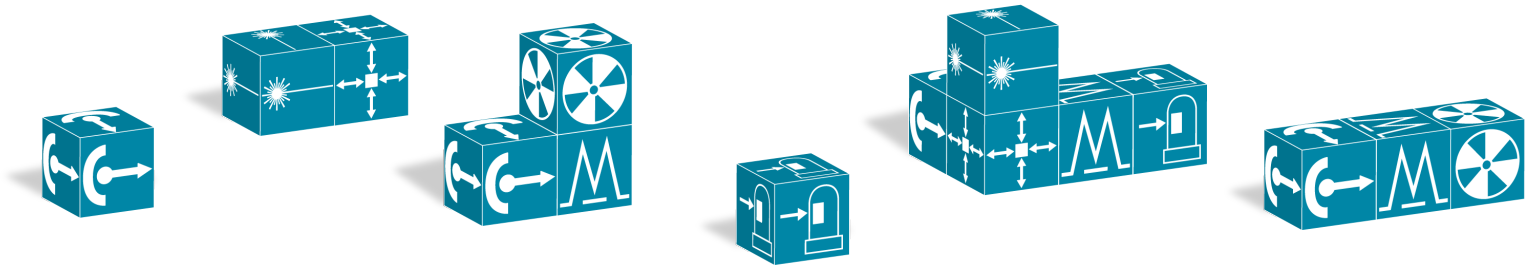
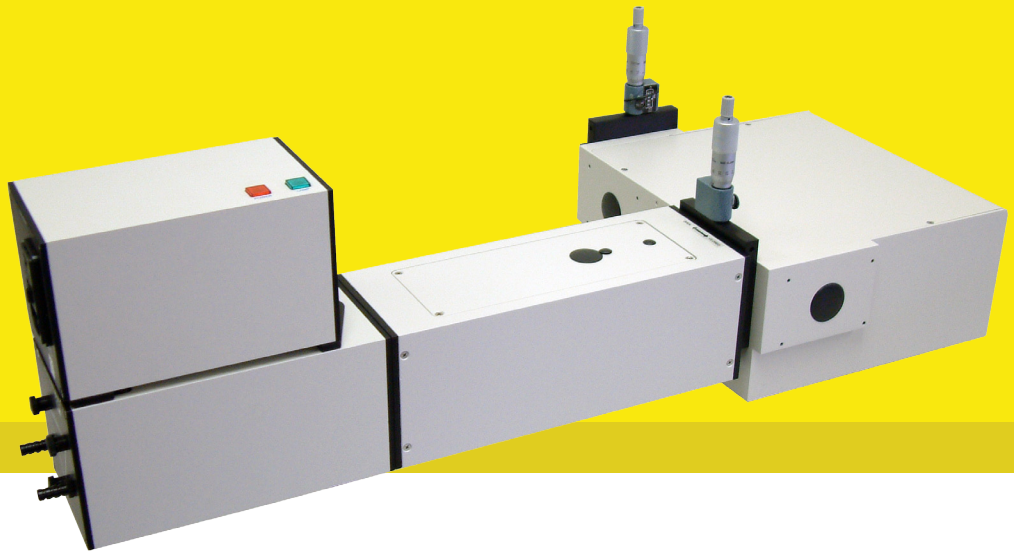


Tunable PowerArc™

Tunable High Intensity Light Source



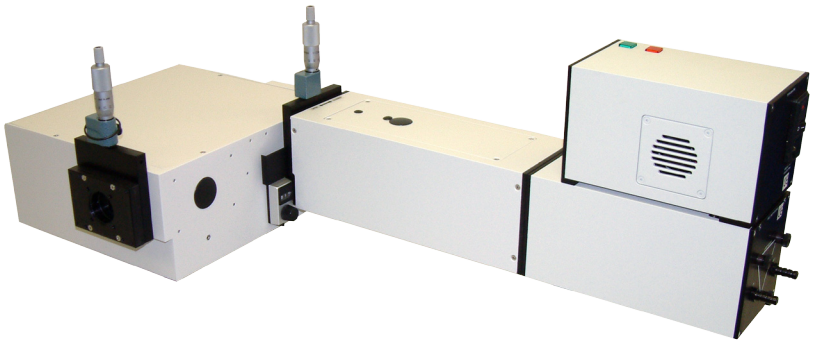
OPTICAL BUILDING BLOCKS CORPORATION

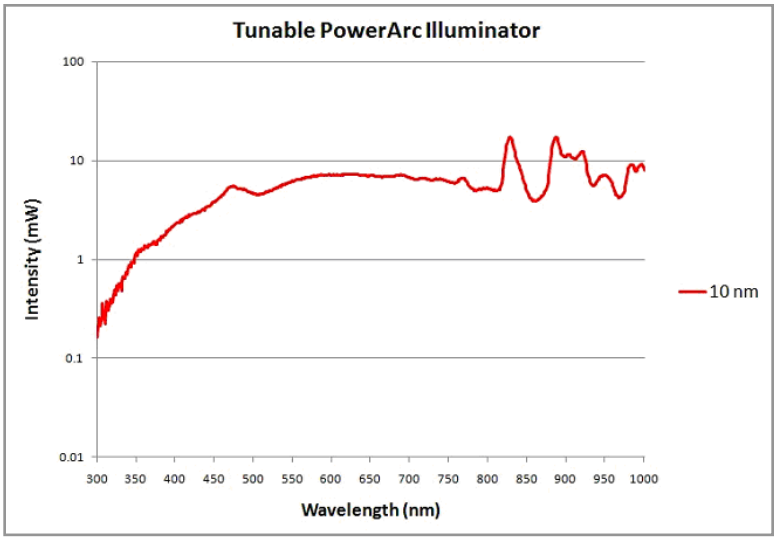
Tunable PowerArc™

Tunable High Intensity Light Source

- Need a high intensity CW laser that is tunable from 250 to 1,000 nm? yes
- Need it to deliver milliwatts of energy? yes
- Need it to be portable and so simple that anyone can operate it? yes
- Want to pay less than $10,000 for this laser? yes

If this sounds like the light source you need, then OBB has the answer. The Tunable PowerArc™ Illuminator provides all of these benefits, it just isn't a laser.





Think of the OBB Tunable PowerArc™ Illuminator as a continuously tunable high intensity laser. It can produce tunable monochromatic light with hundreds of milliwatts of power, and an overall available spectral output from 180 nm to 24 microns.

Key Benefits of the OBB PowerArc™ Lamp Housing Design

- Continuously tunable from 180 nm to 24 microns
- Continuously adjustable bandpass from 0 to 200 nm
- Milliwatts of energy
- Push button start and simple dial the wavelength tunability
- No ozone venting required
- An Illuminator That Is so Easy to Use, anyone can use it
- Compact and portable

Hardware

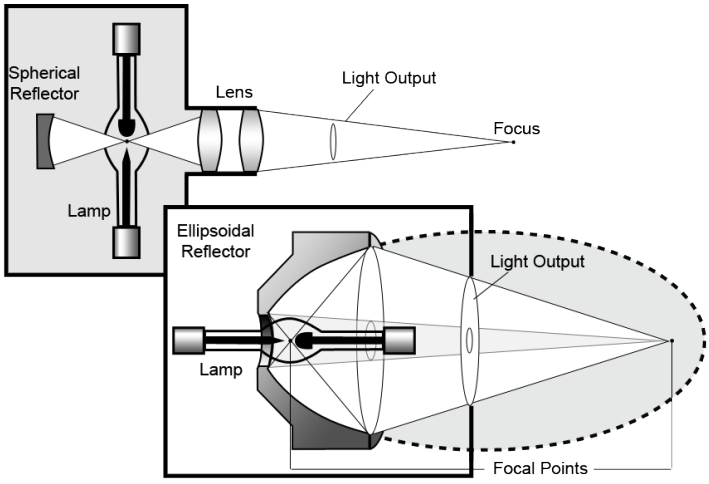
Consisting of a unique arc lamp housing tightly coupled to a 0.2 meter monochromator, the Tunable PowerArc™ Illuminator is a self aligned illuminator that generates milliwatts of intensity and offers the versatility of continuous wavelength and bandwidth selection. The wavelength can be set manually or, for ultimate flexibility, it can be scanned under computer control. The Tunable PowerArc™ Illuminator could not be easier to operate. The system requires no ozone venting, and with the 75 watt xenon lamp no cooling is required. Simply push the start button and dial the wavelength and bandpass of output that you require. It's that easy!

Lamp Housing

At the heart of the OBB Tunable PowerArc™ lamp housing is a proprietary on-axis ellipsoidal reflector. Our reflectors collect up to 70% of the radiant energy from the arc lamp, versus only 12% for typical condenser systems in vertical lamp housings. The ellipse literally wraps around the arc lamp, collecting 5 to 6 times more output power than a conventional system.

The arc source is located at one focal point of the ellipse, and the radiation is reflected by the ellipse to the secondary focus which is actually outside of the lamp housing. Since the light is brought to a focus by reflection rather than refraction (through a lens), there are less losses from absorption or lens-surface back-reflection. This design is so efficient that an OBB Tunable PowerArc™ lamp housing can deliver up to 11 times more optical power into a given smaller area than a conventional lamp housing. This is critical when illuminating light guides, monochromator slits, pinholes or other small areas.

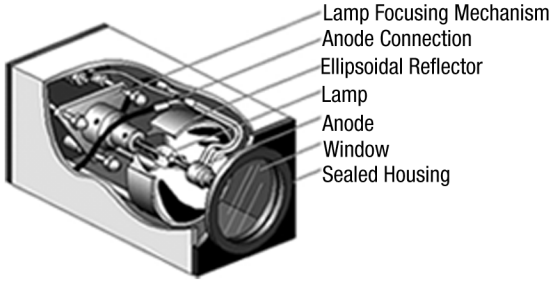
What this means is simply that you get the same output with an OBB 75 W system as with a conventional 450 W system. You obviously will save money and space.



While conventional lamp housings resemble chimneys emitting ozone and requiring cumbersome venting, the OBB Tunable PowerArc™ has a sealed lamp housing that requires no ozone venting.

Lamp Housing Specifications

Lamp Power Capacity	75 to 150 watts
Height	100 mm (3.9 inches)
Width	100 mm (3.9 inches)
Length	210 mm (8.3 inches)
Weight	1.9 kg (4.2 lbs)
Window Diameter (D)	65 nm



Tunable PowerArc™

Lamp

You have a choice of lamps depending on the spectral output that you require. Of course you may order different types of lamps for the housing, they are interchangeable.

There are two types of arc lamps available—xenon and mercury. The xenon gas used in the lamp provides continuous spectra from 180 nm to 2,500 nm of course at varying intensity. The mercury provides a line spectra. The spectral curves for xenon and mercury are normalized (relative intensities) therefore it is not obvious that the mercury lamps, intensity—where it emits, exceeds that of the xenon lamp. Because of the smaller arc size, the mercury lamp can also provide greater intensity in a smaller area (greater brightness) than the xenon lamp.

We also have an optional tungsten-halogen filament lamp for NIR applications.

Arc lamps come with a quartz or suprasil envelope depending on the application. Quartz lamps do not transmit the deep UV below 240 nm. Suprasil lamps do transmit the deepest UV output from the arc down to about 180 nm. For either type of lamp envelope our unique lamp housing design does not create ozone and therefore requires no ozone venting.

The 75 watt xenon lamp and 100 watt tungsten-halogen lamps require no cooling whatsoever. The larger wattages of lamps require water cooling.

You can either get your water directly from the cold-water tap (can be a problem if the water is hard or when water is not available) or from an inexpensive circulating water bath option that we provide.

We have selected water-cooling over air: because it allows us to make a more compact housing; seal in the ozone and eliminates the need for venting.

Reflector

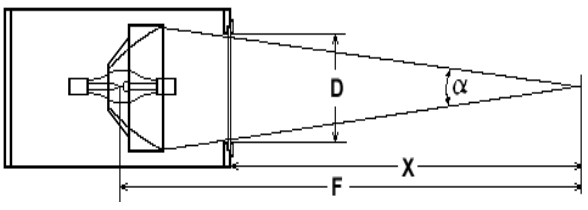
Our ellipsoidal reflectors are proprietary in design and the coating used. They are NOT electro-formed reflectors, which can distort with heat, and can degrade within months. Our proprietary design ensures that distortion of the critical ellipsoid can not occur as the lamp reaches its operating temperature. This ensures thermal stability of focus. The coating ensures reasonably long operating life—typically 3-5 years.

With an OBB Tunable PowerArc™ lamp housing you have a choice of three different ellipsoidal reflectors depending on your requirements. The proprietary reflectors OBB Corp uses allows for the great 70% collection efficiency. In addition to collection of light the reflectors are used as focusing elements. Hence the selection of a reflector determines the focal length. The different focal lengths correspond to the different “focal cones” of light coming from your lamp housing. This “focal cone” is variously referred to as f/#, Numerical Aperture, and/or acceptance, convergence, or divergence angle.

The f/# is important when considering matching a light source to some other component, for example: fiber optics, liquid light guides or monochromators. However the f/# does not affect the light collection as it does in a simple lens design. The shape and size of the ellipsoidal reflector determines how much light is collected from the lamp arc, and the amount of delivered light is the same for all of OBB’s reflectors. Selection of your OBB reflector f/# is primarily based on matching the focal cone of the converging beam with any secondary optical elements you will be using. However the f/# also determines the focal distance and the focal spot size with lower f/#’s having shorter focal lengths and smaller spot sizes.

The spot size at the focus is directly related to the original arc gap size of the lamp and the focal length of the reflector. The larger the arc, or the longer the focal length, the larger the spot size at the focus. Hence if you want to have the maximum power in the smallest spot select the fastest focal length (f/1) and the smallest arc size lamp (100 W Mercury). This is another unique benefit of the OBB Corp’s system; we give you the most power in the smallest spot. No one using an arc lamp can match us in this regardless of their systems size or cost.

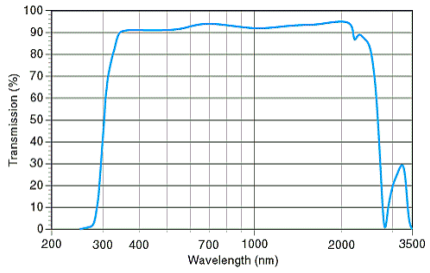
Reflector Selection Guide	f/4.5 reflector	f/2.5 reflector	f/1 reflector
Focal length (F)	379 mm	240.5 mm	112 mm
Focal point from housing (X)	284.35 mm	151.46 mm	22.25 mm
Beam angle (α)	14.5 degrees	28 degrees	45 degrees
Numerical Aperture N.A.	0.12	0.24	0.45

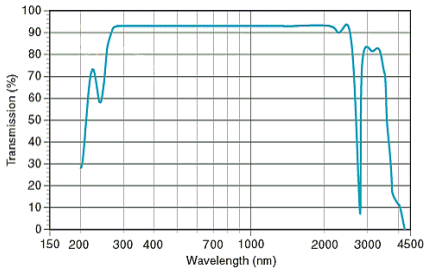


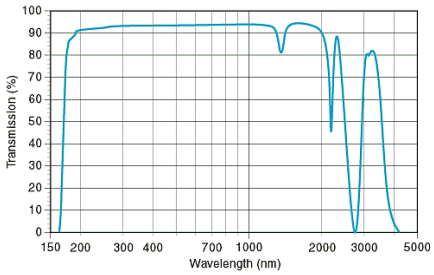
Window

The OBB PowerArc™ is a sealed arc lamp housing. You have a choice of the optical front windows, depending on the spectral output that you require. Please refer to the transmission spectra of the three types of windows available. If you plan to use different types of lamps in your lamp housing, you may want to order different windows or select Suprasil since it will transmit all spectra.

Pyrex	Quartz	Suprasil
Above 350 nm	Above 250 nm	Above 180 nm







Power Supply

The PowerArc™ lamp housing comes with one of two choices for the power supply and igniter.

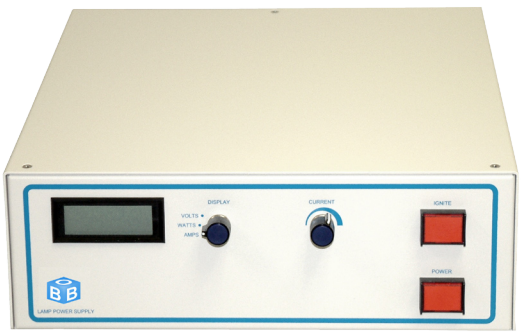
Dedicated 75 or 100 Watt Power Supply

If you are only ever going to use the 75 watt xenon lamp or 100 watt mercury lamp with your OBB PowerArc™ lamp housing, then we offer two dedicated compact power supplies and igniter units that are integrated onto the lamp housing. They are specially designed switch mode power supplies offering outstanding stability with a simple push button, electronically safe, ignition. In fact, although they are not DC regulated power supplies, OBB carefully designed them to offer virtually identical stability specifications to our linear power supply. When used with the PowerArc™ lamp housing this illuminator offers a very small form at a very affordable price.

Universal 75 to 150 Watt Power Supply

If you need to use a lamp other than 75 or 100 watts, then we offer a universal highly-regulated, constant current, linear, DC power supply. This universal power supply provides very stable power for arc lamps. It can also be used with a 100 watt tungsten-halogen filament lamp for enhanced IR output. Designed for use with various lamp housings, it may be used with lamp housings from other manufacturers. When used with an arc lamp in OBB's PowerArc™ lamp housing, this stand alone power supply is connected to a compact igniter that is integrated onto the lamp housing for electronically safe ignition.

The DC regulated power supply pictured below has a current adjust for different operating wattages and can display operating voltage, wattage or current.



Ignition Safe Igniter

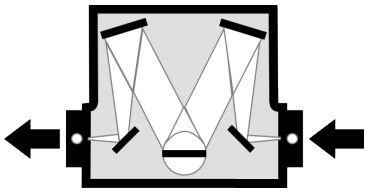
Ignition noise can disrupt, or even destroy, sensitive equipment in the vicinity of an arc lamp during start-up. This can be quite a concern in a crowded lab environment. OBB Engineers introduced an igniter that is integrated onto the lamp housing. This design provides an effective EMI shield which contains the EMI pulse, providing a safer and more convenient environment in which to do your research.

Monochromator

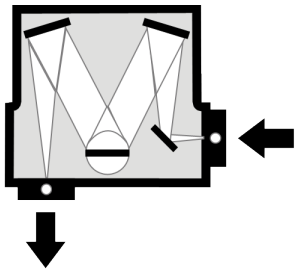
This extremely rugged monochromator is built from a single solid metal casting that includes the base plate, optical mounts and all four sides of the unit. Inside the monochromator has extensive baffles to reduce stray light. There is an entrance and exit baffle box at the entrance and exit silts, as well as a center baffle that separates the input side from the exit side of the monochromator.

The monochromator has four optional ports that can be utilized for two inputs and two outputs. In the standard configuration it comes with one entrance and one exit port. This gives you a choice of four different input/output geometries:

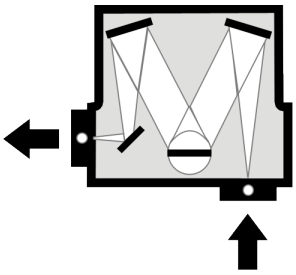
180º Straight Line



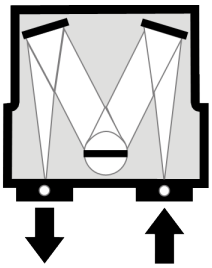
90º Left Angle



90º Right Angle

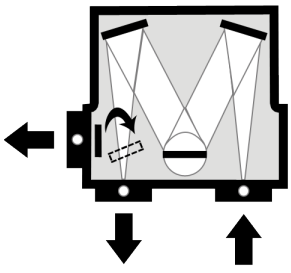


360º

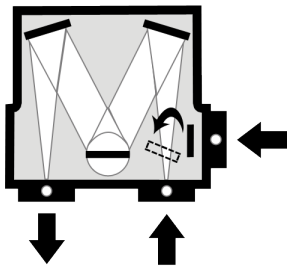


You can also elect as an option to have two entrance ports or two exit ports. This option adds an appropriate flipping mirror(s) and slit assemblies. The flipping mirror is manually switched to receive light from either entrance port, or to deliver light to either exit port depending on the configuration.

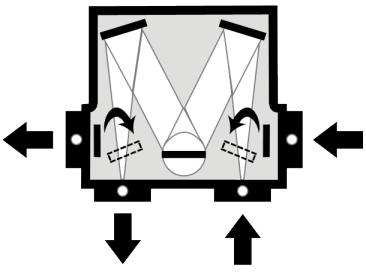
Dual Exit Ports



Dual Entrance Ports



Dual Entrance and Exit Ports



Slits

The monochromator slits are continuously adjustable manual slits with micrometers for adjustment. The slits also have a digital readout of the physical slit size selected. The slit housing also has a manually sliding shutter to quickly shut off or open the light path. This manual shutter has a variable height adjustment to allow you to adjust the allowable slit height.

Gratings

Here is a wide selection of gratings to choose from depending on the optical requirements. All gratings are 50 x 50 mm flat gratings. The Ruled gratings have better optical throughput and Holographic gratings have improved stray light characteristics. Ruled gratings have two fundamental parameters to choose from; the groove density, expressed in grooves (or lines) per millimeter, and the blaze angle which nominally refers to the peak reflectance wavelength expressed in nanometers.

The groove density affects the resolution and mechanical scanning range of the monochromator. Below is a reference chart showing the affect groove density has on the mechanical scanning range of the monochromator as well as the reciprocal linear dispersion.

Groove Density	Mechanical Scanning Range (nm)	Reciprocal Linear Dispersion (nm/mm)
2,400 g/mm	0 to 550 nm	2 nm/mm
1,200 g/mm	0 to 1,100 nm	4 nm/mm
600 g/mm	0 to 2,200 nm	8 nm/mm
300 g/mm	0 to 4,400 nm	16 nm/mm
150 g/mm	0 to 8,800 nm	32 nm/mm

An optional dual grating mount allows you to select two different gratings, say to optimize throughput in different wavelength ranges. The gratings are positioned back to back and a switch dial is available at the top of the monochromator to manually choose which grating is to be used.

Below is a list of our standard gratings. Other gratings are also available upon request.

Standard Gratings
600 g/mm, 1,250 nm blaze
1,200 g/mm 300 nm blaze
1,200 g/mm 400 nm blaze
1,200 g/mm, 500 nm blaze
Holographic grating 300–800 nm
75 g/mm 10.0 µm blaze
150 g/mm, 4.0 µm blaze
300 g/mm, 2.0 µm blaze
600 g/mm, 750 nm blaze
600 g/mm 1.0 µm blaze
1,200 g/mm, 600 nm blaze
1,200 line/mm, 750 nm blaze

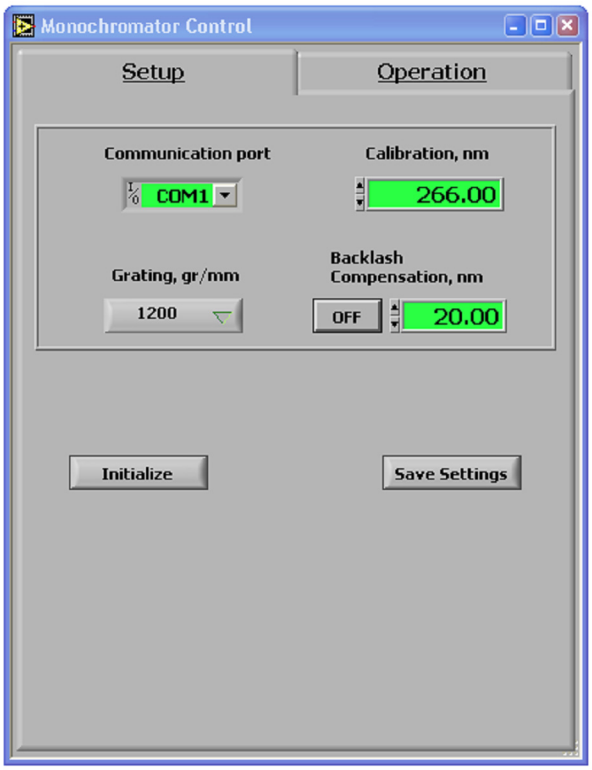
Wavelength Control

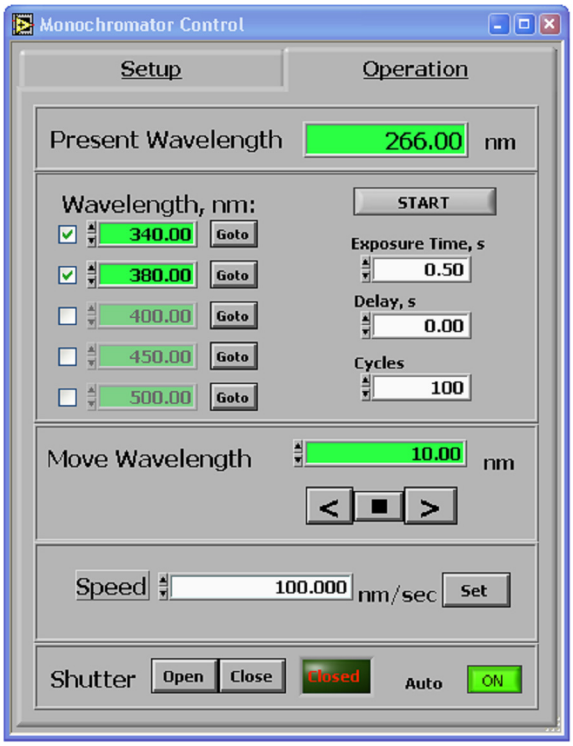
The monochromator wavelength is controlled with a manual dial and readout. The readout is designed to be in true wavelength in nanometers for the 1,200 g/mm grating. For other gratings you have to multiply the dial readout by a factor depending on the actual grating resolution. For example with the 600 g/mm grating you multiply the digital readout by 2 to arrive at the true wavelength position of the monochromator.

Computer Control

An optional computer control accessory is available. It includes a stepper motor assembly, a USB motor controller interface box and an SDK for control of the monochromator wavelength from third party software packages for users with programming experience.

A very simple software package is also provided by OBB to remotely select the wavelength and control the shutter. Requires Windows 2000 or Windows XP operating system.





*LabVIEW is a trade mark of National Instruments

Specifications

Optical Specifications

Optical Power	> 10 mW (grating, bandpass & wavelength dependent)
Spot Size at Slit Exit	5 to 10 mm (lamp and slit dependent)
Diverging Beam Angle (full)	14.5 degrees
Numerical Aperture (N.A.)	0.12
Optical Noise	0.07% RMS
Optical Stability	0.2%

Power Supply Specifications

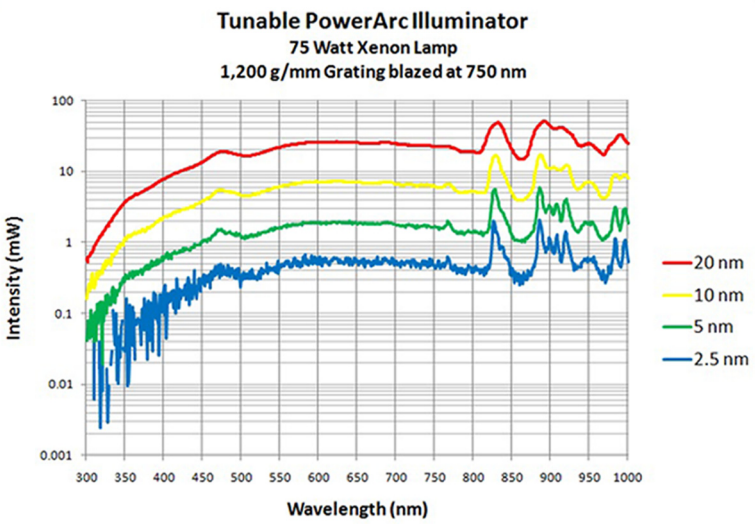
	75 Watt Switch Mode Power Supply	75 to 150 Watt Universal Power Supply
Input (user selectable)	90–274 V AC, 50–60 Hz	105–120 V/60 Hz or 210–240 V/50 Hz
Power Rating	50 to 100 watts	0 to 150 watts
Operating Voltage	10 to 25 volts	10 to 24 volts
Operating Current	3 to 7 amps	0 to 8 amps
Pre-Ignition Voltage	65–75 V DC	> 85 volts
Ripple at Max Current	< 3% peak to peak	< 10 millivolts
Stability After Warm-up	0.5%	0.2%
Line Voltage Regulation	< 0.5% current variation for 5 volts line change	0.1% current variation for 5 volts line change

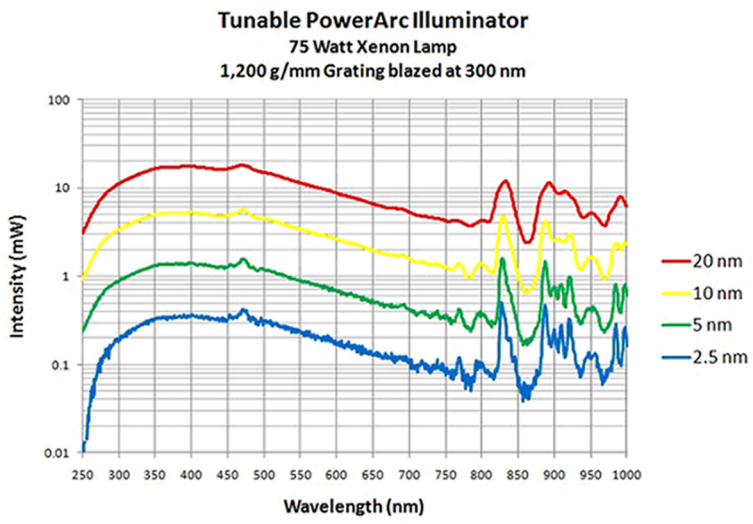
Monochromator Specifications (using standard 1200 line/mm ruled grating)

Focal Length	200 mm
Aperture Ratio	F/4 (calculated using grating width)
Wavelength Range	180 nm to 24 microns (grating dependent)
Bandpass	Continuously adjustable from 0 to 25 nm
Reciprocal Linear Dispersion	4 nm/mm
Resolution	0.25 nm
Throughput	60% at 300 nm
Scattered Light	0.02% two bandwidths from 365 nm Hg line
Accuracy	+/- 0.25 nm (using motorizing option under computer control)
Reproducibility	+/-0.25 nm
Optical Path Height	76 mm
Grating size	50 x 50 mm

Tunable PowerArc™

Output Curves





Higher Resolution Gratings Can Provide Higher Intensities

The data curves above are all from illuminators that had a 1,200 g/mm grating. You will note from these curves that doubling the bandpass, or slit size, typically results in a factor of four increase in intensity. This is true as long as the slit size is the same or equal to the optical spot size. Therefore if you used a 2,400 g/mm grating you would be doubling the slit size from a 1,200 g/mm grating to maintain an equivalent bandpass. Thus a Tunable PowerArc™ Illuminator equipped with a xenon lamp and a 2,400 g/mm grating blazed at 300 nm will give you up to 80 milliwatts of optical power in a 20 nm bandpass. However the 2,400 g/mm grating will only mechanically scan up to 600 nm, refer to OBB's Monochromator brochure for more details.

Applications

Applications for the Tunable PowerArc Illuminator cover a broad range of scientific, OEM and research applications. These illuminators are the light sources of choice for a variety of spectroscopy systems, such as:

- Fluorometers
- UV /Vis Spectrometers
- CD Spectrometers
- Stopped-Flow Spectrometers
- Tunable Illuminators

Tunable illuminators are also used for a broad a range of applications almost as diverse as the wavelength range across which they emit.

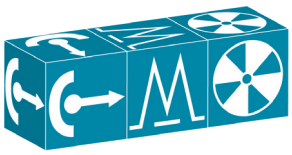
- Detector calibration
- Solar Simulators
- Photochemistry
- Photo-Activation
- Photobiology
- Photovoltaics
- Spectroscopy
- Optical Teaching Labs
- Dermatology

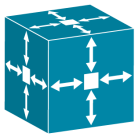
Compatible Optical Building Blocks

The Tunable PowerArc™ Illuminator is one of many inter-connectable optical components. Hence the name of our company, Optical Building Blocks Corporation. These Optical Building Blocks can be ordered together to form a complete subassembly or they can be subsequently added to one another. In fact there are enough OBB components to choose from to build your own complete optical system for various spectroscopy requirements.

Optical Choppers

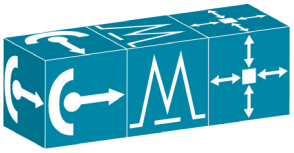
If you would like to convert the continuous illumination of the PowerArc™ into a pulsed light source then we have an optical chopper that can do the job. It can be used on a stand alone basis or it can be physically mounted into a light shield adapter tube that would become an extension of the PowerArc™ lamp housing.





Sample Compartment

If you would like to couple your PowerArc™ lamp housing into a sample compartment, then we have an ideal solution. The OBB QuadraCentric sample compartment is an excellent unit that has various sample handling capabilities. There is also a light shield adapter tube that directly couples the PowerArc™ lamp housing to the sample compartment with matching optics to focus light into the sample. You can then have up to three other input or output optical channels to or from the central sample holder. So you could create a right angle fluorometer or scatter system or a straight through absorbance spectrometer with the appropriate detection components. For each optical channel in the sample compartment there is also a filter holder for wavelength selection.



Other Accessories

Collimating Lenses

If you need a collimated optical beam, then a collimating lens can be employed for the diverging beam after the light focal point. Be sure to match the collimating lens for your beam diameter requirements and for the f/# of the OBB light source you are considering. OBB offers a number of collimating lenses to choose from. Also if you need a uniform collimated beam of light be sure to consider an optical diffuser.

Optical Diffuser

An optical diffuser is necessary when uniform illumination over a targeted area is required.

Programmable Shutter

A computer controlled shutter can be ordered at the time of original order. The programmable shutter is positioned inside the monochromator at the entrance port, so selecting this option precludes the use of a folding mirror or flipping mirror on the entrance port of the monochromator. The programmable shutter requires the MD-1000 USB motor controller interface box for control with LabVIEW* software from National Instruments. A very simple software package is also provided by OBB to remotely control the shutter. Requires Windows 2000 or Windows XP operating system.

Second Entrance or Exit Port

A second entrance to attach for example a second light source or a second exit can be added to the monochromator. It includes a flipping mirror for selecting desired exit or entrance as well as a slit assembly. If you desire both two exits and two entrances for the monochromator you need two of these accessories. Please note that if you select the optional computer controlled shutter, it is positioned inside the monochromator at the entrance port, so selecting this option precludes the use of a flipping mirror on the entrance port of the monochromator.

Nitrogen Inlet Port

If you plan to use the monochromator with UV, below 250 nm, you may wish to purge the monochromator with nitrogen gas to eliminate oxygen, which absorbs in the UV.

Programmable Computer control

An optional computer control accessory is available. It includes a stepper motor assembly, an MD-1000 USB motor controller interface box and a LabVIEW* driver for computer control of the monochromator wavelength with LabVIEW software from National Instruments.

A very simple software package is also provided by OBB to remotely select the wavelength and control the shutter. Requires Windows 2000 or Windows XP operating system.

***LabVIEW is a trade mark of National Instruments**

OEM

One of Optical Building Block Corporation's major markets is for O.E.M applications. Whether its supplying standard off the shelf products, modified products or completely custom designed new products, OBB Corp. has the development team of engineers and scientists to meet your specific needs. Subsequent to the development OBB Corp has the manufacturing capability to produce the product efficiently, reliably and economically in any quantity that you may need.

Our technical expertise resides in developing:

- Specialized light sources
- Monochromators
- Spectrographs
- Microscope accessories
- Low light or fast detection from UV to NIR
- Specific luminescence, fluorescence, phosphorescence systems for use with reagents
- Polarimeters
- Software related to instrumentation control and analysis

In general we specialize in equipment related to the application and uses of light.

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