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The original language of this manual is English.

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Instrumentarium Imaging, a GE Medical Systems company, going to market as GE Healthcare.
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1 Introduction

1.1 General

Orthopantomograph® OP100 D is software controlled diagnostic panoramic dental x-ray equipment for producing high quality digital images of dentition, TM-joints and skull. In order to take images with OP100 D you need a suitable PC hardware connected to the OP100 D unit and CliniView software to handle images.

Orthopantomograph® OP100 D can perform the following procedures:

- Standard panoramic exposure
- Pediatric panoramic exposure
- Ortho Zone panoramic exposure or
- Wide layer panoramic exposure (optional)
- Orthogonal panoramic exposure
- Maxillary sinus
- TMJ, lateral projection or
- Ortho TMJ axial corrected lateral projection (optional)
- TMJ, PA projection

Orthoceph® OC100 D is a more equipped x-ray unit with cephalometric exposure option. In addition to the OP100 D functions OC100 D can perform the following cephalometric procedures:

- lateral view
- posterior-anterior (PA) and anterior-posterior (AP) views

The basic OP100 D can be upgraded later to the Orthoceph® OC100 D.

As the manufacturer we strongly recommend that you read this manual before taking the unit into use.

---

NOTE!

OP100 D Must be installed according to the OP100 D installation & Adjustments manual by a qualified technician. Only trained personnel should be allowed to operate OP100D.
1.2  Markings and graphics symbols

The following markings are used in this manual:

---

**NOTE!**
Contains useful information for the reader about the unit and its use.

---

**CAUTION!**
Contains important instructions. If these instructions are not observed, malfunction of the unit or damage to the unit or other property may occur.

---

**WARNING!**
Contains warnings and instructions about the safety of the unit. If these warnings are not respected, serious risks and injury may be caused to the patient and operator.

The following symbols are used in the OP100 D.

- ![Radiographic control](image)
  - Radiographic control

- ![Protective earth (ground)](image)
  - Protective earth (ground)

- ![Type B equipment](image)
  - Type B equipment

- ![Dangerous voltage](image)
  - Dangerous voltage

- ![On (Power)](image)
  - On (Power)

- ![Off (Power)](image)
  - Off (Power)

- ![Attention, consult accompanying documents](image)
  - Attention, consult accompanying documents

- ![CE Marking](image)
  - If the unit has CE-marking it is CE-marked according to the Medical Device Directive 93/42/EEC.
If the unit has UL-marking, it is UL-marked according to UL 2601-1 and CAN/CSA C22.2 No.601.1

1.3 Type and version

The type and version of the OP100 D is defined in the main label of the unit located on the vertical carriage bottom plate next to the power on/off switch or in the column label of the unit located on the column. The unit is class I, type B and with IP-20 protection.
The type and version of the unit can be read from the main label or column label codes. The type numbers appear in the following form: OP100 D-a-bc-d-S.

<table>
<thead>
<tr>
<th>TYPE AND VERSION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OP100 D</strong></td>
</tr>
<tr>
<td><strong>a</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>bc</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>d</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>S</strong></td>
</tr>
</tbody>
</table>

For example, OP100 D-1-4-1 is Orthopantomograph® OP100 D with Toshiba D-051S -tube Removable combined panoramic and cephalostat camera, Version 1.

### 1.4 Software version

This manual covers the features of the OP100 D software version 1.4.10 or higher. Software version is displayed for few seconds on control panel display after switching the unit on.
1.5 Options, accessories and manuals

The options are listed in the appendices. The accessories are listed in sections 2.4 and 2.5. All standard items and approved accessories are suitable for use within the patient environment.

**WARNING!**

This product itself complies IEC601-1-1 medical safety standard but in order to the system incorporating also a PC to comply the standard, EITHER the PC has to be a medical PC OR the PC has to be located over 1,5 meters apart from the OP/OC100 D unit. The installer and the user of the system shall confirm that at least one of the above requirements is fulfilled. A PC is a medical one if it complies IEC 601-1 standard and that is indicated in the accompanying documents of the PC.

**NOTE!**

In order to maintain safe and correct functioning of OP100 D, only the approved accessories may be used.

**CAUTION!**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Following manuals and documents are shipped with the OP100 D:

- OP100 D Installation & Adjustments Manual
- OP100 D User Manual
- OP100 D User Program Manual
- Installation & User Manual for CliniView software

These manuals and future updates are available on request from Instrumentarium Imaging.
1.6 Radiation protection guidelines

X-ray equipment may cause injury if used improperly. The instructions contained in this manual must be read and followed when operating the Orthopantomograph® OP100 D. All government and local regulations pertaining to radiation safety must be observed.

**NOTE!**
For USA: Many provisions of these regulations are based on recommendations of the National Council on Radiation Protection and Measurements. Recommendations for dental x-ray protection are published in NCRP Report #35 available from NCRP Publications, 7910 Woodmont Avenue, Suite 1016, Bethesda, MD 20814.

Personal radiation monitoring and protective devices are available and recommended for staff members. It is also recommended to provide the patient with a protective apron. Consult the physician before taking images of pregnant patients.

**WARNING!**
Orthopantomograph® OP 100 D must not be used in rooms where an explosion hazard exists.

OP100 D with radiation protection in accordance with IEC 601-1-3:1994.

1.6.1 Protection by distance

In all examinations the user of the x-ray equipment should wear protective clothing. The operator does not need to be close to the patient during normal use. The protection against stray radiation can be achieved by using the hand switch not less than 2 m (7 ft) from the focal spot and the x-ray beam. Operator should maintain visible contact with the patient and technique factors. This allows immediate termination of radiation by the release of the exposure button in the event of a malfunction or disturbance.

![Fig 1.5. Caution information on Control panel](image)
1.6.2 Control from a protected area

The operator does not need to be close to the patient during normal use. Control panel hand switch or optional remote hand switch can be used from a protected area from the focal spot and the x-ray beam. The full extended spiral cable length of the control panel hand switch is approx. 4 m / 13 ft. The cable length of the optional remote hand switch (part #69961) is approx. 10 m / 32 ft.

1.7 Manufacturer’s liability

As a manufacturer we can only assume liability of safe and reliable operation of this unit when

- OP100 D unit installation was performed according to the OP100 D Installation & Adjustments Manual and
- OP100 D Unit is used according to the OP100 D User Manual
- CliniView PC software was installed according to the Installation Manual for CliniView software.
- CliniView software is used according to User Manual for CliniView software.
- Maintenance and repairs are performed by a qualified Orthopantomograph® Dealer and
- Original or authorized spare parts are used

If service on the unit is performed, a work order describing the type and extent of repair must be provided by the service technician. This must contain information of changes of nominal data or work range performed. The work order must furthermore indicate the date of repair, the name of the company concerned and a valid signature. User should keep this work order for future references.

---

**NOTE!**

For PC system: Instrumentarium Imaging can guarantee OP100 D PCI board and CliniView software compatibility with other PC hardware and software only if that configuration has been tested by Instrumentarium Imaging. Any later changes to the hardware and software may void this test.

1.8 Disposal

Follow the local regulations on disposal of waste parts. OP100 D has at least the following parts that should be regarded as non-environmental friendly waste products:

- X-ray source assembly
- All electronic circuits
- Column counter weight (Pb)
1 Introduction
2 OP100 D controls

2.1 Main parts

1. CCD camera
2. CCD camera holder
3. Main support
4. Rotating unit
5. Head and Temple support
6. Primary collimator
7. Bite fork with rod
8. Chin rest
9. Handles
10. Positioning panel
11. Control panel
12. Exposure indicator lights
13. FH light height adjustment
14. Mirror
15. PC equipment
16. Exposure Button with cable and holder (optional in some markets)
Fig 2.1. PC equipment

Fig 2.2. Remote exposure button

Fig 2.3. Carriage bottom plate
Fig 2.4. Optical fibre connectors in OP100 D

Fig 2.5. Optical fibre connectors in PC

17 Main label
18 Power ON / OFF switch with an indicator
19 Main fuses with label
20 Connector for Control panel
21 Connectors (2) for optical link in OP100 D unit (2 optical fibres)
22 Connectors (2) for optical link in PC (2 optical fibres)
23 Service connector
2.2 Control panel

Exposure Control

Exposure Button

Exposure Indicator Light

“Ready” Indicator Light

Imaging Procedures P1-P9 with Indicator lights

1. Standard Panoramic (P1)

2. Pediatric Panoramic (P2)

3. Ortho Zone Panoramic (P3) or Wide Layer Panoramic (P3 Optional)

4. Orthogonal Panoramic (P4)

5. Maxillary Sinus Procedure (P5)

6. Cephalostat, lateral projection (P6) 37 Cephalostat mode (P5, if OC100 attached)

7. Cephalostat, PA/AP projection (P7)

8. Lateral TMJ View (P86) or Ortho TMJ Axial Corrected Lateral TMJ View (P8P6 Optional)

9. TMJ, PA Projection (P9)

10. (P10) Not in use
Exposure Modes with Indicator lights

- Automatic Exposure Control
- Test Mode
- Manual Exposure Control

Automatic Exposure Density Scale (nine steps)

Icons for Preprogrammed Technique Factors with Indicator lights

- Child
- Juvenile
- Adult
- Heavy adult

Function Selection Keys (25 - 29):
- Move the flashing indicator left or right / decrease or increase the value on display
- Move the flashing indicator up or down to the next selection row.
- P1-P9: Show Exposure counter value
NOTE!
This key has special functions in the Program mode. See User Program Manual for details.

Radiation warning

2.3 Positioning panels

Positioning Panel Keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Panoramic (P1-P4)</th>
<th>Maxillary Sinus (P5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Carriage vertical movement up</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Carriage vertical movement down</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Moves the image layer during exposure 3 mm anterior</td>
<td>Moves the image layer during exposure 10 mm anterior from nominal position</td>
</tr>
<tr>
<td>23</td>
<td>Normal occlusion/reset position</td>
<td>Nominal position</td>
</tr>
<tr>
<td>24</td>
<td>Moves the image layer during exposure 3 mm posterior</td>
<td>Moves the image layer during exposure 10 mm posterior from reset position</td>
</tr>
<tr>
<td>25</td>
<td>Positioning lights on/off</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Rotating unit movement: Start position</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Rotating unit movement: Patient position</td>
<td></td>
</tr>
</tbody>
</table>

Position Panel Keys

<table>
<thead>
<tr>
<th>Key</th>
<th>Cephalometric (P6-P7)</th>
<th>TMJ (P8-P9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Carriage vertical movement up</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Carriage vertical movement down</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>No functioning</td>
<td>Moves image layer anterior</td>
</tr>
<tr>
<td>23</td>
<td>No functioning</td>
<td>Reset to middle</td>
</tr>
<tr>
<td>24</td>
<td>No functioning</td>
<td>Moves image layer posterior</td>
</tr>
</tbody>
</table>
### Positioning Panel Keys

<table>
<thead>
<tr>
<th>Part code</th>
<th>Part description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Positioning lights on / off</td>
</tr>
<tr>
<td>26</td>
<td>Rotating unit movement: Start position</td>
</tr>
<tr>
<td>27</td>
<td>Rotating unit movement: Patient position</td>
</tr>
</tbody>
</table>

### 2.4 Patient positioning accessories

#### Fig 2.8. Panoramic patient positioning accessories

#### Fig 2.9. TMJ patient positioning accessories

---

<table>
<thead>
<tr>
<th>Part code:</th>
<th>Part description:</th>
<th>Part code:</th>
<th>Part description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>62875</td>
<td>Chin rest</td>
<td>62904*</td>
<td>Nose support, long</td>
</tr>
<tr>
<td>62895</td>
<td>Sinus rest</td>
<td>62906*</td>
<td>Nose support, short</td>
</tr>
<tr>
<td>62942*</td>
<td>Bite block 10pcs</td>
<td>60477</td>
<td>TMJ pointer</td>
</tr>
<tr>
<td>62985*</td>
<td>Bite fork, short 56 mm</td>
<td>64665</td>
<td>TMJ angle indicator (Ortho TMJ option)</td>
</tr>
<tr>
<td>62988*</td>
<td>Bite fork 71 mm</td>
<td>62943</td>
<td>TMJ chin rest (Ortho TMJ option)</td>
</tr>
</tbody>
</table>
NOTE!
The parts marked with * are autoclavable.

Convenient bins for small accessories and disposables are located on the both sides of the vertical carriage.

Left and right cabins
2.5 Disposables & Service accessories

The following accessories, disposables and tools are available for the equipment:

<table>
<thead>
<tr>
<th>Part code:</th>
<th>Part description:</th>
<th>Part code:</th>
<th>Part description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6644</td>
<td>Bite fork coat, 500 pcs</td>
<td>69980</td>
<td>Ball &amp; pin phantom</td>
</tr>
<tr>
<td>7451</td>
<td>Chin rest coat, 100 pcs</td>
<td>60215</td>
<td>Allen wrenches (metric)</td>
</tr>
<tr>
<td>7452</td>
<td>Temple support coat, 200 pcs</td>
<td>20204</td>
<td>Fuse 15 A slow blow, for 110 V line voltage</td>
</tr>
<tr>
<td>7453</td>
<td>Nose support coat, 100 pcs</td>
<td>20154</td>
<td>Fuse 10 A slow blow, for 110 VAC line voltage</td>
</tr>
<tr>
<td>8915</td>
<td>Ear holder coat, 20 pcs</td>
<td>20912</td>
<td>Spare halogen lamp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>68662</td>
<td>Beam alignment tool</td>
</tr>
</tbody>
</table>

Fig 2.10. Disposables

Fig 2.11. Service
2.6 OC100 D Main parts

1. Cephalostat head
2. Control buttons
3. CCD camera
4. Secondary slot
5. Ear rod
6. Nasion support
7. Locking for ear holder rotation

Tube head

Slide the lever to choose the collimator. The right end is for cephalometric imaging and the left end is for the panoramic imaging. To make the QA image select first the panoramic position and then lift up the lever.
2.7 Changing the fuses

Push upward on the fuse base and twist it counter-clockwise with a screwdriver. The fuse with the base will come out.

Remove the fuse from the base and replace it with the new one. Repeat this with each fuse.

Fasten both fuses by pushing the base up and twisting it clockwise with a screwdriver.

Use only appropriate fuses:

326 Littelfuse 10A (slow blow) 230 VAC
326 Littelfuse 15A (slow blow) 115 VAC
2 OP100 D controls
3 Equipment preparations

3.1 Cleaning recommendations

The unit should be cleaned after every usage between the patients. Items and surfaces that are not given special instructions for cleaning, disinfecting and sterilizing, can be cleaned with soft cloth moistened with disinfective after every usage.

WARNING!
Always disconnect OP100 D from mains or switch off the power prior to cleaning or disinfecting the unit. do not allow any liquid to enter the unit interior.

CAUTION!
Do not allow water or other cleaning liquids to enter the unit interior since these may cause short-circuits or corrosion.

3.1.1 Cleaning

The purpose of cleaning and rinsing is to remove all adherent visible soil (eg. blood, protein substances and other debris), to reduce the number of particulate and micro-organisms, and to reduce the amount of pyrogenic and antigenic material.

Use a cloth moistened in cool-to-lukewarm, soapy water to clean the unit, and prevent coagulation and thus facilitate the removal of protein substances. Then wipe with a cloth moistened in clear water. Mild detergent solution can be used. Never use cleaners or solvents of any kind. If you are uncertain of the nature of cleaning agent, do not use it.

For example, the following cleaning agents are allowed (and not allowed) to clean the unit panels:

Allowed: Acetylene, Butylalcohol, Ethanol (ethyl alcohol) 96%, Methanol (metyl alcohol), Soap.

Not allowed: Bentzene, Chlorine bentzene, Acetone, Acetic ether

3.1.2 Disinfection

For example, use Ethanol 96% for disinfection of equipment. Wipe manually with clean cloth moistured in disinfectant solution. Never use corrosive or solvent disinfectants. All items and surfaces should be dried before next usage.

NOTE!
Wear gloves and other protective equipment during decontamination process.
WARNING!
Do not use any disinfecting sprays since the vapor could ignite causing injury.

Disinfecting techniques for both the unit and the room must comply with all laws and regulations that have jurisdiction of law within the jurisdiction on which the unit is.

3.1.3 Sterilization

Some removable parts in touch with the patient are sterilizable in autoclave. Such parts are:

Bite forks (4401, 2648, 62958), Bite block (62942) and Nose supports (62906, 62904).

3.1.3.1 Autoclave

Sterilizable parts can be autoclaved. If autoclaving is performed for these items, disinfection by immersing in disinfectant solution for 10 minutes is not needed.

3.1.3.2 Steam sterilization

Recommended parameters for sterilizable parts are:

Gravity-displacement steam sterilization
"Flash" sterilization:
Temperature: 270°F (132°C)
Exposure time: 3 minutes

Prevacuum steam sterilization
"Flash" sterilization:
Temperature: 270°F (132°C)
Exposure time: 3 minutes

Steam-flush pressure-pulse steam sterilization
Temperature: 270°F to 275°F (132°C to 135°C)
Exposure time: 3 to 4 minutes

3.1.3.3 Ethylene oxide sterilization

Not recommended as sterilization process for OP100 D parts.

3.1.4 Other sterilization processes

3.1.4.1 Dry heat sterilization

Dry heat sterilization can only be used with the bite forks. Typical cycle parameters are:

Temperature: 338°F (170°C)
Exposure time: 60 minutes

Temperature: 375°F (190°C)
Exposure time: 6 minutes (unwrapped items) or 12 minutes (wrapped items)
3.1.4.2 Liquid chemical sterilant gases

Not recommended as sterilization process for OP100 D parts.

3.1.4.3 Chemical sterilant gases

Not recommended as sterilization process for OP100 D parts.

Testing

For example, a 2% hydrogen per-oxide solution can be used to verify removal of protein from the unit. Solution bubbles if it comes in contact with blood or protein substances. If any bubbling is observed, the decontamination process must be performed again.

3.2 Connecting and disconnecting the CCD camera

OC100 D unit can be equipped with 1 or 2 cameras. If the unit is equipped with 1 cephalostat camera the same camera can be used for pan and ceph imaging. Another possibility is to use 2 cameras at the place all the time. In this case the unit is equipped with 1 pan and 1 ceph camera.

Panoramic camera

To remove the CCD camera from rotating unit pull the ring downwards (Figure 1). Push the camera slightly from below (Figure 2) so that it comes off from the top. Lift the camera a little and pull it away (Figure 3).

![Panoramic camera removal steps](image)

To install the camera back to the rotating unit proceed as stated above in reverse order. However instead of pulling the ring, push the top of the camera towards the rotating unit.

---

**NOTE!**

When installing the camera, make sure that the camera is properly connected by checking that it does not come off from the top when pushing from below.
Cephalostat camera

To remove the CCD camera from the cephalostat head press the knob on the handle and turn it 360 degrees counter-clockwise (Figure 1). Press the clips on the both sides of the camera (Figure 2) and lower the camera.

CAUTION!
Hold the camera while pressing the clips in order that the camera won’t fall. The camera must not be dropped or exposed to impacts.

To install the camera back to the cephalostat head lift the camera to holder until a click is heard. Then press the knob on the handle and turn it 360 degrees clockwise.

CAUTION!
The camera must not be dropped or exposed to impacts.

3.3 Preparation for panoramic image acquisition
1 Locate the power switch under the carriage. Turn the power switch to the "I" position. The green light will go on.
2 Set the CCD camera into the panoramic camera holder. See chapter Connecting and disconnecting the CCD camera.
3 Move the head support towards the mirror and select the panoramic collimator from the tube head. In OP100 D set the lever to the right. One of the panoramic programs will be selected automatically on the control panel.
Equipment preparations

4 Computer preparation:
   – Switch on PC
   – Start Windows software
   – Start the CliniView software. Refer to the *User manual for CliniView software* to get instructions how to use the CliniView software
   – Open the patient database and select patient or type all the required patient details in order to take an image
   – Press "Take PanImage" button to get ready for an exposure

**NOTE!**
Always maintain visible contact with the patient and technique factors during the exposure and stay within earshot to be able to hear the warning tone. This allows immediate termination of radiation by the release of the exposure button in the event of a malfunction or disturbance.

5 Proceed to the section *Panoramic procedures* for Panoramic imaging and to the section *Special imaging procedures* for Sinus and TMJ imaging.

**CAUTION!**
Handle the camera with care as instructed in this manual. The camera must not be dropped or exposed to impacts. A shock indicator inside the camera will show if the camera has been exposed to excess impact.
3 Equipment preparations

NOTE!
When using the system in an extremely high electromagnetic environment interferences may change image quality. If interference appears, contact your local dealer.
4 Panoramic procedures

4.1 P1: Standard panoramic exposure

1 Prepare the equipment per section 3.2.
2 Verify that the light under program "1" (P1) in the control panel is lit.
3 Press patient positioning button to rotate the rotating unit to the patient positioning position.

When the system is turned on it will automatically set itself to standard panoramic with AEC (Automatic exposure control) mode settings. You can also select different power up settings if you want. No other Control Panel settings are necessary.

NOTE!

If you wish to set the AEC density factors darker or lighter or wish to set the technique factors by patient size or manually, refer to section Imaging technique.

4 To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section Imaging technique for more information.

<table>
<thead>
<tr>
<th>Technique factors in standard panoramic imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>child</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>110 VAC</td>
</tr>
<tr>
<td>230 VAC</td>
</tr>
</tbody>
</table>

Note: Example with Pr 52 CCO Constant Contrast = 63kV, Density = 6
5  Install the chin rest and bite fork with bite fork rod (adult or child) with hygienic covers. Open temple supports.

6  Ask patient to remove any metal objects, such as eye glasses, jewelry, oral appliances, removable dentures, hearing aids, bib chain, etc., from the head and neck area. Shadows caused by these opacities may obscure diagnosis.

7  It is strongly recommended to provide the patient with a lead apron for radiation protection.

8  Direct the patient to the unit and instruct to stand as straight and tall as possible. Ask patient to take a grip on handles.

By pressing the up or down button on the Patient positioning panel adjust the carriage height so the chin rest is at the patient's height. Have patient place chin on the chin rest.
9 Show the patient the grooves in the bite fork and place the bite fork into patient's mouth.

![Fig 4.4. Hands on the grips and chin on the chin rest.]

**NOTE!**
The patient can either be standing, seated, or in a wheelchair.

If the bite fork cannot be used because the malocclusion or missing teeth, remove the bite fork with rod (A), reset the chin support (B), and use cotton rolls to separate the bite.

![Fig 4.5. Chin support installation](image1)  ![Fig 4.6. Using chin support](image2)

10 Positioning lights will switch on automatically when the carriage is moved. They stay on for 45 seconds or until exposure is initiated. If necessary, lights can also be switched on and off at the Positioning panel with light key.

11 Ask the patient to take a small step forward, to straighten the cervical vertebrae to minimize spinal shadow.

12 Patient's face and light lines can be seen in the curved mirror. Move the FH light to illuminate the patients' infra-orbital notch. By slightly raising or lowering the carriage, position the patient so that the Frankfort-Horizontal plane (FH) light passes over the ear opening and the infra-orbital notch. Be sure the patient does not slump if carriage is lowered. Adjust patient's head as necessary so that the front light coincides with the patient's mid-sagittal plane.
13 Adjust patient’s head as necessary so that the front light coincides with the patient’s mid sagittal plane.

14 Move the head support by pressing it from sides against the patient and close the temple supports.

15 Confirm the position of the focal trough in reference to the occlusion. The image layer light should illuminate the buccal of the maxillary canine (or base of the nose if edentulous).

If not, then adjust the focal trough by pressing one of the occlusion correction keys. Press the key closest to mirror, if the patient has progenia. Press the key closest to patient, if he has prognathism.
This will adjust the unit during exposure. After the exposure, occlusion correction is automatically reset to center position.

16 Advise patient to close lips and swallow. This will raise the patient's tongue to the roof of the mouth and enhance image quality. Ask the patient to breathe through the nose and remain still during the exposure. Patient can be asked to close eyes.

17 After patient positioning press start button, and wait until the unit stops. Check that the patient positioning is not changed when the rotating unit is moved to its starting position.

**WARNING!**
During the exposure cycle radiation control guidelines must be observed.

18 Press Exposure button. Use remote exposure button or take the exposure control panel to a position at least 2 meters (7 ft.) from the patient or behind a shield. After verifying that the “Ready” light is on, press and hold the exposure button. The exposure button must be pressed until the end of the exposure cycle as indicated by a light and audible tone.

**NOTE!**
Observe the patient and CliniView real time image acquisition during the exposure. In case of a problem, such as patient movement or if the image acquisition does not succeed, the exposure can be terminated immediately upon release of the exposure switch. Retake the exposure.
NOTE!
If exposure cannot be initiated and an error code appears on the exposure control panel, refer to section *Failure Diagnostics* for explanation and correction.

19 At the end of the exposure, release temple supports and guide the patient away from the unit.

20 Remove disposable covers and disinfect the unit.

21 Proceed to the image handling. Refer to the *User Manual for CliniView software* to get instructions how to use CliniView software.
4.2 P2: Pediatric panoramic exposure

Pediatric patients can be imaged with less radiation dosage and shorter exposure time. Patients with narrow than average jaw can be exposed with this procedure, too.

1 Prepare the equipment and PC system per section Preparation for panoramic image acquisition.

2 Select the pediatric exposure program on the Control Panel. Press the right key to move the flashing light from the standard panoramic position to the pediatric position P2.

3 To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section Imaging Technique for more information.

<table>
<thead>
<tr>
<th>Technique factors in pediatric panoramic imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 VAC</td>
</tr>
<tr>
<td>230 VAC</td>
</tr>
</tbody>
</table>

Note: Example with Pr 52 CCO, Constant Contrast = 63kV, Density = 6

4 Press patient positioning button to rotate the rotating unit to the patient positioning position.

5 Install the chin rest and bite fork with bite fork rod (child) with hygienic covers. Open temple supports. Insert a child adapter to the head support when needed. Press adapter ends towards each other with fingers, slide the adapter against the head support, and release. Pins will hold the adapter in place.
6 Position the patient and take exposure per steps 6 through 20 of the standard panoramic exposure procedure.

7 After the exposure return the system to the standard panoramic program by pressing the cursor keys to move the flashing light to the standard program position.

8 Proceed to the image handling. Refer to the User Manual for CliniView software to get instructions how to use CliniView software.

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**NOTE!**

The system can be operated without radiation to demonstrate the movement to the child by setting the system to the Test mode. To do this, press the down key to move the flashing light over the Manual mode (M). Then press the right key once to move the light over the Test mode (T). Pressing the exposure switch will now cause the system to cycle without radiation. To return to operational status, press the left key once to move the flashing light over the Manual mode (M).
4.3 P3: Ortho Zone enhanced panoramic exposure

Fig 4.19. P3: Ortho Zone image layers

When used, this optional program replaces the Wide layer enhanced panoramic program P3 on the Control panel.

The Ortho Zone program produces two different scanning geometries combined on the same image.

The first geometry (#1 and #3 in the figure) starts with the rotation center much further posterior than in the normal panoramic views (eg. Programs P1 and P2).

The result of this scanning location will allow for views of the TM joint without redundant shadows from the opposite side obscuring the image. Patients with prosthetic condyles or other posterior radiopaque objects can have the opposite side successfully imaged.

The second view (#2 in the figure) produces an image of the anterior region with a very wide layer of focus (approx. 35 mm). This view may be helpful when diagnosing trauma, wired shut, severe class III and uncooperative patients.

1 Prepare the equipment and PC system per section Preparation for panoramic image acquisition.

2 Select the Ortho Zone program on the Exposure Control Panel. Press the right key twice to move the flashing light from the standard panoramic position to the Ortho Zone position P3.

Fig 4.20. P3 & AEC Mode

3 To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section Imaging Technique for more information.
4 Panoramic procedures

Press patient positioning button to rotate the rotating unit to the patient positioning position.

Position the patient per steps 5 through 16 of the standard panoramic exposure procedure. Skip step 15.

Take the exposure per steps 17 through 20 of the standard panoramic exposure procedure.

After the exposure return the system to the standard panoramic program by pressing the cursor keys to move the flashing light to the standard program position.

Proceed to the image handling. Refer to the User Manual for CliniView software to get instructions how to use CliniView software.

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<table>
<thead>
<tr>
<th>Technique factors in ortho zone imaging</th>
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</thead>
<tbody>
<tr>
<td>child</td>
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<tr>
<td>-------</td>
</tr>
<tr>
<td>110 VAC</td>
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<tr>
<td>230 VAC</td>
</tr>
</tbody>
</table>

Note: Example with Pr 52 CCO, Constant Contrast = 63kV, Density = 6
4.4 P3: Wide arch panoramic exposure (optional)

When used, this program replaces the Ortho Zone enhanced panoramic program P3 on the Control panel.

When the patient has a wider than normal dental arch, an improved image can be achieved by selecting the wide layer exposure program.

1. Prepare the equipment and PC system per section Preparation for panoramic image acquisition.

2. Select the wide layer panoramic program on the Exposure Control Panel. Press the right key twice to move the flashing light from the standard panoramic position P1 to the wide layer position P3.

3. To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section Imaging technique for more information.

<table>
<thead>
<tr>
<th>Technique factors in wide arch imaging</th>
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</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>-------------------------</td>
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<tr>
<td>110 VAC</td>
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<td></td>
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<tr>
<td>230 VAC</td>
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<td></td>
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</tbody>
</table>

*Note: Example with Pr 52 CCO, Constant Contrast = 63kV, Density = 6*

4. Press patient positioning button to rotate the rotating unit to the patient positioning position.

5. Position the patient and take exposure per steps 5 through 20 of the standard panoramic exposure procedure.

6. After the exposure return the system to the standard panoramic program by pressing the cursor keys to move the flashing light to the standard program position.
4.5  P4: Orthogonal exposure

An optimized view of the dentition only with optimized anqulation and reduced radiation can be achieved by selecting the orthogonal exposure program.

1  Prepare the equipment and PC system per section Preparation for panoramic image acquisition.

2  Select the orthogonal exposure program on the Exposure Control Panel. Press the right key three times to move the flashing light from the standard panoramic position P1 to the orthogonal position P4.

3  To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section Imaging technique for more information.

<table>
<thead>
<tr>
<th>Technique factors in ortho zone imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>child</td>
</tr>
<tr>
<td>110 VAC</td>
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<tr>
<td>230 VAC</td>
</tr>
</tbody>
</table>

Note: Example with Pr 52 CCO, Constant Contrast = 63kV, Density = 6

4  Press patient positioning button to rotate the rotating unit to the patient positioning position.

5  Position the patient and take exposure per steps 5 through 20 of the standard panoramic exposure procedure.

6  After the exposure return the system to the standard panoramic program by pressing the cursor keys to move the flashing light to the standard program position.
7 Proceed to the image handling. Refer to the *User Manual for CliniView software* to get instructions how to use CliniView software.
4 Panoramic procedures
5 Special imaging procedures

5.1 P5: Maxillary Sinus view

1 Prepare the equipment per section *Preparation for panoramic image acquisition*.

2 Select the imaging program for a maxillary sinus view on the Exposure Control Panel. Press the right key four times to move the flashing light from the standard panoramic position P1 to the maxillary sinus position P5.

3 The system is in the Manual Exposure Control mode. To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section *Imaging technique* for more information. Use one step higher technique factors compared to TMJ imaging.

4 Press patient positioning button to rotate the rotating unit to the patient positioning position.

5 Remove the bite fork, bite fork rod and chin rest. Install the bite fork with bite fork rod over the sinus rest. Install hygienic covers.

<table>
<thead>
<tr>
<th>Technique factors in Maxillary Sinus imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>child</td>
</tr>
<tr>
<td>110 VAC</td>
</tr>
<tr>
<td>230 VAC</td>
</tr>
</tbody>
</table>

*Note: Example with Pr 52 CCO, Constant Contrast = 66kV, Density = 7*
6 Direct the patient to the machine and instruct to stand as straight and tall as possible. Ask patient to take a grip on handles.

By pressing the up or down button on the Positioning Control panel adjust the carriage height so the sinus rest is at the patient's height. Have patient place chin on sinus rest.

7 Show the patient the grooves in the bite fork and place the bite fork into patient's mouth.

8 Adjust patient's head as necessary so that the front light coincides with the patient's mid-sagittal plane. Move the head support against the patient forehead and close the temple supports.

9 Adjust the focal trough as necessary. Image layer is 18 mm posterior compared to Standard panoramic procedure. To set this layer 10 mm anterior or 10 mm posterior, press occlusal correction keys. Center layer position is selected by pressing normal occlusion key. This will adjust the unit during the exposure.
Fig 5.6. P5: Sinus view layers: front, center, back

10 Instruct the patient to close lips and swallow. This will raise the tongue to the roof of the mouth. Ask the patient to breathe through the nose and remain still during the exposure.

11 After patient positioning press start button, wait until the unit stops. Check that the patient positioning is not changed when the rotating unit is moved to its starting position.

12 Press and hold the exposure button. The system will cycle and expose the maxillary sinus region.

13 Release the exposure button, open temple supports and guide the patient out. Remove the bite fork and rod, reset chin rest and bite fork.

14 Return the system to the standard panoramic program.

15 Remove disposable covers and disinfect the unit.

16 Proceed to the image handling. Refer to the User Manual for CliniView software to get instructions how to use CliniView software.

5.2 P8: TMJ, Lateral projection

1 Prepare the equipment per section Preparation for panoramic image acquisition.

2 Select the imaging program for TMJ, lateral projection on the Exposure Control Panel. With OP100 D press the key two times to move the flashing light from the standard panoramic position P1 to the TMJ, lateral projection position P8.

3 The system is in the Manual Exposure Control mode. To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the suggested values from the table below. Refer to section Imaging technique for more information.
4 Press patient positioning button to rotate the rotating unit to the patient positioning position.

5 Remove the bite fork, bite fork rod, chin rest and sinus rest. Install the TMJ nose support (2 models available) with hygienic coat and the TMJ pointer.

6 Ask patient to remove any metal objects, such as eye glasses, jewelry, oral appliances, removable dentures, hearing aids, bib chain, etc., from the head and neck area. Shadows caused by these opacities may obscure diagnosis.

7 It is strongly recommended to provide the patient with a lead apron for radiation protection.

8 Direct the patient to the machine and instruct to stand as straight and tall as possible. Ask patient to take a grip on handles.

By pressing the up or down button on the Positioning Control panel adjust the carriage height so that the TMJ nose support is at the patient's nose height. Have patient place nose against TMJ nose support.
9 Adjust patient's head as necessary so that the front light coincides with the patient's mid-sagittal plane. Move the head support by pressing it from sides against the patient and close the temple supports.

10 To adjust the focal trough reference to the TMJ, a special pointer is used. By pressing the appropriate occlusal adjustment button on the Positioning Control, move the TMJ pointer forward (towards the mirror) or back until the pointer aligns with the external auditory meatus.

11 If the TMJ pointer doesn't align with external auditory meatus, replace the TMJ nose support with the other model and repeat patient positioning.

12 Have the patient close or open the jaw. If the jaw is open move the TMJ pointer 10 mm anterior compared to jaw closed positioning.

13 After patient positioning press start button, wait until the unit stops. Check that the patient positioning is not changed when the rotating unit is moved to its starting position.

14 Press and hold the exposure button. The system will cycle, exposing only the two TMJ's.
15 Release the exposure button, open temple supports and guide the patient out. Remove the TMJ pointer and TMJ nose support.

16 After the exposure return the system to the standard panoramic program by pressing the cursor keys to move the flashing light to the standard program position.

17 Remove disposable covers and disinfect the unit.

18 Proceed to the image handling. Refer to the *User Manual for CliniView software* to get instructions how to use CliniView software.
5.3 P8: Ortho TMJ, axial corrected lateral projection (optional)

When used, this optional program replaces the TMJ lateral projection exposure program P8 on the Control panel.

Ortho TMJ program provides a wide layer axial corrected views for the patient's left and right temporomandibular joints. The angle of correction for any particular patient can be derived from tracing a submental vertex image (SMV) obtained with cephalostat, or a statistical average of 18° to 20° may be used if a SMV is unavailable.

1 Expose, process and trace a submental vertex image. Determine the angle of the long axis of the condyle in relationship to a lateral base line. This will be the correction angle. Take care in positioning the patient while taking the SMV. Be sure the patient's ala-tragus line is vertical, if not this can result in an incorrect angular measurement.

If the left and right condyles are at vastly different angles, two corrected joint views may be required.

2 Prepare the equipment per section Preparation for panoramic image acquisition.

3 Select the imaging program for corrected lateral TMJ projections on the Exposure Control Panel. With the OP100 D press the key two times to move the flashing light from the standard panoramic position P1 to the Ortho TMJ position P8.

4 The system is in the Manual Exposure Control mode. To set technique factors by patient size select one of the preprogrammed patient size icons or manually entering the
suggested values from the table below. Technique factors are two steps higher compared to the standard TMJ lateral view program. Refer to section Imaging Technique for more information.

<table>
<thead>
<tr>
<th>Technique factors in Ortho TMJ imaging</th>
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<tbody>
<tr>
<td>child</td>
</tr>
<tr>
<td>110 VAC</td>
</tr>
<tr>
<td>230 VAC</td>
</tr>
</tbody>
</table>

Note: Example with Pr 52 CCO, Constant Contrast = 66kV, Density = 7

5 Press patient positioning button to rotate the rotating unit to the patient positioning position.

6 Remove the bite fork, bite fork rod, chin rest and sinus rest. Install the TMJ chin rest with hygienic coat.

7 Install the carbon fiber TMJ pointer with the TMJ angle indicator into the socket over the patient's head.

8 Ask patient to remove any metal objects, such as eye glasses, jewelry, oral appliances, removable dentures, hearing aids, bib chain, etc., from the head and neck area. Shadows caused by these opacities may obscure diagnosis.

9 It is strongly recommended to provide the patient with a lead apron for radiation protection.

10 Direct the patient to the machine and instruct to stand as straight and tall as possible. Ask patient to take a grip on handles. By pressing the up or down button on the Positioning Control panel adjust the carriage height so that the TMJ chin rest is at the patient's chin level. Have patient place chin against the TMJ chin rest.

11 Adjust patient's head as necessary so that the front light coincides with the patient's mid-sagittal plane. Move the head support by pressing it from sides against the patient and close the temple supports.
12 To adjust the x-ray beam angle to the patient's condylar angle the TMJ pointer and angle indicator are used. By pressing the appropriate occlusal button on the Patient positioning panel, move the TMJ angle indicator forward or back until the desired angle is displayed over the patient's condyle.

13 Have the patient gently close the jaws together.

14 After patient positioning press start button, wait until the unit stops. Check that the patient positioning is not changed when the rotating unit is moved to its starting position.

15 Press and hold the exposure button. The system will cycle exposing only the two TMJ's.

16 Release the exposure button, open temple supports and guide the patient out. Remove the TMJ pointer, TMJ chin rest and TMJ angle indicator.

17 After the exposure return the system to the standard panoramic program by pressing the cursor keys to move the flashing light to the standard program position. Remove Ortho TMJ accessories.
18 Remove disposable covers and disinfect the unit.

19 Proceed to the image handling. Refer to the User Manual for CliniView software to get instructions how to use CliniView software.

5.4 P9: TMJ, posteroanterior projection

1 Prepare the equipment per section Preparation for panoramic image acquisition.

2 Select the imaging program for TMJ, PA projection on the Exposure Control Panel. With OP100 D press the key one time to move the flashing light from the standard panoramic position P1 to the TMJ, PA projection position P9.

3 The system is in the Manual Exposure Control mode. Use technique factors per section TMJ, Lateral projection.

4 Press patient positioning button to rotate the rotating unit to the patient positioning position.

5 Position the patient as in TMJ, Lateral view and procedure steps through. Move the TMJ pointer 10 mm anterior compared to jaw closed positioning.

6 Have the patient open the jaw.

7 After patient positioning press start button, wait until the unit stops. Check that the patient positioning is not changed when the rotating unit is moved to its starting position.

8 Press and hold the exposure button. The system will cycle and expose only as necessary to display the TMJ's in PA projection.
9 Release the exposure button, open temple supports and guide the patient out. Remove the TMJ pointer and TMJ support.

10 Return the system to the standard panoramic program.

11 Remove disposable covers and disinfect the unit.

12 Proceed to the image handling. Refer to the User Manual for CliniView software to get instructions how to use CliniView software.
6 Cephalometric procedures (optional)

Programs P6 and P7 are cephalometric imaging programs. For cephalometric programs pre-programmed patient symbols or manual exposure values can be used to control the dose.

Image magnification is fixed 14%. CliniView software compensates this magnification when measurements are made with CliniView.

Positioning steps demonstrated in this manual are for right-mounted cephalostat. Steps for the left-handed cephalostat are similar otherwise the exception mentioned.

6.1 Preparing the operation

1 Set the CCD camera into the cephalo head’s camera holder unless it isn’t already in place.

WARNING!
The camera must not be dropped or exposed to impacts.

2 Turn the power switch to the "I" position. Slide the lever to the right edge selecting the cephalometric collimator in the tube head.

NOTE!
Remove the chin rest from the lower shelf in left handed cephalostat. (Concerns units up to s/n 79812).

3 Ask patient to remove any metal objects, such as eye glasses, jewelry, oral appliances, removable dentures, hearing aids, bib chain, etc., from the head and neck area. Shadows caused by these opacities may obscure diagnosis.

4 Make the computer preparations according to CliniView User Manual.
6.2 P6: Lateral projection

Tilt the nasion support aside. Drive the unit to the patient positioning position by pressing the patient positioning button.

⚠️ **CAUTION!**
Make sure that the secondary collimator does not hit the nasion support during the movement.

Turn the ear rods to the lateral projection position and lock by turning the handle on the cephalostat head.

💪 **NOTE!**
Turning the handle 180 degrees alters the state of the ear rods (locked-unlocked) regardless of the turning direction.

Verify that the light under the program 6 (P6) in the control panel is lit.

Insert the optional hygienic covers over the ear rods and the nasion support. Guide the patient under the cephalostat.

Adjust the cephalostat to the proper height and introduce the ear rods to external auditory meatuses.

Switch the laser light on. Position the patient so that the Frankfurt-Horizontal plane (FH) passes over the ear opening and the infra-orbital notch.
6.3 P7: Postero-anterior (PA) projection

Tilt the nasion support aside. Drive the unit to the patient positioning position by pressing the patient positioning button.

NOTE!
Make sure that the secondary collimator does not hit the nasion support during the movement.
Turn the ear rods to the PA projection position and lock by turning the handle on the cephalostat head.

Verify that the light under the program 7 (P7) in the control panel is lit.

Insert the optional hygienic covers over the ear rods. Guide the patient under the cephalostat.

Adjust the cephalostat to the proper height and introduce the ear rods to external auditory meatuses.

Select the technique factors.

Verify that "READY" light is on. Make the exposure by pressing the exposure button.
After the exposure, release the patient by opening the ear rods and guide him/her out. Pay attention that the patient does not hit the secondary slot when stepping out from the cephalostat. Remove the disposables.

6.4 Using the carpus support

Turn the rotation chassis so that the nasion support is against the cameraholder. Turn the nasion support sideway and fasten the carpus holder to the nasion support holder.

Press the white lever to attach the carpus support tightly.

Ask patient to remove any metal objects and place hand against the carpus holder. Select technique factors manually.

<table>
<thead>
<tr>
<th>Directive technique factors for carpus imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 kV</td>
</tr>
<tr>
<td>3,2 mA</td>
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<tr>
<td>8sek</td>
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</tbody>
</table>

Verify that “READY” light is on. Press the exposure button to make the exposure.
6 Cephalometric procedures (optional)
7 Imaging technique

7.1 Automatic exposure control (AEC)

When the OP100 D is turned on, it is set as a default to Standard Panoramic with Automatic Exposure Control. The software will monitor the amount of radiation the CCD camera is receiving and automatically set the exposure factors for proper dose. After the exposure the adjusted values are shown on the display.

The AEC will stay engaged with the other panoramic procedures unless set to manual mode.

The signal to noise ratio can be changed while keeping AEC engaged:

1. The signal to noise ratio can be adjusted without disengaging the AEC by resetting the automatic exposure density scale on the Control Panel.

2. Press the down key twice to move the flashing light from the standard panoramic position to the central light on the automatic exposure density scale.

3. To increase the signal to noise ratio, press the left key to move the flashing light to the right. Each change increases the radiation output by approximately 12 percent.

4. To decrease the patient dose, press the cursor key to move the flashing light to the left. Each change decreases the radiation output by approximately 12 percent.

**NOTE!**

AEC density is controlled in half steps. A half step between two indicators is shown with both indicators lit.

7.2 AEC test

To make sure the Automatic Exposure Control (AEC) works properly the following test can be performed.

Cover the x-ray source with lead. Set the unit to Automatic mode and choose the standard panoramic program. Make an exposure and observe the technique factors. The technique factors should increase to the highest values (85 kV, 12 mA).
Remove the lead from the x-ray source and make the exposure once again. Now the technique factors should decrease to the lowest value (57kV, 2 mA).

### 7.3 Exposure technique factors

OP100 D has a flexibility to use a variety of exposure technique factors, ranging from 57 kV to 85 kV and from 2 mA to 16 mA. The kV/mA values used depend on OP100 D software settings, i.e. constant contrast kV setting defined in Pr 52 CCo and also on line voltage.

In the following charts each "ball" represent a kV/mA pair that can be used with the selected line voltage, with imaging programs P1 to P5 and P8 to P9. Exposure time is fixed with programs P1 to P5 and P8 to P9.

![Diagram](image1.png) **Fig 7.2.** Exposure factors with 230 V

![Diagram](image2.png) **Fig 7.3.** Exposure factors with 110 V

![Diagram](image3.png) **Fig 7.4.** Example: When kV is lowered and mA increased, the same radiation output level results

Exposure factors shown on the control panel are automatically selected by the OP100 D software based on settings done during the installation. These settings can be changed. See OP100 D User Program Manual, Pr 52 CCo for details.

The following charts show examples of exposure values with different software settings. A "ball" represents a kV/mA value used in Manual mode and a "line" represents kV/mA values which can be selected by the Automatic Exposure Control (AEC).
Fig 7.5. Possible exposure values when constant contrast has value of 70kV and supply voltage is 230 VAC.

Fig 7.6. Possible exposure values when constant contrast has value of 63kV and supply voltage is 230 VAC.

Fig 7.7. Possible exposure values when constant contrast has value of 70kV and supply voltage is 110 VAC.

Fig 7.8. Possible exposure values when constant contrast has value of 70kV and supply voltage is 110 VAC.
7.4 Manual mode

If desired, the exposure technique factors can be set manually with the AEC disengaged. The technique factors can be set either by patient size or by specific kV and mA factors.

1. To set the unit to manual mode first press the down key once to move the flashing light from the standard panoramic position to the AEC (A) position. Then press the right key once to move the flashing light to manual (M) position.

![Fig 7.9. Manual mode](image)

2. At this time the light over the juvenile of the programmed exposure factor should be lit. To change the programmed exposure, first press the down key 2 times until the flashing light is over the patient size symbol. To raise or lower the setting, press the right or left key.

3. To set specific technique factors set the unit to manual mode first, then press the down key once until the flashing light is at the kV and mA section. By pressing the right or left key the displayed value can be increased or decreased.

4. Panoramic and Special procedures can use the following technique settings:

<table>
<thead>
<tr>
<th>Panoramic, TMJ and Sinus Imaging Procedures</th>
<th>Technique Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>KVP</td>
<td>57 - 60 - 63 - 66 - 70 - 73 - 77 - 81 - 85</td>
</tr>
<tr>
<td>MA</td>
<td>2 - 2.5 - 3.2 - 4 - 5 - 6.4 - 8 - 10 - 12 - 16</td>
</tr>
<tr>
<td>kVP/MA pairs</td>
<td>57/2 - 85/12</td>
</tr>
<tr>
<td>Exposure time</td>
<td>8.0 - 17.6s. Fixed for each imaging procedure.</td>
</tr>
</tbody>
</table>

NOTE!
kVp and mA can be selected independently in Manual mode. With this option, kV can be selected in steps of 1 kV. See Service Program Manual, section Sr 89 COP, option 4 FE for details.

5. Technique factors for patient size symbols can be programmed for Panoramic and Special procedures. See User Program Manual, section Pr52CCo for details.

6. These programmed values are for guidance only. Adjust contrast and brightness with CliniView software when necessary.

7. To adjust for optimum image quality select one density setting lower or higher in Automatic Exposure Control and one point higher or lower technique factors in Manual Exposure Control and expose again. Consult your dealer for detailed information.
7.5 Free selection of kV and mA

OP100 D technique factors are normally selected based on kV target level set with the constant contrast program (Pr 52 CCo), where kV and mA values are tied to each other. It is possible to configure OP100 D so that kV and mA are selected independently in Manual mode. Please consult your dealer to activate this software option. When activated, this feature has no effect on the AEC mode and on preprogrammed technique factors.

In Manual mode the tube voltage can be selected in steps of 1 kV. When the LED indicator for kV/mA values is lit, first kV display is blinking. Select kV value by pressing the right or left key.

**NOTE!**
Pressing the key longer causes kV to change in larger steps.

Then press the down key; mA display is blinking. Select the mA value.

mA can be selected from the fixed table: 2.0, 2.5, 3.2, 4.0, 5.0, 6.4, 8.0, 10, 12 and 16.

**NOTE!**
If the kV is increased with maximum mA selection, the mA value is automatically decreased when the product of kV * mA exceeds the allowed X-ray tube rating.
7 Imaging technique

7.6 Test mode

The movements of the unit can be performed without radiation. This may be useful for children or uncooperative patients to demonstrate the operation prior to taking the exposure.

1 To set the unit to test mode first press the down and right keys to move the flashing light from the standard panoramic position to the AEC (A) position. Then press the right key twice to move the flashing light to the test mode (T) position.

![Fig 7.12. Test mode](image)

2 The unit will now operate without X-ray emission.

3 To return to the AEC (A) mode press the left key twice.

7.7 Measurements from the image

In normal panoramic mode images the vertical dimension must be divided by a factor of 1.3. Horizontal dimensions should not be measured because the horizontal magnification is accurate only in the center of focal trough (1.3 in panoramic and TMJ lateral, 1.8 in TMJ PA) and changes rapidly when moving away from focal trough.

---

**NOTE!**

CliniView software corrects automatically the enlargement proportion. Refer to *User Manual for CliniView software*.

---

**WARNING!**

In panoramic images the horizontal and vertical magnifications are the same only in the focal trough. Manufacturer assumes no liability on the accuracy of the measurements from the X-ray image. Angulation of the object being imaged affects on the dimensional accuracy on the image.
8 Special features

8.1 Quality assurance

The Orthopantomograph® OP100 D can produce a self diagnosing image for checking that OP100 D digital system, OP100 D unit, PC hardware with connections and CliniView software, works properly.

1. Remove the bite fork with bite fork rod.
2. Set the primary collimator to the QA position (Move the lever to the left and pull up). QA selection is indicated in control panel with lowest kV/mA values (57kV/2mA) and a moving indicators in the AEC density scale.

![Fig 8.1. OP100 D QA collimator selection](image)

3. Press the start button in the patient positioning panel. The rotating unit turns towards the column.
4. Computer preparation:
   • Switch on PC.
   • Start Windows software.
   • Start the CliniView software. Refer to the User manual for CliniView software to get instructions how to use CliniView software.
   • Select test image patient from the patient database.
   • Press "Take PanImage" button to get ready for an exposure.
5. Press and hold the exposure button. The rotating unit will remain stationary while exposure with increasing kVp/mA values.
6. QA image appears on the PC display.
7. Check that you have 15 blocks in the image and their density is increasing smoothly from light to dark. If you do not have these blocks or the image does not appear on the display change CliniView contrast default settings. If this doesn’t work contact your local dealer.
If everything is as described then the system is working properly.

Set the primary collimator back to the panoramic position and insert the bite block.

Perform the test if you suspect there is something wrong with your images.

### 8.2 Exposure counter

The total number of exposures the system has taken is automatically counted and can be read any time.

Turn the OP100 D power on, and wait until the normal display appears. Make sure that one of the programs P1-P9 is selected.

Press the OK key.

Several numbers will be displayed on the Control panel and other indicators will be turned off.

Numbers will be shown for few seconds or until the OK key is released.

The total number of exposures is read from top to bottom. The example above is **12 345** exposures.

Resume to normal operation.
8.3 Preventive maintenance reminder

The exposure counter also provides a means of reminding when maintenance is due. After every 2000 exposures a special reminder message, "Ch 8 PSE", will be displayed for few seconds when the power is switched on.

This message indicates that the user should contact the dealer for the scheduled maintenance. We recommend that this unit will be provided for regular service for best performance and reliable operation. Refer to chapter Maintenance of this manual for details.

The message display does not affect the equipment operation. It will be reset during the maintenance service procedure, or it can be reset by the user.
9 Understanding the OP100 D image

Typical OP100 D radiograph with anatomical landmarks and structures.

1 hyoid bone
2 angle of mandible
3 external oblique line
4 maxillary tuberosity
5 styloid process
6 middle cranial fossa
7 zygomatic arch
8 palate
9 orbit
10 septa in maxillary sinus
11 maxillary sinus
12 pterygoid plates
13 coronoid process
14 articular eminence
15 mandibular condyle
16 glenoid fossa
17 vertebra
18 ear lobe
19 mandibular canal
20 mental foramen
21 Sella Turcica
10 Failure diagnostics

The OP100 D has many safety functions and features assuring the safe operation of the equipment. In the event of certain user failures or system malfunction the unit will not produce x-rays and a failure code will be displayed on the Control Panel.

10.1 Failure messages

In case of malfunction, the unit displays a failure message. Various letters and numbers will be displayed in the technique factors display positions next to kV, mA and s, eg. Ch 6 POS. Failure code classification is displayed next to kV. A special 2-digit failure code number is displayed next to mA.

![Failure message](image)

Fig 10.1. Failure message

10.2 kV display

The kV-display indicates the nature of the failure, whether it is caused by user (eg. exposure button prematurely released by operator), environment (eg. low line voltage) or protection in the unit (eg. tubehead too hot), or whether there is a serious defect in the unit, which disables the complete operation (eg. program memory error):

<table>
<thead>
<tr>
<th>Ch</th>
<th>Check. A failure caused by the user (eg. exposure button prematurely released by operator).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sy</td>
<td>Safety. Temporary malfunction or protection in the unit, caused by the unit or environment. Operation is prohibited or terminated to protect the operator, patient and the unit itself. (Eg. the temperature in the tube head assembly is too high due to intensive use). After the corrective action, unit can be used.</td>
</tr>
<tr>
<td>Er</td>
<td>Error. There is a serious defect in the unit, and the operation is therefore prohibited to protect the operator, patient and the unit itself. (Eg. failure in the CPU Board).</td>
</tr>
</tbody>
</table>

**WARNING!**

If the unit is further used, "er" failure may cause malfunction.
10.3 mA display

The mA-display indicates the actual numeric failure code by two-digit number. Each failure code has a unique number, to differ one malfunction from another:

<table>
<thead>
<tr>
<th>kV</th>
<th>Ch</th>
<th>Sy</th>
<th>Er</th>
</tr>
</thead>
<tbody>
<tr>
<td>mA</td>
<td>1 to 9</td>
<td>20 to 31</td>
<td>40 to 45</td>
</tr>
</tbody>
</table>

10.4 Time display

The exposure time display indicates the alphanumeric short form explanation of the malfunction. This reminds the user or the serviceman of what the actual numeric failure code means, or sometimes numeric information of the malfunction. The display may also blink telling more information about the fault, for example in Sy 20 where blinking display also tells the waiting time for tube head cooling.

<table>
<thead>
<tr>
<th>kV</th>
<th>Time display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch-failure</td>
<td>PC, COL, POS, rEL, PSE, rEo, or numbers</td>
</tr>
<tr>
<td>Sy-failure</td>
<td>HHo, ArC, Inu, FIL, AEC, EEP, Por, CCD, PoL, PoH, PoU, or numbers</td>
</tr>
<tr>
<td>Er-failure</td>
<td>CPU, FIL, InP</td>
</tr>
</tbody>
</table>

10.5 Resetting failure

Ch failure codes can be reset by correcting the reason for the failure code. Ch and Sy failures can be reset by pushing any key in the control panel or in the patient positioning panel. If Sy failure appears repeatedly call your local dealer. Exception is Sy 20 failure which appears when the tube head is too hot and you have to wait for cooling. This is normal operation if you are exposing a lot and in warm places.

Er failures can not be reset. Switch the unit off and on, to test whether the failure was only temporary.
10.6 Multiple failure codes

In the case of multiple errors press "OK" key to display other failure codes.

<table>
<thead>
<tr>
<th>Check</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 1 PC</td>
<td>PC SYSTEM: System not ready for an exposure.</td>
</tr>
<tr>
<td>Ch 3 COL</td>
<td>COLLIMATOR: Collimator not in right position</td>
</tr>
</tbody>
</table>
| Ch 5 *** | LINE VOLTAGE: Line voltage out of limits  
- Approximate line voltage (*** ) displayed in s-display |
| Ch 6 POS | POSITION: System not in Start position,  
- Start button not pressed prior to QA procedure or  
- Collimator in QA position when taking a panoramic exposure |
| Ch 7 rEL | EXPOSURE SWITCH: Exposure button prematurely released by operator  
- Blinking display tells also exposure time (*** ) in s-display |
| Ch 8 PSE | PREVENTATIVE SERVICE: Preventative service reminder after 2000 exposures |
| Ch 9 rEo | REMOTE EXPOSURE: Exposure was initiated from control panel, while remote exposure has been selected. |

All error messages are explained in detail on OP100 D & OC100D Troubleshooting Manual.

PCI board LED:s (H1 is uppermost H5 is lowermost)

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1:</td>
<td>LINK_OK Light is lit when link is OK.</td>
</tr>
<tr>
<td>H2:</td>
<td>EPROM FAILURE (red) Light is lit when there is an EPROM failure</td>
</tr>
<tr>
<td>H3:</td>
<td>+3.3V Light is lit when +3.3V.</td>
</tr>
<tr>
<td>H4:</td>
<td>+5V Light is lit when +5V.</td>
</tr>
<tr>
<td>H5:</td>
<td>LOCAL RESET (red) Light is lit when RESET.</td>
</tr>
</tbody>
</table>

![Fig 10.4. PCI board LED:s](image-url)
11 Diagnosing image quality problems

High quality images with sharp contrast and good detail present optimum diagnostic information. Images with less quality are usually the result of one or more common problems, which are discussed here.

11.1 Patient positioning

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Incisors and canines narrow and unsharp. Overshadow in molar and premolar areas. Rows of teeth are compressed. | 1 Occlusal correction of focal trough set too far posterior  
2 Image layer light not obeyed  
3 Bite block was not used | 1 Check patient positioning with light lines and occlusion correction buttons  
2 Check patient positioning with light lines and occlusion correction buttons  
3 Insert bite block |
| Incisors and canines wide and unsharp. Rows of teeth widened. | 1 Occlusal correction of focal trough set too far anterior  
2 Image layer light not obeyed  
3 Bite block was not used | 1 Check patient positioning with light lines and occlusion correction buttons  
2 Check patient positioning with light lines and occlusion correction buttons  
3 Insert bite block |
| Teeth appear wider on one side and narrower on the opposite. Ramus widths are different on opposite sides. | 1 Midsagittal line not obeyed  
2 Patient's head not in center position | 1 Check patient's mid sagittal plane with light line  
2 Check that patient’s head is centered |
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The shadow of hard palate is exposed over maxillary molars. Row of teeth has a wavy appearance. TM joints are exposed outward. Image is not &quot;smiling&quot;. Mandible is imaged sharper than maxilla.</td>
<td>Patient head tilted back</td>
<td>Check FH plane</td>
</tr>
<tr>
<td>Rows of teeth curved upwards. Mandibular incisors are unsharp. TMJ joints exposed high and are often cut off from the image. Image is &quot;smiling&quot; too much.</td>
<td>Patient head tilted forward</td>
<td>Check FH plane</td>
</tr>
<tr>
<td>Middle area of the image too bright and unsharp. Spine shadow.</td>
<td>1 Patient's neck was not stretched</td>
<td>1 Stretch patient's neck</td>
</tr>
<tr>
<td></td>
<td>2 kV compensation not used or LOW compensation was used with heavy adult patient</td>
<td>2 Enable or increase kV compensation</td>
</tr>
<tr>
<td>Rows of teeth overexposed.</td>
<td>Tongue was not against the roof of palate.</td>
<td>Ask patient to swallow and place tongue against the roof of palate.</td>
</tr>
<tr>
<td>Problem</td>
<td>Possible Cause</td>
<td>Remedy</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| TMJ's exposed on different heights on image. Bilateral distortion in molar and premolar regions. | 1 Patient tilted to one side  
2 Midsagittal light line not obeyed.           | 1 Check midsagittal plane and center patient's head.  
2 Check midsagittal plane and center patient's head. |
| Rows of teeth exposed too high. TMJ's cut off.                         | 1 Chin was not resting on chin support  
2 Patient positioned too high | 1 Check patient positioning and type of bite fork rod.  
2 Check patient positioning and type of bite fork rod. |
| Rows of teeth exposed too low. Mandible not exposed completely to the image. | Chin rest was not used with bite fork. | Install chin rest. |
## 11.2 Image brightness & contrast

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Images are too light</td>
<td>1 CliniView: Contrast and brightness not optimum</td>
<td>1 Adjust contrast and brightness.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Images are too dark</td>
<td>1 CliniView: Contrast and brightness not optimum</td>
<td>1 Adjust contrast and density.</td>
</tr>
<tr>
<td></td>
<td>2 Density setting is too high in Pr52CCo when patient symbols are used.</td>
<td>2 Adjust density setting to a lower value.</td>
</tr>
<tr>
<td></td>
<td>3 Manual technique factors used too high.</td>
<td>3 Decrease technique factors.</td>
</tr>
<tr>
<td></td>
<td>4 AEC control misadjusted.</td>
<td>4 Call service.</td>
</tr>
<tr>
<td>Lack of image contrast</td>
<td>1 CliniView: Contrast and brightness not optimum</td>
<td>3 Adjust contrast and brightness.</td>
</tr>
<tr>
<td></td>
<td>2 kV used is too high.</td>
<td>4 Lower the kV setting. See Pr52CCo (User program manual) for details.</td>
</tr>
</tbody>
</table>

## 11.3 Artefacts

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irregular, bright shadows or artefacts</td>
<td>Patient is wearing metal objects, such as earrings, necklace etc.</td>
<td>Ask patient to remove objects.</td>
</tr>
<tr>
<td>Problem</td>
<td>Possible cause</td>
<td>Remedy</td>
</tr>
<tr>
<td>---------</td>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td>An unexposed area is shown down in the lower middle section of the image.</td>
<td>Lead apron misplaced.</td>
<td>Check the lead apron positioning.</td>
</tr>
<tr>
<td>Partial lack of detail and motion artefacts. Irregular vertical bright lines on image.</td>
<td>Patient has moved during the exposure.</td>
<td>Retake the image.</td>
</tr>
<tr>
<td>Vertical dark lines on image.</td>
<td>Patient's shoulder in touch with machine parts.</td>
<td>Check patient positioning.</td>
</tr>
<tr>
<td>One side of the image unexposed.</td>
<td>Exposure button released prematurely.</td>
<td>Retake the image.</td>
</tr>
<tr>
<td>Right and left image sides are unexposed. TMJ's are not shown.</td>
<td>Orthogonal procedure was mistakenly used.</td>
<td>Select correct panoramic procedure.</td>
</tr>
<tr>
<td>QA: Light horizontal line on image.</td>
<td>Bite block was left on place.</td>
<td>Remove the bite block.</td>
</tr>
<tr>
<td>Horizontal lines on image.</td>
<td>CCD camera problem.</td>
<td>Consult the dealer.</td>
</tr>
<tr>
<td>CEPH: Unexposed rectangular on the image.</td>
<td>Ceph collimator not correctly selected.</td>
<td>Select correct collimation.</td>
</tr>
<tr>
<td>CEPH: Lateral view has 2 ear holder pins.</td>
<td>1 Cephalostat lock not locked 2 Ear holders misaligned</td>
<td>1 Lock it 2 Call service</td>
</tr>
</tbody>
</table>
### 11.4 Unit operation

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>READY not lit.</td>
<td>1 Unit is not ready for exposure</td>
<td>1 Check the program selection and CCD camera. If the unit still not ready, momentarily press exposure button: Failure message will be displayed. Make the corrective measures</td>
</tr>
<tr>
<td></td>
<td>2 PC is not ready for exposure</td>
<td>2 Start PC and CliniView software. Press take Pan Image button.</td>
</tr>
<tr>
<td></td>
<td>3 System is not ready for exposure</td>
<td>3 Check that the fibre optic cables are connected.</td>
</tr>
<tr>
<td>Patient's back head is touching the x-ray tube during the exposure.</td>
<td>1 Patient's head inclination not correct</td>
<td>If the image is not acceptable then</td>
</tr>
<tr>
<td></td>
<td>2 Patient is too big for the unit.</td>
<td>1 Check the head position and retake the image.</td>
</tr>
<tr>
<td></td>
<td>3 Patient has slumped.</td>
<td>2 Check the patient positioning. Make the exposure even though the head may touch the tube head.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Check the patient positioning. Make the exposure even though the head may touch the tube head.</td>
</tr>
<tr>
<td>Patient's shoulders are touching the x-ray tube or CCD camera.</td>
<td>Patient is too big for the unit.</td>
<td>Reverse patient's hands on handles: left to right side handle and vice versa.</td>
</tr>
</tbody>
</table>
12 User's statement

Instructions for the use of the Orthopantomograph® OP100 D and precautionary statements are part of the OP100 D User Manual.

Radiation leakage technique factors

The maximum-rated peak tube potential is 85 kVp with the maximum rated continuous tube current of 1.5 mA. 1.5 mA is the equivalent maximum rated continuous tube current for 12 mA with a duty cycle of 1:7. Duty cycle is automatically calculated by the software so that the next exposure does not exceed the anode thermal capacity. The equation used by the software is

\[ mA \times s \times kVp = \text{Initial heat capacity [J]} + \text{Anode cooling rate [J/s]} \times 3600 \ [s] \]

where:

\[ mA \times s \times kVp = \text{Maximum energy input during one hour} \]

Initial heat capacity = 28000 Joules [J] for tube type D-051S

Anode cooling rate = 120 Joules/s [J/s] for tube type D-051S

3600 = 1 hour observation time [s]

Beam limiting device / tube housing assembly compatibility

The tube housing assembly THA 100 is compatible with the beam limiting device BDP138 or BDC184.

Equipment statement for tube housing assembly

Maximum operating voltage is 85 kVp. Effective focal spot 0.5 mm (IEC 336/1982).

X-ray tube: Toshiba D-051S. For additional information please refer to the tube specification sheets.

Maximum deviation from indicated values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Indicated value</th>
<th>Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube voltage</td>
<td>57 - 85 kVp</td>
<td>± 5 kVp</td>
</tr>
<tr>
<td>Tube current</td>
<td>2 - 16 mA</td>
<td>± 1mA or 15%, whichever is larger</td>
</tr>
<tr>
<td>Exposure time (pan)</td>
<td>16.8 - 17.6 s</td>
<td>± 0.1 s or 15%, whichever is larger</td>
</tr>
<tr>
<td>Exposure time (TMJ, Sinus)</td>
<td>8 - 15.6 s</td>
<td>± 0.1 s or 15%, whichever is larger</td>
</tr>
<tr>
<td>Exposure time (cephalometric)</td>
<td>8 - 20 s</td>
<td>± 0.1 s or 15%, whichever is larger</td>
</tr>
</tbody>
</table>
Power supply requirements

Rated nominal voltage 110 / 230 VAC, 50/60 Hz single phase. Line voltage ranges are 99 - 121 VAC and 207 - 253 VAC. Automatic regulation for all voltages within the line voltage range.

Maximum line current

With 110 VAC power supply systems maximum line current during the exposure is 15 A, at stand-by maximum 1A. The system line fuses are 15 A slow blow type.

With 230 VAC power supply systems the maximum line current during the exposure is 10 A, at stand by maximum 1 A. The system line fuses are 10 A slow blow type.

General output rating and duty cycle

The following charts represent technique factors that can be used with the selected line voltage. One of the three technique factors is always fixed. Panoramic and Special procedures use fixed exposure time.

Exposures are automatically limited during duty cycle cooling times, minimum of 15 s.

Maintenance

To keep the equipment in compliance with the DHHS Performance Standard the following maintenance schedule shall be observed:

Up to 40 exposures per week, perform maintenance every 12 months. At 40 - 100 exposures per week, perform maintenance every 6 months. Refer to the chapter Maintenance of this manual for details.

Tube ratings

Maximum rating chart

Multi-Peak Full Wave rectified

(HF Inverter System)

Focal spot: 0.5 mm (IEC 336/1982)
Fig 12.3. Tube ratings

Tube anode thermal characteristics (D-051s)

Fig 12.4. Tube anode thermal characteristics (D-051S)

Tube head assembly cooling curve

Fig 12.5. Tube head assembly cooling curve
Location of a focal spot is marked on the tube head’s cover.

**Measurement criteria for exposure time**

**Exposure time**

Consists of beginning and ending points as measured by a calibrated x-ray monitor at 70% of the peak radiation waveform

**kV**

The high voltage mean value received after measurement with a calibrated x-ray monitor

**mAs**

The resistance value divided by voltage. A calibrated x-ray monitor measures the voltage over feedback resistor and provides a mAs value.

The nominal x-ray voltage 85 kV is obtained at highest tube current 12 mA.

The nominal tube current 16 mA is obtained at the highest tube voltage 77 kV.

The highest electric power is obtained at 77 kV tube voltage and 16 mA tube current.

The nominal electric power of 1232 W is obtained when loading time is 0.1s and nominal x-ray tube voltage 77 kV is used.

We reserve the rights for technical changes at any time.
13 Technical specifications

<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>Instrumentarium Imaging P.O. Box 20, FIN-04301 Tuusula, FINLAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality system:</td>
<td>In accordance with ISO 9001 standard</td>
</tr>
<tr>
<td>Environmental management system:</td>
<td>In accordance with ISO 14001 standard</td>
</tr>
<tr>
<td>Electrical &amp; mechanical safety:</td>
<td>According to IEC 601-1, UL and C-UL (File E218408) CE models marked according to the Medical Device Directive 93/42/EEC</td>
</tr>
<tr>
<td>Product name:</td>
<td>ORTHOPANTOMOGRAPH® ORTHOCEPH®</td>
</tr>
<tr>
<td>Model:</td>
<td>OP100 D OC100 D</td>
</tr>
<tr>
<td>Product type:</td>
<td>Digital Panoramic X-ray Unit Digital Panoramic X-ray Unit with Cephalostat</td>
</tr>
</tbody>
</table>

**Unit data**

<table>
<thead>
<tr>
<th>Class</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>B</td>
</tr>
<tr>
<td>Protection</td>
<td>IP-20</td>
</tr>
<tr>
<td>Operation</td>
<td>Continuous operation with intermittent loading</td>
</tr>
<tr>
<td>Power supply</td>
<td>Mains plug connection</td>
</tr>
<tr>
<td>High voltage</td>
<td>DC</td>
</tr>
<tr>
<td>Software version with AEC</td>
<td>1.4.15 or higher</td>
</tr>
</tbody>
</table>

**Tube head assembly**

<table>
<thead>
<tr>
<th>Tube head assembly type</th>
<th>THA 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube type</td>
<td>Toshiba D-051S, Stationary anode</td>
</tr>
<tr>
<td>Tube voltage</td>
<td>57 - 85 kV</td>
</tr>
<tr>
<td>Max. tube current</td>
<td>2 - 16 mA</td>
</tr>
<tr>
<td>Max. electric output</td>
<td>1,36 kW</td>
</tr>
</tbody>
</table>
### Technical specifications

#### Tube head assembly

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target angle</td>
<td>5 degrees</td>
</tr>
<tr>
<td>Focal spot</td>
<td>0,5 mm (IEC 336/1982)</td>
</tr>
<tr>
<td>Nominal anode input power</td>
<td>1750 W</td>
</tr>
<tr>
<td>Reference axis</td>
<td>In the middle of the panoramic sensor’s active area</td>
</tr>
<tr>
<td>Max. anode heat content</td>
<td>28 kJ</td>
</tr>
<tr>
<td>Max. X-ray tube assembly heat content</td>
<td>385 kJ</td>
</tr>
<tr>
<td>Max. continuous heat dissipation of the X-ray tube assembly</td>
<td>38 W</td>
</tr>
<tr>
<td>Total filtration</td>
<td>2,5 mm Al</td>
</tr>
<tr>
<td>Leakage Technique Factors</td>
<td>85 kV /1.5 mA</td>
</tr>
</tbody>
</table>

#### Electrical connections

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal mains voltage</td>
<td>110 / 230 VAC +/- 10% Automatic mains voltage compensation</td>
</tr>
<tr>
<td>Input power frequency</td>
<td>50 / 60 Hz</td>
</tr>
<tr>
<td>Nominal current</td>
<td>10A @ 230 VAC, 15A @ 110 VAC</td>
</tr>
<tr>
<td>Fuses</td>
<td>326 Littelfuse (slow blow) 10A @ 230 VAC, MDA-15 COOPER BUSSMAN (Time delay) 15A @ 110 VAC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>2.3 kVA @ 230 VAC, 1.65 kVA @ 110 VAC</td>
</tr>
<tr>
<td>Maximum impedance of main</td>
<td>1,0 Ω</td>
</tr>
</tbody>
</table>

#### Positioning lights

<table>
<thead>
<tr>
<th>Programs</th>
<th>Light Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panoramic, TMJ &amp; Maxillary Sinus Programs</td>
<td>Tungsten halogen</td>
</tr>
</tbody>
</table>
### Positioning lights

<table>
<thead>
<tr>
<th>Cephalostat FH laser light</th>
<th>Class I Warning symbols are placed next to the lights and the label describing the laser classification is placed inside the carriage side cabinet. USA / Canada models have different types of laser stickers according to local requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EN 60825-1/A2:2001 (IEC 60825-1 Ed.1.1, 2001-08)</td>
</tr>
</tbody>
</table>

### X-ray generator

<table>
<thead>
<tr>
<th>Nominal power</th>
<th>1.2 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube voltage</td>
<td>57 - 85 kV</td>
</tr>
<tr>
<td>Tube current</td>
<td>2 - 16 mA</td>
</tr>
<tr>
<td>Supply frequency</td>
<td>75 - 150 kHz</td>
</tr>
<tr>
<td>Spine compensation</td>
<td>0 to 8 kV increment max. 85kV</td>
</tr>
<tr>
<td>Spine compensation mode</td>
<td>Automatic (ASC), Pre-programmed</td>
</tr>
</tbody>
</table>

### User interface

<table>
<thead>
<tr>
<th>Program and technique factors selection, exposure control</th>
<th>Control panel, removable Auxiliary exposure button with 10m cable* Note: * optional in USA/Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient positioning</td>
<td>Positioning panel, integrated</td>
</tr>
<tr>
<td>Connection to PC</td>
<td>Optical link</td>
</tr>
<tr>
<td>Connection cable (OP100 D - PC)</td>
<td>Optical fibre 10m or 20m</td>
</tr>
</tbody>
</table>

### Panoramic programs & technique factors:

<table>
<thead>
<tr>
<th>Standard Adult Panoramic (Program 1)</th>
<th>57-85kV / 2-16mA / 17.6 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediatric Panoramic (P2)</td>
<td>57-85kV / 2-16mA / 16.8 s</td>
</tr>
<tr>
<td>Ortho Zone (P3) Wide Layer Panoramic (P3 optional)</td>
<td>57-85kV / 2-16mA / 17.0 s, 57-85kV / 2-16mA / 17.4 s</td>
</tr>
<tr>
<td>Orthogonal Panoramic (P4)</td>
<td>57-85kV / 2-16mA / 16.8 s</td>
</tr>
</tbody>
</table>
### Panoramic programs & technique factors:

<table>
<thead>
<tr>
<th>Program</th>
<th>Technique Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxillary Sinus (P5)</td>
<td>57-85kV / 2-16mA / 15.6 s</td>
</tr>
<tr>
<td>TMJ lateral 2 views (P8)</td>
<td>57-85kV / 2-16mA / 10.8 s</td>
</tr>
<tr>
<td>Ortho TMJ (P8 optional)</td>
<td>57-85kV / 2-16mA / 10.8 s</td>
</tr>
<tr>
<td>TMJ PA, 2 views (P9)</td>
<td>57-85kV / 2-16mA / 8.0 s</td>
</tr>
<tr>
<td>Quality Assurance QA (P0)</td>
<td>57kV/2mA -85kV / 8mA, 12.7 s, 15 values</td>
</tr>
</tbody>
</table>

**Exposure Control**
- Automatic Exposure Control (AEC) (P1-P4)
- Pre-programmed icons for all programs
- Automatic Spine Compensation

### Cephalometric programs & technique factors:

<table>
<thead>
<tr>
<th>Program</th>
<th>Technique Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral view (P6)</td>
<td>60-85kV / 3.2-16mA / 8-20 s</td>
</tr>
<tr>
<td>PA/AP, facial and oblique views (P7)</td>
<td>60-85kV / 3.2-16mA / 8-20 s</td>
</tr>
<tr>
<td>Carpus View (P7)</td>
<td>60-85kV / 3.2-16mA / 8-20 s</td>
</tr>
</tbody>
</table>

**Exposure Control**
- Automatic soft tissue adjustment through manual nasion setting,
- Automatic Facial Contour (AFC)
- Pre-programmed icons for all programs.

**Magnification factor**
- 1.14

### Image storing and retrieving:

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>File formats</td>
<td>Standard 8-bit (.png)</td>
</tr>
<tr>
<td></td>
<td>Enhanced 16-bit (.d32)</td>
</tr>
<tr>
<td></td>
<td>Compressed (.jpg)</td>
</tr>
<tr>
<td>Typical panoramic file size</td>
<td>1.6 MB in &quot;png&quot; format</td>
</tr>
<tr>
<td></td>
<td>9.2 MB in &quot;d32&quot; format</td>
</tr>
<tr>
<td></td>
<td>0.5 MB in &quot;jpg&quot; format</td>
</tr>
<tr>
<td>Typical cephalometric file size</td>
<td>2.4 MB in &quot;png&quot; format</td>
</tr>
<tr>
<td></td>
<td>11.8 MB in &quot;d32&quot; format</td>
</tr>
<tr>
<td></td>
<td>0.8 MB in &quot;jpg&quot; format</td>
</tr>
<tr>
<td>Patient database</td>
<td>Standalone workstation</td>
</tr>
<tr>
<td></td>
<td>Server on local area network (LAN)</td>
</tr>
<tr>
<td>Communication standards</td>
<td>DICOM 3.0(By merge) print, storage, import/export, patient worklist- with optional CliniView DICOM version.</td>
</tr>
</tbody>
</table>
# Technical specifications

## Panoramic patient positioning

<table>
<thead>
<tr>
<th>Operation</th>
<th>Left or right side of unit (Motorised carriage movement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning aids</td>
<td>Chin rest, bite block, 3-point headrest, Curved mirror, 3 tungsten halogen positioning lights, Occlusion correction buttons</td>
</tr>
</tbody>
</table>

## Cephalostat patient positioning

<table>
<thead>
<tr>
<th>Operation</th>
<th>Arm mounts on left or right side of the unit (Interlocked pan/ceph CCD camera, Motorised carriage keys at cephalostat head assembly, Lock for ear positioner rotation movement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning aids</td>
<td>Ear holders, Nasion support with vertical mm scale, Frankfurt horizontal plane laser light, Contact plate (Carpus view) and Patient positioning mirror in left handed cephalostat</td>
</tr>
</tbody>
</table>

## Cephalostat scanning

<table>
<thead>
<tr>
<th>Scanning method</th>
<th>Horizontal scan, synchronized CCD camera and secondary slot motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning time</td>
<td>8 - 20 s.</td>
</tr>
</tbody>
</table>

## Panoramic image receptor

<table>
<thead>
<tr>
<th>Camera unit</th>
<th>Pan camera or interchangeable pan/ceph camera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Charged Couple Device (CCD)</td>
</tr>
<tr>
<td>Image pixel size</td>
<td>96 x 96 µm²</td>
</tr>
<tr>
<td>Image field height</td>
<td>5.4 inches / 138 mm / 1440 pixels</td>
</tr>
<tr>
<td>Resolution</td>
<td>Pan: 5.5 LP/mm</td>
</tr>
<tr>
<td>Data transmission</td>
<td>Fibreoptic cable Transmission speed 160 MBps</td>
</tr>
</tbody>
</table>
### Cephalometric image receptor

<table>
<thead>
<tr>
<th>Camera unit</th>
<th>Separate ceph camera or interchangeable pan/ceph camera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Charged Couple Device (CCD)</td>
</tr>
<tr>
<td>Image pixel size</td>
<td>96 x 96 µm²</td>
</tr>
<tr>
<td>Image field height</td>
<td>7.5 inches / 190 mm / 1980 pixels</td>
</tr>
<tr>
<td>Image field width in lateral view</td>
<td>10.2 inches / 260 mm, maximum</td>
</tr>
<tr>
<td>Image field width in PA view</td>
<td>7.9 inches / 200 mm</td>
</tr>
<tr>
<td>Resolution</td>
<td>5 LP/mm (cephalometric)</td>
</tr>
<tr>
<td>Data transmission</td>
<td>Fibreoptic cable Transmission speed 160 MBps</td>
</tr>
</tbody>
</table>

#### OP100 D physical measures:

<table>
<thead>
<tr>
<th>source-image distance (SID)</th>
<th>19.2 inches / 487 mm (Panoramic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation</td>
<td>Standard wall mount with ±45° angled joint, Optional base for free standing unit</td>
</tr>
<tr>
<td>Magnification</td>
<td>30% nominal in panoramic and lateral TMJ procedures 80% nominal in PA TMJ procedure</td>
</tr>
<tr>
<td>Height x Width x Depth (inches/mm)</td>
<td>87.3 x 32.7 x 39.4 inches -Max. 2225 x 830 x 1000 (standard column) - 84.0 x 32.7 x 39.4 inches -Max. 2135 x 830 x 1000 (short column option)</td>
</tr>
<tr>
<td>Weight</td>
<td>175 kg / 385 lbs. (Panoramic)</td>
</tr>
</tbody>
</table>

#### OC100 D physical measures:

<table>
<thead>
<tr>
<th>source-image distance (SID)</th>
<th>68.7 inches / 1745 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>source-object distance (SOD)</td>
<td>60 inches / 1524 mm</td>
</tr>
<tr>
<td>Magnification</td>
<td>14% nominal in cephalometric procedures</td>
</tr>
</tbody>
</table>
**OC100 D physical measures:**

<table>
<thead>
<tr>
<th>Installation</th>
<th>Standard wall mount with 45° angled joint, Optional base for free standing unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height x Width x Depth (inches/mm)</td>
<td>87.6 x 74.8 x 39.4 inches-Max. 2225 x 1900 x 1000 (standard column)-84.0 x 74.8 x 39.4 inches-Max. 2135 x 1900 x 1000 (short column option)</td>
</tr>
<tr>
<td>Weight</td>
<td>210 kg / 465 lbs. (Cephalometric)</td>
</tr>
</tbody>
</table>

**Ambient temperatures:**

<table>
<thead>
<tr>
<th>Transportation and Storage</th>
<th>-10º…+50ºC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation Temperature</td>
<td>+10º…+40ºC, RH max. 95%</td>
</tr>
</tbody>
</table>

**Recommended computer system:**

<table>
<thead>
<tr>
<th>Platform</th>
<th>Pentium II ® PC or equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>700MHz or higher</td>
</tr>
<tr>
<td>Hard disk</td>
<td>20GB HDD minimum</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>32X CD-ROM minimum</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows® 2000 Windows ® XP</td>
</tr>
<tr>
<td>Main memory (RAM)</td>
<td>256 MB</td>
</tr>
<tr>
<td>Display graphics</td>
<td>SVGA, 1024x768, 16.7M colors (24-bit), graphics card 4 MB minimum</td>
</tr>
<tr>
<td>Color monitor size</td>
<td>17” or larger (15” minimum)</td>
</tr>
<tr>
<td>PCI board connection</td>
<td>PCI slot</td>
</tr>
<tr>
<td>Back-up</td>
<td>CDR DAT Iomega® Jaz® MOD</td>
</tr>
</tbody>
</table>

**Customized model OP100D**

**Patient positioning (Please specify)**

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>Controls on the left side of the unit. Left side operator's view for panoramic patient positioning. Cephalostat arm on the left. Controls and ceph arm can be reversed any later date.</td>
</tr>
</tbody>
</table>
### Technical specifications

#### Patient positioning (Please specify)

| Controls on the right side of the unit. Right side operator's view for panoramic patient positioning. Cephalostat arm on the right. Controls and ceph arm can be reversed any later date. |
| RR |

| Controls on the left side of unit. Left side operator's view for panoramic patient positioning. Cephalostat arm on the right. Controls and ceph arm can be reversed any later date. |
| LR |

| Controls on the right side of unit. Right side operator's view for panoramic patient positioning. Cephalostat arm on the left. Controls and ceph arm can be reversed any later date. |
| RL |

#### Program options (Ordered separately)

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ortho TMJ</td>
<td>Axial corrected TMJ software. Replaces lateral TMJ program (P8)</td>
</tr>
</tbody>
</table>

#### Ceph ready option (Ordered separately)

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceph CCD camera with OP100 D</td>
<td>Unit has the same CCD camera as ceph unit. Cost saving with future digital ceph upgrade.</td>
</tr>
</tbody>
</table>

#### Installation options for OP100 D (Ordered separately)

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short column</td>
<td>9 cm shorter column. Allows low ceiling siting.</td>
</tr>
<tr>
<td>Cooling Fan Kit</td>
<td>For heavy-duty users (more than 50 OP100 D images a day) or for sites with high ambient temperature</td>
</tr>
<tr>
<td>OP100 D Base plate</td>
<td>Base for OP100 D. Free standing installation for pan</td>
</tr>
<tr>
<td>Universal base plate</td>
<td>Flat steel plate base. Free standing installation. OP100 D and OC100 D.</td>
</tr>
<tr>
<td>Upgrade</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Digital Cephalostat Kit</td>
<td>Add digital ceph imaging to OP100 D digital pan</td>
</tr>
<tr>
<td>Ortho TMJ software Kit</td>
<td>Axial corrected TMJ software replaces lateral TMJ program P8</td>
</tr>
</tbody>
</table>
13 Technical specifications
14 Maintenance

This unit is designed to provide reliable performance and many years of customer satisfaction. In order to assure safe performance of this X-ray equipment, a preventative maintenance program must be established. It is the owner's responsibility to supply or arrange for this service. Consult your Orthopantomograph® dealer to arrange for this service.

Maintenance Schedule

Maintenance service for Orthopantomograph® OP100 D is suggested at installation and after each 2000 exposures. This periodic maintenance is outlined in OP100 D Service Manual Maintenance.

These maintenance procedures require the services of a qualified technician. In addition to periodic maintenance any deviation from normal performance should be immediately reported to your dealer.

WARNING!
Only trained and qualified personnel should be permitted access to the internal parts of the equipment.

Monthly Inspection by User

The user must perform monthly the following inspections:

- Visually check that all visible labels are intact and legible
- Visually check that the exposure indicator light is lit for the duration of exposure
- Confirm that the audible indicator sounds for the duration of the exposure
- Check that exposure button must be kept pressed continuously during the exposure cycle
- Check that exposure terminates and an error code is displayed when prematurely releasing the exposure button
- Check all the functions of the control panel and the positioning panel

Preventive Reminder

The equipment has a special feature that displays a message "Ch 8 PSE" on time display after every 2000 exposures. See OP100 D User Program Manual for details.

NOTE!
Wiring diagrams, schematics and other documents, which are needed when the unit is repaired, will be supplied by request.
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Fax 414 481 8665

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