

Frequency Doubler

OPERATION MANUAL



Photon Technology International

WARNING: Operation or adjustment of this product inconsistent with the instructions herein can result in hazardous radiation exposure.

Frequency Doubler

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Specifications and contents are subject to change without notice.

PTI Standard Instrument Warranty

Warranty Period and Extent

Photon Technology International (PTI) warrants that its instruments will be delivered in a functional state and free from defect, and will meet stated specifications for a period of one (1) year. The warranty period will start on the date of shipment by PTI. In case of systems that include installation by PTI, the warranty will start from the date of installation or thirty (30) days after the shipping date, whichever is earlier.

This warranty is in lieu of all other warranties, expressed or implied, including, without limitation, the implied warranties of merchantability and fitness for a particular purpose, nor will PTI provide training on its use free of charge. PTI shall not be responsible for any liability, loss or damages, caused or alleged to be caused, by the system, as a result of use or operation including, without limitation, consequential damages and loss of profit.

Specific Exclusions and Limitations

1. It is recognized that the performance of consumable items will diminish as a function of use, and that it may be necessary to replace such items to restore the stated specifications. Consumable items (arc lamps, filters, cuvettes, lenses, etc.) are not covered by the warranty.
2. The original manufacturer's warranty will be maintained for major system components not manufactured by PTI (e.g. computers, printers, microscopes, cameras and components thereof).
3. Fiber optic bundles are not covered by the warranty.
4. The use of arc lamps not supplied by PTI (or approved in writing by PTI) will void PTI's warranty on all illuminator subsystem components.
5. If there is any evidence of physical contact with coated optics (e.g. fingerprints), the warranty on that item will be voided.
6. If the optical components are realigned by the customer without specific permission from PTI, the warranty will be voided. Please note that the customer is responsible for changing lamps and aligning the lamp after installation. Aligning the lamp will not void the warranty unless other exclusions are applicable (nos. 4 and 5).
7. Instrument systems that are not authorized to be installed by anyone other than PTI service personnel will not be warranted.
8. In case of systems that include installation as part of the original purchase, unpacking the instrument by anyone other than PTI personnel will void the warranty.
9. Moving systems to another site within a facility or to another location, without specific permission from PTI, will void the warranty.
10. Damage or loss caused by shipping is not covered by the warranty.
11. Damage caused by improper operation of the instrument will void the warranty.
12. Damage caused by equipment not purchased from PTI that is attached to the instrument is not covered by the warranty.
13. Warranty is valid only in the state, province or country of the original purchase.
14. Warranty is valid only on systems having a computer supplied by PTI.
15. Software upgrades performed on the PTI computer workstation (e.g., adding word processors, image editors, etc.) not authorized by PTI will void the warranty.
16. Hardware upgrades performed on the PTI computer workstation (e.g., adding network boards, sound cards, etc.) not authorized by PTI will void the warranty.

Warranty Returns

A Return Material Authorization (RMA) Number must be obtained from the PTI Service Department before any items can be shipped to the factory. Returned goods will not be accepted without an RMA Number. Customer will bear all shipping charges for warranty repairs. All goods returned to the factory for warranty repair should be properly packed to avoid damage and clearly marked with the RMA Number.

Warranty Repairs

Warranty repairs will be done either at the customer's site or at the PTI plant, at our option. All service rendered by PTI will be performed in a professional manner by qualified personnel.

Software

PTI makes no warranties regarding either the satisfactory performance of the software or the fitness of the software for any specific purpose. PTI shall not be responsible for any liability, loss or damages caused or alleged to be caused by our software as a result of its use, including, without limitation, consequential damages and loss of profit, nor will PTI provide training on its use free of charge.

Safety Symbols Used In This Manual

(NOTE: Not all may be present in this manual)



(DANGER)

This symbol indicates the potential for serious bodily harm. Extreme care should be taken when performing the task and all warnings should be strictly adhered to. All possible steps should be taken to ensure safety.



(WARNING)

This symbol represents the potential for electrical shock and/or other bodily harm. Care should be taken when performing the task. There is also the potential for damage to equipment if warnings are not taken seriously.



(CAUTION)

This symbol represents the potential for equipment damage. The user is expected to use care when performing the task.



(RADIATION)

This symbol represents the risk of UV radiation. User must take all appropriate steps to protect eyes and exposed areas of the skin.

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Controls

The Frequency Doubler has only two operational controls: the counting dial and the aperture.

Turn the counting dial knob to select the dial setting.

The aperture is opened and closed using the sliding shutter. It is open when the slider is pushed toward the body of the frequency doubler, and closed when it is pulled out.

Dimensions

Weight: 25 lbs [12 kg]

Inches [mm]

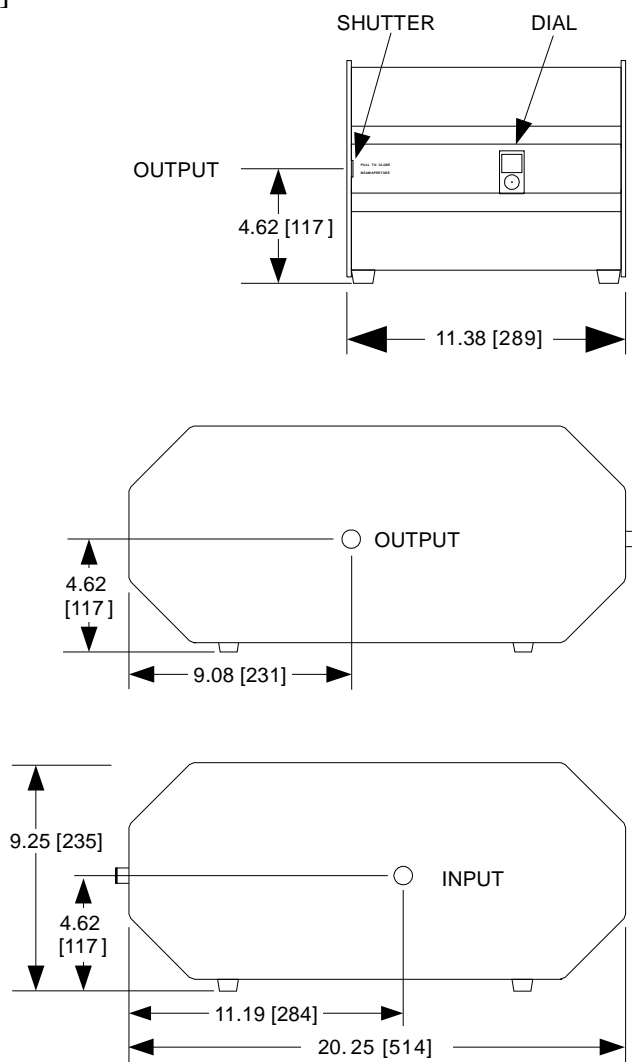


Figure 1 - Dimensions

Optical Schematic

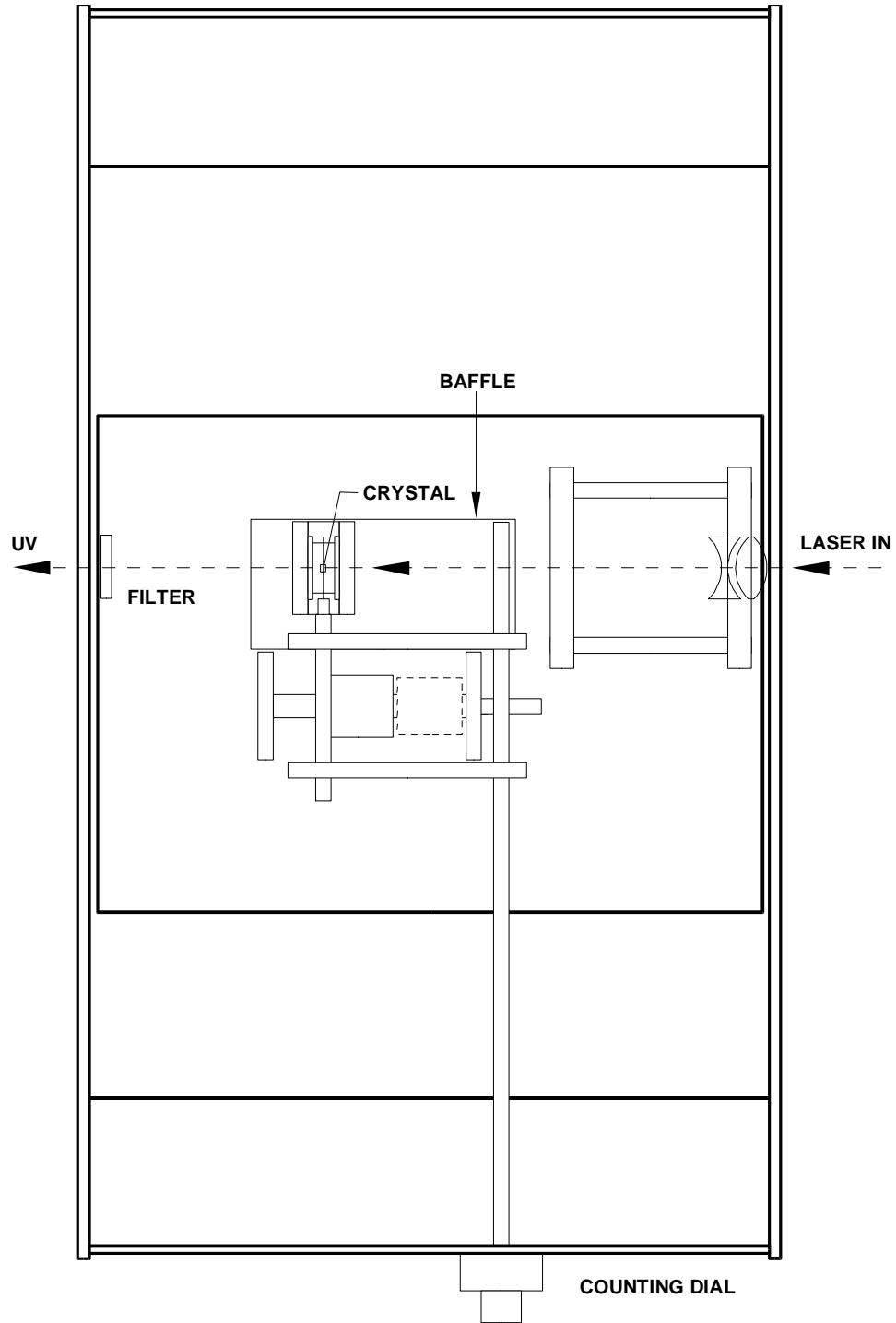


Figure 2 –View from above showing optical schematic

2. OPERATION

Initial Setup

1. Be sure the nitrogen laser is off.
2. Align the nitrogen laser and the dye laser.
3. Physically position the frequency doubler flush against the face of the dye laser such that their cabinet profiles match and the black bands align.

Operation



CAUTION: Always use appropriate laser safety goggles when operating the laser and frequency doubler. Avoid direct exposure to the beam.



WARNING: Under no circumstances is it recommended or required to operate the frequency doubler with the lid raised. Eye injury can result because the surfaces of the quartz crystal cell can reflect a portion of the laser beam out of the compartment. Close the lid of the frequency doubler before restarting the nitrogen laser or opening its shutter.

Although this frequency doubler is highly sophisticated, it is extremely easy and safe to use. The frequency doubler consists of an optically non-linear crystal mounted in a precisely adjustable angle tuner. For efficient operation, the angle tuner must be adjusted to maximize the output power at each wavelength. Optical filters are placed in the filter holder to remove the fundamental wavelength for each dye and any super-radiance from the dye laser.

Note: Do not touch the windows of the crystal cell or any of the optics. Fingerprints can distort the beam and adversely affect performance.

1. The lid of the frequency doubler is hinged to swing back. Open the lid and place the proper filters into their holder (see the calibration report for filter selection).
2. Close the lid of the frequency doubler.
3. From the calibration report, select or interpolate to find the desired dial setting for the frequency doubler.
4. Select the desired dial setting on the frequency doubler.
5. Insert the proper dye cuvettes in the dye laser.
6. Select the desired wavelength on the dye laser.
7. Start the nitrogen laser, following the instructions.
8. Open the shutters of the nitrogen laser, dye laser and frequency doubler.

Interpolation from the calibration report is only approximate. The exact angle depends on temperature and even on the flatness of the bench. Therefore, more precise adjustments to the dial setting must be made using a white business card to observe the emission and adjusting the dial setting to obtain a maximum.

The above initial setup should be sufficient to produce an output beam. Small transverse adjustments of the frequency doubler with respect to the dye laser can then be used to further optimize the power.

The frequency doubler can be used to pass the dye laser beam without doubling its frequency. To do this, remove the filters from the frequency doubler and detune it (change the dial setting away from that which doubles the frequency of the dye laser).

Once the frequency doubler is optimized, it may be removed to use the beam directly from the dye laser. To put the frequency doubler back in its place requires realigning the endplates of the dye laser and doubler (flush against each other, profiles matching). Small transverse adjustments of the frequency doubler with respect to the dye laser can then be used to optimize the power.



All of the components in the frequency doubler are manufactured, assembled and aligned to exacting standards, and locked securely in place before shipment. ***Under no circumstances should any of these components be unlocked and/or adjusted without the express consent of a PTI Service Engineer.***

Tuning Curve

A typical frequency doubler tuning curve is shown below. The curve varies with each crystal and upon the quality of the laser dyes used.

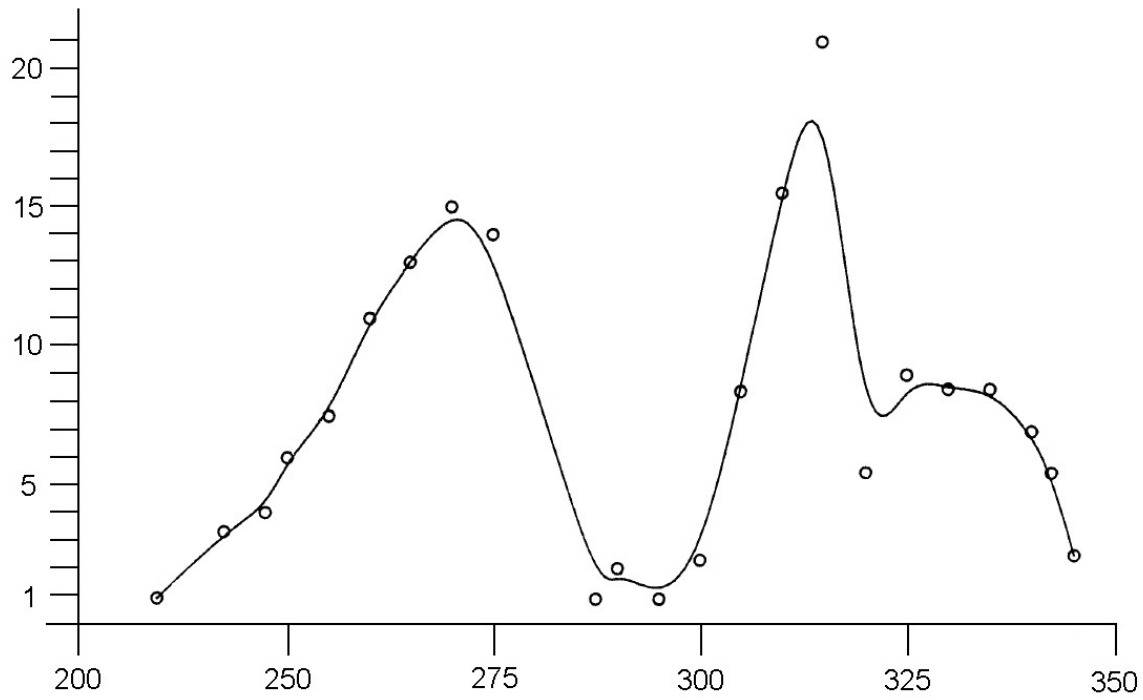


Figure 3 – Typical tuning curve

3. SERVICE

Maintenance

The frequency doubler will deliver trouble-free, reliable performance in part because of the virtual absence of maintenance requirements. Occasionally, remove and clean the filters with lens tissue moistened with methanol. If the quartz windows of the crystal cell appear to be dusty, remove the baffle above the crystal cell, wipe the windows of the crystal cell with lens tissue moistened with methanol, and replace the baffle.



Clean the windows in place. Do not remove or adjust the crystal cell.

Service Calls to PTI

Photon Technology International has designed this frequency doubler to provide years of dependable operation. If for any reason the unit is not performing to your satisfaction, do not hesitate to call PTI for assistance. Most problems can be resolved over the phone.

To aid our Service Department in discussing your questions, as well as to aid in the timely solution of any problems, please assemble as much as possible of the following information before calling PTI:

- Your system serial number, or as many other component serial numbers as possible
- Your instrument type and hardware configuration (and software version, if applicable)
- The date on which your instrument was installed
- As much detail as possible on the particular chain of events or circumstances that led to the problem. This information should include the complete instrument status and data gathering protocol.

Contact PTI Service at
Toll Free: 877-784-4349 US/Canada
Phone: 609 894-4420 Ext 115
Fax: 609 894-1579
Email: service@pti-nj.com

In the rare instance your frequency doubler requires more than routine service, replacement parts and service support can usually be obtained by phone. We will need a purchase order for any replacement parts you require.

It is extremely rare that a frequency doubler or any of its components must be shipped back to PTI for service. However, if such service is required, you must obtain an R.A. (Return Authorization) number from PTI before shipment. No items will be accepted at the plant without an R.A. number.

We listen to our customers. While we feel that we have developed the most advanced frequency doubler available, we are open to your suggestions. Please feel free to contact PTI.

VISIT OUR WEBSITE AT
www.pti-nj.com