

Kodak 9500

Cone Beam 3D System

User's Guide



Notice

Congratulations on your purchase of the KODAK 9500 Cone Beam 3D System. Thank you for your confidence in our products and we will do all in our power to ensure your complete satisfaction.

The User Guide for the KODAK 9500 Cone Beam 3D System includes information on the 3D imaging features. We recommend that you thoroughly familiarize yourself with this Guide in order to make the most effective use of your system.

The KODAK 9500 Cone Beam 3D Extraoral Imaging System is intended to be used at the direction of health care professionals for dental volumetric reconstruction of extra-oral dento- maxillo-facial region of the human anatomy.



WARNING: We recommend that you consult the “Safety, Regulatory and the Technical Specification User Guide” before using the KODAK 9500 Cone Beam 3D Systems.

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This document is originally written in English.

Manual Name: *KODAK 9500 Cone Beam 3D System User Guide*

Part Number: SM717

Revision Number: 02

Print Date: 02/2010

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KODAK 9500 Cone Beam 3D System, complies with Directive 93/42/CEE relating to medical equipment.



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Manufacturer



Carestream Health, Inc.
150 Verona Street
Rochester NY 14 608

Authorized Representative in the European Community



TROPHY

4, Rue F. Pelloutier, Croissy-Beaubourg
77435 Marne la Vallée Cedex 2, France

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Chapter 1

About This Guide

Conventions in this Guide

The following special messages emphasize information or indicate potential risk to personnel or equipment:



WARNING

Warns you to avoid injury to yourself or others by following the safety instructions precisely.



CAUTION

Alerts you to a condition that might cause serious damage.



IMPORTANT

Alerts you to a condition that might cause problems.



NOTE

Emphasizes important information.



TIP

Provides extra information and hints.

Chapter 2

KODAK 9500 UNIT OVERVIEW

The KODAK 9500 digital imaging unit is compliant with the requirements of the EEC and international medical standards.

The KODAK 9500 unit has been designed to carry out the following radiological examinations:

- Large mode (18 cm height x 20.6 cm diameter) region of interest: From the bottom of the chin to the top of the sinus (full skull).
- Medium mode (9 cm height x 15 cm diameter) region of interest: From the bottom of the chin to the top of the jaw (full jaw).

In both radiological examinations, the TMJ region is covered.

General Overview

The KODAK 9500 unit is composed of the following functional components:

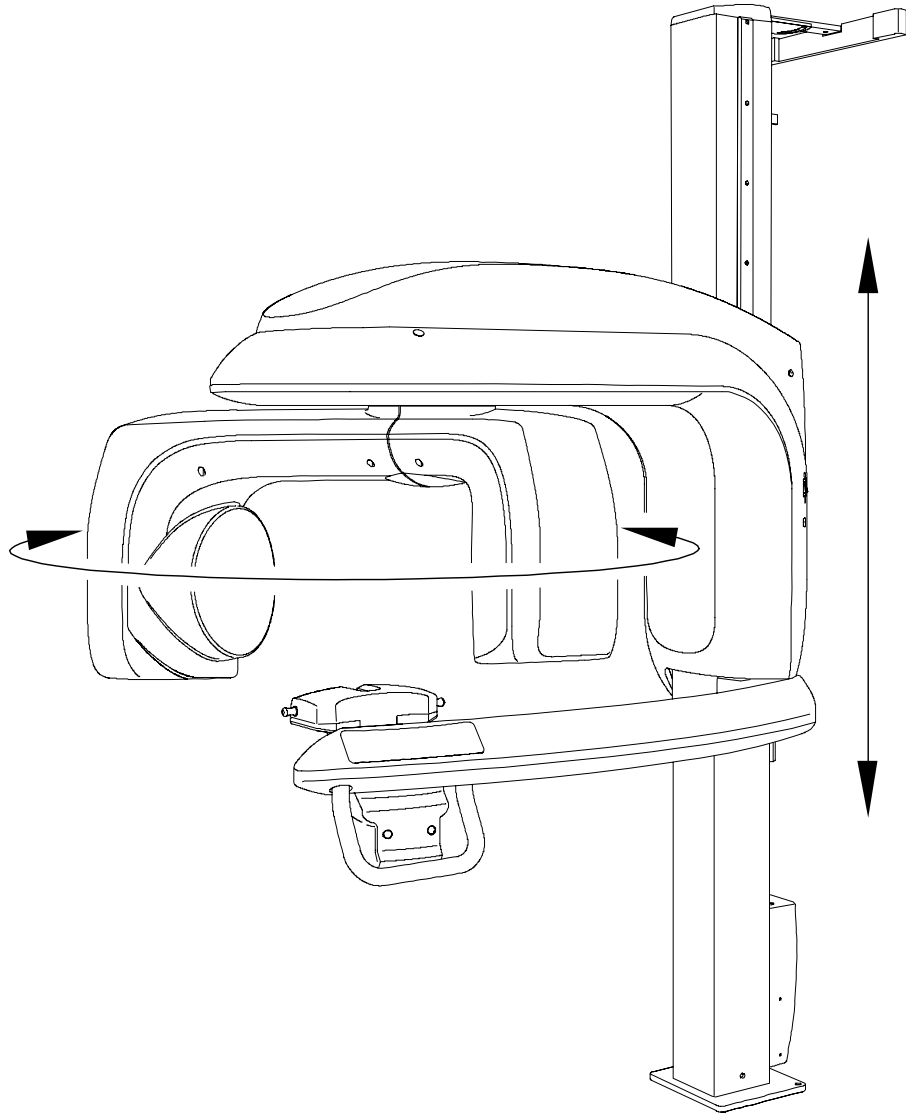
- The unit head that contains all the electronic control
- The rotative arm
- The fixed arm with a control panel
- The 3D digital sensor
- The x-ray source assembly
- The x-ray remote control
- The chin rest base
- The chin rest and bite block
- The temple supports
- The hand grips
- The acquisition software (see “**Imaging Software Overview**”)

The following figures illustrate the general overview of the KODAK 9500 unit.

Mobile Components

Figure 2-1 illustrates the up and down movement of the KODAK 9500 mobile component and the 360° rotation of the rotative arm.

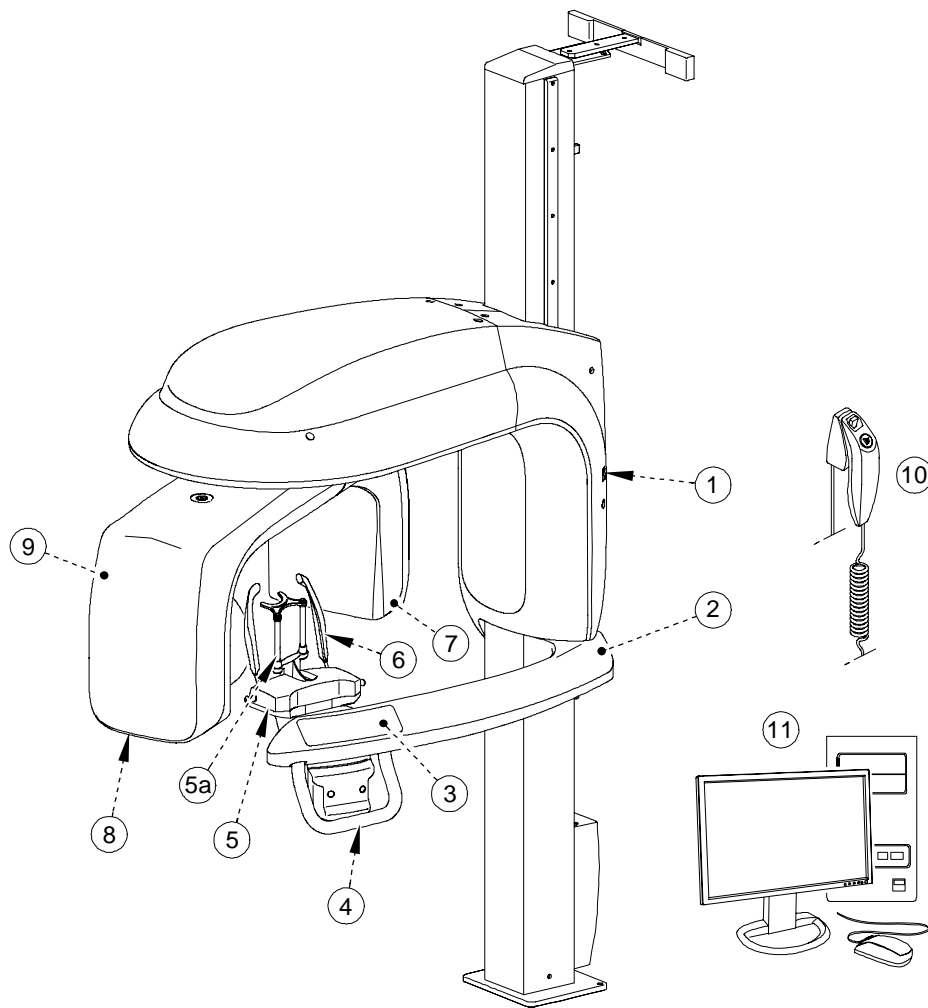
Figure 2-1 KODAK 9500 Unit Mobile Components



General Functional Components

Figure 2-2 illustrates the general functional components of the KODAK 9500 unit.

Figure 2-2 KODAK 9500 Unit functional components

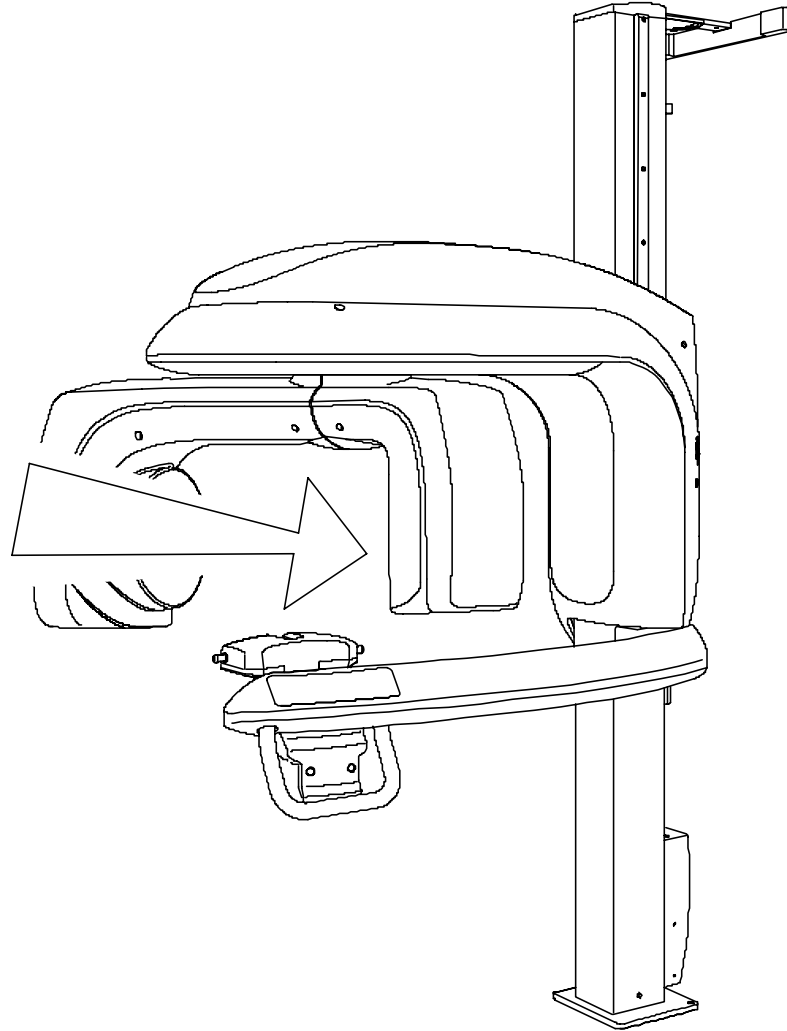


- | | | | |
|-----|----------------|----|---|
| 1 | ON/OFF button | 6 | Temple supports |
| 2 | Fixed arm | 7 | Digital sensor |
| 3 | Control panel | 8 | X-ray source assembly |
| 4 | Handgrip | 9 | Unit rotative arm |
| 5 | Chin rest base | 10 | X-ray remote control |
| 5 a | Chin rest | 11 | PC hosting the imaging and acquisition software |

Digital Sensor Location

Figure 2-3 illustrates the locations of the KODAK 9500 digital sensor.

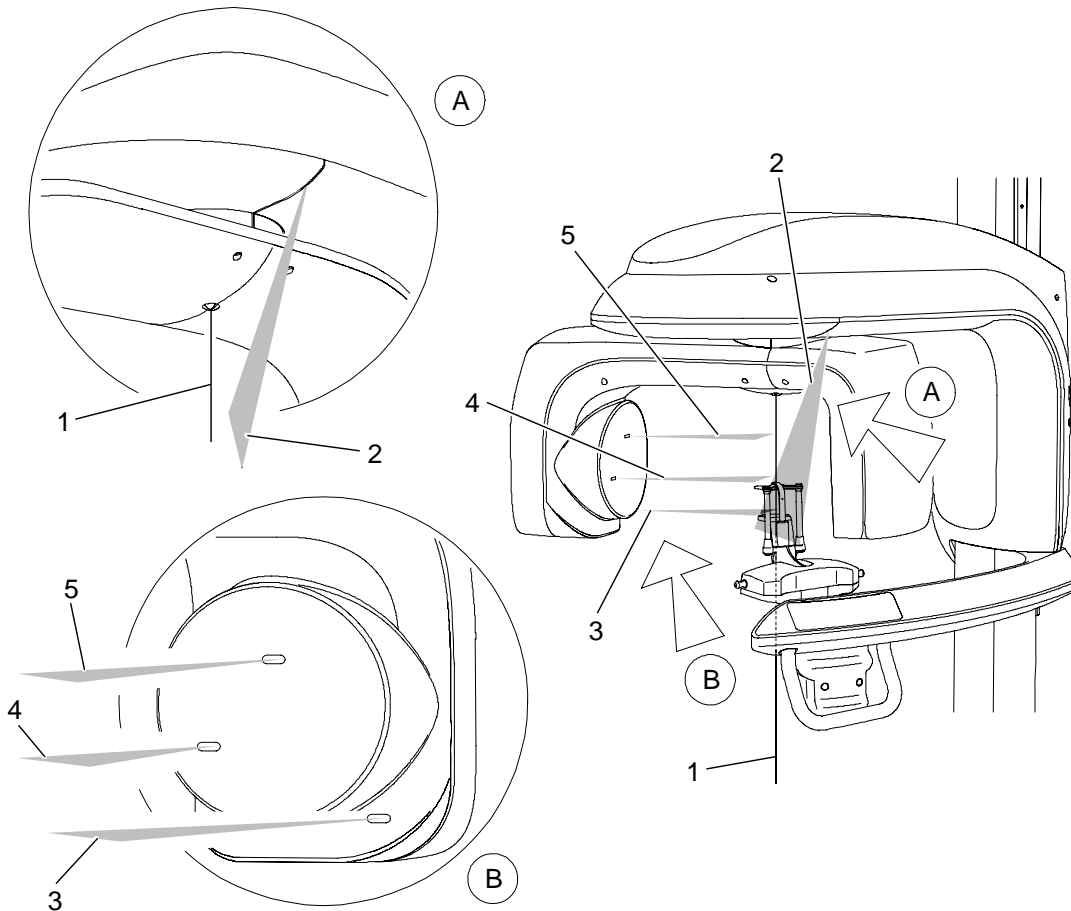
Figure 2-3 KODAK 9500 Unit Digital Sensor Location



Laser Locations

Figure 2-4 illustrates the location of the KODAK 9500 unit lasers. Figure

Figure 2-4 KODAK 9500 Unit Laser Beam Positions

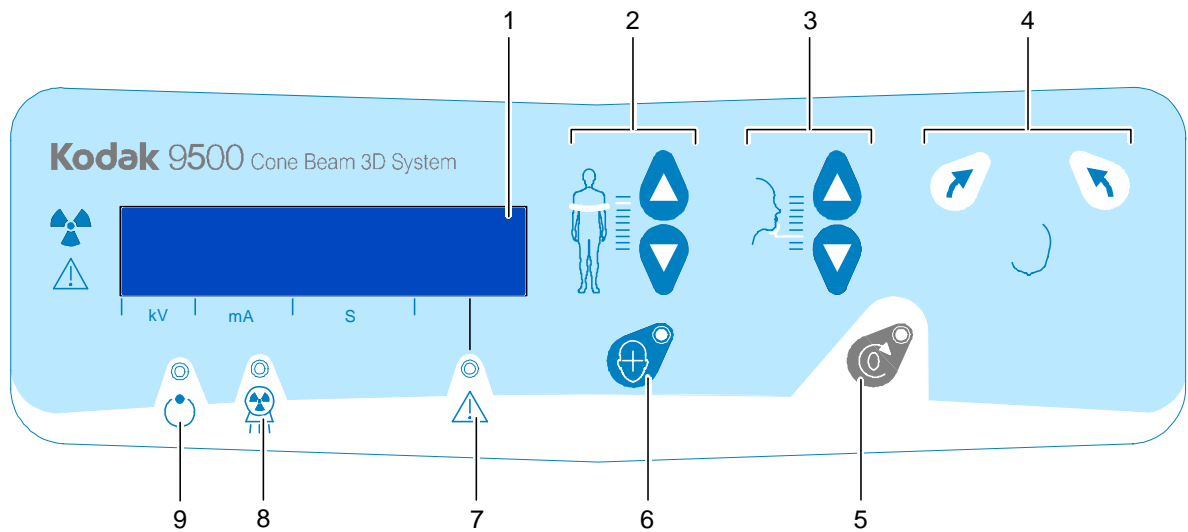


- 1 3D central positioning laser beam
- 2 Mid-sagittal positioning laser beam
- 3 Lower volume limit positioning laser beam
- 4 Upper volume limit positioning laser beam for Medium mode (9 x 15 cm) x-ray image
- 5 Upper volume limit positioning laser beam for Large mode (18 x 20.6 cm) x-ray image

Control Panel Overview

The control panel is an alphanumeric, digital soft touch console. It allows the operator to control certain unit functions. It also displays the operating parameters and error messages.

Figure 2–5 Unit Control Panel

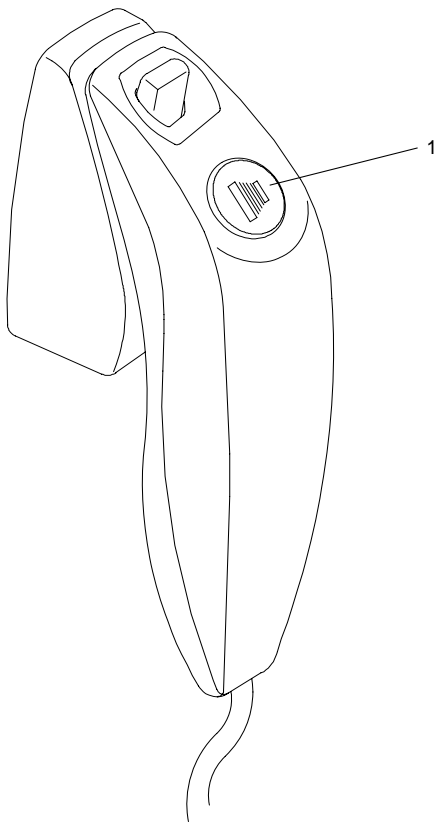


- 1 **Display Screen:** Displays the current acquisition parameters and the error messages.
- 2 **Height Adjustment Button:** Adjusts the height of the unit to the height of the patient.
- 3 **Head Adjustment Button:** Adjusts the patient's head to the x-ray beams.
- 4 **Rotative Arm Adjustment Button:** Adjusts the unit rotative arm movements to correctly position the patient for acquisition.
- 5 **Reset Button:** Resets the unit arm to the initial position to enable the patient to enter and exit the unit.
- 6 **Laser Beam Button:** Activates the beams to correctly position the patient.
- 7 **System Status LED:** Red, indicates the error alerts.
- 8 **X-Ray Emission LED:** Yellow, indicates the x-rays are being emitted.
- 9 **Ready Indicator LED:** Green, indicates the unit is ready for acquisition.

X-Ray Remote Control Overview

The x-ray remote control enables you to launch the radiological acquisition process using the exposure button from outside the x-ray room. You must press and hold the exposure button until the end of acquisition. Premature release of the exposure button interrupts the acquisition.

Figure 2-6 X-Ray Remote Control



- 1 **Exposure button:** launches image acquisition.

Positioning Accessories and Replacement Parts

The following accessories are used when positioning a patient. They are delivered with the KODAK 9500 digital imaging unit.

Table 2-2 lists the positioning accessories.

Table 2-1 Positioning Accessories and Replacement Parts


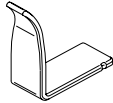

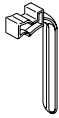
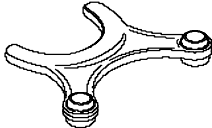
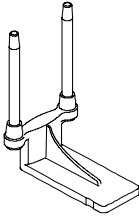
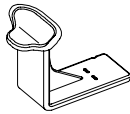

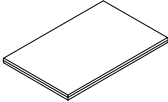
Accessory	Description
	Chin rest
	TMJ x4 nose rest
	Standard bite block
	Bite block for edentulous patients
	3D bite block
	3D chin rest
	Universal 3D chin rest

Table 2-1 Positioning Accessories and Replacement Parts (Continued)

Accessory	Description
	Single use hygienic sleeves for standard bite block (500 pcs box)
	Single use hygienic sleeves for 3D bite block (100 pcs box)

Chapter 3

IMAGING SOFTWARE OVERVIEW

Computer System Requirements

This section specifies the minimum computer system requirements for KODAK 9500 3D cone beam system software.



IMPORTANT

It is **MANDATORY** to check that the computer system configuration is compatible with the computer system requirements for the KODAK 9500 3D software. If necessary you **MUST** update your computer system configuration. KODAK 9500 3D **MUST** be connected to the computer via a point-to-point Ethernet link and not via a LAN. **DO NOT** place the computer and the peripheral equipment connected to it in the immediate vicinity of the patient in the unit. Leave at least 1.5 m distance from the unit. The computer and the peripheral equipment must conform to the IEC 60950 standard

Table 3–1 Minimum Computer System Requirements

Item	Viewing	Acquisition	Comments
CPU	2 GHz Intel Duo Core	2 GHz Intel Duo Core	
RAM	4 GB	4 GB	RAM has a major impact on system performance.
Hard disk drive	<ul style="list-style-type: none"> 1.2 GB for software installation 80 GB free space to use the software 	<ul style="list-style-type: none"> 4 GB for software installation 80 GB free space to use the software 	We strongly recommend a 250 GB hard disk space for a good viewing and acquisition use.
Graphic board	Nvidia / ATI based board supporting Open GL 1.2 with 256 MB of video RAM on AGP x8 video bus (example: Nvidia GeForce 6800 GT)	Nvidia based board on PCI Express video bus with minimum 512 MB of video RAM (for example: Nvidia GeForce 8800 GT or Quadro FX 4600)	The video RAM has major impact on system performance.
Monitor	<ul style="list-style-type: none"> 1 monitor 17" or larger 1024 x 768 minimum screen resolution - 32 bits color mode 	<ul style="list-style-type: none"> 1 monitor 17" 1280 x 1024 minimum screen resolution 1/1000 	Your monitor is a vital component in displaying quality images. Low-quality screens will prevent you from proper diagnoses and treatment.
Operating system	<ul style="list-style-type: none"> Windows 2000 SP4 Windows XP Home / Pro edition SP2 Windows Vista 	Windows XP Home / Pro edition SP3	

Table 3–1 Minimum Computer System Requirements (Continued)

Item	Viewing	Acquisition	Comments
Ethernet interface	100 Mbits for LAN	2 Ethernet interfaces: <ul style="list-style-type: none"> • 100 Mbits system link connection • 1 GB sensor link connection 	If there is a LAN connection a third Ethernet interface is required.
CD/DVD drive	A DVD-BURNER drive is required.	A DVD-BURNER drive is required.	
Backup Media	Removable/portable, external hard disk drive	Removable/portable, external hard disk drive.	We strongly recommend a daily backup of x-ray images and patient records.
Mouse	A mouse with 2 buttons and a scroll wheel is required		You need a mouse with 2 buttons and a scroll wheel to view and use the 3D acquired image.

General Software Overview

The KODAK 9500 3D cone beam system operates with the following software:

- KODAK dental imaging software
- Acquisition Window

KODAK Dental Imaging Software

The KODAK dental imaging software is a user-friendly working interface that was designed and developed specifically for radiological diagnosis. It is the common imaging platform for all our digital systems for dentistry.

The KODAK dental imaging software has the following features:

- Patient record management using **Patient Window** features.
- Extraoral and intraoral image management using **Imaging Window** features.
- 3D image management using **3D Imaging Window** features.



NOTE

For a complete information on the Kodak Dental Imaging Software, see the “*KODAK Dental Imaging Software, Quick Start Guide*”.

Acquisition Window

The **Acquisition Window** is the acquisition user-friendly interface that was designed and developed specifically for KODAK 9500 3D cone beam system.

Acquisition Window Overview

The **Acquisition Window** is the main acquisition interface with the KODAK 9500 3D cone beam system that provides you with imaging acquisition functions.

Figure 3-1 Acquisition Window



- 1 **Information button:**
 - **About:** Identifies the Software and the Firmware versions
 - **Reset of the Values:** Resets to the manufacturing parameter settings
 - **Memorize settings:** Memorizes the user preference settings for each patient type (kV, mA and seconds)
- 2 **Preview Screen:** Displays the acquired image in real time.
- 3 **Selected Parameter Display:** Displays the current acquisition parameter settings.
- 4 **System Status Screen:** Displays various alert or warning messages originating from the unit.
- 5 **X-Rays ON / OFF button:** Turns off the x-ray emissions to demonstrate the acquisition process for the patient.
- 6 **Generator Cooling indicator:** Indicates the automatic cooling time (mm:ss) required for the generator to reach 0 for a new acquisition.
- 7 **Stop button:** Stops the unit rotative arm movement.

- 8 **Ready Indicator LED:**
 - Green indicates the unit is ready to start acquisition
 - Black indicates the unit is not ready to start acquisition
- 9 **Exit button:** Closes the Acquisition Window.
- 10 **X-Ray Emission Indicator:** Yellow indicates the x-ray emission status.
- 11 **Selector button:** Selects different acquisition setting options.
 - Click **Program** to select examination type options
 - Click **Patient** to select patient type parameters
 - Click **Parameters** to select exposure parameter options

The **Selector button** enables you to access the following 3 panes:


- **Program pane:** Examination type options
- **Patient pane:** Patient type parameter options
- **Parameters pane:** Exposure parameter options

Program Pane


The **Program pane** enables you to choose different radiological exams.

Figure 3-2 Program Pane



Click  for a large mode (18 cm height x 20.6 cm diameter) radiological exam.



Click  for a medium mode (9 cm height x 15 cm diameter) radiological exam.


Patient Pane


The **Patient pane** enables you to choose different patient parameters. The selection of the patient parameters influences the quality of the image. The selected parameters must be based on the age and morphology of the patient.


Figure 3-3 Patient Pane




Patient type parameters:

Click  if the patient is a child.

Click  if the patient is small.

Click  if the patient is medium.

Click  if the patient is large.

Parameter Pane

The **Parameter pane** enables you to choose exposure parameters and image resolution for the radiological image acquisition. If the default parameter setting is not adapted to your patient's type, you can manually adapt the parameter settings to the patient's type and save this setting as the default setting.

Figure 3-4 Parameter Pane



Radiation dose options:



kV: kilovolt



mA: milliampere

Fine-tuning buttons:




Click  to fine-tune the kV, the mA and the μm (voxel).

Image resolution options:



μm (Voxel): micrometer

Chapter 4

GETTING STARTED

Switching on the Unit

Before switching on the unit, check that:



- The installation of the unit is complete.
- The PC is switched on.

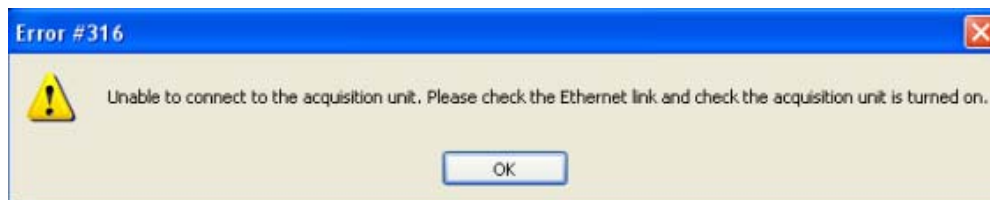


IMPORTANT

You must switch on the PC and wait for it to be ready for the connection before switching on the unit.

To switch on the unit, follow these steps:

1. On the unit column, press the **ON** button.
2. Switch on the unit and wait for a minute for the connection between the unit and the PC to be established. In the status bar,  must become .
3. If you start the imaging software before the connection is established an error message is displayed. Click **OK**, close the imaging software and wait for the connection to be established.



4. You can now proceed to launch the imaging software:
 - Start the KODAK dental imaging software.
 - OR
 - Start your imaging software.



IMPORTANT

To increase the operating life of the x-ray tube, if the unit has not been used for a month, you must follow the following procedures before use.

1. In the **Acquisition Window**, select the **Parameter** pane.
2. Select the following series of parameter settings:
 - 70 kV - 6.3 mA
 - 80 kV - 10 mA
 - 85 kV - 10 mA
3. leave the x-ray room and close the door. For each parameter setting, from the x-ray remote control, press and hold the button to launch the x-ray

The unit is now ready to be used for acquisition.




IMPORTANT

If you have another imaging software, see the user guide for your imaging software.

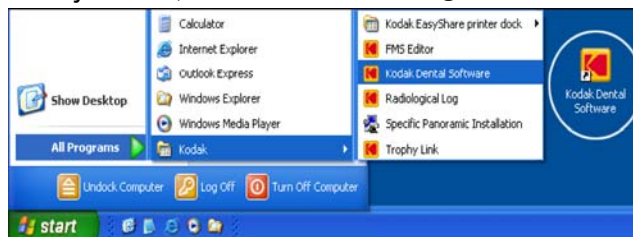
Starting the KODAK Dental Imaging Software

To start the KODAK dental imaging software, follow these steps:

1. On your desktop, double-click .

OR

From your PC, click **Start > All Programs > Kodak > Kodak Dental Software**.



A blank **Patient Window** is displayed.

2. Create or open an existing patient record.


Creating a Patient Record

To create a patient record, follow these steps:

1. In the **Patient Window**, from the toolbar, click .


OR

From the menu bar, select **Patient > New**.

2. Enter the required patient information. The **Last name**, the **First name** and the **Date of birth** fields are required.
3. From the menu bar, select **Picture > Insert Picture** to add a *.tif or *.bmp picture of the patient to the record. Select the picture from your directory and click **Open**.
4. Click **OK** to save. The patient record is automatically assigned a 7-digit number starting with a letter (for example, M0000001).
5. Click  to access the **Imaging Window**.
6. Select an image acquisition.

Accessing the Acquisition Window

To access the **Acquisition Window**, follow these steps:

1. In the **Imaging Window**, from the toolbar, click  to access the **Acquisition Window**.
2. See the chapter “**Acquiring an Image**” to launch an acquisition.

Chapter 5

ACQUIRING IMAGES

Acquiring a Large Mode or Medium Mode Image

Before acquiring a large mode or a medium mode image, check that you have:

- Reset the unit rotative arm to the start position for patient to enter the unit.
- Selected the patient record.
- Accessed the **Imaging Window**.
- Accessed the **Acquisition Window**.


Preparing the Unit and Setting the Acquisition Parameters

To set the acquisition parameters, follow these steps:

1. In the **Acquisition Window**, click the **Program** button to access the **Program pane**.

- Click  for a large mode.

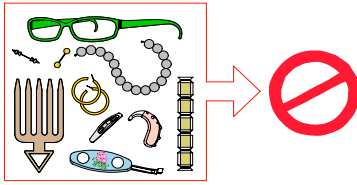
- Click  for a medium mode.

2. Click the **Patient** button to access the **Patient pane**. Select the patient type.
3. Click the **Parameter** button to access the **Parameter pane**.
 - kV and mA: If the default parameter settings for kV and mA is not adapted to your patient type, select the appropriate kV and mA parameters. To save the new parameter settings as the default parameter settings, click  and select **Memorize settings**.
 - μm (Voxel): If the default parameter setting is not adapted to the desired image resolution, select the appropriate μm parameter. The higher you select the image resolution the greater will be the image data size.
4. Position the chin rest and bite block and cover the bite block with a hygienic barrier.


Preparing and Positioning the Patient

To prepare and position the patient, follow these steps:

1. Ask the patient to remove all metal objects.

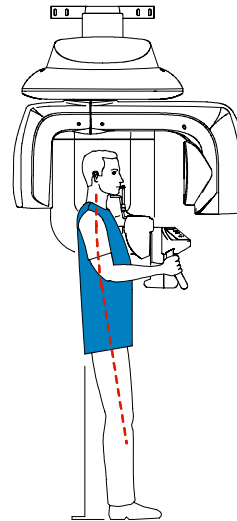
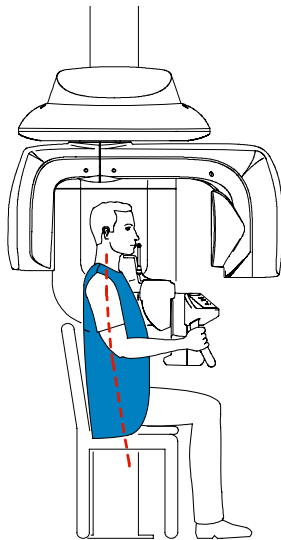


2. Ask the patient to wear a lead apron. Ensure that the apron lays flat across the patient's shoulders.

3. On the **Control Panel**, press and hold  to adjust the unit to the height of the patient. Ask the patient to enter the unit.



4. Ask the patient to do the following:

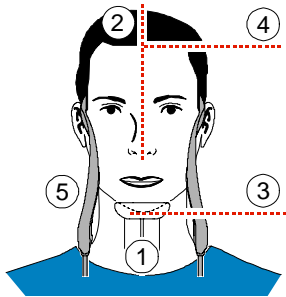
- Sit on a stool or stand.
- Grip the lower handle on each side.
- Position the feet slightly forward.
- Relax the shoulders for full motion of the unit rotating Arm.



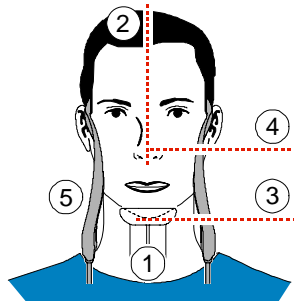
NOTE

Correct posture reduces the shadow of the spinal column transferred to the image.

5. Press and hold  to adjust the chin rest to the patient's chin.
6. Position the patient:
 - Ask the patient to place the chin on the chin rest (1).
 - Ask the patient to open the mouth and bite gently and naturally the bite block.
7. Click  on the **Control Panel** to turn on the positioning laser beams. Adjust the patient using the mid-sagittal (2) positioning laser beam for a central positioning.
8. Adjust the patient using the positioning lasers relevant to the desired region of interest:
 - Large mode:



- Medium mode:

**NOTE**

You can re-activate the laser positioning beams as needed. You can press the same button to turn off the laser beams, or wait 60 seconds for the beams to turn off automatically.

9. Tighten the temple supports (3).
10. Ask the patient to close the eyes, to remains still and to breath through the nose.

Launching the X-ray

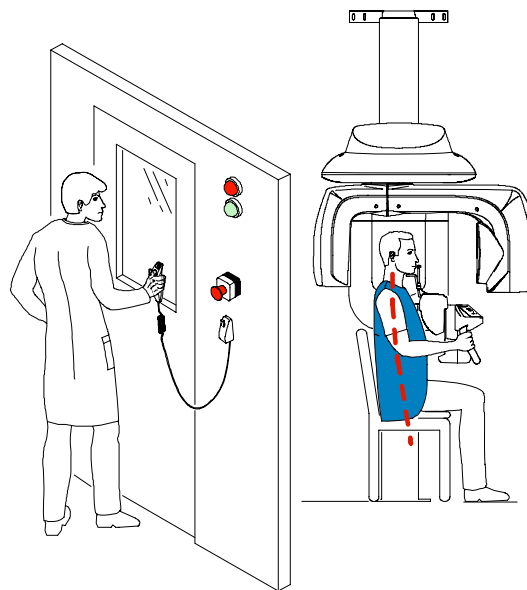
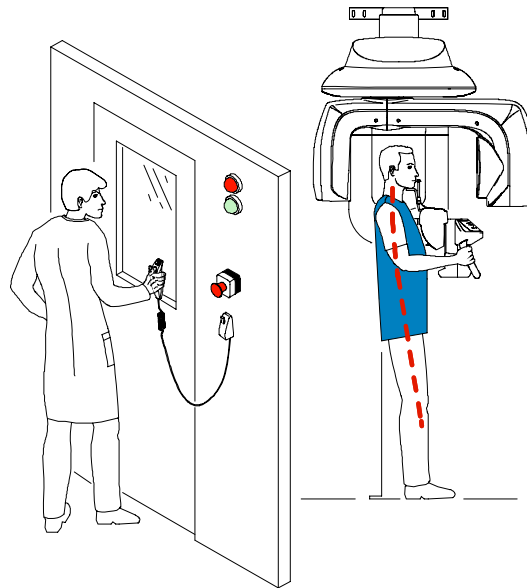
To launch the x-ray, follow these steps:

1. Leave the x-ray room and close the door. You must keep visual contact with the patient during acquisition.




IMPORTANT

To stop the acquisition, if any problem, release the exposure button of the remote control or press the red emergency stop button.



2. Trigger the x-ray with the remote control. Press and hold the exposure button until the

end of acquisition and the positioning of the rotative arm for patient release. The  turns yellow, indicating x-ray emission. The image appears in the **Preview Screen**. When the acquisition ends, the **Acquisition Window** disappears.

3. Open the temple supports and release the patient while waiting for the 3D image reconstruction. Remove the hygiene barrier of the chin rest.
4. Wait for the 3D image reconstruction and view the acquired image:

- If your imaging software is the KODAK dental imaging software, open the

Imaging Window and in the  pane, click  to access the patient's record and to open the acquired 3D image.

- If your imaging software is not KODAK dental imaging software, see the relevant imaging software user guide to view the acquired 3D image.

X-Ray Dose Emission Information

Compliance with EURATOM 97/43 Directive

You can right-click on each image to display the estimated emitted dose received by the patient. You can use this information to calculate the effective dose received by the patient for the image.

The radiation emission dose is expressed in mGy.cm². This dose is measured at the primary collimator outlet. The dose is accurate to +/-30%. The primary slot is 16.4mm wide and 19.4mm high.

Chapter 6

MAINTENANCE

This section describes the maintenance tasks that you need to perform regularly for your KODAK 9500 3D unit and the accessories.



WARNING

Switch off the unit, then, clean all accessible parts of the machine with an alcohol-based non-corrosive product. Avoid using liquids inside the unit. Follow the alcohol-based product manufacturer recommendations for safety precautions.




CAUTION

You can use the usual disinfectant products, but we recommend that you protect the unit from contamination by using barriers available from dental distributors. Follow the disinfectant product manufacturer recommendations for safety precautions.

Daily

Carry out the following maintenance tasks:

Table 6-1 Daily Maintenance Tasks

Accessories	Maintenance Tasks
Temple support	Clean the temple support and chin rest with medical-grade 76% alcohol disinfectant before the next patient is x-rayed.
Chin rest	
All components that come into contact with the patient and the operator	Clean all components with medical-grade 76% alcohol disinfectant before the next patient is x-rayed.
Outer covers of the unit	Wipe the unit with a dry cloth at the end of each day's operation.  WARNING Do not use detergents or solvents to clean the outer covers of the unit.

Monthly

Wipe the outer covers of the unit with a soft and dry cloth.

Annually

We recommend a general inspection of the unit carried out by an authorized service technician.

Chapter 7

TROUBLESHOOTING

Quick Troubleshooting

Occasionally, malfunctions can occur during use in the event of an incorrect action. An information (I) error code is displayed on the **Display Screen** of the unit **Control Panel** and the message is displayed on the popup on the **Acquisition Window System Status Screen**. In some cases, an audible warning is also issued.

The following table lists the information messages, their description and the action to take:



IMPORTANT

If an “E” message is displayed, the malfunction persists or more serious conditions occur, contact a qualified technician. When you call the qualified technician have the following information ready:

- **Model Number: K9500 3D**
- **Error Code Number: E xxx**
- **Message displayed on the popup on the Acquisition Window.**



Table 7–1 Error Message

Information Error Code	Error Message	Description	Action
E 1	Handswitch was released before the end of exposure	The user has released the exposure button prematurely.	Relaunch the acquisition and hold the exposure button until the end of the acquisition cycle.

Table 7–2 Information Messages

Information Error Code	Information Message	Description	Action
I 1	X-Ray tube cooling	Cooling in progress.	Wait until the Generator Cooling Indicator on the Acquisition Window reaches zero.
I 2	Thermal security	Cooling in progress.	Wait until the Generator Cooling Indicator on the Acquisition Window reaches zero.
I 3	Release handswitch	The acquisition has ended.	Release the exposure button of the x-ray remote control.

Table 7–2 Information Messages (Continued)

Information Error Code	Information Message	Description	Action
I 6	Wrong rotative arm position	The exposure button of the x-ray remote control is inactive because the rotative arm is not in the start position.	 Press  to reset the rotative arm in start position.
I 15	Interface inactive	The Acquisition Window cannot be accessed.	<ul style="list-style-type: none"> • Check that the unit is switched on. • Wait for the connection between the unit and the PC. • Check that the Acquisition Window is not masked by another application, in this case close the masking application.

Trophy

A Subsidiary of Carestream Health, Inc.
4 rue F. Pelloutier – Croissy-Beaubourg
77435 Marne la Vallée Cedex 2 (France)
+ 33 1 64 80 85 00

FOR MORE INFORMATION, VISIT: www.kodakdental.com



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SM717 Ed02 02/2010