

Gel Doc™ 2000 Gel Documentation Systems

Hardware Instruction Manual

Catalog Numbers

170-8100

through

170-8103

For Technical Service, call your local Bio-Rad office, or in the U.S. call **1-800-4BIORAD** (1-800-424-6723)

P/N 4000124 Rev. A

Important

Please read these instructions before operating the Gel Doc™ 2000 gel documentation system to familiarize yourself with its operation.

This instrument is intended for clinical diagnostic and research laboratory use and should only be operated by specialized personnel.

Warranty

The Gel Doc 2000 gel documentation system is warranted against defects in materials and workmanship for 1 year. If any defects occur in the instrument during this warranty period, Bio-Rad laboratories will repair or replace the defective parts at its discretion without charge. The following defects, however, are specifically excluded:

- Defects caused by improper operation.
- Repair or modification done by anyone other than Bio-Rad Laboratories or an authorized agent.
- Use of spare parts supplied by anyone other than Bio-Rad Laboratories.
- Damage caused by accident or misuse.
- Damage caused by disaster.
- Corrosion caused by improper solvents or samples.

Regulatory Notice

IMPORTANT: This Bio-Rad instrument is designed and certified to meet EN61010, the internationally accepted electrical safety standards and EMC regulations. Certified products are safe to use when operated in accordance with the instruction manual. This instrument should not be modified or altered in any way. Modification or alteration of this instrument will:

1. Void the manufacturer's warranty.
2. Void the regulatory certifications.
3. Create a potential safety hazard.

NOTE: Bio-Rad Laboratories is not responsible for any injury or damage caused by use of this instrument for purposes other than those for which it is intended, or by modifications of the instrument not performed by Bio-Rad Laboratories or an authorized agent.

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Section 1 Introduction

The Bio-Rad Gel Doc™ 2000 gel documentation system is an easy-to-use, high-performance gel documentation system. It uses a CCD camera to capture images in real time, which allows you to more accurately position and focus the image. Using Bio-Rad software, images acquired with the Gel Doc 2000 can be optimized, annotated, analyzed, and printed to a video printer or your local printer.

The Gel Doc 2000 system contains the Gel Doc 2000 darkroom cabinet, UV transilluminator 2000, CCD camera, and Bio-Rad software.

Section 2 Important Safety Information

2.1 SAFETY INFORMATION



Use of the Gel Doc involves UV illumination. Proper precautions must be taken to avoid eye and skin exposure to the UV radiation per the instructions in the UV transilluminator manual.

2.2 POWER SAFETY INFORMATION:

- a) **Voltage Setting Information:** The Gel Doc 2000 must be set to the correct voltage for your country or region. Before connecting the cable to the power source, turn the voltage selector with a screwdriver to set the correct voltage.

The UV transilluminator 2000 also must be set to the correct voltage with a screwdriver.

- b) **Fusing :** The user serviceable fuses are located in XXXXXXXXXX

Section 3 Product Description

3.1 *CCD Camera*

The Gel Doc 2000 system uses an 8-bit CCD camera for capturing images. The 1/2" CCD array of this camera provides high-resolution imaging. The camera comes with an 848 mm zoom lens and a +2 diopter, which allows for flexible zoom capability. The lens has a manual aperture that can be used to improve image sensitivity.

3.2 *Darkroom Cabinet*

The Gel Doc 2000 darkroom cabinet is designed to capture fluorescent light without using a photographic darkroom. The cabinet has built-in white light illumination. The drawer of the cabinet is designed to accommodate either a UV transilluminator 2000 (standard) or a white light transilluminator (optional), depending upon the application. These transilluminators are easily interchangeable. Once the cables are connected inside the drawer, the controls on the front panel of the cabinet can be used to control illumination.

The light in the darkroom cabinet turns off automatically after about 15 minutes. This time period can be extended by pressing the HOLD button.

3.3 *Transilluminator*

The Gel Doc system comes with a UV transilluminator 2000 that has a 302-nm UV wavelength to excite most fluorescent dyes used for gel imaging applications.

For white light applications, an optional white light conversion plate or white light transilluminator is available. For ordering information, please see section 7, "Accessories and Spare Parts."

3. 4 *PCI Digitizing Card*

The Gel Doc system requires a PCI Digitizing Card to convert the video signal captured with the CCD camera to an image that can be displayed on your computer monitor. This card is inserted in the PCI slot of your Macintosh or PC.

3. 5 *Software*

The software package that comes with the Gel Doc 2000 system can be used to annotate and document images, analyze molecular weights, video print, and perform a host of other applications. See the software manual for instructions on how to install and operate the software.

3. 6 *Thermal Printer (Optional)*

The recommended thermal printer to be used with the Gel Doc 2000 system is the Mitsubishi P-90W, with 256 gray levels.

3. 7 *Packaging*

The Gel Doc 2000 system consists of eight boxes, each with its own label. Please unpack each box carefully and verify the contents.

<u>Descriptions</u>	<u>Q'ty</u>
170-8111 Gel Doc 2000 Darkroom Cabinet	
Gel Doc 2000 main body	1
Power cable	1
 170-8110 UV Transilluminator 2000	
UV Transilluminator 2000	1
Power cable	1
 170-8112 CCD Camera RS-170	
or	
170-8113 CCD Camera CCIR	
CCD camera with zoom lens and cable	1
Camera hold screws	2
Washers	2

170-7540 PCI Digitizing Card CCIR	
or	
170-7541 PCI Digitizing Card RS-170	1
170-7546 Integration Cable	1
170-7710 Multi-Analyst Software PC	
or	
170-7711 Multi-Analyst Software Mac	
Set of software diskettes	1
Software manual	1
170-8104 Gel Doc Accessory kit	
EthBr filter (170-7542)	1
Fluorescent ruler	1
Focusing target	1
Instruction manual	1

Section 4 Getting Started

4.1 *Selecting the Location of the Gel Doc System*

Since the Gel Doc system has a complete fluorescent darkroom, it can be placed on any bench top. You should place the Gel Doc 2000 near the computer with the software that will control it. It is a good idea to keep a open area of 60 cm x 60 cm around the computer.

4.2 *Assembling the System*

Step 1. Assembling the Gel Doc 2000 darkroom cabinet

Important: It is recommended to carry the Gel Doc 2000 with more than two people. The Gel Doc 2000 system is designed to fit to most of voltages in your region. But it is necessary to set an appropriate voltage with the Voltage Selector. Please see the section b) to make sure that your system is set to your voltage.

- a) Pull the cabinet carefully out of the box and place it at suitable place.
- b) Select the Voltage Selector to your appropriate voltage in your region.
 - The Voltage Selector is at the back of the cabinet.
 - Use a screwdriver and turn the dial to appropriate position 100 V, 115V or 240 V.

- c) Plug the female end of power cable to the cabinet. Power socket is at the back of the cabinet.
Note: Please do not connect the other end of power cable to a power source until all connections are done.
- d) Open front door of the cabinet. Take out the camera bracket by unscrewing it from the base.
- e) Use the included washers and knobs to affix the camera bracket to the top of the Gel Doc 2000.

Step 2. Assembling the CCD camera

- a) Carefully take the CCD camera assembly out of the box and hold the camera so the two locking holes are faced to you.
- b) Insert it into the camera holder from the side.
- c) Use washers and screws that come with the camera to hold the camera.

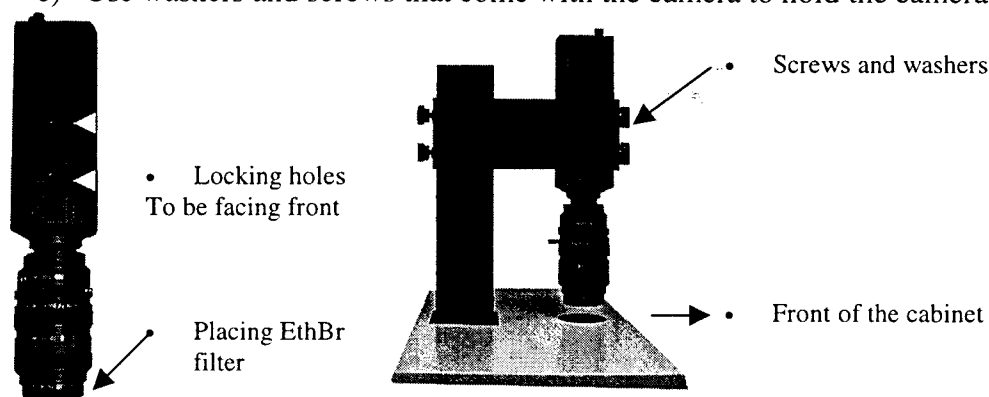


Fig. 3. Assembling the CCD camera to the holder

- d) Open the accessory box (170-8104). Take the EthBr filter (170-7542).
- e) Remove the lens cap from the lens assembly and screw in the EthBr filter to the lens assembly.
- f) Use the focusing target and the included software to center the bracket/camera assembly over the camera hole.
- g) Connect the power cable of the camera that comes with the camera with attached to input at back of the cabinet.

Step 3. Assembling the UV transilluminator

Important: The UV Transilluminator 2000 system must be set to the correct voltage for your country or region. Select the proper voltage using a screwdriver (see step 3.b below).

- a) Carefully unpack the transilluminator from its box. Place the transilluminator on a bench facing forward.

- b) Select the proper voltage for your country or region using the Voltage Selector.
 - The Voltage Selector is on the right front of the instrument.
 - Use a screwdriver to turn the dial to the appropriate position—100 V, 115 V, or 240 V.
- c) Set the On/Off switch to **On** and the Analytical/Preparative switch to **Analytical position**.

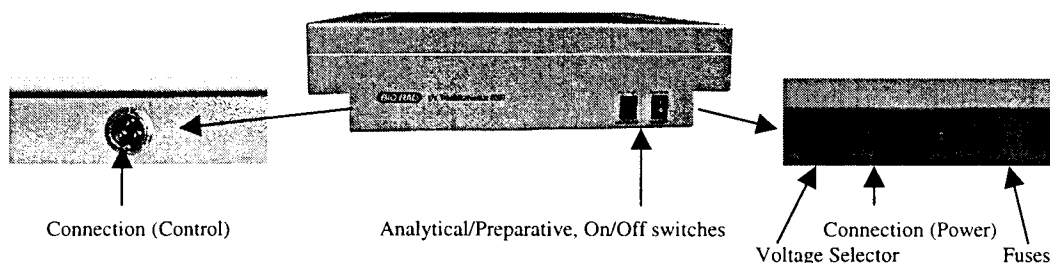


Fig. 4. UV Transilluminator 2000

Note: If the On/Off switch is Off, it will not be controlled by the control panel on the front of the cabinet. Make sure the switch is On before putting it in the drawer.

- d) Hold the transilluminator so that it is facing you and place it into the drawer of the Gel Doc 2000 with the two connecting cables on each side.
- e) Connecting these two cables will allow you to control the transilluminator from the panel on the front of the cabinet.
- f) To position the transilluminator properly, position the four feet of the transilluminator on top of the dots marked on the drawer.

Step 4. Installing the digitizing card

- a) Make sure that your computer is turned off.
- b) Open the cover of your computer's CPU.
- c) Insert the digitizing card in the PCI slot of your computer. This digitizing board works for both PC and Macintosh.
- d) Close the cover.

Step 5. Installing the Multi-Analyst software

Please refer to your software manual and release notes for proper software installation.

Step 6. Connecting the cabling harnesses

- a) Unpack the 170-7546 integration cable carefully.
- b) Connect each end of the cable according to the specifications below.

<u>Label / Color</u>	<u>Instrument / Connection</u>
9-pin connector / Black	PCI board / Back of computer
Camera Video / Black	CCD Camera / Video
Camera AUX / Red	CCD Camera / AUX
Video In / Blue	Printer / Video In
Remote / Gray	Printer / Remote

Remarks: The Gel Doc 2000 transmits video signals and controls print functions through the integration cable (170-7546). The recommended video printer for use with the Gel Doc system is the Mitsubishi Video Printer, model P-90W. This printer is available from Bio-Rad (catalog number 170-7251 (100-240 V)). For alternative printers, please call (800) 4BIORAD, or ask your local representative.

4.3 Description of Functions

4. 3. 1 Camera and lens

The CCD is able to optimize an image in several ways.

Aperture is adjusted using the top ring of the lens. Aperture allows the CCD sensor to take in more light or less light. Turning the aperture clockwise decreases the amount of light coming into the sensor, thereby making the image darker. Turning the aperture counterclockwise increases the amount of light coming into the sensor, resulting in a lighter image.

Focus is adjusted using the second ring from the top. Turning the ring clockwise or counterclockwise changes the focal point of the lens.

Zoom is adjusted using the third ring from the top. Zoom allows you to change the size of the image on the screen. Turning the ring clockwise makes an image appear bigger. Turning the ring counterclockwise makes an image appear smaller. The zoom control will not change the focus.

The **Diopter**, located on the bottom ring, is not adjustable. However, the diopter lens should always remain on the lens assembly.

An **EthBr Filter** is available as an accessory kit box (170-81xx). This may be attached after the lens cap is removed. The EthBr filter is designed to be used only with fluorescent light. This filter will lower the background image.

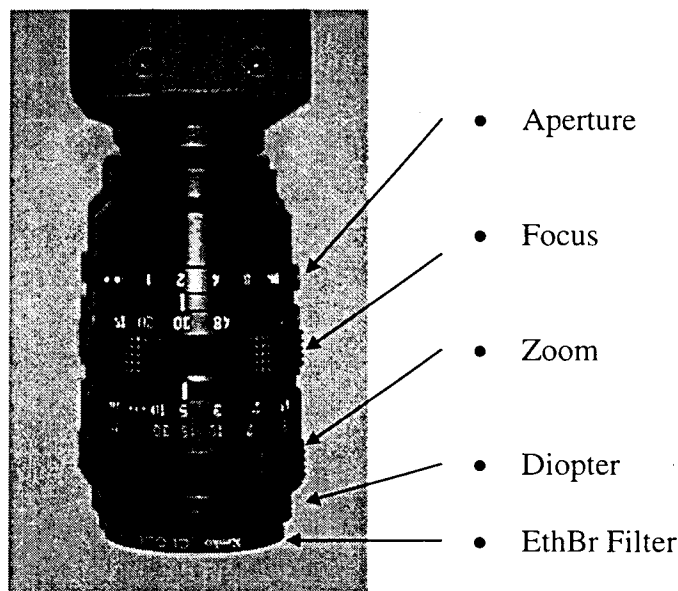


Figure 5. CCD camera lens assembly

4. 3. 2Control panel

The front control panel of the Gel Doc 2000 allows you to control the illumination in the darkroom cabinet. Please read the following section to familiarize yourself with each function.

The **Power** light tells you whether the system is turned on or not. The power on/off switch is located on the back of the instrument.

The **ON/OFF Epi-light** button controls the white light epi-illumination. Press the button to turn on epi-illumination; press the button again to turn it off. Epi-illumination will automatically turn off after 15 minutes. When the UV transilluminator switch is pressed, the epi-white light is automatically turned off.

The **ON/OFF Transilluminator** button controls the UV transilluminator with full intensity. Press the button to turn it on; press the button again to turn it off. The transilluminator will automatically turn off after 15 minutes. For safety purposes, this switch is subject to the following automatic controls:

- It is turned off when the front door is open.
- It is turned off when the drawer is open.
If the door or drawer is opened while the transilluminator is on, the blinking light will tell you that the transilluminator has been turned off. After the door or the drawer is closed, you have to press the ON/OFF switch again to turn on the light.

Important: For the purposes of band cut applications, it is possible to turn on UV light with the drawer fully open. You must wear all possible UV protection, especially for your eyes, when the transilluminator switch is turned on with the drawer fully open.

The *UV Preparative* switch is similar to the ON/OFF Transilluminator button. The UV Preparative light is a lower intensity light designed to minimize the effects of UV exposure on DNA. The Preparative mode is recommended for applications that require longer UV exposure times.

The *Hold* key terminates the automatic shut-off of the transilluminator and the epi-illumination; the lights will remain active until the hold status is cancelled. When the Hold key is pressed, the red LED blinks, indicating that Hold is now active.

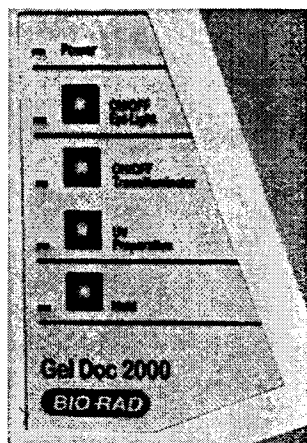


Fig. 6. Control panel

4. 3. 3 Initial test

Before starting the initial testing, please make sure that:

- The voltage selector is set for the appropriate voltage for your country or region. (See section 4.2, step 3.b.)
- The software and the digitizing board are installed properly. (See the software manual and section 4.2, step 4.)
- The cabling harness is connected properly. (See section 4.2, step 6.)

It is recommended that you do a test to make sure that each function works properly. Please perform each procedure in the left column and make sure it is working correctly as specified in the right column.

1. Initial test for the darkroom cabinet

Procedure	Control Panel
1. Make sure the door and drawer are closed.	Power LED is turned on.
2. Turn on the system (switch at back).	Transilluminator LED blinks.
3. Open the door.	The LED turns off.
4. Close the door.	Transilluminator LED blinks.
5. Open the drawer.	The LED turns off.
6. Close the drawer.	The LED turns on.
7. Press the Transilluminator key.	The LED turns off.
8. Press the key again.	The LED turns on.
9. Press the Preparative key.	The LED turns off.
10. Press the Preparative key again.	The LED turns on.
11. Press the Epi-Illumination key.	Epi-light is on inside.
12. Open the door.	Epi-light is turned off.
13. Press the Epi-Illumination key again.	The LED blinks.
14. Press the Hold key.	The LED turns off.
15. Press the Hold key again.	

2. Initial test for the camera and lens assembly

Procedure	Control Panel/On-screen Display
1. Make sure the Gel Doc 2000 is turned on.	Power LED is on.
2. Turn on computer and activate software.	
3. Select Gel Doc acquisition module from the software.	Acquisition window opens.
4. Place a target on the transilluminator.	
5. Turn the aperture ring clockwise.	Screen gets brighter.
6. Adjust the focus ring.	Able to see the target.
7. Turn the zoom lens counterclockwise.	Image on the screen gets bigger.
8. Turn the zoom lens clockwise.	Image gets smaller.

Section 5 Operation of the Gel Doc 2000

The Gel Doc 2000 is an easy-to-use instrument. In the Gel Doc Acquisition Screen on your computer, select Live mode and adjust your image position, size, focus, and intensity using the lens assembly. After the image is optimized, capture the image. A typical procedure is described below.

Step 1. Switch on the Gel Doc system

1. Turn on the Gel Doc main switch (on the back of the cabinet).
2. Turn on the computer and start the software.
3. Select the Gel Doc acquisition module from the File menu.

Step 2. Position your gel

1. Either open the front door or open the drawer of the Gel Doc.
2. Position your gel and close the door.
3. Press the Epi-Illumination key to turn on the white light.
4. Adjust the lens aperture, zoom, and focus while looking at the computer screen.
5. Open the door and reposition the gel if necessary.

Step 3. Acquire an image

1. Press the Transilluminator key to turn on the UV light.
2. Select an integration time (see software manual for details).
3. Once the image looks bright enough for a final picture, click Acquire.

Section 6 Trouble Shooting

Problem	Possible Cause	Solution
Image is not visible on the monitor	• Aperture is closed. • Lens cap is on. • Incorrect monitor settings. • Wrong cable connections. • Integration Control Unit is OFF.	• Open the aperture. • Remove the lens cap. • See Section 4 for monitor setting instructions. • See Section 4 for cabling. • Turn on the main switch.
Image is not bright enough.	• Wrong aperture setting. • Wrong monitor and printer settings. • Wrong frame count on integrator.	• Open the aperture. • See Section 4 for monitor and printer settings. • Increase frame count.
Impossible to image whole sample area.	• Lens is zoomed-in too close. • Camera position is not high enough.	• Zoom-out the lens. • Turn the locking knob and pull the camera holder upward.
Print-out does not look the same as the image on the monitor.	Monitor settings are wrong.	See Section 4 for monitor and printer settings.
Print-out area is not the same as the image on the monitor.	Improper dip switch selection on the printer.	The dip switch must be: 1 and 8 up, and rest down.

Section 7 Accessories and Replacement Parts

	Catalog Number	Product Description
Accessories	170-7251	Mitsubishi P-90W Printer 100 - 240 Volts
	170-7582	Mitsubishi K65H Paper, 4 rolls
	170-3745	Mini-Transilluminator, 100 Volts
	170-3737	Mini-Transilluminator, 115 Volts
	170-3738	Mini-Transilluminator, 220 / 240 Volts
	170-7554	White Light Transilluminator 100 Volts
	170-7555	White Light Transilluminator 115 Volts
	170-7556	White Light Transilluminator 220 / 240 Volts
	170-7538	UV / White Light Conversion Screen
Upgrades	170-7262	Insta Doc II Upgrade Kit 100 Volts
	170-7263	Insta Doc II Upgrade Kit 115 Volts
	170-7264	Insta Doc II Upgrade Kit 220 / 240 Volts
	170-7273	Gel Doc 1000 / PC Upgrade RS-170
	170-7274	Gel Doc 1000 / PC Upgrade CCIR
	170-7275	Gel Doc 1000 / Mac Upgrade PCI, RS-170
	170-7276	Gel Doc 1000 / Mac Upgrade PCI, CCIR
	170-7277	Gel Doc 1000 / Mac Upgrade Nu-bus, RS-170
	170-7278	Gel Doc 1000 / Mac Upgrade Nu-bus, CCIR
Spare Parts	170-7542	Fluorescent Filter, fits to camera lens
	930-2004	BNC Cable 1'
	170-7546	Integration cable (Integration Control Unit option)