

Cary 100/300/4000/5000/ 6000i Spectrophotometers

Hardware Operation Manual

Installation Category II
Pollution Degree 2
Safety Class 1 (EN61010-1)

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Agilent Technologies

Publication No. 8510197200
Issue 03
May 2010

Varian, Inc. – Serving Industries Worldwide

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First published May 2002. Updated June 2002 and May 2010.

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Declaration of Conformity

We hereby declare that the equipment listed below complies with the requirements of:
 The Low Voltage Directive 73/23/EEC (93/68/EEC)
 The EMC Directive 89/336/EEC (92/31/EEC and 93/68/EEC)

Applicable Standards

LVD	BS EN 61010-1:1993		
EMC	BS EN 61326:1998	EN55022:1994	IEC1000-3-2:1995
	IEC1000-3-3:1994	IEC1000-4-2:1995	IEC1000-4-3:1998
	IEC1000-4-4:1995	IEC1000-4-5:1995	IEC1000-4-6:1996
	IEC1000-4-11:1994		
Equipment Model Number	Cary 100, 300 Series II Series		

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Publication number 8510189800 10/01



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EMC	BS EN 61326:1998	EN 55011:1998	EN 61000-4-2:1995
	IEC 61000-3-2:1995	IEC 61000-3-3:1995	IEC 61000-4-3:1995
	EN 61000-4-4:1995	IEC 61000-4-5:1995	IEC 61000-4-6:1996
	EN 61000-4-11:1994		
Equipment Model Number	Cary 4000, 5000, 6000i series spectrophotometers		

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Publication number 8510196600 04/02

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Safety Practices and Hazards

Your Varian Cary instrument and accessories have been carefully designed so that when used properly you have an accurate, fast, flexible and safe analytical system.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Information on safety practices appears throughout the documentation (both printed and on-line) provided with your instrument and accessories. Before using the instrument or accessories, you must thoroughly read these safety practices.

Observe all relevant safety practices at all times.

Ultraviolet Radiation

The Deuterium (standard in all instruments) and Mercury lamps (if fitted) in the instrument emit hazardous UV radiation. This radiation can cause serious damage to eyes. NEVER look directly at either lamp and NEVER operate either lamp unless it is mounted correctly in the lamp turret (Cary 4000/5000/6000i only) and the turret is mounted correctly in the instrument.

Note The mercury lamp is fitted as standard in the Cary 4000/5000/6000i.

Ozone can be generated by radiation from the source lamps. Exposure to ozone can result in severe irritation to the skin, eyes, and upper respiratory system. The maximum permissible exposure level is 0.1 ppm (0.2 mg/m³).

ALWAYS ventilate the area surrounding the spectrophotometer such that the concentration of ozone does not exceed the maximum permissible level. All venting must be to outside air, never within the building.

Electrical Hazards

The Cary 100/300/4000/5000/6000i instruments and some accessories contain electrical circuits, devices, and components operating at dangerous voltages. Contact with these circuits, devices and components can cause death, serious injury, or painful electrical shock.

Panels or covers which are retained by screws on the spectrophotometer and accessories (with the exception of the lamp access cover) may be opened ONLY by Varian-trained, Varian-qualified, or Varian-approved service engineers. Consult the manuals or product labels supplied with your PC, monitor and printer/plotter to determine which parts are operator-accessible.

Operators and other unauthorized personnel are permitted access ONLY to the lamp compartment and the sample compartment of the Cary. ALWAYS switch off the spectrophotometer before changing a lamp in the lamp compartment.

Good grounding/earthing is essential to avoid a potentially serious electric shock hazard. Ensure that there is an integral ground connection between the metal base of the spectrophotometer and accessories and the 3 pin earth-grounded receptacle. Consult the manuals or product labels supplied with your PC, monitor and printer/plotter for the relevant grounding requirements.

Note The safety classification is given as Class 1 (EN 61010-1).

Application of the wrong supply voltage can create a fire hazard and a potentially serious shock hazard, and could seriously damage the Cary system, accessories and any attached ancillary equipment. The Cary 4000/5000/6000i has a Universal Power Supply that adapts to the supply voltage. However, care must be taken to ensure that the correct voltage is used.

Do not connect the spectrophotometer or accessories to the mains power supply until you have made sure that the slide switch(es) (Cary 100/300 only) at the rear of these are correctly set for the mains power supply in the specific outlet in your laboratory to which the equipment will be connected. Consult the manuals supplied with your PC, monitor and printer/plotter for their specific voltage requirements.

Replace blown fuses with fuses of the size and rating as stipulated in the text adjacent to the fuse holder or in the manuals where listed.

Do NOT use power cords with faulty or frayed insulation.

Other Precautions

Both the deuterium and the visible lamps operate at high temperatures, and touching either of these lamps may result in burns. Before replacing a lamp that has been lit, switch off the spectrophotometer and either ensure that the lamp has cooled, or protect your fingers from burns.

Do not block the ventilation grills on the spectrophotometer and accessories. Consult the manuals supplied with your PC, monitor and printer/plotter for their specific ventilation requirements.

Use of the Cary system and accessories may involve materials, solvents and solutions which are flammable, corrosive, toxic or otherwise hazardous.

Careless, improper, or unskilled use of such materials, solvents and solutions can create explosion hazards, fire hazards, toxicity and other hazards which can result in death, serious personal injury, and damage to equipment and property.

ALWAYS ensure that laboratory safety practices governing the use, handling and disposal of such materials are strictly observed. These safety practices should include the wearing of appropriate safety clothing and safety glasses.

Warnings and Cautions

Other specific warnings and cautions appear in this manual and in the on-line help where appropriate, and will detail the specific hazard, describe how to avoid it, and specify the possible consequences of not heeding the warning or caution.



Warning

A 'Warning' message appears in the manual when failure to observe instructions or precautions could result in death or injury. Symbols depicting the nature of the specific hazard are also placed alongside warnings.

Caution

A 'Caution' message is used when failure to observe instructions could result in damage to equipment (Varian supplied and/or associated equipment).

A 'Note' is used to give advice or information.

Read all warnings and cautions carefully and observe them at all times.

A triangular symbol indicates a warning. The meanings of the symbols that may appear alongside warnings in the documentation are as follows:



Electrical shock



Eye hazard



Noxious gases



Hot surfaces



Fire hazard



Sharp Object



Corrosive liquids



Moving part



*Heavy weight
(danger to feet)*



*Heavy weight
(danger to hands)*



Part can be ejected

The following symbol may be used on warning labels attached to the instrument. When you see this symbol you must refer to the relevant operation or service manual for the correct procedure referred to by that warning label.









Color Coding

The various indicator lights appearing on the Cary 100/300/4000/5000/6000i instruments and any associated accessories have been color coded to represent the status of the instrument or accessory:

- ❑ A green light indicates the instrument is in normal/standby condition.
- ❑ An orange light indicates that a potential hazard is present.
- ❑ A blue light indicates that operator intervention is required.
- ❑ A red light warns of danger or an emergency.

Information Symbols

The following symbols appear on the Cary 100/300/4000/5000/6000i instruments to provide you with additional information:

I	Mains power on
0	Mains power off
	Fuse
	Single phase alternating current
	When attached to the rear of the product, indicates that the product complies with the requirements of one or more EU Directives
	Focus
	Vertical adjustment
	Horizontal adjustment

US FCC Advisory Statement

This equipment generates, uses and can radiate radio frequency energy, and if not installed and operated in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user will be required to take

whatever measures may be necessary to correct the interference at his or her expense.

CE Compliant Products

Cary instruments have been designed to comply with the requirements of the Electro-magnetic Compatibility (EMC) Directive and the Low Voltage (electrical safety) Directive (commonly referred to as the LVD) of the European Union.

Varian has confirmed that each product complies with the relevant Directives by testing a prototype against the prescribed EN (European Norm), IEC or CISPR standards.

Proof that a product complies with the Directives is indicated by:-

- the CE Marking appearing on the rear of the product
- the documentation package that accompanies the product containing a copy of the Declaration of Conformity. This Declaration is the legal declaration by Varian that the product complies with the Directives, and also shows the EN standards to which the product was tested to demonstrate compliance.

It is also signed by Varian's Authorized Representative in the EU, and by the representative of the manufacturing plant.

1. Introduction

1.1 Installation Requirements

Prior to receiving your Cary instrument you will have been provided with a Cary Pre-installation manual (publication number 8510128000), which describes the environmental and operating requirements of the Cary system. You must prepare your laboratory according to these instructions before the Cary can be installed. You should keep the Pre-installation manual for future reference. If you have misplaced your copy, you can obtain a replacement from your local Varian office.

1.2 Cary Documentation

This manual provides instructions for installing and maintaining your Cary 100/300/4000/5000/6000i hardware. Thus it is referred to as the Cary Hardware manual. Where procedures differ for the various instrument models they will be clearly identified.

Instructions for installing the Cary software, together with an overview of the system, are included in the WinUV software operation manual provided with the Cary software (part number: 8510162500). Operating procedures are included in the on-line Help.

Installation instructions for any Cary accessories you ordered are available on-line with the Cary WinUV software.

1.3 Specifications

Your Cary instrument is designed for indoor use. It is suitable for the following categories:

- Installation category II
- Pollution degree 2
- Safety Class 1 (EN 61010-1)

1.3.1 Environmental

Condition	Altitude	Temp T (°C)	Humidity (%RH) non-condensing
Non-operating (transport)	0-2133 m (0-7000')	5-45	20-80
Non-operating and meeting dielectric strength tests	sea level	40	90-95
Operating but not necessarily meeting performance spec's	0-2000 m (0-6562')	5-31 31-40	≤80 ≤{80-3.33(t-31)}
Operating within performance specifications	0-853 m (0-2800')	10-35	8-80
	853-2133 m (2800-7000')	10-25	8-80

For optimum analytical performance it is recommended that the ambient temperature of the laboratory be maintained between 20-25°C and be held constant to within ±2 °C throughout the entire working day.

1.3.2 Power

Voltage

Cary 100/300 100, 120, 220 or 240 VAC ±10%
 230 +14% -6% VAC
 230 +6% -14% VAC

Cary 4000/5000/6000i 85-264 VAC

Frequency

47 to 63 Hz

Consumption

Cary 100/300 270 VA (approx)
 Cary 4000/5000/6000i 300 VA (approx)

Mains inlet coupler:

3/2 A 120/250 VAC 50-60Hz IEC type

1.3.2.1 Connections

Mains power cord

Australia	10A 250VAC	Complies with AS3112
USA	10A 125VAC	Complies with NEMA 5-15P
Europe	6A 250VAC	Complies with CEE7 sheet vii or NFC61.303VA

Rear

IEEE 488

Sample compartment

15-pin D-range connector with 2 high voltage pins: -1000 volts DC, +125 volts DC (Cary 100/300)
+85 volts DC (Cary 4000 to 6000i)

When the Accessory Controller Board is fitted in the Cary 100/300 and for all Cary 4000/5000/6000i instruments:

- Three connectors for accessories in the sample compartment (Low Voltage DC, and digital lines)
- One connector for accessories on the front of the instrument (identical to one of the connectors described above).

Note There is no separate Accessory Controller Board on the Cary 4000/5000/6000i. This functionality is now part of the standard instrument.

Note For more information refer to the Accessory Controller Board operation manual, which is accessible from the online help.

Fuses

(220 – 240AC)

T4AH 250V, IEC 127 sheet 5, 5 x 20 mm ceramic (Cary 100/300)

F1.6AH 250V, IEC 127 sheet 5, 5 x 20 mm ceramic
(Cary 4000/5000/6000i)

(100-120 VAC)

T5AH 250V, IEC 127 sheet 5, 5 x 20 mm ceramic (Cary 100/300)

F4AH 250V IEC 127 sheet 5, 5 x 20 mm ceramic
(Cary 4000/5000/6000i)

Note For safety reasons, any other internal fuse or circuit breaker is not operator accessible, and should be replaced only by Varian authorized personnel.

Fuse information on the rear of the instrument is the most up to date.

1.3.3 Gas Supplies

The nitrogen purging system, which is not provided by Varian, requires an operating pressure of 83 to 172 kPa (12 to 25 psig).

Nitrogen supply tubing should be clean, flexible plastic tubing, 6 mm (1/4 in) ID (Tygon PVC or equivalent). Do not use rubber tubing as this is usually treated with talc which will be carried into and contaminate the instrument optics.

Flow rates are between 0 and 30 litres per minute (64 cubic feet per hour).

1.3.4 Weights and Dimensions

Weight

	Cary 100/300	Cary 4000/5000/6000i
Packed	75 kg (165 lb)	141 kg (310 lb)
Unpacked	45 kg (99 lb)	91 kg (200 lb)

Dimensions (W x D x H)

	Cary 100/300	Cary 4000/5000/6000i
Packed	860 x 770 x 655 mm (34 x 30 x 26 in)	1425 x 800 x 670 mm (56 x 31 x 26 in)
Unpacked	640 x 650 x 320 mm (25 x 26 x 13 in)	1000 x 650 x 340 mm (40 x 26 x 14 in)

2. Installation

2.1 PC Hardware Installation

In some countries, customer-installation of the Cary 100/300 is allowable. If you wish to install the Cary system yourself, refer to the Installation checklist (section 2.1.1). The Cary 4000/5000 and 6000i must be installed by a Varian Customer Service Representative (CSR).

If your Cary is to be installed by a Varian trained and certified Customer Service Representative (CSR) you may ignore sections 2.1.2, and 2.2. However you may need to refer to this information if you move the instrument at a later stage.

2.1.1 Lifting the Instrument



Warning – Heavy Weight

The Cary 100/300 instruments weigh in excess of 40kg and the Cary 4000/5000/6000i instruments weigh in excess of 90kg. To reduce the risk of injured to personnel, mechanical lifting devices should be used whenever possible. Where manual lifting is unavoidable, at least two people should be used, and the lifting should be performed in accordance with your workplace occupational health and safety guidelines for heavy lifting.

Instructions

Use a fork lift to lift the instrument off the packing pallet and up to the level of the bench where the instrument is to operate.

The instrument must be lifted onto the bench top by two people.
To do this:

Cary 100/300

1. One person should stand of each side of the instrument.
2. Place their fingers under the front and rear of the instrument.

Cary 4000/5000/6000i

1. One person should stand of each side of the instrument.
2. Place the fingers of one hand under the ledge at the front of the instrument.
3. Place the fingers of the other hand under the ledge at the side towards the rear. Hook the thumb of the second hand around the rear of the instrument to prevent the hand from sliding along the ledge.

If you are ready to have the spectrophotometer installed by a CSR (i.e., the installation site has been prepared in accordance with the instructions included in the Cary Pre-installation manual) you should complete the form at the front of the Pre-installation manual and send it to your local Varian office or dealer.

2.1.2 Installation Checklist

Use the following checklist to ensure that you complete each step of the installation procedure:

- Unpack the spectrophotometer and place it on the intended workbench as described in the Cary Unpacking instructions (attached to the packing crate). Refer to section 2.1
- Connect the monitor, printer/plotter, and keyboard to the Computer, and connect the system to the power supply as described in section 2.4
- Install the Cary software (as described in the Software manual accompanying the Cary Software)
- Install the GPIB card in the computer (if you supplied your own computer) as described in section 2.2 (if required)
- Connect the GPIB cable or connect USB-GPIB-HS convertor described in section 2.2
- Connect the spectrophotometer to the computer, and connect the system to the power supply as described in section 2.3
- Plug the instrument into the power supply

- ❑ Check the Varian Cary WinUV Pharma version 4_1_464 Readme.pdf or Varian Cary WinUV Analysis_Bio version 4_1_464 Readme.pdf file(s) found in the C:\Program files\Varian\Cary WinUV folder for the latest release information
- ❑ Check the Late Breaking News document accompanying the Cary Software for the latest list of Problems/Workarounds for each Cary WinUV application.
- ❑ Turn the instrument on as described in section 2.4 and allow the system to stabilize for two hours. During this time you can unpack the Cary accessories (see below) and familiarize yourself with the Cary Software (refer to your Cary Software manual)
- ❑ Perform the Instrument tests as described in section 2.5, file a report near the instrument and mail a copy to the Service Manager, Varian Australia (address appears near the front of this manual)
- ❑ Unpack the accessories supplied with the instrument and check that you have received everything listed in the packing lists (enclosed in the packing crate and inside each accessory box)
- ❑ Read the installation section of each accessory manual to determine the order in which they need to be installed (depending on your software, the accessory manuals may be on-line) and install the accessories according to the instructions
- ❑ Fill out the appropriate parts of the Quality card (not all questions can be answered at this stage) and put a note in your diary to complete and return the card in 3-6 months time.

2.2 GPIB Communications Card

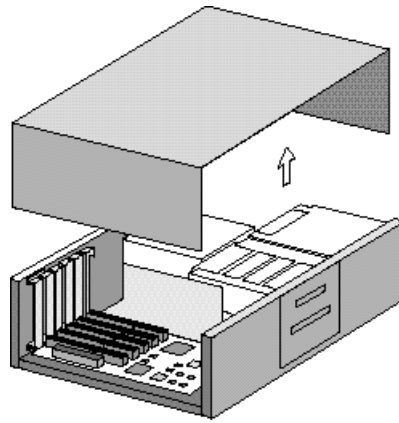
Either a GPIB communications card, (part number 9910102100) or a USB-GPIB-HS convertor (part number 7910051600) must be installed in your computer to interface the computer and Cary spectrophotometer. Refer to section 2.2.1 for information on installing PCI-GPIB communications card or section 2.2.2 for connecting the USB-GPIB-HS convertor. If you have purchased a computer from Varian as part of your instrument the GPIB card may have already been installed for you. If you have supplied your own computer, or have to change computers for some reason, you will need to install a GPIB card.

Caution The components on the communications card and in the computer are highly static-sensitive. To avoid damaging these components, you must drain any static charges from your body before installing the board, and prevent the generation of any new static charges during the installation. This can be done by wearing an ESD (electrostatic discharge) wrist strap attached to a grounding point. You can obtain a disposable ESD strap from Varian on part number 7910031300, otherwise you can obtain one from your local electronics supplier.

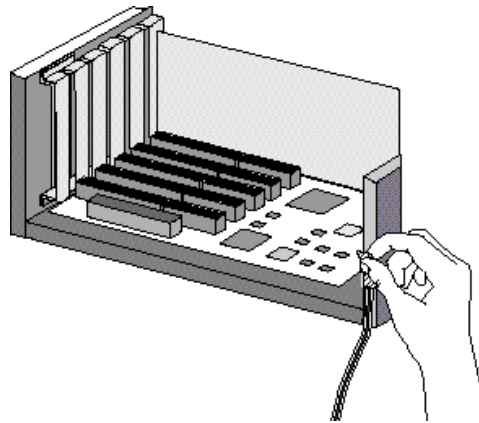
2.2.1 Installing the PCI-GPIB Communications Card

To install a National Instruments PCI-GPIB communications card:

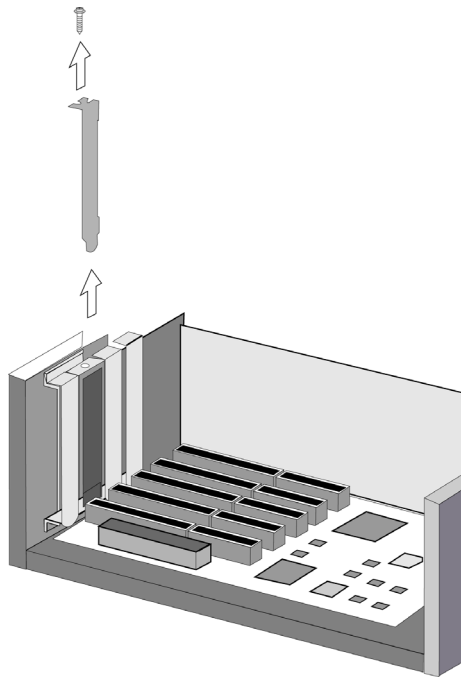
- Note** Ensure the Cary WinUV software has been installed. Refer to Varian Cary WinUV Software Manual (Publication Number 8510162500) accompanying the Cary Software.
1. Turn off and unplug the computer.
 2. Remove the cover, following the instructions in the manual provided with the computer.



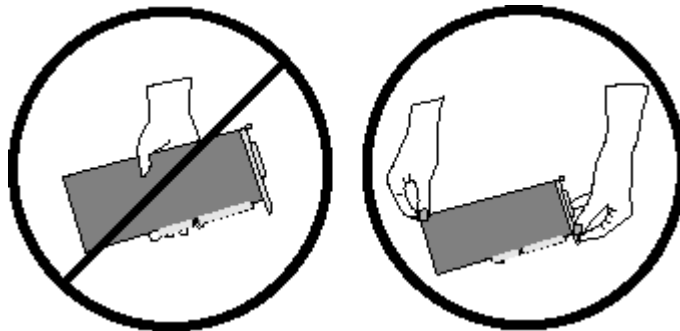
3. Attach one end of the ESD strap to a bare metal part of the PC chassis and wrap the other end around your wrist.



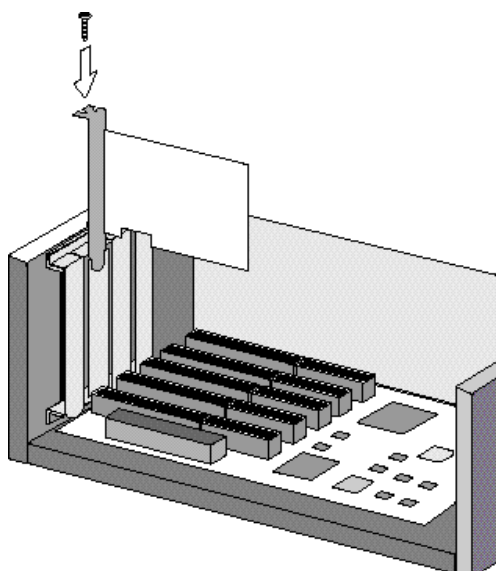
4. Remove a blanking plate from one of the empty slots in the computer.



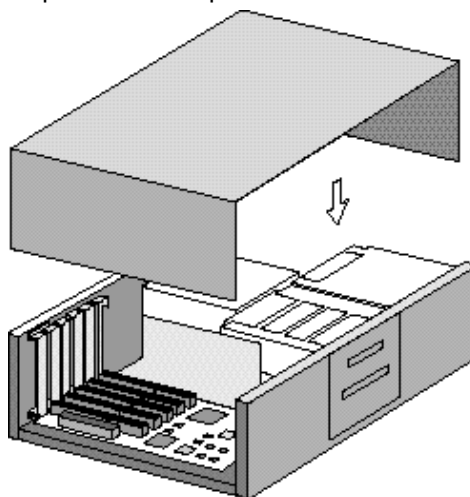
5. Remove the card from its static-shielded packaging. Do not touch the gold edge connectors.



6. Press the card firmly into the empty PC slot. The gold edge connectors should slide firmly into the matching sockets of the PC slot. Secure the card with the screw.



7. Replace the computer cover.



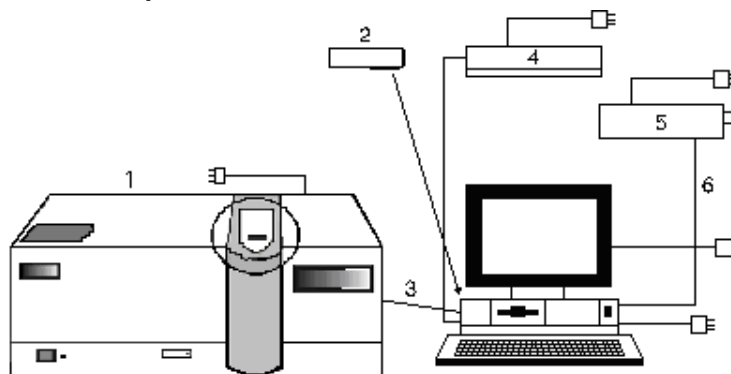
8. Connect the cable between the instrument and the computer (one end plugs into the interface board in the computer, and the other plugs into the socket in the rear of the instrument).
9. Connect the computer to the mains power
10. Turn the computer on.

2.2.2 Installing USB-GPIB-HS Convertor

To install a National Instruments USB-GPIB-HS Convertor:

- Note** Ensure the Cary WinUV software has been installed. Refer to Varian Cary WinUV Software Manual (Publication Number 8510162500) accompanying the Cary Software.
1. Turn off the computer.
 2. Connect one end of the convertor to the instrument and the other end to the USB connection on the back of the computer.
 3. Turn the computer on.

2.3 Instrument Setup



Cary system connection diagram (Cary 4000 shown):

- | | |
|-------------------|------------------|
| 1. Instrument | 2. IEEE card |
| 3. IEEE-488 cable | 4. Plotter |
| 5. Printer | 6. Printer cable |

2.3.1 Cabling

The monitor, printer/plotter and spectrophotometer are all connected to the computer via cables that plug into the back of the computer. Consult your monitor and printer/plotter manuals for details of their cabling requirements.

The spectrophotometer is connected to the computer by a shielded IEEE-488 cable. One end of this plugs into the interfacing board in the computer and the other plugs into the socket at the rear of the spectrometer.

2.3.2 Power

Requirements

Power requirements are detailed in your Cary Pre-installation manual, and in the Specifications section (refer to section 1.3). You should read this information thoroughly before connecting the Cary system to the power supply.

Consult the manuals supplied with your printer and PC for their power requirements.

Connection

The mains power connection is located at the rear of the instrument. Before connecting the instrument to the power supply, ensure both the instrument and the power supply are turned OFF, and that the voltage selector switches on the instrument rear panel (Cary 100/300 only) are set to the correct mains power supply voltage (refer to the table on the rear panel of the instrument).

You should also check the fuses before connecting the instrument to the mains power supply to make sure they are the correct type and rating for your location. There are two operator accessible fuses located at the rear of the instrument. Refer to section 3.3 for instructions on how to check the fuses.

To connect the instrument to the mains power supply, plug the mains power cord into the back of the instrument and the free end of the power cord into the mains power supply, and then switch the mains power supply on.

2.4 Starting the System

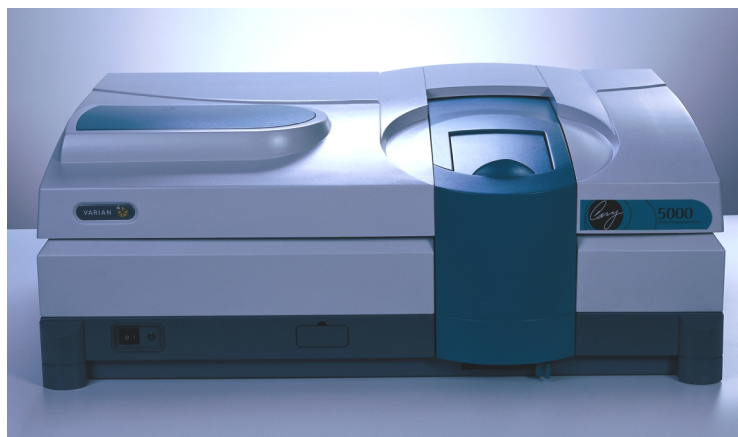
Before turning on the instrument you should ensure:

- you have connected the components of the system to one another, checked the setting of the voltage taps and connected the equipment to the power supply as described in section 2.3;
- the sample compartment is empty;
- the sample compartment lid is closed.



Caution

If you have a Cary 300 instrument, you **MUST** loosen the transit screw in the wavelength drive before turning the instrument on. Turning the instrument on without releasing this screw will damage the instrument. Use a flat-head screwdriver to loosen the transit screw approximately three turns. (The transit screw is located at the rear of the instrument, on the right hand side when viewed from the rear, and is clearly labeled.)



Cary 5000

Switch on the spectrophotometer by depressing the side of the rocker switch marked 'I' on the front left hand side of the instrument.

Note For optimum performance, allow your Cary instrument to warm up for 2 hours before use.

2.5 Instrument Performance Tests

The Cary WinUV software has a Validate module, enabling you to carry out a number of performance tests which check for conformance to specification for a major subset of instrument parameters. Many applications are equipped with validation files that enable you to check that your software has been correctly installed. Refer to the on-line Help for more information on validating your software.

If any of the tests fail to meet the specifications you will need to arrange for a Varian CSR to diagnose and correct the problem.

2.6 Sample Holders

This section describes how to install the sample holders in your instrument. Removal procedures are the reverse unless otherwise stated.

Before the solid sample or single sample holders can be installed into the Cary 4000/5000/6000i instruments they must first be mounted onto the base plate. The base plate is then installed into the instrument using the new LockDown mechanism, see section 2.7.

2.6.1 Cell Holders—Cary 100/300

The Cary 100/300 comes with a cell holder base and two single cell holders. These are shipped installed in the sample compartment. However, if removed they can be re-installed as follows:

1. Open the sample compartment lid and remove the front panel.
2. Loosen the two black screws at the back of the sample compartment and remove the black screw on the front right hand side. Note the position of the locating pin at the front left hand side of the sample compartment.
3. Hold the cell holder base so that the black, solid section is away from you. Note the key holes at the back of the cell holder base.
4. Carefully place the cell holder base in the sample compartment and slot the keyholes under the two raised black screws at the back of the compartment. The front of the cell holder base should fit over the locating pin.
5. Tighten the raised black screws and also secure the black screw at the front right hand side of the compartment.
6. Holding a cell holder so that the notched section is to the right, carefully place the cell holder over the two locating pins on the cell holder base in the reference beam.



Top view of cell holder with notched section to the right

7. Tighten the thumbscrew.
8. Repeat steps 6-7 for the sample beam.

The cell holders are now installed and ready for use.

2.6.2 Cell Holders—Cary 4000/5000/6000i

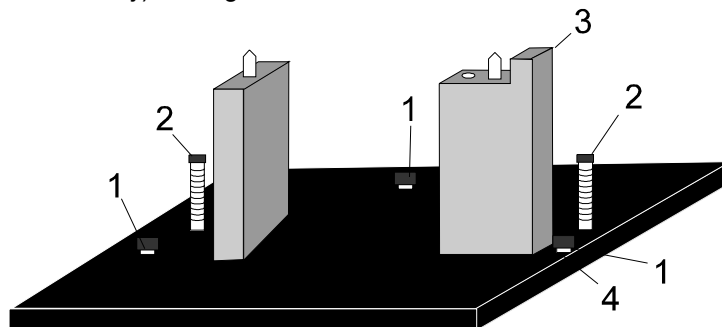
The Cary 4000/5000/6000i comes with two single cell holders. All instruments come with base plates as standard.

Note The single cell holders must be installed onto the base plate before they can be installed into the sample compartment of the instrument. For instructions on installing the base plate into the sample compartment using the LockDown mechanism, see section 2.7.

1. Open the sample compartment lid and remove the front cover.
2. Place the cell holder base in the sample position on the base plate. The notched pillar should be on the right hand side.

Note If you are operating in normal or double mode the sample position is at the front of the sample compartment. If you are operating in reverse mode the sample position is at the rear.

3. Tighten the two locating screws using the 1/8" hexagonal balldriver.
4. Place a cell holder on the cell holder base (it will only fit one way) and tighten the thumbscrew.



The cell holder base

1. Adjusting screws
2. Locating screws

3. Notched pillar
4. Locknuts

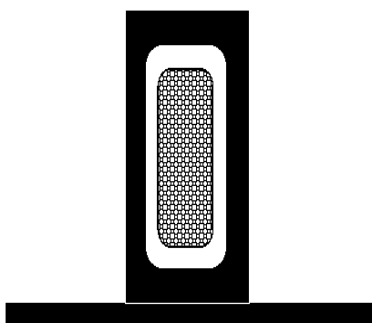
5. You can now install the base plate into the sample compartment of the instrument. See section 2.7.

6. Once the base plate is installed the cell holder must be aligned in the light beam. See section 2.6.3.

2.6.3 Aligning the Single Cell Holder

Use this procedure for aligning the cell holders for all instruments.

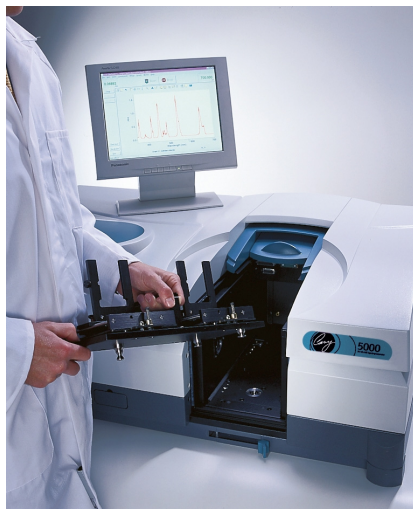
1. Close the sample compartment lid. In the Cary Win UV software select the Windows® **Start** button and then select **Programs, Cary WinUV, Align**. Select the **Cary** tab and select **Zero order** in the Instrument Parameters group. Click **Apply**.
2. Open the sample compartment lid and place a piece of white paper in the light path and note where the light beam strikes the cell holder. The beam should be centered on the aperture of the cell holder.



Single cell holder aperture, the thatched area in the middle shows the beam image.

3. If the beam is not centered, use the 2.5 mm hexagonal balldriver to adjust the three adjusting screws in the cell holder base until the beam appears to be central to the aperture. Gently tighten the lock nuts underneath the cell holder base to fix the height of the adjusting screws.

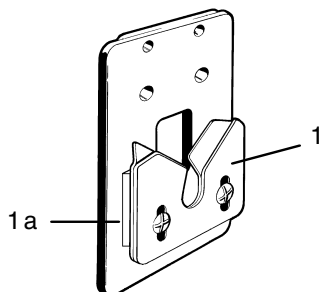
2.6.4 Solid Sample Holder—Cary 4000/5000/6000i



Solid Sample holders installed onto LockDown base plate for Cary 4000/5000/6000i

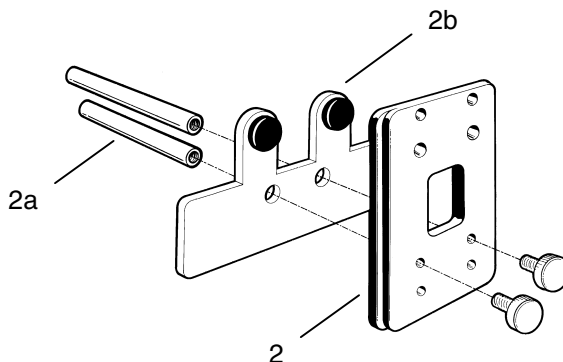
The Cary 5000/6000i comes with two solid sample holders, which are optional for the Cary 4000. Each solid sample holder comes with four solid sample slides of various apertures: standard, 1 mm, 5 mm and 10 mm.

To hold the solid samples, two 'V' holders are supplied (one small and one large). These are held in place on the solid sample slides by two screws. For delicate samples, a spacer is provided. This is placed between the V-holder and the solid sample slide. Delicate samples are then held in place by their edge only.



V-holder (1) and spacer (1a) attached to solid sample slide

Alternatively, you can attach a locking plate to a solid sample slide using the two 40 mm pins, as shown below. This arrangement is suitable for large samples.

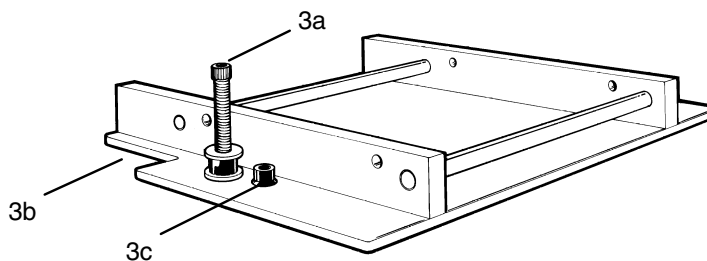


Solid sample slide (2) with pins (2a) and locking plate (2b)

The solid sample holder must be fitted to the LockDown base plate prior to being installed into the instrument. To install the solid sample holder onto the base plate:

1. Screw the Optical Rails into the removable base, plate using the 1/8" hexagonal balldriver to tighten the two locating screws. The notch should be on the right hand side. (Two post clips on the underside of the plate identify the back of the base plate.)

Tip Some users may find it more convenient to have a set of optical rails and solid sample holders, permanently installed onto a base plate and simply install and remove the base plate as required.

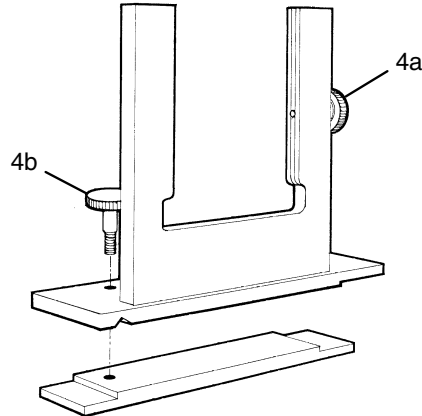


Optical rails showing the locating screw (3a), notch (3b) and adjustment screw (3c)

2. Place the other set of rails in the reference position with the notch towards the left side of the base plate. The setup procedure for both sample and reference solid sample holders is otherwise the same.

Note If you are operating in normal or double mode the reference position is at the rear of the sample compartment. If you are operating in reverse mode the reference position is at the front.

3. Loosely clamp the slide holder to its base. Insert the slide holder onto the optical rails but do not tighten the clamping screw.



Slide holder showing the side screw (4a) and clamping screw (4b)

4. Insert the solid sample slide with attached V holder or locking plate into the centre of the slide holder and tighten the side screw.

Tip It is recommended that you place the solid sample slide into the slide holder so that the slide masks the light beam before it reaches the sample. This minimizes scattering of the light beam.

5. You must now install the base plate into the sample compartment. See section 2.7 and then align the accessory, see section 2.6.5.

2.6.5 Aligning the Solid Sample Holder

Use this procedure for aligning the solid cell holders.

1. Close the sample compartment lid. In the Cary Win UV software set the wavelength to 0 nm (zero order) by selecting the Windows® **Start** button and then **Programs, Cary WinUV, Align**. Select the **Cary** tab and select **Zero order** in the Instrument Parameters group. Select **Apply**.
2. Place a piece of white paper in the light path and note where the light beam strikes the solid sample slide. The beam should be centered on the aperture.
3. If the beam is not centered, align it by first moving the slide holder along the optical rails to the centre of the sample compartment. Tighten the clamping screw on the slide holder. You will then need to use the 2.5 mm hexagonal balldriver to adjust the three adjusting screws on the optical rail base until the beam appears to be visually aligned.

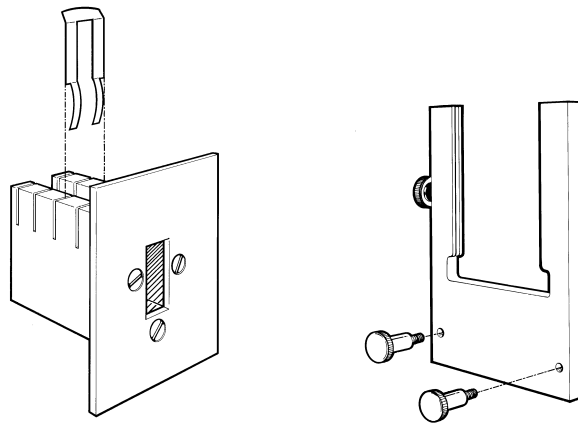
Once you have done this, the solid sample holder is aligned and ready for use.

Note You can use a polarizer/depolarizer with the solid sample holder. These are available from Varian (part number 02 101316 00/02 101317 00).

Extra slide holders are also available (part number 58 100054 00). Two of these can be screwed into the ends of the optical rails.

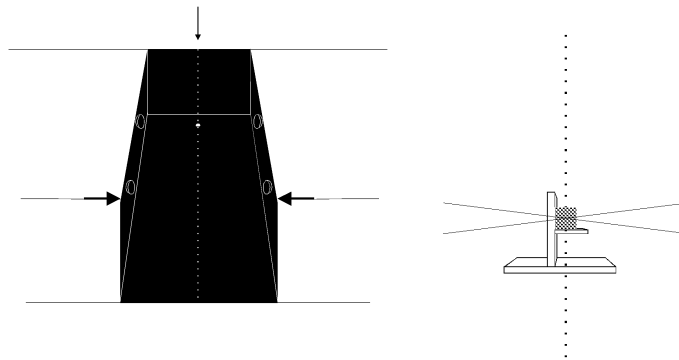
If you want to use liquid rather than solid samples with your Cary instrument, you will first need to purchase a cell holder base (part number 00 100481 00) and a single cell holder (part number 01 102601 90) from Varian.

Alternatively, you can buy a variable path length cell holder available from Varian (part number 02 101253 00 for 50 mm or part number 66 100140 00 for 100 mm). This will slot into your solid sample holder base. Refer to the figure below.



*Optional accessories for the Solid Sample Holder:
Variable path length cell holder (left) Side mounted slide (right)*

Position the sample so that the centre of the sample sits in the centre of the sample compartment (as shown below). The sample should be centered both horizontally and vertically.



Aligning the sample in the sample compartment. The picture on the left shows the sample compartment from above, the dotted line indicates the middle of the compartment. The picture on the right shows the middle of the sample compartment when viewed from the side.

2.7 Installing the Base Plate Using the LockDown Mechanism

The base plate needs to be locked into position in the sample compartment.

1. The LockDown mechanism features two posts at the back of the base plate and a clamp post at the front of the plate. Hold the base plate by the handle (with accessory), so that the posts are situated at the rear of the sample compartment.
2. Load the base plate into the sample compartment by pushing it rearwards, allowing the two rear-mounted posts to engage under the clamps in the sample compartment floor.
3. Lower the front edge of the base plate so that the front post engages in the lockdown.
4. Move the lever at the front of the sample compartment to the left to lock the base plate into position.
5. You now need to align the accessory. See section 2.6.5.

2.8 Installing Other Accessories

Your Cary instruments are compatible with a wide range of accessories. In the online Help there are descriptions of the accessories as well as instructions for installing them. Many of the installation instructions are available as a .PDF file for easy printing out from the Help.

2.9 Nitrogen Purging

2.9.1 Nitrogen Purging System—Cary 4000/5000/6000i

The nitrogen purging system is NOT supplied by Varian, but the following items are available from appropriate commercial suppliers:

1. Nitrogen

Ultra-high purity liquid nitrogen, for example Nitrogen 5.0, (in conjunction with a heat exchanger) is recommended because it is less expensive than compressed nitrogen and is usually of better quality. If compressed nitrogen must be used, the gas must be dry, oil-free and uncontaminated. Never use compressed nitrogen from

a supplier who uses oil or water in the compression process. Such processes invariably leave fine particles of oil suspended in the nitrogen, which will form an oily deposit on optical surfaces. Use nitrogen from a supplier who fills containers from immersion pumps lubricated with liquid nitrogen.

Note The instrument warranty will be void if damage is caused by the use of unsatisfactory nitrogen.

2. Pressure regulator and gauge

Operating pressure is from 83 to 172 kPa (12 to 25 psig). Always use an appropriate regulator and gauge to ensure that the nitrogen supply is consistently maintained at the correct pressure.

3. Supply tubing

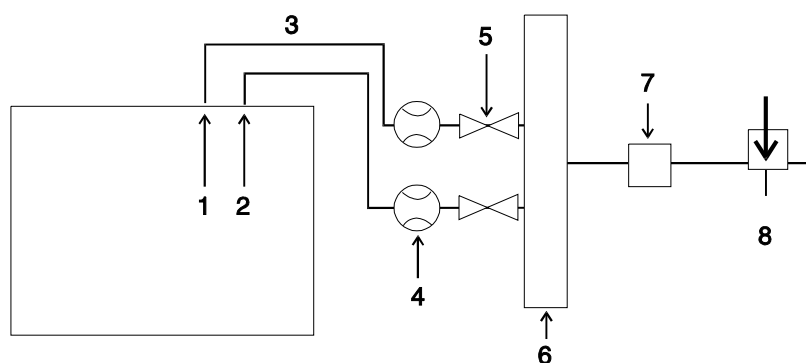
Use clean, flexible plastic tubing 6 mm (1/4 inch) inside diameter (Tygon PVC or equivalent). Never use rubber tubing because it may be treated internally with talc that can be blown into the optical system.

4. Gas manifold

The manifold should be fitted with one inlet suitable for connection to the nitrogen supply system and two outlets suitable for connection to the spectrophotometer.

5. Flowmeter

Two flowmeters (complete with control valves) should be inserted in the system between the manifold outlets and the spectrophotometer (refer to diagram). Each flowmeter should be capable of monitoring flow rates between 0 and 30 litres per minute (64 cubic feet per hour).



The position of flowmeters when purging with nitrogen:

- | | |
|-----------------------|---------------------------|
| 1. Instrument | 2. Sample compartment |
| 3. Tubing | 4. Flow meters |
| 5. Shut-off valves | 6. Manifold |
| 7. Pressure regulator | 8. Nitrogen control valve |

This figure is included in the Pre-Installation manual, (publication number 85 101280 00 for the Cary 100/300/4000/5000 and 6000i spectrophotometers).

2.9.2 Purging Procedure

You may need to purge the instrument with nitrogen under the following circumstances:

- (a) When taking measurements at wavelengths below 200 nm where it is necessary to minimize the effects of oxygen absorption bands and other absorbing species in the atmosphere such as organic solvents (e.g. acetone and isopropanol).
- (b) When taking measurements through water-absorption bands in the NIR region near 1370, 1850 (Cary 5000/6000i) and 2580 and 2750 nm (Cary 5000 only).
- (c) When operational conditions are such that environmental vapors or solid particles could cause damage to optical surfaces.
- (d) When working continuously in the UV region for long periods, purging will protect the optics.

To purge the instrument, do the following:

1. Ensure that the nitrogen purging system is installed according to the requirements in section 2.9.1.

2. Open the nitrogen control valve and then adjust the regulator to provide a supply pressure between 83 and 172 kPa (12–25 psig).
3. Set the flowmeter valves to give the following flow rates:

Instrument	0-20 L/min
Sample compartment	0-10 L/min

- Note**
- (i) If samples are changed frequently, you may need to increase the flow rate through the sample compartment.
 - (ii) You can gauge the success of purging by scanning for oxygen in the UV-Vis region and by scanning for water vapor in the NIR region (Cary 5000/6000i only).

2.9.3 Nitrogen Purging—Cary 100/300

The sample compartment of the Cary 100/300 can be nitrogen purged if the Extended Sample Compartment is fitted. The nitrogen supply should be attached to the inlet tubes beneath the Extended Sample Compartment.

Refer to the Extended Sample Compartment operating instructions in the online Help for further information.

2.10 Sample Compartment Base Removal

2.10.1 Cary 100/300

The Cary 100/300 has a rectangular base plate in the sample compartment to protect the connectors from spills. You will need to remove this plate when you install an accessory that plugs into one of the sockets underneath the sample compartment.

The plate should be replaced in the sample compartment when the accessory is removed to prevent damage to the connectors from liquid spillage.

2.10.2 Cary 4000/5000/6000i

The base of the Cary 4000/5000/6000i sample compartment is completely removable. This allows for large apparatus to be positioned in the sample compartment.

Note Once the floor of the sample compartment has been removed, the optical alignment with respect to the floor has been lost. Before performing any microcell analyses you will need to realign the optics.

To remove the base, follow the steps described below:

1. Remove the front door.
2. Remove the cover plate between the floor and the horizontal extrusion.
3. Remove the horizontal extrusion by unscrewing the 2 screws in its base.
4. Remove the lower cover plate.
5. Undo the fasteners holding the sample compartment floor.
6. Remove the sample compartment floor, the lock down mechanism will also be removed.

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3. Maintenance

This chapter includes some of the maintenance procedures for the Cary instrument that may be carried out by an operator. Others are included in the on-line help. Any maintenance procedures not specifically mentioned in this chapter or in the on-line help should be carried out only by Varian-trained, Varian-qualified or Varian-authorized service engineers.



Warning – Shock Hazard

This instrument contains electrical circuits, devices, and components operating at dangerous voltages. Contact with these circuits, devices and components can cause death, serious injury, or painful electrical shock.

Operators and other unauthorized personnel must NEVER remove the main cover.

Only Varian-trained, Varian-qualified, or Varian-approved service engineers may open the main cover of the instrument.

Note This section refers only to maintenance procedures for the Cary spectrophotometer. You should refer to your PC and printer manuals for their maintenance procedures.

3.1 Cleaning

Any spills in the sample compartment should be wiped up immediately and any deposits on the sample compartment windows should also be removed.

The exterior surfaces of the Cary spectrophotometer should be kept clean. All cleaning should be done with a soft cloth. If necessary, this cloth can be dampened with water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

3.2 Source Lamps

Instructions for how to change and align both the visible and UV lamps for Cary instruments are included in the online Help provided with the software.

For both lamps the following safety precautions should be observed:



Warning – Hot Surface, Shock Hazard

Lamp surfaces and mounting brackets will become hot during operation and will remain hot for some time after being switched off. The temperatures are sufficient to cause burns.

The UV and mercury lamps operate at high voltage. Contact with this voltage can cause death, serious injury, or painful electric shock.

Before changing either the deuterium or visible lamps, ALWAYS switch the instrument off, remove the power supply cable and allow the lamps to cool.

Caution Care must also be taken when removing lamps. Touching the glass envelope of either the deuterium or visible lamp will reduce its efficiency. NEVER touch the glass surfaces of new lamps. ALWAYS handle a lamp by its base, using a soft cloth.

3.3 Fuses

The spectrophotometer contains two fuses which are located at the back of the instrument. To replace a fuse, disconnect the spectrophotometer from the power supply, and replace the blown fuse with one of the type and rating as indicated in the Specifications section of this manual.

The fuses have a code marked on the cap (e.g. T 2AH250V). This refers to the fuse characteristic ('T' - time lag, 'F' - fast acting), the current rating ('x' amperes), the breaking capacity ('H' - heavy, 'L' - low) and the voltage rating ('y' volts). This code must correspond to the code appearing next to the fuseholders.



Warning – Shock Hazard, Fire Hazard

To prevent reduced safety protection or unwanted fusing, ALWAYS ensure that the code on the fuse cap matches the information printed next to the fuseholders.

To check a fuse:

1. Disconnect the instrument from the mains power supply.
2. Undo the fuse cap by pressing the cap and turning it counter-clockwise.
3. Pull the cap out carefully. The fuse should be held in the fuse cap.
4. Check that the fuse is the correct type and is not damaged. If necessary, replace the fuse.
5. Place the fuse into the cap, push the cap in, and then turn the cap clockwise.
6. Reconnect the instrument to the mains power supply.

Note

If a fuse blows repeatedly, it may indicate other problems with the Cary instrument. A service call may be required.

3.4 Spare Parts

Instrument spares for Cary 100/300 instruments

Item	Part Number
PCI-GPIB National Instruments card. Supplied as standard.	9910102100
Controller GPIB USB	7910051600
Instrument fuse*, 4amp time lag, ceramic/5x20mm	1910008900
Instrument fuse*, 5 amp time lag, ceramic/M205	1910009100
Thumbscrew kit: Includes all thumbscrews for instrument and accessory	9910064100
Spares kit: Includes: Accessory locating pin, Accessory fastening screws (rear), Instrument feet (plastic), Instrument cover snap cap washer, Snap cap, ACB cover plate, socket covers for ACB	9910064300
Visible QI lamp	5610021700
Deuterium lamp	5610021800

*Refer to the information printed on the back of the instrument to determine which fuse types you need.

Instrument spares for Cary 4000, 5000 and 6000i instruments

Item	Part Number
Instrument fuse T2AH250V for 240v operation	1910009400
Instrument fuse T2.5AH250V for 110v operation	1910009500
VIS lamp	5610013900
Deuterium lamp	0110713990
Mercury lamp	5610136300
PCI-GPIB card	9910102100
Controller GPIB USB	7910051600

For further information regarding spare parts and their part numbers please refer to the Varian, Inc website found at:

<http://www.varianinc.com>.