

# Model 280 UV Monitor

D30200 • 020501

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The Model 280 UV Monitor has been found to comply with:

IEC 801-2:1991  
IEC 801-3:1988  
IEC 801-4:1990  
EN 55011, Group 1, Class A:1991  
EN 50082:1992

## Important Information



- Read this manual **before** applying power.
- Do not apply power unless the flow cell is in place.
- This device emits visible and invisible UV radiation.

The Spectra/Chrom® Model 280 UV Monitor includes cold-room heaters that are active whenever power is applied and the monitor is switched off. If the detector is used or stored below 10°C, power should be applied with the unit off for at least 30 minutes; this will diminish the possibility that condensation will affect the electronic components.



Caution: Lethal voltages may be present in the Model 280 UV Monitor. Do not open the case with power applied to the Monitor.



Caution: The lamp used in the Model 280 UV Monitor contains mercury. Please use appropriate care when disposing of this lamp.

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# 1 INTRODUCTION

## 1.1 DESCRIPTION

The Spectra/Chrom<sup>®</sup> Model 280 UV Monitor can be used with low-pressure liquid chromatography, RBLC, HPLC, and other procedures involving the detection or quantitation of species that absorb UV light.

The Model 280 UV Monitor is a photometric monitor used to measure the absorbance of light by flowing liquid streams. It is a dual beam fixed wavelength monitor. It includes filters for use at both 254 and 280 nm. Its maximum sensitivity is 0.01 AU full-scale (AUFS) and it has a total of seven ranges the least sensitive of which is 1 AUFS.

The monitor is a single cold-room compatible case including both the electronics and the optical components.

## 1.2 TECHNICAL SPECIFICATIONS

Table 1-1 details the technical specifications. Tables 1-2 and 1-3 in conjunction with Figure 1-1 and 1-2 explain the controls and connectors on the front and back of the Fraction Collector.

**TABLE 1-1. TECHNICAL SPECIFICATIONS**

<b>Power Requirements</b>	115±20 VAC, 20 VA 230±40 VAC, 20 VA	<b>Noise</b>	0.0003 AU after 30 minute warm-up with dry flow paths at 254 nm.
<b>Line Frequency</b>	45 to 65 Hz	<b>Drift</b>	Less than 0.0005 AU per hour after 30 minute warm-up with dry flow paths at 254 nm.
<b>Dimensions</b>	23 cm x 12 cm x 24 cm 9" x 4.5" x 9.5" w x h x d	<b>Rise Time</b>	10-90% rise time is 0.5 sec on 0.5 AU range
<b>Weight</b>	5 kg (10 lb)	<b>Auto-Zero Compliance</b>	+1.5 AU/- .5 AU
<b>Full-Scale Absorbance Ranges</b>	0.01, 0.02, 0.05, 0.1, 0.2 0.5, and 1.0 Absorbance Units Full-Scale	<b>Operating Temperature</b>	-5° to 40° C, noncondensing

**TABLE 1-2. FRONT PANEL INDICATORS AND CONTROLS**

Item in Fig. 1-1	Description	Purpose
1	LED Display	Display the monitor output as a percentage of full-scale.
2	Range LEDs	Display the current full-scale output in absorbance units.
3	+ ABS	Press to increase the full-scale absorbance range.
4	- ABS	Press to decrease the full-scale absorbance range.
5	ZERO	Press to zero the monitor output.
6	MARK	Press to put a small positive tick mark on the recorder trace.



**Figure 1-1. Front Panel**

### TABLE 1-3. REAR PANEL CONNECTORS AND CONTROL

Item in Fig. 1-2	Name	Type	Function
1	<b>Power</b>	switch	Used to turn the monitor on and off.
2	<b>Power</b>	5 pin DIN	14 VAC power input.
3	<b>Remote</b>	26 pin Sub-D	For remote control of the monitor.
4	<b>Ground</b>	Thumbscrew	For grounding the metal case of the monitor.
5	<b>Recorder</b>	Banana Jacks	The output to the recorder, 1 volt full-scale.
6	<b>Integrator</b>	Banana Jacks	An output for an integrator. This is always 1 volt per Absorbance Unit and is not reset to zero with the <b>ZERO</b> button.
7	<b>Event Mark</b>	4 pin mini-DIN	Enables other instruments to place tick marks on the recorder trace.



**Figure 1-2. Rear Panel**

## 2 INSTALLATION

### 2.1 UNPACKING

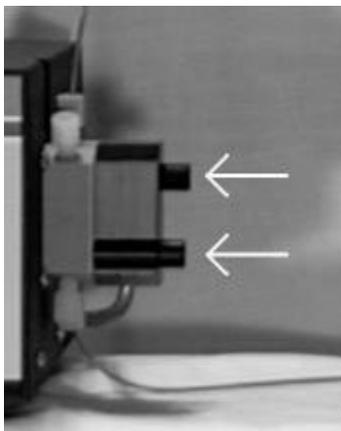
Check the contents of the shipment against the packing slip. If there are any discrepancies notify Spectrum immediately.

After removing the UV monitor and accessories from their shipping carton, examine them for signs of damage. If there is any shipping damage, file a claim with the delivering carrier immediately.

Save all packing materials and shipping cartons until you are sure that the instrument is working properly and all materials have been received.

### 2.2 SETUP

The Spectra/Chrom Model 280 UV Monitor is normally shipped with a flow cell and 254/280 nm filter slide installed. Check the thumbscrews that hold the flow cell and detector block in place on the side of the monitor; they should be finger tight. The single filter slide holds both the 254 and 280 nm filters, when slid into place the selected wavelength is shown at the top of the slide. Be sure that the filter slide is in place.



**Figure 2-1. Flow Cell Thumbscrew Locations**

Mains power is provided to the monitor by a remote transformer. Before applying power to the monitor, check to make sure that the transformer is appropriate for your local mains voltage.

Apply power to the monitor and turn it on. The range lights should indicate the 0.5 AU range and the digital display should light up. Press the **ZERO** key. The decimal point on the display will go out, the digital display will change to near 0, and then the decimal point will come back on. Use the **▲** and **▼** keys to change the absorbance range. This display should remain near zero, but because the detector has not warmed up, some drift will occur.

If the detector passed these simple steps, it is probably operating normally. Turn it off, and let it warm up for 30 minutes or more. You may plumb the detector while it is warming up.

### 2.3 PLUMBING

The Model 280 UV Monitor is normally shipped with a dual-path 5 mm flow cell. This single flow cell has both a reference and a measuring chamber. There should be white plastic plugs in each of the 4 flow cell ports. You need to remove the plugs from the ports you are going to use.

The 2 vertical ports (top and bottom) are for the measuring flow path and the 2 angled ports at the front of the flow cell are for the reference flow path. In all cases, the flow should be from the bottom of the flow cell toward the top; this minimizes bubble entrapment.

**For most applications, you do not need to make any connections to the reference flow path (the one with the angled ports).** The reference flow path is only useful when the baseline absorbance will change during the course of a chromatogram. For isocratic separations and most gradient separations it is not needed. **If you will not be using the reference flow path, leave the white plugs in place.**

The UV Monitor is shipped with both hose barb connectors and flangeless nuts and ferrules to accommodate size 8, 12 and 14 Spectra/Chrom tubing. The flangeless fittings will accommodate either  $1/16$ " or  $1/8$ " OD tubing and the hose barb will accommodate  $1/16$ " ID tubing.

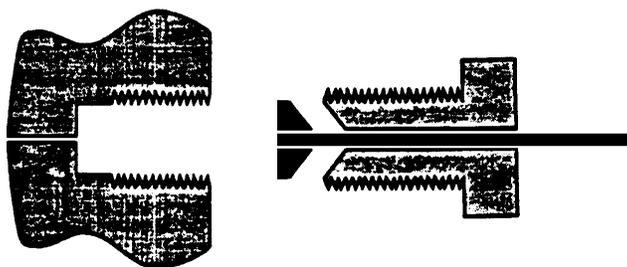
To use the Kel-F hose barbs simply screw them into the ports in the flow cell and push the tubing over their barbed ends.

Two sets of flangeless nuts and ferrules are provided for use with the UV Monitor. The blue nuts and ferrules are for use with  $1/16$ " OD tubing. The yellow colored nuts and ferrules are for use with  $1/8$ " OD tubing.

In each case the nut is made of Delrin and the ferrule is made of Tefzel. The Tefzel ferrule has excellent resistance to most solvents, although some halogenated hydrocarbons may cause it to swell. This is normally not a problem as long as the ferrule is replaced with the tubing. The Delrin nut, not a wetted part in normal operation, is subject to attack by many organic solvents.

To attach tubing to the flow cell, first cut the end of the tubing square. For soft tubing, the use of a Spectrum tubing cutter is recommended; for hard (steel) tubing, use an HPLC tubing cutter. If you will be using steel tubing, be sure that the tubing is bent so that it does not put any stress on the flow cell.

Slide the nut and then the ferrule over the end of the tubing as shown in Figure 2-3. The narrower end of the ferrule should be away from the end of the tubing and toward the nut as shown.



**Figure 2-2. Assembling Flangeless Fittings**

If you will be using the reference flow path it is normally connected in the flow path after the pump and before the injector and column. The measuring path is, of course, connected after the column.

## **2.4 CONNECTION TO A RECORDER**

The red and black banana jacks on the back of the Monitor are provided for using a chart recorder or data system to record the chromatogram. They provide a 1 volt full-scale output.

The Model 280 UV Monitor includes a cable which can be used to connect this output to a Spectrum chart recorder (Reorder number 124700). Simply plug one end of the cable into the red and black banana jacks. **The side of the connector with an extra hump should be put in the black jack.**

The other end of the cable has two spade lugs. Connect the lug on the silver wire to the + terminal on the recorder and the lug on the black wire to the — terminal on the recorder. Make no connection to the event terminal on the recorder.

## 2.5 INSTALLING THE MAST MOUNT

The Mast Mount is an option for the UV Monitor (Spectrum reorder number 142610). It attaches to the bottom of the UV Monitor and allows it to be supported by a 3/4 inch diameter mast.

To attach the mast mount, simply place it over the 4 studs protruding from the bottom of the UV monitor. Use the thumbnut included with the kit to secure the mount to the bottom of the UV monitor. The mount and the Monitor may then be attached to a 3/4 inch mast and secured with the large thumbscrew.

## 2.6 CONNECTION TO A SPECTRA/CHROM CF-1 FRACTION COLLECTOR

The Model 280 UV Monitor is capable of annotating the chromatogram with marks indicating when the fraction collector changes tubes. Also, if the peak separator is to be used, the UV Monitor's output must be connected to the CF-1 Fraction Collector's signal input.

Two cable options are available for these connections.

The normal connection from the CF-1 Fraction Collector to the Model 280 UV Monitor is with the 142615 cable. This connects the signal output of the UV Monitor to the Fraction Collector so that the peak separator can be used. It also annotates the chromatogram by placing a small tick mark on the trace for every tube change. This cable can also be used to annotate the chromatogram when the peak separator is not used.

To use the peak separator in the CF-1 Fraction Collector without annotating the chromatogram, cable 124865 can be used to connect the RECORDER output on the back of the UV Monitor to the SIGNAL input on the back of the CF-1 Fraction Collector. On each end of the cable, **the side of the connector with the extra hump goes into the black jack.**

## 2.7 REPLACEMENT FITTINGS

A kit containing a variety of replacement fittings is available as Part No. 142620. This package contains an assortment of flangeless fittings and hose barbs as well as windows and gaskets for the flow cell.

## 2.8 EXTERNAL EVENT ANNOTATION

The 142630 Event Mark cable can be used to annotate the chromatogram with indications of external events. This cable plugs in to the Event Mark connector on the rear of the UV Monitor and allows you to produce both positive and negative tick marks using either a contact closure or an open collector.

Both the green and black wires from this cable are signal common (a.k.a. ground) connections. Connect the red wire to common to produce a positive tick mark and connect the white wire to common to produce a negative tick mark.

## 2.9 REMOTE CONTROL

The 142625 Universal Remote cable plugs into the Remote connector on the back of the UV Monitor and allows other instrumentation to monitor and control the operation of the UV detector.

## 2.10 AVAILABLE ACCESSORIES

The following accessories are available for use with the Model 280 UV Monitor:

<b>Part Number</b>	<b>Description</b>
<b>142640</b>	Dual flow cell, 10 mm pathlength.
<b>142642</b>	Dual flow cell, 5 mm pathlength.
<b>142644</b>	Dual flow cell, 2 mm pathlength.
<b>142650</b>	Replacement lamp assembly.
<b>142608</b>	Replacement filter slide for 254 and 280 nm.
<b>123450</b>	Cable to connect the Model 280 UV Monitor to a recorder.
<b>124615</b>	Cable to connect the Model 280 UV Monitor to the CF-1 Fraction Collector.
<b>124865</b>	Cable to connect the Model 280 UV Monitor to the CF-1 Fraction Collector, connects the signal leads only (no chromatogram annotation).
<b>142620</b>	Replacement fittings and flow cell windows for the Model 280 UV Monitor.
<b>142630</b>	Cable to place event marks on the chromatogram.
<b>142625</b>	Universal remote cable for the Model 280 UV Monitor.
<b>124845</b>	CF-1 Fraction Collector for use on 115 VAC (domestic US).
<b>124846</b>	CF-1 Fraction Collector for use on 230 VAC (European, CE marked).

## 3 OPERATION

### 3.1 INTRODUCTION

The basic operation of the Monitor consists of selecting the sensitivity and adjusting the baseline. Once the Monitor has been setup, plumbed, and connected to a recorder as described in section 2, these simple steps describe the how the monitor will most commonly be used:

1. Use the power switch to turn the monitor on. If the detector is at 10°C or less and has been unplugged, plug it in and leave it off for at least 30 minutes to that the internal heaters will warm it before use.
2. The baseline will achieve maximum stability after 30 minutes. For detection using the 0.05, 0.1, 0.2, 0.5 or 1.0 ranges only a shorter warmup of 10 minutes is normally needed.
3. Select the desired sensitivity and press the **ZERO** key to zero the detector. Adjust the zero control on the recorder to place the baseline at an appropriate place, generally 5% to 10% of full-scale.
4. Run your chromatogram.

### 3.2 OPERATING CONTROLS

The keys on the UV monitor have the following functions.

-  Increase the full-scale absorbance range by one step for each press.
-  Decrease the full-scale absorbance range by one step for each press.
- ZERO** Start an auto-zero cycle. The decimal point on the display will go out, the detector will adjust its output to zero, and the decimal point will reappear. While the decimal point is off, none of the front panel keys will operate.
- MARK** A small positive-going tick mark will be superimposed on the recorder trace for every press of this button.

### 3.3 WAVELENGTH SELECTION

The Model 280 UV Monitor includes filters for use at both 254 and 280 nm. The operating wavelength is selected by placing the appropriate filter in the optical path.

The wavelength slide is positioned between the flow cell and the detector case. The selected wavelength is shown at the top of the slide.

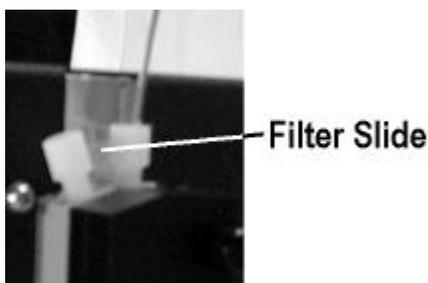


Figure 3-1. Filter Slide Location

To change the wavelength, first use your fingernail, a bent paper clip, or the tip of a pen, to pull the slide from the Monitor. Then turn the slide so the desired wavelength is at the top of the slide and push it back into position **until it clicks into place**.

When the slide is properly positioned, the desired wavelength will be visible above the flow cell. If you cannot see the desired wavelength above the flow cell, you have installed the slide improperly.

### 3.4 FLOW CELLS

The Model 280 UV Monitor includes a 5 mm pathlength flow cell. The single flow cell includes channels for both reference and measuring paths. Additionally, 2 mm and 10 mm pathlength flow cells are available as options. The pathlength of each flow cell is stamped into its body for easy identification.



**Figure 3-2. Flow Cell Pathlength Marking**

The flow cell bodies are constructed of solvent-resistant PEEK (polyetheretherketone). This material is a crystalline solid that is resistant to most organic and aqueous solvents. A thin Teflon gasket is used to seal the flow cell body to the quartz flow-cell windows. The only wetted materials are the PEEK body, the Teflon gasket and the quartz window.

Changing flow cells is easy with the Model 280 UV Monitor.

First turn the UV monitor off. Depress the bottom edge of the power switch on the back of the UV monitor and make sure that all of the front panel indicators are dark. Removing the flow cell with the monitor on will allow some UV radiation to escape; while it is not likely that this will cause any harm, it is best to not allow this to happen.

Then unscrew the two thumbscrews that hold the detector block and flow cell in place. There is a wave-type spring on each of the thumbscrews, leave these springs on the thumbscrews.

Remove the detector block, flow cell, and wavelength slide from the side of the monitor. Keep the detector slide safe and separate, you will replace it after the new flow cell is in place.

Put the new flow cell in position, hold it in place with the detector block, and secure it with the 2 thumbscrews.

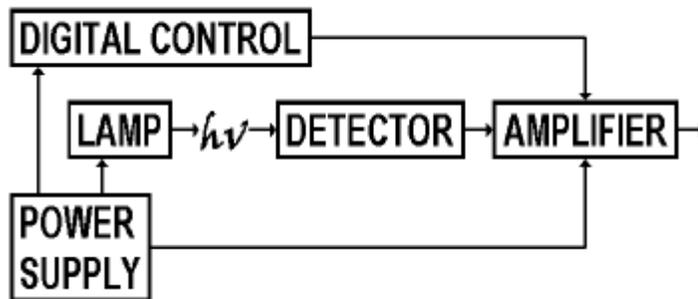
Push the filter slide back into place until it clicks. The desired wavelength should be visible above the top of the flow cell.

You can now turn the UV monitor back on.

## 4 THEORY OF OPERATION

### 4.1 CIRCUIT DESCRIPTIONS

Refer to the block diagram, Figure 4-1, and the schematic diagram, Figure 4-2 located at the back of this manual, as needed when following the circuit descriptions.



**Figure 4-1. Model 280 UV Monitor Block Diagram.**

### 4.2 POWER SUPPLY

The mains voltage is stepped down to 14 VAC with an external wall-mount transformer. This is rectified and filtered to provide the voltages used by the UV Monitor. The bottom circuit board holds the rectifiers, filters, voltage and current regulators used by the UV Monitor.

Industry standard 3-terminal type regulators are used to provide the regulated DC voltages used by much of the UV monitor's circuitry. The digital control portion makes use of a regulated 5 volt supply. The LED displays consume most of the current passing through this regulator; up to 200 mA of current can be required by the display. The balance of the detector requires less than 10 mA from this supply.

The analog portion of the detector makes use of regulated a separate +5 volt supply as well as +12, -12, and -6 volt supplies.

An additional, constant alternating current, supply is used to power the lamp. The lamp requires about 200 VAC during operation and up to 1200 VAC to light. This is provided and regulated by a discrete inverter module. Power for the inverter is provided by a step-down switching regulator (U305 and it's associated circuitry). The lamp current is adjusted with R316.

### 4.3 DIGITAL CONTROL

A small microprocessor, U306, is used to control both the auto-zero and the range select. This single-chip solution contains both an 8 bit processor and it's program and data memories. It monitors both the remote control inputs and the front panel control and adjusts the operation of the detector in response to both types of input. It also keeps the output indicators, both the LED range and the remote output indicators, up to date. It is also responsible for zeroing the detector during an auto-zero cycle.

The auto-zero feature makes use of a 1-bit analog to digital converter, U204A, and a brace of 12 bit digital to analog converters, U206 and U207. These are connected to provide about 22 bits of resolution. This resolution (1 part in 4,000,000) is more than sufficient to cover the range of the auto-zero.

## 4.4 DETECTOR

A pair of UV enhanced silicon photodiodes are used as UV intensity detectors. These diodes have a quantum efficiency of more than 50% at 254 nm. One photodiode is used to measure the light passing through the measuring flow path and a second is used to monitor the light in the reference flow path.

Both the reference and measuring detectors are operated as current sources so that they provide an output current that is proportional to the light intensity. By maintaining both ends of each diode at the same potential, excellent linearity is obtained with minimal dark current.

## 4.5 AMPLIFIER

The amplifier is used to monitor the output of both photodiodes and convert this into a voltage output that indicates the relative light absorbance of the reference and measuring flow paths.

The amplifier starts with a pair of high sensitivity current-to-voltage converters (U201A and U201B), one for each photodiode. These are used to both convert the photodiode output from a current level into a voltage level and maintain the zero bias on the photodiodes. An adjustable resistor, R220, is used to compensate for any difference in sensitivity between the reference and measuring photodiode.

Since the absorbance is related to the log of the transmitted light intensity, rather than the intensity itself, a pair of logging amplifiers follow the current-to-voltage converters. The logging action is effected by using the small signal dependence of emitter current on base-to-emitter voltage of a transistor. By using a pair of matched transistors, excellent conversion linearity is obtained. Because the logging action effected by the transistors is temperature dependent, a thermister (R235) is used in a following stage to compensate for temperature changes.

The difference in the intensity logarithms is taken by amplifier U203A. By subtracting the logarithms we obtain a value that is directly proportional to the difference in light absorbance between the measuring flow path and the reference flow path. The detector output is calibrated with R230.

The full-scale output range is controlled by U208. This is a digitally controlled analog switch. It controls the gain of U204B by selecting a tap on the resistor chain composed of R241 through R247. The output of the digital-to-analog converters used for zeroing is also added to the absorbance output by U208.

Event mark pulses are generated by a dual one-shot multivibrator, U210. This non-retriggerable pulse generator, produces one short, uniform pulse for every input trigger. The positive tick mark output is directly summed with the absorbance output provided from U204B. The negative tick mark output is inverted by Q201 to provide the negative mark.

**Table 4-1 Remote Connector Pin Assignments**

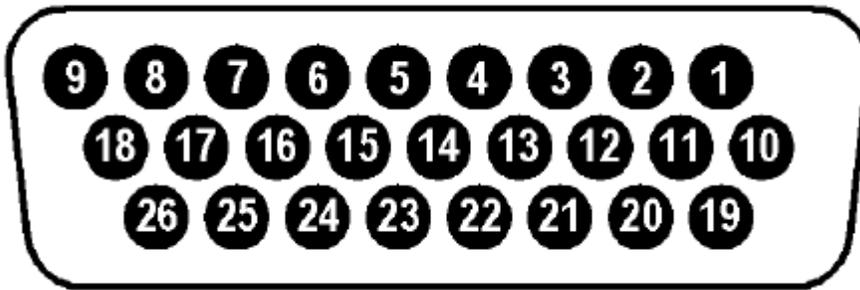


Figure 4-1. Remote Connector on Rear Panel.

Pin #	Function	Direction	Description
1	ABS0	Output	Open collector output referenced to common. Low on the 0.5, 0.1, and 0.02 ranges
2	MARK	Input	Open collector or contact closure to common will make a positive event mark on the recorder trace.
3	ABS1	Output	Open collector output referenced to common. Low on the 0.2, 0.1, and 0.01 ranges.
4	ABS2	Output	Open collector output referenced to common. Low on the 0.05, 0.02, and 0.01 ranges.
5	Event	Output	Open collector output referenced to common. One low pulse for every press of the <b>MARK</b> key.
6	Zero In Prog.	Output	Open collector output referenced to common. Low when the UV detector is auto-zeroing.
9	On	Output	Open collector output referenced to common. Low when the UV detector is on.
10	Common	—	Ground reference for all other signals.
11	-ABS	Input	Open collector or contact closure to common will decrease the absorbance range.
12	+ABS	Input	Open collector or contact closure to common will increase the absorbance range.
13	ZERO	Input	Open collector or contact closure to common will re-zero the detector.
14	SIGNAL	Output	Absorbance output, 1 volt full-scale, 1000 ohm source impedance.
16	Common	—	Ground reference for all other signals.
17	Low	Output	A 100 ohm resistor to common.
18	High	Output	A 1K ohm resistor in series with a 16V source, only active then the detector is on.
26	Earth	—	Connected to the detector case.

**Table 4-2 Event Connector Pin Assignments**



Figure 4-2. Event Connector on Rear Panel.

Pin #	Function	Direction	Description
1	common	—	Signal common or ground. The other signals are referenced to this.
2	common	—	Signal common or ground. The other signals are referenced to this.
3	event +	input	Momentarily connecting this pin to ground with a switch or an open collector output will put a small positive tick mark on the recorder trace.
4	event -	input	Momentarily connecting this pin to ground with a switch or an open collector output will put a small negative tick mark on the recorder trace.

# 5 MAINTENANCE

## 5.1 INTRODUCTION

This section describes the maintenance procedures for the Model 280 UV Monitor. The lamp in the Model 280 contains toxic mercury, emits invisible UV radiation, and requires a relatively high (200 to 1200 volts) voltage to operate. Extreme care should be exercised when dealing with the lamp so that does not break. Only skilled, trained, electronic technicians should have the case of the UV Monitor opened while power is applied.

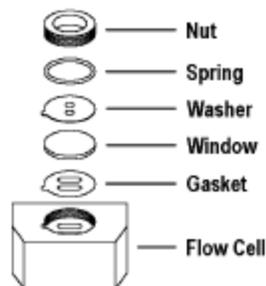
Additional information can be obtained from the Spectrum Technical Service Department at 800-459-9700 (US & Canada), +1-281-443-2900 (voice), +1-281-443-3100 (fax), or sales@lplc.com (email).

- ⚠ Caution: Lethal voltages are present in the Model 280 UV Monitor. Extreme care should be taken if the case is opened while power is applied.
- ⚠ Caution: The mercury lamp in the Model 280 UV Monitor contains toxic mercury and emits invisible UV radiation. Do not break the lamp or expose your eyes to the light.

## 5.2 FLOW CELL CLEANING

Normally, the flow cell will not require disassembly in order to clean it. Generally, simply running an appropriate solvent (or solvents) through the flow cell will provide excellent cleaning. If the flow cell windows do become covered in insoluble deposits, the following procedure may be used to clean or replace the flow cell windows:

1. Turn the UV Monitor off and disconnect it from mains power.
2. Disconnect any tubing from the flow cell.
3. Carefully pull the filter slide from behind the flow cell. Store the slide in a safe, clean, dry, place.
4. Unscrew the two thumbscrews that hold the detector block and flow cell in place. Do not lose the small flat springs that are used to keep the screws in tension.
5. Lay the detector block on the bench top next to the detector. The detector block is permanently attached to the UV Monitor; you should not try to pull the cable from the monitor.
6. An exploded view of one side of the flow cell is shown in Figure 5-1 (below).



**Figure 5-1. Flow Cell Window Assembly**

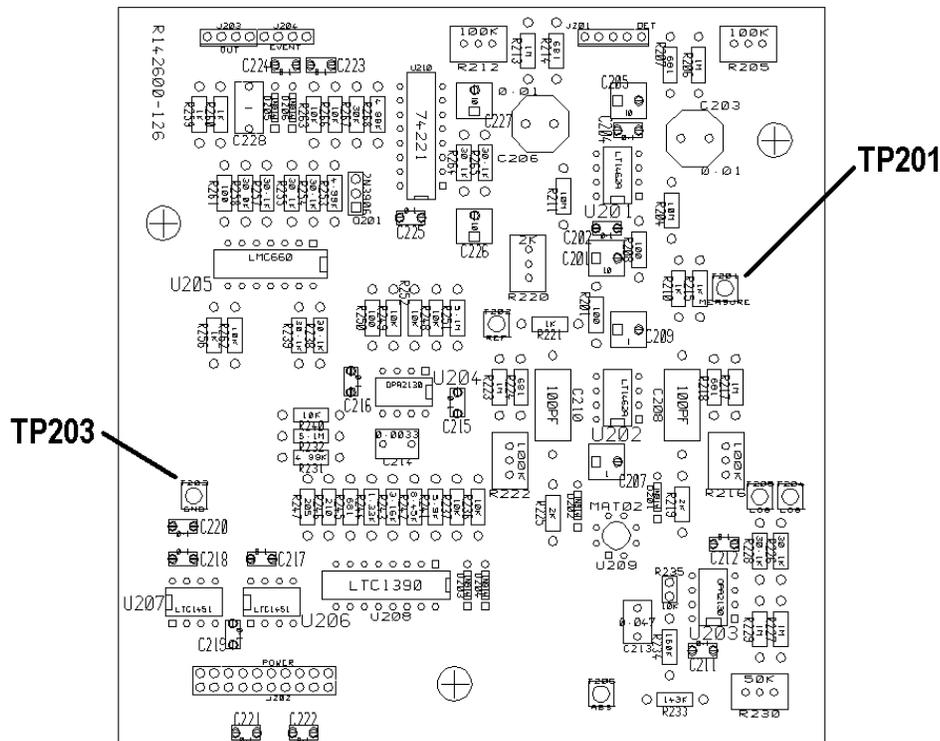
7. Use the wrench provided with the UV Monitor (or a large screwdriver) to unscrew the nut from one side of the flow cell. Then remove spring, washer, window and gasket and examine them. Clean or replace any damaged or dirty items. Do the same for the other side.

8. After you have cleaned and/or replaced any dirty or damaged items, reassemble the flow cell. The gaskets and washers are keyed to only go in one way. If the holes in the gasket and/or washer do not line up with the flow passages in the flow cell, turn the gasket or washer over.
9. Use the wrench or a large screwdriver to tighten the nuts in the flow cell.
10. Place the flow cell and detector block back into position on the side of the UV Monitor. Secure them in place with the 2 thumbscrews. Finally, reattach any tubing fittings.

### 5.3 LAMP CURRENT ADJUSTMENT

The detector noise level and drift depend upon the lamp current. The current is normally adjusted to minimize the detector noise level.

 Extreme caution should be observed when setting the lamp current. To set the lamp current, it is necessary to operate the detector with the case opened. There are high voltages present in the detector and it may emit hazardous UV radiation. We recommend that the UV Monitor be returned to the factory for adjustment of the lamp current, although a skilled electronics technician can use the following procedure to adjust the lamp current. Be sure to wear UV absorbing eyewear while the detector is opened and powered.



**Figure 5-1. Top Circuit Board Layout**

To adjust the lamp current you will need a voltmeter and a strip-chart recorder.

1. Turn the UV Monitor off and disconnect it from mains power. Make sure that the 254 nm filter is in position.
2. Disconnect any tubing from the flow cell.
3. Unscrew the 6 screws that hold the case top and case bottom together and gently pull the case top from the case bottom. There are several wires that join the case top and case bottom, leave these in place. Place the case top near the case bottom, the side that was the back should be placed down.

4. Locate R304. It is on the bottom circuit board near the edge of the circuit board. Turn it fully counterclockwise.
5. Reassemble the UV Monitor, apply power, turn it on, and connect it to the strip-chart recorder.
6. Wait 30 minutes for the Monitor to warm up. Press the **ZERO** key and adjust the recorder so that the trace is near the center of the recorder's scale. Press the  key several times until the 0.01AU range is indicated. Record the output of the UV Monitor for at least 60 minutes to evaluate the noise output.
7. If the noise output is less than 0.03 Volts then the lamp current is properly adjusted, you may skip the remaining steps.
8. Turn the UV Monitor off and disconnect it from mains power.
9. Unscrew the 6 screws that hold the case top and case bottom together and gently pull the case top from the case bottom. There are several wires that join the case top and case bottom, leave these in place. Place the case top near the case bottom, the side that was the back should be placed down.
10. Connect a DC voltmeter between TP203 (— terminal) and TP201 (+ terminal) on the bottom circuit board. The voltages read will be between 0 and 2 volts.
11. Connect mains power to the Monitor and turn it on. **Be careful, at this point the voltage driving the lamp will be between 200 and 800 volts. Be careful, at this point the lamp will be emitting both visible and invisible UV radiation.**
12. Adjust R304 so that the voltage read on the DC voltmeter decreases by about 0.05 volt. Do not set the voltage below 0.5 volt. If you need to set the voltage below 0.5 volt then you probably need to replace the lamp assembly to meet the noise specification.
13. Turn the UV Monitor off and disconnect it from mains power.
14. Go back to step 5.

## 5.4 LAMP REPLACEMENT

If the noise level becomes excessive or the dynamic range decreases, it may be necessary to replace the lamp. Prior to replacing a lamp, we recommend that you either try to correct the problem by adjusting the lamp current or that you return the Monitor to us for evaluation.

 Extreme caution should be observed when replacing the lamp assembly. The old lamp assembly contains toxic mercury and should only be disposed of in compliance with all Federal, State, and local regulations.

 After replacing the lamp assembly you may still need to set the lamp current. To do this it is necessary to operate the detector with the case opened. There are high voltages present in the detector and it may emit hazardous UV radiation. We recommend that the UV Monitor be returned to the factory for adjustment of the lamp current, although a skilled electronics technician can use the following procedure to adjust the lamp current. Be sure to wear UV absorbing eyewear while the detector is opened and powered.

To replace the lamp assembly:

1. Turn the UV Monitor off and disconnect it from mains power.
2. Disconnect any tubing from the flow cell.
3. Unscrew the 6 screws that hold the case top and case bottom together and gently pull the case top from the case bottom. There are several wires that join the case top and case bottom, leave

these in place. Place the case top near the case bottom, the side that was the back should be placed down.

4. The lamp assembly plugs into the bottom circuit board and is held in place by a metal plate that also holds the cold-room heater. Unplug the lamp from the bottom circuit board and unplug the cold-room heater. Then remove the 4 nuts and lockwashers that hold the metal plate in place.
5. Along each of the long edges of the lamp tube, where it touches the case side, a thin bead of silicone rubber seals the lamp tube to the side of the case. Carefully use a razor blade or knife to remove this bead. You should then be able to remove the old lamp assembly.
6. Unwrap the new lamp assembly and put it in place on the case side. The opening in the tube should fit in the notches in the case side.
7. Use the metal place, nuts, and washers you removed in step 4 to secure the new lamp assembly in place. Use a drop of nail polish or thread-locker on the threads of the studs prior to putting the nuts on.
8. Plug the new lamp into the bottom circuit board and plug the small cable back onto the cold-room heater.
9. Reassemble the UV Monitor, apply power, turn it on, and connect it to the strip-chart recorder.
10. Wait 30 minutes for the Monitor to warm up. Press the **ZERO** key and adjust the recorder so that the trace is near the center of the recorder's scale. Press the **▶** key several times until the 0.01AU range is indicated. Record the output of the UV Monitor for at least 60 minutes to evaluate the noise output.
11. If the noise output is more than 0.03 volts then the lamp current needs to be adjusted as described in section 5.3.

## 5.5 SERVICE DEPARTMENT

If you have trouble with the UV Monitor or need parts information contact Spectrum's Technical Service Department at (800) 459-9700, +1-281-443-2900, fax (281) 443-3100, or email [service@lplc.com](mailto:service@lplc.com). If you write, please address your inquiry to:

Spectrum Chromatography  
Service Department  
PO Box 672026  
Houston, TX 77267-2026 USA

Please contact the Service Department prior to returning a UV Monitor for repair. Many problems are solved with a simple telephone or mail consultation.

## 5.6 SHIPPING RETURNS

Be sure that all parts and hardware are back in place before packing a return. Wrap the return in heavy paper or a plastic bag. Put the unit in a strong cardboard box with at least three inches of resilient packing material (shredded paper, foam, etc.) on each side of the return. Seal the package with reinforced tape. Send the return to the address given by the Technical Service Department during your consultation.

It is important that the return be well packed and shipped insured. Claims for damage during shipping must be settled between you and the carrier prior to repair.

## **5.7 REPLACEMENT PARTS**

When ordering replacement parts, please first consult with a Technical Service Representative to determine exactly which items need to be replaced. The following information will be beneficial in determining the necessary part:

- Part No. of the unit
- Serial number of the unit
- Approximate date of purchase of the unit

## 6 ORDERING INFORMATION

<b>Part No.</b>	<b>Description</b>
142600	Model 280 UV Monitor, 115 V (US plug)
142602	Model 280 UV Monitor, 230 V (Europlug)
124845	CF-1 Fraction Collector, 115 V (US plug)
124846	CF-1 Fraction Collector, 230 V (Europlug)
142640	Dual Flow Cell, 10 mm pathlength
142642	Dual Flow Cell, 5 mm pathlength
142644	Dual Flow Cell, 2 mm pathlength
142650	Replacement lamp assembly
142608	Replacement 254/280 filter slide

Orders may be placed directly with Spectrum

By Phone: (800) 459-9700 US & Canada  
+1-281-443-2900 Everywhere

By Fax: +1-281-443-3100

By Email: [sales@lplc.com](mailto:sales@lplc.com)

By Mail: Spectrum Chromatography  
Customer Service  
PO Box 672026  
Houston, TX 77267-2026 USA

Last Revision Date: 10/29/00 6:49 PM