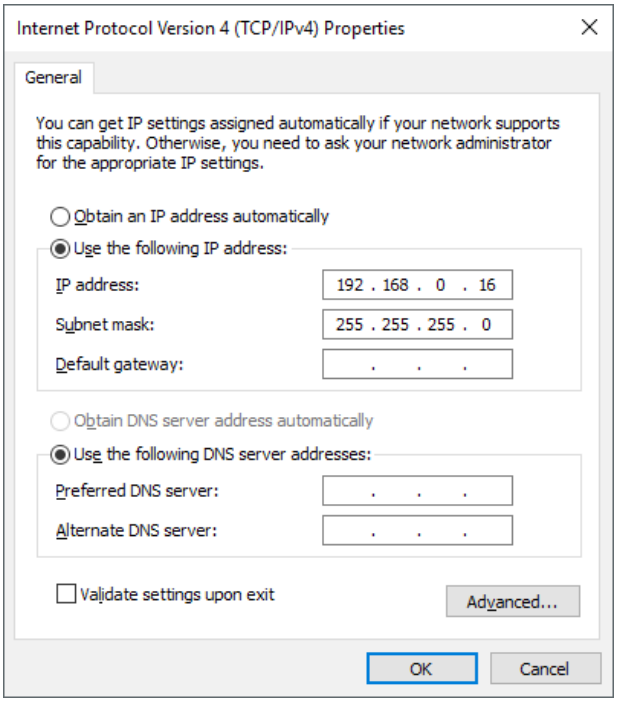
1. Go to *Control Panel* > *Network and Internet* > *Network and Sharing Center* > *Change adapter settings*. The network adapters are labelled with the NIC model that is either Intel I350-T2 or Intel PRO/1000 or Intel I210.

2. Plug the Ethernet cable DIRECTLY to a giga-ethernet port of the PC. Connections through a network switch is not allowed.
3. Switch on the unit. The network adapter connected to unit 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".

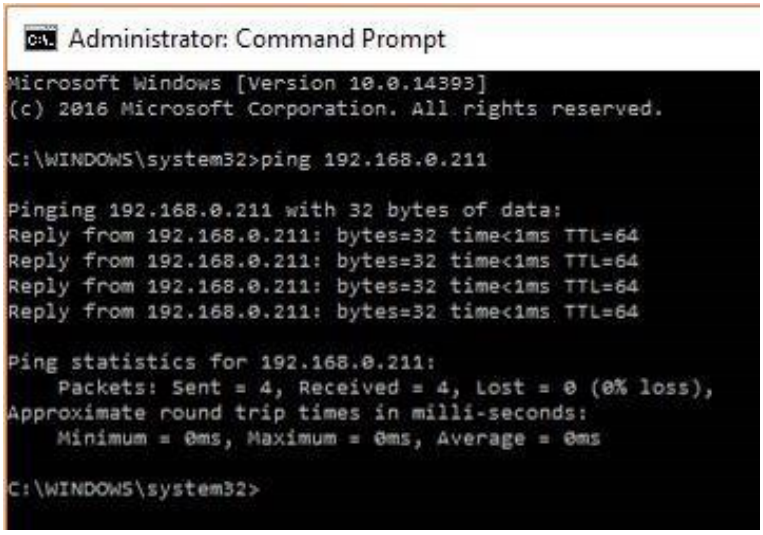


Note

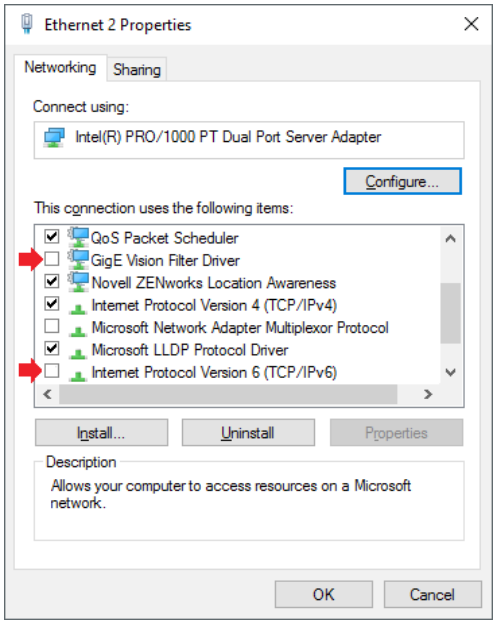
In any case to set the network card IP address avoid using the following values:

- 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, 192.168.0.100 and 192.168.0.101 dedicated to PAN detector

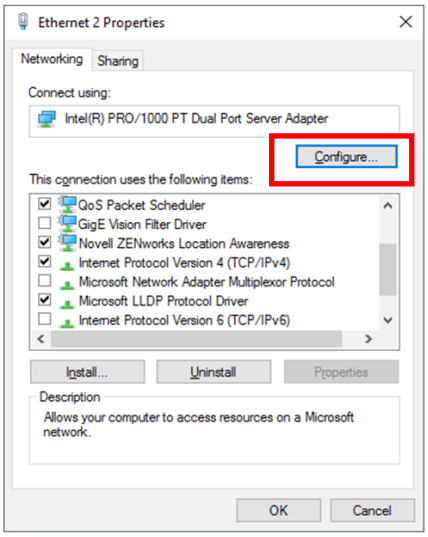
6. To check that the connection is properly configured, with the unit ON, run a command prompt and type "ping 192.168.0.211". Press Enter and verify that the unit replies to the ping as shown in the figure below.



If the ping does not reply, unflag the items "GigE Vision Filter Driver" and "Internet Protocol Version 6" from the properties of all the network adapters.



7. On the Ethernet board property window click on "*Configure…*":

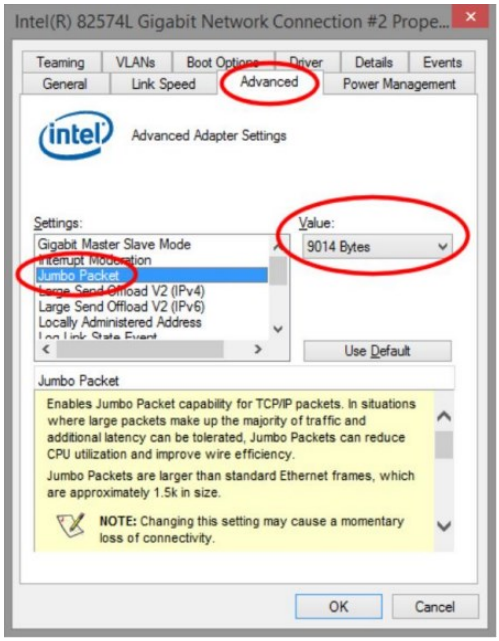


8. Select the "*Advanced*" sheet on the network board configuration window.

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

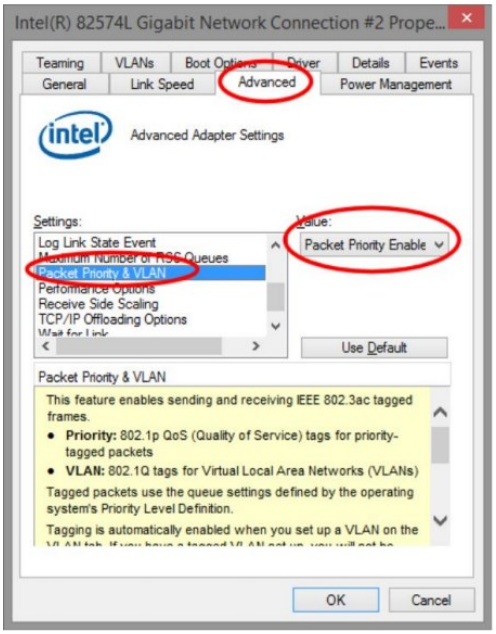
- Interrupt Moderation = Disabled

- Jumbo Packet = 9014 Bytes

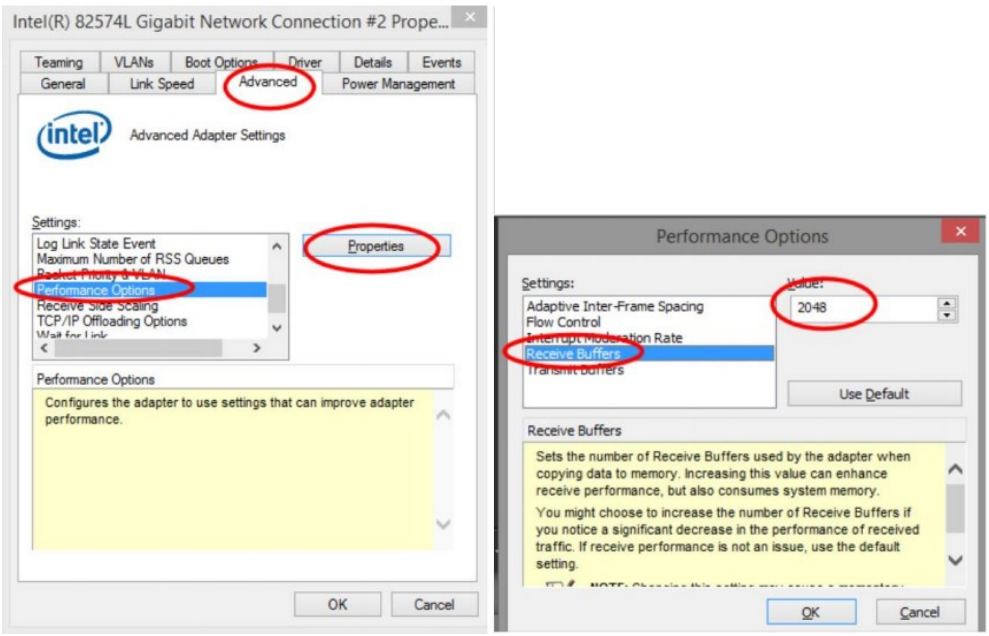


- Maximum Number of RSS Queues = 2 Queues

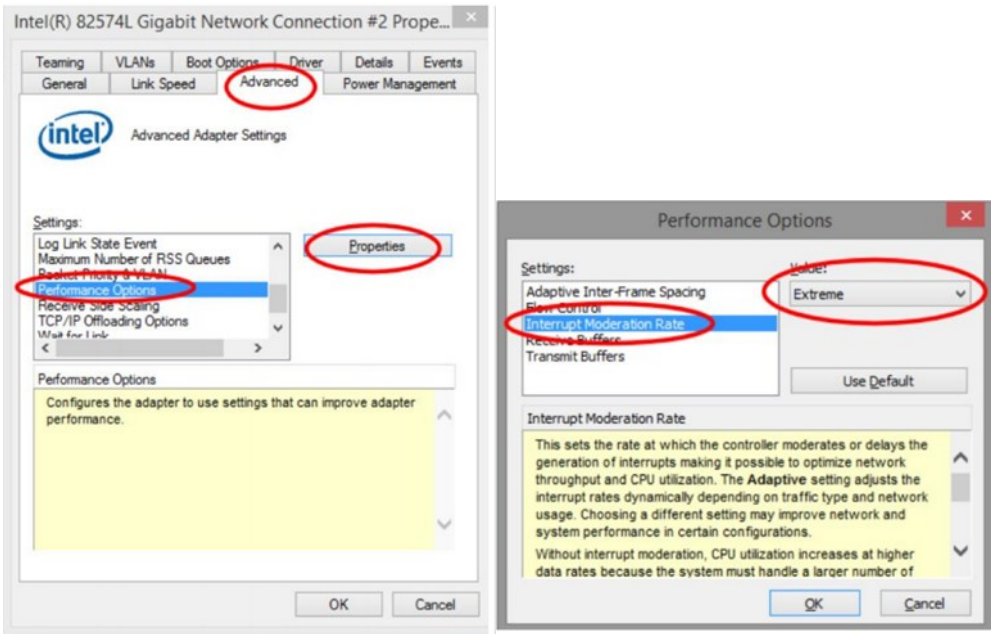
- Packet Priority &VLAN = Packet Priority Enabled



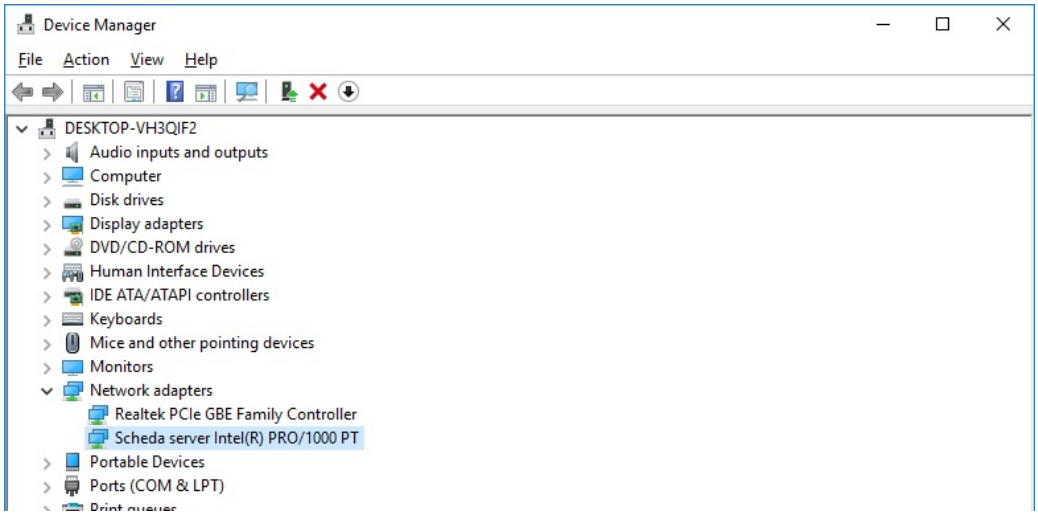
- Performance Options→Properties→Received Buffers = 2048



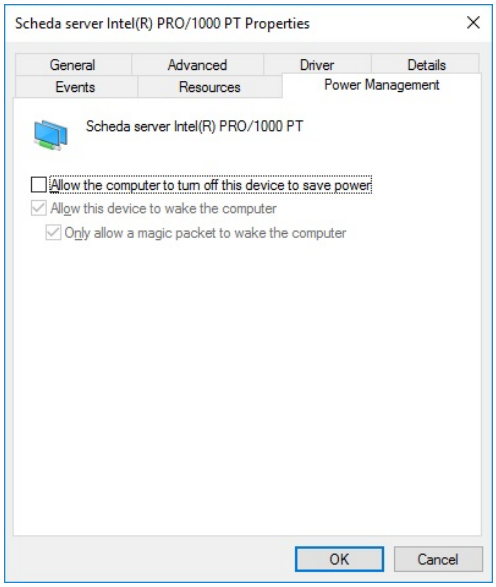
- Performance Options→Properties→Interrupt Moderation Rate = Extreme



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



11. Double click on the network card. Select the "Power Management" tab and unflag the box "Allow the computer to turn off the device to save power".



Go to *C: \ Program Files (x86) \ Teledyne DALSA \ Network Interface \ Bin* and double click on "*Cor-NetConfigApp.exe*" (Network Configuration Tool); Under NIC IP Configuration for the card connected to the LAN, they must NOT be flagged:

- *"Sapera Network Imaging Driver Enabled"*
- *"Included in the Discovery process"*

Note
Make sure the following settings are flagged for the NIC connected to the I-MAX:
• "Sapera Network Imaging Driver Enabled"
• "Included in the Discovery process"

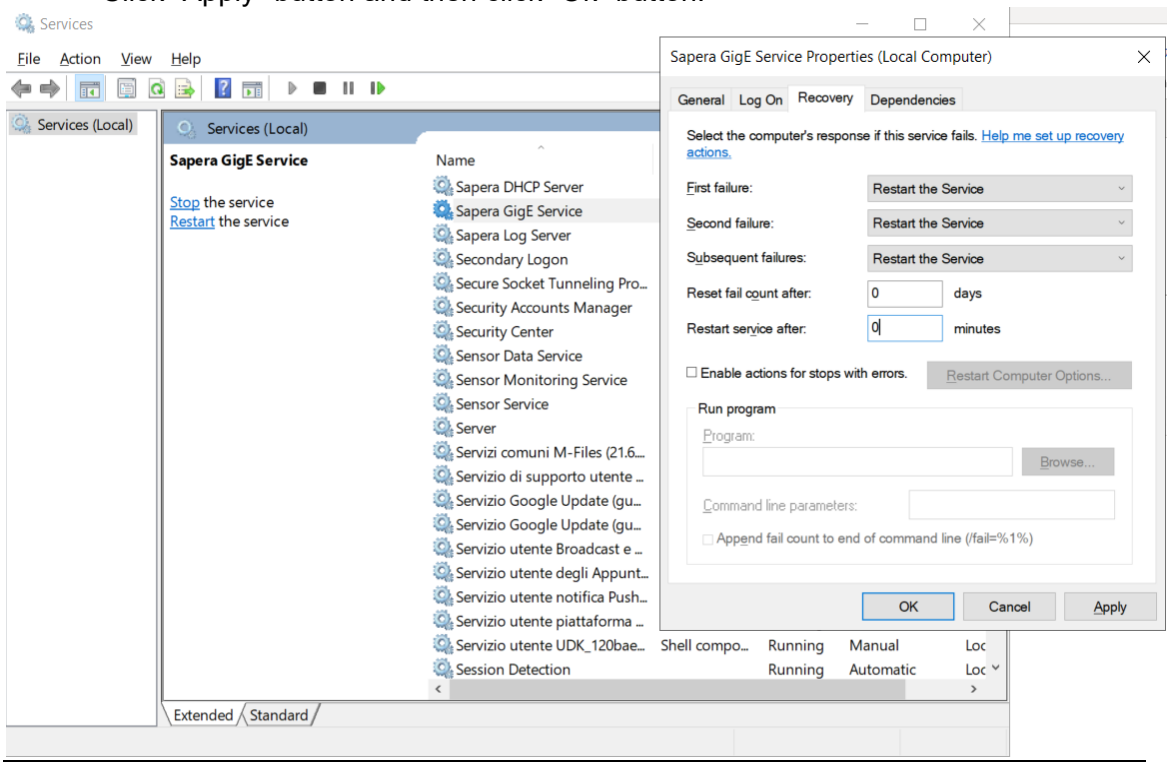
7.5.2. Sapera service settings

This option is used to prevent the Sapera GigE Service from being interrupted in the event of a degradation of the Ethernet transmission (1Gbps → 100Mbps).

1) From the Windows search icon type "Services"and open it
2) Look for "Sapera GigE Service" in the list and click twice.
3) Click the "Recovery" tab and set as follows:

- First failure: Restart the Service
- Second failure: Restart the Service
- Subsequent failures: Restart the Service
- Restart fail count at: 0 days
- Restart service after: 0 minutes

Click “Apply” button and then click “Ok” button.



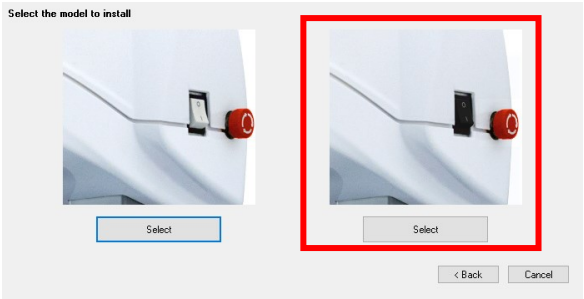
7.6. QuickVision software installation

Note
The windows user must have an administrator profile.
QuickVision requires that Windows 7, 8 or 10 is already installed on your computer and correctly configured.

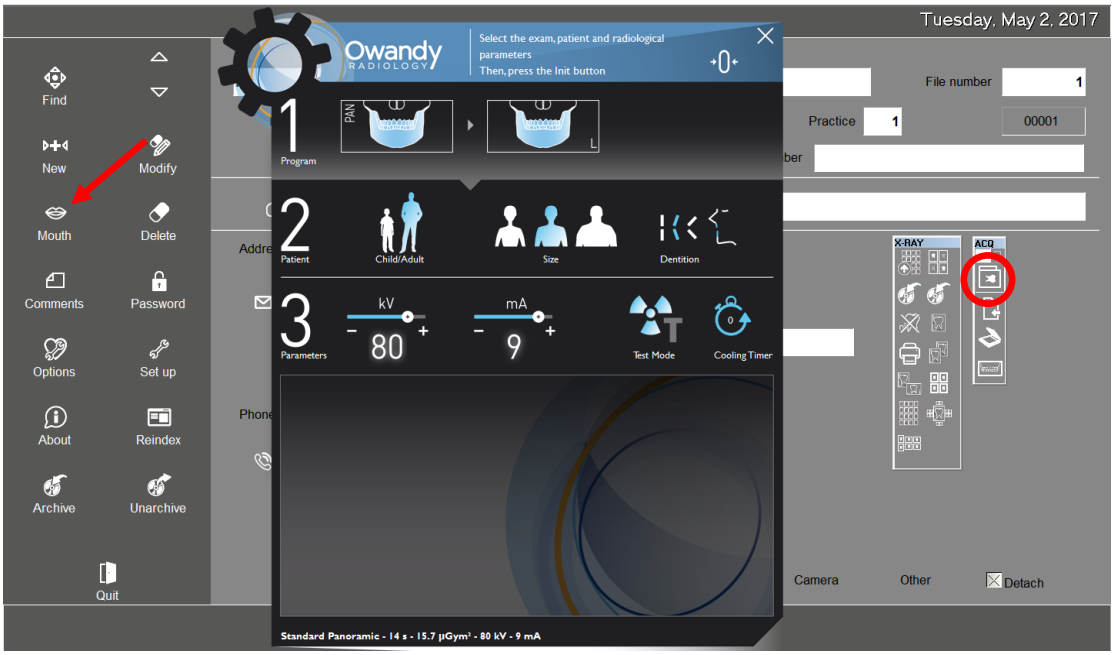
1. Close all the running applications.
2. Insert the USB pen drive or CD/DVD media.
   In case of USB pen drive, open the partition "SETUP" and double click on "Autorun.exe".
   In case of CD/DVD, the Installation wizard starts automatically, if this does not happen, double click on "Autorun.exe" at the root of the disc.
   In both cases, the window below opens:

3. Click on "QuickVision" icon. The installation program starts; go through the installation procedure.

4. At the end of QuickVision installation, click on "I-MAX" icon on the main QuickVision installation window then "*Black power switch*" to start drivers and utility software installation. Confirm until the installation is completed.

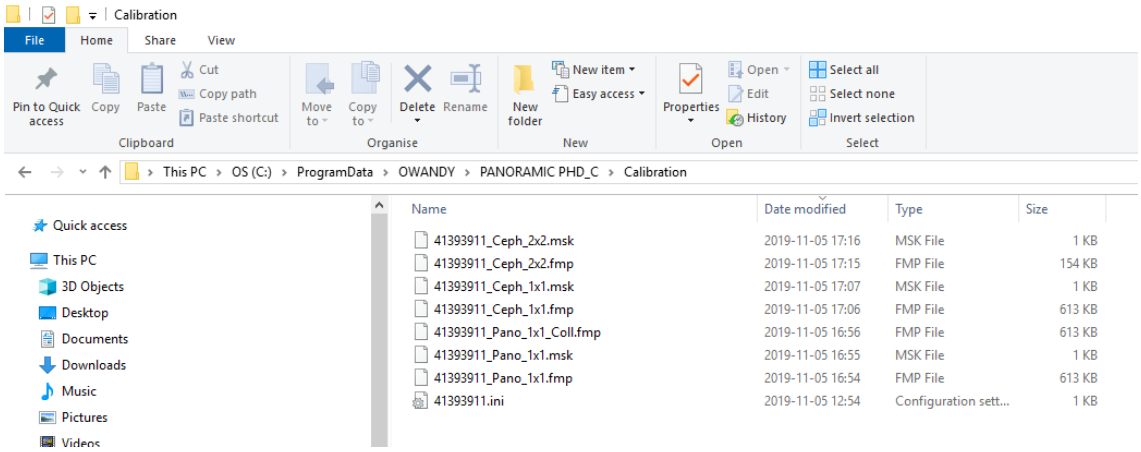


5. To check that the installation is correctly completed, open QuickVision, click on "Mouth" symbol (see arrow) and then on keyboard symbol (see circle) to open Virtual Keyboard of the unit.


Tuesday, May 2, 2017
Find
New
Modify
Mouth
Delete
Comments
Password
Options
Set up
About
Reindex
Archive
Unarchive
Quit
Owandy
RADIOLOGY
Select the exam, patient and radiological parameters
Then, press the Init button
1
Program
PAN
2
Patient
Child/Adult
Size
Dentition
3
Parameters
kV
80
mA
9
Test Mode
Cooling Timer
Standard Panoramic - 14 s - 15.7 µGym² - 80 kV - 9 mA
File number
1
Practice
1
00001
X-RAY
ACQ
Camera
Other
Detach

7.6.1. 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 or CD/DVD media containing the detector calibration files and open it.
In case of USB pen drive, 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).
In case of CD/DVD, copy all the files contained in the media support and paste them in the directory C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration (create the directory "Calibration" if not present).

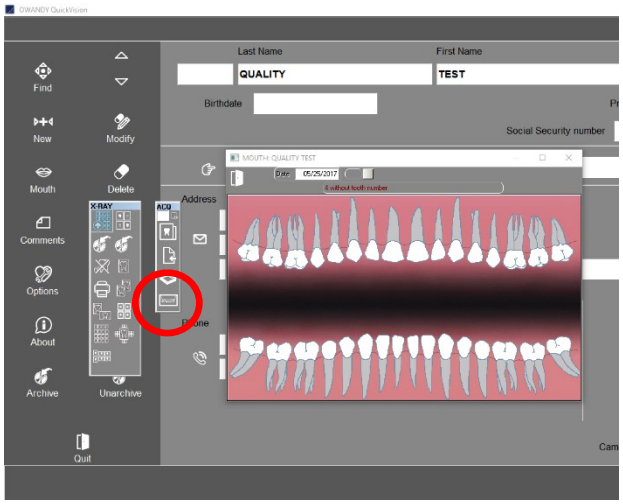


7.7. Verification of the PANORAMIC function

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 go to Exam Selection.
2. Open QuickVision software and open the patient "Quality Test". If not present, create a new patient (Last Name: "Quality"; First 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

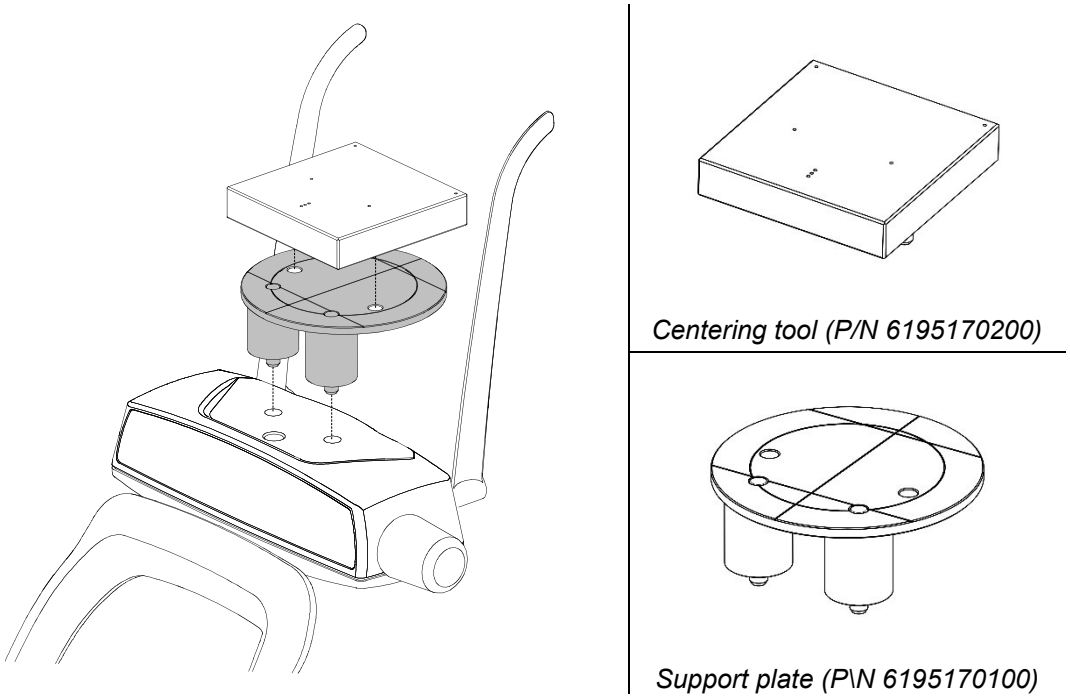
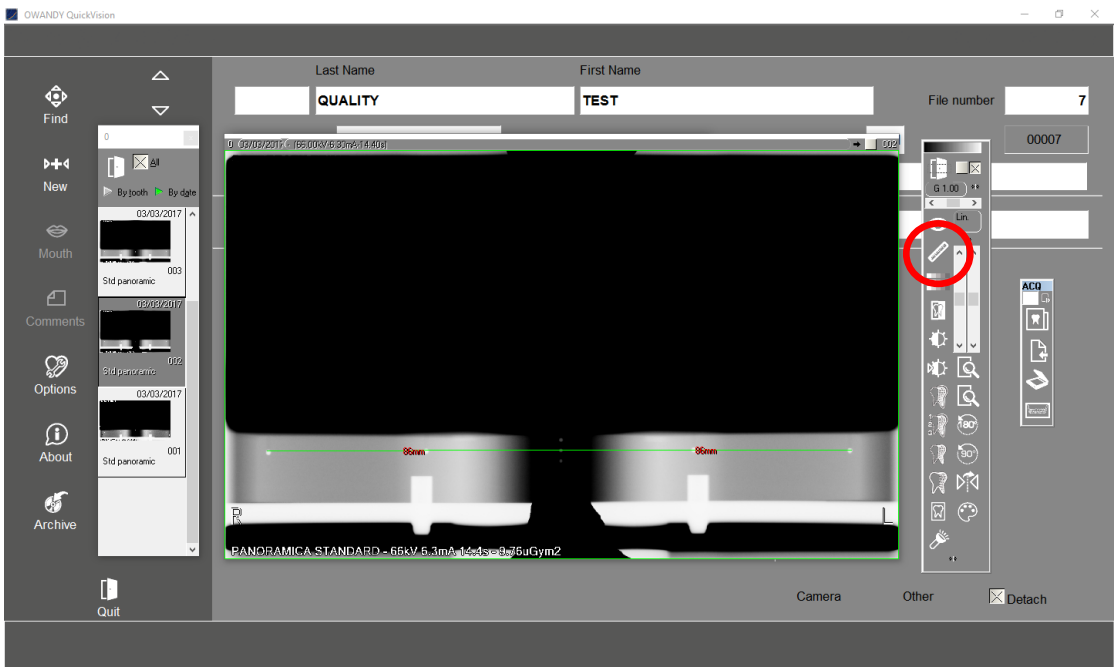


Figure 27: Support plate and centering tool positioning

6. On the virtual keyboard, select *Panoramic QC* – and make an exposure at 66kV, 6.3mA.

7. Select the "Ruler" icon and measure the distance between the two external spheres; this value must be 169mm ± 2mm.



8. If distance is outside the tolerance range, enter the service menu (see chapter 8) and adjust the Y axis offset (see paragraph 8.4) accordingly. Repeat the exposure.
9. Measure also the two half of the image in order to check symmetry. The difference has to be max. 1mm.
10. If distance is outside the tolerance range, 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".
    Repeat the exposure.

7.8. 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 (require 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 Phisician to verify periodically the unit

In order to make easier the exposure parameters measurements, I-MAX 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.

7.8.1. 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.

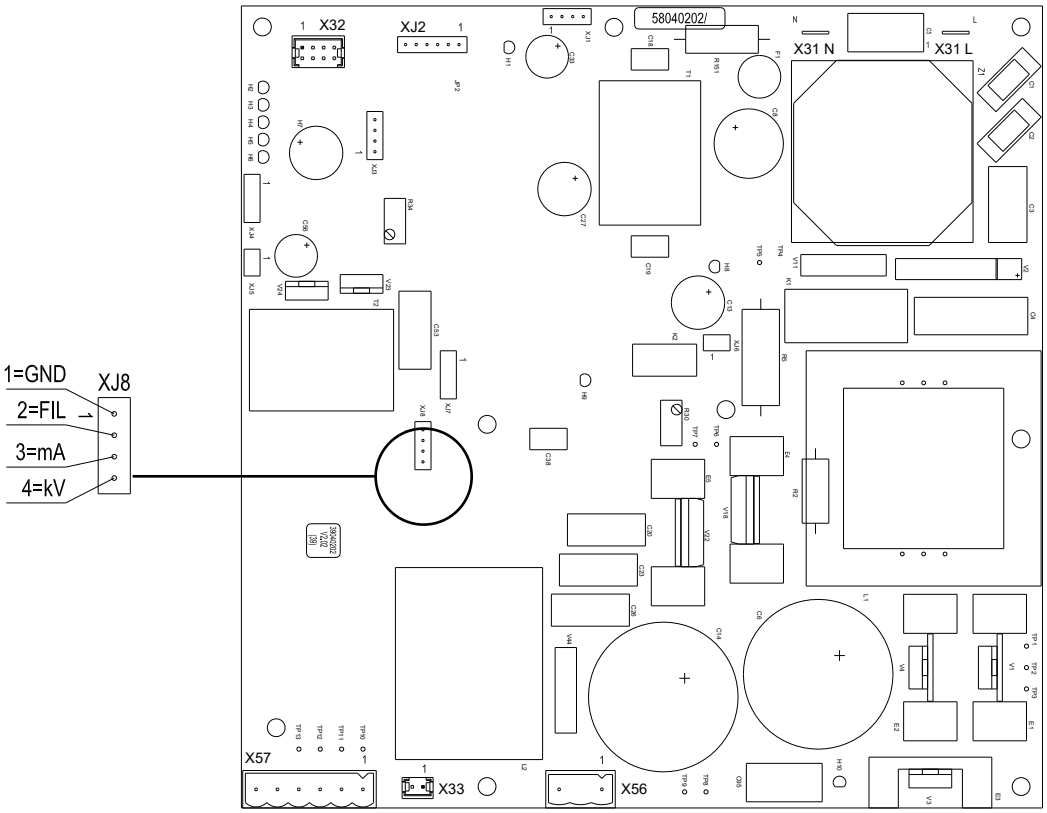
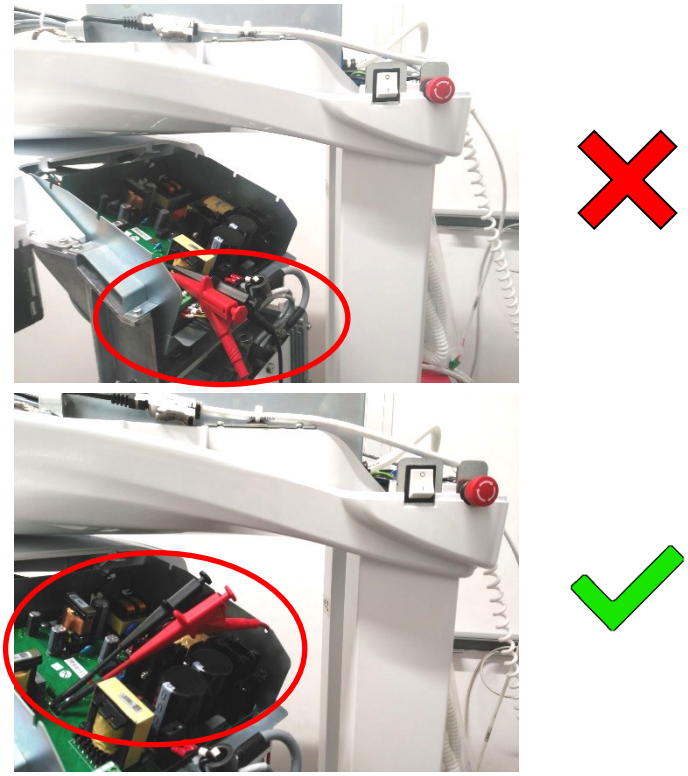


Figure 28

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

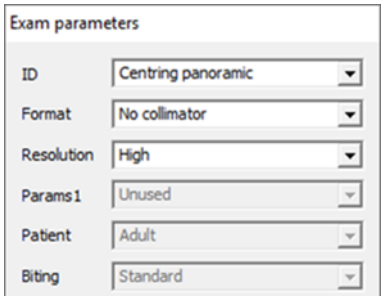
Warning
Beware that the probes do not interfere with columns during the rotation of the arm.



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

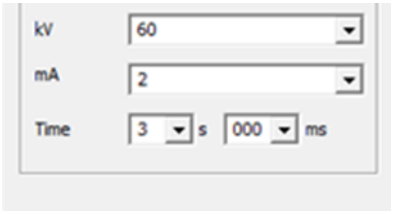
6. Open the PhD_C_Test software (located at C:\Program Files (x86)\OWANDY\ PANORAMIC PHD_C) and check that the unit is connected to the PC (the message "MCU is connected" is displayed in the bottom left corner of the program window).

7. From the "Exam parameters" panel select the ID as "Centring Panoramic". Select format as "No collimator".



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

8. 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.

9. 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 10.
10. Take a second exposure setting the following parameters: 70kV, 6mA, 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	0.59 to 0.73 V	2.85 to 3.15 s
70	6	3	3.22 to 3.78 V	1.82 to 2.14 V	2.85 to 3.15 s

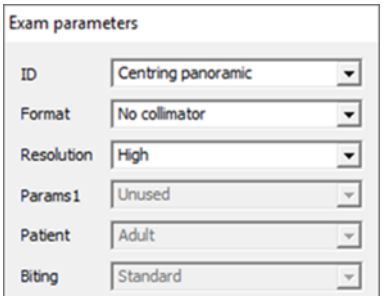
11. In case the test fails (results do not match the indicated values), perform the following actions according to which parameter is out of the acceptance range:

- kV out of range: follow the instructions described at paragraph 9.2.6.2
- mA out of range: follow the instructions described at paragraph 9.2.6.3
- time out of range: replace the generator board.

7.8.2. Verification of Exposure parameters with NON invasive method

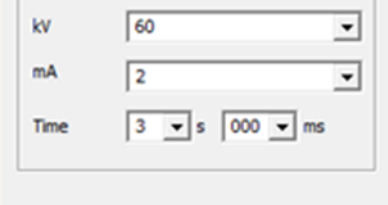
The exposure parameters (kV, time and dose) can also be verified using the so-called "non-invasive method".
The exposure parameters can be checked with a non-invasive instrument by performing the following procedure:

1. Place the probe of the dosimeter on the sensor plastic cover.
2. Open the PhD_Test software (located at C:\Program Files (x86)\OWANDY\OSP – PHD PANORAMIC) 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 panoramic".



Note
The "Centring panoramic" 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, 3mA, 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.

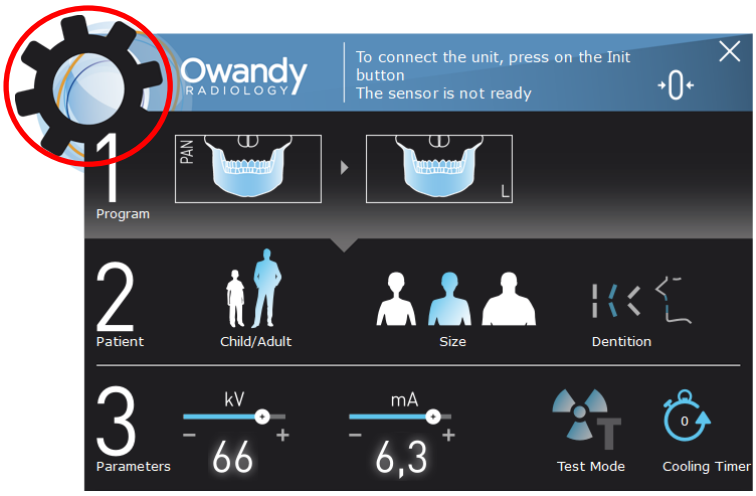
6. Take a second exposure setting the following parameters: 70kV, 6mA, 3s and verify that the measured values are in the acceptance limits listed in the following table.

kV	mA	t (s)	kV acceptance limits	Time acceptance limits
60	3	3	55.2 to 64.8 kV	2.85 to 3.15 s
70	6	3	64.4 to 75.6 kV	2.85 to 3.15 s

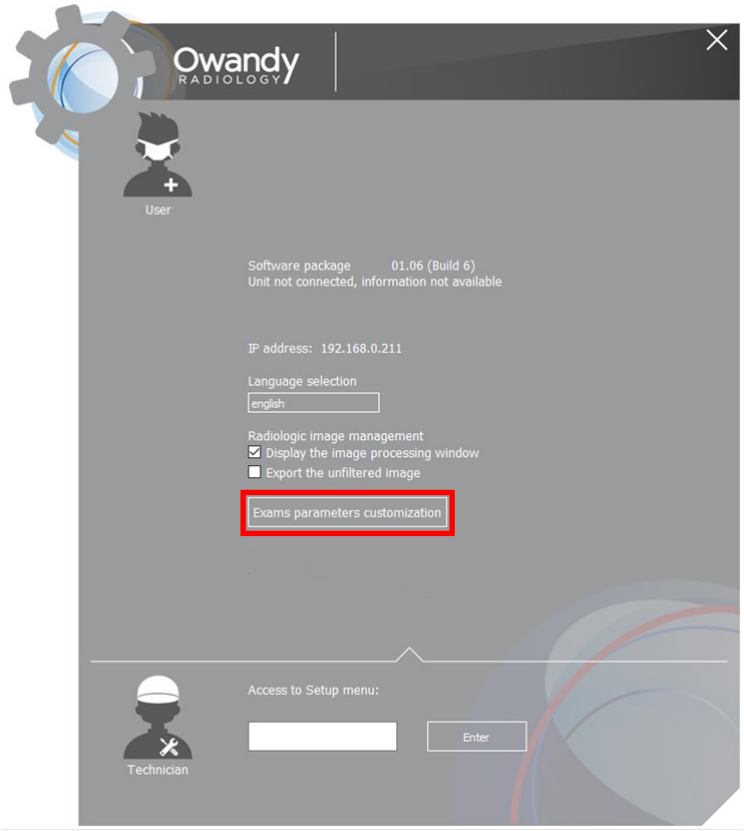
7. In case the test fails (result do not match the indicated values), proceed with the following actions:
   - Check the probe position and repeat the test
   - If the values are still out of range, perform the test using the invasive method as described in paragraph 7.8.1.

7.9. 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).

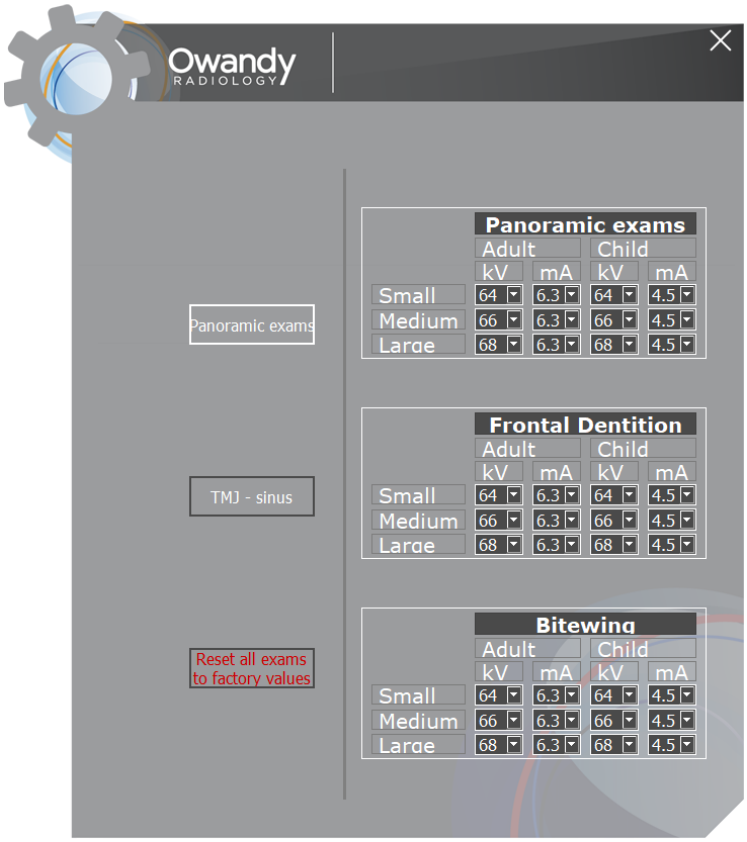


The following window will be displayed:



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".

7.9.1. Table of pre-set anatomic parameters

Exposure values in PAN mode				
	Adult Patient (14.4 seconds)		Child Patient (14.4 seconds)	
	kV	mA	kV	mA
Small	64	6.3	64	5
Medium	66	6.3	66	5
Large	68	6.3	68	5

Exposure values in Bitewing mode				
	Adult Patient (14.4 seconds)		Child Patient (14.4 seconds)	
	kV	mA	kV	mA
Small	64	6.3	64	5
Medium	66	6.3	66	5
Large	68	6.3	68	5

Exposure values in SINUS mode				
	Adult Patient (9.4 seconds)		Child Patient (9.4 seconds)	
	kV	mA	kV	mA
Small	64	6.3	64	5
Medium	66	6.3	66	5
Large	68	6.3	68	5

Exposure values in TMJ mode				
	Adult Patient (9,7 seconds)		Child Patient (9,7 seconds)	
	kV	mA	kV	mA
Small	64	6.3	64	5
Medium	66	6.3	66	5
Large	68	6.3	68	5

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.

7.10. 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 unit
- Setup Parameter Table containing the factory configuration
- Detector calibration files / Software installation CDs or USB pen drive media.

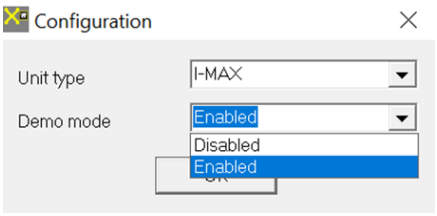
7.11. Exhibition mode setup

The I-MAX 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.

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



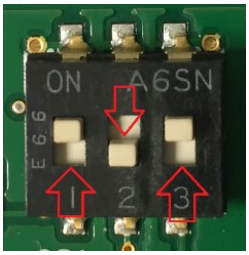
   Confirm with "OK".
3. Start QuickVision program and open the G.U.I. The user interface (G.U.I.) will work normally without the unit connected.

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.

7.11.2. 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 4.2.2.1)



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

7.11.2.1. Single Panoramic exam simulation

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.

7.11.2.2. 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.
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 and a column movement.
6. In order to stop the movements, switch OFF the unit

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

Note
Single exam simulation and automatic continuous movements are only available for single sensor I-MAX.

7.11.3. 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.

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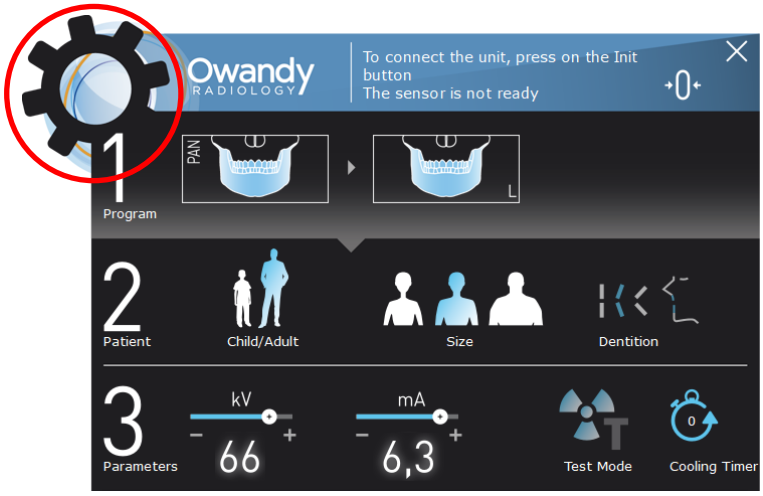
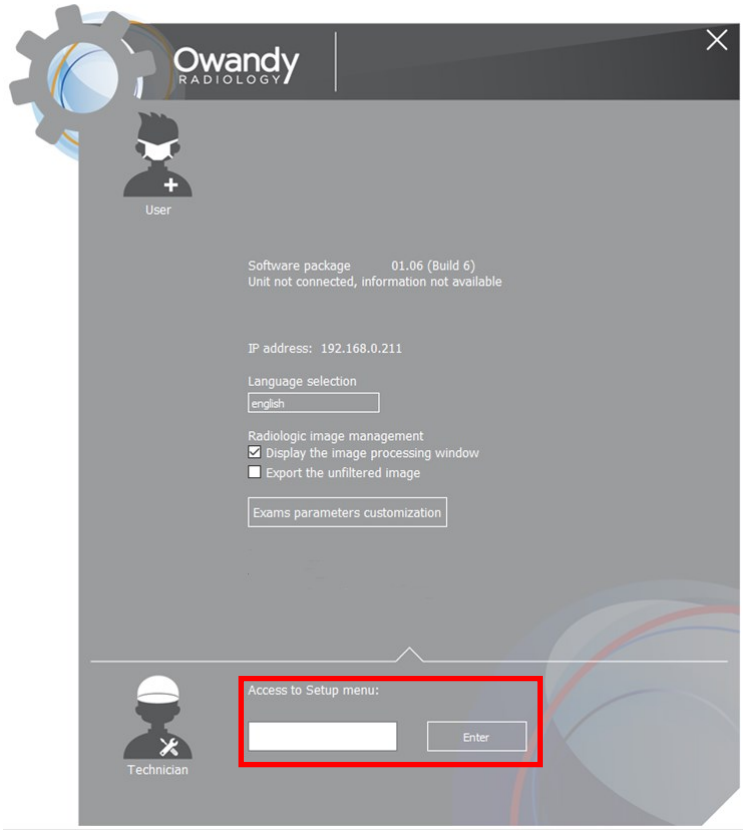
8. SERVICE PROGRAM DESCRIPTIONS

In order to access Service programs, from Main Menu select the symbol "GEAR" (configuration).



The first page show the SW versions present in the unit. This is useful in case it is required to know the actual versions. This page doesn't require any password.

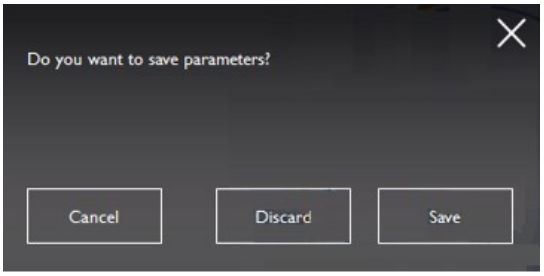


In order to enter in Configuration menu, type the password "TechAccess" in "Access to Setup menu" filed and press Enter.

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

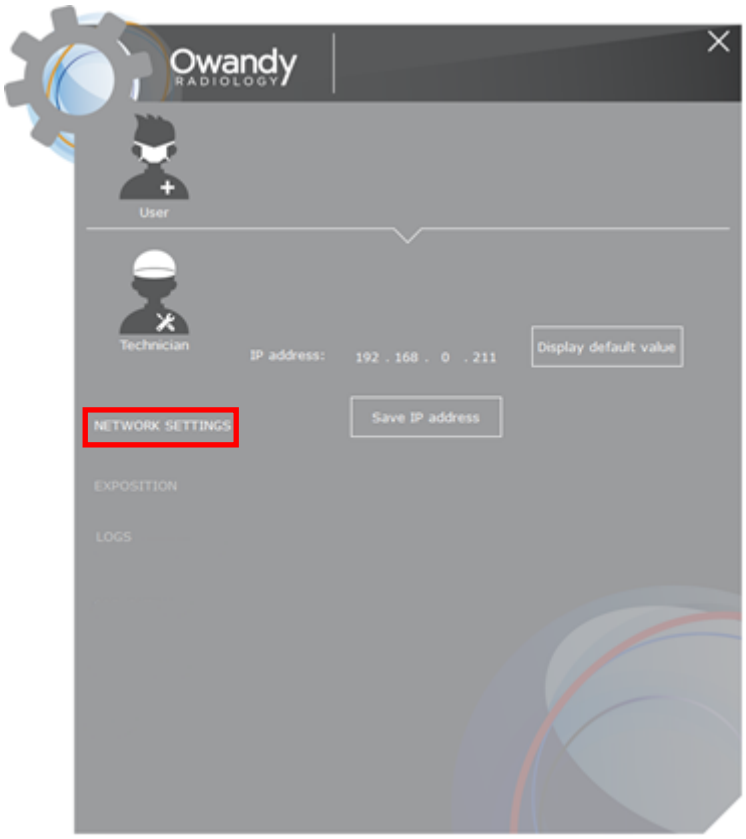
- ***Network Setting:*** allows to set the IP address of the unit (see paragraph 8.1)
- ***Exposition:*** allows to disable the x-ray emission permanently (see paragraph 8.2)
- ***Logs:*** this page displays the exam counters (see paragraph 8.3)

Each time a parameter is modified, or a different sub menu is selected, 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 (see paragraph 7.5).

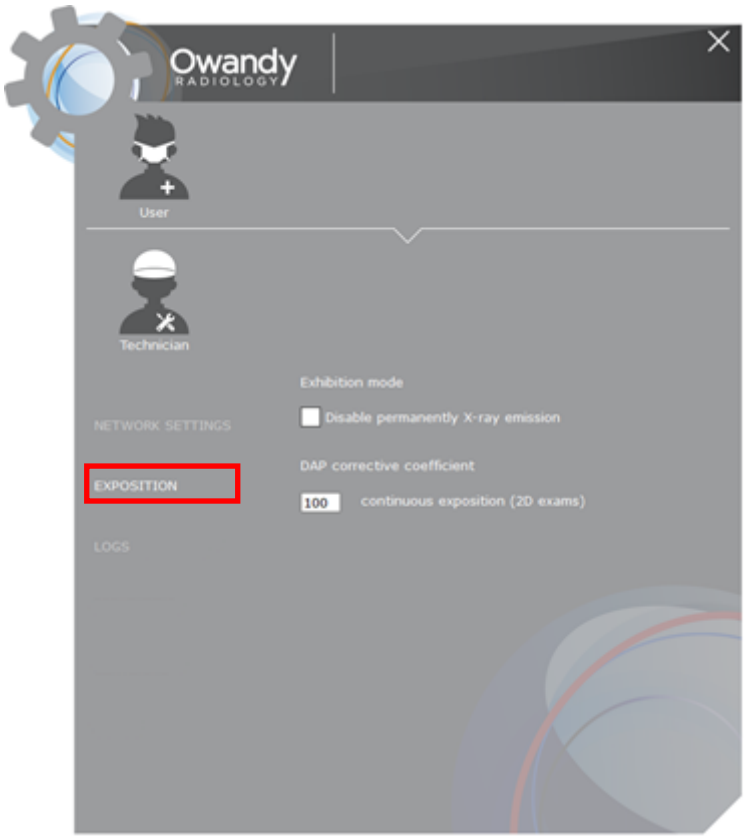


If necessary, change the IP Address according with the one present on the PC (same IP, but last 3 digits different; same Subnet mask).

8.2. Exposition

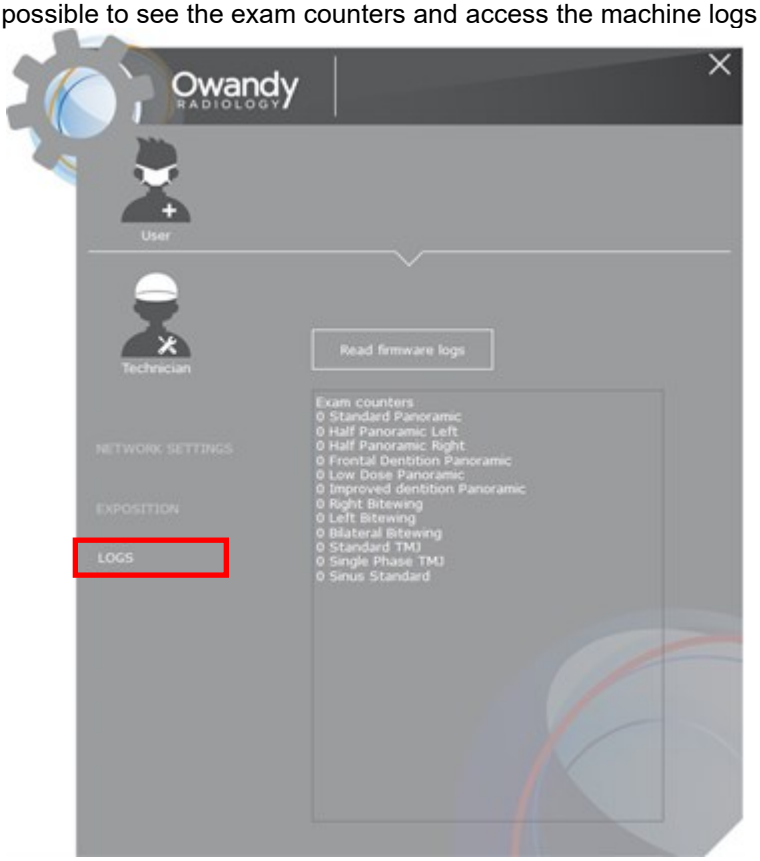
This function allows:

- 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



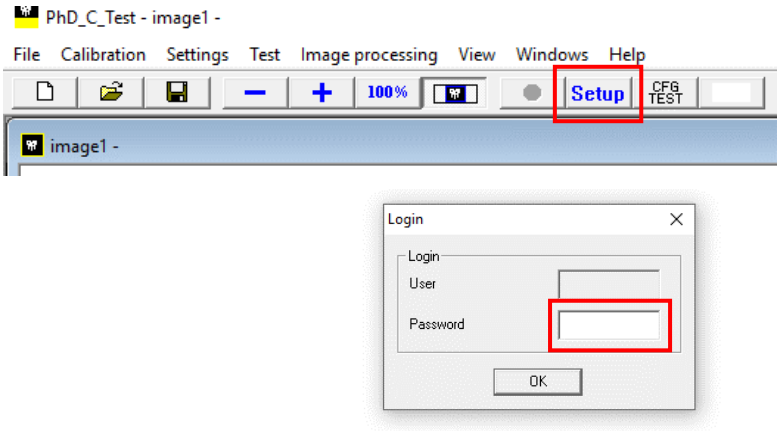
In order to keep the unit logs, refer to paragraph 11.2.1.

8.4. Machine configuration and setup

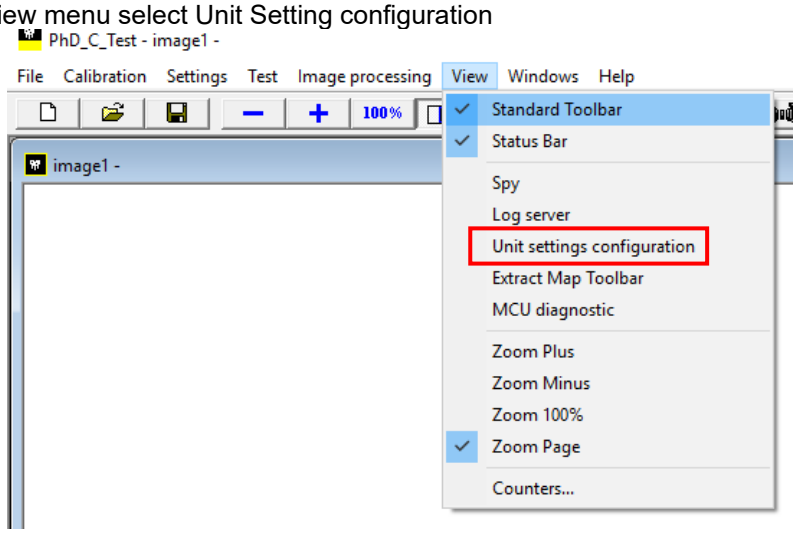
In addition to the Service Programs available in the Graphical User interface, other Service Programs and the machine configuration can be be done by running the **"PhD_C_Test"** program located in the directory C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C.

To access the machine configuration:

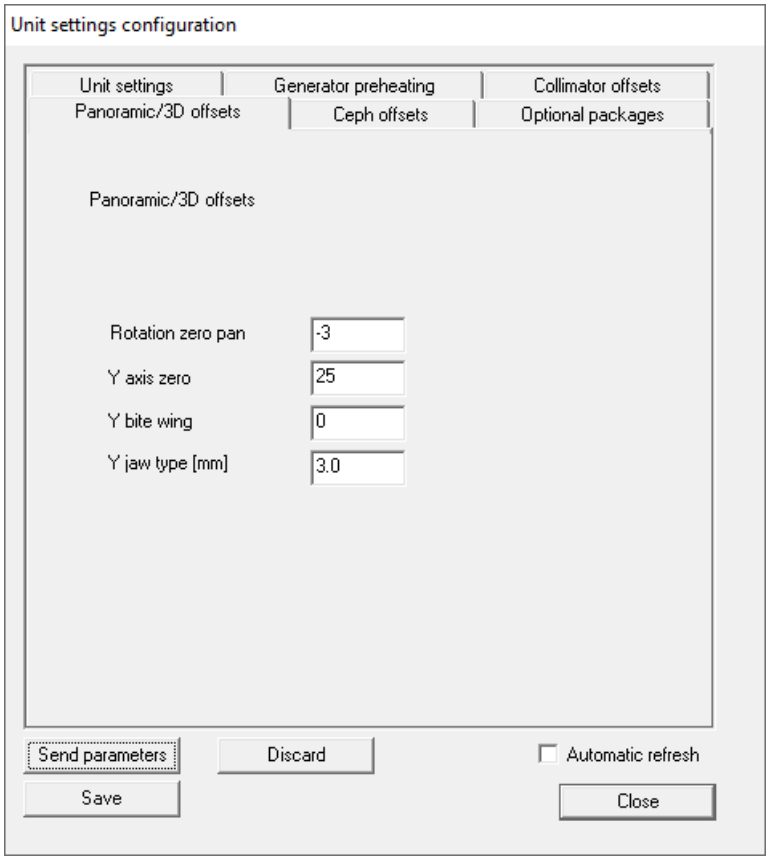
- Run the software "PhD_C_Test"
- Click on the SET-UP button and in the windows that will open type the password **PhdAccess**.

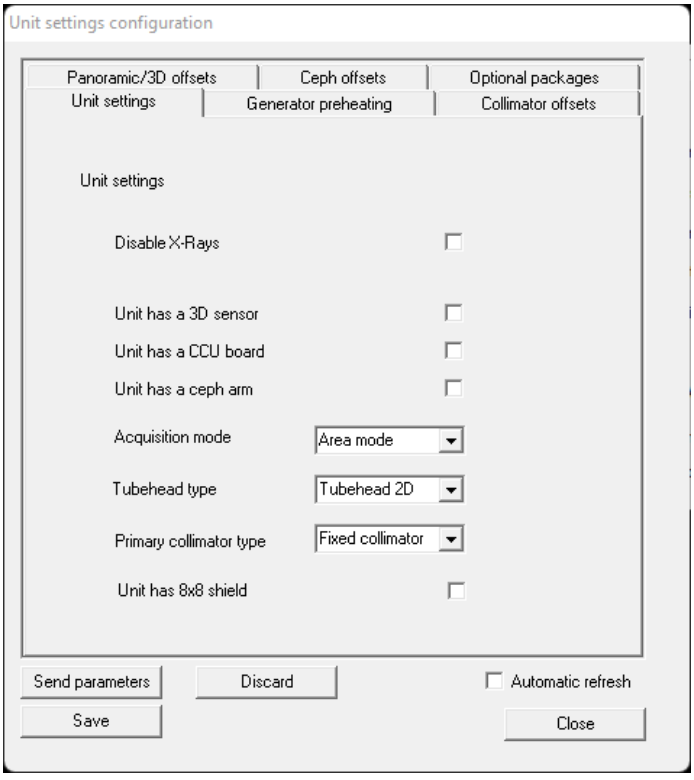


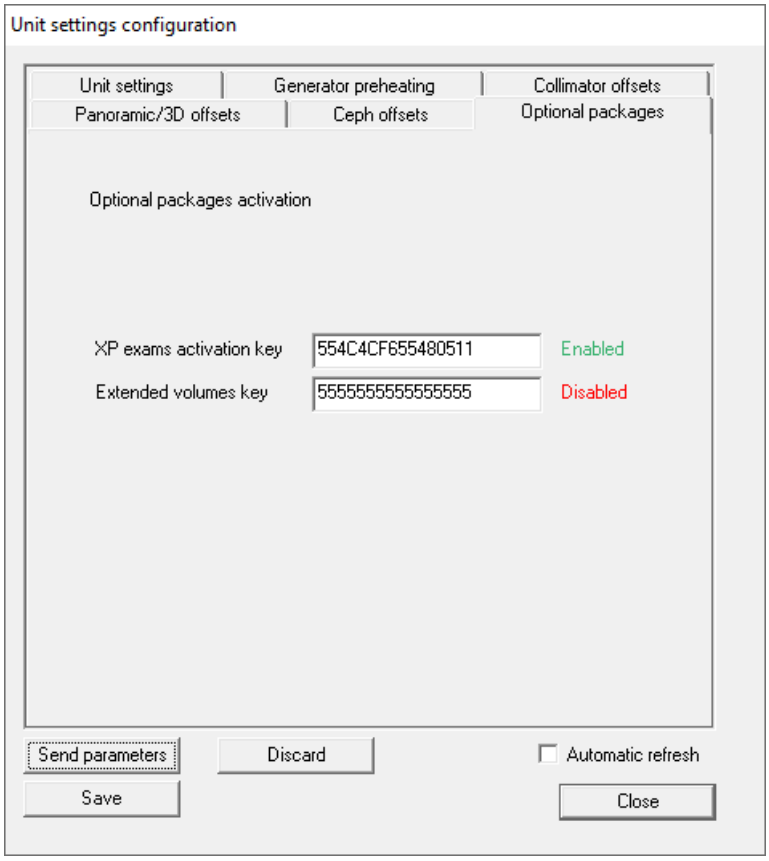
- In the View menu select Unit Setting configuration

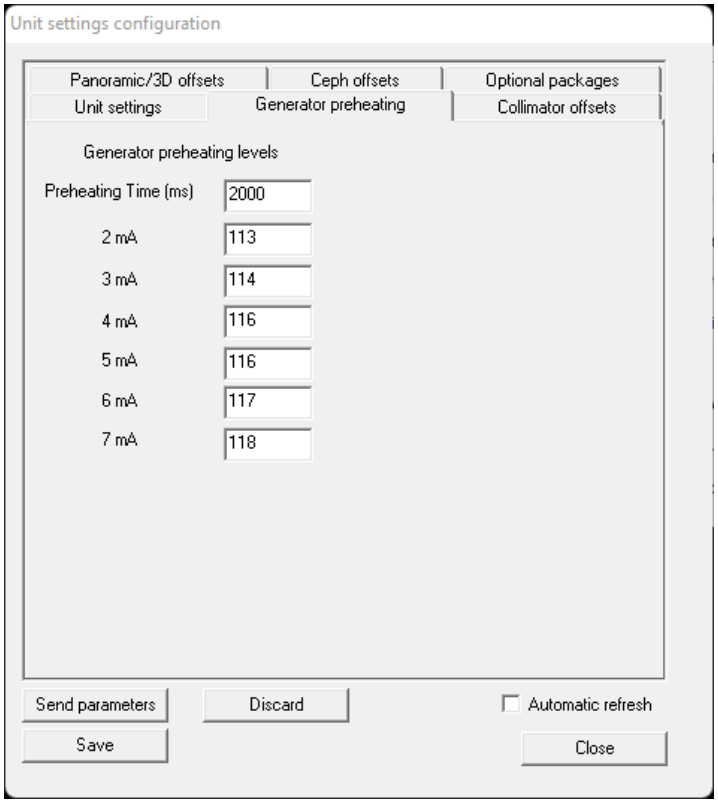


- The following window will open; there are several different tabs for different system settings


Unit settings configuration
Unit settings
Generator preheating
Collimator offsets
Panoramic/3D offsets
Ceph offsets
Optional packages
Panoramic/3D offsets
Rotation zero pan
-3
Y axis zero
25
Y bite wing
0
Y jaw type [mm]
3.0
Send parameters
Discard
Automatic refresh
Save
Close


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 2D
Primary collimator type
Fixed collimator
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
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)
2000
2 mA
113
3 mA
114
4 mA
116
5 mA
116
6 mA
117
7 mA
118
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 Radiology 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	Stand-by 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, X36, X15, X10, 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= error on CANbus Steady OFF	Can Bus communication	
H7	Red	Flashing / lit weakly	Steady ON= error on CANbus Steady OFF	Can Bus communication	
H8 **H9** **H10**	Green	OFF		The three LEDs indicates 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 9.2.6.9)

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	Stand-by status	Failure status	Main function	Corrective action
H1	Green	ON	OFF = Failure	+5Vdc	See Error E750 (paragraph 9.2.6.1)
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 9.2.6.9)
H3	Green	Flashing / lit weakly	Steady ON= error on CAN-bus Steady OFF	CANbus communication	
H4	Green	Flashing / lit weakly	Steady ON= error on CAN-bus Steady OFF	CANbus communication	
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 9.2.6.2, 9.2.6.3, 9.2.6.4, 9.2.6.7, 9.2.6.9)
H6	Yellow	OFF	ON during stand-by OFF during X-ray	X-ray emission active	
H8	Green	ON	OFF	Auxiliary power supply	See Error E750 (paragraph 9.2.6.1)
H9	Red	OFF	ON	X-ray exposure too long (backup timer intervention)	See Error E755 (paragraph 9.2.6.5)
H10	Green	ON	OFF	Main power supply	See Error E750 (paragraph 9.2.6.1)

9.2. Displayed messages

The I-MAX 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
000 / 001	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**
Hardware key board (U.I.C.)		
Code	**Error description**	**Reference paragraph**
270 / 271	Hardware key fault	**9.2.3.4**
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**
Generator Board		
Code	**Error description**	**Reference paragraph**
750	Generator board initialization error	**9.2.6.1**
751	Alarm "overvoltage kV"	**9.2.6.2**
753	Alarm "overload anodic current"	**9.2.6.3**
754	Alarm "filament not OK"	**9.2.6.4**
755	Alarm "backup timer"	**9.2.6.5**
757	Alarm "Brown OUT"	**9.2.6.6**
758	Alarm "NO X-ray"	**9.2.6.7**
759	Alarm "unexpected emission"	**9.2.6.8**
760	Alarm "NO RX button command"	**9.2.6.9**
761	Alarm "NO X-ray emission"	**9.2.6.7**
762	Bad unit status: emission flag detected unexpectedly	**9.2.6.10**
763	kV analog feedback out of range	**9.2.6.11**

Generator Board		
Code	**Error description**	**Reference paragraph**
764	mA analog feedback out of range	**9.2.6.11**
765	Filament analog feedback out of range	**9.2.6.11**
766	Generator board reset due to a brown out	**9.2.6.11**
767	Generator board reset due to low voltage detection	**9.2.6.11**
768	Generator board reset due to a watchdog timeout	**9.2.6.11**
769	Generator board reset due to a stack overflow	**9.2.6.11**
770	Mismatch between generator board (A2) and MCU board (A1) types (2D / 3D)	**9.2.6.12**

Keyboard		
Code	**Error description**	**Reference paragraph**
850	One or more keycodes are pressed	**9.2.7.1**
852	Button >0< pressed during movements	**9.2.7.2**

PC software user interface (GUI)		
Code	**Error description**	**Reference paragraph**
1200	DLL communication error	**9.2.8.1**
1201	Setup menu: write data EEPROM failure	**9.2.8.2**
1202	Unespected value detected by the software	**9.2.8.3**
1203	Software allocation failure	**9.2.8.2**
1204	Exposure parameters failure	**9.2.8.3**
1205	Image buffer allocation failure	**9.2.8.3**

PC driver interface (OSP)		
Code	**Error description**	**Reference paragraph**
1401	Sensor connection lost during exam	**9.2.9.1**
1402	Sensor communication failure	**9.2.9.2**
1403	Software watchdog error	**9.2.9.3**
1404	Sensor does not detect X-rays during exam	**9.2.9.4**
1405	Sensor frame lost during exam	**9.2.9.1**
1406	Error in sensor in frame rate	**9.2.9.1**

9.2.1. Errors with code E000 and E001

All these are errors related to the MCU board and its internal peripheral.
Power OFF the unit and, after 1 minute delay, power it ON again; if the error is displayed again, replace the MCU board.

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.

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 – see paragraph 14.1) 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 4.2.2.1).
   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 and the unit top cover.
   h. Switch ON the unit and restore the factory setting offsets reported in the equipment parameters table (see paragraph 14.1) following the procedures present on chapter 8.

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.

***Technical Service additional information required**: MCU SD card log (see paragraph 11.2.1.3).*

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 5804040700/XX. If it does not match, replace the MCU board with a correct one (see paragraph 11.3.2).
2. Contact Owandy Radiology 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 11.2.1.3).*

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 (motors and zero position sensors).

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)*

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

These errors are shown when the firmware of the I-MAX does not sense the presence of the U.I.C. (Unique Identification Code).
The hardware key board (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 – see paragraph 14.1).

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 the examination procedure

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 signal lost during exam

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

With the unit powered OFF, proceed as follow:

1. Perform the troubleshooting tests listed on Errors E1401 and E1402 (see paragraphs 9.2.9.1 and 0).

***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/VSP is constantly active, if it closes (e.g. OSP/VSP 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).

9.2.5. Error with code from E500 to E505

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

check the ethernet connection and the network card settings (see paragraph 7.5).

Power ON the unit and wait the connection to the PC-GUI. Verify the compatibility between MCU firmware and OSP/VSP versions: update/downgrade the FW-SW to a released/compatible configuration.

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

Technical Service additional information required:
Software logs
MCU SD card log (see paragraph 11.2.1).

9.2.6. Errors with code from E750 to E770

Warning
Those errors are related to the X-ray generator, so they can be safety related.
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).

9.2.6.1. E750: Generator board initialization failure

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).

9.2.6.2. 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 11.3.5).
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.

9.2.6.3. 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 11.3.5) 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.

9.2.6.4. 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 11.3.5).
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 14.1) (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.

9.2.6.5. 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 Radiology Technical Service **and not use or switch ON the system anymore.**

9.2.6.6. 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 Radiology Technical Service.

9.2.6.7. 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 others 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 14.1) (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 paragraph 11.3.5).
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).

9.2.6.8. 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 11.3.5).
   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 Radiology Technical Service.

9.2.6.9. 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.

9.2.6.10. 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 Radiology Technical Service.

9.2.6.11. 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 Radiology Technical Service.

9.2.6.12. 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: 5807406100/XX
- MCU board: 5804040700/YY

Replace the wrong board.

If the boards have the correct p/n, check the settings in the "unit setting" window (see paragraph 8.4).

9.2.7. Errors with code E850 and E852

These errors indicate a keyboard fault.

9.2.7.1. E850: More than one button 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)
      - If the error is no more displayed, verify integrity of the cable X12: replace the cable and verify if the error is still present
   b. If the above tests are OK, replace the keyboard membrane.

9.2.7.2. 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 9.2.7.1).

9.2.8. 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.

9.2.8.1. E1200: DLL communication error

This message could be raised by:

- The software detects a difference between SW exam parameters and unit exam parameters.
    - In this case the user has to press >0< button or reboot the unit if it was in "ready to shoot" status
- Internal SW error (bug, library call)

If the error is displayed, contact Technical Service.

Technical Service additional information required:

- Software logs (see paragraph 11.2.1).

9.2.8.2. 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 Radiology 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).*

9.2.8.3. 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 Radiology Technical Service.

Technical Service additional information required:

- *Software logs*

9.2.9. Errors from 1401 to 1406

9.2.9.1. E1401: Sensor connection lost during the exam / E1405: Sensor frame lost during exam/ E1406: Error in sensor frame rate

This message is displayed if the unit drivers on PC detects less frame than expected during the exam acquisitions.
The error is related to a bad transmission of the image from the unit sensor to the PC. The cause can be a bad ethernet connection or a fault in the sensor itself.

1. Check the Ethernet connections (cables, junctions, PC network board) and PC network board settings (see paragraph 7.5).
   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 or Intel Pro 1000 single or dual port or Intel I210 or Intel I225.
- The Ethernet cables must be the ones supplied with the unit or CAT 6 cables (or higher category)
- The unit must be directly connected to the PC, no Ethernet hub/switch are allowed between the sensor and the PC.

2. Check the cables from the detector holder to the ethernet switch on PAN station

3. Verify if the tubehead connector X56 is well inserted and then perform the tests of the Error E761 (see paragraph 9.2.6.7).

Contact Technical Service providing the following additional information:

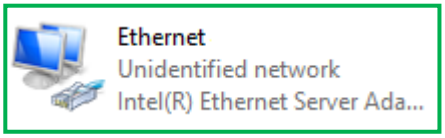
- Software logs
- Last RAW files folder stored (see paragraph 11.2.2)

9.2.9.2. E1402: sensor configuration failure

This error is related to a communication problem between the image sensor and the PC or to a problem of the boards 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).

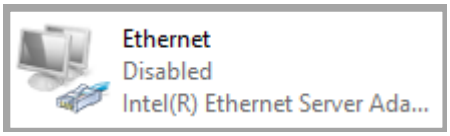
1. IF the Ethernet connection is steady ACTIVE:



   a. Perform the checks described for E1401 (see paragraph 9.2.9.1).

   b. Activate the sensor logs 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:

   Check the Ethernet connections (cables, junctions, PC network board): replace the faulty components (see Error E1401 – paragraph 9.2.9.1).

Contact Technical Service providing the following additional information:

- Software logs
- Sensor logs (see paragraph 11.2.1)
- Last RAW files folder stored (see paragraph 11.2.2)

9.2.9.3. 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.
Refer to *paragraph 8.4* to check machine configuration.

Refer to Error E1402 (see *paragraph 9.2.9.2*).

Technical Service additional information required:
- *Software logs*
- *Sensor logs*

9.2.9.4. 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.

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).

Contact Technical Service providing the following additional information:
- *Software logs (see paragraph 11.2.1.1)*
- *Last RAW files folder stored (see paragraph 11.2.2)*

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 (only in OSP/VSP ≤ 1.04.05 and QuickVision installer ≤ 5.03C).

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.

9.3.2. "Sensor not ready"

Refer to Error E370 (paragraph 9.2.4.3).

9.4. System Anomalies

9.4.1. White panoramic image

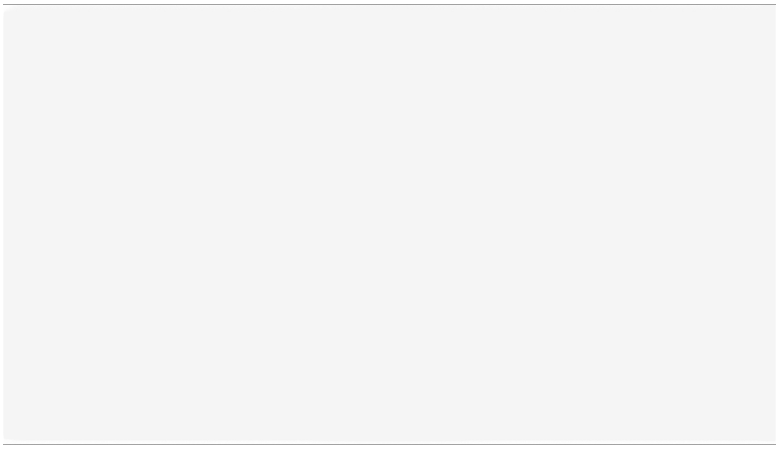
	Panoramic white image

Figure 29

1. Verify the presence of the correct calibration files (8 files named as the SN of the 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 10.3).

2. Perform tests of Error E760 (paragraph 9.2.6.9).

3. Verify the integrity of tubehead X57 connector, pin 5 and 6.

9.4.2. Panoramic acquisition with less frames

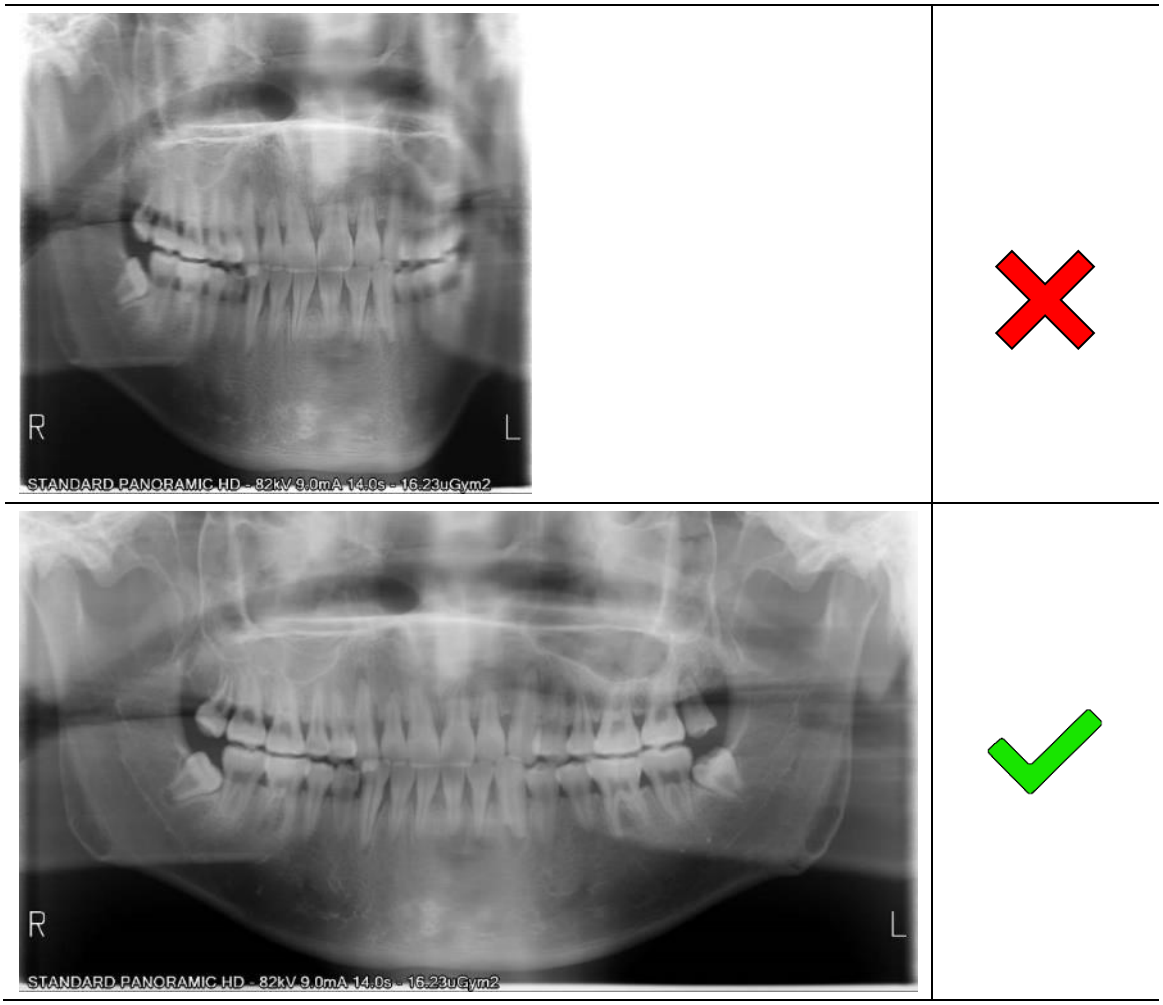


Figure 30

1. The panoramic acquisition above (X) may be indicate an acquisition with less frame than expected. In this case verify the Sensor Ethernet connections (cables, junctions, PC network board). Refer to Error E1401 point 1 (see paragraph 9.2.9.1).

2. If the error is still present, send the acquired RAW file (see paragraph 11.2.2) to Owandy Radiology Technical Service.

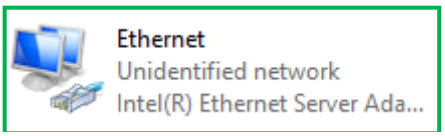
9.4.3. Asymmetries on the panoramic images

1. Check the orthogonality of the unit lasers (se User Manual - paragraph 7.3).

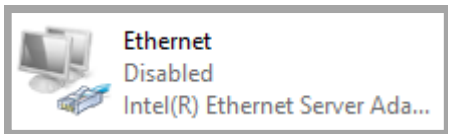
2. Perform the verification of the panoramic function (see paragraph 7.7).

9.4.4. Unit/MCU connection problems

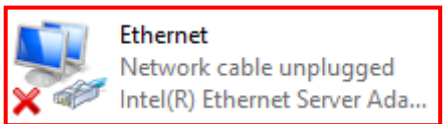
1. Verify if MCU DIP switches are set in normal mode (see paragraph 4.2.2.1).
2. Check the unit power supply (see paragraphs 6.1 and 11.2.3).
3. Verify the unit Ethernet connection status (Control Panel→Network and Internet→Network Connections):
   - **a.** IF the Ethernet connection is steady ACTIVE:

     Verify the correct network interface board configuration (see paragraph 7.5).
   - **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 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 (setting the right IP address on the network interfaces see paragraph – see paragraph 7.5).
     If the problem is solved, it can be related to the network interface board.

9.4.5. The columns do not move

1. Verify that the safety red switch is released in the top side of the unit.
2. Verify the main power supply and columns driver board connection (see paragraph 6.1 and 7.2).
3. Verify the column fuse (see paragraph 11.3.1).
4. Verify that the buttons work:
   Turn OFF the I-MAX. 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 blinking on the keyboard, it means that the button has not been recognized as pressed by the MCU board
     (see paragraph 9.2.7.1)

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

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 authorised 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

Warning
If the operator detects irregularities or failure, he must immediately call Owandy Radiology Technical Service.

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

The periodic maintenance performed by the Owandy Radiology 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 accessible conductive parts	Practical inspection
Annually	Condition of the internal and external cables: wear and tear and fastenings	Visual and practical inspection
Annually	The tightening of the primary bolts and screws such as the wall fastening systems and the moving mechanisms	Visual and practical inspection
Annually	Correct equipment centering	See paragraph 7.7
Annually	Check technical factors	See paragraphs 7.8.1 and 7.8.2
Annually	Tensioning of R and Y motor belts and the alignment between shaft and pulley	Refer to paragraph 10.1.1 and 10.1.2

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.

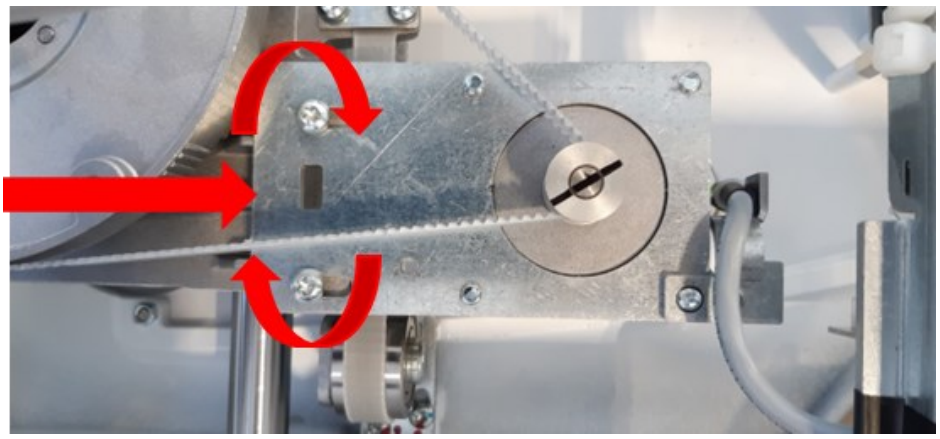
Note
Interventions carried out by the Service Engineer must be noted in the Maintenance Record page at the end of the User Manual, with a short description of the actions done.

10.1.1. Tensioning of R and Y motor belt

It is recommended to verify annually the proper tensioning of the R and Y prober belts.
Please refer to the instructions listed below.

R motor belts

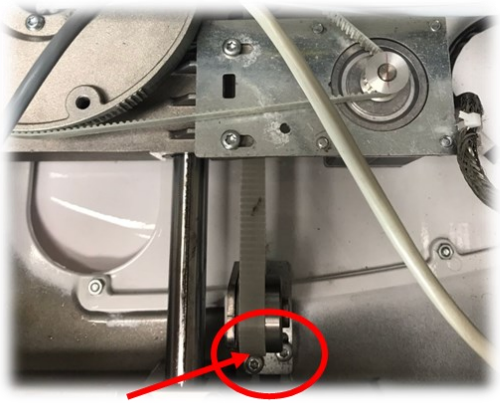
1. If the belts should be loose, tighten them more by unscrewing slightly the screw, push the motor support plate in the direction indicated by the red arrow and then tighten the screws as shown below.

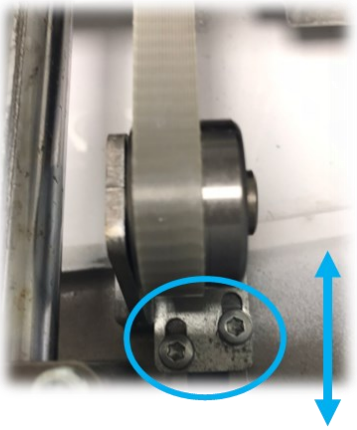


2. After that, perform the panoramic centring verification (reference to chapter *Errore. L 'origine riferimento non è stata trovata.*)

Y motor belts

1. If the belts should be loose, tighten them more by unscrewing slightly the screw, then adjust the excursion (highlighted in blue)

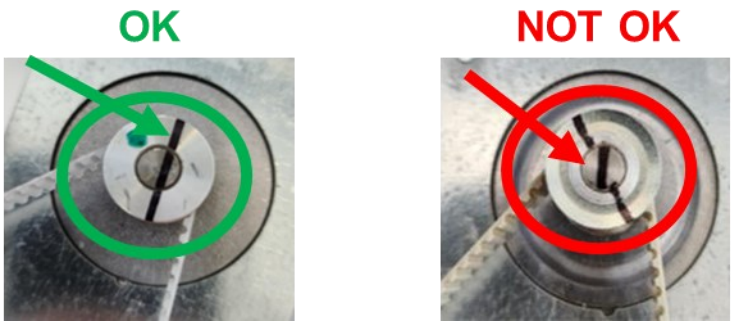




2. After that, perform the panoramic centring verification (reference to chapter *Errore. L 'origine riferimento non è stata trovata.*)

10.1.2. Shaft – pulley alignment

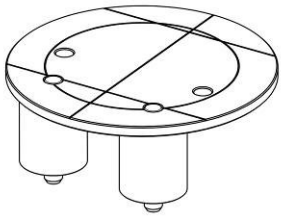
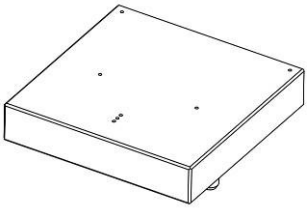
It is recommended to verify annually the alignment between shaft and pulley.
To do so draw a line between shaft and pulley, then perform a panoramic exam without X-ray emission and verify if the lines are still aligned.



If they are not aligned, replace R and Y motors by ordering them as spare parts (**Y motor** *cod.* ***6604040200 for 2D*** and *cod.* ***6604041200 for 3D***; **R motor** *cod.* ***6604040100 for 2D*** and *cod.* ***6604041100 for 3D***)
After replacement, perform the panoramic centring verification (reference to chapter *Errore. L'origine riferimento non è stata trovata.*)

10.2. Service tools

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

Image	Description	Function
-	Laser centering tool	Laser alignment check
	Support plate	Support for panoramic centering tool
	Centering tool	Panoramic function adjustment
-	1.5mm copper filter	Sensor calibration

10.3. Sensor Calibration

In order to perform CMOS sensor calibration, the device drivers require to remove the collimator from the X-ray field and irradiate completely the acquisition area for the first 3 acquisition.

The last acquisition requires and verifies the correct presence of the collimator closed and fixed in the operation position.

For this reason a collimator with an hinge has been implemented.

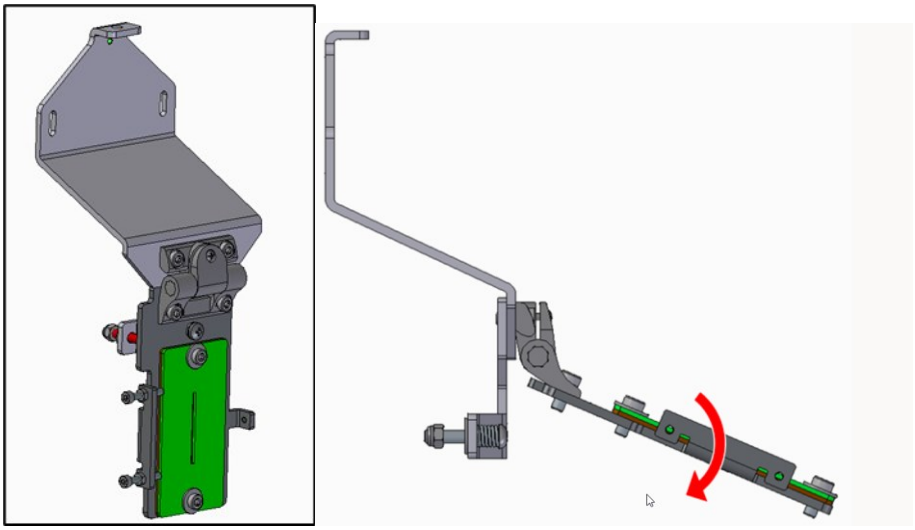


Figure 31

1. Remove the collimator by unscrewing the screw circled in red

Warning
Do not unscrew the red coloured screws

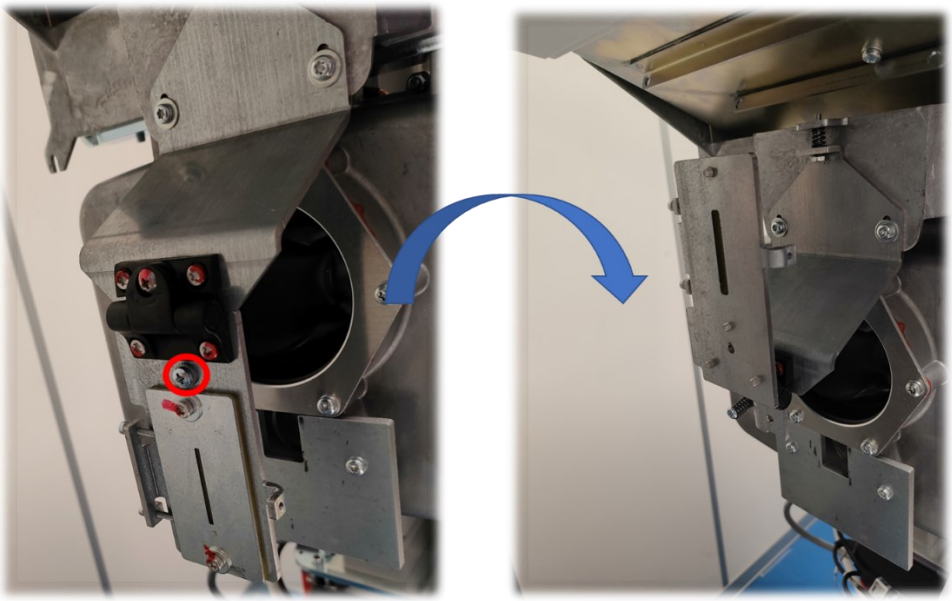


Figure 32

2. Place the 1.5 mm copper filter in place of the collimator using its magnetic extremities as shown in the picture.

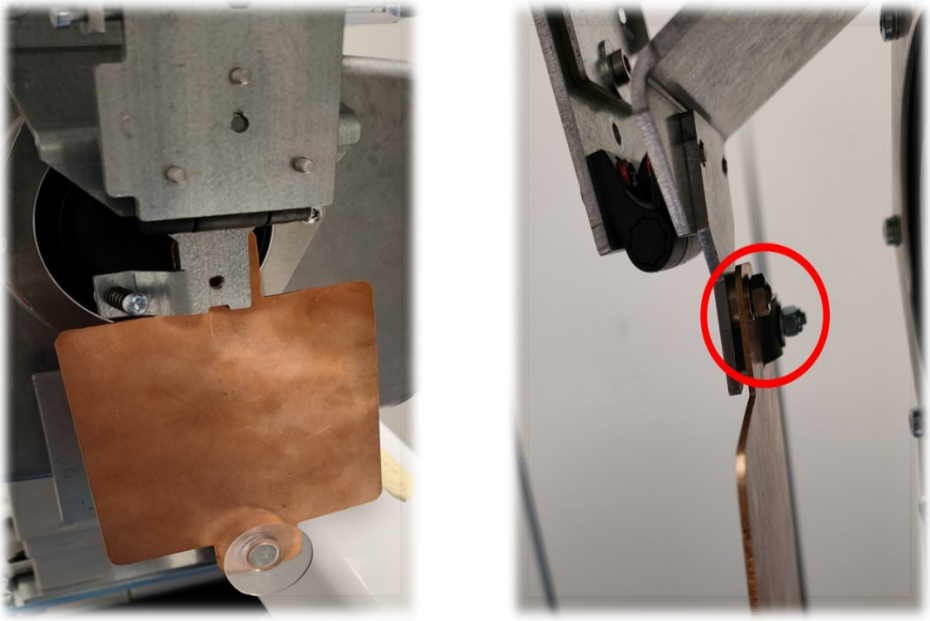
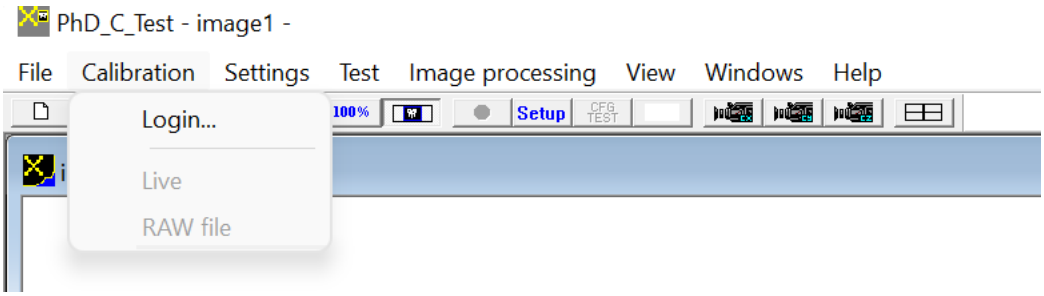
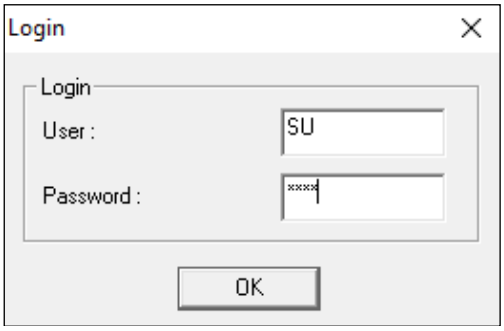


Figure 33

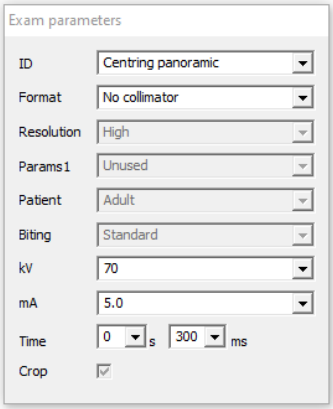
3. Open the "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C).
4. Open the "Calibration" panel from the menu, and select "Login".



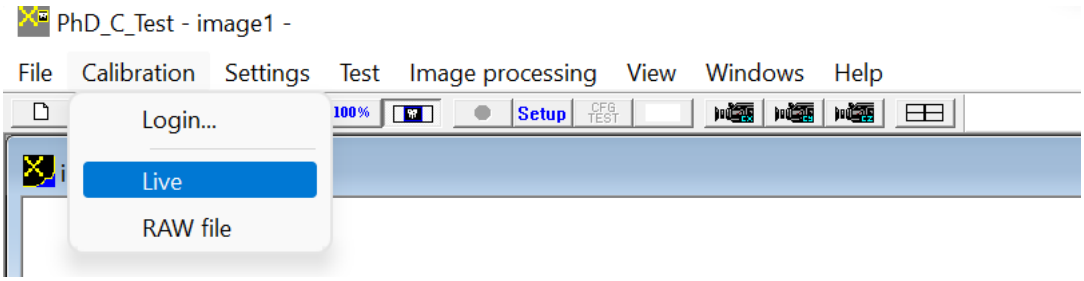
5. In the "User" field type in capital letter "SU". In the "Password" field type the password (see password generation on paragraph 10.3.1).



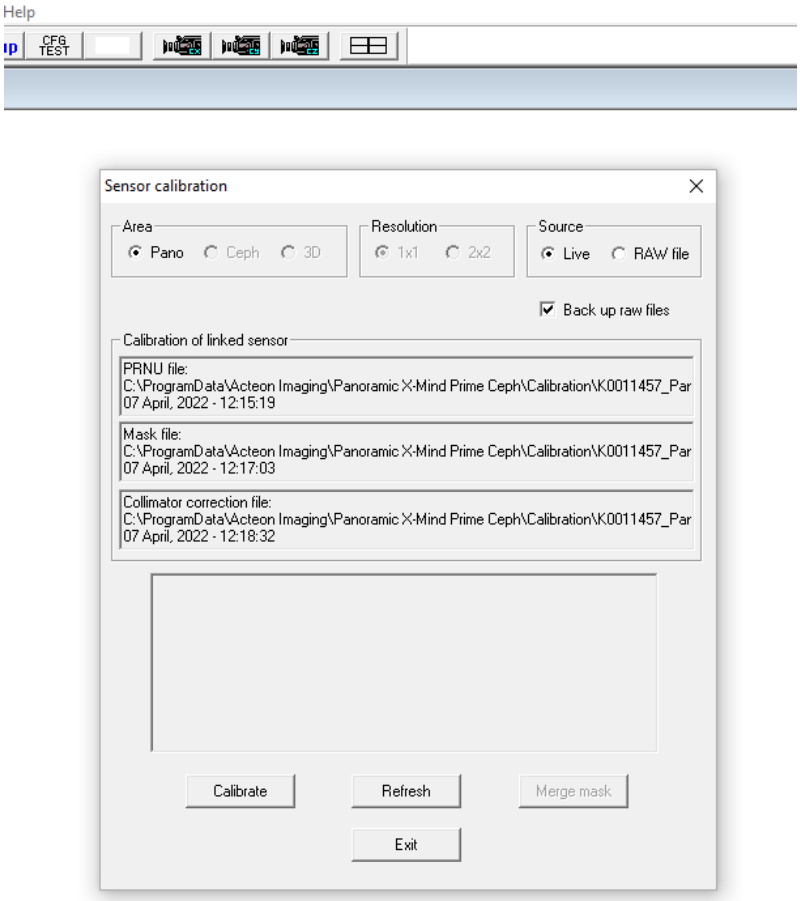
6. Select in "*Exam parameters*":
   - ID: Centring emission
   - Format: No collimator
   - kV: 70
   - mA: 5.0



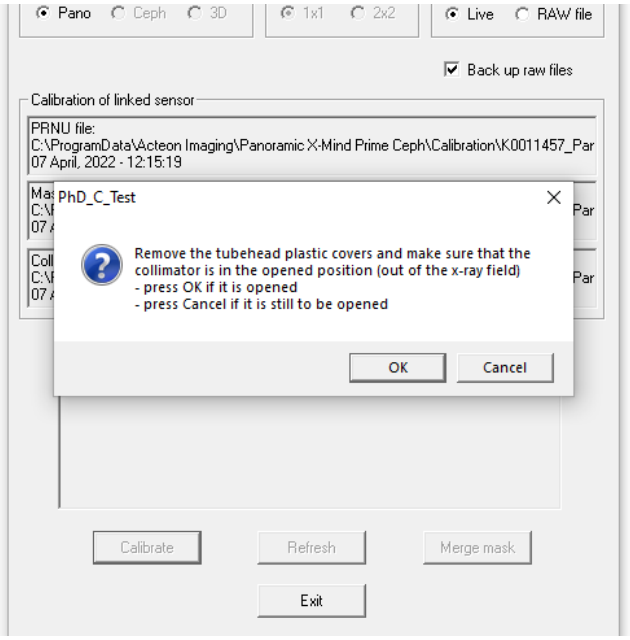
7. Open the "Calibration" panel and select "PRNU- Live".



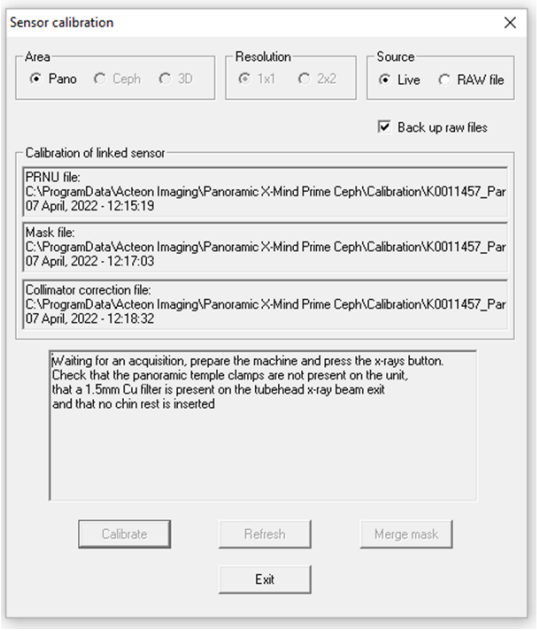
8. Press the button "Calibrate".

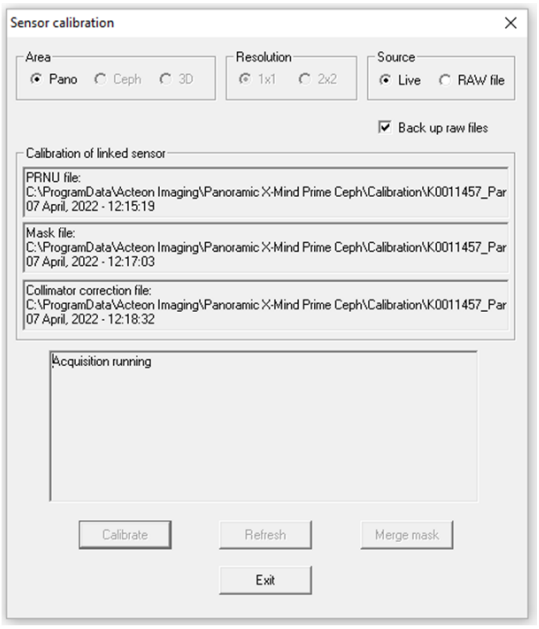


9. Make sure that no objects are present in the X-ray field and that the collimator is in the opened position. If so, press “Ok”



10. Press the X-ray button and wait for the end of the acquisition.



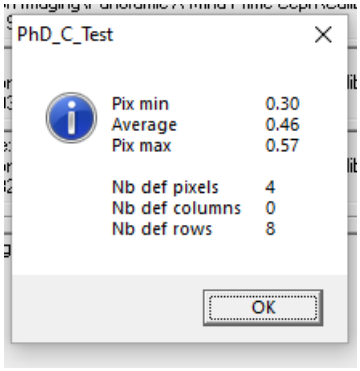


Note
During the calibration, when one of the following windows is displayed, verify that the values reported are within the tolerances:

- Pix min: > 0.20

- Pix max: < 0.90

and then press OK.



If they are not in the above limits, repeat the calibration with:

- Lower mA if Pix max > tolerance
- Higher mA if Pix min < tolerance

11. Press OK button
12. Between two exposures, wait for the tube head to complete the cooling progress

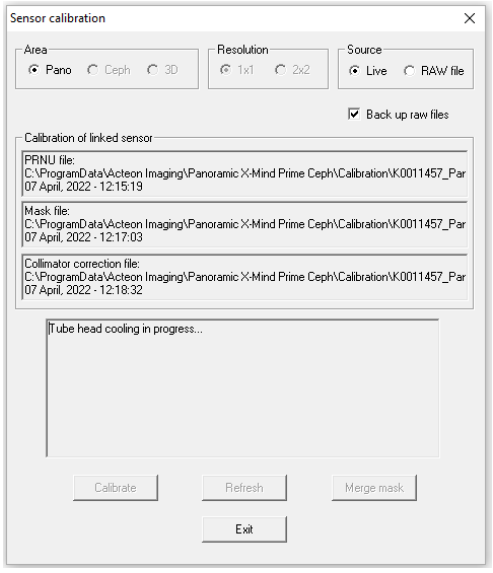


Figure 34

13. For the last exposition, remove the copper filter and placed the collimator in its closed position.

MAKE SURE THAT THE FIXING SCEWS IS WELL TIGHTENED

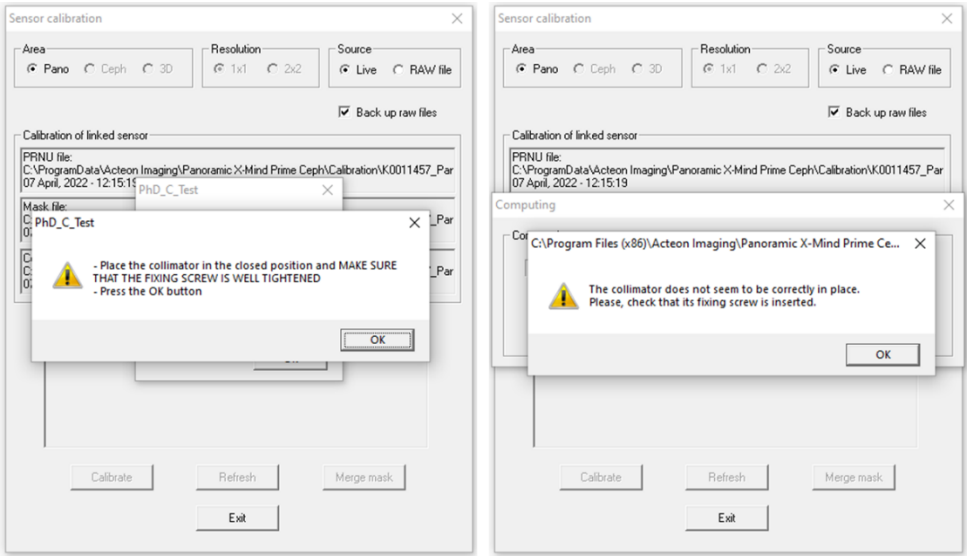
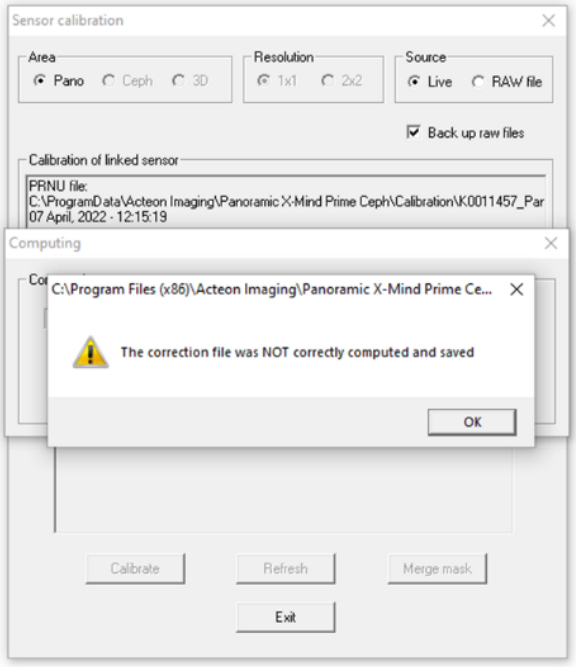


Figure 35

Note
If an error occurred during calibration procedure (e.g. fixing screw of the collimator not perfectly tightened during last exposition) an error message will occur



Press “Ok” and then repeat the calibration process

14. The calibration is finished and the calibration file is saved in the folder “2_KASxxxxx” in C:\ProgramData\OWANDY\PANORAMIC PHD_C\Calibration:
15. PRNU_2B_PANO_2X2.FMP

16. In the “Image Processing” menu select:
    - Dark signal correction

- PRNU correction if possible
- Collimator correction if possible

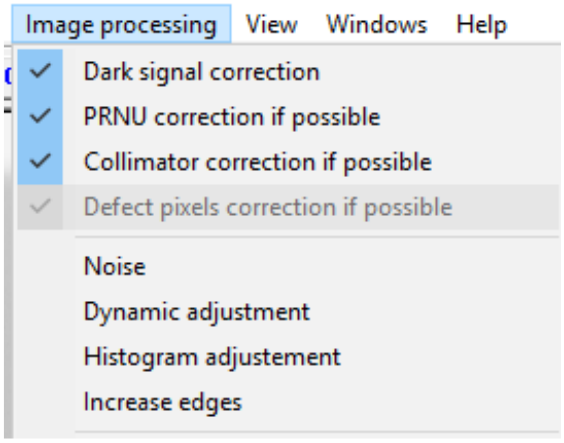
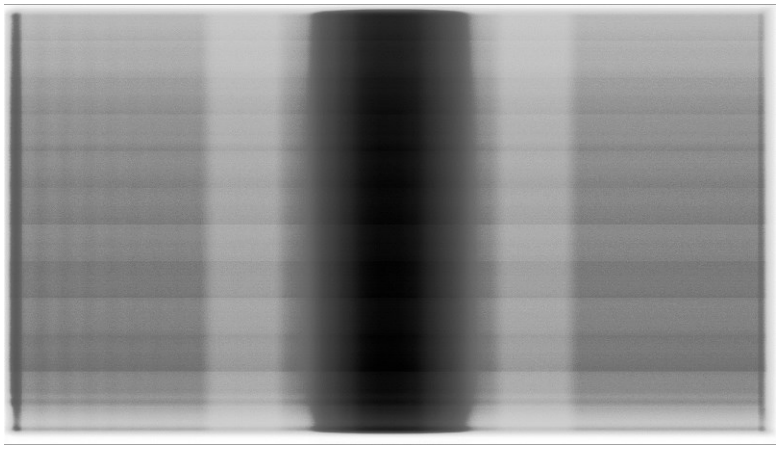


Figure 36

17. Make an exposure without objects in the X-ray field with the same parameters as before.

18. Verify that there are no defect lines or inhomogeneous bands on the panoramic image:



19. If the acquisitions are not OK (X):
    - Verify the presence of the calibration file in the calibration folder
    - Verify that all the calibration options are checked in image processing menu (see point 16 above)
    - If the acquisitions are still not OK, redo the calibration.

10.3.1. 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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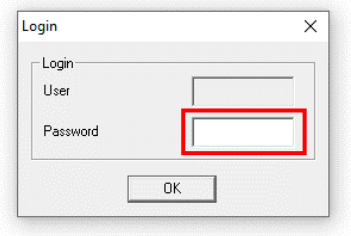
11. CORRECTIVE MAINTENANCE

11.1. Firmware upgrade

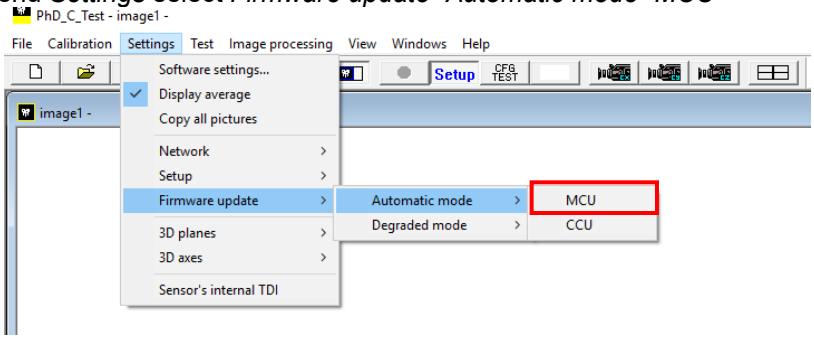
Note
To update the MCU board be sure the ethernet board connected to the machine is properly set as described in paragraph 7.5

11.1.1. MCU Firmware upgrade

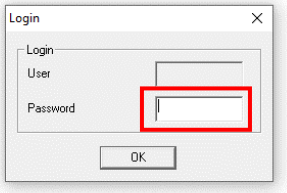
1. Copy in a working directory of the PC the MCU firmware to upload (the file name is in the form MCUet-YYYY-MM-DD-vM.mm.bbb.hex).
2. Power ON the machine. Open "PhD_C_Test.exe" service program (C:\Program Files (x86)\OWANDY\PANORAMIC PHD_C).
3. Click on SETUP button and in the Login windows that will open insert the password **PhdAccess** and click OK



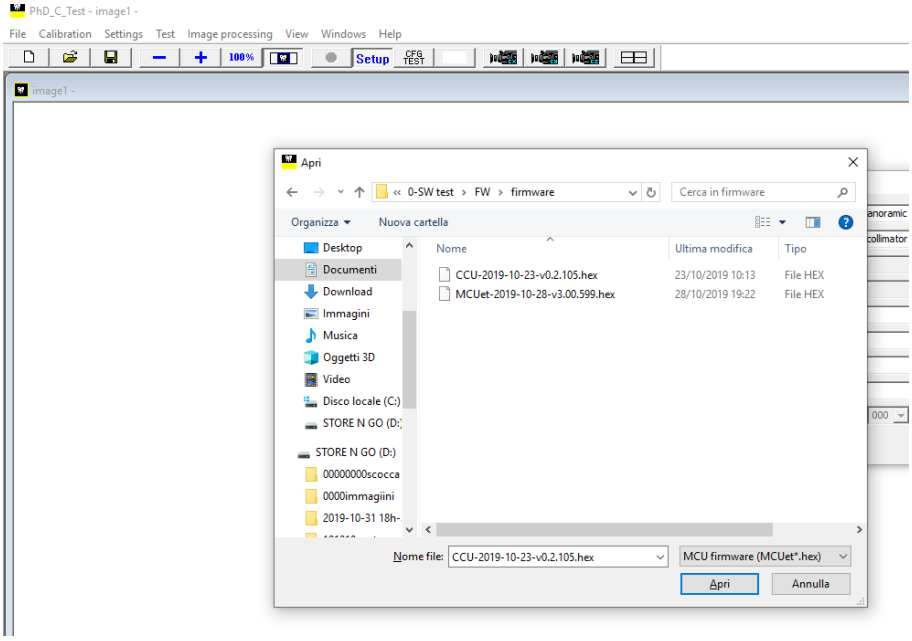
4. From the menu *Settings* select *Firmware update>Automatic mode>MCU*



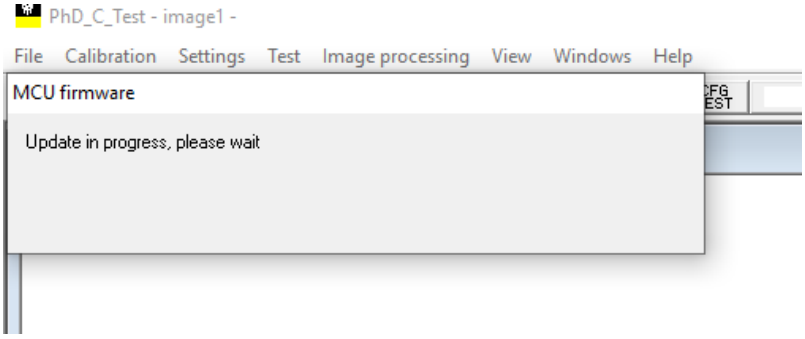
5. in the Login window that will open insert the password **EthUpload** and click OK



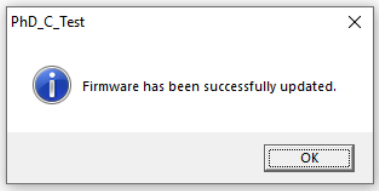
6. Browse the working folder where the firmware to upload has been copied, select it and click Open



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.

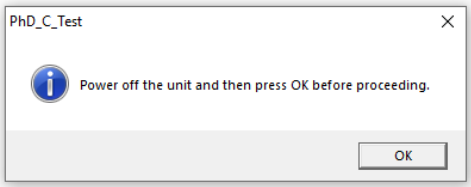


8. When the upload process has been completed, the following window is displayed. Click on OK button.



9. Switch OFF the unit.

10. Click on OK button of the information window



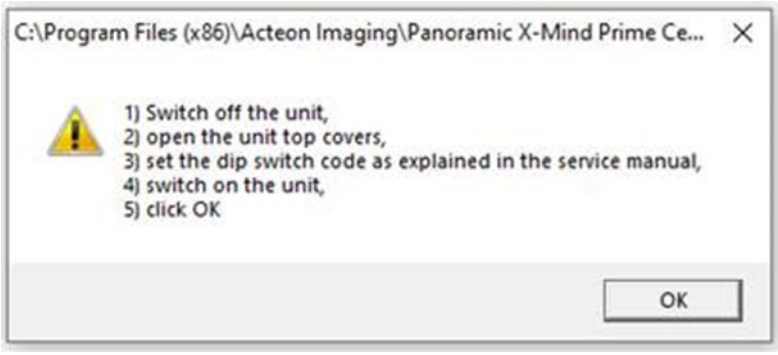
11. Switch ON the unit and check on the first page of the GUI service program the current MCU firmware version.

Only in case the firmware upload process fails (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

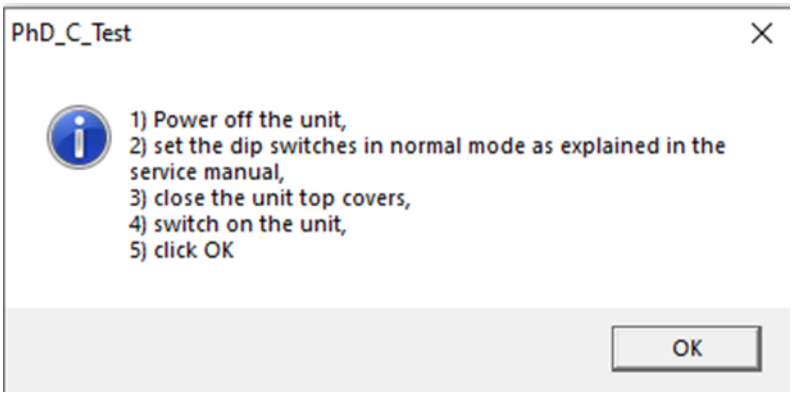
- Switch off the unit
- Close PhD_C_test
- Open Phd_C_Test and Switch on the unit
- Wait at least 1 minute (the unit it will be probably in an error state: 3 keyboard LEDs blinks fast)
- In the PhD_C_Test selection bar select: Settings->Firmware update ->**Degraded mode**->MCU
- Insert the password (same 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)



11.2. Checks, settings and adjustment

11.2.1. Logs files recover

The I-MAX 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* *imax.log*	[SDCARD]:\imax\Logs	**NO**
Sensor	*logs.dat*	*C:\Windows\SysWOW64*	**YES**

11.2.1.1. Software package (OSP/VSP) logs

These logs record the events that occurs during the OSP/VSP (installed on the PC) execution. These logs are always active by default after any I-MAX OSP/VSP installation.

The logs file are stored in the folder path: C:\ProgramData\ OWANDY\OSP-PHD PANORAMIC\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).

(*) See installed version in the first configuration window page (chapter 8) or in the Control Panel\Programs\Programs and Features windows.

11.2.1.2. Sensor logs

This log records the events that occur in the communication between the sensor and OSP/VSP software.

Note
Before recording the log, check that the network interface board connected to the sensor the one labelled as “Network” is configured properly

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 save 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.

11.2.1.3. 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 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*
   - *imax.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 4.2.2.1) 0 = Normal mode
S/N	MCU hardware key number (U.I.C.)
XP-PACK option	XP exam option ENABLED or DISABLED
XCU version numbers	Generator board Firmware (SW) version

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 (pan 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.

Only the last ten acquisitions are stored.

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 4.2.1 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.

2. If MCU H1 is ON, verify if the MCU LED H2 is ON.

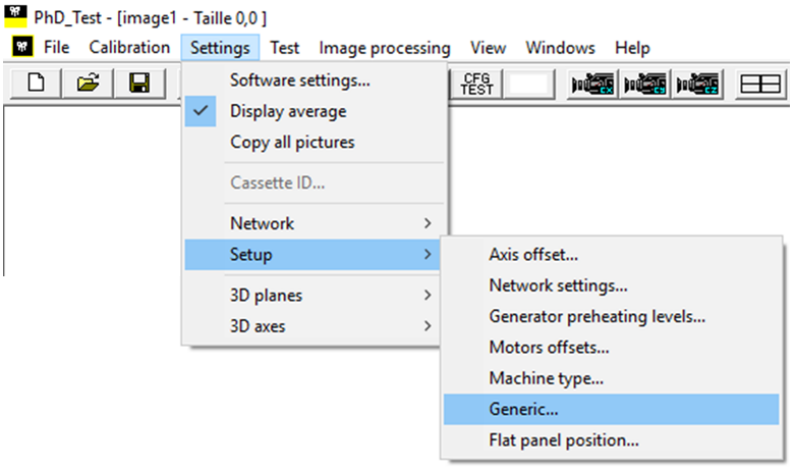
   a. IF MCU LED H2 is OFF, verify that fuse F1 is not blown:
      - IF fuse F1 is blown, replace it and verify if the error is still present (* see Note below).
      - IF fuse F1 is NOT blown, disconnect the motors connectors (X18, X19, X20 and X34) and verify if the LED H2 lights up:
        - IF MCU 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) and theirs cables as described in the troubleshooting of the Errors E200 ÷ E205 (paragraph 9.2.3.1) and E240 ÷ E243 (paragraph 9.2.3.3). Verify also that there are no short-circuits on cables X8-J8.

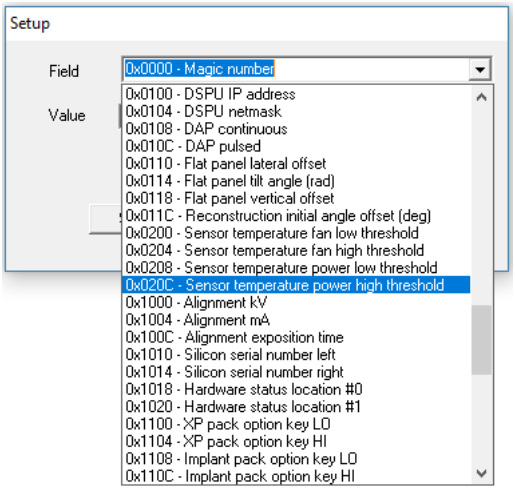
11.2.4. EEPROM Memory values verification and modification

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.

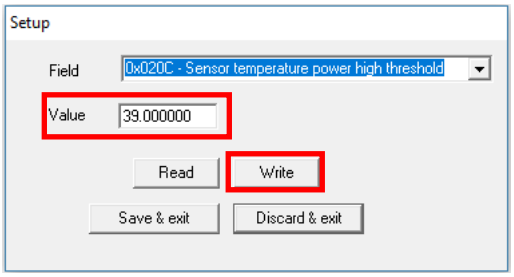
1. Switch ON the unit and when the green keyboard LED blinks slow press the >0< button.
2. Open the "PhD_test.exe" (folder path: C:\Program Files (x86)\OWANDY\OSP-PHD PANORAMIC) and wait the unit connection.
3. Click on the menu Settings→Setup→Generic:



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":

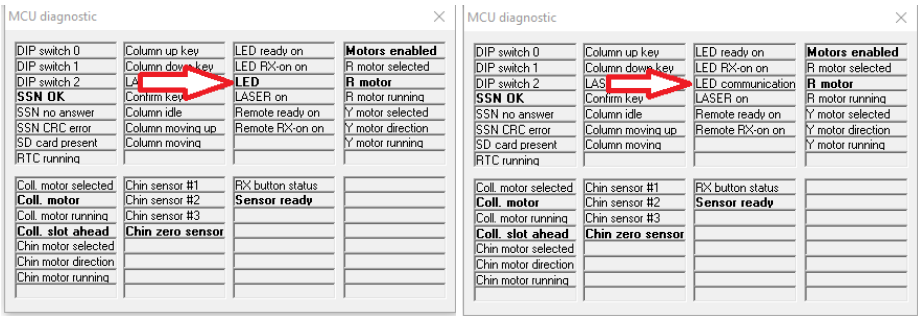


Note
If in the "Value" field the number is preceded by the prefix "0x", means that it is expressed in hexadecimal base. In this case refer to the DECIMAL values reported on the right of the field:

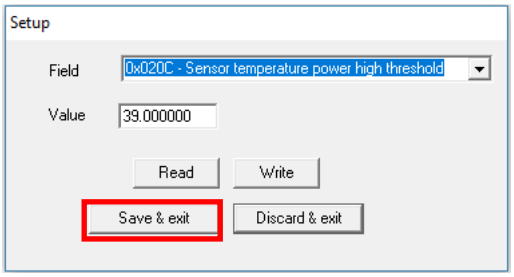
If the value must be changed, write in the white filed the correct DECIMAL number and then press the button "Write".

5. Wait the blue keyboard LED blink.

Note
In case of remote technical session: the BLU LED blinking state it signaled also in the "MCU diagnostic" window through the loop-variation between the bold "LED" text and the "LED communication" text in the field indicated by the red arrow in the Figure below:



6. Press "Save& exit" button and wait the unit reboot (green LED blink slow).



7. Switch OFF the unit.

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)

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.

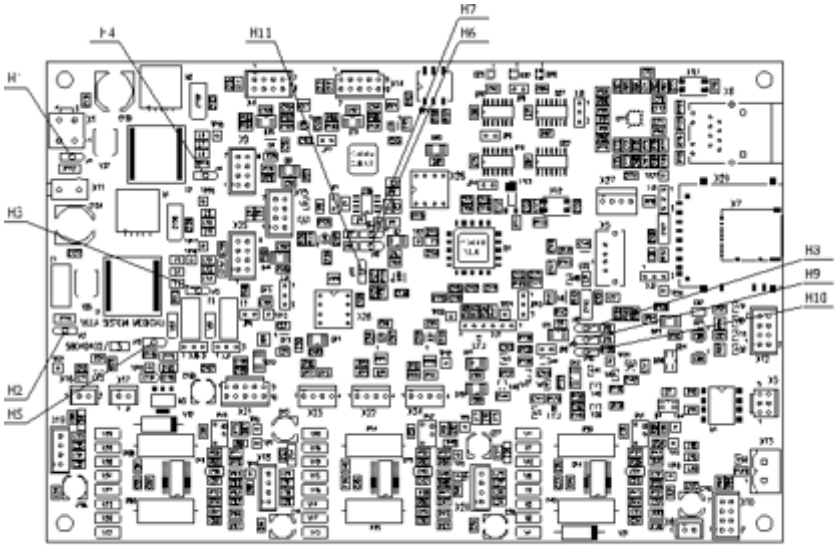
11.3.2. MCU board replacement

Warning
The board shipped as replacement carry 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) witch determines the enabling codes for the radiological exams.

Moreover, on the EEPROM has stored the system configuration data; 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 (see paragraph 14.1), following the procedure present on chapter 8.

Note
At the end of the replacement, restore the metallic cover and the ground connection. Both parts has to be recovered from failed board.


H7
H6
H4
H11
H1
H3
H2
H5
H3
H9
H10

11.3.3. Sensor replacement

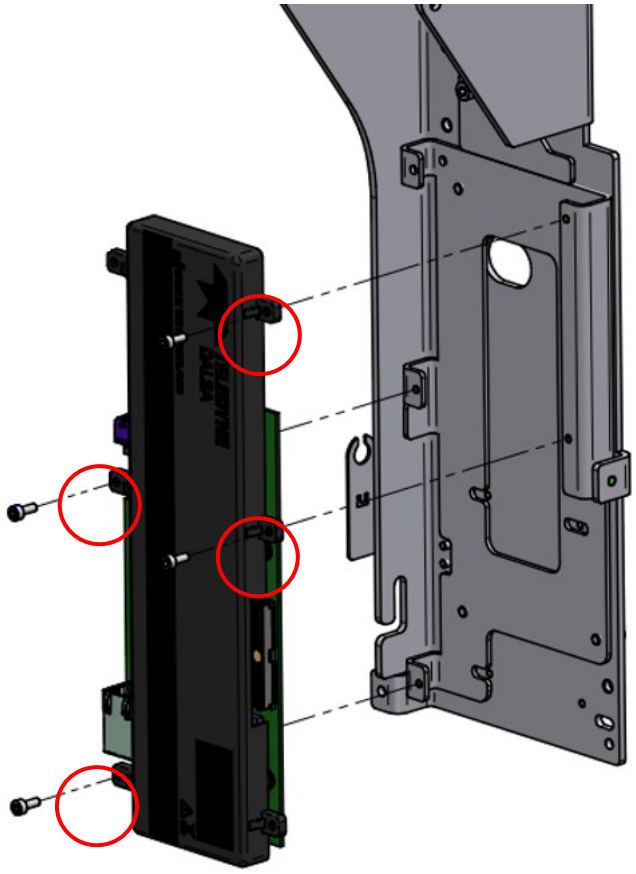
Digital sensor is fixed with two pins, that define the position. No adjustment are allowed in the sensor area.
It is always required to perform X-ray beam centering verification (see paragraph 7.7) and make the standard verification on image quality before to make examinations with patients.

Note
Before the sensor replacement, it is MANDATORY to:

- Properly set the network interface board
- Provide the sensor logs* to Technical Service
- If the sensor has to be replaced due to an image quality problem, provide to Technical Service the .raw files of the complained acquisitions

*The logs MUST be record with the Network board set as described by paragraph 11.2.1.2

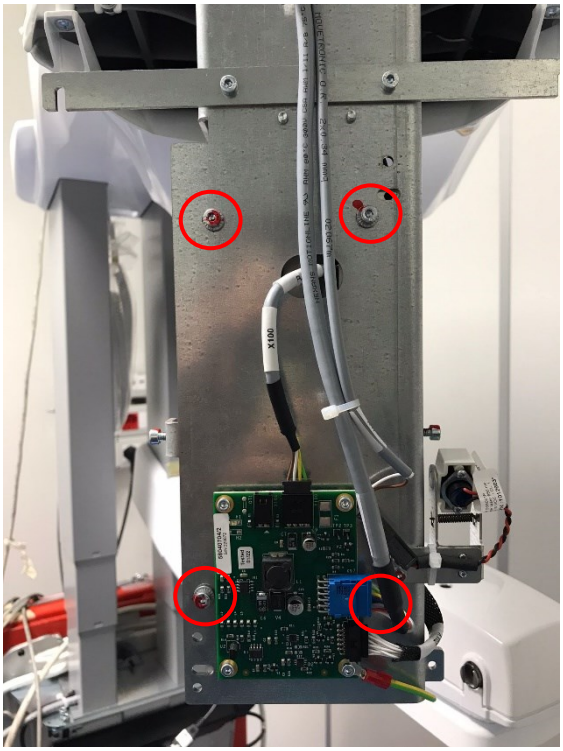
1. Switch OFF the unit.
2. Remove the sensor's covers.
3. Disconnect cables:
    - X100-Pwr
    - X102-Sync
    - Ground
    - Ethernet cable
4. Hold the sensor and unscrews the 4 screws indicated by the red circles in the image:



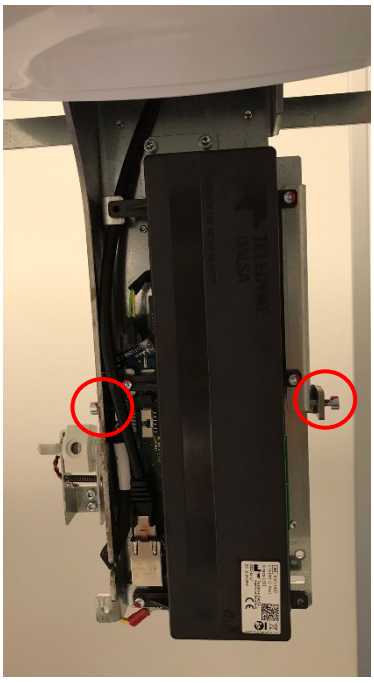
5. Place the defective sensor in the box of the spare sensor, following the packaging instructions supplied with the new sensor.
6. Place the new sensor on the unit and tighten the four screws removed before. Connect the cables removed in point 1.
7. Verify the X-ray beam alignment (see paragraph 11.3.4).
8. Perform sensor calibration (see paragraph 10.3).
9. Verify the panoramic function (see paragraph 7.7).

11.3.4. X-ray beam alignment

The sensor is mounted on a control plate. To align it, first remove the four screws located on the back.

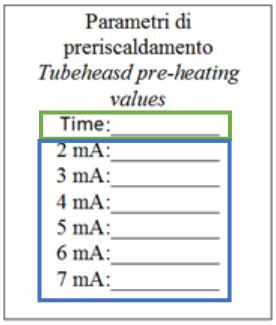


Then it is possible to adjust its position to the left or the right with log screws



11.3.5. Tube head replacement

Warning
After replacing the tubehead, it's mandatory to modify the pre-heating time and values (see paragraph 8.4) as shown on the label of the new tubehead.



Eg. in case of MP05 Time=2000ms and in case of MPV05 Time =3000ms

1. Switch OFF the unit.
2. Remove the tubehead external and internal cover.
3. Remove the Generator board metallic cover:

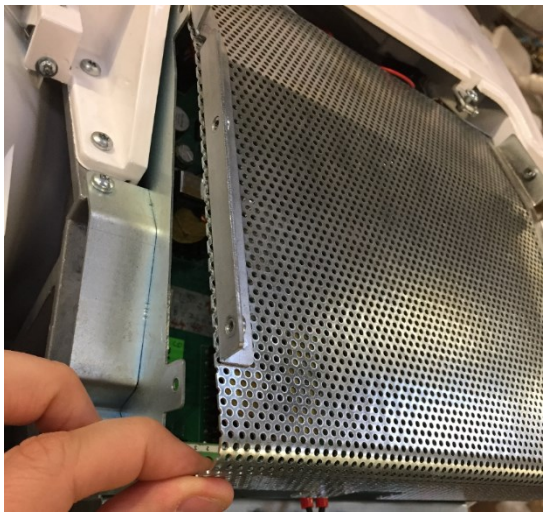


Figure 37

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":

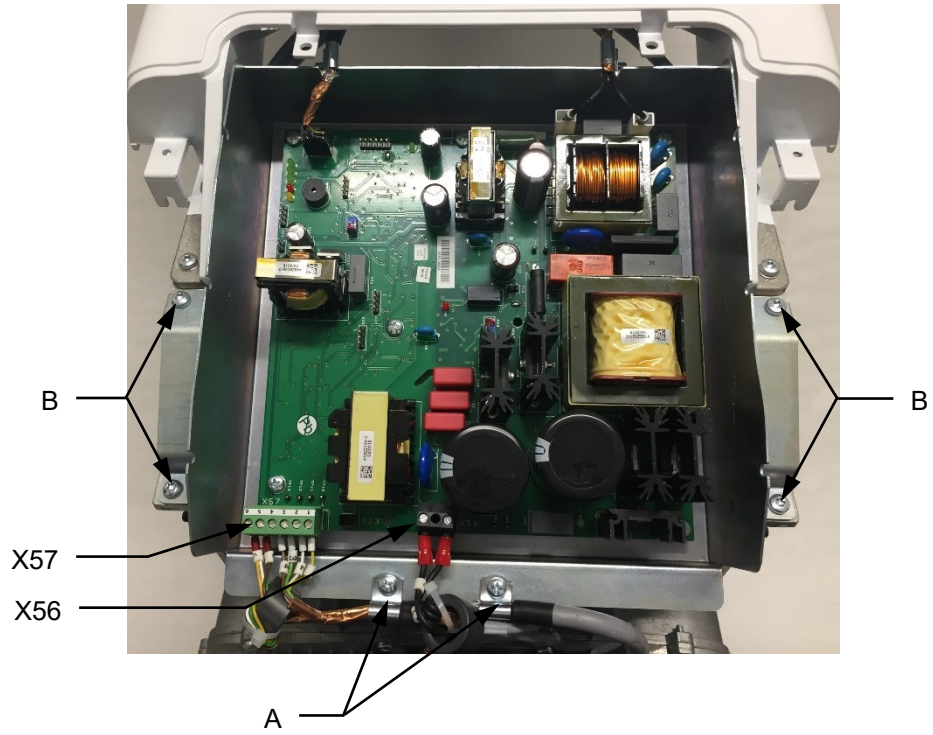


Figure 38

5. Pull up the generator board.

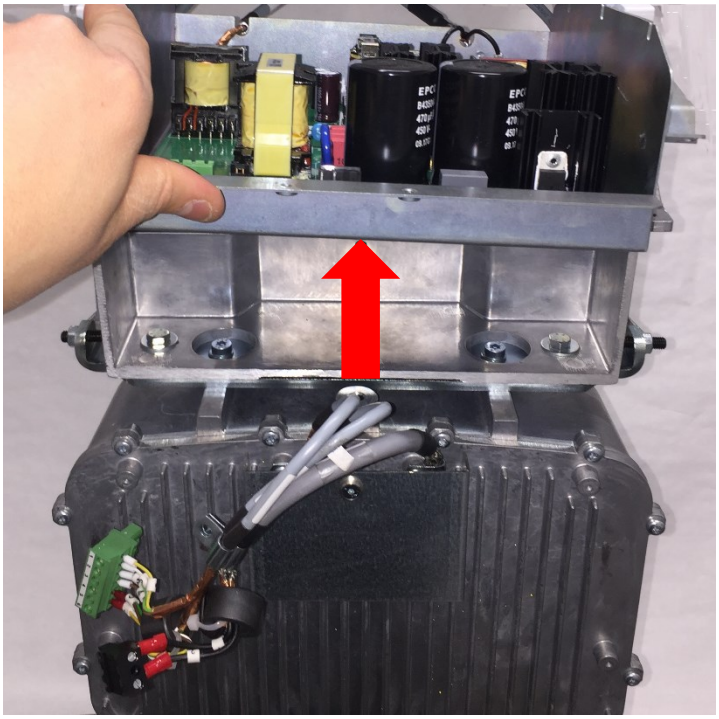


Figure 39

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".

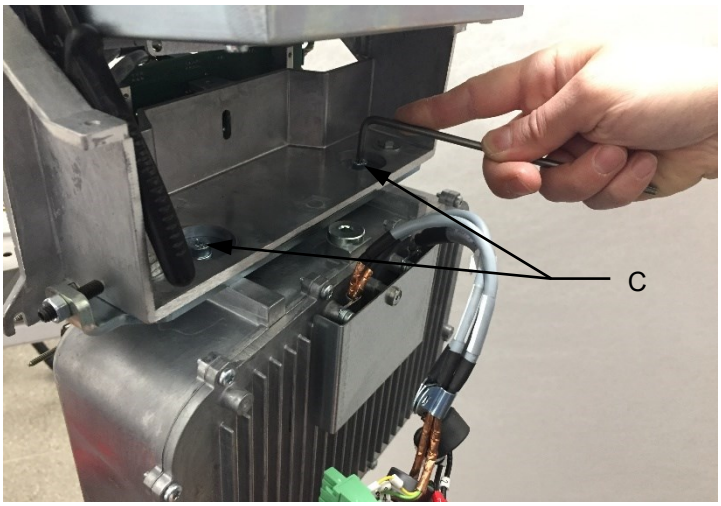


Figure 40

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).

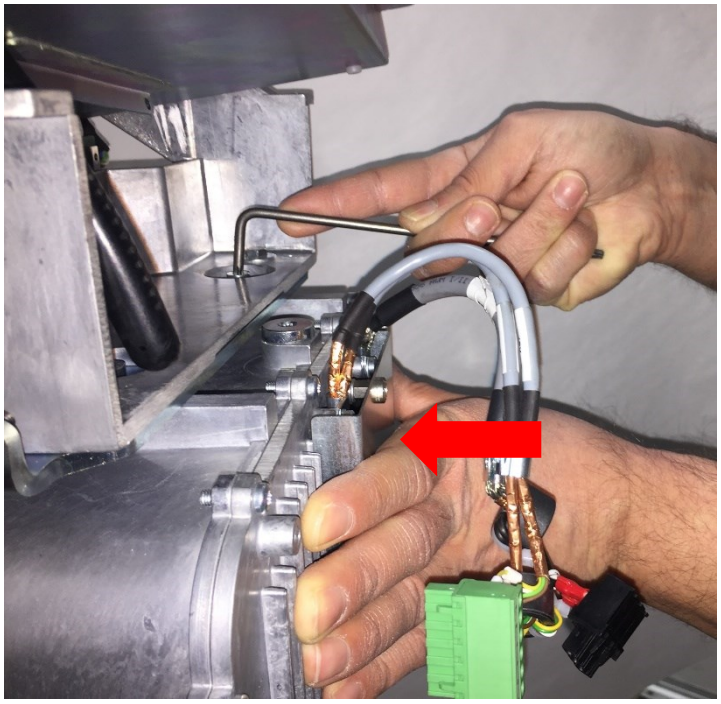


Figure 41

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 8.4).

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)

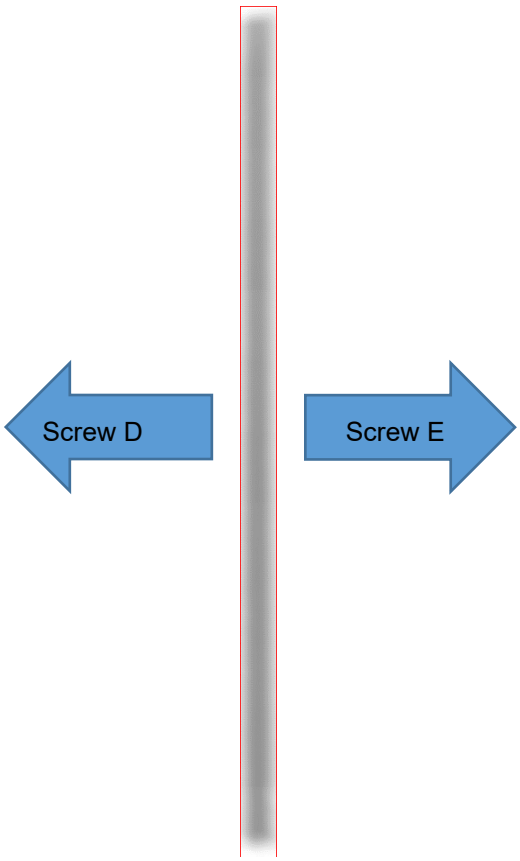


Figure 42

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 (Figure 44)

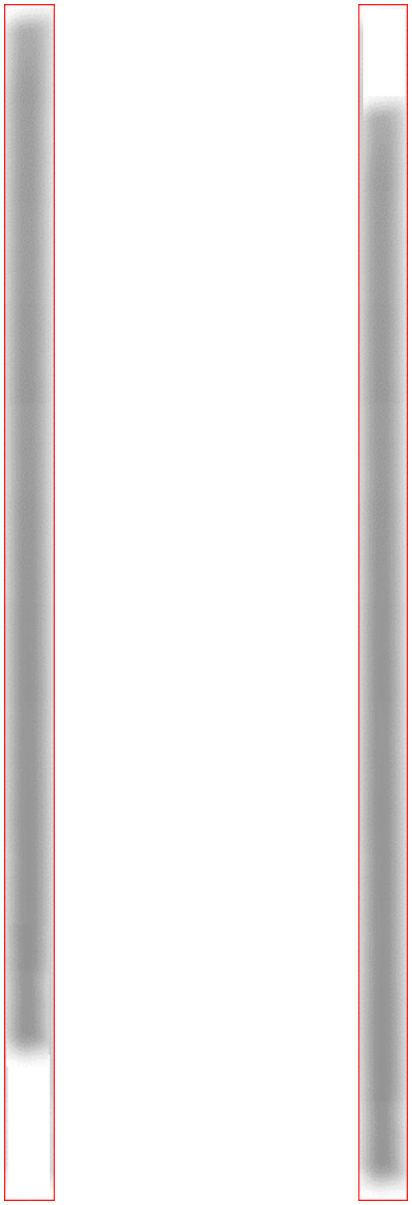


Figure 44

Warning
Don't move the primary collimator to adjust the x-ray beam on vertical plane.

Loosen the screw C (*Figure 43*) insert a washer (supplied with the spare part) in the internal part to lower the x-ray beam (*Figure 45*) and in the external part to raise the x-ray beam (*Figure 46*). Then return to *point 14*

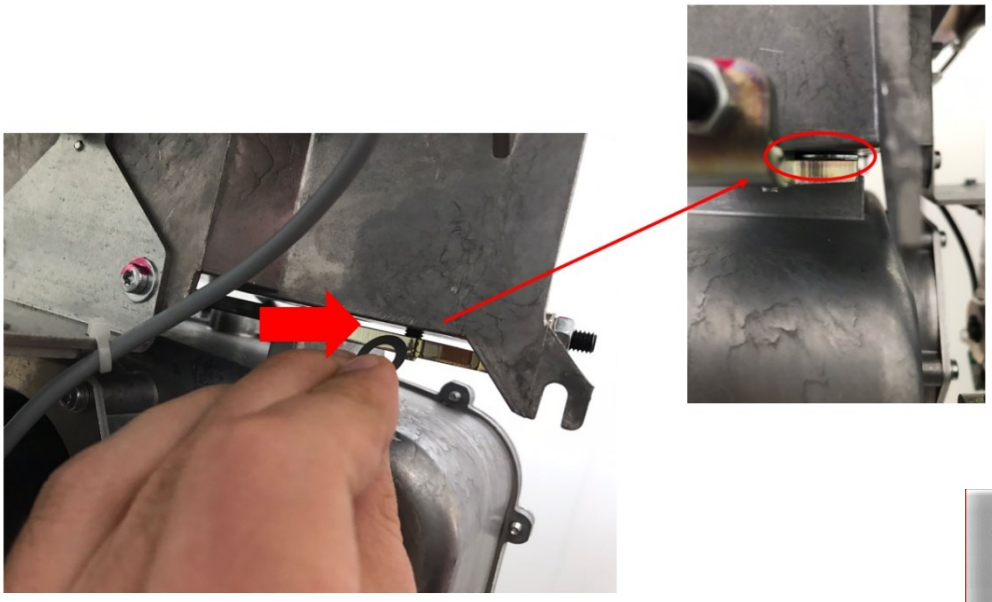


Figure 45

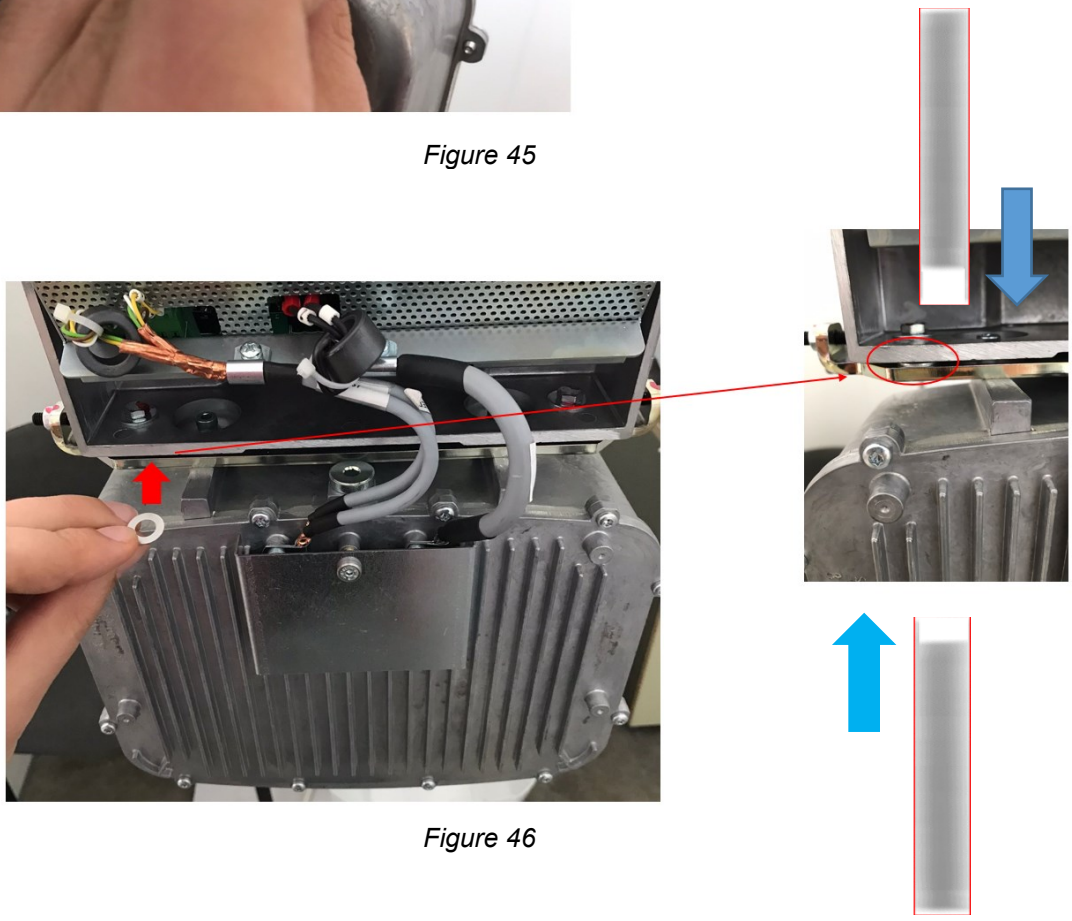


Figure 46

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.

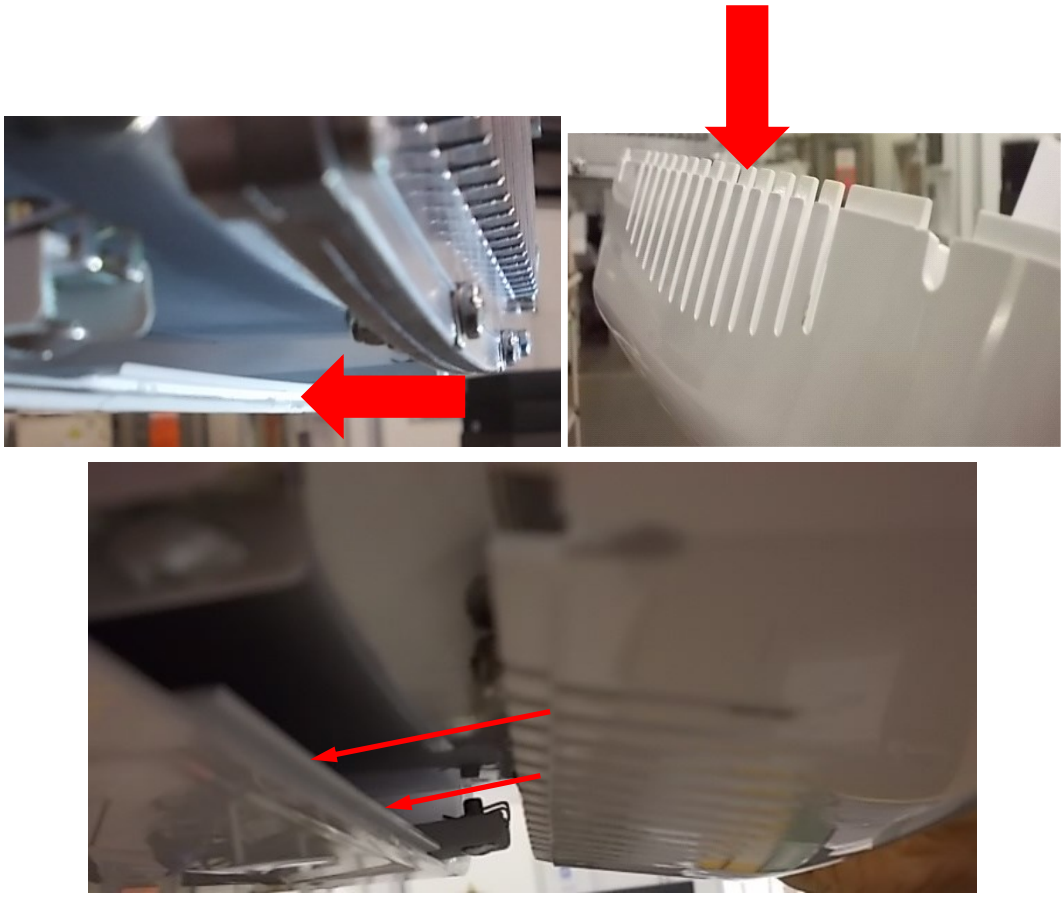


Figure 47

19. Perform a panoramic symmetry verification (see paragraph 7.7).

11.3.6. Columns replacement

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 4.2.2.1).
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).

Figure 48

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).

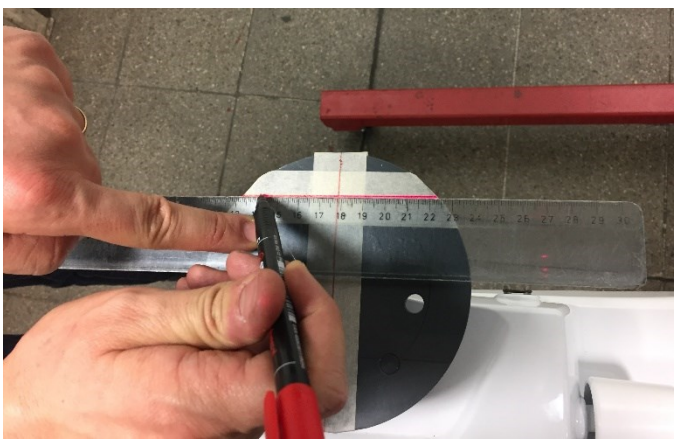


Figure 49

Rotation references are present on the tool and it has to be used as reference to position the unit in the same position.

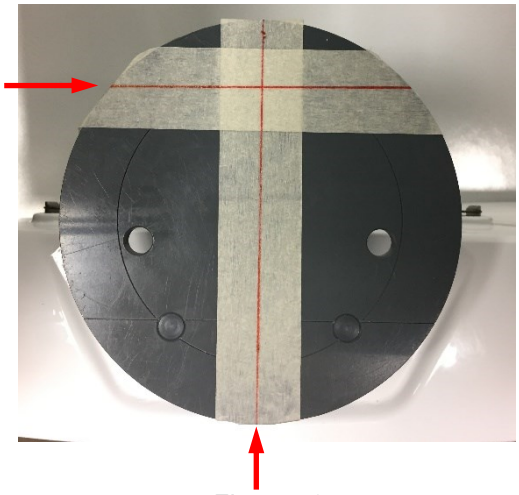
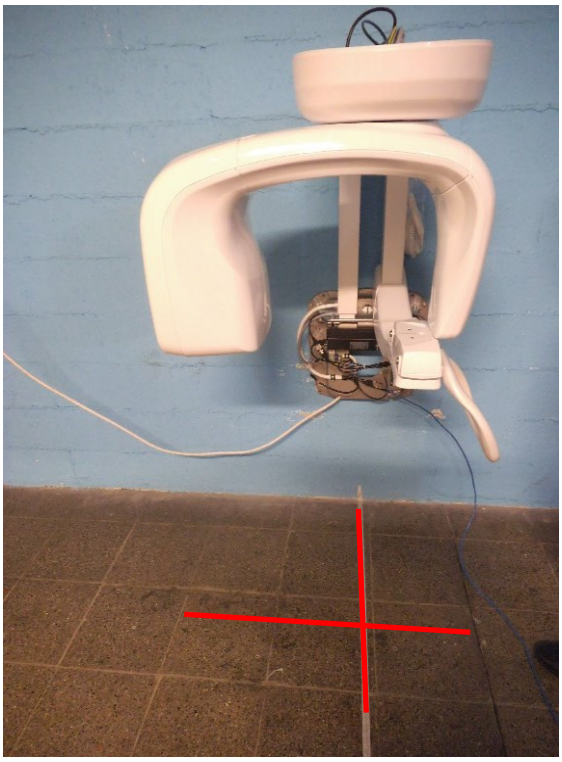


Figure 50

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.

Figure 51

10. Cut strips and disconnect the cables X3, X10 and X13 from MCU

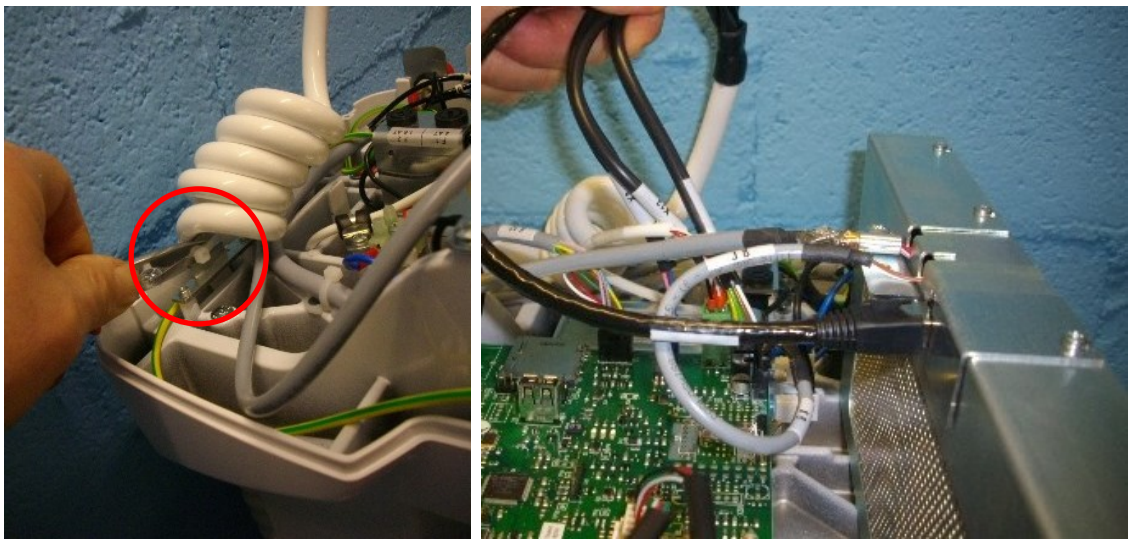


Figure 52

11. Remove connector from cable X13 (it may include exposure button).

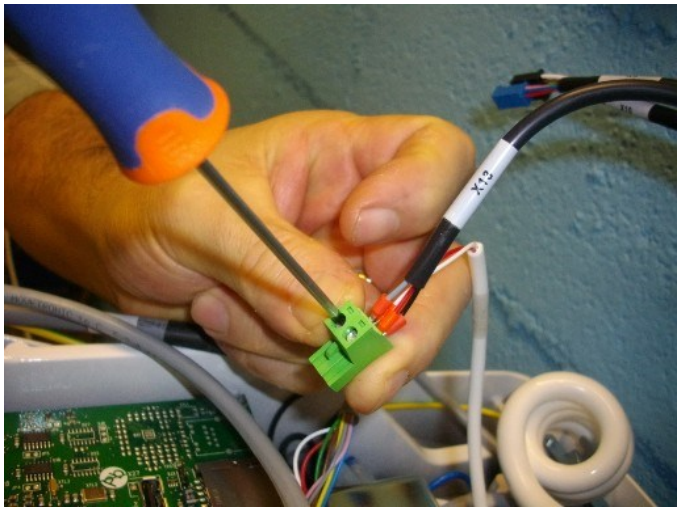


Figure 53

12. Pass the cable out from the top side of the unit.

Figure 54

13. Cut lower strip.

Figure 55

14. Disconnect power cables and chin arm cables from top side of the unit.

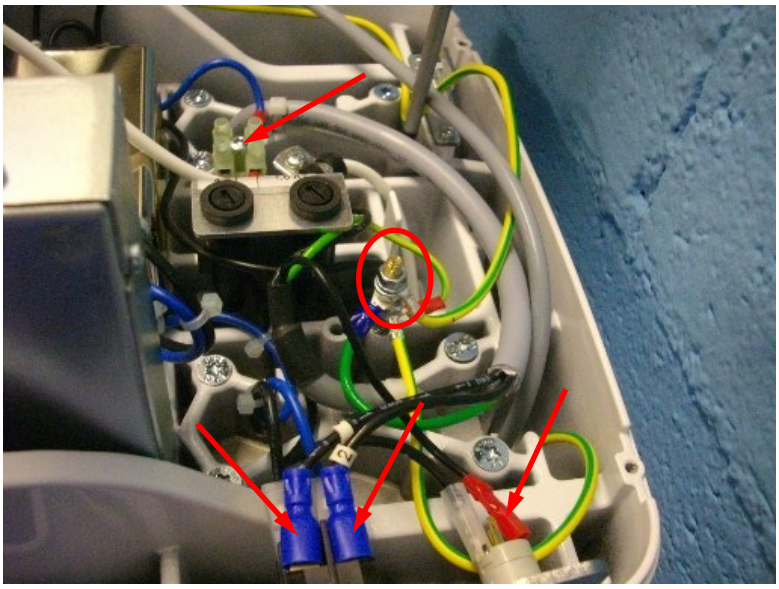
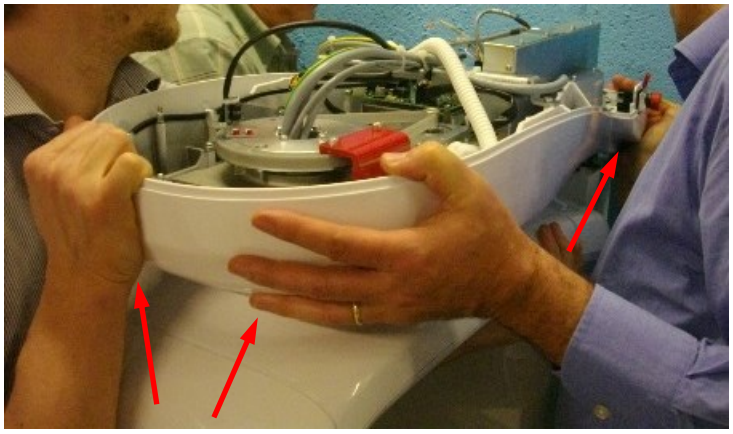


Figure 56

15. Disconnect the exposure button in case it has been connected in the upper side.

Figure 57

Note
Two person 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.

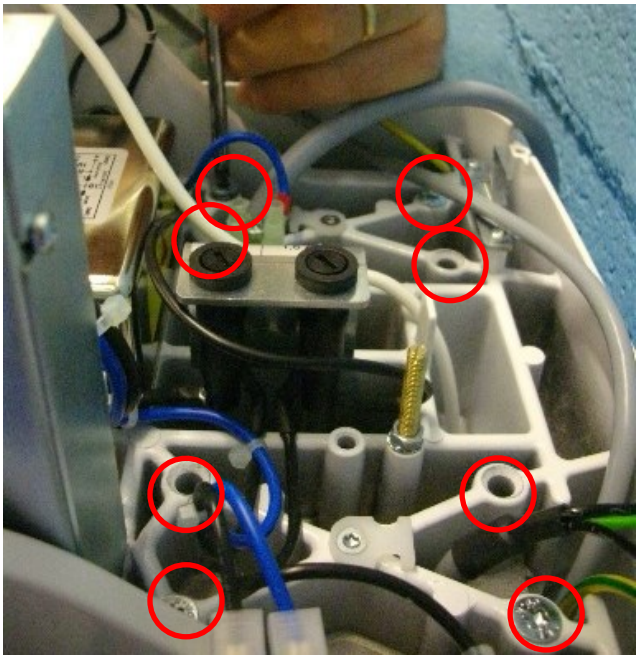


Figure 58

17. Pass the cables out of rotating head.

Figure 59

18. Position head on a protected surface in order to avoid damages.

Figure 60

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.

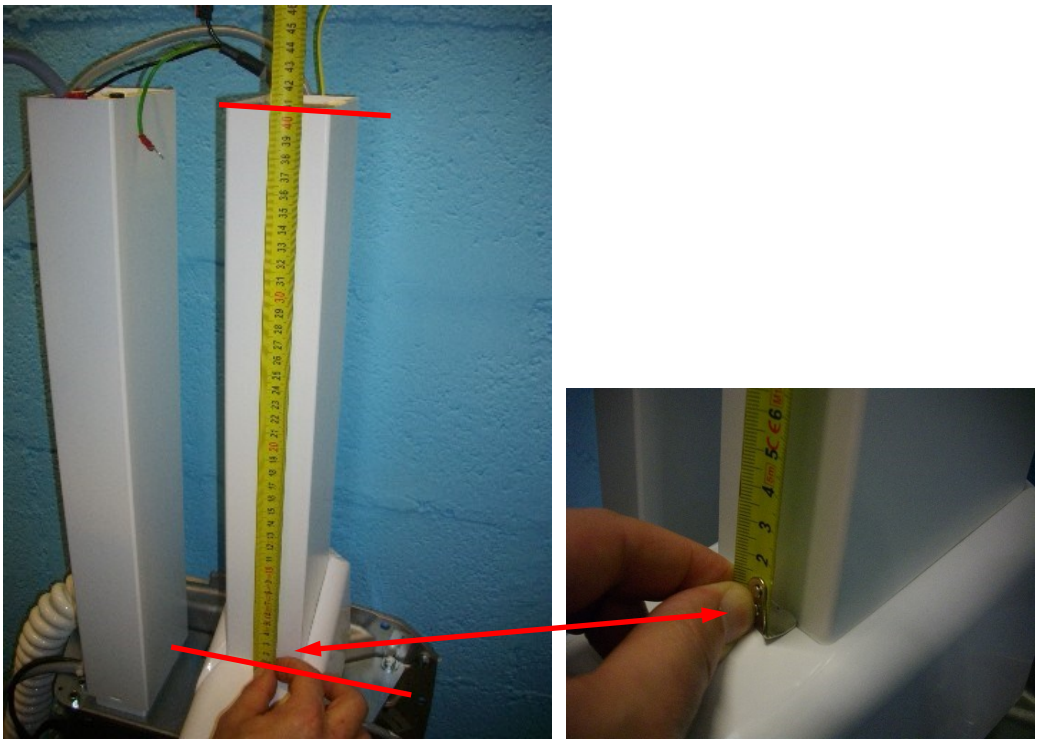


Figure 61

20. Disconnect lift motors control cables and power supply from fixing plate.

Figure 62

21. In order to remove the columns plate, loosen the nuts of the hinges fixing the plate in both sides.

Figure 63

22. Move up the pin used to block the hinge pin in both sides. Slide out the hinge pin in both sides.

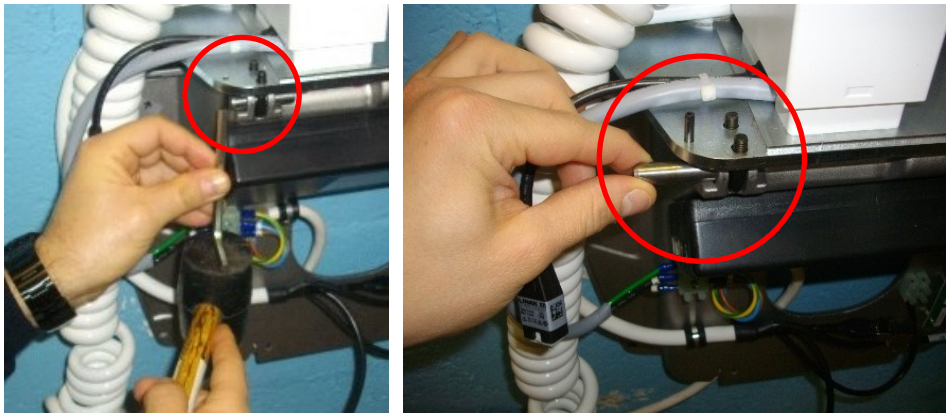


Figure 64

23. Remove the safety pins. In this phase, support the assy.

Figure 65

24. Release the fixing pin to remove the columns assembly.

Figure 66

25. With the group on a desk, remove the adhesive plate and pass the cables out of the column.

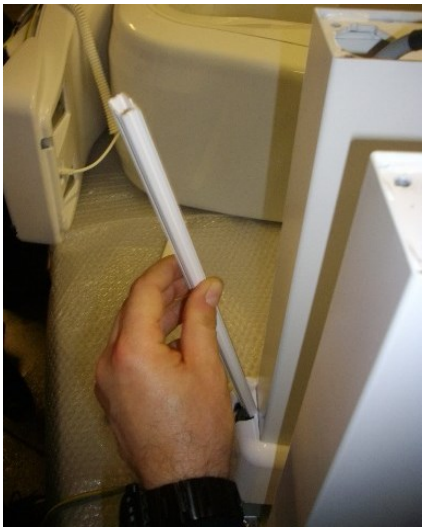


Figure 67

26. Remove the lower cover from chin support.

Figure 68

27. Loosen the two nuts inside the chin support arm.

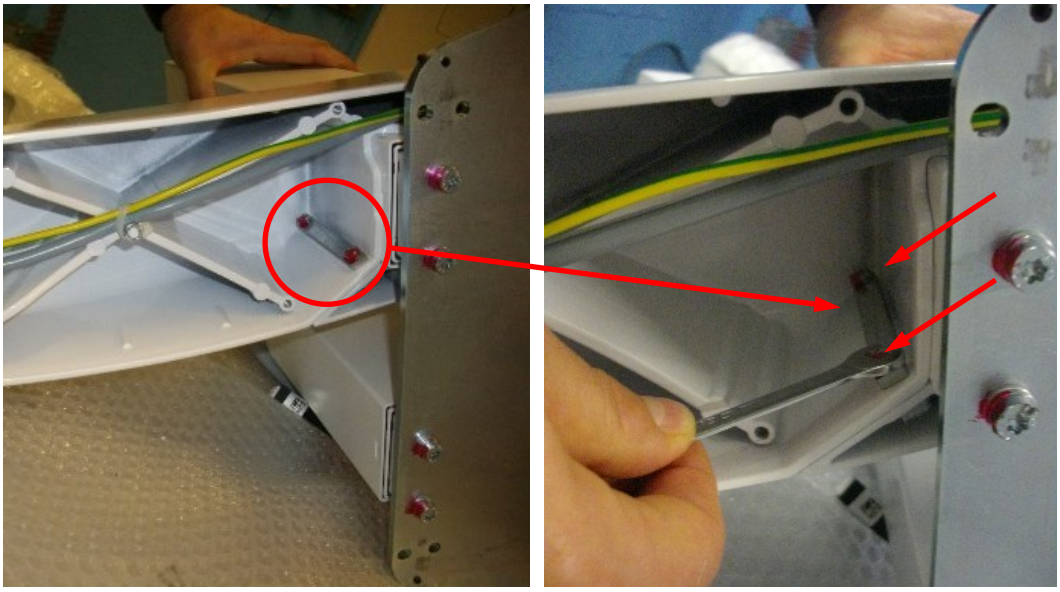


Figure 69

28. Loosen the two screws in the back side of the arm.

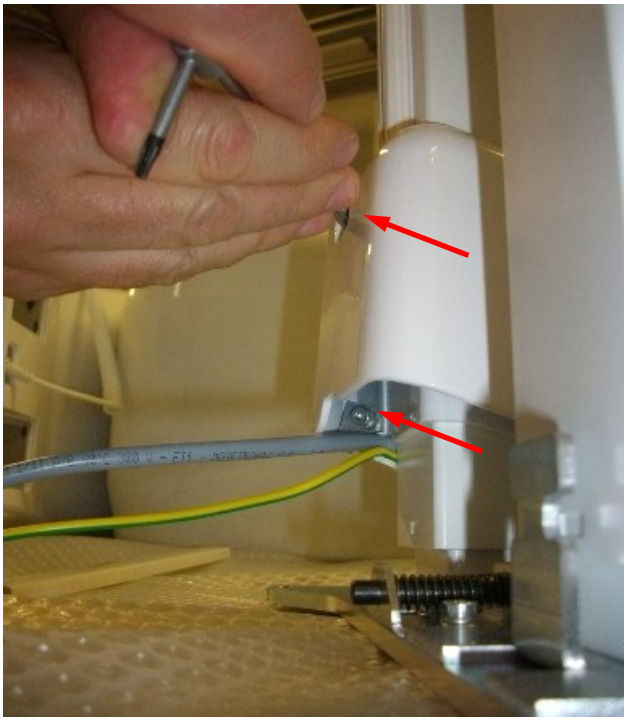


Figure 70

29. Slide the arm out of the column.

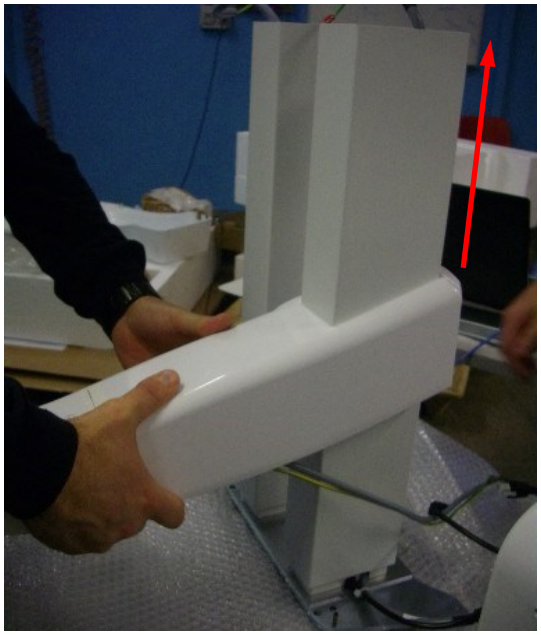


Figure 71

30. Remove the control box from the wall plate.

Figure 72

31. Position the arm on right side of the spare column, measuring the distance between top side and arm. Fix it to the column.

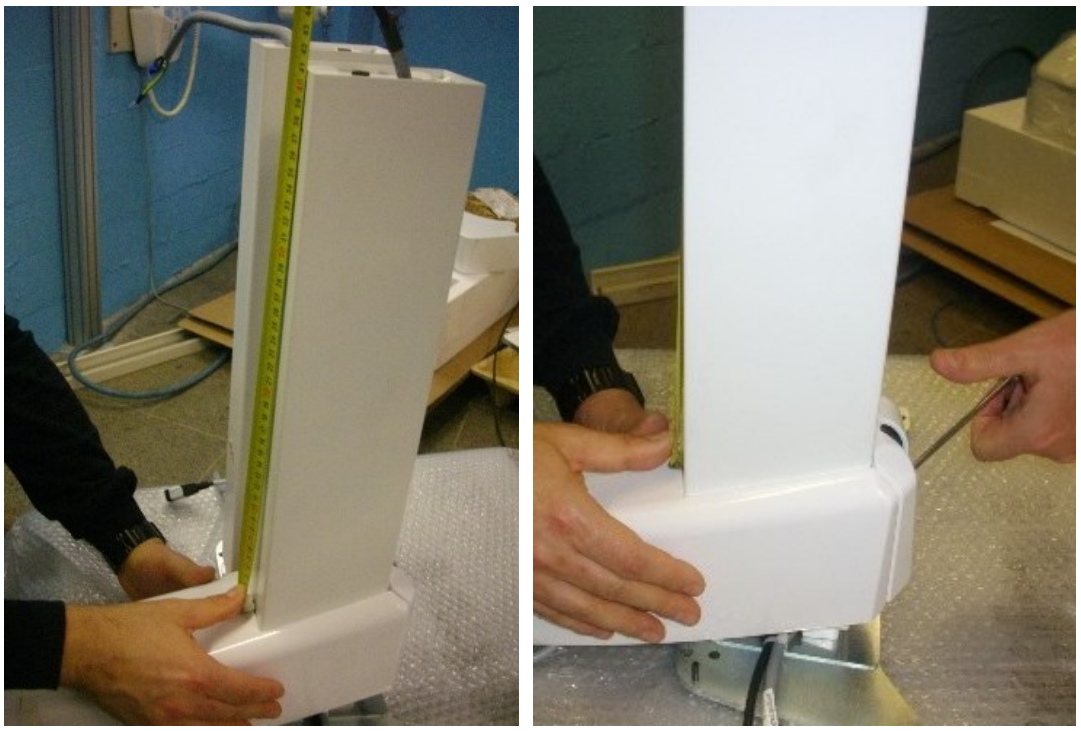


Figure 73

32. Close the arm lower cover.

Figure 74

33. Mount the new control box.

Figure 75

34. Position the new group and pass the cables in the back side of the arm, without mounting the adhesive channel.

Figure 76

35. Mount the hinge and push down the safety pin using a hammer.

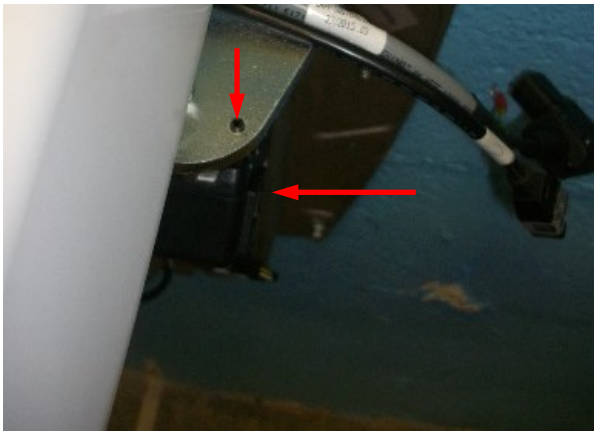


Figure 77

36. In order to easily mount the cable, tilt the column group and fix the cable with the terminal strip.

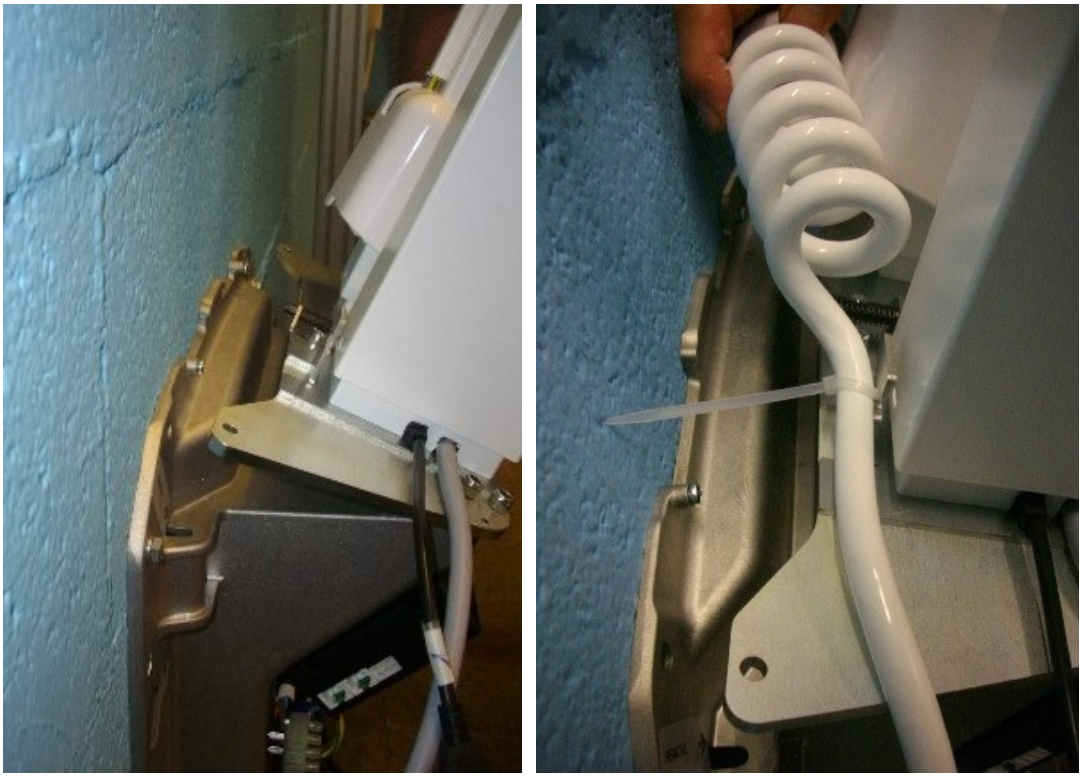


Figure 78

37. Once fixed the cable, insert and fix the safety pin; tighten the hinges.

Figure 79

38. Insert the cables from new column in the head.

Figure 80

39. Position the head on the columns.

Figure 81

40. Put the screws on the column top side and fix them without tightening completely.

Figure 82

41. Insert the spiral cable on top side of the head and connect all the cables (see points 10, 14 and 16 above).

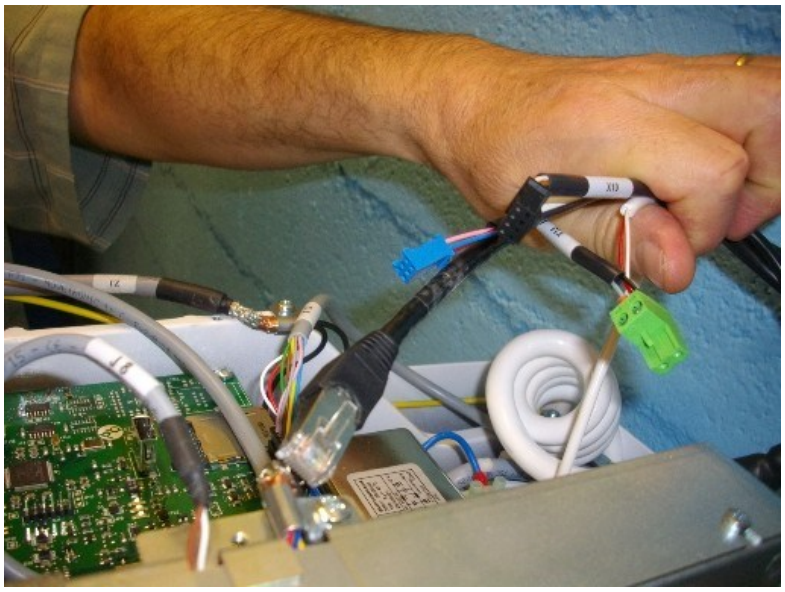


Figure 83

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 84

43. Remove the rotating arm fixing plate.

Figure 85

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 58) it is possible to rotate head until the laser correspond 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 4.2.2.1).

49. Turn ON the unit and check up/down movement.

Note
The first time I-MAX is switched on, we recommend resetting the columns. To do this, bring the columns to the lowest point, then press the "column down" button for a few seconds until the columns make a small down-up movement.

50. Make exposure and verify the image quality as described in paragraph 7.7.

11.3.7. 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 4.2.2.1).
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.

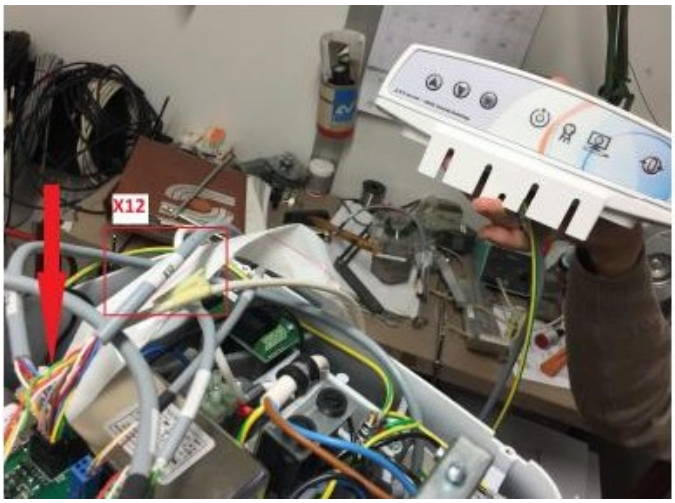


Figure 86

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 87

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).

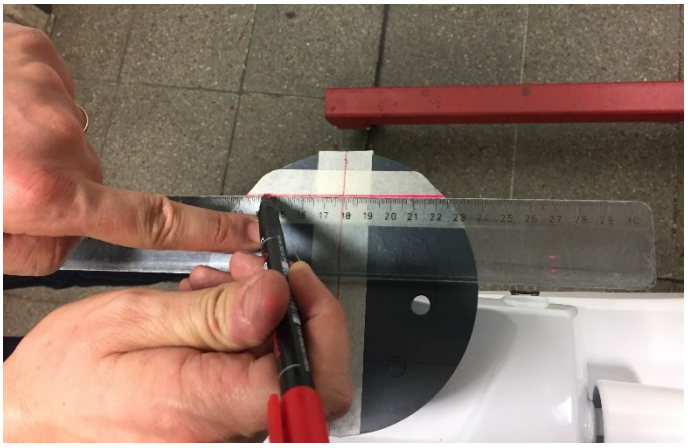


Figure 88

Rotation references are present on the tool and it has to be used as reference to position the unit in the same position.

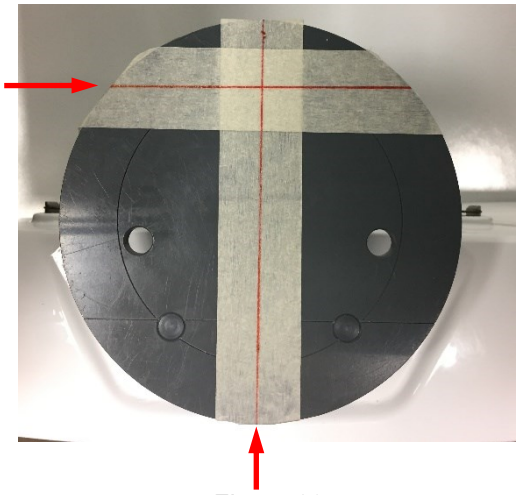
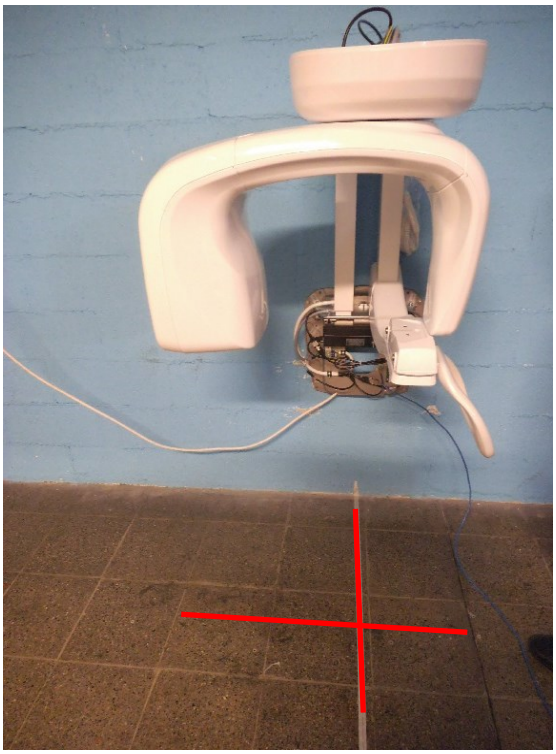


Figure 89

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.



10. Unplug the X12 cable and the ground.

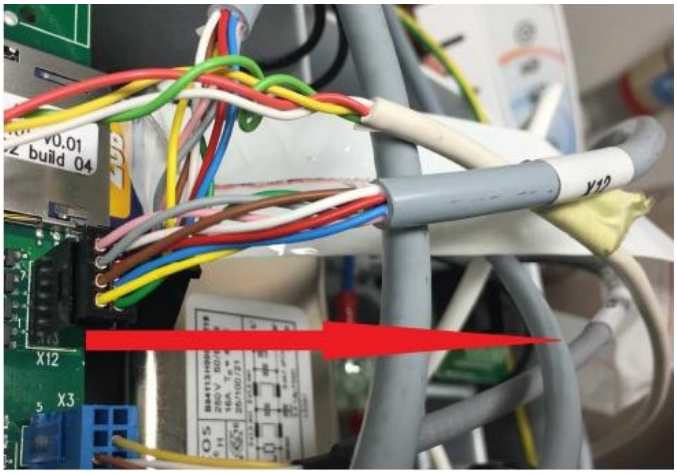


Figure 90

11. Open the wire-way positioned in the back side of the column as shown in the following images.

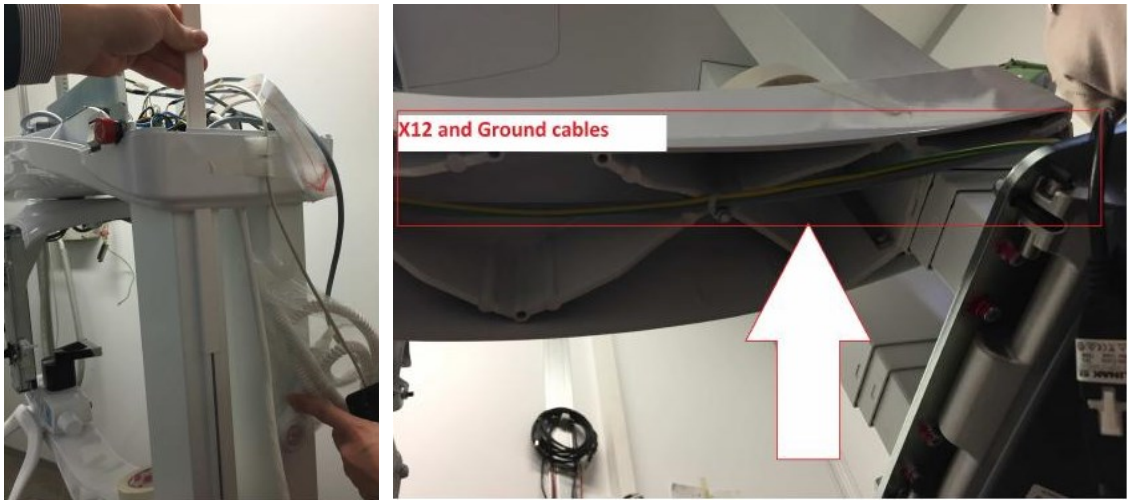


Figure 91

12. Unscrew the two screws under the arm.

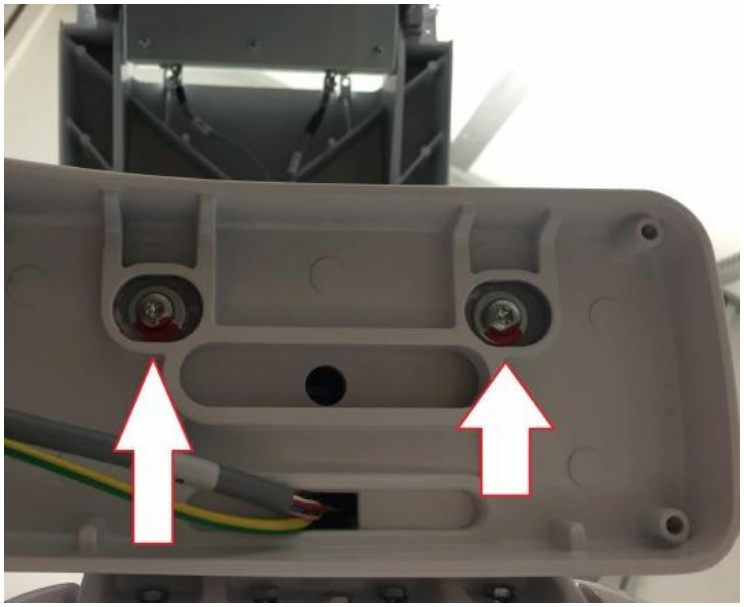


Figure 92

13. Remove the group "key board-handle".

14. Position the new group.

15. Turn ON the unit in Service mode.

16. Turn ON the laser and press >0< button on the keyboard to rotate the unit.

17. 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.

18. If both the sagittal and horizontal line are aligned, hard tighten the screws.

19. Turn OFF the unit.

20. Set DIP-switch 3 to OFF to set the unit in normal mode (see paragraph 4.2.2.1).

21. Turn ON the unit.

22. Make exposure and verify the image quality as described in paragraph 7.5.

11.3.8. 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.

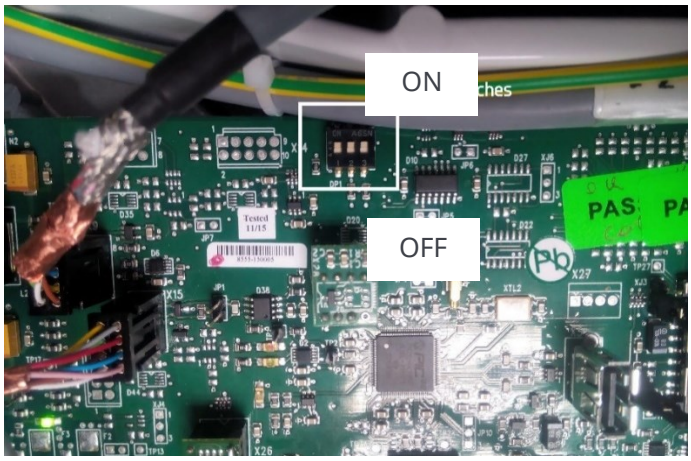


Figure 93

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).

Figure 94

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).

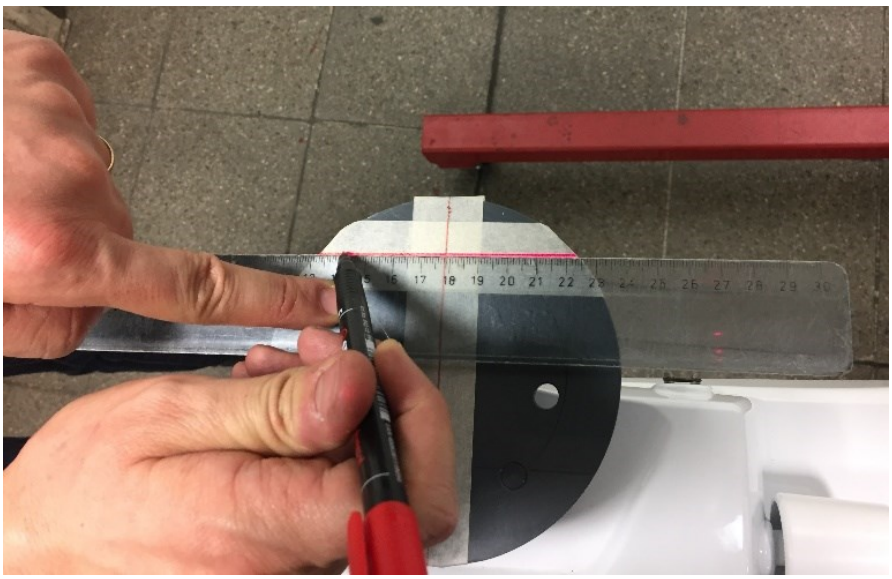


Figure 95

Rotation references are present on the tool and it has to be used as reference to position the unit in the same position.

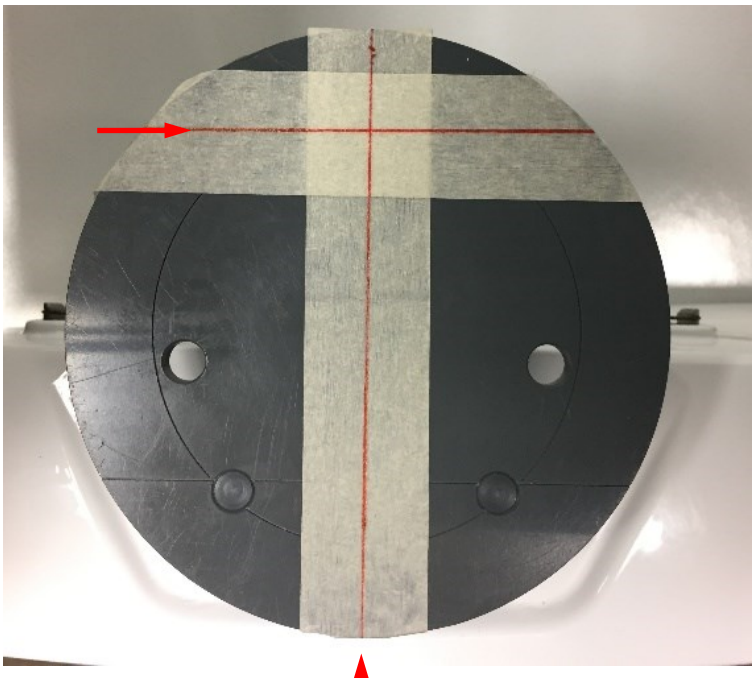


Figure 96

8. Turn OFF the unit.
9. Take the wrench TORX T20 provided with the spare part (Figure 97)

Figure 97

10. Identify the four torx screws and unscrew first the two external ones (n.1and n.2 *in Figure 107*). At this point the first step is to lose the two internal screws (n.3 and n.4 in Figure 107) and then to remove them in a second step. Now you can remove the upper cover.

Figure 98

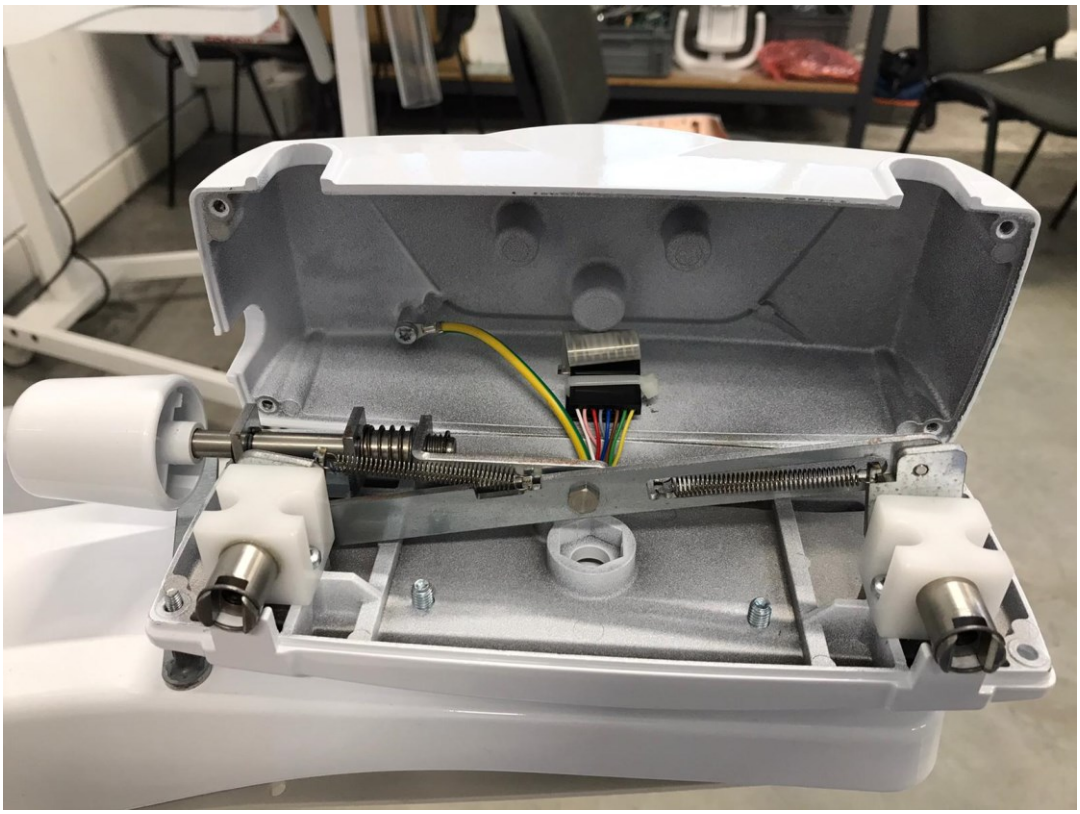
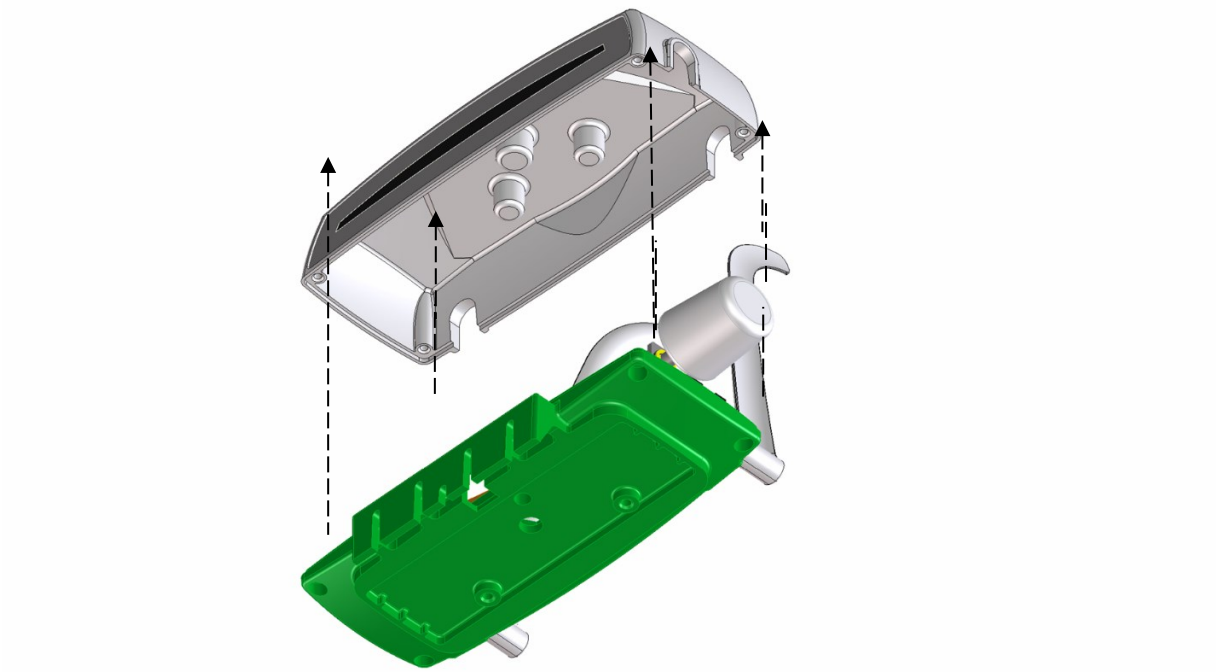


Figure 99 – Chin support assy 2D

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.

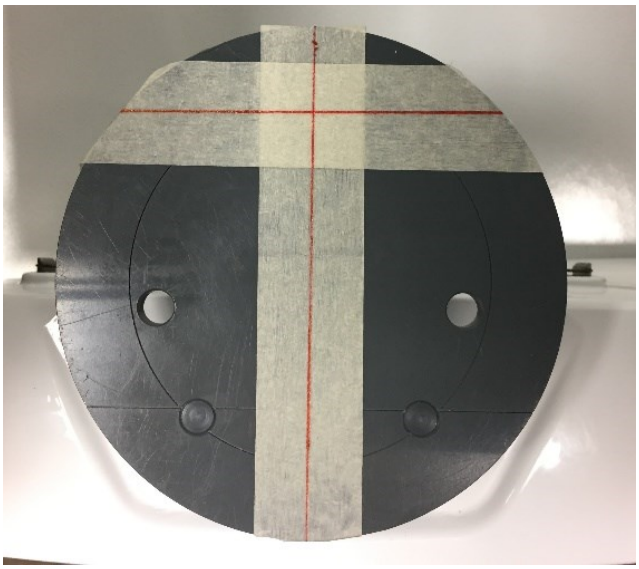


Figure 100

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.

Figure 101

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.

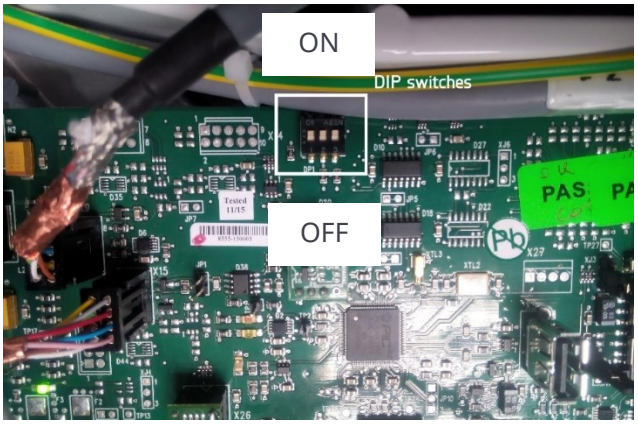


Figure 102

15. Turn ON the unit.

Make exposure and verify the image quality as described in paragraph 7.7

11.3.9. Patient handle replacement instruction

1. To remove a broken patient handle (Figure 103) you need a 7mm wrench (Figure 104)

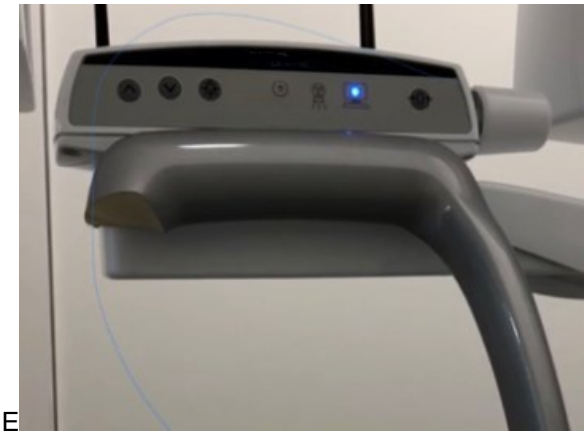


Figure 103

Figure 104

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 (Figure 105 and Figure 106).

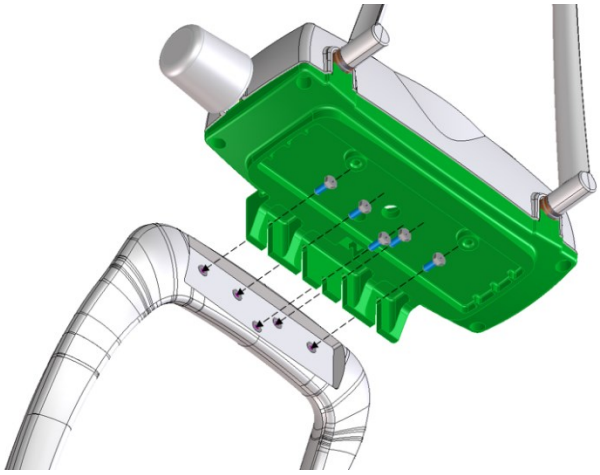


Figure 105

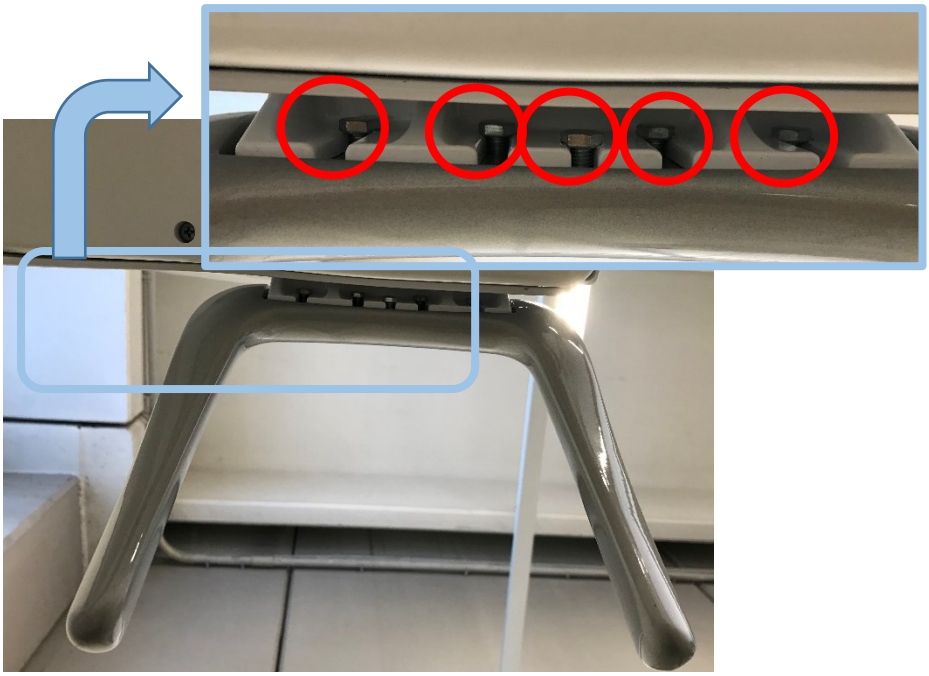


Figure 106

2. Now you can point the screws into the spare part and mount the new handle (Figure 107).

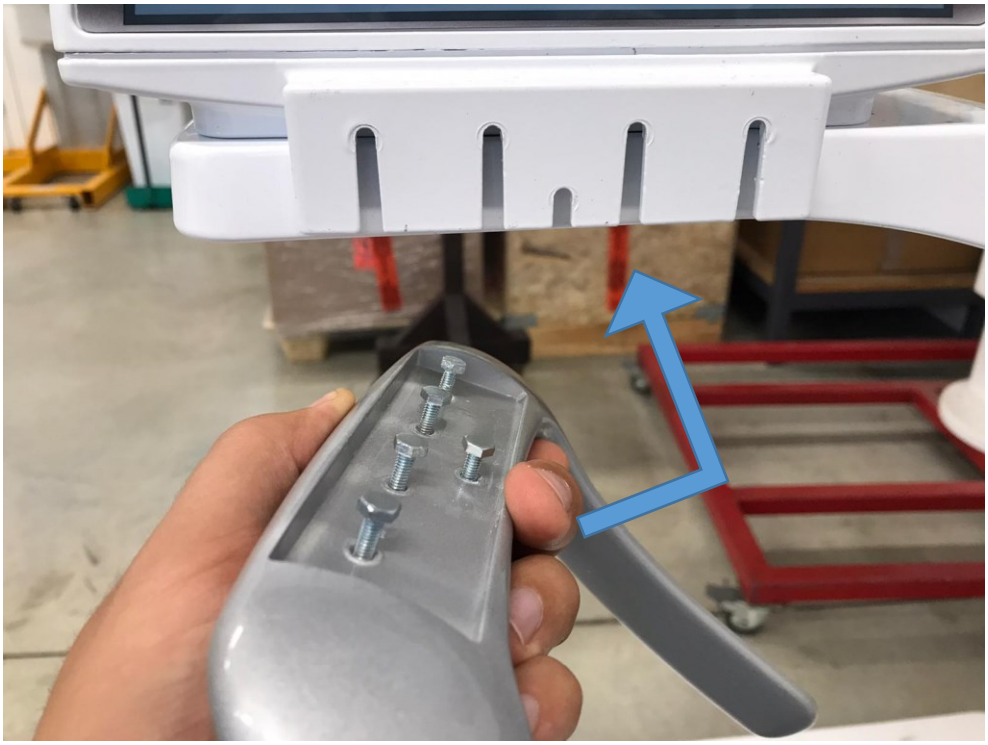


Figure 107

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12. SCHEMATICS AND DRAWINGS

1 – General diagram

2 – Layout MCU PCB A1

3 – Layout Generator PCB A2

4 – Layout External signal PCB A8

5 –Pan sensor power supply board A14

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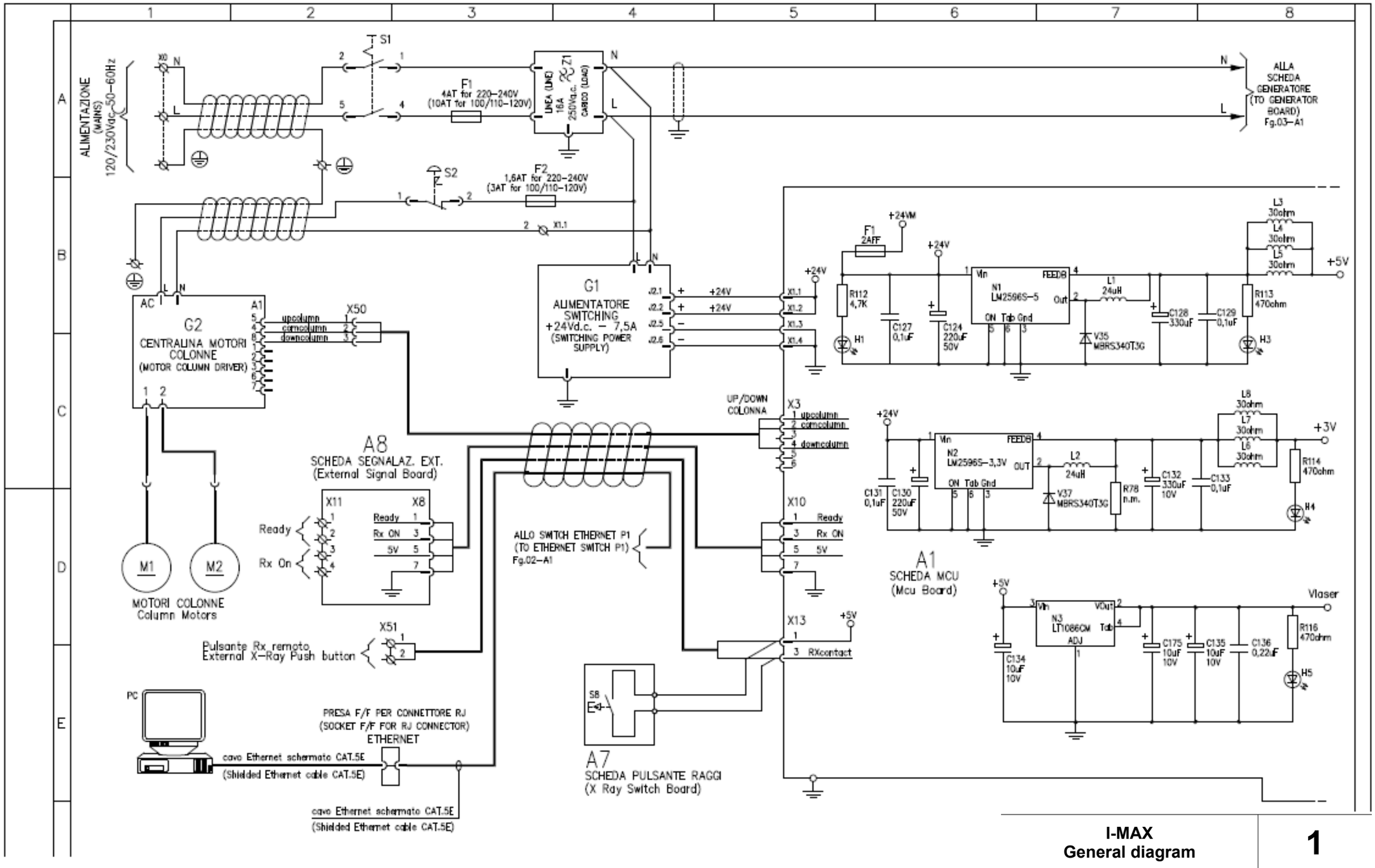
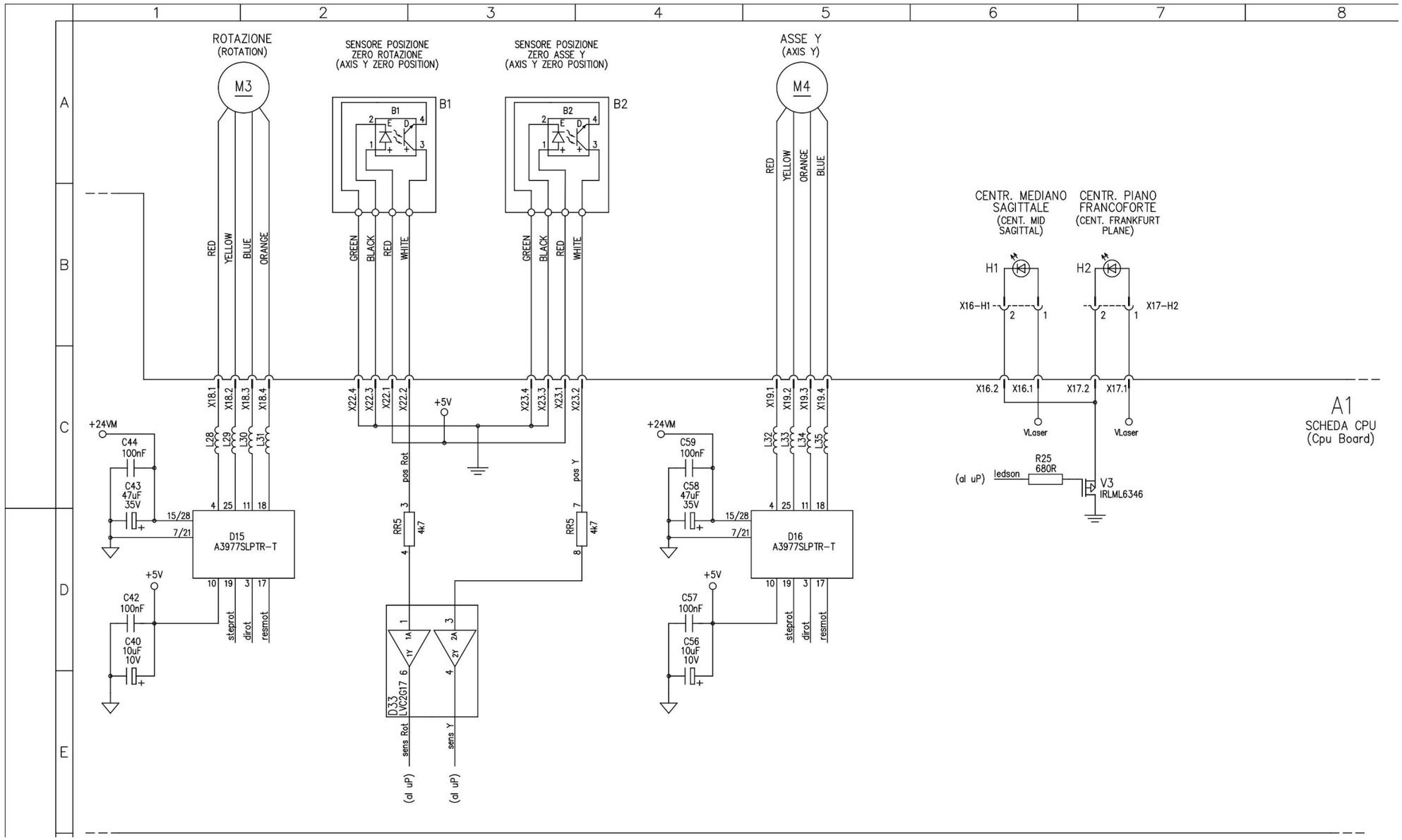
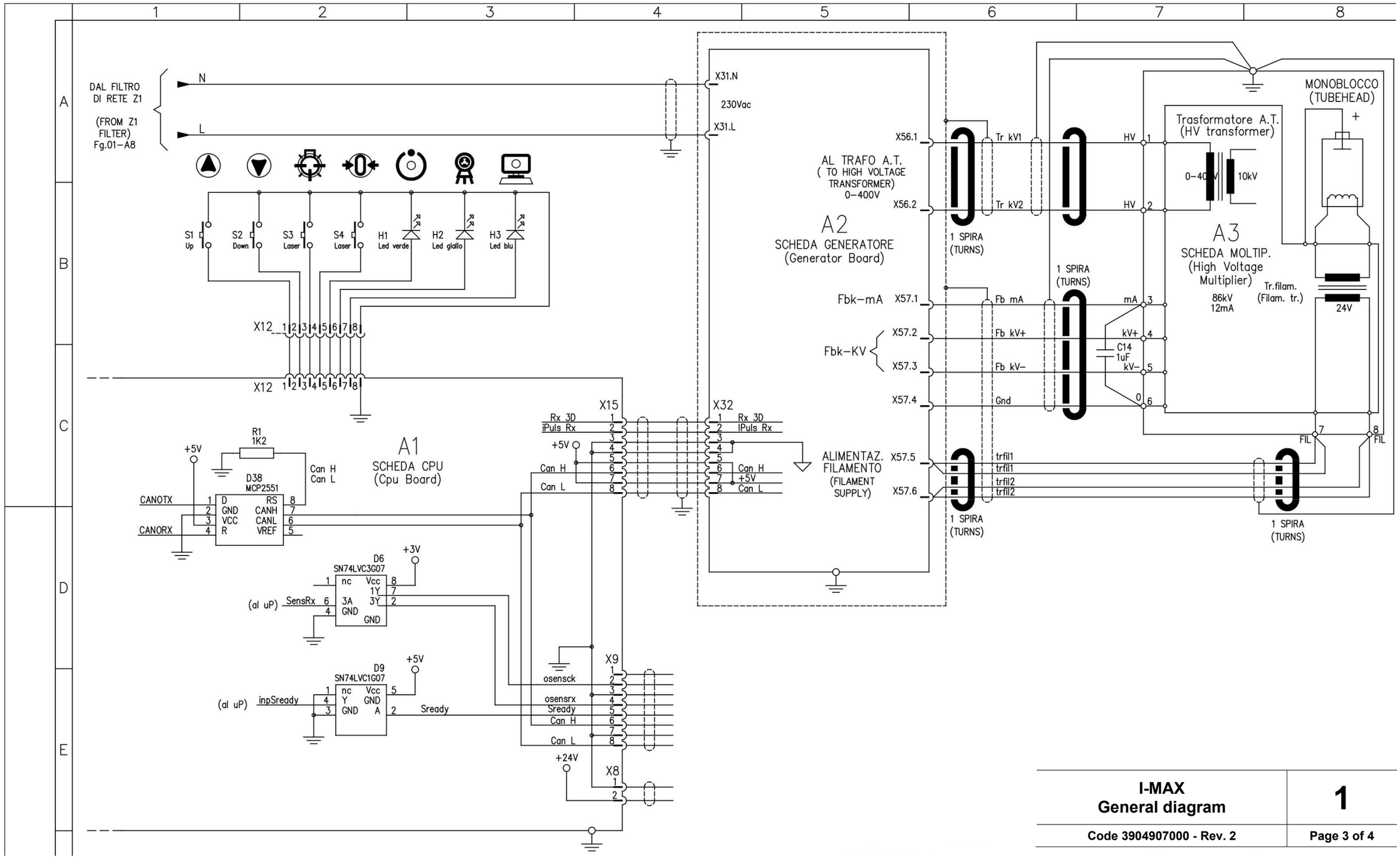


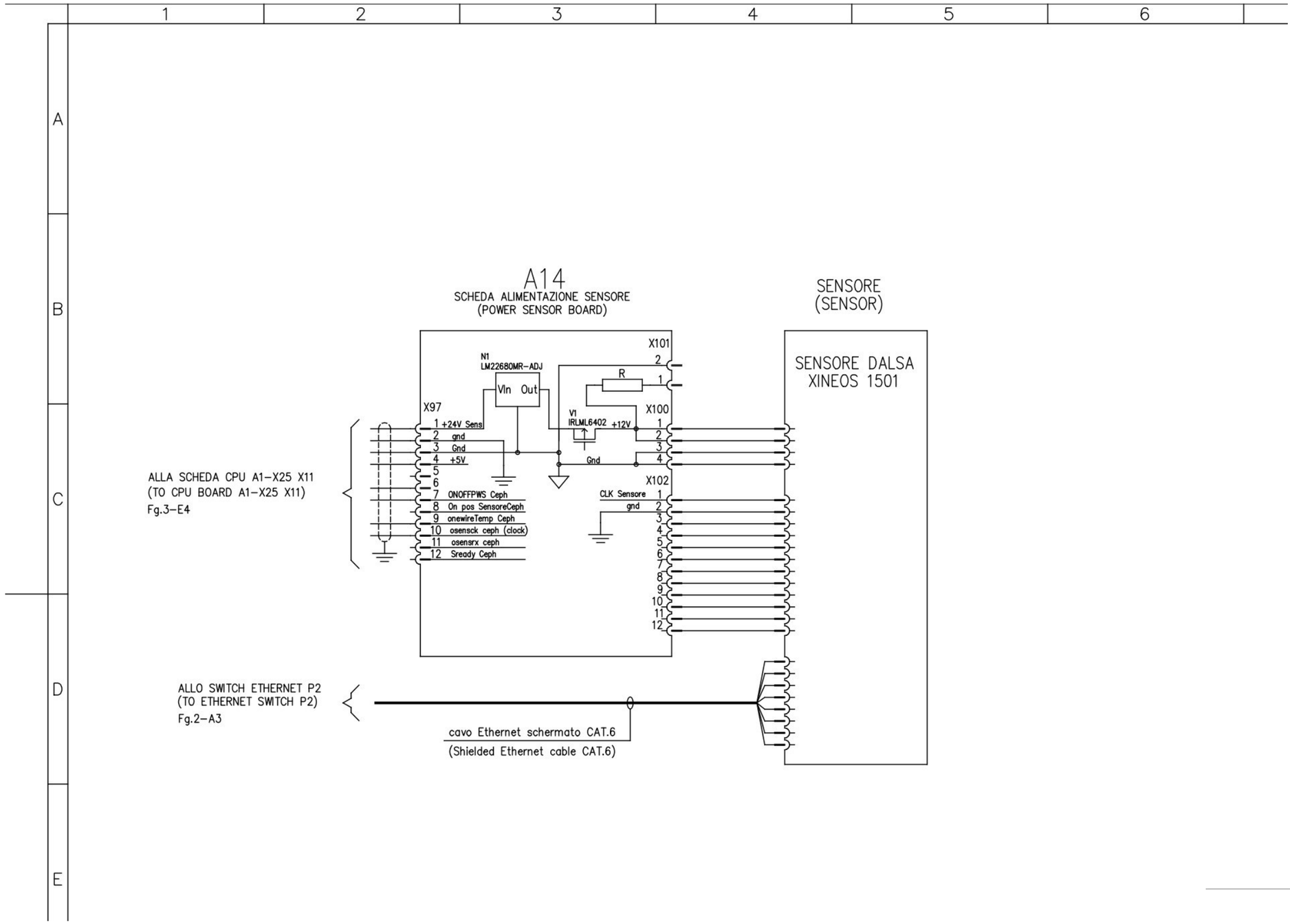
I-MAX General diagram	**1**
Code 3904907000 - Rev. 2	**Page 1 of 4**



I-MAX General diagram	1
Code 3904907000 - Rev. 2	Page 2 of 4



I-MAX General diagram	1
Code 3904907000 - Rev. 2	Page 3 of 4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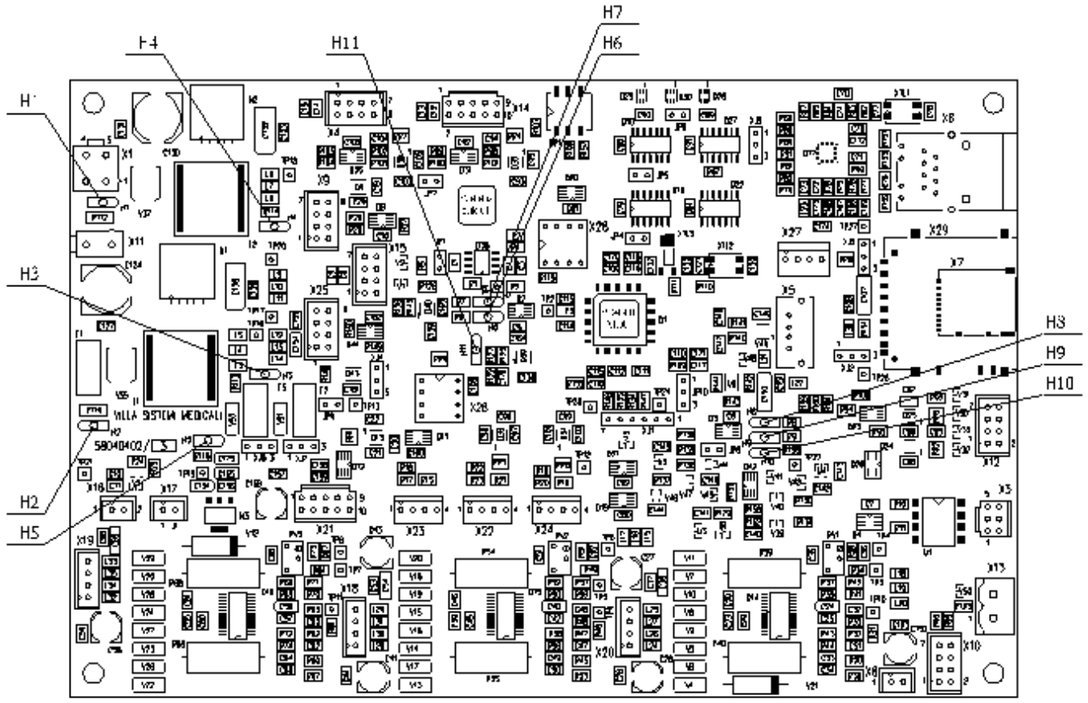
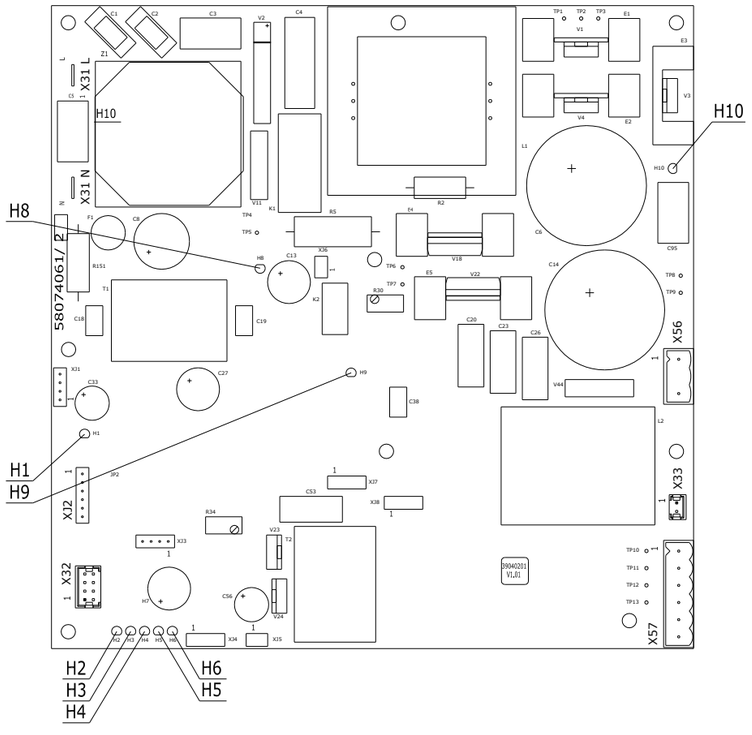
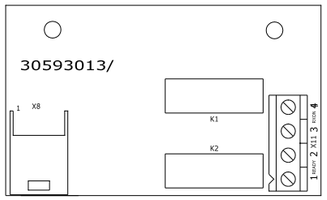
A
B
C
D
E
A14
SCHEDA ALIMENTAZIONE SENSORE
(POWER SENSOR BOARD)
SENSORE
(SENSOR)
SENSORE DALSA
XINEOS 1501
N1
LM22680MR-ADJ
Vin Out
R
V1
IRLML6402
+12V
Gnd
X97
1 +24V Sens
2 gnd
3 Gnd
4 +5V
5
6
7 ONOFFPWS Ceph
8 On pos SensoreCeph
9 onewireTemp Ceph
10 osensck ceph (clock)
11 osensrx ceph
12 Sready Ceph
X100
1
2
3
4
X101
2
1
X102
CLK Sensore 1
gnd 2
3
4
5
6
7
8
9
10
11
12
ALLA SCHEDA CPU A1–X25 X11
(TO CPU BOARD A1–X25 X11)
Fg.3–E4
ALLO SWITCH ETHERNET P2
(TO ETHERNET SWITCH P2)
Fg.2–A3
cavo Ethernet schermato CAT.6
(Shielded Ethernet cable CAT.6)



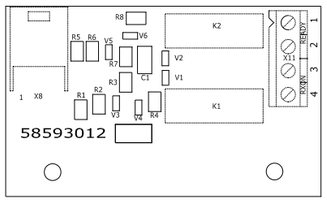
I-MAX Layout MCU ETH	2
Code 58040700 - Rev. 2	Page 1 of 1



I-MAX Layout Generator PCB A2	3
Code 58074061 - Rev. 2	Page 1 of 1

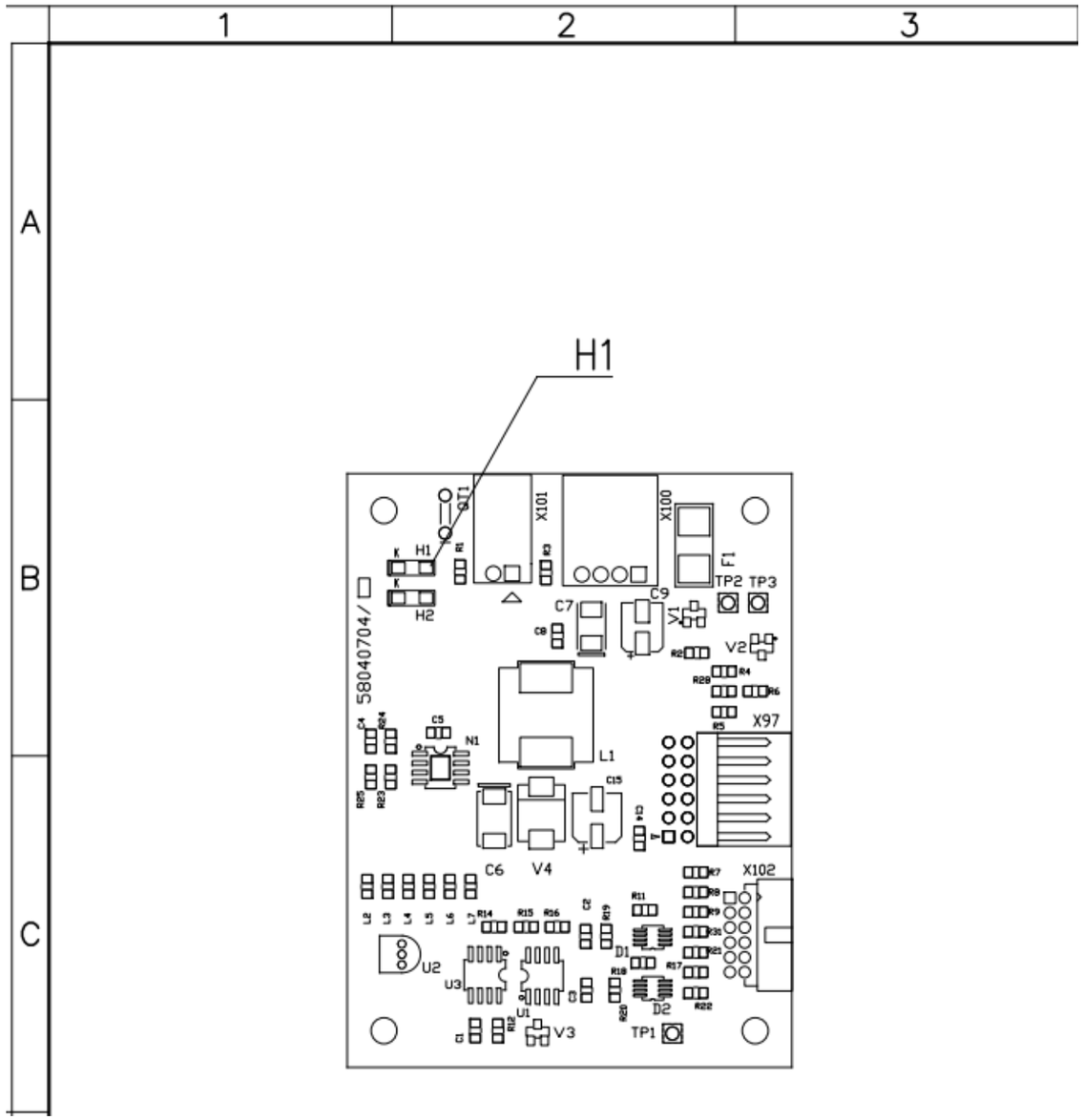


Solder side



Component side

I-MAX Layout External signal PCB A8	4
Code 58593012 - Rev. 0	Page 1 of 1



I-MAX Pan sensor power board A14 layout	5
Code 58040704 - Rev. 0	Page 1 of 1

13. SPARE PARTS

1 – Top side of the unit

2 – Rotating arm

3 – Up/Down Column

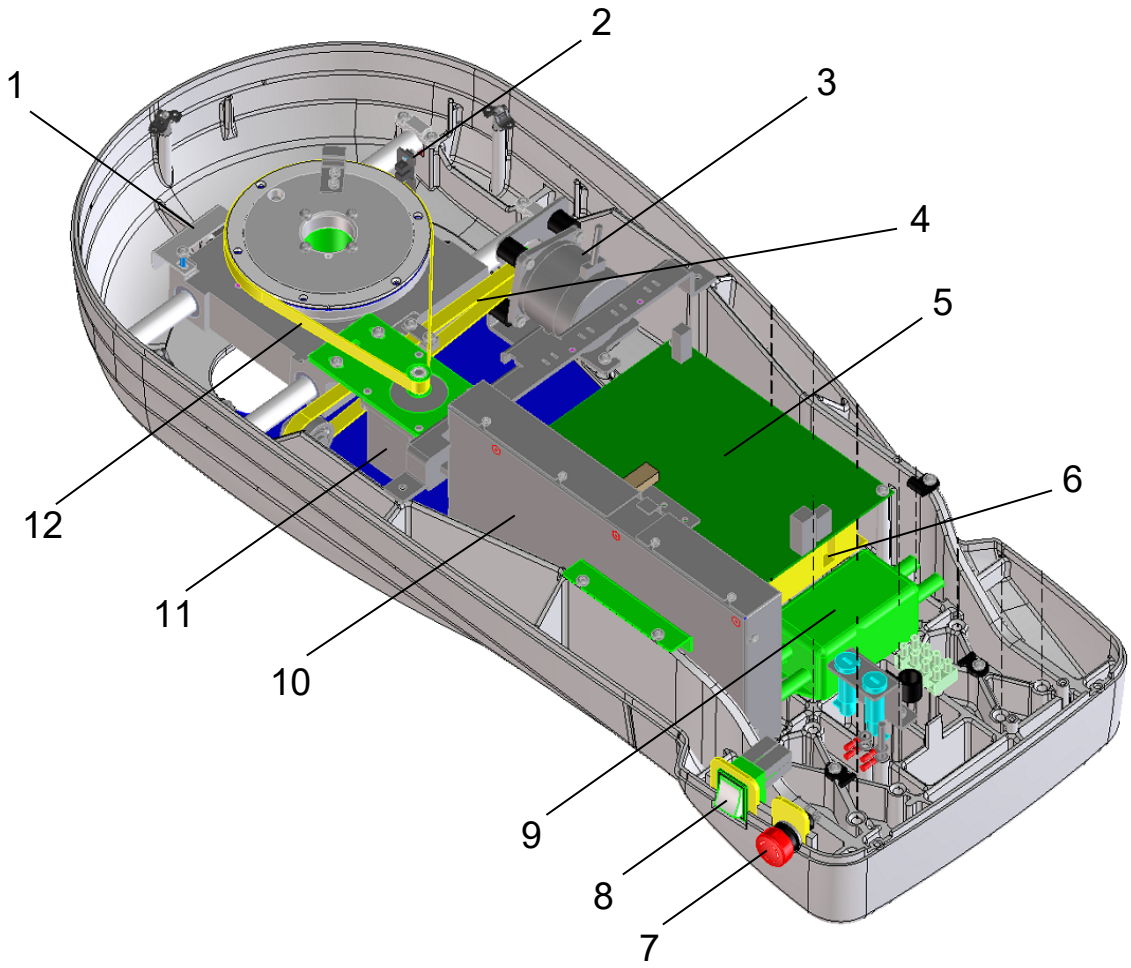
4 - Cables

5 - Covers

4 - Accessories and Service tools

1 – Top side of the unit

Ref.	Order code	Description	Note
1	6604041000 (old code: *6204041000*)	Light sensor assy Y axes	
2	6604040900 (old code: 6204040900)	Light sensor assy rotation	
3	6604040200	Y axes motor assy	
4	6690807000 (old code: 4990807000)	Y movement belt	
5	6604000500 (old code: 5804040200)	MCU board	For **white switch** device
6	6692824900 (old code: 4492824900)	Power supply board	
7	6691421400 (old code: 4291421400)	Emergency push button	
8	6691420900 (old code: 4291420900)	ON/OFF Switch	For **white switch** device
9	6692212200 (old code: 4192212200)	Main filter	
10	6604001300 (old code: 4695478800 4695483100)	DSPU board kit	For **white switch** device
11	6604040100	Rotation motor assy	
12	6690806900 (old code: 4990806900)	Rotation belt	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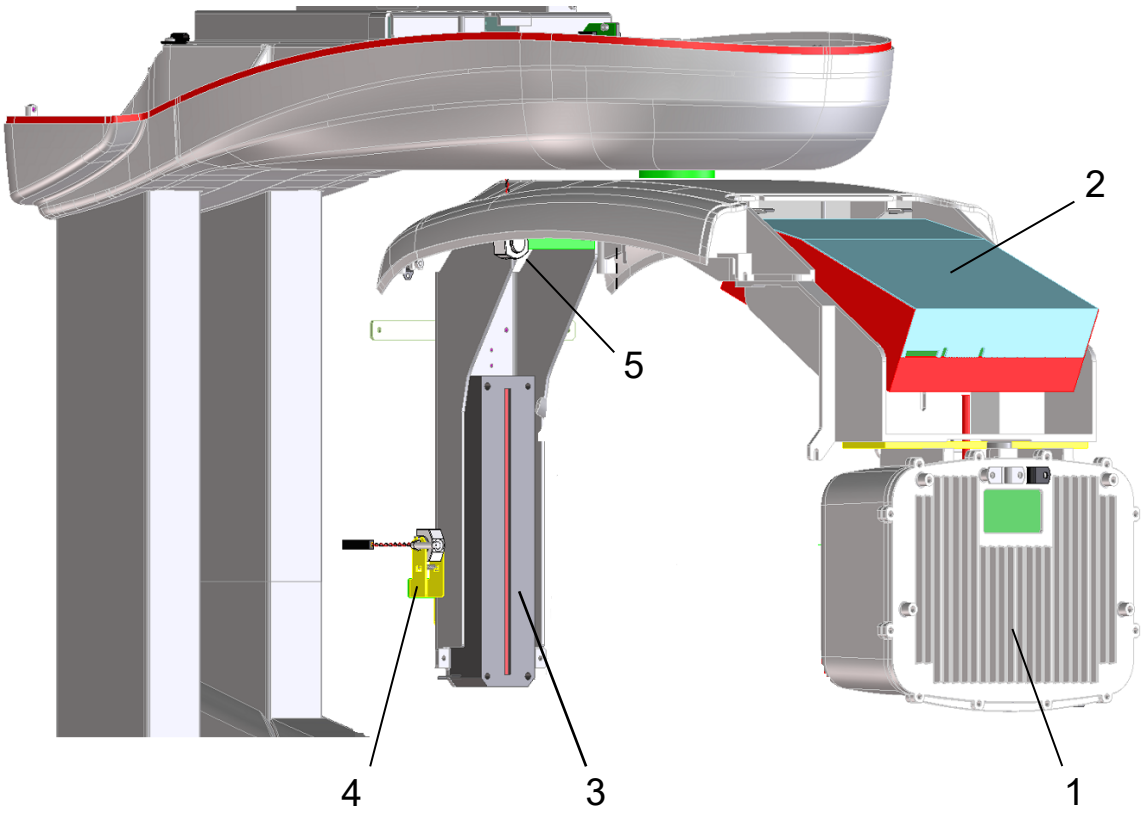
2 - Rotating Arm

Ref.	Order code	Description	Note
1	6604000000	Tube head assy	
2	6604000600 (old code: 5807406100)	HF board	
3.a	6695443500 (old code: 4695443500)	Pan Sensor White Switch (S7199-01D2)	For **white switch** device
3.b	6604071100	Pan Sensor Black Switch (Xineos 1501)	
4	6604020000	Sagittal laser assy	
5	6604020100	Frankfurt laser assy	
6	6604010400	Chin support assy	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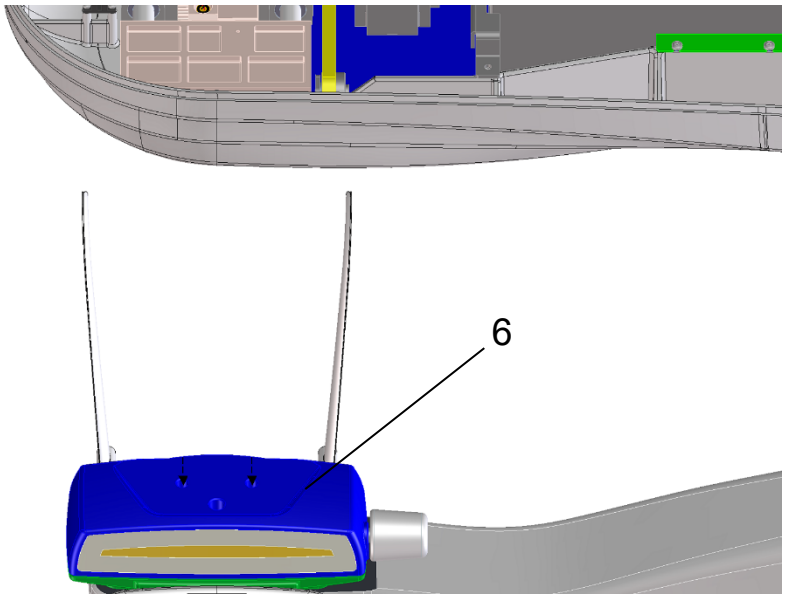
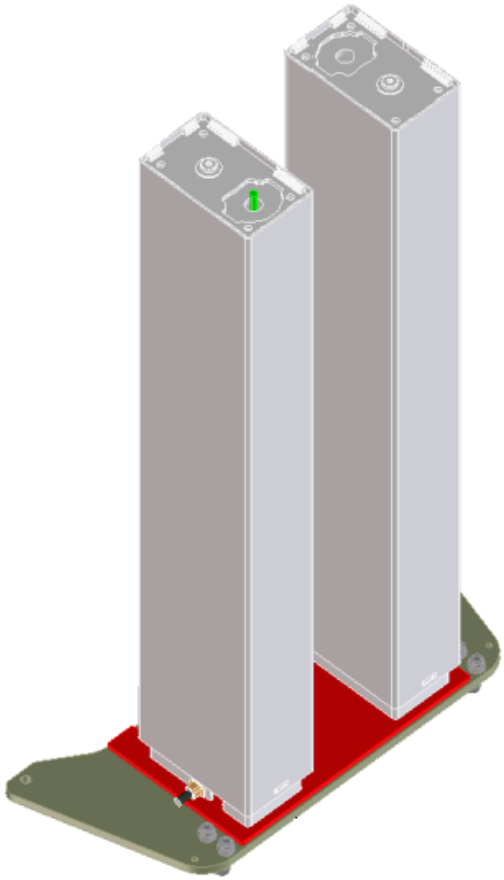

6

3 – UP/DOWN Column

Ref.	Order code	Description	Note
1	6604102600	2D – 3D Grey Column Group	
--	6692707700	Linak control board	--

Note
Kit includes both column adjusted and assembled to the support plate and the relevant control box.

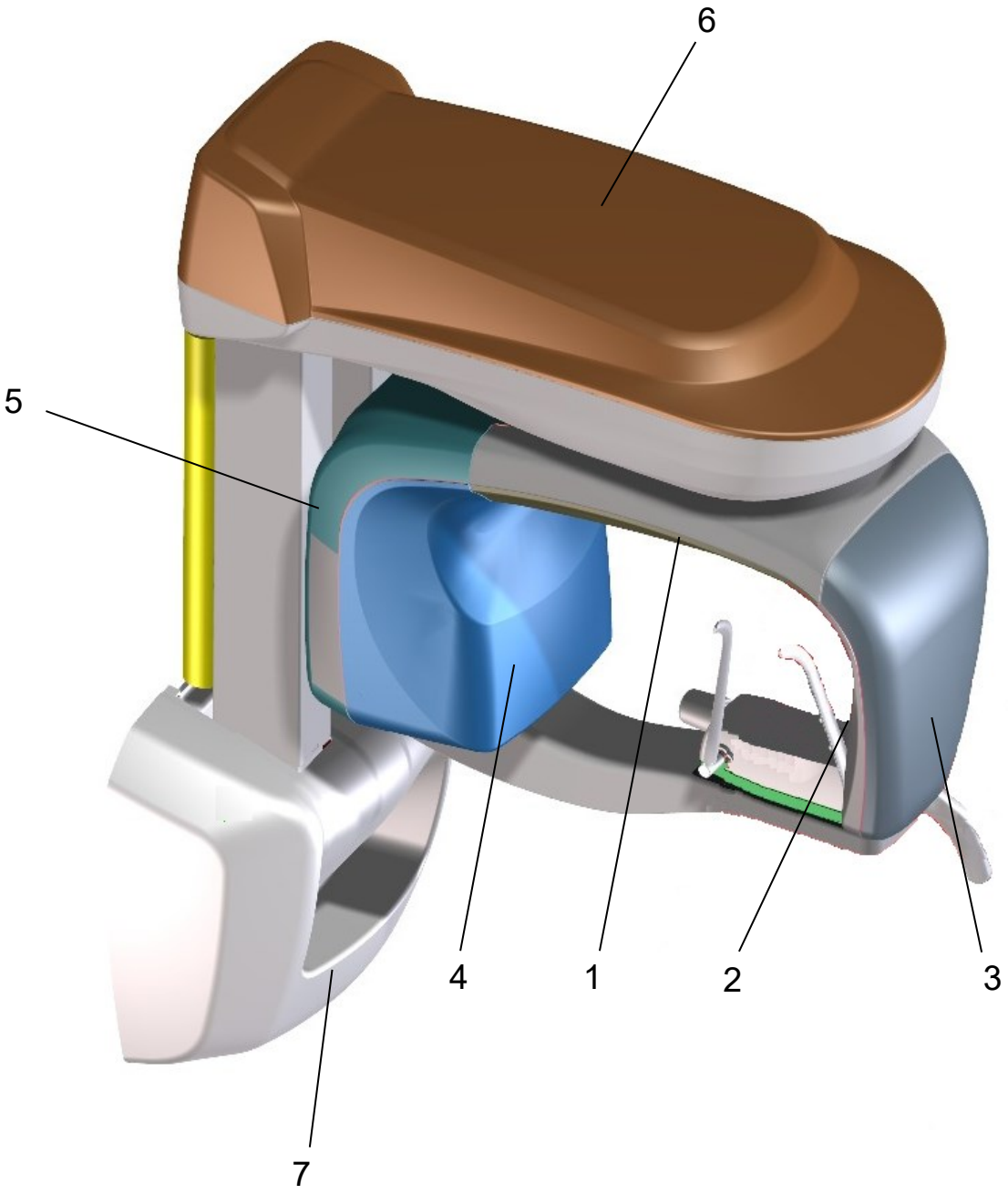


4 - Cables

Ref.	Order code	Description	Note
--	6604100500 (old code: 6204100500)	Main coiled cable	
--	6604040500 (old code: 6204040500)	Laser cable 1	
--	6604040600 (old code: 6204040600)	Laser cable 2	
--	6604040101 (old code: 6204040100)	Generator board power supply cable	
--	6604040201 (old code: 6204040200)	Generator board signal cable	
--	6604042000 *(old code: 6204042000)*	MCU board power supply cable	
--	6604040400 (old code: 6204040400)	DSPU Board CAN Bus and signal cable	

5 - Covers

Ref.	Order code	Description	Note
1	6604022005 (old code: 5404020305)	Rotating arm lower cover	
2	6604022105	Sensor internal cover	
3	6604023305	Sensor external cover	
4	6604022405	Tube head internal cover	
5	6604022121 (old code: 5404020605)	Tube head external cover	
6	6604042005	Upper cover	
7	6604103121	Wall support cover	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6 - Accessories and Service Tool

Ref.	Order code	Description	Note
--	6607090100	PAN centering bites (50 pcs)	
--	6607110700 (old code: 6107110700)	Disposable bite protective sleeves (100 pcs)	
--	6604011508	Panoramic standard chin support	
--	6604011708	Panoramic chin support (reduced height)	
--	6604011608	Maxillary-Sinus chin support	
--	6607099800 (old code: 6604011800)	TMJ positioner	
--	6607110800 (old code: 6107110800)	TMJ positioner protective sleevers (60 pcs)	
--	6695190000 (includes: 5207900900 6195170100 6195170200)	Service tools kit	
--	6604090800 (old code: *6104090800*)	X-ray button	

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

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						
Bitewing Y offset						
Y Jaw type (mm)						
Tubehead pre-heating values	2mA					
	3mA					
	4mA					
	5mA					
	6mA					
	7mA					