

**Installation guide of the sensor**

**Guide d'installation du capteur**

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This document was originally written in French.

SM650  
Installation Guide for the KODAK RVG 6000 digital radiography system  
Guide d'installation du système de radiologie KODAK RVG 6000

Revision date: 02/2005

# ENGLISH

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You have recently purchased a Kodak RVG 6000 digital radiography system.

We would like to thank you for your confidence and will do everything possible to guarantee that you are fully satisfied.

The Kodak RVG 6000 sensor is the only in the world capable of providing resolution performance similar to that obtained with silver film. The sensor comes with powerful software tools designed to give you optimum system performance through simple, efficient procedures.

This is the installation manual for the Kodak RVG 6000 sensor. We recommend that you carefully read this guide in order to get the most out of your sensor.

You should also keep this manual near your equipment in case you need to refer to it in the future.

The information in this manual could be subject to change without warning, or without justification or notification to the people concerned.

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The RVG technology is covered by an international patent registered by the Eastman Kodak Company.

## FOREWORD

This manual contains information on how to install the RVG 6000 digital radiography system.

The RVG 6000 sensor is used with the Kodak dental imaging software version 6. The Kodak dental imaging software is a product specifically designed to make the most of the capabilities of the RVG 6000 sensor. For optimum image display and processing quality, the RVG 6000 sensor should be used with the Kodak dental imaging software.

### **IMPORTANT NOTE:**

**The installer must be qualified in both the hardware and software aspects of a computer to properly install the RVG 6000 system. We strongly recommend that you have your system installed by a certified Kodak installer.**

The RVG 6000 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 lecture of this installation guide is necessary to fully exploit the capabilities of the RVG 6000 digital radiography system.

This manual is divided into three parts:

- Installation of the software
- Connection of the sensor to the USB port
- Quick troubleshooting principles

Do not hesitate to contact your certified Kodak dealer for any additional information you may need.

## RESPONSIBILITY AND WARRANTY

The Eastman Kodak Company guarantees for a period of two years starting from the date of the product invoice, that the aforementioned product does not contain any defects neither in the materials used nor in the manufacturing process. This guarantee is only applicable where the product is correctly used and maintained.

Only damage affecting the products themselves will be taken into account. The customer shall on no account have a claim for compensation of damage that does not affect the product as such. This exclusion of liability shall not apply insofar as mandatory law provides otherwise.

This warranty does not cover damages and faults caused by accident, incorrect or excessive repetitive use, negligence or general wear and tear due to normal everyday use.

The Eastman Kodak company cannot therefore be held responsible for any consequences resulting from the non-application of the instructions contained in the installation and user manuals, namely bodily harm, profit loss, loss of production, data loss, financial loss or any other direct or consequential damage.

If, however, the product is proven to be defective or faulty in materials or manufacture, the responsibility of Kodak will be limited to the repair of the aforementioned product at Kodak's premises or, at Kodak's discretion, its replacement. Regardless of the solution chosen by Kodak, the customer must return the faulty product at his own expense. Other than cost incurred for repair, cost of spare parts and labor, Kodak will only take on the cost of return to the delivery address initially communicated by the client.

Kodak shall be given the opportunity to examine any alleged defect.

Customers are not entitled to withhold payment of invoices or make deductions on account of products claimed to be defective.

Due to the continuous development of its products, Kodak reserves the right to amend at any time and without justification or obligation to notify those concerned the manual and products mentioned therein.

Given that our products are guaranteed in their original packaging at the point when they leave the place of manufacture, Kodak cannot be held liable for any damages caused during transportation.

Consumable spares, software and accessories are excluded under this warranty.

## Inspection and verification of the imaging system in compliance with applicable standards

The electronics used in the Kodak RVG 6000 digital radiography system are designed to observe all European and international medical standards.

Once installed, to ensure that the system does not represent any risk to the operator or patient, all equipment associated to the RVG 6000 system must bear a CE marking.

Check that the electrical network complies with the current standards of the country of installation.

## Directive 93/42/CEE concerning medical devices

The RVG 6000 system is a product belonging to class I of the Directive Concerning Medical Devices. The RVG 6000 system 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 and Electromagnetic Compatibility (EN 60601-1-2 and collaterals).

## Marking and labeling symbols



The Kodak RVG 6000 sensor is a Type BF device, the corresponding standardized label (opposite) (supplied with each kit) must be visibly affixed where the sensor is connected (on the hub or on the computer).

## Non-medical devices



For all non-medical devices forming part of the system and which could represent a risk of electric shock, such as the computer or the peripherals, a warning represented by the corresponding standardized label (opposite) (supplied with each kit) must be affixed at a visible location.

This warning symbol means: "Warning: Consult the accompanying documents" and refers to this document. Using accessories that do not meet the Kodak RVG 6000 system equivalent security requirements could result in a lower level of security for the entire system. When choosing accessories, you must take into account their use around the patient and ensure that they comply with the harmonized standards EN 60 601-1 and EN 60 601-1-1. The installation and use of a computer or video peripheral equipment while closely following the steps in this manual will ensure that everything will be in compliance with these standards.

# INTRODUCTION

## Electrical safety

Once installed, the system should not represent any hazards to the patient or operator. Keep in mind:

- The computer with which our imaging system is installed, and all other equipment connected, must bear the CE marking (IEC 950). If this is not the case, any non-compliant equipment must be connected to an isolating transformer (IEC 989 - withstand 1500 V), which is securely mounted (the equipment connected to the transformer should only be separable using a tool).
- In the documentation for the equipment associated to the Kodak RVG 6000 system, check that there are no operating limitations that could impact the safety of the operators.
- The computer and all associated equipment, including the hub supplied with the kit, must be located outside the patient's environment (more than 1.50 meters from the chair). It should not be possible to touch the patient and such devices at the same time.
- Only the sensor and its remote control can be located in the patient's environment. If the devices to which the Kodak RVG 6000 system is connected are supplied via a multiple socket extension, the multiple socket extension must not be set on the floor and only RVG 6000 system components should be connected to it. 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 989 – withstand 1500 V). The multiple socket extension must be rated for a power level of at least 2200 VA.

## Environment

For the computer systems (central unit, screen, printer), refer to their respective installation and user manuals. Sufficient space should be provided around the computer and video-screen to provide adequate ventilation. To obtain the best quality image and the highest level of visual comfort, the screen should be positioned so as to avoid direct light reflections (interior or exterior light).



## Electrostatic discharges

- 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 Kodak RVG 6000 system

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 RVG 6000 sensor on the USB 2 plug of the computer: approx. 300 mA

Compliance of the RVG 6000 sensor with standards IEC 601-1, UL2601

# PRESENTATION OF THE RVG 6000 SYSTEM

## Description of the sensors

Two different sensor sizes are available to cater for all the different needs in dental radiology. Depending on the kit you have ordered, you will have received a size 1 sensor (universal size), or a size 2 sensor, or both.

The two sensors must not be connected simultaneously on the same computer.



Above are displayed respectively the backside of the size 1 sensor then its active surface, and the backside of the size 2 sensor and its active surface.

The remote control contains all the electronics of the RVG 6000 sensor. The button on the remote control offers the possibility to activate, at a distance, the acquisition in the Kodak dental imaging software (see further in the software chapter).

The remote control is connected to the computer with its USB 2 connector. The connection can be made with the power on, when the computer is working. It is not necessary to start the Kodak dental imaging software prior to connecting the sensor. The acquisition of the image on the other hand can only be made in the Kodak dental imaging software. The disconnection can also be made with the power on, except when an image is being acquired (you could damage the sensor).



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**CAUTION:** Also refer to the user guide for the precautions to take when connecting and disconnecting the sensor.

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## Coding

### NOTE

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

The serial numbers differ depending on the generation of the sensor.  
We describe the numbers for the RVG 6000 sensor below:

The sensor (serial number on the connector):

X X V C x x x = RVG 6000 sensor size 1

X X V D x x x = RVG 6000 sensor size 2

## Minimum computer configuration

### CAUTION

Generators of less than 60 KV should be avoided.

Operating system	OS X.3
Microprocessor	G4
RAM	256 MB (512 preferred)
Hard disk	40 GB (80GO preferred)
Graphics card	32 MB
Screen configuration	1024x768 - 16 million colors (32 bit)
USB connector	USB 2.0 certified - 500mA
Other	CD-Rom drive
	Printer
At the image acquisition station	Complete Kodak RVG 6000 system + 60-70KV X-ray generator of less than 10 years with electronic timer

\* The computer must have a SUB2 port built in. Any add on card such like PCI or PCMCIA USB2 extensions cannot guaranty a good working and therefore must not be used.

## Obtaining the best display quality

This section is dedicated to the display quality of the images on a computer screen. The screen, being the last component of the imaging chain, can influence on its own 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. Please read this section carefully so as to be able to select your screen in the best possible manner and to be able to set it up properly for radiology purposes.

## Monitor quality

Different sizes of computer monitors are available. A 17-inch screen represents the best compromise for displaying images and word processing. Display quality is very variable from one screen to another (depending on brand and price), one should be very careful about the dot size (or pitch) and the contrast (400 to 1 minimum). Flat panel displays are most sensible to variations and it will be necessary to select at least a mid-range screen to obtain a quality suitable for radiology. The screen is the last element in the digital imaging chain and should therefore be carefully selected!

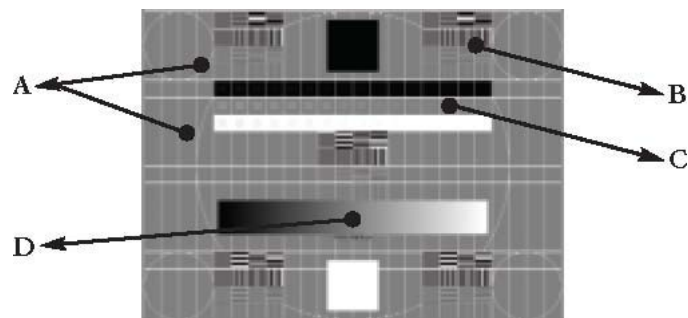
## Test pattern used to check the quality of the display system

A test pattern has been developed to measure the gray level display capabilities of a monitor. This will allow you to determine if a monitor is capable of displaying images of sufficient quality for a diagnostic.

The pattern shown below is of the same size as an image generated by the size 1 RVG 6000 sensor. The pattern is located in The directory where is installed the imaging software (see the software user's guide) This image called "Mire16001200.sc" must be displayed in maximum display mode (scale 1:1) by double-clicking on the image.

### NOTE

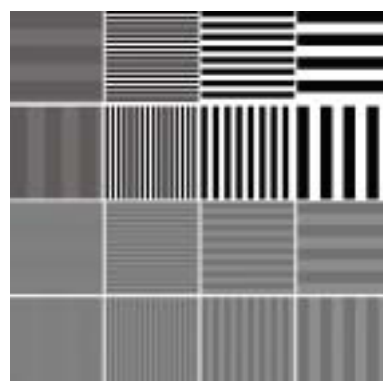
For more details, also refer to the RVG 6000 user guide.



A - The circles and lines indicate the distortion level of the display; if the screen distorts the images, the circles will appear as ellipses and the lines will appear as curves.

B - The horizontal and vertical grids measure the display resolution of the screen. The grid is formed, from top to bottom, of four series of four cells.

The grid is formed, from top to bottom, of four series of four cells.



Horizontal series no. 1, black and white

Vertical series no. 2, black and white

Horizontal series no. 3, gray

Vertical series no. 4, gray

25 lp/mm 12 lp/mm 6 lp/mm 3 lp/mm

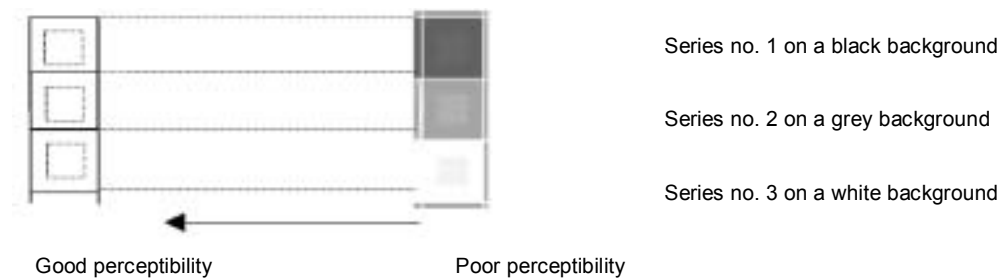
Displayed from right to left are resolutions of 3, 6, 12 and 25 lp/mm. The grids are

displayed horizontally, then vertically, in black and white (high contrast), then in gray (low contrast).

You should be able to clearly distinguish all the lines in maximum display mode (double click on pattern) 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 RVG 6000 images.

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



You should be able to 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.

This tool allows you to obtain the optimum contrast, brightness and color temperature (if available) adjustments for the screen. All screens will not allow you to see the squares on the right side but a good adjustment can optimize perceptibility.

Aim at adjusting 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.

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

The gray levels should actually be 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 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 (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)

## INSTALLING THE RVG 6000 SYSTEM












**CAUTION:** It is imperative to perform the installation in the order indicated below:

1 – Installation of the software and the drivers. The sensor **SHOULD NOT** be connected at this stage.

2 – First connection of the sensor.

### Description of the kit supplied

The complete\* RVG 6000 kit is composed of:

	An RVG 6000 size 1 or size 2 sensor depending on the order
	A support for size 1 and 2 sensors
	USB 2 HUB with its power supply and its 5-meter USB cable
	Rinn type positioner kit for size 1 and size 2 sensors
	Stirrup type positioners – only with size 1 sensor
	Toothbrush type positioners as an option – only with size 1 sensor
	Toothbrush type positioners – only with size 2 sensor
	A pack of hygienic sheaths (+/-50)
	Installation and user/maintenance manuals
	Kodak dental imaging software and drivers necessary for the installation of the RVG 6000
	A synchronization kit for Kodak timers as an option (synchro cable, box, short USB cable)

\* Subsequent to a hardware upgrade with respect to an earlier version of the sensor, addition of a sensor or addition of a workstation, certain elements may not be contained in the kit. The most complete kit required for a first time installation is presented here.

## Installing the software

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REMINDER: The software installation should be performed before the first connection of the sensor. The installation software actually installs all the necessary drivers as well as the imaging software and the patient file.

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- 1) Insert the imaging software CD-Rom in the CD-Rom drive.
- 2) Follow the instructions given in the Installation and User's guide of the software (locate on the Trophy Mac's CD-ROM)
- 3) Once the installation finished, reboot the computer.

## Connecting the RVG 6000 sensor

Simply connect the RVG 6000 sensor on a USB 2 port of the computer using the USB 2 hub supplied with the kit. Make sure that the USB connector that is being used supports the USB 2.0 high speed standard and that each USB port supplies 500 mA, otherwise it will be impossible to operate the sensor. The 5-meter cable supplied with the hub permits a greater distance between the computer and the chair.

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WARNING: Only the USB 2 hub supplied with the RVG 6000 system should be used.

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If need be, if the computer is very close to the operating area, it is possible to connect the RVG 6000 sensor without going through the USB hub supplied with the RVG 6000 system. If no hub is used, the maximum distance between the remote control and the computer should never be more than 5 meters. In any case, respect the security guideline and maintain 1.5 meters between the patient and the computer.

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**WARNING:** 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 RVG 6000 sensor.

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## **Synchronization option with Kodak timers**

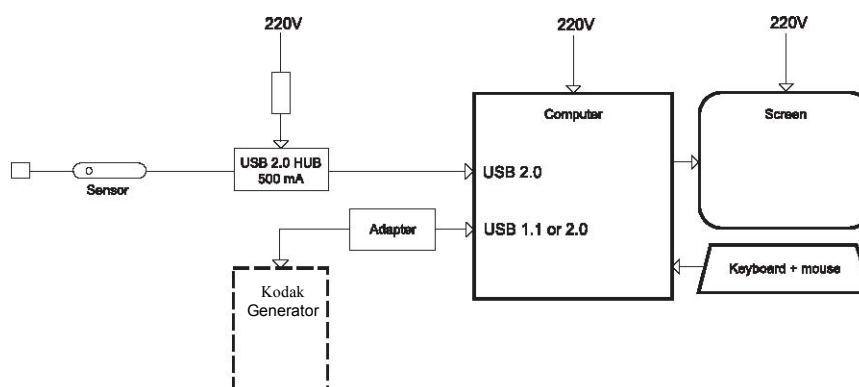


To activate the synchronization option with the timer, launch the imaging software, in the Acquisition menu select Trophy Timer.

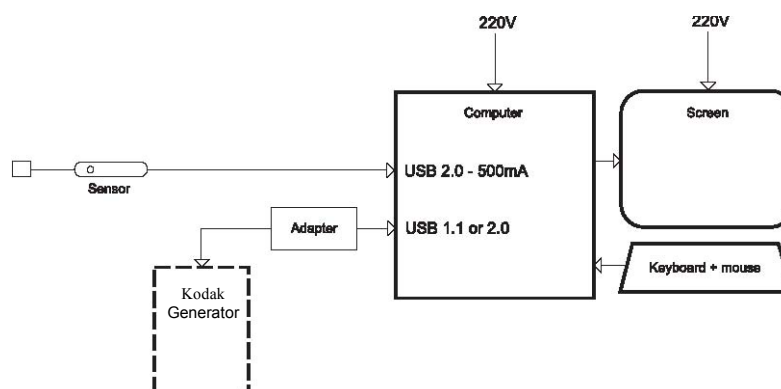
This way the acquisition icon will remain green permanently as soon as the sensor is connected and the timer has been switched on (with the synchronization cable properly connected on a USB 1.1 or 2.0 port).

## General connection schematics

Installing the sensor with a USB 2.0 hub (recommended)



Installing the sensor without a hub (direct connection)



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NOTE: The connection of the synchronization cable to the Kodak timer unit is optional, it must be carried out by a Kodak-certified installer specialized in the installation of X-ray generators.

When using a generator of a brand other than Kodak, the adaptor cannot be used.

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## Checking the installation of the RVG 6000 sensor



To know if the RVG 6000 sensor is properly recognized by the system, simply launch the Kodak dental imaging software and verify whether the acquisition icon shown opposite is activated. It needs to be green (if the synchronization with a Kodak timer is activated and the timer is switched on) or red.

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NOTE: It is advised to deactivate the power management of the USB ports when this is possible on the working station on which the sensor is connected.

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## Installing the sensor support

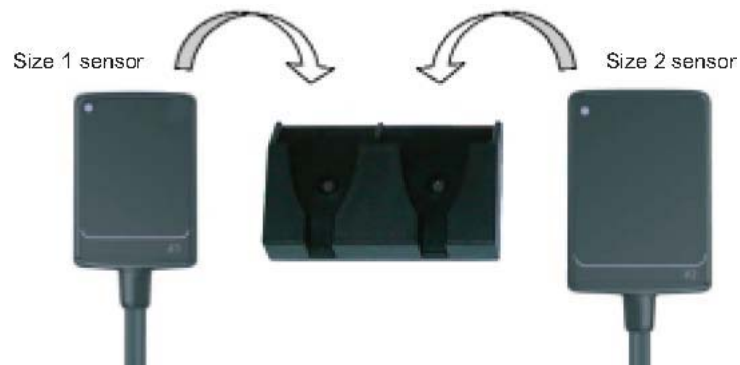
### IMPORTANT

To ensure normal operation, only the support provided by Kodak should be used.

The RVG 6000 system 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 support must be placed at the edge of the operating area, in such a way that the practitioner can always quickly have access to the sensor.

The support should be screwed and/or secured with double-sided adhesive tape in the vertical position (be sure to carefully degrease the mounting surface).



## DAILY AND LONG-TERM MAINTENANCE

For routine cleaning and maintenance of the sensor and the precautions to be taken when using the sensor, refer to the RVG 6000 user manual.

### Quick troubleshooting (Symptoms related to the installation)

The information below will allow you to troubleshoot, with no special technical knowledge required, most of the apparent problems that you could encounter during the installation procedure. Try to solve the problem by following the instructions given below. If the problem persists or if the problem is not described, contact your certified Kodak dealer. For malfunctions related to use, refer to the RVG 6000 user manual under the "Routine Servicing and Maintenance" section.

Symptom	Cause and remedy
The acquisition icon remains gray	<ul style="list-style-type: none"><li>1- The hub is not switched on</li><li>2- The sensor is not recognized, check driver installation, reinstall if necessary</li><li>3- The sensor is conflicting with another USB peripheral, remove all peripherals and test with only the RVG 6000 sensor</li><li>4- 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</li><li>5- The "Trophy Timer option in the Acquisition menu is ticked 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 untick the Synchro-link option</li><li>6- The sensor is not connected</li></ul>
Gray levels seem to be missing on the image or appear as contour lines	<ul style="list-style-type: none"><li>1- Check the quality of the screen with the test pattern supplied on the Kodak dental imaging software CD-Rom (see screen qualification section), replace the screen, the cable or the graphics board</li><li>2- Check the display configuration in the Windows control panel, 16 million colors display is required</li></ul>