CTOMAPT
DENTAL SOLUTIONS

FONA

FONA ART Plus C

Operating Instructions

English

Dear Customer

Thank you for purchasing your new FONA ART Plus C X-ray unit for panoramic and cephalometric radiography.
For this we have provided you with a set of technical literature: Operating Instructions, Installation instructions, Maintenance Instructions and Service Manual. Keep this literature for easy and quick reference. In order to protect your warranty rights, please fill out the "Installation Report" provided at the end of the installation manual immediately after the installation of the unit. Read the Operating Instructions to familiarize yourself with the unit before taking radiographs on the patient. Please observe the radiation Protection Regulations and Warning and Safety Notes.

Responsibilities of the User

The user has the following responsibilities:

- Use the system following the instructions and recommendations contained in this user manual.
- Keep the machine in perfect working condition following the maintenance instructions given by the manufacturer. Failure to observe the instructions relieves the manufacturer or his agent from any responsibility for injury, damage or non-conformities that may derive there from.
- Promptly notify the competent Health Authority and the manufacturer in the event of an accident involving this medical device and/or operations that may cause death or put the patient and/or the user at risk. The type and serial numbers of the components involved, indicated on the external labels, are to be communicated to the manufacturer.

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1. Warning and Safety Notes

Instructions	The accompanying documents among which the Operating Instructions and the Installation Instructions supplied with the unit are integral parts of the product. The original language of the Operating Instructions is English.
Labeling of warning and safety information	In order to prevent injury to persons and damage to the equipment you must also read the warning and safety notes given in these Operating Instructions.
Destination of use	This unit has been designed for use in creating panorama radiographic exposures.
System assembly at installation	The system is fully tested in manufacturing and can be operated once the major modules are mechanically assembled at installation and then connected to the power line.
General safety information	As manufacturers of medical devices, we can assume responsibility for safety-related performance of the equipment only if maintenance, repair and modifications are carried out only by us or agencies we have authorized for this purpose, and if components affecting safe operation of the unit that may be needed are replaced with original parts. We suggest that you request a certificate showing the nature and extent of the work performed, from those who carry out such work, and specify that the certificate show any changes in rated parameters or working ranges, as well as the date, the name of the firm, and a signature. For safety reasons only use original accessories indicated in this Operating Instructions. It is the user's risk when using non-released accessories. Exposures of patients may only be taken if the unit functions fault-free. Never leave the unit unattended.
Safety measures during switch-on	Following extreme temperature fluctuations, condensate formation may occur; therefore please do not switch on the device until normal room temperature has been reached (see chapter 2, Technical Description).
Electromagnetic Compatibility	This unit may be operated in a residential/hospital area, provided it is used under the responsibility of a trained medical operator, and following the recommendations reported in chapter 14, .
Interference with medical devices by radio telephones	To guarantee the operational safety of medical devices, it is recommended that the operation of mobile radio telephones in the medical practice or hospital is prohibited.
Malfunction of electronic units/ devices which are worn on the patient's body	In order to prevent failure of electronic units and data storage devices, e.g. radio-controlled watch and telephone card, etc., it is essential that these be removed prior to X-ray exposure.
Laser light localizers used	This product incorporates Class 1 lasers as light localizers for the positioning of the patient. They must not be used for other purposes. A minimum distance of 100 mm must be maintained between the eye and the laser. Avoid unnecessary exposure of the eyes and pay attention that the beams are not intercepted by any optical device.
Electrical safety	Trained and qualified technicians only are authorized to remove covers and have access to power circuits. Power supply lines must comply with safety legislation and have ground terminals for protective earth connection.

Computer hardware

It is recommended that the computer and other additional devices for image acquisition, processing, and printing comply with the requirements of the safety standard IEC EN 60601-1.

If not, such hardware must stay outside the patient area, i.e. at an horizontal distance greater that 1.5 m from the patient or more than 2.5 m from the floor, when placed above the patient, and it is recommended that be compliant with the requirements of the standard IEC EN 60950.

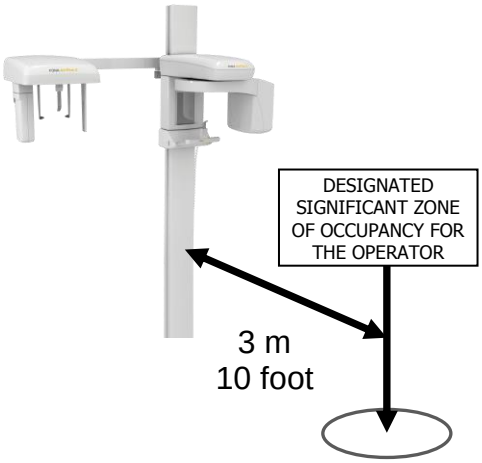
Mechanical safety

Make sure that fingers or other parts of the patient or of the operator are not pinched during the movement of the unit.

Explosion

The equipment cannot be used in presence of flammable gases or vapours.

Radiation protection guidelines



X-ray equipment produces ionizing radiation that may be harmful if not properly controlled. It is therefore recommended that the equipment be operated by trained personnel only, in accordance with existing law.

Observe the applicable health physics regulations. The radiation protection facilities should be used.

The operator should remain as far away from the X-ray tube as the cable of the release button permits (in the designated significant zone of occupancy for the operator).

With the exception of the patient, no other persons may remain in the room while the exposure is being made. Under exceptional circumstances a third person, however not belonging to the dental practice, may then assist.

Maintain visual contact with the patient and the unit during the exposure and in case of faulty operation, immediately discontinue the exposure by releasing the X-ray button.

Disassembly and reinstallation

For disassembly and reinstallation of the unit proceed as described in the installation instructions for new installation to ensure perfect function of the unit and its stability.

Disposal

It generally applies that any disposal of this product must comply with the relevant national regulations. Please observe the regulations applicable in your country.

Within the European Economic Community, Council Directive 2012/19/EU (WEEE) requires environmentally sound recycling/disposal of electrical and electronic devices.

Your product is marked with the adjacent symbol. Disposal of your product with domestic refuse is not compatible with the objectives of environmentally sound recycling/ disposal. The black bar underneath the "garbage can" symbol means that it was put into circulation after Aug. 13, 2005 (see EN 50419:2005).

Please note that this product is subject to Council Directive 2012/19/EU (WEEE) and the applicable national law of your country and must be recycled or disposed of in an environmentally sound manner.

The X-ray tube assembly of this product contains a tube with a potential implosion hazard, a lead lining and mineral oil.

Please contact your dealer if final disposal of your product is required.

2. Technical Description

Equipment classification	IEC: Class I, type B equipment with Class I LASER sources (IEC 60825-1). US FDA: Class II (21CFR872-1800, 21CFR892.1650) with Class I LASER sources (21CFR PARTS 1040.10, 1040.11) CE: medical device listed in class IIb

This product complies with the following standards:

IEC 601-1	General requirements for safety
IEC 601-1-2	Electromagnetic compatibility
IEC 601-1-3	General requirements for radiation protection in diagnostic X-ray equipment
EN 60601-1-4	Programmable Electrical Medical Systems
IEC 601-2-7	Particular requirements for the safety of high voltage generators of diagnostic X-ray generators
IEC 601-2-28	Particular requirements for the safety of X-ray source assemblies and X-ray tube assemblies for medical diagnosis
IEC 60825-1	Safety of laser products. Part 1: Equipment classification, requirements and user's guide
US FDA 21CFR1020.30	Performance Standards for Ionizing Radiation Emitting Products: Diagnostic X-ray Systems and their major Components
US FDA 21CFR1020.31	Performance Standards for Ionizing Radiation Emitting Products: Radiographic Equipment
US FDA 21CFR1040.10	Performance Standard for Light Emitting Products: Laser products
US FDA 21CFR1040.11	Performance Standard for Light Emitting Products: Specific purpose laser products

CE mark	This product meets the provisions of the European Council Directive 93/42/EEC relating to Medical Devices, and subsequent amendments and integrations of which in the Directive 2007/47/EC of the European Parliament and of the Council.

Nominal line voltage:	230 V ± 10%, 115 V ± 10%,
Nominal line frequency	50/60 Hz
Line fuse	8 A slow blow @ 230 V, 16 A slow blow @ 115 V
Mains Resistance	≤ 0.8 ohm at 230 V, ≤ 0.4 ohm at 115 V
Rating	1.8 kW
Curve form of high voltage	High frequency multi-pulse, ripple ≤ 4%
Tube Voltage	61 - 85 kV ± 5%, constant potential
Tube Current	4 - 10 mA ± 10%, direct current (DC)
Focus size	0.5 IEC 336
Inherent Filtration	> 3.0 mm Al @ 85 kV
Loading factor for leakage radiation	1.0 mA @ 85 kV
Leakage Radiation	< 50 mR/h (0.43 mGy/h) @ 100 cm, 85 kV 10 mA
Cool down pause	Variable pause depending on requested tube load
Maximum duty cycle	1/8
Column height	222 cm/87" (holes for wall plate at 210 cm/82.7" from floor)
Maximum height	229 cm/90.2"
Vertical displacement	89 cm/35", da 90 a 179 cm (da 35.5" a 70.5")
Vertical Movement	Motorized control with slow and quick motion
Weight	Pan Solo 100 kg/220 lb, Pan Ceph 120 kg/264 lb
Self standing base	Optional on request. Order code 93 600 09000

Panoramic Projections	P1: Adult Standard Panorama: 14 s, P2: Child Panorama: 13 s, P3: Left hemi-arch: 7 s, P4: Right hemi-arch: 7 s, P5: Anterior Teeth: 4.9 s, P6: TMJ normal occlusion or TMJ mouth opened: 2 x 2.2 s, P7: Frontal View of Maxillary Sinuses: 12 s
Cephalometric projections	P8: Antero-posterior (8 s), P9: Latero-lateral (10 s), P10: Carpus (8 s)
Anatomical Selection	Patient build on 4 levels: Small, Medium, Large, Extra Large
kV setting	9 positions in 3 kV steps: 61, 64, 67, 70, 73, 76, 79, 82, 85 kV
mA setting	5 positions according to R10 scale: 4, 5, 6.3, 8, 10 mA
Source-Image Receptor distance	Pan 51.3 cm/20.2”, Ceph 165 cm/65”
Vertical Magnification	Panoramic: 27% Cephalometric: 10%
Centering References	Bite block, Chin Rest for edentulous
Accessories	Temple support carbon fiber reinforced (optional). Oder code 93 600 03060

Aiming lights

Type	Class I LASER beam
Wavelength	650 nm
Output Power	< 0.15 mW at 100 mm
Reference planes	Lateral, Median Sagittal Vertical and Frankfort Horizontal planes
Pulse duration	60 s

Image receptor

Type	Multi-element Cd(Zn)Te-CMOS	
Active area	5.5 x 210 mm^2	
Effective pixel size	100 micron	
Static resolution	5 lpp/mm	
A/D conversion	16 bits	
Computer interface	Gigabit Ethernet connection	
Resulting image format	Panoramic image	15x30 cm, about 3000x1500 pixel
	Cephalometric image	25x23 cm (8”x9”), about 2500x2400 pixel

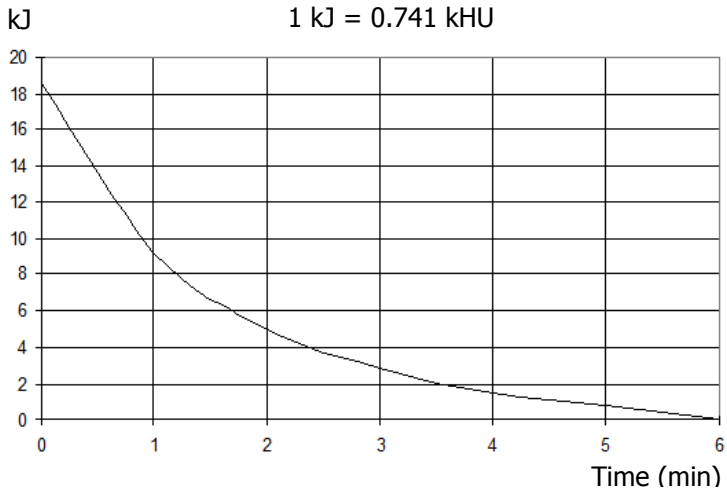
Minimum requirements for PC

Standard	Information Technology Equipment (ITE) certified
Operating System	Windows XP SP3 or Windows 7 Professional (32/64 bits) Recommended: Windows 7 Professional 64 bit
CPU	Intel Core 2 Duo 3.0 GHz or higher. Recommended: Quad Core
RAM	4 GB minimum
Hard disk	> 100 GB free disk space
Drives	CD ROM, USB
PCI	One PCI Express (PCIe) slot, full height
Display Adapter	AGP or PCI Express connection or integrated non-PCI connected
Monitor	0.25 dot pitch; 450:1 contrast ratio 1024x768 minimum resolution; 1280x1024 recommended resolution

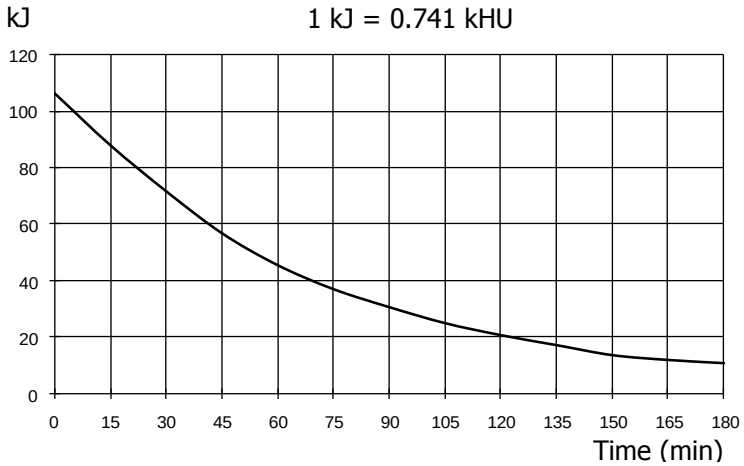
Environmental data

Operating conditions	Temperature: from 10 to 40 °C Humidity: from 30 to 75% Pressure: from700 to 1060 hPa
Transport and storage	Temperature: from –20 to +50 °C Humidity: from 10 to 100% Pressure: from 500 to 1060 hPa

Cooling curve
X-ray tube



Cooling curve
Tube housing assembly



Used Icons

○	OFF (disconnected from mains supply)		Inherent Filtration
|	ON (connected to mains supply)		Fragile, Handle With Care
	Fuse		Fear of Humidity
~	Alternate Current		Up, Do Not Overturn
	Protective Earth	2	Stacking Limit Number

3. Introduction

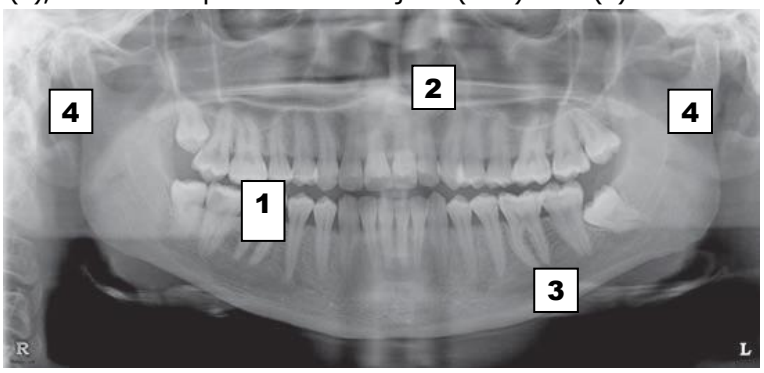
General Information

FONA ART Plus C is a dental panoramic digital imaging system utilizing the latest CdTe-CMOS technology. It offers exceptional image quality and some advanced and unique features such as the ability to focus on different focal troughs, for optimal diagnostic result in the day to day routine.
The Operating Instructions and the Service and Installation Manual provided with the system are an integral part of the product. The original language of the Operating Instructions is English.

3.1 Destination of use

FONA ART Plus C is an extraoral dental X-ray machine for diagnostic use. Any use different from what indicated has to be considered improper.

Panoramic dental X-rays are considered normal practice for a complete examination of the dental arch (1), the maxillary area (2), the mandibular area (3), and the temporomandibular joint (TMJ) area (4).



Models available

- Panoramic Only (Pan Solo)
- Panoramic and Cephalometric (Pan Ceph)

Panoramic examinations

- Panoramic on adult
- Panoramic on child with reduced dose
- Left-hand dental arch
- Right-hand dental arch
- Front dental arch
- TMJ in normal occlusion and in maximum opening
- View of the maxillary sinuses.

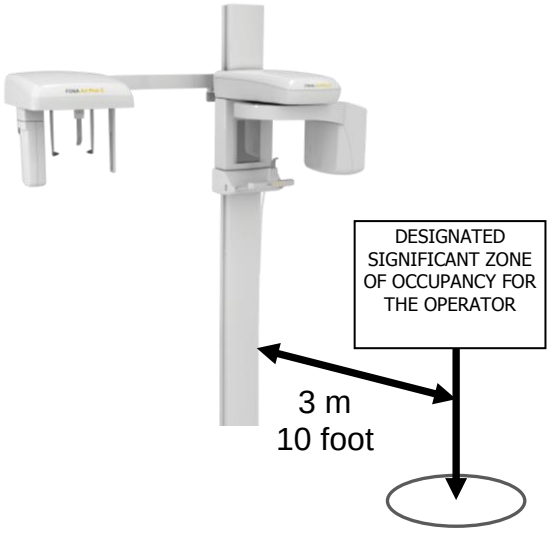
Cephalometric projections

- Latero-lateral (LL) X-ray of the cranium with filter for soft tissues
- Antero-Posterior (AP) X-ray of the cranium
- Carpus (wrist).

3.2 General Description

The FONA ART Plus C system allows producing diagnostic images both in panoramic and cephalometric mode by means of a digital image acquisition module (digital sensor) that can be removed and positioned on a rotating arm for panoramic acquisition or on a cephalostat for cephalometric acquisition (tele-X-ray for cephalometry).

A gigabit ethernet connection cable allows interfacing with a computer for the image acquisition, processing and storage operations using an image data base program. The X-ray system detects where the digital sensor is connected thus determining the operating mode: panoramic projections in PAN mode (PAN side) or cephalometric projections in CEPH mode (CEPH side). If the digital sensor is not connected to the system, it starts in standby mode.



The main body of the X-ray system (refer to section 4 Operating Controls and Displays) is composed of a vertical carriage (A) with a rotating arm (C) to which are connected the power cable, the connection cable to the computer, the hand-switch control with X-ray control button (L), and the removable digital sensor (M).

The diagnostic equipment can be raised or lowered during patient positioning with the up and down keys (K) to activate the motorized movement.

The rotating arm (C) comprising a generator (D), a housing for the PAN sensor (E) and a control panel (F) is connected to the vertical carriage (A).

The column is fastened to the wall by means of a bracket (G). Alternatively, an optional self-supporting base (H) is available to be fastened on the floor.

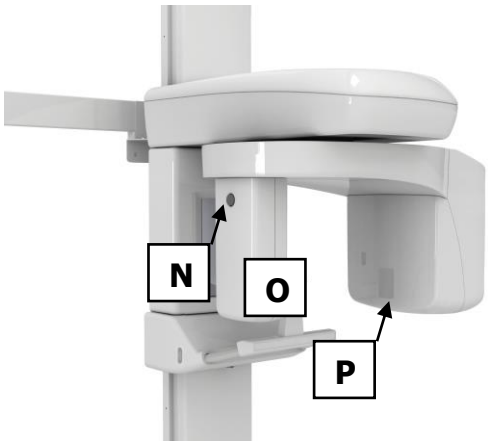
The side arm with cephalostat (I) and a housing for the CEPH sensor (J) is fastened to the load-bearing carriage (A).

The area designated for the operator is in front of the system 3 metres from the column.

The panoramic image of the dental arch is constructed with a thin vertical X-ray beam that turns around the head of the patient from the left to the right.

In order to be certain that the roots of the teeth, particularly incisors, are within the layer in focus it may be necessary to adjust the rotating arm forward or backward.

This is normally not necessary for patients with normal occlusion. However, in cases of overjet with class II or III malocclusion, in order to bring the roots within the layer in focus, you can correct the position of the rotating arm with the movement buttons (O) on the control panel using the lateral light beam references.



The median-sagittal plane beam is used to control lateral rotation of the head.

The Frankfurt plane beam is used to control forward or backward tilting of the head.

To set the system to Tele-X-ray mode, position the digital sensor (M) in the CEPH housing (J) after releasing it from the system by pressing the release button (N) positioned at the top edge of the digital sensor.

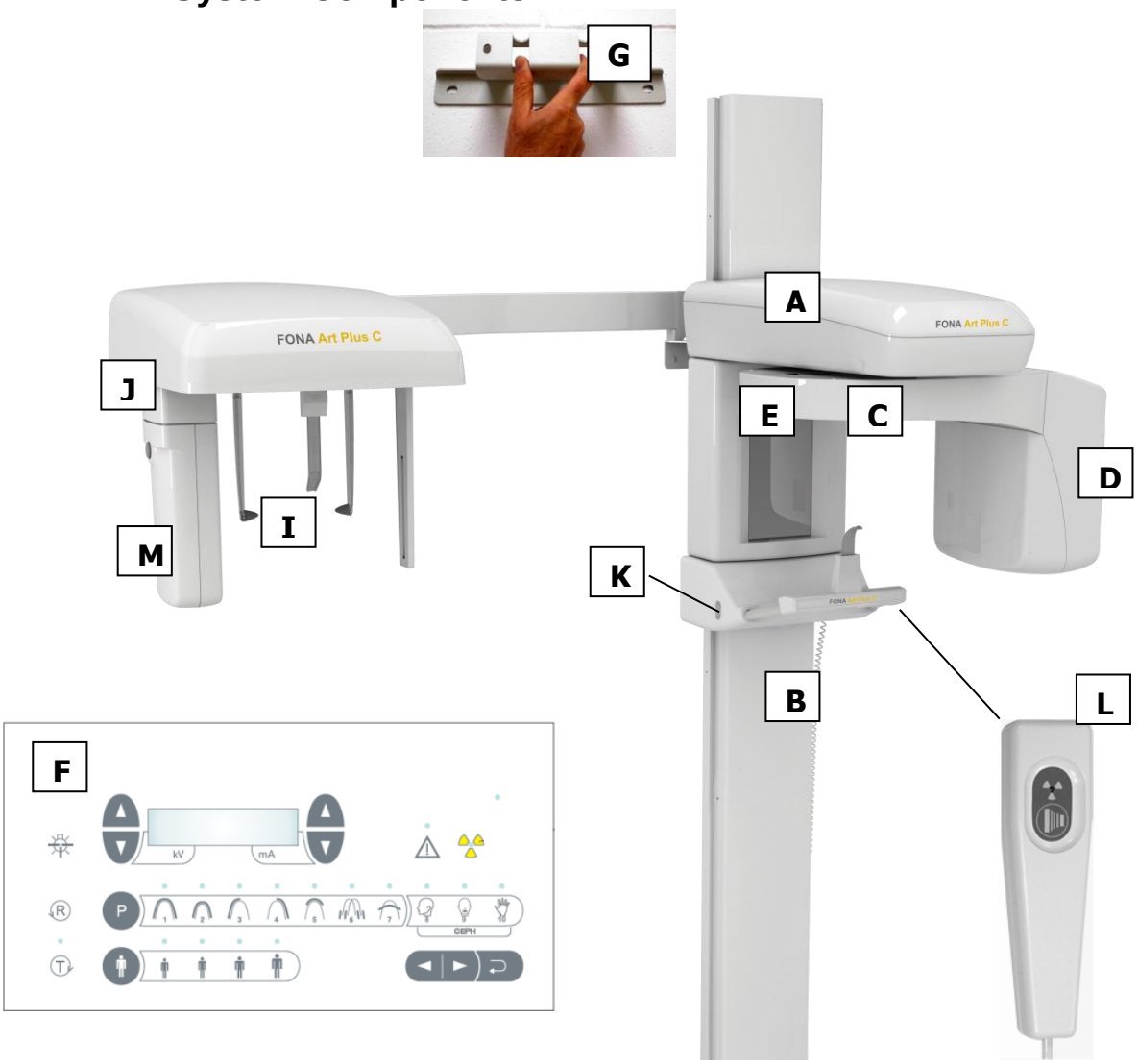
In addition, select the appropriate X-ray beam collimator by turning the disc protruding from the lower part of the X-ray generator (P).

The Latero-lateral (LL) or Antero-posterior (AP) tele-X-ray image in CEPH mode is constructed with a thin vertical X-ray beam that horizontally scans the head of the patient.

In CEPH mode the Frankfurt plane light beam facilitates patient positioning for both LL and AP scanning.

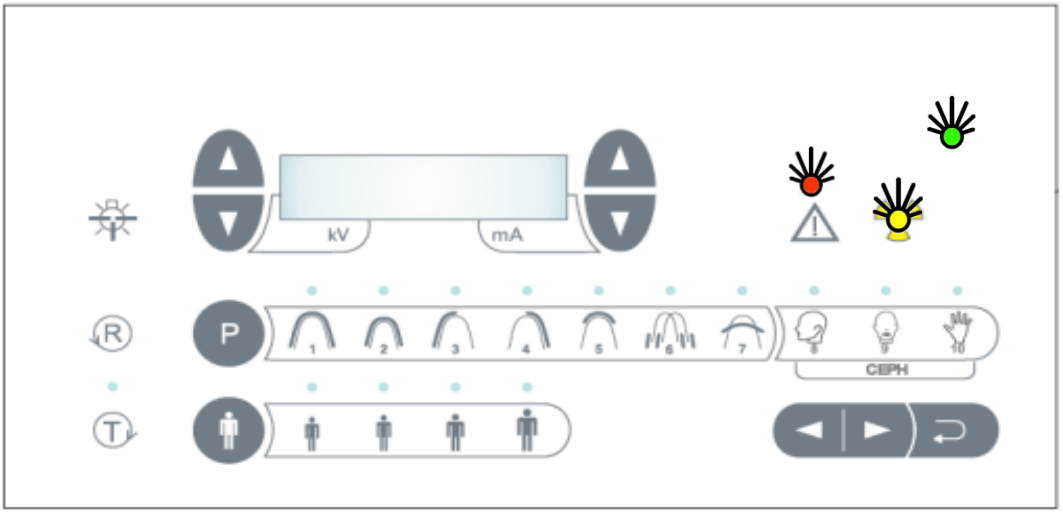
4. Operating Controls and Displays

4.1 System Components



A. Vertical Carriage
B. Column
C. Rotating arm
D. X-Ray generator
E. Housing for PAN Sensor
F. Control Panel
G. Wall Support
H. Self-supporting base
I. Cephalostat
J. Housing for CEPH sensor
K. Up/down keys
L. Hand switch
M. Digital Sensor

4.2 Control panel

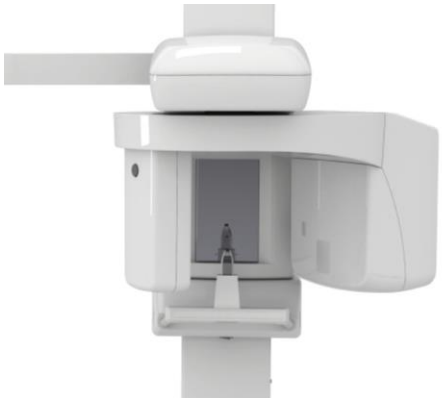


		Unit ON with light on display
		READY green light ON when system ready
		ALARM red light ON upon alarm message
		EXPOSURE key on Hand Switch
		X-ray Radiation – Yellow Light ON
	P	PROGRAM Selection
		INCREASE kV (left side) mA (right side)
		DECREASE kV (left side) mA (right side)
		PATIENT build: Small, Medium, Large, Extra-Large
		LIGHT for alignment ON for 60 s
	R	RETURN Arm Movement
	T	TEST Mode without Radiation
		BACK for backward movement and alarm reset
		UP carriage movement
		DOWN Carriage movement
		BACKWORD Shift (referred to patient)
		FORWORD Shift (referred to patient)

4.3 Panoramic Operating Positions

A. PATIENT ENTRY position

Control panel and X-ray source on the right of the patient and the image receiver on the left.



B. START position

System ready to start the exposure. When the unit reaches the START position the green light of the READY indicator on the control panel is turned ON

C. END position

At the end of the exposure the unit comes to a complete stop.

D. PATIENT EXIT position

Control panel and X-ray source on the left of the patient and the image receiver on the right.

5. Accessories

5.1 Rests and supports

Bite block

Chin rest for edentulous patients

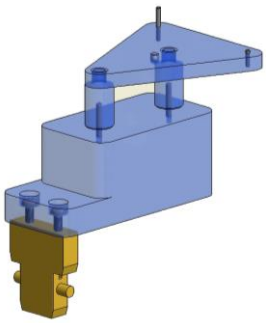
Nasal support for edentulous patients

Bite block with chin rest

Temple support can be added as an option

Order code 93 600 03060

5.2 Service tool



Ball and needle phantom

Order code 7668010036

It is recommended to use only the accessories indicated in this Operating Instructions.

6. Application Software

6.1 OrisWin DG Suite

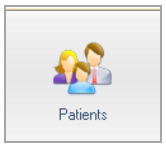
This software manages the acquisition of the panoramic and cephalometric X-ray images and also the associated patient data records.
The images acquired with OrisWin DG Suite are saved in DICOM format.
For more information on installation and use of the application, refer to the OrisWin DG Suite user manual.
The installation and configuration operations are described in the FONA ART Plus C service and installation manuals.
The image acquisition procedures are described below; the instructions for subsequent processing and storage of the images are described in the OrisWin DG Suite user manual.

NOTE. The USB software license must be connected to the PC, or other PC in the local area network.

A. Starting

On the PC connected to FONA ART Plus C with OrisWin DG Suite installed:

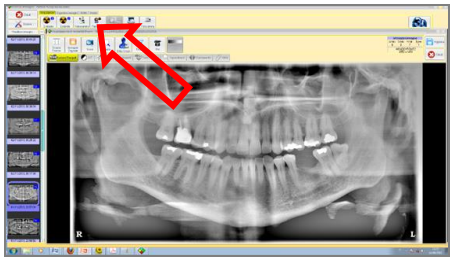
- Start OrisWin DG Suite and select the Patient module with the relevant button



B. Selecting the patient

- Select the patient from the list or insert a new patient.
- Then start image management.

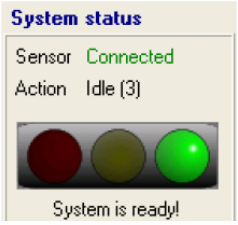
C. Selecting the X-ray system



- Start an acquisition session by selecting the Panoramic X-ray system button.

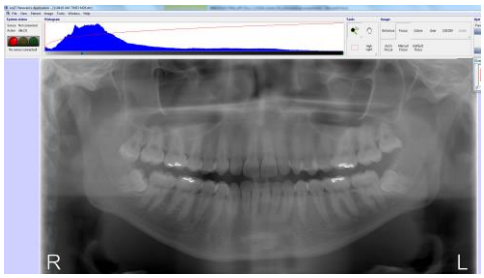
The Ajat Application (sensor driver) will open.

D. Image Acquisition



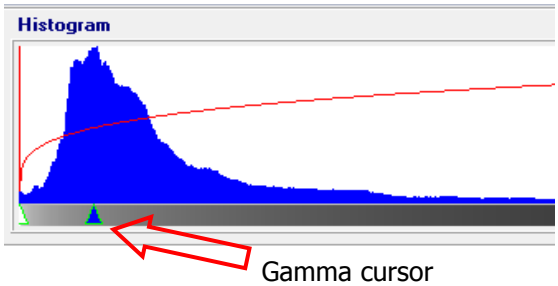
When the unit is ready for image acquisition, the green light is turned on. At this point, the image can be acquired by pressing the X-Ray button.

E. Preliminary Image Processing

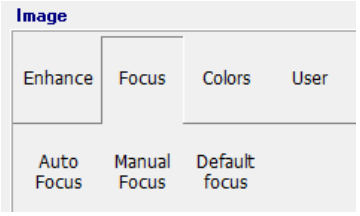


Preliminary processing can be done immediately after image acquisition.

- Grey level adjustment by moving the gamma cursor

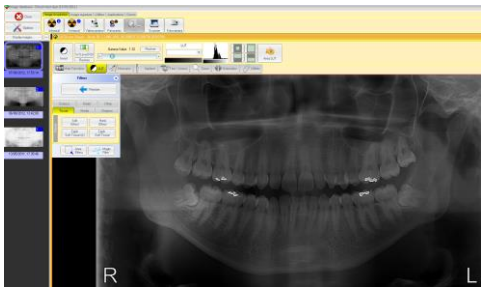


- Focus can be activated in case of need.



Save changes and close the Ajat application. When finished, the image is automatically saved in the patient data base.

F. Image Processing



The image can be further process using the OrisWin environment.

Typical image processing sequence:

- LUT: Move the gamma value to obtain the desired darkness
- Sharpening: Click on "Filters", and select "Tissue" → "Hard Effect"
- Adjust the contrast with LUT → W/Level
- Use the "Area Filter" to correct specific areas
- Click on "Filters", and select the "Magic Filter"

The above sequence is an example. For more details about the processing tools, refer to the OrisWin DG Suite Reference Guide.

6.2 Ajat Application Overview

A. File

Open image file	Opens images saved as PNG,TIFF or DAT.
Open dataset	Opens a saved dataset.
Reopen	Lists the ten recent images for quick opening
Data repository	Allows reopening of automatically saved images or dataset.
Save Image As	Allows the saving of an acquired image. The formats are Tagged Image (TIF) 8 bit, Tagged Image (TIF) 16 bit, Portable Network, Graphics (PNG) 8 bit, Portable Network Graphics (PNG) 16 bit, DICOM (DCM) 8 bit, DICOM (DCM) 16 bit, Binary 32 bit and Text (TXT).
Save Dataset As	Allows you to save the full acquired data. The full dataset will be several hundred megabytes and can only be viewed in this software.
Save image as TWAIN	Returns an acquired image back to the software that called it. (TWAIN mode only)
Close image	Closes currently displayed image
Close dataset	Finalizes dataset
Exit	Closes the panoramic software

B. View

Show mean frame signal level	Displays the average signal strength of the last exposure for support purposes.
Show overview image	Enables or disables the small overview window used while viewing magnified images.
Show temperature plot	Enables or disables the sensor temperature status windows.
Show function bar	Enables or disables tools and status information displayed above the image area.

C. Patient

Patient information	Opens a dialog box for entering patient information. Patient ID (up to 19 characters) Family name (up to 43 characters) Given names (up to 43 characters)

D. Image

Denoise Gaussian	Noise removal tool
Denoise Median	Smoothing tool
Sharpen unsharp mask	Sharpening tool
Edge enhancement horizontal	Sharpens horizontal edges
Edge enhancement vertical	Sharpens vertical edges
Apply auto-leveling	Automatically changes the grey levels to the best use of the display's dynamic range.

E. Tools

Settings	Opens the advance setting area
Dataset Tools	Advanced dataset handling tools
DICOM	Opens the DICOM saving and sending options
Maintenance	Sub menu that contains mechanical alignment, calibration, diagnostics tools and open log file tool.
Send error report	Can be configured to electronically send reports to support personnel.

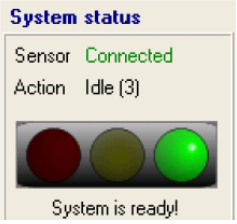
F. Window

Tile horizontally	Displays multiple open images side by side.
Tile horizontally	Displays multiple open images side by side.
Tile vertically	Displays multiple open images vertically stacked.
Tile square	Displays multiple images in equal square pattern.
Cascade	Displays multiple images as a cascade.
Dataset image	Displays the current dataset on top of all open images.

G. Help

About	Displays the software date and version.

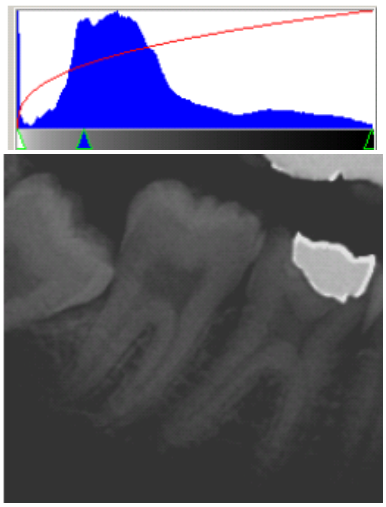
H. Status Indicator (Traffic Light)



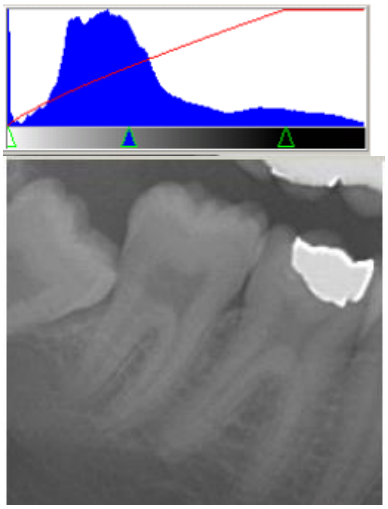
- Green: The sensor and software are ready to acquire and image.
- Yellow: The system is preparing to go to ready mode.
- Red: The system is not ready. See Troubleshooting.

I. Histogram

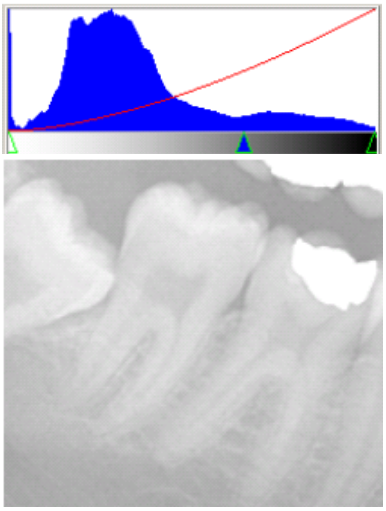
A histogram or graphical representation of how many times a colour occurs in an image. Use this tool to adjust the brightness and intensity for the overall image. The histogram is adjusted using three sliding arrows. The arrow to left represents the white end of the dynamic range and the arrow to the right, the black end. The arrow in middle is used to shift the histogram toward the black or white (gamma correction). The result of making a shift will be seen as brightening or darkening of the image. To change the contrast of an image, black or white may be clipped by moving the far left and right arrows towards its opposite side. Normally shifting the histogram is sufficient and the contrast can be left alone. Below are some examples of shifting and clipping.



Histogram is shifted toward the black

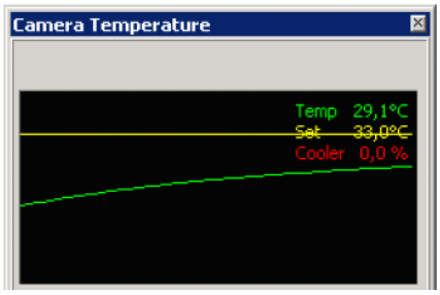


Histogram with white clipped.



Histogram is shifted toward the white

J. Temperature



The optional temperature view is a real time report of the current temperature of the sensor. This window can be toggled by selecting View>Show temperature plot. By default this control is not enabled.

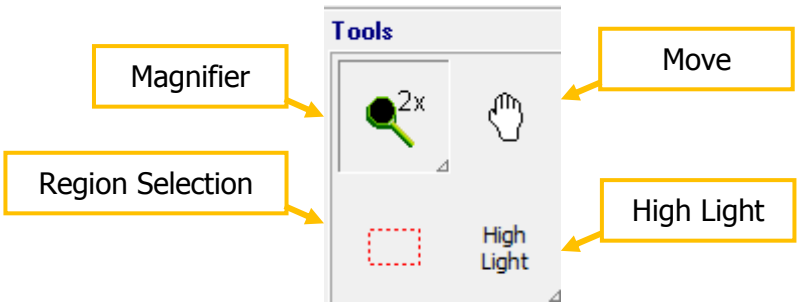
K. Tools

Magnifier — Is a spot magnifier that is controlled by the mouse while the left button is pressed. More magnification is available by right clicking on the tool.

Move Tool — is used to move the image when magnified beyond the limits of the screen. When desired the entire image may be magnified by right clicking anywhere on the image and select a desired magnification. Use the move tool to navigate around the image. Optionally, a small overview may be enabled for easier navigation while the image is magnified. This feature is enabled by selecting View>Show overview image.

Region Selection Tool — Used for selecting a region of interest during focusing. Select a starting position and click and hold the left mouse button. While still holding the left button, move the mouse to enlarge the box to the desired size.

Highlight Tool — The highlight tool is used by moving the mouse while pressing the left mouse button. This tool produces a high contrast filter, revealing information in difficult regions. Right click the mouse button to choose different sizes for the "High Light" square.



L. Enhance

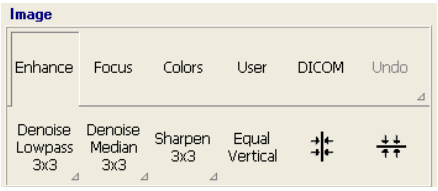
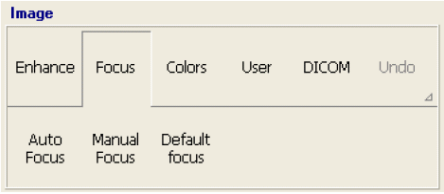


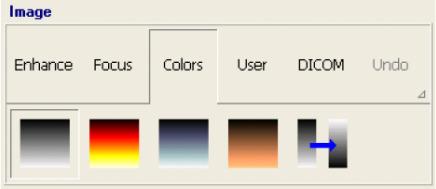
Image enhancement tools are provided for more advance diagnostics. Denoising, Sharpening and Enhancing can be quickly applied to improve quality, overcome anatomical defects or enhance areas of interest.

M. Focus



The focus area contains several advanced focusing tools. The area selection tool is used to select an area of the image that is outside the default focal trough and then the auto focus can be applied. The manual focus or tilt tool may also be used for greater control

N. Colours



The colours section offers four different colour schemes as well as invert.
These colours can be toggled on and off by left clicking the desired colour.

O. User

This area is used configure and apply user defined image processing. Many times you will find yourself using the same image enhancement or other processing tools. To save time, the auto process button can be configured to automatically apply any combination of tools available in the image process area. Four additional configurable tools are available, quickly configurable to any preference.

P. DICOM

DICOM options include, saving, printing and sending to a server. Sending and printing require advanced configuration and must be configured by an administrator. Save will automatically save an image in the DICOM (DCM) format to a preconfigured location and automatically name the image based on the patient information provided.

Q. Undo

The Undo incrementally (once per click) removes image processing that has been applied by the user utilizing the "Enhance" area.

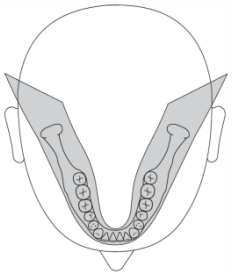
7. Exposure programs

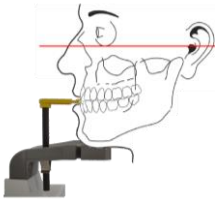
7.1 Panoramic X-Ray Programs

To access the panoramic X-ray programs, connect the digital sensor in PAN position.

Symbol	Program	Exposure time
1	Standard panoramic on adult with constant vertical enlargement on dental arch	14 s
2	Panoramic on child with reduced dose	13 s
3	Hemi left arch	7 s
4	Hemi right arch	7 s
5	Front teeth	4.9 s
6	Lateral TMJ in normal occlusion and maximum opening	2 x 2.2 s
7	Front view of maxillary sinuses	12 s

A. P1 Program: Standard Panoramic



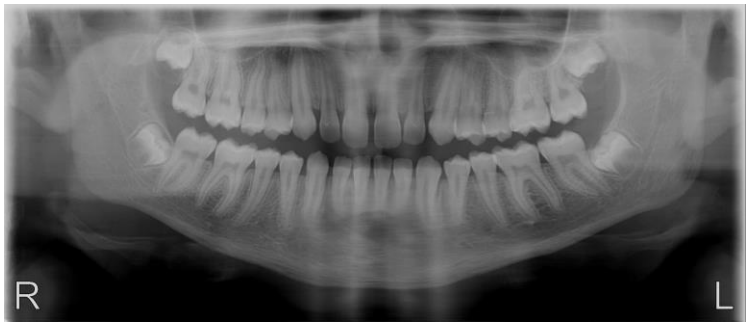


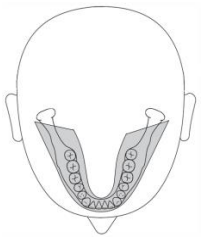
Adult standard panorama
with constant vertical magnification on dental arch:

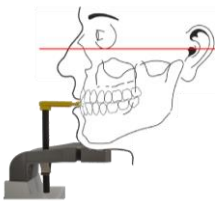
- Program duration time approx.: 16 s
- Program exposure time: 14 s

The image at receptor's plane is approximately 27% higher than real size: the vertical magnification on adult standard profile is 1.27:1 approximately.

B. P2 Program: Child Panoramic



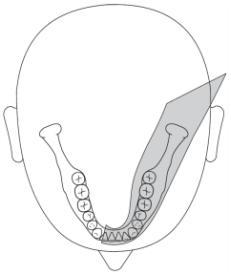
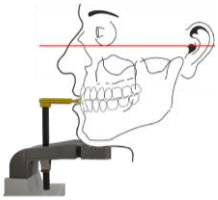




Child panorama:

- Program duration time approx.: 16 s
- Program exposure time: 13 s

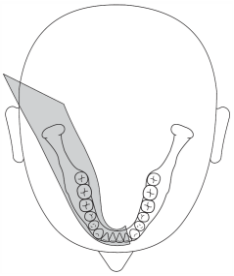
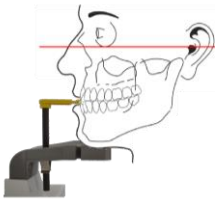
C. P3 Program: Left Hemi- arch

Half Dentition Left:

- Program duration time approx.: 14 s
- Program exposure time: 7 s

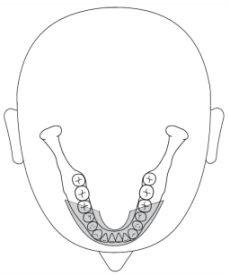
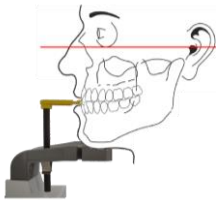
D. P4 Program: Right Hemi-arch

Half Dentition Right:

- Program duration time approx.: 16 s
- Program exposure time: 7 s

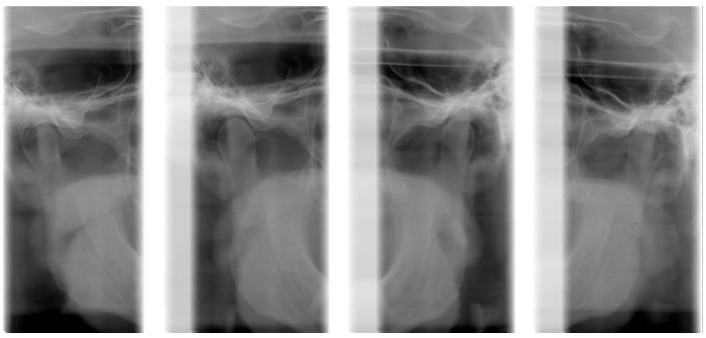
E. P5 Program: Anterior Teeth

Anterior Teeth:

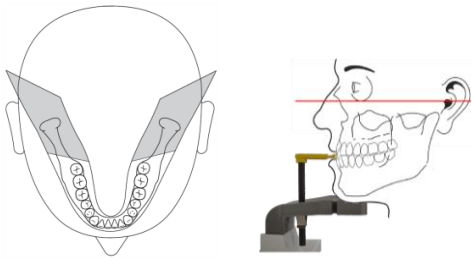
- Program duration time approx.: 14 s
- Program exposure time: 4.9 s

F. P6 Program: TMJ

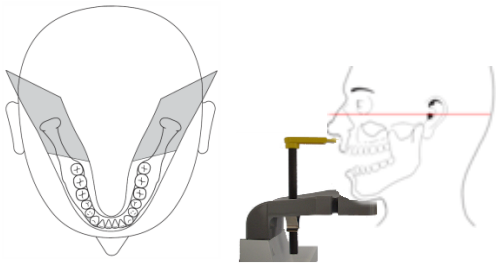


- Two exposures are usually taken with closed and open mouth.
- Patient is positioned with bite block under the nose.
- Once taken the first set of two images, return the unit.
- A second set of two exposures can be taken immediately.

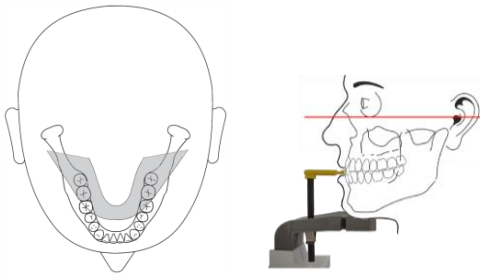
TMJ closed mouth:
- Program duration time approx.: 16 s
- Program exposure time: 2.2 s



TMJ open mouth:
- Program duration time approx.: 16 s
- Program exposure time: 2.2 s



G. P7 Program: Sinus



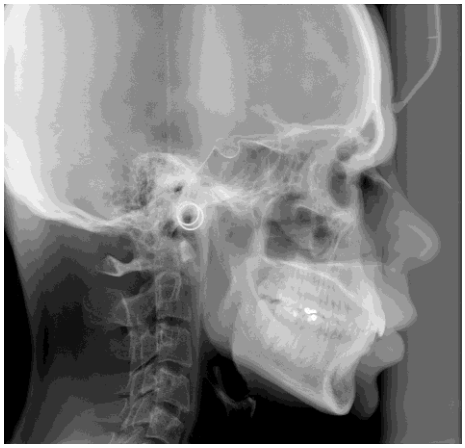
Maxillary Sinuses:
- Program duration time approx.: 16 s
- Program exposure time: 12 s

7.2 Cephalometric X-ray programs

To access the cephalometric tele-X-ray programs, connect the digital sensor in CEPH position.

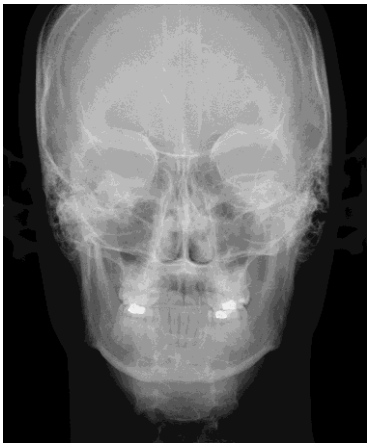
Symbol	Program	Exposure time	Format notes
8	Latero-lateral with filter for soft tissues	10 s	A (asymmetrical)
9	Antero-posterior or Postero-anterior	8 s	S (symmetrical)
10	Wrist	8 s	S (symmetrical)

A. P8 Program: Latero-lateral



Latero-lateral:
Program duration time approx.: 12 s
Program exposure time: 10 s

B. P9 Program: Antero-posterior



Antero-posterior:
Program duration time approx.: 12 s
Program exposure time: 8 s

C. P10 Program: Carpus

Carpus:
Program duration time approx.: 12 s
Program exposure time: 8 s

8. Operation

8.1 Preparing for exposure

A. Switching ON the Unit

ATTENTION
Following extreme temperature fluctuations, condensate formation may occur; therefore please do not switch on the device until normal room temperature has been reached.

By pressing the mains switch in the lower part of the vertical carriage under the mirror, the unit is supplied as indicated by the green light of the mains switch.

```
Initialization
Please wait:  xx
```

```
 * Do Pan Reset *
61       6.3     ..
```

- The system ON light on the control panel turns on
- The display on the control panel turns on too
- System initialization is started
- Reset function has to be performed

ATTENTION
When switching on the unit there must NOT be a patient positioned in the unit. If a fault occurs which requires switching the unit off and then back on again, the patient must be taken out of the unit at the latest before switching it on again!

B. Reset Function

By pressing the RESET key the rotation arm locates the reference points and moves to the PATIENT ENTRY position.
Depending on the specific condi

```
 * Do Pan Reset *
61       6.3     ..
```

```
 * Do Ceph Init *
61       6.3     ..
```

```
X-Ray Sensor
Not Connected
```

- "DO PAN RESET" if the system is waiting to execute alignment of the mechanical axes when the digital sensor is connected for panoramic projections in PAN mode.
- "DO CEPH INIT" if the system is waiting to execute alignment of the mechanical axes including CEPH movement when the digital sensor is connected for cephalometric projections in CEPH mode .
- "X-Ray Sensor Not Connected" if the digital sensor is not connected. To continue you need to connect the digital sensor on the PAN side or the CEPH side as described above. During sensor connection, the sensor is reset and the progress is shown on the control panel.

ATTENTION
If this message appears when the digital sensor is connected on the PAN side or the CEPH side, check that the green light on the digital sensor release button is on and that it is properly fitted in place, otherwise push it into place on the holding magnet.

C. Setting PAN or CEPH Mode

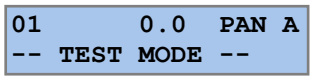
You can switch from PAN to CEPH mode or vice versa by moving the digital sensor after releasing it by pressing the button at the top of the sensor. This operation must be carried out with the system on in order to allow the holding magnet to disengage and handling the digital sensor with extreme care.

ATTENTION

Always grip the digital sensor with both hands during the disconnection and connection operations in order to prevent accidental dropping which would irreparably damage it. In case of accidental fall immediately contact Technical Service and do NOT use the sensor on a patient before a functional test is performed.

The appropriate collimator will be automatically set through the selection of the program.

D. TEST Mode without Radiation



With unit in START position, TEST mode can be activated to run the unit without radiation. It is not necessary to connect the computer nor enable the acquisition program

On the display:

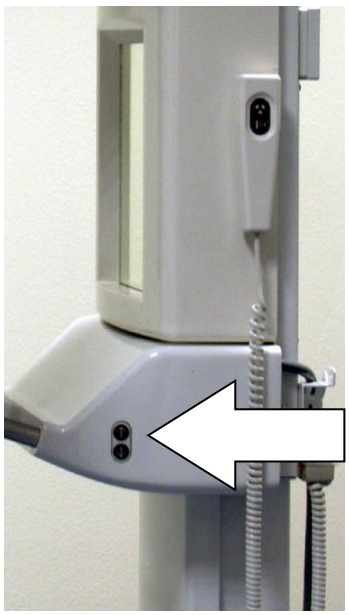
- The selected program number
- The message "Test Mode" instead of values of kV and mA

Starting the unit with the hand-switch allows for rotation of the arm according to the program selected.

When the arm is returned to PATIENT ENTRY position test mode is terminated and the units enters normal mode.

To exit TEST mode, press the TEST button again.

E. Raising or lowering the system



The unit is equipped with a motor to raise or lower the carriage and fit the patient height by activating the UP or DOWN keys on the sides.

8.2 Selecting exposure data

Select the exposure program with the key for PROGRAM selection

Select the PATIENT build, Small, Medium, Large, Extra Large

The selected program and the selected patient build are indicated by a corresponding green light.

The pre-programmed technique factors, tube voltage in kV and tube current in mA, are indicated on the display.

Manual correction of tube voltage and of tube current can be done using the INCREASE or DECRESE keys at display sides

Upon manual correction of the pre-set technique factors, the corresponding light on the patient build is turned OFF.

Setting tube voltage is done using the INCREASE or DECREASE keys at the left of the display

The tube voltage can be set from 61 to 85 kV in steps of 3 kV.

61 64 67 70 73 76 79 82 85

Setting tube current is done using the INCREASE or DECREASE keys at the right of the display. The tube current can be set from 4 to 10 mA.

4.0 5.0 6.3 8.0 10

NOTE. The pre-programmed values of technique factors are factory programmed. Different values can be loaded if needed using the available on board programming functionality. Refer to Service Manual for details.

F. Preparing the PC

NOTE. The USB software license must be connected to the PC, or other PC in the local area network.

- Start the OrisWin Suite software and click on Patients.
- Select the "demo" patient from the list and start image management.
- Click on Panoramic module, which activates the device driver.
- When the unit is ready for image acquisition, the green light is turned on.

8.3 Positioning the patient

A. PAN Patient Positioning

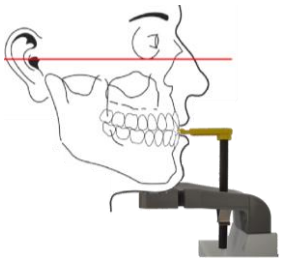
- Have the patient remove from head and neck all metallic items such as removable denture, earrings, necklaces, glasses which might cause ghost images on the radiograph.
- Physical constitution, clothing, bandages, etc. must not interfere with the movement of the arm.
  If in doubt, perform a test rotation without radiation by having selected before the TEST mode.
- In case a protective apron is used leave the neck free not to interfere with the X-ray beam: radiation enters from sides and from back.
- Insert bite block or chin rest according need.

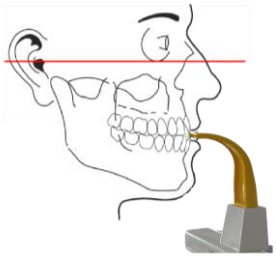
- With the arm in "PATIENT ENTRY" position, have the patient stand in front of the mirror close to the unit.
- Bring the unit the proper height using UP or DOWN keys.

NOTE

The height adjustment motor starts slowly and then increases its speed. Press the height adjustment key until the unit has reached the desired height.

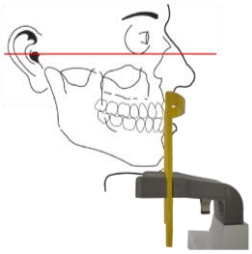
- Bring the carriage to have the bite block or the chin rest slightly higher.





… with bite block, and chin rest with bite block

- Have the patient bite into the indentation in the tip of the bite block.
  Mouth is closed but teeth are not superimposed.



… with chin rest, for patient without anterior teeth

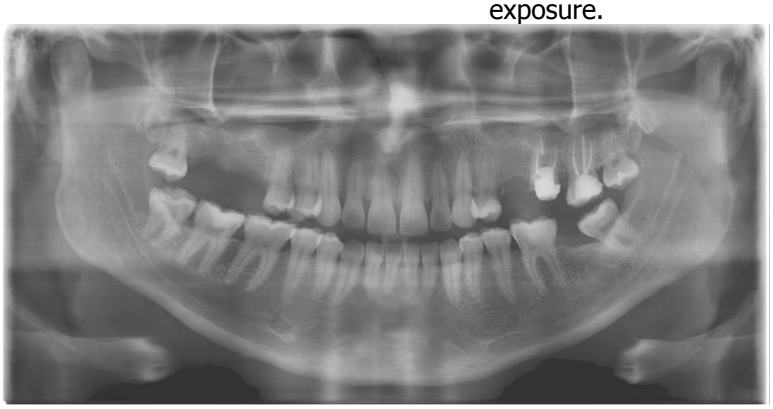
- Make sure the upper and lower jaws are lined up with each other.
  Use of a cotton roll to prevent superimposition of teeth.

- The patient must stay with lowered shoulders and advanced feet, close to the column, to favor spine stretching at cervical level for a better beam penetration, holding firmly the handles.
- Switch on the light beam localizers.

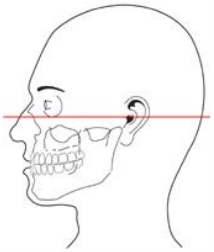
ATTENTION

The light beams are LASER lights. Avoid unnecessary exposure of the eyes of the patient or of the operator to the laser radiation and pay attention that the laser beams are not intercepted by any optical device.

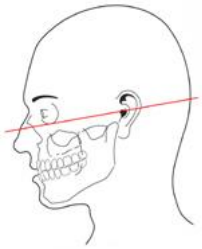
- Turn on the LASER beams by pressing the LIGHT BEAMS button
- The FH horizontal beam should be falling between the upper edge of the external auditory meatus and the lower edge of the infra-orbital rim (Frankfort Horizontal plane FH).
- The height of the FH horizontal beam can be adjusted with a dedicated knob.
- Adjust the height of the unit to have the Frankfort plane Horizontal (FH) and the cervical vertebrae straight (not bent forward) and stretched.
- Fine tune the head inclination for the FH setting by briefly touching the UP or DOWN height adjustment key.
- Verify side rotation of the head with reference to the Midsagittal light using the mirror from the back of the patient and correct in case.
- Ask the patient to swallow and keep the tongue lightly pressed to the palate.
- Eventually recommend to avoid movements till the end of the exposure.



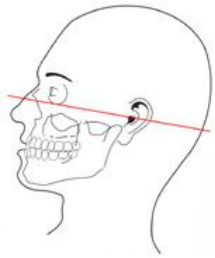
Correct position:
Frankfort plane is horizontal.



Wrong position:
Frankfort plane is NOT horizontal
The head is tilted forward thus resulting in a V shaped dental arch.

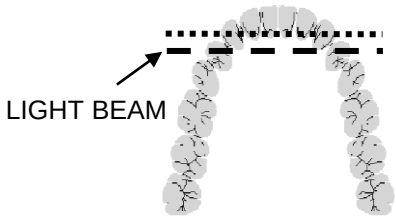


Wrong position:
Frankfort plane is NOT horizontal
The head is tilted backward, thus resulting in a flat dental arch.

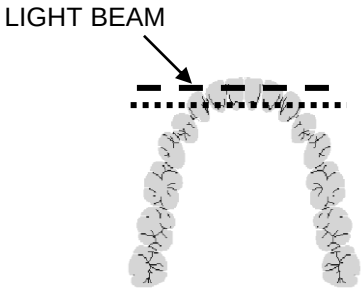


The lateral light beam does not need to be corrected for patients with normal occlusion.
In cases of overjet with class II or III malocclusion, move the carriage with the FORWARD/BACKWARD buttons until the lateral light beam is on the canine, to have the roots of the incisors within the layer in focus (the movement in mm is shown on the control panel) (13).

- Layer correctly centered
  - The light beam (broken line) falls on the canine.
  - The roots of the incisors fall exactly in the centre of the layer in focus.
  - The front teeth appear sharp.
- The light beam (broken line) falls behind the canine (dotted line).
  - The roots of the incisors fall outside the layer in focus.
  - The front teeth appear blurred and proportionally smaller.
  - Move the rotating arm forward (towards the column) to correct.



- The light beam (broken line) falls in front of the canine (dotted line).
  - The roots of the incisors fall outside the layer in focus.
  - The front teeth appear blurred and proportionally larger.
  - Move the rotating arm backward (away from the column) to correct.



B. CEPH Patient Positioning

A craniostat with auricular rods is available for Latero-lateral or Antero-posterior projection and an adjustable nasion support.

Remove the nasion support by acting on the release pin in the case of Antero-posterior or Carpus projection

For the Carpus examination a transparent support is supplied with an X-ray range outline to be fitted with two screws.

ATTENTION
Only use the accessories indicated in this Operating Instructions

8.4 Panoramic Exposure

ATTENTION

Operator: observe the radiation protection guidelines (see chapter 1, Warning and Safety Notes).

Before releasing the exposure always check display for proper exposure data for the patient.

Press the RETURN key or the EXPOSURE key on the hand switch for short time to bring the arm from position PATIENT ENTRY to position START, ready to start the exposure.

When the unit reaches the START position the green light of the READY indicator on the control panel is turned ON

READY GREEN LIGHT ON

ATTENTION

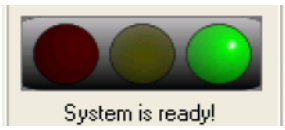
Should you need to reposition the patient, the arm has to be moved from the START position back to the PATIENT ENTRY position keeping pressed the BACK key: see Resetting Carriage in PATIENT ENTRY position, in the following.

Set the desired technical parameters in the X-ray system

Position the patient according to the selected PAN program

Start the acquisition program on computer

When the unit is ready for image acquisition, the green light is turned on.



Go to the area designated for the operator behind the patient three meters away from the column, or exit the room always keeping an eye on the patient, ready to immediately interrupt radiation if necessary.

Expose the patient

The exposure is released by keeping the exposure key pressed till end of movement.

The rotation movement runs automatically in accordance with the exposure program selected.

During radiation

A yellow light is on control panel and on the exposure switch emitted during irradiation and an acoustic signal is activated.

Exposure interruption

ERROR MESSAGE

ATTENTION

For safety reasons the operator can terminate the exposure any time by releasing the exposure switch. Premature termination is signaled by an error message (see details in the following).

After the exposure has been completed, acknowledge image acquisition on computer.

After the exposure

At the end of the exposure the unit comes to a complete stop. Move the arm to PATIENT EXIT position using the RETURN Arm Movement key or the EXPOSURE key on the hand switch for short time.

Patient out

Open the temple support (optional) and have the patient stepping out.

Arm back to patient entry position

Move the arm to PATIENT ENTRY position for next exposure using the RETURN key or the EXPOSURE key on the hand switch for short time.

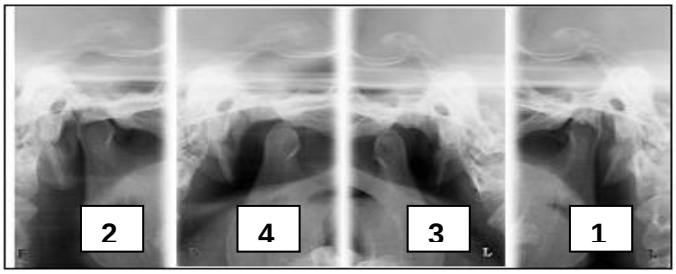
```
P1 DA 123 mGycm2
  67        6.3
```

The value of the dose by area (DA) product in mGy cm^2 is indicated on display after a panoramic exposure. Do acknowledge the Dose Area value with RETURN or EXPOSURE key to proceed.
DA computations can be enabled or disabled via service function.

8.5 TMJ X-Ray

Normally two exposures are done for the temporomandibular joint (TMJ), one in normal occlusion and one in maximum opening

The acquisition program composes the two exposures into one image: the first viewed from the outside the second from the inside



- To position the patient use the bite block positioning it above the upper lip just below the nose.
- The lateral light beam falls on the canine as with the standard panoramic X-ray.
- Set the TMJ PAN examination in the image acquisition program on the computer.
- Once the patient has been positioned and the X-ray system set to READY position to start the examination, press "Start acquisition" on the PC then start exposure by pressing the command button.
- After taking the first sequence, move the rotating arm to the initial position. The second sequence can be taken without having to wait for any significant time.
- After positioning the patient for the second exposure, set the X-ray system to the READY position to start the examination, press "Start acquisition" on the PC then start exposure by pressing the command button

8.6 Maxillary Sinus X-Ray

- To position the patient use the bite block positioning it above the upper lip just below the nose
- The lateral light beam falls on the canine as with the standard panoramic X-ray
- Then continue as described in section 8.4 Panoramic Exposure.

8.7 Cephalometric Exposure

Press the RETURN key or the EXPOSURE key on the hand switch for short time to bring the arm from position PATIENT ENTRY to position START, ready to start the exposure.

When the unit reaches the START position the green light of the READY indicator on the control panel is turned ON.

READY GREEN LIGHT ON

Set the desired technical parameters in the X-ray system

Position the patient according to the selected CEPH program

Start the acquisition program on computer

Expose the patient

The exposure is released by keeping the exposure key pressed till end of movement.

After the exposure has been completed, acknowledge image acquisition on computer.

8.8 Exposure Interruption

ATTENTION

For safety reasons the operator can terminate the exposure any time by releasing the exposure switch.

Premature termination is signaled by an error message:

```
     ERROR
#:  11
```

Error 11: Exposure aborted during irradiation.
The patient has been partially exposed. Part of the radiograph is being available. Examination may have to be repeated.

```
     ERROR
#:  12
```

Error 12: Exposure aborted before irradiation.
The patient was not irradiated.
Examination to be restarted.

```
     ERROR
#:  20
```

Error 20: Exposure aborted after irradiation.
No need to repeat the examination.

```
Wait PC READY
```

Data Acquisition System Not Ready.
The data acquisition program has to be started first to make sure data acquisition will be performed during radiographic exposure.

Automatic Exposure Blockage

This feature protects the X-ray tube by preventing premature triggering of a new exposure should the load requested by the next exposure exceed the available capacity.

ALARM RED LIGHT BLINKING

The red light on the control panel keeps blinking until cool-off time has elapsed.

Other error messages

Possible malfunctions during the use generate an error message and the unit is blocked. A list of messages are reported in chapter Depending on the malfunction technical service might be required.

8.9 Remote hand-switch

The hand switch can alternatively be mounted remotely in case the unit is located in an X-ray room which has a door and enables visual contact with the patient.

An optional kit is available for remote mounting of the hand switch. Order code 93 190 00155.

9. Programming

Programming procedure

In the factory kV and mA values are assigned to PAN and CEPH programs for each one of the four types of patient build.

Such values can be re-loaded using a dedicated service function.

- Increasing the values results in greater blackening.
- Decreasing the values results in lesser blackening.

The kV level relates to the X-ray penetration characteristics, i.e. their capability of going through the anatomical structures and forming the diagnostic image: the larger the patient's build the higher the kV level (anode voltage) to be used.

9.1 Entering Service Mode

By keeping pressed the BACK key for 5 s the system enters Service Mode

```
 Service +/-
Expos. Settings
```

Service function can be selected using the INCREASE or DECRESE keys on the RIGHT side of the display.

Scroll the menu until Exposure Settings is displayed

Press the PROGRAM key to enter Exposure Settings.

NOTE

Keep pressed the TEST key to reset all values to default (factory) conditions

By pressing the PROGRAM key select the exposure program

By pressing the PATIENT key select the patient build, Small, Medium, Large, Extra Large

```
* SET kV / mA *
 67        6.3
```

Change the kV level to the desired value by pressing the INCREASE or DECRESE keys at the LEFT side of the display

Change the mA level to the desired value by pressing the INCREASE or DECRESE keys at the RIGHT side of the display

Keep pressed the LIGHT key to store the selected value

Repeat kV setting and mA setting
for the other types of patient build if requested
for the other CHILD or ADULT group of programs if requested

Press BACK key to exit EXPOSURE SETTINGS

Press TEST Mode key to exit SERVICE MODE

10. Program Values

	Factory programmed values				Freely programmed values			
PAN Programs								
P1, P3, P4, P5, P6, P7	61/6.3	67/6.3	73/6.3	79/6.3				
P2	61/5.0	67/5.0	73/5.0	79/5.0				
CEPH Program								
P8, P9	73/8.0	76/8.0	79/8.0	82/8.0				
P10	61/4.0	61/4.0	61/4.0	61/4.0				

11. Care of the surfaces

ATTENTION

Always disconnect the system from the mains (main switch in the room) before cleaning it.

Cleaning

Use a mild soap to remove fingerprints or other traces of dirt being careful not to let liquid substances penetrate the machine.

The plastic covers can be cleaned with a soft cloth and a mild detergent.

Disinfecting

The parts that come into contact with the patient must be cleaned after each use with a detergent (for example, a 2% ammonia solution) and then disinfected. DO NOT use solvents or corrosive substances.

The bite block and the chin rest can be sterilized in autoclave at 134°C.

12. Inspection and maintenance

Inspection and maintenance work must be performed at regular intervals to protect the safety and health of patients, users and third parties.

Annual inspection performed by the operator or other authorized personnel

As the operator, you should ensure the safety and reliability of your system by performing maintenance on it at regular intervals (at least once annually) or having this work performed by your dental dealership.

Maintenance performed by the service technician

In addition to the scheduled annual inspection by the user or persons contracted to perform this, a maintenance inspection must be performed by the service technician after 4, 7, 10 years and then every two years.

Checking image quality

At regular intervals, however at least once a year, the user must evaluate the image quality.

13. Error messages

13.1 Warning messages

#	Message	Action required
A	Low Battery (NVRAM battery)	The battery on the control board is almost discharged and must be replaced within a month.
B	X Ray generator hot	The system is cooling down and the requested exposure would exceed the loading capacity. Wait until ready.
C	CAM init (starting in progress)	Wait for system to complete initialization.
D	Adj Arm Position	The rotating arm is out of position. Turn the system OFF and manually relocate the arm centrally, then turn the system ON.
E	Wait PC ready	The communication line to the computer is missing or the image acquisition program is not in input mode. Perform necessary correction. This warning message is not active in test mode (service functions).
F	X-Ray Sensor Not Connected	If FONA XPan DG Plus does not detect the presence of the X-ray sensor in either of the two positions (PAN or CEPH), the message "X-Ray Sensor Not Connected" will be shown on the display. In this condition, FONA XPan DG Plus will remain in standby until it detects the presence in one of the two positions. If the digital sensor is installed but not detected, an electrical problem may have occurred. A manual sensor release function is available in the event that it is locked by the holding magnet. The release procedure must be carried out by appropriately trained persons.
G	Wrong CEPH Format	The message "Wrong CEPH Format" appears when there is an incongruence between the configuration of the dip switches in the control unit and the CEPH format selected with the CEPH Format function in the Service menu. The message is shown once the examination start position in CEPH mode has been reached

13.2 Error messages

ALARM RED LIGHT BLINKING

The ERROR number is shown on the display with the red light blinking.

To reset the error condition, press the BACK key.

#	Message	Action required
01	kV reference signal out of range	Switch the unit off. Report to technical service.
02	mA reference signal out of range	Switch the unit off. Report to technical service.
03	Rotation sensor malfunction (R-axis)	Switch the unit off. Report to technical service.
04	Translation sensor malfunction (X-axis)	Switch the unit off. Report to technical service.
05	Rotation sensor reading error (R-axis)	Switch the unit off. Report to technical service.
06	Translation sensor reading error (X-axis)	Switch the unit off. Report to technical service.
09	Tube-head temperature exceeding limit	Wait for tube cool down
11	Interruption of exposure during irradiation	Restart if termination was requested by the operator. Call for technical service if termination was spontaneous.

12	Interruption of exposure before irradiation	Restart if termination was requested by the operator. Call for technical service if termination was spontaneous.
13	38 VDC supply voltage out of range	Switch the unit off. Report to technical service.
14	24 VDC supply voltage out of range	Switch the unit off. Report to technical service.
15	15 VDC supply voltage out of range	Switch the unit off. Report to technical service.
16	5 VDC supply voltage out of range	Switch the unit off. Report to technical service.
17	High voltage failure	Switch the unit off. Report to technical service.
19	Set exposure time exceeded	Switch the unit off. Report to technical service.
20	Interruption of exposure after irradiation	Call for technical service if termination was spontaneous.
21	Anode current insufficient or absent	Switch the unit off. Report to technical service.
23	Filament current out of range	Switch the unit off. Report to technical service.
25	Thermal sensor faulty or not connected	Switch the unit off. Report to technical service.
26	System battery voltage below threshold	Switch the unit off. Report to technical service.
27	Multiplexer board malfunction with sensor presence in PAN and CEPH	Switch the unit off. Report to technical service.
28	CEPH movement end stop exceeded	Switch the unit off. Report to technical service.
30	CEPH movement end stop during examination	Switch the unit off. Report to technical service.
32	Microprocessor-controlled board fault	Switch the unit off. Report to technical service.

14. Electromagnetic Compatibility

14.1 Electromagnetic emission

The FONA ART Plus C system is intended for use in the electromagnetic environment specified below. The customer or the user of the FONA ART Plus C system should assure that it is used in such an environment.

Emission test	Compliance	Electromagnetic environment
RF emissions CISPR 11	Group 1	The FONA ART Plus C system uses RF energy only for its internal functions. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
	Class B	The FONA ART Plus C system must be used only in a radio-frequency shielded environment with a minimum shielding effectiveness. FONA ART Plus C may be installed in environments with anti-X-ray shielding with attenuation of at least 12 dB for radio interference from 30 to 1000 MHz. (Class B+12).

14.2 Electromagnetic immunity

The FONA ART Plus C system is intended for use in the electromagnetic environment specified below. The customer or the user of the FONA ART Plus C system should assure that it is used in such an environment.

Immunity test	EN 60601-1-2 test level	Compliance level	Electromagnetic environment
Electrostatic discharge (ESD) EN 6 1000-4-2	6 kV contact 8 kV air	EN 60601-1-2 test level	Residential /hospital
Electrical fast transients/bursts EN 6 1000-4-4	2 kV for power supply lines 1 kV for input/output lines > 3 m	EN 60601-1-2 test level	Residential /hospital
Surges EN 61000 4-5	1 kV differential mode, 2 kV common mode	EN 60601-1-2 test level	Residential /hospital
Voltage dips, short interruptions and voltage variations on power supply input lines EN 6 1000-4-11	0% U_T for 0.5 cycle 40% U_T for 5 cycles 70% U_T for 25 cycles 0% U_T for 5 sec	EN 60601-1-2 test level	Residential /hospital

14.3 Systems that are non-life-supporting

The FONA ART Plus C system is intended for use in the electromagnetic environment specified below. The customer or the user of the FONA ART Plus C system should assure that it is used in such an environment.

Immunity test	EN 60601-1-2 test level	Compliance level	Electromagnetic environment
			Portable and mobile RF communications equipment should be used no closer to any part of the FONA ART Plus C system, including cables, than the recommended separation distances calculated from the equation applicable to the frequency of the transmitter. Recommended separation distances (d)
Radiated RF EN 61000-4-3	3 V/m: 80 MHz to 2.5GHz	3 V/m	d = 1.2 x √P 80 MHz to 800 MHz d = 2.3 x √P 800 MHz to 2.5GHz
Conducted RF EN 61000-4-6	3V 150 kHz to 80MHz	3V	d = 1.2 x √P
			where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol:

14.4 Recommended safety distances for systems that are not life-supporting

The FONA ART Plus C system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the FONA ART Plus C system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the FONA ART Plus C system as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output of transmitter (W)	Separation distance according to frequency of the transmitter (m)		
	150 KHz to 80 MHz d = 1.2 x √P	80 MHz to 800 MHz d = 1.2 x √P	800 MHz to 2.5GHz d = 2.3 x √P
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. Note: At 80 MHz and 800 MHz the separation distance for the higher frequency range applies. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection of structures, objects and people.			

We reserve the right to make any alterations which may be required due to clinical improvements

FONA ART Plus C Operating Instructions – English Edition 150831

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