Spectro-115E™ and Spectro-115U™ Spectroelectrochemical System

Operator's Manual

Limited Warranty

Gamry Instruments, Inc. warrants to the original user of this product that it shall be free of defects resulting from faulty manufacture of the product or its components from the date of your purchase. Spectrometer, light source, sampling accessories, and fibers are covered by manufacturing defects for one (1) year from Ocean Optics from the date of shipment from Gamry Instruments' facility.

Gamry Instruments, Inc. makes no warranties regarding either the satisfactory performance of the spectroelectrochemical system or the fitness of the product for any particular purpose. The remedy for breach of this Limited Warranty shall be limited solely to repair or by replacement, as determined by Gamry Instruments, Inc., and shall not include other damages.

Gamry Instruments, Inc. reserves the right to make revisions to the product at any time without incurring any obligation to install same on systems previously purchased. All product specifications are subject to change without notice.

There are no warranties which extend beyond the description herein. This warranty is in lieu of, and excludes any and all other warranties or representations, expressed, implied or statutory, including merchantability and fitness, as well as any and all other obligations or liabilities of Gamry Instruments, Inc.; including but not limited to, special or consequential damages.

This Limited Warranty gives you specific legal rights and you may have others which vary from state to state. Some states do not allow for the exclusion of incidental or consequential damages.

No person, firm or corporation is authorized to assume for Gamry Instruments, Inc., any additional obligation or liability not expressly provided herein except in writing duly executed by an officer of Gamry Instruments, Inc.

If You Have Problems

Please visit our service and support page at http://www.gamry.com/support/.

This page contains information on installation, software updates, and training. It also contains links to the latest available documentation. If you are unable to locate the information you need from our website, you can contact us via form submission using the link provided on our website. Alternatively, you can call us using one of the telephone numbers listed below:

Tech support form	www.gamry.com/service-support/contact-technical-support/	
Telephone	(215) 682-9330	9:00 AM - 5:00 PM (US Eastern Standard Time)
	(877) 367-4267	Toll Free (US & Canada Only)

Replacement parts are available from Gamry Instruments, Inc. Optional parts may be available from Gamry Instruments, or from 3rd party vendors. Contact your local Gamry sales representative to discuss any special requirements or accessories that you need.

Disclaimer

The information in this manual has been carefully checked and is believed to be accurate as of the time of printing. However, Gamry Instruments, Inc. assumes no responsibility for errors that might appear.

Copyrights and Trademarks

Spectro-115E™ and Spectro-115U™ Spectroelectrochemical System

Operator's Manual

Revision 1.0
January 14, 2015
988-00029

Table of Contents

Introduction

Gamry's spectroelectrochemical system has been designed to perform standard spectroscopic experiments (e.g. absorbance, transmission, or reflectance) in combination with electrochemical techniques (e.g. cyclic voltammetry, linear sweep voltammetry, and chrono-methods).

Synchronization of both techniques is done by Gamry's Framework. Any of Gamry's potentiostats can be used to perform spectroelectrochemical experiments with this system. Ocean Optics is supporting the optical equipment, i.e. spectrometer, light source, cuvette holder, and fiber cords.

Gamry offers two different system configurations. The Spectro-115U™ allows measurements in the UV-VIS range. The Spectro-115E™ system enables measurements in the VIS-NIR range. Both systems include a spectrometer with its specific configuration, light source, cuvette holder, and two fibers. The software is provided with this system. Updates for the latest version of your software can be downloaded on our website (http://www.gamry.com/support/software-updates/).

Unpacking and Checking your Spectro System

This section is primarily intended for the user who has just received a new Spectro-115E™ or Spectro-115U™ system.

Checking for Shipping Damage

Your new system was shipped disassembled to minimize shipping damage. All of the pieces have been carefully packaged in anticipation of rough handling in shipment. Unfortunately, no matter how carefully glass pieces and other delicate parts are packaged, damage will sometimes occur.

When you first receive your system, please check it for any signs of shipping damage. Be especially careful if the shipping container shows signs of rough handling.

Obviously, the fiber cords are most susceptible to damage. Check the fiber cords for any sharp bends and small cracks as well as for major damage.

Do not use any part if it is damaged in any way. If parts have been broken in shipment, please take a photograph and contact our US facility or your local Gamry representative as soon as possible. In most cases, Gamry should have replacement parts in stock. Please retain the shipment's packaging material for a possible claim against the shipping company.

Parts List

Please check the contents of your system versus the packing list in Table 1 or Table 2. When shipped, all of the components should be labeled with their Gamry part number. If you are checking the completeness of an older system, most of the components are shown in photographs throughout this manual.

Table 1
Spectro-115U (200 nm – 850 nm) Spectroelectrochemical System with Light Source – 992-00103

Quantity	Part Number	Description
1	978-00032	Gamry Software CD (V6.x)
1	988-00029	Manual
1	990-00351	Spectro-115U w/ light source top assembly

Table 2
Spectro-115E (350 nm – 1050 nm) Spectroelectrochemical System with Light Source – 992-00104

Quantity	Part Number	Description
1	978-00032	Gamry Software CD (V6.x)
1	988-00029	Manual
1	990-00352	Spectro-115E w/ light source top assembly

Assembly and Use of Your Spectro System

This section of the manual tells you how to assemble and use your Spectroelectrochemical System (992-00103 or 992-00104) in its usual configuration.

This "standard" system contains following parts:

- One (1) spectrometer with USB cable

Figure 1: Spectro-115U spectrometer

- One (1) light source with power adapter, various outlet adapters, and SUB-D-15 pin cable

Figure 2: UV-VIS-NIR light source

- Two (2) 30 cm long fiber cords

Figure 3: Single fiber patch cord with dust caps.

- One (1) four-way cuvette holder with cuvette cover for standard 12.5 mm x 12.5 mm cuvettes

Figure 4: Ocean Optics CUV-ALL-UV cuvette holder.

Setup - General Information

You should pay careful attention to cleanliness. Spectrometer, light source, and cuvette holder include metal caps which protect the optical parts inside from dust and other contaminations. Remove the caps only if you want to connect fiber cords. Please cover the fiber optic interfaces with those caps if you disassemble your setup. The same is true for the fiber optics which have plastic dust caps on both ends.

All optical parts are sensitive to contaminations. They can reduce their performance and lifetime as well as lead to poorly reproducible results. If you touch critical optical components with your fingers, you can inadvertently add salts and organic compounds to your cell solution. Hence we recommend that you wear gloves while handling assembling the spectroelectrochemical system.

Setup - Assembly

Remove the dust caps from light your spectrometer, the light source, cuvette holder, and both fiber optics. Slide one fiber cord carefully into the connector of your light source and fasten it. Connect the other end of the fiber cord to your cuvette holder.

For transmission measurements, attach the second fiber cord on the opposite side of your first fiber cord. For fluorescence measurement, attach the second fiber cord in a 90° angle relative to the first fiber. Both fibers can be hold in place by plastic clamps of the cuvette holder. They can be removed from the holder if not needed.

Connect the other end of your second fiber cord to your spectrometer.

> NOTE: Avoid extreme bending of your fibers. They can be easily damaged and broken which makes them impractical for further use. See specifications (Appendix D) for minimum bend radii.

Connect your spectrometer to your computer using the provided USB cable. The light source comes with a separate power adapter. The appropriate outlet adapter can be snapped into the connector. Warm your light source up for several minutes before performing any experiments. Figure 5 shows a schematic setup.

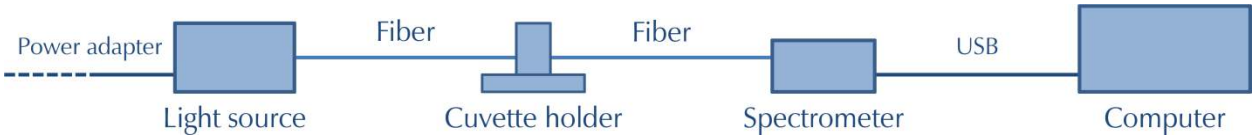

Figure 5: Schematic diagram of the spectroscopy setup.

> **WARNING: Never look directly into the light beam! It can damage your eyes. Wear protective eyewear when using the equipment. UV radiation is present.**

Appendix A - Spectrometer specifications

All specifications are subject to change without notice.

Spectrometer

Detector	Sony ILX511B (2048-element linear silicon CCD array) with UV window (Spectro-115U) or VIS window (Spectro-115E)
Total range	200 nm – 1100 nm
Best efficiency, >30 %	200 nm – 850 nm (Spectro-115U) 350 nm – 1050 nm (Spectro-115E)
Slit width	10 micron
Pixels	2048
Pixel range	14 µm x 200 µm
Pixel well depth	~62500 electrons
Setup	Asymmetric crossed Czerny-Turner
Channels	1
Fiber connector	SMA 905

Spectroscopic

Optical resolution	~0.3 nm – 10 nm FWHM
Signal-to-Noise ratio	250:1 (full signal)
A/D resolution	16 bit
Dark noise	50 counts RMS, 300 counts peak-to-peak
Dynamic range	8.5×10^7 (system); 1300:1 for single acquisition
Integration time	1 ms – 65 s
Stray light	<0.05 % @ 600 nm; <0.10 % @ 435 nm

Environmental

Operating temperature range	-10°C – +50°C
Storage and shipping temperature	-30°C – +70°C
Relative humidity	0 % – 90 % (non-condensing)

General

Power consumption	250 mA @ +5 VDC
Interfaces	USB 2.0 (480 Mbps); RS-232 (2-wire); 22-pin connector (for external devices)
Width x Length x Height	89.1 mm x 63.3 mm x 34.4 mm
Weight	190 g

Appendix B - Light source specifications

All specifications are subject to change without notice.

Light source

Source	Deuterium and Tungsten Halogen
Wavelength range	~215 nm – 2500 nm
Stability optical output	<0.1 %
Nominal bulb power	3.8 W (Deuterium); 1.2 W (Tungsten Halogen)
Typical output power	9.4 µW (Deuterium); 7.0 µW (Tungsten Halogen)
Warm-up time	10 min (Deuterium); 6 minutes (Tungsten Halogen)
Source lifetime	1000 hours
Fiber connector	SMA 905

General

Power requirements	12 VDC
Power consumption	up to 6 W
Interfaces	SUB-D connector for TTL controlling
Width x Length x Height	125 mm x 140 mm x 50 mm
Weight	500 g

Appendix C - Cuvette holder specifications

All specifications are subject to change without notice.

Cuvette holder

Cuvette dimensions	12.5 mm x 12.5 mm (standard)
Z-dimension	15 mm
Fiber connector	Four (4) SMA 905
Collimating lenses	Four (4) 74-UV fused silica lenses (200 nm – 2000 nm)
Filter slot	Accepts filters up to 6.25 mm (1/4″) thickness

General

Width x Length x Height	147 mm x 147 mm x 40 mm
Weight	540 g

Appendix D - Fiber specifications

All specifications are subject to change without notice.

Fiber cord

Fiber core size	600 ± 10 µm
Wavelength range	200 nm – 1100 nm
Connector	SMA 905 on each side
Buffer material	UV/VIS polyimide
Long-term bend radius	24 cm
Short-term bend radius	12 cm

General

Length	30 cm
Nominal outer diameter	3.8 mm

Index