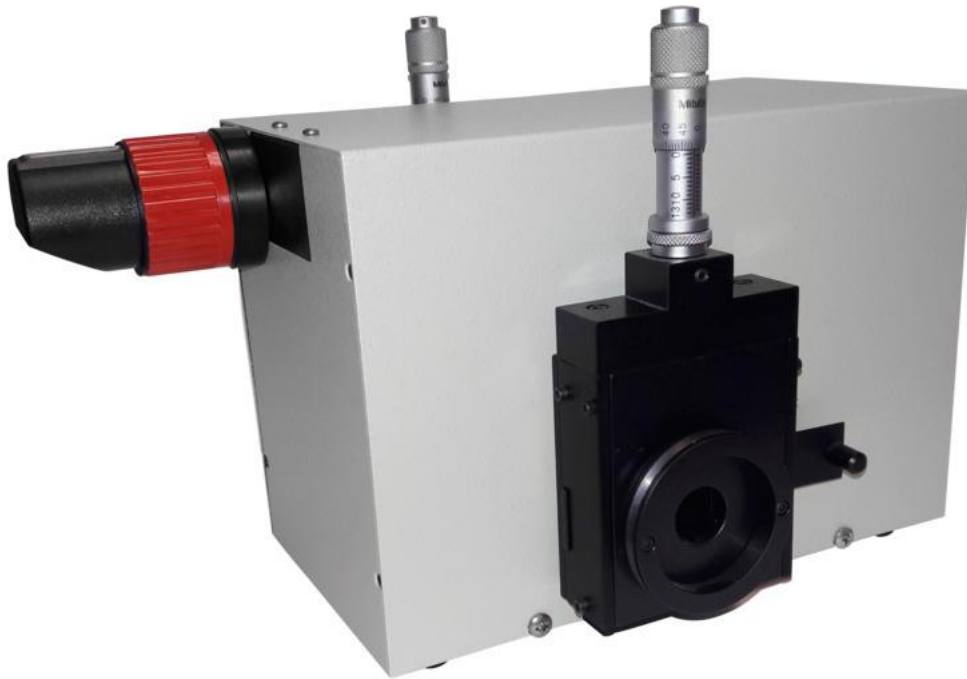


# 77250B

## 1/8m Monochromator Family



USER'S MANUAL

 **Newport**<sup>™</sup>

 **Newport**

Family of Brands – ILX Lightwave® • New Focus™ • Ophir® • Corion • Richardson Gratings™ • Spectra-Physics®

M77250B, Rev A



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## I INTRODUCTION

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The 77250B 1/8m Monochromator is an excellent general-purpose laboratory monochromator. It has a wide spectral range (200 nm to 23  $\mu\text{m}$ ) with interchangeable gratings, high throughput, and low stray light. Accessories for the 77250B include fiber optic adapters, order sorting filters, focusing lens assemblies, mounting kit, micrometer driven slit assembly, fixed slit holder, and multiple diffraction gratings.

### I.1 Illumination

The 77250B 1/8m Monochromator can be used with a wide variety of broadband, incoherent light sources. By coupling such a source to the input of the monochromator, it is possible to adjust or tune the output wavelength of the monochromator based on the position of the diffraction grating. This creates a versatile illumination system.

### I.2 Monochromators and Detectors

A wide variety of detection instruments and accessories are available for use with the 77250B Monochromator. Detection instruments and accessories include vacuum photomultipliers and pyroelectric detectors; from readout instruments and the optical chopper to the silicon photodiode detector module. Some elementary considerations are the wavelength range to be covered and the expected signal levels. Regardless of the detector used, care must be taken to **eliminate light leakage between the monochromator and the detector**, since small leakages of ambient light can often be greater than the monochromator signal. A wide selection of flange mounted accessories is available which provides almost light tight coupling of the monochromator and detectors, providing they are correctly installed. This can be tested by turning off the room lights or by covering the assembly with a dark (opaque) cloth. For complete "light tightness" use black tape on joints as black anodized aluminum is reflective.

## II MOUNTING

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You can hard mount the 77250B Monochromator to optical tables, rails and benches, or rod mount it for variable height adjustment.

### II.1 Fixed Height Mounting

The 77387 Monochromator Mounting Kit includes all the necessary components needed to mount the 77250B to a table, rail, bench, carrier, or magnetic base. The kit consists of a monochromator mounting plate which fastens to the base of the monochromator, two standoffs, one set of two 1.0 inch (25.4 mm) high precision spacers, one set of two 0.5 inch (12.7 mm) high precision spacers, two sets of two 0.25 inch (6.4 mm) high precision spacers, and necessary screws. With this kit you can mount the monochromator at multiple heights above the mounting surface.

### II.2 Variable Height Mounting

Post mounting allows you to adjust the height of the optical axis without removing the monochromator from a set up. You can post mount 77250B to optical tables, rails, benches, carriers, and magnetic bases using a double post mounting or single post mounting method. With double post mounting, standard posts are used; single post mounting uses one 25.4 mm diameter large post. If you are attaching various monochromator accessories to the entrance and/or exit slits of the 77250B, use the double post mounting method. See an example in Figure 1.

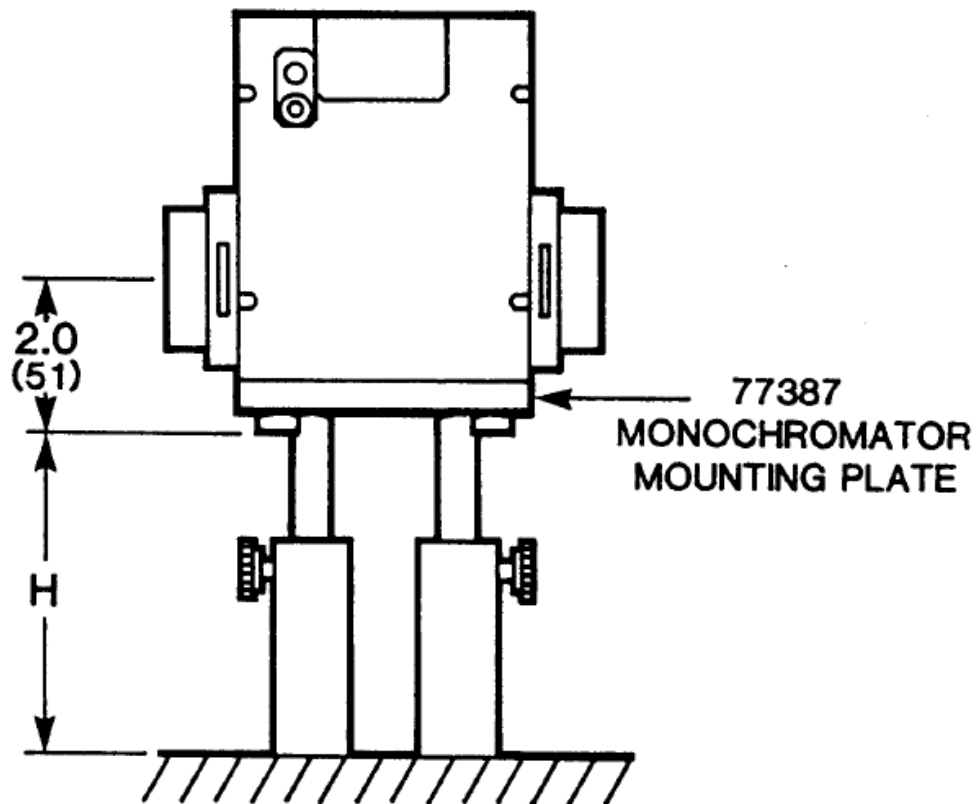


Figure 1: 77250B Monochromator using double post mounting method with 77387

### III OPTICAL ALIGNMENT

The 6035 Hg(Ar) Lamp is a low pressure pencil type mercury lamp recommended for aligning slits and checking wavelength. Use the 6047 or 6048 Power Supply with the lamp, based on the AC electrical specifications of your location. To conveniently hold the lamp at the entrance slit of the monochromator order the 78819 Spectral Calibration Mount.

<<< caution >>>

DO NOT EXPOSE THE EYES TO DIRECT RADIATION FROM THIS LAMP WITHOUT GLASS SHIELDING. The SHORT-WAVE UV will cause painful burns to the outer layer of the eye.

Note: The Model 6057 Glass Safety Filter will provide the required shielding. It consists of a cylindrical metal housing with a glass window. It will slip over the pencil type lamps and completely block their UV emission.

As an alternative to the 6035 Lamp, a white light source, such as a filament lamp with lens (or focusing mirror) can be used to image the source onto the slit and fully illuminate the grating. If a source with substantial short-wave UV is used (such as a xenon lamp), take care that a glass slide is placed in the path for protection.

Because this source is continuum, the only wavelength setting that can be used or checked is 000.0 (i.e., the zero order or specular reflection from the grating).

### III.1 Alignment and Focusing After Slit Change

The slits provided with the monochromator are aligned and focused at the factory. Should you change the slits for a different set, the alignment and focus should be tested. It is assumed here that the primary focusing of the monochromator, made at the factory, is still valid, and that no further focus adjustment of the slits is needed. For information on refocusing your device, see Section V MONOCHROMATOR REFOCUSING

## IV SLITS

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An identical entrance and exit slit are required for the 77250B. The throughput and bandpass of the monochromator depend directly on slit height and width. When a weak source is being measured, a trade off must be made between maximum throughput and bandpass. Hence, the smallest acceptable slit width and slit height may have to be found for any given experiment.

If a bright enough source is used and the slit is completely filled by the source image, this trade off may not be necessary. But, if the source does not fill the slit height, reducing the slit height will affect neither the throughput nor the resolution.

The types of slits are available for the 77250B Monochromator include interchangeable fixed slits and micrometer driven slits.

### IV.1 Micrometer driven slit

The 74001 slit is adjustable from approximately 4  $\mu\text{m}$  to 3 mm using the micrometer drive on top. You should apply a 10x multiplier to the micrometer markings to readout the slit opening. Thus, each mark on the micrometer barrel corresponds to 10  $\mu\text{m}$  of slit width. The height is also continuously adjustable from 3 mm to 12 mm tall. Please note that optimum spectral resolution for any monochromator is obtained with short, narrow slits. However, the 74001 is designed primarily for versatility and convenience in changing resolution and throughput; fixed slits should be used for the utmost accuracy and repeatability, especially at high resolution.

<b>Slit Width:</b>	4 $\mu\text{m}$ to 3 mm
<b>Slit Height:</b>	3 mm to 12 mm
<b>Repeatability:</b>	+/- 10 $\mu\text{m}$
<b>Accuracy:</b>	+/- 10% from 4 $\mu\text{m}$ to 250 $\mu\text{m}$ ; +/- 5% from 250 $\mu\text{m}$ to 3 mm

### IV.2 Operation with Interchangeable Fixed Slits

Interchangeable fixed slits are available for applications where only a few slit widths are needed. Fixed slits are available in widths from 50 $\mu\text{m}$  to 6.32mm. A full list of slits may be found in Table 1.

The slits are mounted in machined slides for quick and repeatable interchangeable into a fixed slit holder. The height is 18 mm, except for the 50  $\mu\text{m}$  slits which are 6 mm high. This slit holder assembly has a 1.5-inch series male flange.

Insert the slit in the slit holder as shown in Figure 2.

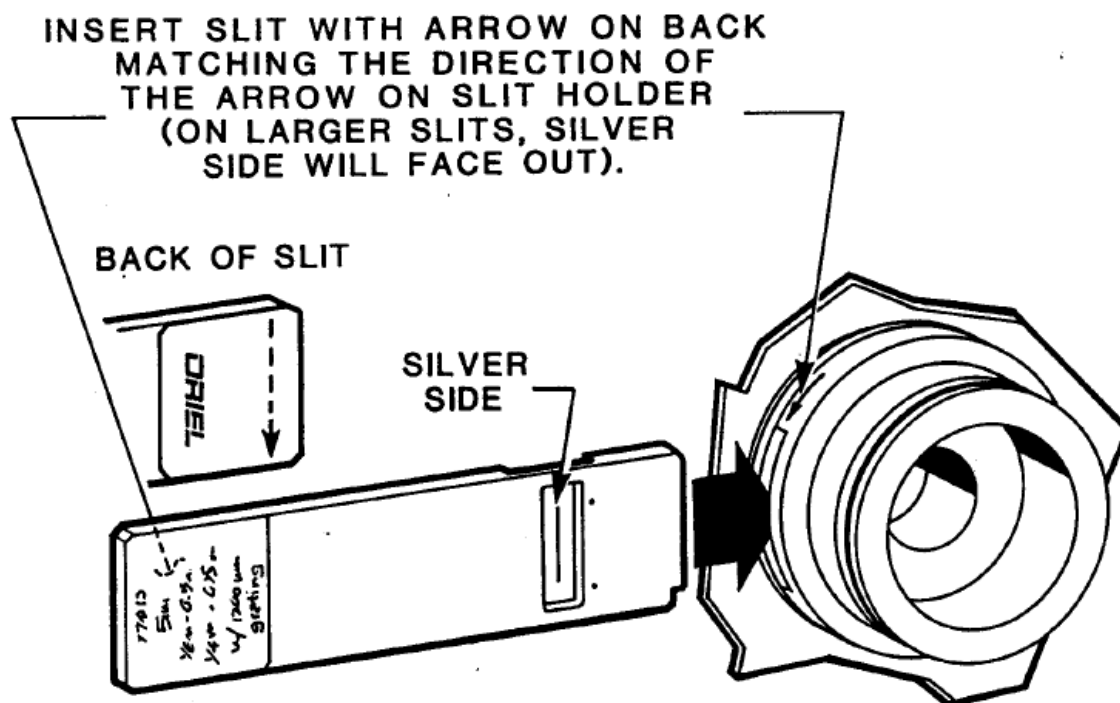


Figure 2: Insertion of Fixed Slits

Table 1: Approximate Bandpass of Fixed Slits when used with a 1200 l/mm grating

Slit Width ( $\mu\text{m}$ )	Slit Height*	Bandpass (@ 500 nm)	Model No.
50	6	0.5	77219
120	18	1	77218
280	18	2	77217
600	18	4	77216
760	18	5	77215
1240	18	8	77214
1560	18	10	77213
3160	18	20	77212
6320	18	40	77211

Note: Maximum usable slit height is 12 mm.



### IV.3 Slit Interchangeable Procedure - All Types

#### IV.3.1 Interchanging and Focusing

1. Loosen the single set screws holding the entrance and exit slit assemblies to the monochromator housing and remove both assemblies.
2. Put one of the replacement slit assemblies into the **entrance** tube of the monochromator. Rotate it so its guide hole is in line with the pinion the monochromator and push the assembly into the tube until it is flush against the monochromator. Tighten the set screw.
3. Place the other replacement slit assembly into the **exit** slit tube of the monochromator. Rotate it so the slit is approximately vertical and push it snugly against the monochromator. Do **not** tighten the set screw.
4. Set both slit openings at 0.05 mm, either by inserting the appropriate fixed slit, adjusting the variable slit or by setting the multiple fixed slit wheel at the appropriate position.
5. Place a mercury lamp at the entrance slit (you can use the 78819 Spectral Calibration Mount) so its radiant output fills the slit. Be sure there is a glass plate in the light of the path for eye safety, as cautioned in Section III OPTICAL ALIGNMENT. Set the wavelength counter to 546 nm.
6. Place your eye close enough to the exit slit so you can see the entire square grating imaged through the monochromator mirrors. Center your eye vertically on the slit.
7. Scan the wavelength counter back and forth slowly through the green (546 nm) line. If the slit is in focus at the center of the line, a cross in the shape of a four-pointed star will appear in the center of the grating. If the cross is too high in the grating, pull the slit out slightly to bring it down. If the cross is too low, it means the focus position is further into the monochromator. Since the slit assembly is already pushed against the monochromator, you need to move the focus position outward by an internal adjustment of the monochromator. This is described in Section V MONOCHROMATOR REFOCUSING. Turn now to this section and carry out the adjustment before proceeding with the alignment procedure.

#### IV.4 Alignment

1. Place your eye approximately 10 to 12 inches away from the exit slit and look at the slit.
2. Set the wavelength to the green (546 nm) line. Scan the wavelength back and forth slowly across the line.
3. Rotate the exit slit without changing its in-out focus position so it is parallel to the entrance slit image seen through the slit.

**Note:** The illuminated image is slightly curved. This is normal. Therefore, align the straight exit slit with the image (see Figure 3).

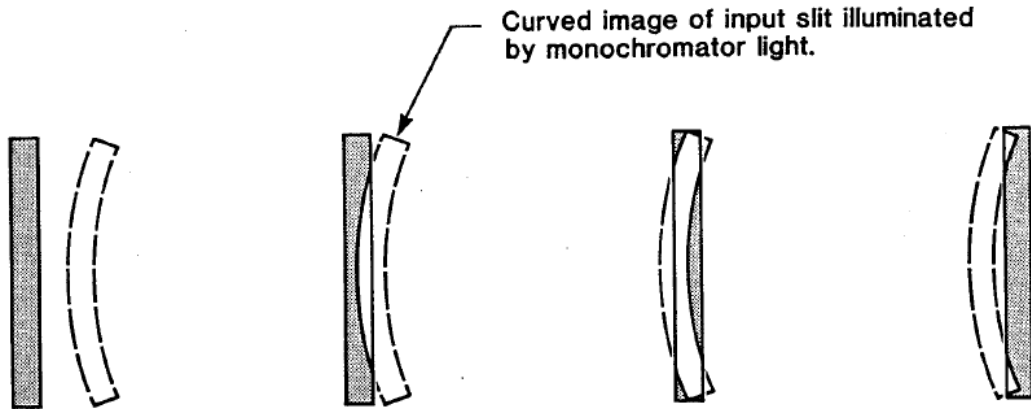


Figure 3: The exit slit appears straight, whereas the illuminated image of the entrance slit appears curved (exaggerated in the illustration).

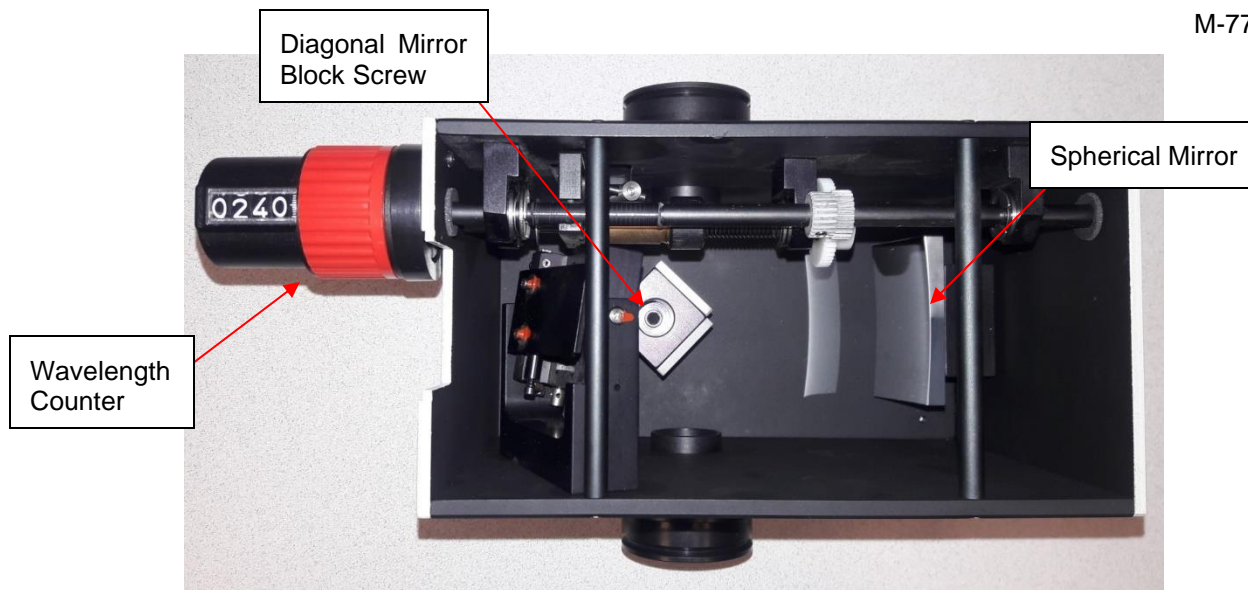
## V MONOCHROMATOR REFOCUSING

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This procedure should only be used if it is impossible to place the exit slit at the exit focal plane of the monochromator during an interchange of slits. Since the location of the exit focus is affected by the position of the entrance slit, it is wise to check that the entrance slit assembly is placed firmly against the monochromator so its slit plane is the correct distance from the monochromator face. If this is not the case, make whatever adjustment is necessary to properly locate the slit and then test the exit slit focus again. Only if the focal plane is still too short should you proceed with refocusing the monochromator.

To refocus the monochromator, refer to the directions below and image on the following page:

1. Loosen the four monochromator cover screws (two located on each of the input and output side panels, near the bottom) and remove the top cover and the end plate behind to the counter.
2. Loosen the screw which holds the diagonal mirror block to the base of the monochromator.
3. Without rotating the mirror block, gently push it toward the spherical mirror. Only move it a fraction of a millimeter.
4. Check the focus by observing the position of the cross through the exit slit. With the exit slit assembly pushed against the monochromator, the cross should be centered on the grating image. If it is still too low, push the mirror block closer to the spherical mirror; if it is too high, pull it back. Note: any small left or right movement will cause the image to disappear. If this happens, rotate the mirror assembly until the cross is on the grating image.
5. When the mirror block is properly positioned, tighten the screw holding it to the base without moving the block.
6. Replace the cover and the end plate on the monochromator and tighten the four screws holding it in place.
7. Complete the slit alignment described in Section IV.4 Alignment.



## VI WAVELENGTH COUNTER CALIBRATION

Although the wavelength counter has been calibrated at the factory, its calibration may have changed slightly during shipping and installation.

To check the wavelength calibration, place a mercury lamp (with glass shield as described in Sections III & IV.3.1) at the entrance slit. As you look into the exit slit, observing the necessary precautions, turn the wavelength drive until you observe the mercury line you have chosen. Record the reading found for this line. Repeat the same procedure to obtain readings for all the common mercury lines you wish to locate and record the respective readings. Note that output from some lines is obtained at 2X the wavelength and 3X the wavelength (i.e., 2nd and 3rd order).

Make all readings by rotating the wavelength counter in the same direction to eliminate errors due to backlash.

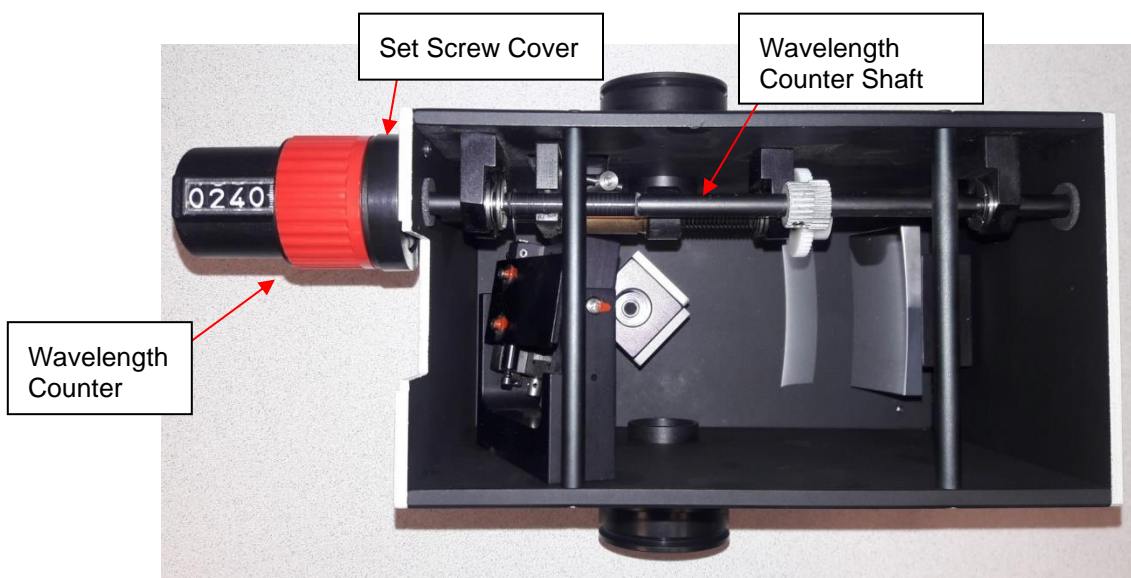
Mercury Lines and their Multiples:

253.7	UV - Detector only
365.0	UV - Detector only
404.7	Visible (Faintly) – Violet
407.8	Visible – Violet
434.8	Visible - Blue (This is doublet that cannot be resolved)
435.8	Visible - Blue
507.3	2nd order UV - Detector only
546.1	Visible – Green
577.0	Visible - Yellow (This is doublet that cannot be resolved)
579.1	Visible - Yellow
730.0	2nd order UV - Detector only
760.9	3rd order UV - Detector only
809.4	2nd order - Violet (dim)
871.6	2nd order - Blue

To readjust the wavelength counter, refer to the directions below and image on the following page:

1. Loosen the four monochromator cover screws (two located on each of the input and output side panels, near the bottom) and remove the top cover and the end plate behind to the counter.

2. Remove the circular plastic set screw cover on the counter (located on the part of the counter closest to the main monochromator housing), and rotate the counter to reveal the set screw. Loosen and remove the set screw.
3. Holding onto the shaft to prevent rotation, readjust the counter and rotate the last digit of the counter until the desired setting is reached, using the horizontal markings as guidelines for 0.1nm resolution.
4. Replace and tighten the set screw and replace the circular plastic cover.
5. Return to desired scan position.
6. Replace the cover and the end plate on the monochromator and tighten the four screws holding it in place.
7. For convenience, the wavelength counter adjustment can also be performed without removing the cover, by utilizing the protrusion of the wavelength counter shaft at the rear panel of the monochromator. Use this point to secure the shaft from rotation in step three.



## VII GRATINGS

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The gratings used in the 77250B Monochromator are 30 x 30 mm replicated gratings held in a protective frame. The frame has a tab for quick and easy insertion and removal without touching the surface of the grating. A list of the available gratings may be found in Table 2.

Blaze Wavelength	Type	Groove Spacing (l/mm)	Wavelength Counter & Bandwidth Factor	Reciprocal Dispersion (nm/mm)	Primary Wavelength	Model No.
225 nm	Ruled	600	X2	13.3	200-400 nm	77304
240 nm	Holographic	1200	X1	6.7	200-600 nm	77296
275 nm	Ruled	2400	X0.5	3.3	200-500 nm	77308
300 nm	Holographic	3600	X0.33	1.7	250-330 nm	77310
360 nm	Ruled	1200	X1	6.6	200-1000 nm	77298
560 nm	Holographic	1800	X0.67	4.1	320-670 nm	77309
700 nm	Ruled	600	X2	13.2	450-2000 nm	77305
750 nm	Ruled	1200	X1	6.2	475-1000 nm	77306
800 nm	Ruled	150	X8	53.0	425-1600 nm	77317
1.0 $\mu\text{m}$	Ruled	600	X2	13.0	650-2000 nm	77299
1.7 $\mu\text{m}$	Ruled	300	X4	26.0	1.1-2.4 $\mu\text{m}$	77300
1.85 $\mu\text{m}$	Ruled	150	X8	52.0	1.45-2.2 $\mu\text{m}$	77301
8.0 $\mu\text{m}$	Ruled	75	X16	105.0	4.5-20.0 $\mu\text{m}$	77302
12.0 $\mu\text{m}$	Ruled	50	X24	157.0	7.0-23.0 $\mu\text{m}$	77303

Table 2: Grating Specifications

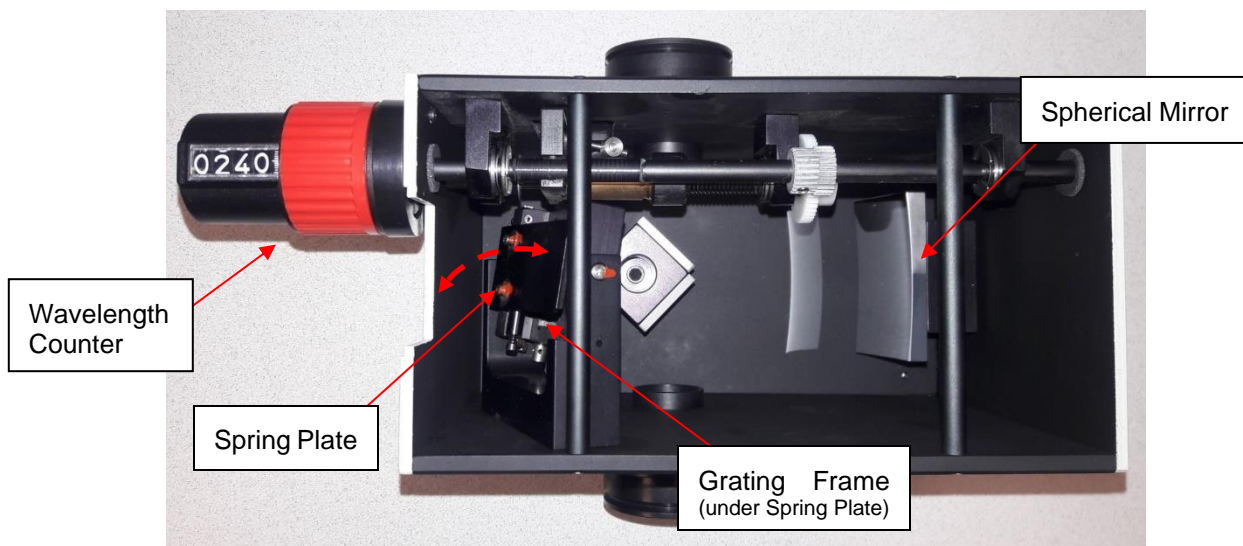
Note: The counter wavelength, bandwidths, and scanning speeds must be multiplied by the Wavelength Counter & Bandwidth Factor listed in the above table.

### VII.1 Grating Interchange Procedure

All gratings used in the monochromator are mounted so the plane of the grating surface is accurately positioned in the grating drive mechanism. This makes it possible to obtain repeatable values when mounted gratings are interchanged.

To interchange gratings, refer to the directions below and image on the following page:

1. Loosen the four monochromator cover screws (two located on each of the input and output side panels, near the bottom) and remove the top cover and the end plate behind to the counter.
2. Rotate the wavelength counter to move the grating so it is facing directly toward the center of the spherical mirror.
3. Pull the spring plate away from the grating mount.
4. Remove the grating carefully. DO NOT TOUCH THE GRATING SURFACE.
5. Insert the new mounted grating into the grating frame. Allow the spring plate to press against the grating mount. Do not allow the spring plate to return without gently guiding it back.
6. Pull the spring plate gently away from the grating mount, check that the grating is properly seated, and return the spring plate back to the grating mount.
7. Return the monochromator counter to the desired reading using the wavelength counter. If the monochromator is mounted on a single post mount, hold the monochromator housing while turning the counter manually to make sure the monochromator center line remains in proper alignment with any other optical components.
8. Replace the cover and the end plate on the monochromator and tighten the four screws holding it in place.



### VIII NITROGEN PURGE (OPTIONAL)

In certain operating environments, water vapor and condensation may be of concern to the accuracy and integrity of the system. This environmental problem has been addressed by the use of a nitrogen purge system. This purge system ventilates the inner cavity of the monochromator, preventing condensation on the internal components. To flow nitrogen through the 77250B, a purge nipple is provided on the back panel, pictured below. Connect the appropriate plastic tubing on to the nipple and push over the flare to prevent the tubing from disconnecting or leaking under pressure.



### IX 77250B MONOCHROMATOR ACCESSORIES

Newport provides a large number of accessories to make the most effective use of your monochromator. For a comprehensive list, please visit our website: [www.Newport.com](http://www.Newport.com)

Fiber optic accessories increase the effectiveness of the monochromator. You can measure a small source at a relatively long distance, measure an extended source, or measure a narrow beam.

Another advantage of fiber optics is that experiments can be set up quickly and easily; i.e., light can be brought to your sample, rather than your sample to the light.

Other fiber optic accessories, which may be useful, are bifurcated and trifurcated fiber optic cables; these make use of the fact that fiber optics are reversible. The fiber optic cable used as input in one experiment functions as the output in another experiment. Add to this liquid light guides and your repertoire will be complete for your monochromator. Mounting accessories for fiber optics facilitate their use in conjunction with the 77250B Monochromator. Mounting accessories with optical benches, base plates or tables facilitate the use of the 77250B Monochromator with other components.

## X 77250B MONOCHROMATOR PRODUCT SPECIFICATIONS

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PARAMETER	77250B Specification
Focal Length	125 mm
F/#	F/3.7
Wavelength Selection Method	Manual
Spectral Range	200 nm to 23 $\mu$ m, grating dependent (refer to Table 2)
Spectral Bandwidth	Grating and slit width dependent (refer to Table 1 and Table 2)
Wavelength Accuracy	1 nm <sup>1</sup>
Step Counter Resolution	0.1 nm <sup>1</sup>
Stray Light	0.03%
Input Port	1
Output Ports	1
TracQ Basic Software Compatible	No
74009 Hand Controller Compatible	No
Power Requirements	N/A
Weight	4 lbs. (1.8 kg)
Computer Interface	N/A
Grating Size	30 mm x 30 mm
Optical Axis Height	2.0 inch (50.8mm)
Number of gratings supported	1
Flange Series Size	1.5 inch

<sup>1</sup> 1200 L/mm grating

Table 3: Monochromator Specifications

## XI WARRANTY AND SERVICE

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### XI.1 CONTACTING NEWPORT CORPORATION

Oriel Instruments belongs to Newport Corporation's family of brands. Thanks to a steadfast commitment to quality, innovation, hard work and customer care, Newport is trusted the world over as the complete source for all photonics and laser technology and equipment.

Founded in 1969, Newport is a pioneering single-source solutions provider of laser and photonics components to the leaders in scientific research, life and health sciences, photovoltaics, microelectronics, industrial manufacturing and homeland security markets.

Newport Corporation proudly serves customers across Canada, Europe, Asia, and the United States through numerous international subsidiaries and sales offices worldwide. Every year, the Newport Resource catalog is hailed as the premier sourcebook for those in need of advanced technology products and services. It is available by mail request or through Newport's website. The website is where one will find product updates, interactive demonstrations, specification charts and more.

To obtain information regarding sales, technical support or factory service, United States and Canadian customers should contact Newport Corporation directly.

Newport Corporation  
1791 Deere Avenue  
Irvine, CA 92606 USA

Telephone: 800-222-6440 (toll-free in United States)  
949-863-3144

Fax: 949-253-1680

Sales: [oriel.sales@newport.com](mailto:oriel.sales@newport.com)  
Technical assistance: [oriel.tech@newport.com](mailto:oriel.tech@newport.com)  
Repair Service: [rma.service@newport.com](mailto:rma.service@newport.com)

Customers outside of the United States must contact their regional representative for all sales, technical support and service inquiries. A list of worldwide representatives can be found on the following website: <https://www.newport.com/contact/contactslocations>



## **XI.2 REQUEST FOR ASSISTANCE / SERVICE**

Please have the following information available when requesting assistance or service:

- Contact information for the owner of the product.
- Instrument model number (located on the product label).
- Product serial number and date of manufacture (located on the product label).
- Description of the problem.

To help Newport's Technical Support Representatives diagnose the problem, please note the following:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Had this problem occurred before? If so, when and how frequently?
- Can the system continue to operate with this problem, or is it non-operational?
- Were there any differences in the application or environment before the problem occurred?

## **XI.3 REPAIR SERVICE**

This section contains information regarding factory service for this product. The user should not attempt any maintenance or service of the system beyond the procedures outlined in this manual. This product contains no user serviceable parts other than what is noted in this manual. Any problem that cannot be resolved should be referred to Newport Corporation.

If the instrument needs to be returned for service, a Return Material Authorization (RMA) number must be obtained prior to shipment to Newport. This RMA number must appear on both the shipping container and the package documents.

Return the product to Newport, freight prepaid, clearly marked with the RMA number and it either will be repaired or replaced at Newport's discretion.

Newport is not responsible for damage occurring in transit. The Owner of the product bears all risk of loss or damage to the returned Products until delivery at Newport's facility. Newport is not responsible for product damage once it has left the facility after repair or replacement has been completed.

Newport is not obligated to accept products returned without an RMA number. Any return shipment received by Newport without an RMA number may be reshipped by Newport, freight collect, to the Owner of the product.

## **XI.4 NON-WARRANTY REPAIR**

For Products returned for repair that are not covered under warranty, Newport's standard repair charges shall be applicable in addition to all shipping expenses. Unless otherwise stated in Newport's repair quote, any such out-of-warranty repairs are warranted for ninety (90) days from date of shipment of the repaired Product.

Newport will charge an evaluation fee to examine the product and determine the most appropriate course of action. Payment information must be obtained prior to having an RMA number assigned. Customers may use a valid credit card, and those who have an existing account with Newport Corporation may use a purchase order.

When the evaluation had been completed, the owner of the product will be contacted and notified of the final cost to repair or replace the item. If the decision is made to not proceed with the repair, only

the evaluation fee will be billed. If authorization to perform the repair or provide a replacement is obtained, the evaluation fee will be applied to the final cost. A revised purchase order must be submitted for the final cost. If paying by credit card, written authorization must be provided that will allow the full repair cost to be charged to the card.

## **XI.5 WARRANTY REPAIR**

If there are any defects in material or workmanship or a failure to meet specifications, notify Newport Corporation promptly, prior to the expiration of the warranty.

Except as otherwise expressly stated in Newport's quote or in the current operating manual or other written guarantee for any of the Products, Newport warrants that, for the period of time set forth below with respect to each Product or component type (the "Warranty Period"), the Products sold hereunder will be free from defects in material and workmanship, and will conform to the applicable specifications, under normal use and service when correctly installed and maintained. Newport shall repair or replace, at Newport's sole option, any defective or nonconforming Product or part thereof which is returned at Buyer's expense to Newport's facility, provided, that Buyer notifies Newport in writing promptly after discovery of the defect or nonconformity and within the Warranty Period. Products may only be returned by Buyer when accompanied by a return material authorization number ("RMA number") issued by Newport, with freight prepaid by Buyer. Newport shall not be responsible for any damage occurring in transit or obligated to accept Products returned for warranty repair without an RMA number. The buyer bears all risk of loss or damage to the Products until delivery at Newport's facility. Newport shall pay for shipment back to Buyer for Products repaired under warranty.

### WARRANTY PERIOD

All Products (except consumables such as lamps, filters, etc.) described here are warranted for a period of twelve (12) months from the date of shipment or 3000 hours of operation, whichever comes first.

Lamps, gratings, optical filters and other consumables / spare parts (whether sold as separate Products or constituting components of other Products) are warranted for a period of ninety (90) days from the date of shipment.

### WARRANTY EXCLUSIONS

The above warranty does not apply to Products which are (a) repaired, modified or altered by any party other than Newport; (b) used in conjunction with equipment not provided or authorized by Newport; (c) subjected to unusual physical, thermal, or electrical stress, improper installation, misuse, abuse, accident or negligence in use, storage, transportation or handling, alteration, or tampering, or (d) considered a consumable item or an item requiring repair or replacement due to normal wear and tear.

### DISCLAIMER OF WARRANTIES; EXCLUSIVE REMEDY

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warranty shall not be binding on Newport unless reduced to writing and approved by an expressly an authorized officer of Newport.

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