KODAK RVG Digital Radiography Systems

Installation Guide
About This Guide

This manual contains information on installing following products.

• KODAK RVG 5100 digital radiography sensor
• KODAK RVG 6100 digital radiography sensor

The following list describes information contained in each chapter of this guide:

1 Compliance and Safety  Describes compliance information and indicates potential risks to personnel or equipment.
2 Getting Started  Describes basic information about the sensor.
3 Installing the Sensor  Describes the procedures for installing the sensor.
4 Troubleshooting Images  Describes techniques for producing better images.

Note
Have a Kodak technician install your RVG system.

Note
Contact your Kodak dealer for additional information.
The Kodak dental imaging software is a product specifically designed to make the most of the capabilities of the sensor. For optimum image display and processing quality, use the sensor with the Kodak dental imaging software.

The sensor is a class I device in accordance with annex VII of directive 93/42/EEC concerning medical devices. The CE marking guarantees compliance with the main requirements of this directive.

A thorough review of this installation guide is necessary to use the capabilities of the sensor.
Chapter 1
Compliance and Safety

This chapter includes the following topics:

• Ensuring Compliance with Applicable Standards on page 1–1

• Directive 93/42/CEE Concerning Medical Devices on page 1–2

• Marking and Labeling Symbols on page 1–2

• Non-Medical Devices on page 1–3

Ensuring Compliance with Applicable Standards

The electronics used in the sensor are designed to observe all applicable standards.

To ensure compliance with the applicable standards, do the following:

• After installation, ensure that the system does not represent any risk to the operator or patient.

• Ensure all equipment associated with the system bears a CE marking.

• Place a CE marking on all equipment associated with the sensor.

• Check that the electrical network complies with the current standards of the country of installation.
Directive 93/42/CEE Concerning Medical Devices

The sensor belongs to class I of the Directive Concerning Medical Devices. The sensor is an active device that temporarily penetrates the body through a body orifice for diagnostic purposes. The applicable European standards are the General requirements for Safety (IEC/EN 60601-1 and collaterals) and Electromagnetic Compatibility (EN 60601-1-2).

Marking and Labeling Symbols

Table 1–1 describes the applicable marking and labeling symbols.

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Type BF Device](image) | Type BF Device  
The sensor is a Type BF device. |
| ![WEEE Symbol](image) | WEEE Symbol  
In the European Union, this symbol indicates that when the last user discards this product, it must be sent to appropriate facilities for recovery and recycling. Contact your local Kodak representative or refer to [www.kodak.com/go/recycle](http://www.kodak.com/go/recycle) for additional information on the collection and recovery programs available for this product. |
Non-Medical Devices

This warning symbol means: “Warning: Consult the accompanying documents” and refers to this document. Using accessories that do not meet the equivalent sensor security requirements could result in a lower level of security for the entire system. When choosing an accessory, take into account its use around the patient and ensure that it complies with the harmonized standards IEC/EN 60 601-1 and IEC/EN 60 601-1-1. Install and use computer or video peripheral equipment while closely following the steps in this manual to ensure compliance with these standards.
Chapter 2
Getting Started

This chapter includes the following topics:

• Electrical Safety on page 2–1
• Environment on page 2–2
• Understanding the Sensor on page 2–4
• Maintaining the Sensor on page 2–11

Electrical Safety

After you install the system, make sure it does not represent any hazards to the patient or operator. Follow these guidelines:

• The computer with which our imaging system is installed, and all other equipment connected, must bear the CE marking (IEC 60950). If this is not the case, connect non-compliant equipment to an isolating transformer (IEC 60989 - withstand 1500 V), which is securely mounted. Connect the transformer to equipment so that a tool is required to separate the equipment.

• Check the documentation for the equipment associated to the sensor, to ensure there are no operating limitations that could impact the safety of the operators.
• Place the computer and all associated equipment, including the hub supplied with the kit outside the patient's environment, more than 1.50 meters from the chair. Make sure you cannot access the patient and such devices at the same time.

• Place only the sensor and its remote control in the patient's environment. Do not place any devices connected the system with a multiple socket extension, the multiple socket extension on the floor. Connect only sensor components to the extension.

It should not be possible to separate these components from the multiple socket extension without a tool. Otherwise, the multiple socket extension must be connected to an isolating transformer (IEC 60989 - withstand 1500 V). The multiple socket extension must be rated for a power level of at least 2200 VA.

Environment

For the auxiliary equipment, refer to the respective installation and user manuals.

• Provide sufficient space around the computer and video-screen to provide adequate ventilation.

• To obtain the best quality image and the highest level of visual comfort, position the screen to avoid direct light reflections from interior or exterior light.
Electrostatic Discharges

To prevent electrostatic discharges, follow these guidelines:

• Store the sensor in its case whenever it is not connected to the computer.

• Do not touch the display screen and the sensor simultaneously as this could result in severe damage to the sensor.

Technical Characteristics of the System

The following are the technical characteristics for the sensor:

• Operation—Temperature range: 15 to 35°C; Relative humidity: 30 to 75%

• Storage—Temperature range: 10 to 50°C; Relative humidity at 50°C: 90%

Consumption of the sensor on the USB 2 plug of the computer: approx. 300 mA

Compliance of the sensor with standards
IEC/EN 60601-1
Understanding the Sensor

Figure 2–1 shows the three available sensor sizes.

- Size 0, pediatric
- Size 1 sensor, universal size
- Size 2 sensor

You can connect the sensors simultaneously on the same computer. Do not simultaneously connect several sensors of the same size or of a different generation on the computer.
Remote Control

The remote control contains all the electronics of the sensor. The button on the remote control activates, at a distance, the acquisition in the Kodak dental imaging software.

Connect the remote control to the computer with the USB 2 connector. You can connect the remote control with the power on, when the computer is switched on.

You do not need to start the Kodak dental imaging software before you connect the sensor. However, you can acquire the image only in the imaging module. You can disconnect the remote control with the power on, but do not disconnect the remote control when you are acquiring an image. This can damage the sensor.

Coding

The serial numbers differ depending on the generation of the sensor.

Table 2–1 describes the numbering convention for the sensors.

<table>
<thead>
<tr>
<th>Sensor Size</th>
<th>Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>X X G C x x x</td>
</tr>
<tr>
<td>1</td>
<td>X X G D x x x</td>
</tr>
<tr>
<td>2</td>
<td>X X G E x x x</td>
</tr>
</tbody>
</table>

Note

X and x respectively represent letters and numbers of the serial number.
**Computer Configuration**

Table 2–2 describes the minimum computer configuration.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>Windows 2000 (SP3) or XP (SP1) DirectX 9.0b or higher</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>Pentium III 1GHz</td>
</tr>
<tr>
<td>RAM</td>
<td>256 MB</td>
</tr>
<tr>
<td>Hard disk</td>
<td>40 GB</td>
</tr>
<tr>
<td>Graphics card</td>
<td>32 MB</td>
</tr>
<tr>
<td>Screen configuration</td>
<td>1024x768 - 16 million colors (32 bit)</td>
</tr>
<tr>
<td>USB connector</td>
<td>USB 2.0 certified - 500mA</td>
</tr>
<tr>
<td>Other</td>
<td>CD-Rom drive</td>
</tr>
<tr>
<td></td>
<td>Internet Explorer 5 or +</td>
</tr>
<tr>
<td></td>
<td>Printer</td>
</tr>
<tr>
<td>At the image acquisition station</td>
<td>Complete RVG system + 60-70KV X-ray generator of less than 10 years with electronic timer</td>
</tr>
</tbody>
</table>

*Caution!*

Do not use generators of less than 60 KV.
Obtaining the Best Display Quality

Follow the guidelines in this section to select your screen in the best possible manner and to set it up properly for radiology purposes.

Monitor Quality

The screen affects the perceived quality of the images acquired with your sensor. If the screen is set up badly or is inherently of a bad quality, chances are that the gray levels necessary for the interpretation of images cannot be displayed in a satisfactory manner. Keep in mind that an entry-level screen can seem excellent color-wise and present serious shortcomings with regards to the gray levels.

A monitor with a 17-inch screen works best for displaying images and using a word processor. Preferably, select a monitor with optimal dot size, or pitch, and a contrast of 400 to 1 minimum.

Flat-panel displays are most sensible to variations and it is necessary to select at least a mid-range screen to obtain a quality suitable for radiology.
Checking Display Quality

Use the **Test Pattern** window to measure the gray level display capabilities of a monitor and determine if a monitor is capable of displaying images of sufficient quality for a diagnosis.

To open the **Test Pattern** window, select **Options > Test pattern**. Double-click the image to view it in maximum display mode, scale 1:1.

![Test Pattern Window]

**Figure 2–2  Test Pattern Window**

**Circles and Lines**

The circles and lines indicate the distortion level of the display. If the screen distorts the images, the circles are displayed as ellipses and the lines are displayed as curves.
**Horizontal and Vertical Grids**

The horizontal and vertical grids measure the display resolution of the screen. The grid, shown in Figure 2–3, is formed of four series of four cells, from top to bottom.

![Horizontal and Vertical Grids](image)

**Figure 2–3   Horizontal and Vertical Grids**

Displayed from right to left are resolutions of 3, 6, 12 and 25 lp/mm. The grids are displayed horizontally, then vertically. Black and white is high contrast and gray is low contrast.

Make sure you can clearly distinguish all of the lines in maximum display mode in the Kodak dental imaging software. If the cells containing the thinnest lines seem to shimmer or show irregularities, this means the screen is unable to provide a full resolution display of the image.
**Gray Scales**

The gray scales give an indication of the perceptibility of the gray levels on the screen.

The gray level scale is shown in Figure 2–4.

![Gray Scales Test Pattern](image)

**Series no. 1, on a black background**
**Series no. 2, a gray background**
**Series no. 3, a white background**

**Good perceptibility**
**Poor perceptibility**

**Figure 2–4 Test Pattern Window Gray Levels**

Make sure you can see the square in each cell. The more squares are visible towards the right, for each of the three series, the better the screen. The background color is constant for each of the series. On the other hand, as you move from left to right, the difference between the background of the cell and the central square decreases.

Use this tool to obtain the optimum contrast, brightness and color temperature, if available. Not all screens display the squares on the right side, but a good adjustment can optimize perceptibility.

Adjust the screen so that your perception of the gray levels is offset as far as possible to the right, while ensuring that it progresses together on the three series. For example, do not settle for an adjustment showing all the squares of series no. 3 on the white background, and none or few of the squares of series no. 1.
Range of Gray Levels

The range of gray levels indicates the quality of the display chain.

Make sure the gray levels display continuous from black to white without showing any vertical bands differentiating the different levels of gray.

If you can distinguish several vertical bands or if the test pattern is displayed with a green tint, this means the following:

- The color adjustment is not defined for 24 or 32 bits
- The graphics board is a poor quality board
- The screen is a poor quality screen. This is often the case with flat panel displays.
- The cable between the computer and the screen is too long or of poor quality
- The flat panel display is not connected to the computer using a digital connection (DVI)

Maintaining the Sensor

For routine cleaning and maintenance of the sensor use the guidelines in the user’s guide.
Chapter 3
Installing the Sensor

This chapter includes the following topics;

• “Description of the Kit Supplied.”
• “Installing the Software.”
• “Connecting the Sensor.”
• “Specific Features of the USB System.”
• “Using the Synchronization Option.”
• “General Connection Schematics.”

Caution!
First, install the software and the drivers, and then, connect the sensor.
Description of the Kit Supplied

The sensor kit includes the following components:

- The sensor
- A support for size 1 and 2 sensors
- USB 2 HUB with its power supply and its 5-meter USB cable
- A pack of hygienic sheaths (+/-50)
- Sensor holders
- Depends on the sensor size, please see user leaflet included into the kit
- Installation and user/maintenance manuals
- Kodak dental imaging software and drivers
- A synchronization kit for Kodak timers as an option, synchro cable, box, short USB cable

Note
Some kits may not contain all items listed.
Installing the Software

Installing the software installs the drivers, imaging software, and the patient file.

To install the software, follow these steps:

1. Insert the Kodak dental imaging software CD-Rom in the CD-Rom drive.
   
   If the installation wizard does not open automatically, select Start > Run from the Microsoft Windows taskbar and type D:\setup.exe, if D is the letter assigned to your CD-ROM drive. If your CD-ROM drive is represented by a different letter, substitute that letter for D.

2. Follow the instructions as prompted.

3. On the Installation Menu, select RVG 5x00/6x00. You can install up to two sensors.

   To install one sensor, select RVG 5x00/6x00 for the first option and No intraoral radiography installation for the second option.

4. After the installation is complete, reboot the computer.

Note

Install the software before you connect the sensor.
Connecting the Sensor

Using the USB 2 hub supplied with the kit, connect the sensor to a USB 2 port of the computer. Make sure that the USB connector supports the USB 2.0 high speed standard and that each USB port supplies 500 mA, otherwise you cannot operate the sensor. The 5-meter cable supplied with the hub permits a greater distance between the computer and the chair.

If the computer is close to the operating area, you can connect the sensor without going through the USB hub supplied with the sensor. If no hub is used, make sure the maximum distance between the remote control and the computer is more than 5 meters. In any case, respect the security guideline and maintain 1.5 meters between the patient and the computer.

If your computer does not have USB 2.0 ports use a PCI card or a PCMCIA card. Use boards from renowned manufacturers whose specifications comply with the requirements mentioned above. Use PCMCIA cards with an external power supply. If the USB 2.0 port does not supply enough power, use a powered hub between the computer port and the sensor. Contact your IT vendor for more information.

---

**Important**

Use the USB 2 hub supplied with the sensor.

**Important**

Do not use the USB connectors available on the keyboard or front side of the computer, as these connectors are often unable to supply sufficient power for the proper functioning of the sensor.
Specific Features of the USB System

When you first connect sensor on a USB port, the operating system needs a few seconds to recognize the sensor.

If using Windows XP, when prompted to accept of this new peripheral click Yes. This procedure repeats itself for each connection on a port that has not hosted the sensor.

After this, the USB connection to the computer is accepted by the operating system and you can move the sensor between workstations without restarting the computer or Kodak dental imaging software.

Using the Synchronization Option

Use the synchronization option, to automatically activate the RVG Acquisition button when you connect the sensor and turn on the timer. Connect the synchronization cable properly on a USB 1.1 or 2.0 port.

To activate the synchronization option with the timer, follow these steps:

1. Launch the Kodak dental imaging software.
2. Select Option > Preferences.
3. On the RVG tab and select Synchro-link installed.
General Connection Schematics

You cannot use the adapter with a non-Kodak brand generator.

Figure 3–1 shows the schematics for installing the sensor with a USB 2.0 hub. This connection is recommended.

Note
Have a Kodak-certified installer connect the synchronization cable to the Kodak timer unit.

Figure 3–1 Installation with Hub
Figure 3–2 shows the schematics for installing the sensor without a hub.

![Diagram of installation without hub]

**Figure 3–2   Installation without Hub**

**Checking the Installation**

To make sure the sensor is properly recognized by the system, launch the Kodak dental imaging software and verify the **RVG Acquisition** button is activated.

If the synchronization with a Kodak timer is activated and the timer is switched on, ensure the button is green.

**Note**

Under Windows XP, it is advised to deactivate the power management of the USB ports. Open the device manager, then in the properties of the USB controllers deactivate this option.
Installing the Sensor Support

The sensor is supplied with a sensor holder. Two places are provided, one for the size 1 sensor and the other for the size 2 sensor. The size 0 sensor is delivered with a one-place support for size 0 type only.

To access the sensor quickly, place the support at the edge of the operating area.

Screw in and/or secure the support with double-sided adhesive tape in the vertical position.
Appendix A  
Troubleshooting Images

When troubleshooting problems that you may encounter with images, try to solve the problem by using the following instructions. If the problem persists, or if it is not outlined below, contact Kodak dental imaging support.

Table A–1 outlines troubleshooting methods for resolving most problems that you may encounter.

**Table A–1  Troubleshooting Tips**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause and Corrective Action</th>
</tr>
</thead>
</table>
| The acquisition icon remains gray           | • The hub is not switched on  
• The sensor is not recognized, check driver installation, reinstall if necessary  
• The sensor is conflicting with another USB peripheral, remove all peripherals and test with only the sensor  
• The USB bus is overloaded, use the hub with its power supply and check the capacity of the hub (if different from the standard hub supplied) to provide 500mA on each port  
• The Synchro-link option in the Preferences - RVG menu is selected but the synchronization cable is not connected or the Kodak timer is not switched on. Connect the cable or switch on the timer to work in synchro mode (if the timer is a Kodak timer) or deselect the Synchro-link option  
• The sensor is not connected                                                                 |

| Gray levels seem to be missing on the image or appear as contour lines | • Check the quality of the screen with the test pattern supplied on the Kodak dental imaging software CD-Rom, replace the screen, the cable or the graphics board  
• Check the display configuration in the Windows control panel, 16 million colors display is required |

Table A–1 Troubleshooting Tips (Continued)