

# TLS 260 Series

## Oriel<sup>®</sup> Tunable Light Source Systems



TLS260-250Q

TLS260-300X

User's Manual

**DRIEL**  
**INSTRUMENTS**

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## 1 GENERAL INFORMATION

Thank you for your purchase of this Tunable Light Source system from Oriel Instruments.

Please carefully read the following important safety precautions prior to unpacking and operating this equipment. In addition, please refer to the complete User's Manual for additional important notes and cautionary statements regarding the use and operation of the system.

Do not attempt to operate the system without reading all the information provided with each of the components.

## 2 SYMBOLS AND DEFINITIONS

	<b>WARNING</b> Situation has the potential to cause bodily harm or death.
	<b>CAUTION</b> Situation has the potential to cause damage to property or equipment.
	<b>ELECTRICAL SHOCK</b> Hazard arising from dangerous voltage. Any mishandling could result in irreparable damage to the equipment, and personal injury or death.
	<b>EUROPEAN UNION CE MARK</b> The presence of the CE Mark on Newport Corporation equipment means that it has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.
Note:	Additional important information the user or operator should consider.

Please read all instructions that were provided prior to operation of the system.

If there are any questions, please contact Oriel Instruments or the representative through whom the system was purchased.

## 2.1 GENERAL WARNINGS

- Read all warnings and operating instructions for this system prior to setup and use.
- Do not use this equipment in or near water.
- To prevent damage to the equipment, read the instructions in the equipment manual for proper input voltage.
- This equipment is grounded through the grounding conductor of the power cords.
- Route power cords and other cables so they are not likely to be damaged.
- Disconnect power before cleaning the equipment
- Do not use liquid or aerosol cleaners; use only a damp lint-free cloth.
- Lock out all electrical power sources before servicing the equipment.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Qualified service personnel should perform safety checks after any service.
- If this equipment is used in a manner not specified in this manual, the protection provided by this equipment may be impaired.
- To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.
- Do not block ventilation openings.
- Do not position this product in such a manner that would make it difficult to disconnect the power cords.
- Use only the specified replacement parts.
- Follow precautions for static sensitive devices when handling this equipment.
- This product should only be powered as described in the manual.
- Do not remove the cover for normal usage

## 2.2 ELECTRICAL HAZARDS

Make all connections to or from the power supply with the power off.

Do not use the power supply without its cover in place. Lethal voltages are present inside.

## 2.3 FIRE HAZARDS

Lamps are extremely hot during operation, and for several minutes after being shut off. Keep flammable objects away from the lamp and lamp housing.

Newport Research (fan-cooled) Housings are equipped with a condenser lens. The re-focused output of this lens can cause ignition of flammable targets (ex: wooden walls, certain chemicals).

To avoid fire hazard, use only the specified fuses with the correct type number, voltage and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Only qualified service personnel should replace fuses.

## 2.4 LAMP HANDLING

Read all information and warnings provided with lamp.

Xenon arc lamps used in this system is filled with rare gas at high pressure, so there is a danger of lamp explosion due to mechanical failure. This is particularly true when the lamp is operating since the internal pressure can reach tens of atmospheres. Thermal strains can cause the lamp to explode under certain conditions.

Never touch any lamp with bare fingers or other contaminates. Skin oil or other substances can burn into the lamp envelope during operation and negatively affect the lamp's performance and lifetime.

Always wear appropriate gloves and impact-resistant goggles when handling any lamp. Avoid any mechanical strain during handling. Do not operate the lamp without all housing panels in place.

Lamps become very hot after only a few minutes of operation (up to 150°C) and remain quite hot for at least 10 to 15 minutes after being turned off.

### 3 INTRODUCTION

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Oriel Instruments has extended their Tunable Light Source product line with two new additions. These light sources are already known for being pre-aligned, pre-assembled illumination systems with the following benefits:

- Broad ultraviolet to near-infrared (Xenon lamp models) or visible to near-infrared (Quartz Tungsten Halogen lamp models), tunable wavelength range
- High resolution (slit size dependent)
- Integrated, motorized filter wheel with order sorting filters for filtering input light into the monochromator
- Complete instrument control and data acquisition software

The TLS260 series Tunable Light Sources add the additional benefits and capabilities of:

- Highest output light power at peak intensity wavelength among TLS product
- Exclusive TLS Utility software enabling PC control and data acquisition by a single USB port
- Built-in Oriel detector readout and real-time Oriel detector output display without requiring an external meter
- 360° Rotating output flange for flexibility of use/ease of installation into existing systems
- Flexible output power/resolution adjustment via micrometer driven variable slit

The TLS260 is capable of outputting broadband or monochromatic light from 300-1800 nm with a Xe source or 350-1800 nm with a QTH source with resolution as great as 0.7 nm (slit size dependent). All components are firmly secured to the mounting board and the TLS260 is ready to use once the lamp is installed and all necessary cables have been connected. The new mounting board design has handles mounted for easy transporting of the unit. Mounting feet at the bottom of the mounting board help with placing and leveling the system.

The motorized filter wheel preceding the monochromator includes filters to eliminate second order effects that would otherwise occur within the monochromator. A fixed slit holder is located at the input port of the monochromator, and a micrometer driven slit is located at the output end of the monochromator for simplicity and flexibility in adjusting the resolution and throughput of output light. The output flange of the TLS260 is an optical assembly containing a protected aluminum, off-axis parabolic mirror. This output flange has 360° freedom of rotation, allowing for flexibility and convenience in installing the TLS260 into existing measurement systems. This optical assembly is compatible with Oriel's line of 1.5 inch flange coupling accessories such as lens tubes and filter holders.

Exclusive to the TLS260 series is TLS Utility, a new data acquisition and control software designed exclusively for the TLS260 models. This software communicates with the integrated OPS Power Supply to control the entire TLS260 system, ignite or start the lamp, switch the Cornerstone 260 ¼ m monochromator to the proper grating and grating position, and switch the filter wheel position to the correct order sorting filter. All TLS260 components and any current output detector connected to the OPS Power Supply are automatically detected by TLS Utility among startup of the program.

Two models of TLS260 are available, differentiated by lamp type:

- TLS260-300X: 300 W Xenon lamp
- TLS260-250Q: 250 W Quartz Tungsten Halogen lamp

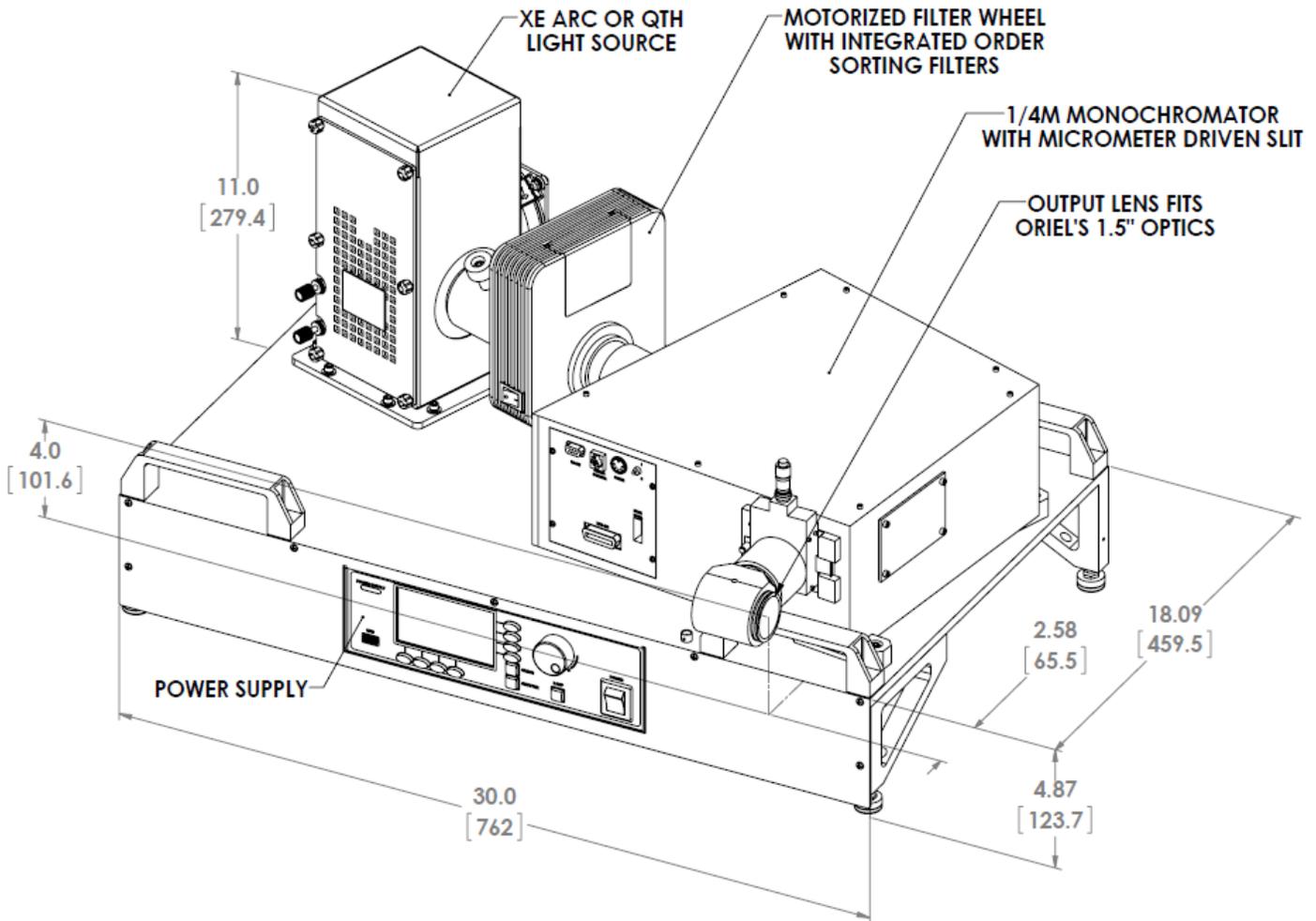


Figure 1: Basic system block diagram and dimensions in inches (mm)

## 4 SYSTEM SETUP

### 4.1 ITEMS INCLUDED WITH SYSTEM

Oriel Instruments provides a pre-aligned Tunable Light Source with all major components firmly secured to a customized mounting plate. The contents of the shipping crate include:

- Power Supply, Research Lamp Housing, filter wheel, and Cornerstone 260 monochromator mounted to base plate
- 2 pcs 250 W QTH lamp for TLS260-250Q model. The TLS260-250Q will have the socket adapter pre-installed inside the research lamp housing.
- 300 W Xe lamp for TLS260-300X model. The TLS260-300X will have the socket adapter already coupled to the lamp.
- 77216 600  $\mu\text{m}$  fixed slit
- 77214 1240  $\mu\text{m}$  fixed slit
- Output optical assembly with off-axis parabolic mirror
- AC power cable for lamp power supply
- AC Power cable for monochromator
- USB cable
- USB stick with TLS Utility v1.0, individual manuals for monochromator, research lamp housing, and power supply
- Cornerstone 260 calibration certificate
- TLS260 system characterization report
- 1/16 L-shape ball hex wrench

### 4.2 UNPACKING

Remove all items from the shipping containers and verify each item is accounted for. The system is carefully packaged to minimize the possibility of damage during shipment. Inspect the shipping boxes for external signs of damage or mishandling. Inspect the contents for damage.

If any item is missing or damaged, immediately contact Oriel Instruments or the Newport representative from whom the system was purchased.

It is suggested to save the packaging material and shipping container, in case the equipment needs to be relocated at a future date.



#### **WARNING**

Do not attempt to operate this equipment if there is evidence of shipping damage or there is suspicion that the equipment will not operate correctly. Damaged equipment may present hazards.

### 4.3 CHOOSING A LOCATION

Choose an installation location where the power requirements can be met for the system. Be sure power is not applied to the system until the setup has been completed.

The environment should be that of a typical laboratory atmosphere, without excessive humidity and contaminants in the air. Do not allow the ventilation holes on the system's components or its computer to be blocked. Air should be able to circulate freely around the system.

When the system is placed in its final location, check to ensure that none of the pre-assembled items have become loose during handling.

## 5 USING THE TLS FOR THE FIRST TIME

The TLS is a plug and play system designed for minimum setup required on the user's end to make the unit operational for use. After unpacking the TLS, follow the steps in the flow chart below, starting with Lamp Installation.

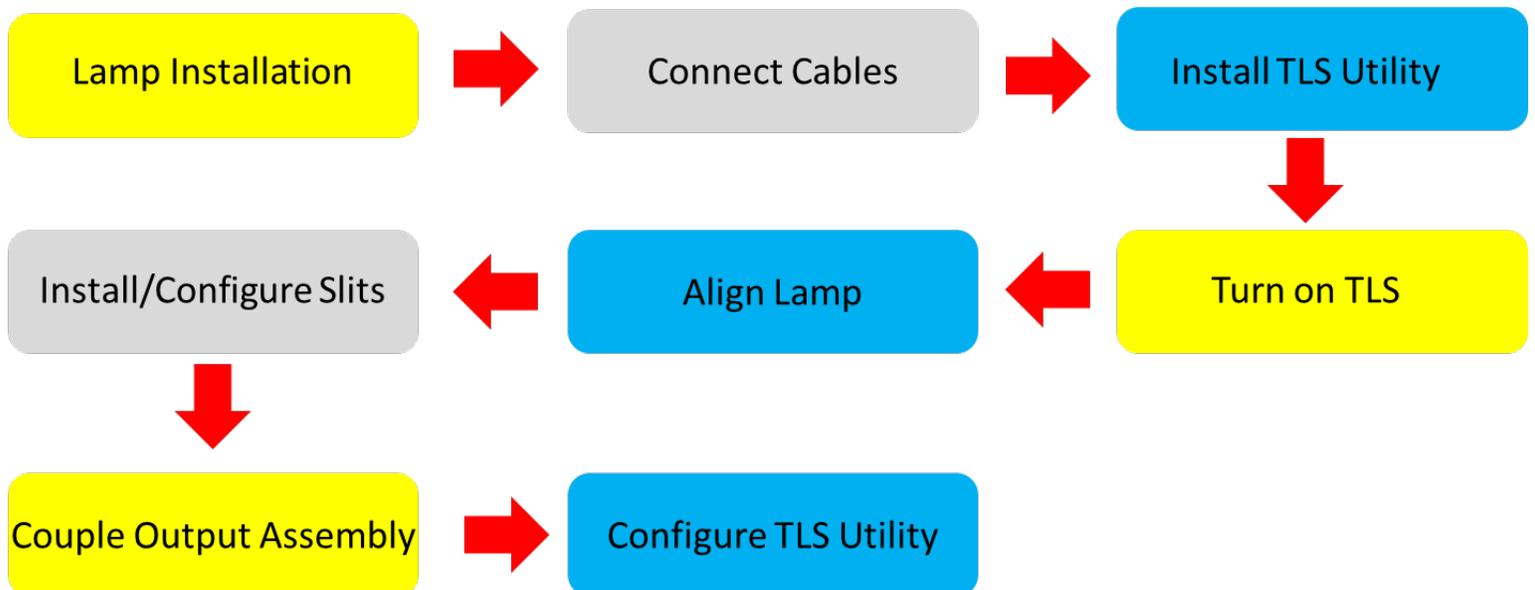


Figure 2: TLS Setup process for optimum system performance

**1. Lamp Installation.** The TLS includes a 250 W QTH (TLS260-250Q) or 300 W Xe (TLS260-300X) lamp. This lamp must be installed into the housing before use. See **SECTION 6 LAMP INSTALLATION** for detailed instructions.

**2. Connect Cables.** The following cables are included with the TLS:

- Cornerstone 260 Monochromator AC power cable
- OPS Series Power Supply AC power cable

**SECTION 6.5 ELECTRICAL AND COMPUTER CONNECTIONS** explains how to properly connect these cables and the necessary safety precautions that must be followed.

- 3. Install TLS Utility.** **SECTION 7.2 INSTALLATION** explains how to install TLS Utility. Users may want to refer to **SECTION 7.1 SYSTEM REQUIREMENTS** of this manual first to ensure their system meets the minimum requirements for installation.
- 4. Turn on TLS.** Turning on the Cornerstone 260 Monochromator, OPS Power Supply, and igniting/starting the lamp turns on all components of the TLS system. Figure 3 shows the On/Off switch of the Cornerstone 260 Monochromator. The 0 position indicates the monochromator is Off and moving the switch to the 1 position turns on the monochromator.



Figure 3: The On/Off switch of the Cornerstone 260 monochromator

5. **Align Lamp. SECTION 8 LAMP ALIGNMENT** explains how to properly align the lamp for both QTH (TLS260-250Q) and Xe lamp (TLS260-300X) versions of the TLS.
6. **Install Slits/Configure. SECTION 9 SLIT WIDTH ADJUSTMENT** explains how to properly install a fixed slit into the fixed slit holder at the input slit of the monochromator and how to configure the micrometer driven slit at the output port of the monochromator
7. **Couple Output Assembly.** To avoid damage during shipping, the optical output assembly is not coupled to the TLS260 during shipping. If this assembly is to be used, it must be installed onto the unit. See **SECTION 10 OPTICAL OUTPUT ASSEMBLY** for installation instructions.
8. **Configure TLS Utility. SECTION 7 TLS UTILITY DETECTOR READOUT AND CONTROL SOFTWARE** explains how to configure TLS Utility and basic functions of the software.

## 6 LAMP INSTALLATION

### 6.1 LAMP HANDLING PRECAUTIONS



Read all warning labels and literature that were provided with the lamp and all literature provided with this system. The power supply must be unpowered before installing the lamp. Never touch the envelope of any lamp. If it is touched, clean it with isopropyl alcohol and a lint-free tissue such as a Kimwipe®.

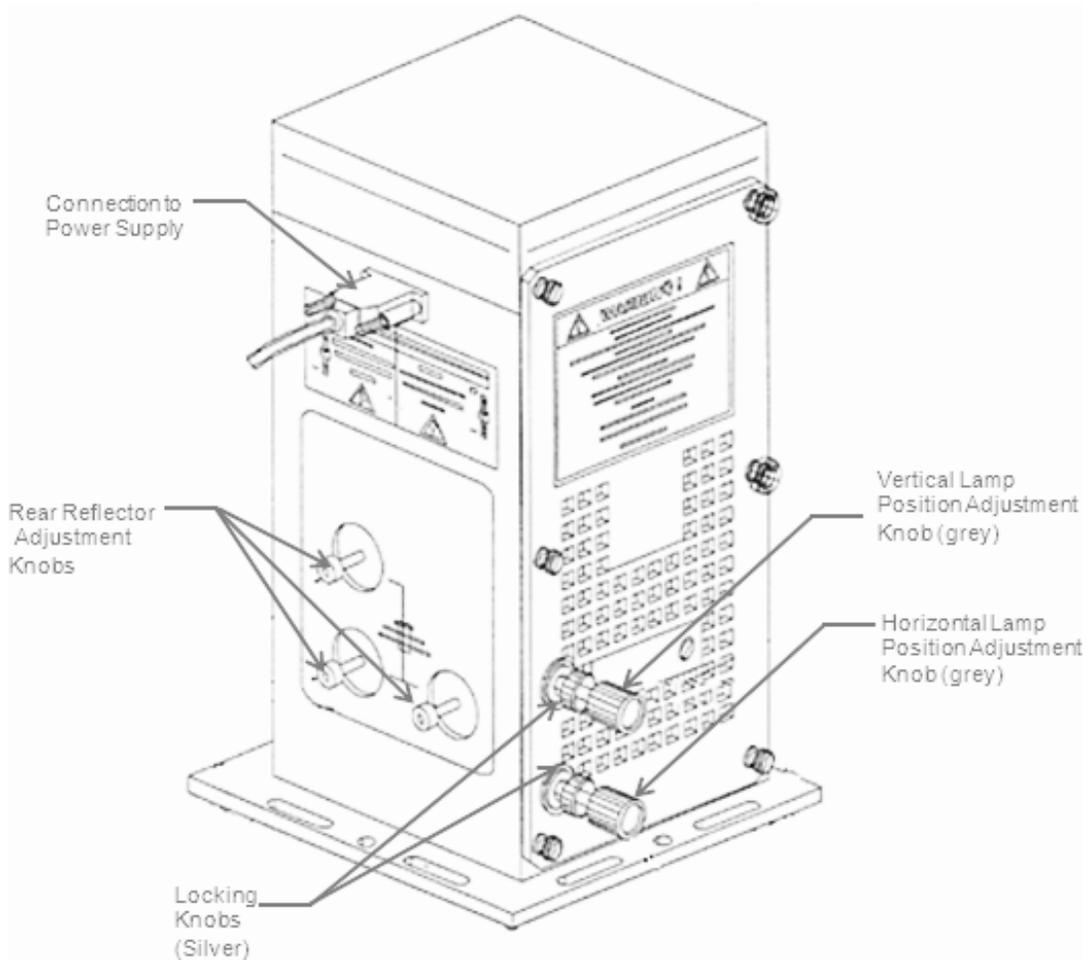
In order to prevent getting contaminants on the glass envelope, Oriel Instruments advises using powder free gloves while handling the lamp. Wearing goggles is also strongly advised. Use care when handling the lamp. Do not bend, flex, or otherwise exert any unnecessary force on the lamp. The lamp is under pressure and glass particles can act as projectiles if the lamp is broken.

Unpack the lamp carefully. Set aside the packing material and box, so that they can be used for lamp storage if the system is to be relocated at a later date (do not transport a lamp housing while the lamp is installed).

### 6.2 ACCESSING THE LAMP COMPARTMENT

The lamp position and reflector position have been pre-set at the factory. **Do not turn the grey end caps** when removing the door to the lamp compartment, as this will move the lamp position.

If the rear reflector or lamp position adjustment knobs are moved, it may reduce throughput and the accuracy of certain sensitive measurements, such as quantum efficiency or spectral responsivity



**Figure 4: Lamp housing adjustment controls**

The lamp is packaged in its own protective box, to prevent shipping damage. The lamp housing door needs to be removed in order to install the lamp. Remove the two socket head cap screws in front of the lamp housing door using the hex wrench provided with the system, as shown in Figure 5.



**WARNING**

Never attempt to ignite a Xenon lamp without being certain that the lamp has been installed into the housing. The resulting electrical arc will result in damage to the ignition circuit, and may result in injury or death.

To open the research housing, unscrew the six knurled black thumbscrews on the side of the housing to remove the access door as shown in Figure 5. It may be necessary to back off the knurled lock nuts on the lamp positioning adjustment screws.



**Figure 5: Opening lamp housing door**

### 6.3 XENON LAMP INSTALLATION

Remove the twist tie or cable tie holding the sensor block in place and loosen the thumbscrew on the lamp mount as shown by the arrows in Figure 6.

Note: always use powder-free gloves when handling a lamp. After a lamp is ignited, finger oils left on the lamp will etch into the envelope material.

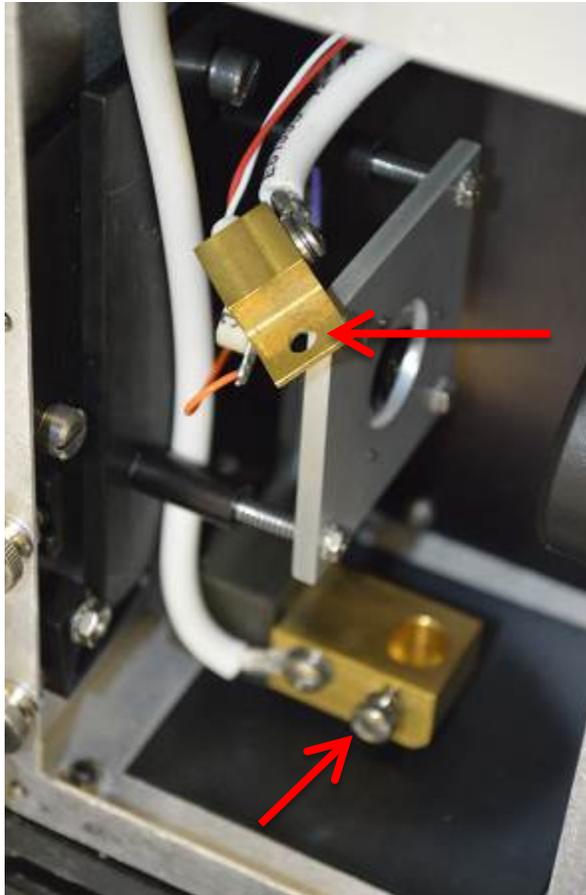


Figure 6: Preparation for arc lamp installation

The lamp shipped with the system comes with a brass piece connected to the bottom lamp terminal (cathode) and a knurled thumbscrew at the top terminal (anode). The brass piece is referred to as a socket adapter. The anode of the lamp is marked with a “+” on the terminal.

A replacement lamp comes with knurled thumbscrews at both terminals. When installing a replacement lamp, the socket adapter must be removed from the previously used lamp and installed in place of the cathode thumbscrew. The socket adapter installation is shown in Figure 7. The cathode is the bottom (negative) terminal.

Note: The lamp shown in Figure 7 has a wire attached to the lamp envelope. This is what is referred to as a “starter wire”. Its purpose is to help with achieving ignition. Do not remove this wire.



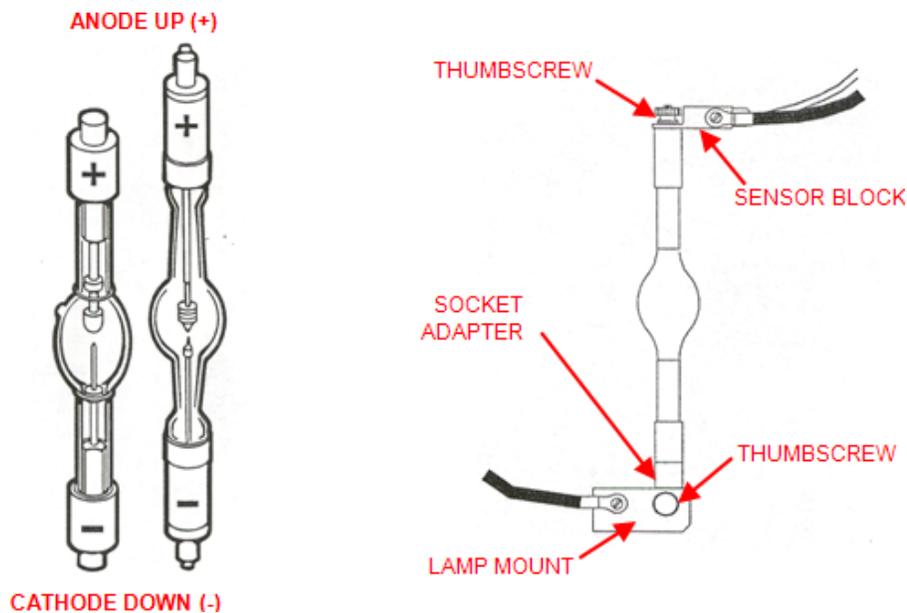
**Figure 7: Socket adapter installation**

Remove the knurled thumbscrews that come installed on the anode end of the lamp, as shown in Figure 8.



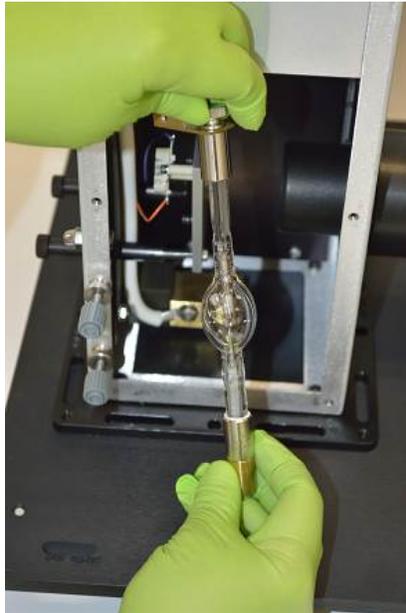
**Figure 8: Lamp prepared for installation**

Before installing the lamp, refer to Figure 9 and double check that the socket adapter is installed on the cathode. Running a lamp installed backwards will result in very premature failure, which is not covered under warranty.



**Figure 9: Arc lamp orientation**

Place the sensor block onto the threaded post at the anode (+ terminal) of the lamp. Loosely secure the sensor block to the lamp with the knurled thumbscrew that came with the lamp as shown in Figure 10.



**Figure 10: Attaching sensor block**

Carefully place the lamp into the lamp mount with the cathode side down. This is the end of the lamp where the brass socket adapter has been installed by the factory. The endcaps of the lamps should not be subjected to strain, as the lamp seals are fragile.

If the lamp includes a starter wire, rotate the lamp so that the wire is facing towards the back of the lamp housing. The back of the lamp housing is where the baffle covers the fan, directly opposite of the door opening.

After the lamp has been oriented correctly, be sure to fully tighten the thumbscrew on the lamp mount and tighten the thumbscrew at the top of the lamp.

Replace the door of the lamp housing, making sure to engage the safety interlock tabs. Secure the door in place using the six plastic fasteners. Use all of them to prevent light leakage. Reinstall the socket head cap screws in front of the door, to secure the lamp housing to the mounting plate.

**Note:** Under no circumstances should the interlock tabs be removed or the interlock circumvented or defeated. Note that the lamp housing cannot be operated without its door being secured in place. If the door is not secured in place then an “Interlock Open” error will appear on the power supply display as shown in Figure 11.



Figure 11: Interlock Open Error Message of the OPS Series Power Supply



Figure 12: Tightening thumbscrew



**Figure 13: Xenon arc lamp installed**

#### **6.4 QTH LAMP INSTLLATION**

Note: always use powder-free gloves when handling a lamp. After a lamp is ignited, finger oils left on the lamp will etch into the envelope material. A Quartz Tungsten Halogen (QTH) lamp is very delicate, so it should not be subjected to excessive strain or it may break.



**Figure 14: QTH lamp installation**

Mount the lamp in the socket adapter by carefully lining up the two pins of the lamp with the socket and pushing in slowly without excessive rocking back and forth.

Replace the door of the lamp housing, making sure to engage the safety interlock tabs. Secure the door in place using the six plastic fasteners. Use all of them to prevent light leakage. Reinstall the socket head cap screws in from of the door, to secure the lamp housing to the mounting plate.

Note: Under no circumstances should the interlock tabs be removed or the interlock circumvented or defeated. Note that the lamp housing cannot be operated without its door being secured in place. If the door is not secured in place then an “Interlock Open” error will appear on the power supply display as shown in Figure 11.

## 6.5 ELECTRICAL AND COMPUTER CONNECTIONS

Before powering up the system for the first time, it is strongly suggested to have a qualified electrician verify the wall socket to be used with the TLS System meets the requirements for operation as noted.

Before making any electrical connections, verify the front panel power switches are in the off position for the monochromator and lamp power supply.

	<p><b>WARNING</b></p> <p>To avoid electric shock, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury or death.</p>
---	---

The line voltage requirements are as follows:

Lamp Power Supply	95 to 264 VAC, 50-60 Hz
Monochromator Power Adapter	100 to 240 VAC, 47-63 Hz

The Tunable Light Source system conforms to CE standards for both safety and EMC. During normal use, this equipment will not pose any electrical hazards to the user. Read all warnings before installing or operating this system. If there are any questions or concerns, contact Oriel Instruments or the regional sales representative for Newport.

	<p><b>ELECTRICAL SHOCK</b></p> <p>Never attempt to open the lamp power supply or monochromator power adapter. These items do not contain any user serviceable parts. Failure to follow this warning can result in severe injury or death.</p>
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The monochromator’s power adapter connects to an AC wall socket and supplies DC voltage to the instrument. Do not open the monochromator cover and attempt to work inside without first turning the instrument off and disconnecting the power cord from the AC mains.

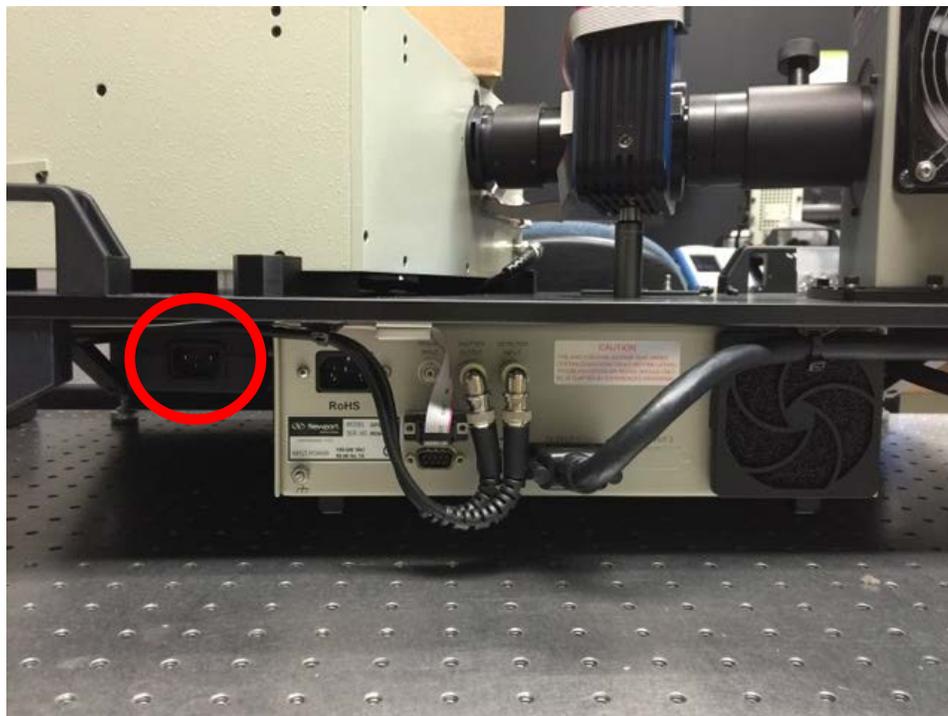
The monochromator has an internal microprocessor and should be installed with appropriate surge/EMI/RFI protection on the power line. A dedicated power line or line isolation may be required in certain locations, as the electronics contained in the instrument are sensitive to static electricity and radiated electromagnetic fields. Operation of the monochromator near intense pulsed sources (lasers,

Xenon flash lamps, etc.) may compromise performance. If shielding is inadequate, the microprocessor may be damaged.

The ribbon cable connecting the monochromator to the filter wheel is installed before the system ships out. The monochromator provides power to the filter wheel and allows the user to select which filter is placed in the optical path.

Ensure the monochromator power switch is in the off position (marked as O). Insert the power cord provided into the power adapter and connect to the AC mains as shown in Figure 15.

Both TLS models come with the USB 1.0 cable. Connect this cable to the computer intended for external control of the TLS260 and the USB connector on the rear panel of the OPS Power Supply as shown in Figure 16.



**Figure 15: The AC mains of the monochromator power adapter**



Figure 16: USB Connector on OPS Power Supply

The following screen will appear on the power supply's LCD upon powering up the OPS Power Supply:

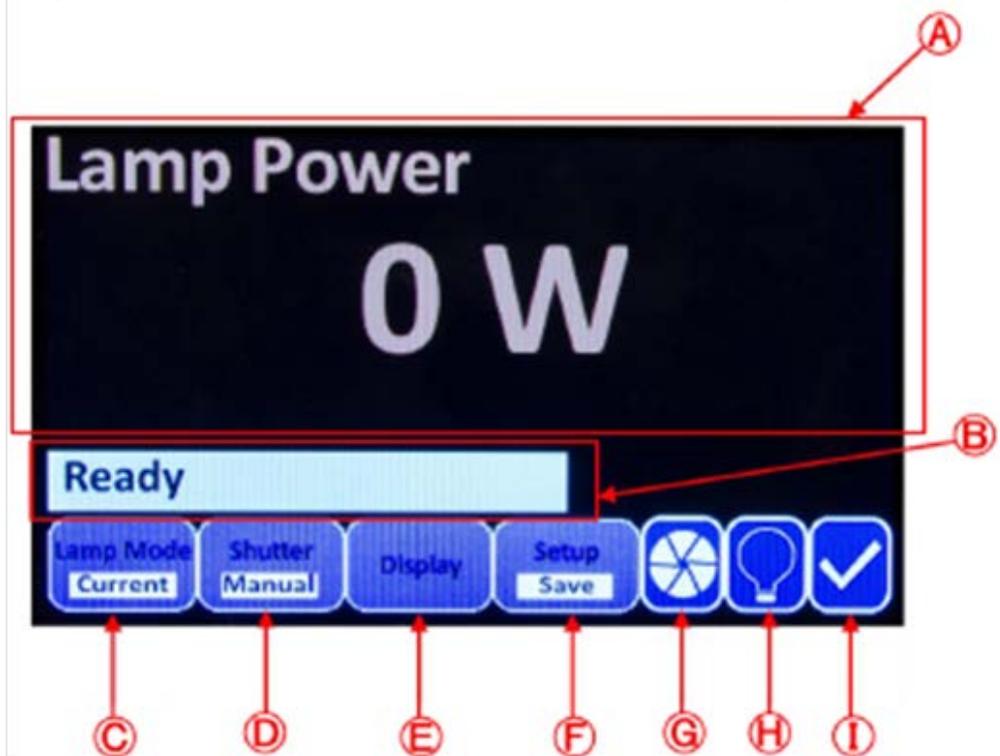


Figure 17: The LCD display of OPS Power Supply

- A. The main section of the LCD screen displays the desired parameter as selected by the user and will be used for menu navigation.
- B. This portion of the LCD screen displays a “Ready” status indicating the power supply and related components (lamp housing, lamp housing interconnection cable) are prepared for lamp ignition, or displays “Interlock Open,” indicating a problem with the system setup. Similar error messages such as “Function Not Available” may also be displayed here. The meaning of these error messages and troubleshooting techniques are explained in the relevant portions of this manual.
- C. **Lamp Mode.** The operating mode as designated by the user will be displayed by this indicator.
- D. **Shutter.** The setting of the shutter, manual or timed, as designated by the user will be displayed here.
- E. **Display.** Pressing the horizontal menu button under this icon will reveal the vertical menu listing the display options available by the OPS-A Model Power Supply.
- F. **Setup.** Pressing the horizontal menu button under this icon will allow the user to Save and Load preferred settings, reset the amount of hours the OPS-A has been recording for the current lamp in use, and access other functions of the power supply. More details on the functions accessible with the menu button under this icon are explained throughout this manual.
- G. **Shutter Indicator.** This icon displays the open/close status of the shutter.
- H. **Lamp Indicator.** This icon displays the ignition status of the lamp.
- I. This icon will display either a Check Mark, indicating lamp housing connections and lamp housing door are properly secured, or an Exclamation Point, indicating the connections and/or door previously referenced need to be re-examined for secure connection(s)

To start the lamp, first switch on the power supply using the switch marked **POWER** located on its front panel as shown in . Then, press the **LAMP** button on the front panel of the power supply.

A Xenon lamp will go to full power immediately after it has been ignited. A QTH lamp will gradually ramp up to the operating current to minimize the stress on the lamp. **All types of lamps must be allowed to fully warm up and stabilize prior to data acquisition.**

For TLS systems with an arc lamp (TLS260-300X) it is recommended to operate the lamp in **Constant Power mode** for better long term output stability and lamp lifetime.

For TLS systems with a QTH lamp (TLS260-250Q) it is recommended to operate the lamp in **Constant Current mode** for consistent light intensity output throughout the lifetime of the lamp. Please see the OPS Power Supply Manual for more information on operating the OPS Series Power Supply.

In order to achieve the maximum light output from the lamp, it is recommended the lamp be operated at but not exceed the voltage and current values shown in the following table:

Model	Power	Current
TLS260-250Q	250 W	10.42 A
TLS260-300X	300 W	15 A

The lamp housing is cooled by its own fan. The fan speed is regulated by the electronics built into the lamp housing. An additional safety shutoff switch is also present to turn off the lamp in case of overheating.

When one is finished with using the system, use the **LAMP** button to turn off the lamp. While the power switch is left on, the lamp housing fan will switch to high speed to cool the lamp. This cooling process takes up to 20 minutes. After this time has elapsed, the fan shuts off.

Note: Excessive ignition places stress on the lamp, wears away the arc lamp electrodes and will reduce lamp life. Always allow the lamp to cool off completely before re-igniting it. If there are any difficulties igniting the lamp, refer to the portion of this manual marked **SECTION 16.2** for possible causes of lamp ignition failure and power supply error messages.

## 7 TLS UTILITY DETECTOR READOUT AND CONTROL SOFTWARE

### 7.1 SYSTEM REQUIREMENTS

Basic system requirements for installation of the TLS Utility Software are shown in the following table:

Operating System	Microsoft Windows 7 (32-bit or 64-bit) Microsoft Windows 8 (32-bit or 64-bit) Microsoft Windows 10 (32-bit or 64-bit) Microsoft .NET Framework 4.0
Processor	Pentium 4M (or equivalent) or later (32-bit) Pentium 4 G1 (or equivalent) or later (64-bit)
RAM	1 GB minimum
Peripheral	USB 2.0 Port
Hard Drive Space	1 GB minimum

### 7.2 INSTALLATION

The TLS Utility installer will install the following items to the computer:

- TLS Utility Application v1.0

Additional Application Dependencies:

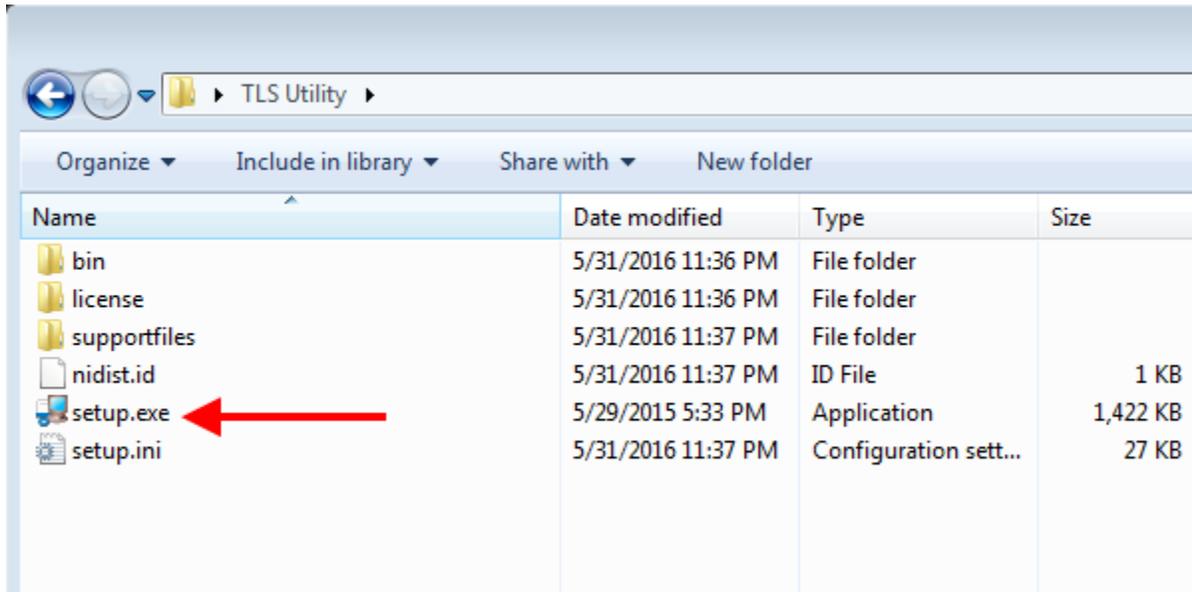
- LabVIEW Runtime 14.0
- NI-VISA Runtime 14.0
- NI-Serial Runtime 14.0
- NI-488.2 Runtime 14.0

Please note that the installation procedure shown in this user manual is based on a Windows 7 64-bit operating system, with all files installed into default directories. The installation procedure will differ slightly when using a different operating system. This installation procedure is also for TLS Utility v1.0. The installation procedure for future, updated versions of TLS Utility may vary.

TLS Utility was developed in National Instruments LabVIEW. This software is not required to use TLS Utility. When installing TLS Utility software, a LabVIEW runtime engine is installed, allowing any computer meeting the minimum system requirements to operate this software. If the appropriate version of the runtime engine is already installed onto the computer, the installation screens may differ slightly from what is shown in this user manual.

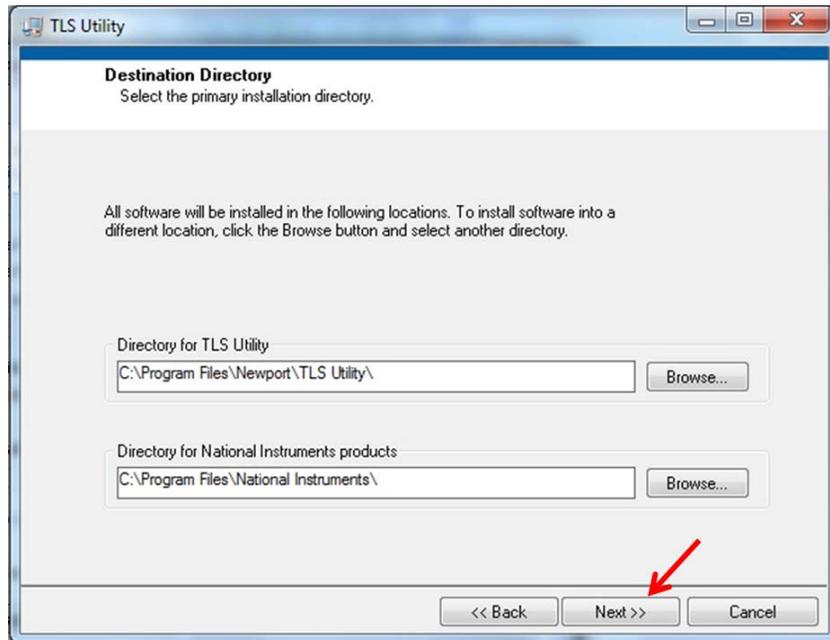
Before beginning the installation procedure, turn off and disconnect all instruments from the computer, then close all applications. An account with Administrator privileges should be logged into to install the program.

Insert the TLS Utility USB memory stick into the computer's USB port and open its contents. Double click on the setup application to begin the installation procedure.



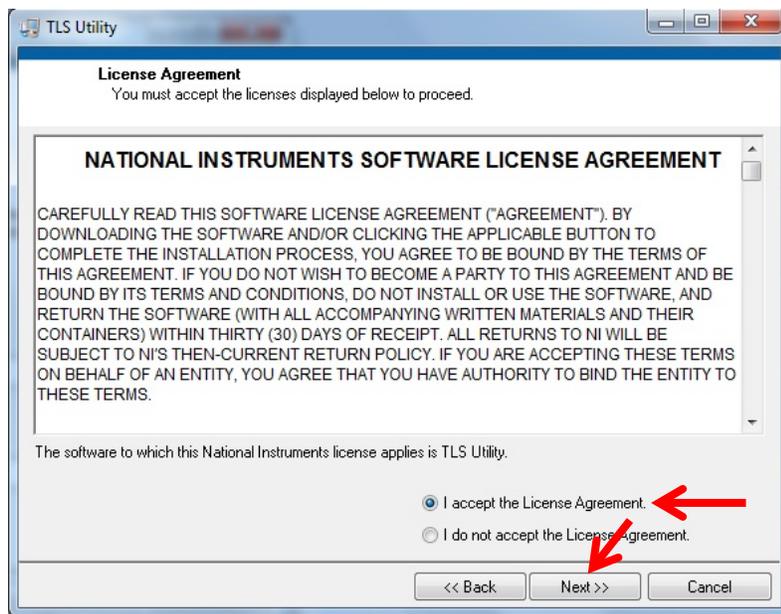
**Figure 18: Setup.exe application**

Select the destination directories for TLS Utility and the National Instruments software, and click Next.



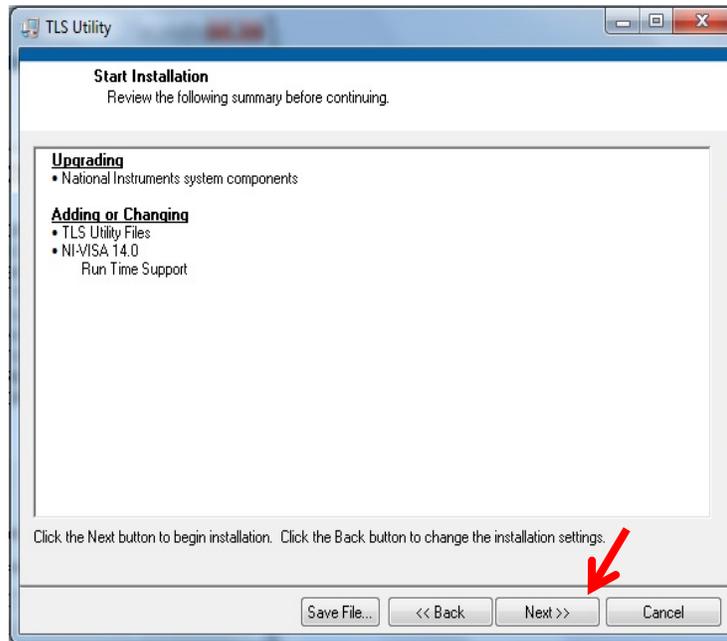
**Figure 19: Destination directories**

Accept all license agreements and click “Next”.



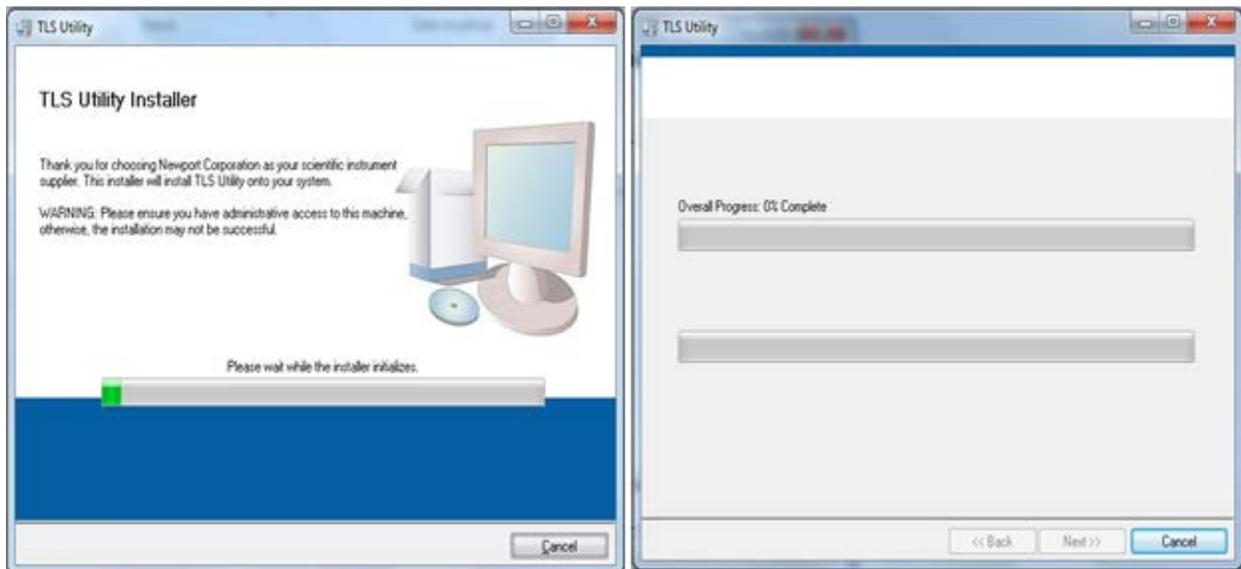
**Figure 20: License Agreement**

Review the Installation summary and click “Next” to begin the installation process. This screen will vary depending on what software is already installed on the computer.



**Figure 21: Installation summary**

TLS Utility Installer will initialize and begin. If installation needs to be stopped at any time during the installation process, click Cancel at the bottom right of the window.



**Figure 22: TLS Utility Installer**

When TLS Utility has finished installing, a window confirming installation and offering the option to restart the computer will appear. Click Restart to complete the installation process. The computer must be restarted before attempting to use TLS Utility.

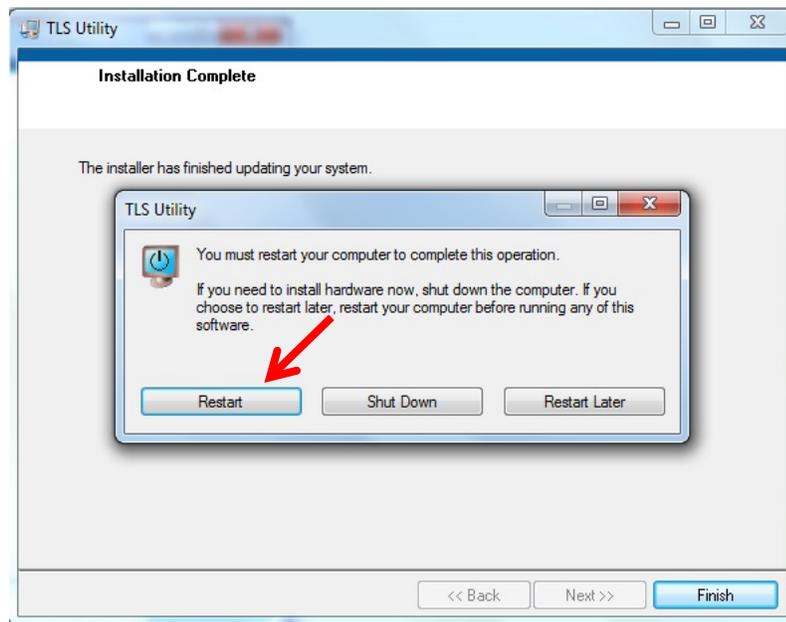


Figure 23: Restart prompt

### 7.3 OPS POWER SUPPLY FIRMWARE

	<p><b>WARNING</b></p> <p>Do not install any OPS Power Supply firmware updates on Newport.com without consulting your Technical Sales Engineer first. Doing so will render your OPS Power Supply incompatible with TLS Utility Software.</p>
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Be advised the OPS Power Supply firmware is a specially optimized firmware for integration with the TLS260. Any OPS Power Supply firmware updates available from Newport.com are meant for those using the OPS Power Supply as a standalone unit, not in an integrated system. Updating the OPS Power Supply firmware with any of these updates will erase the power supply's compatibility with TLS Utility and its ability to control the monochromator and filter wheel. If you have any questions contact your Technical Sales Engineer or call (800)-222-6440.

### 7.4 STARTING TLS UTILITY

Before launching TLS Utility, the PC intended for use with the TLS260 should be connected to the OPS Power Supply via the USB connector as shown in Figure 16 of **SECTION 6.5 ELECTRICAL AND COMPUTER CONNECTIONS**. The power supply and monochromator should be switched on. power supply and monochromator should be switched on.

## 7.5 ESTABLISHING MONOCHROMATOR COMMUNICATION

The Cornerstone 260 monochromator should be automatically detected by TLS Utility, as indicated by a green light near the MONO status icon of the Instrument Status bar of the main interface.

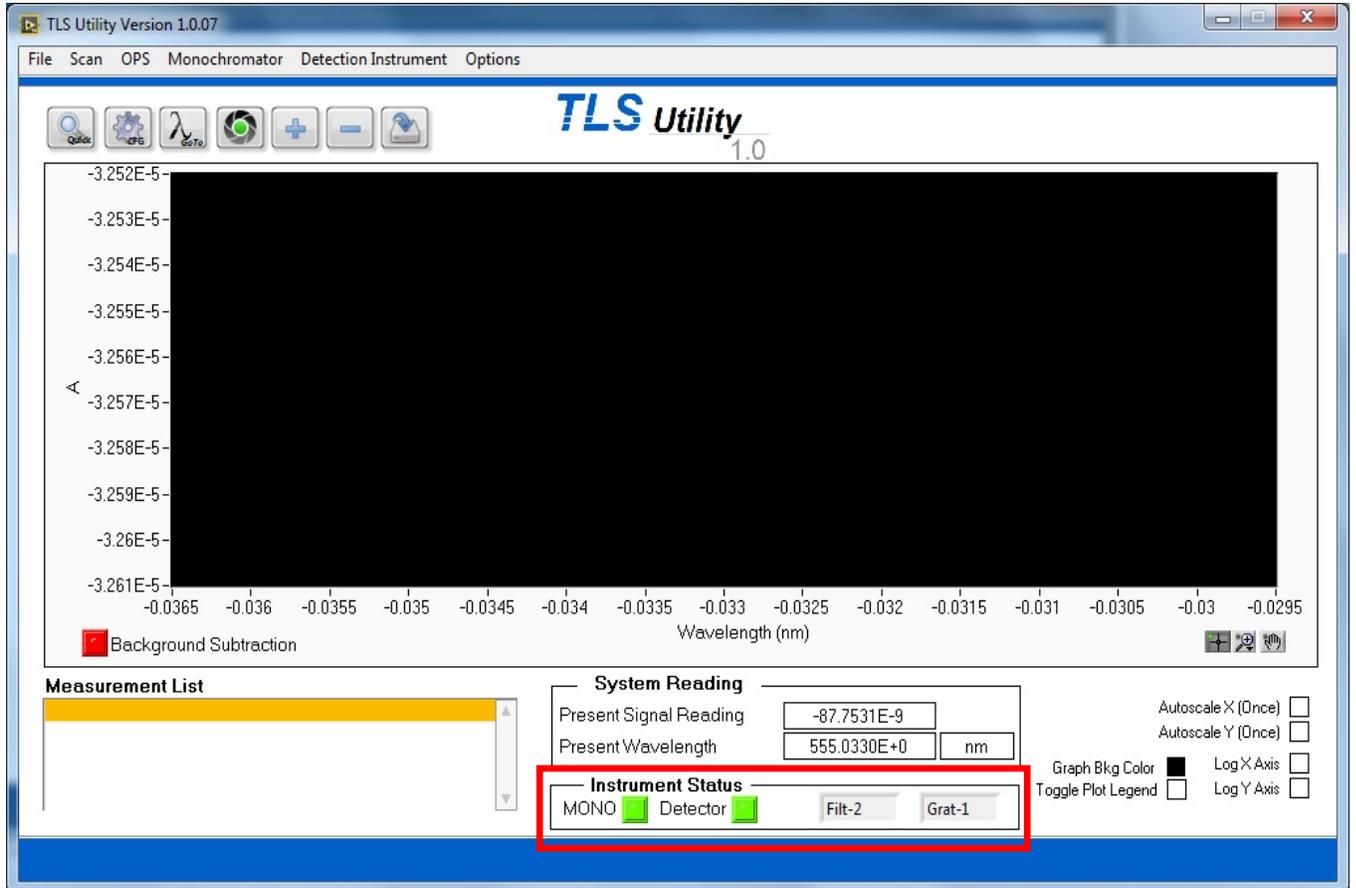


Figure 24: TLS Utility Main interface

If the icon next to the right of MONO is red, the monochromator is not detected by TLS Utility. To connect the monochromator, use the Select Monochromator option from the Monochromator pulldown menu. Click Connect at the Connect to Instrument pop-up menu. The icon to the right of MONO will flash between red and green, and stay green when the monochromator has been connected.

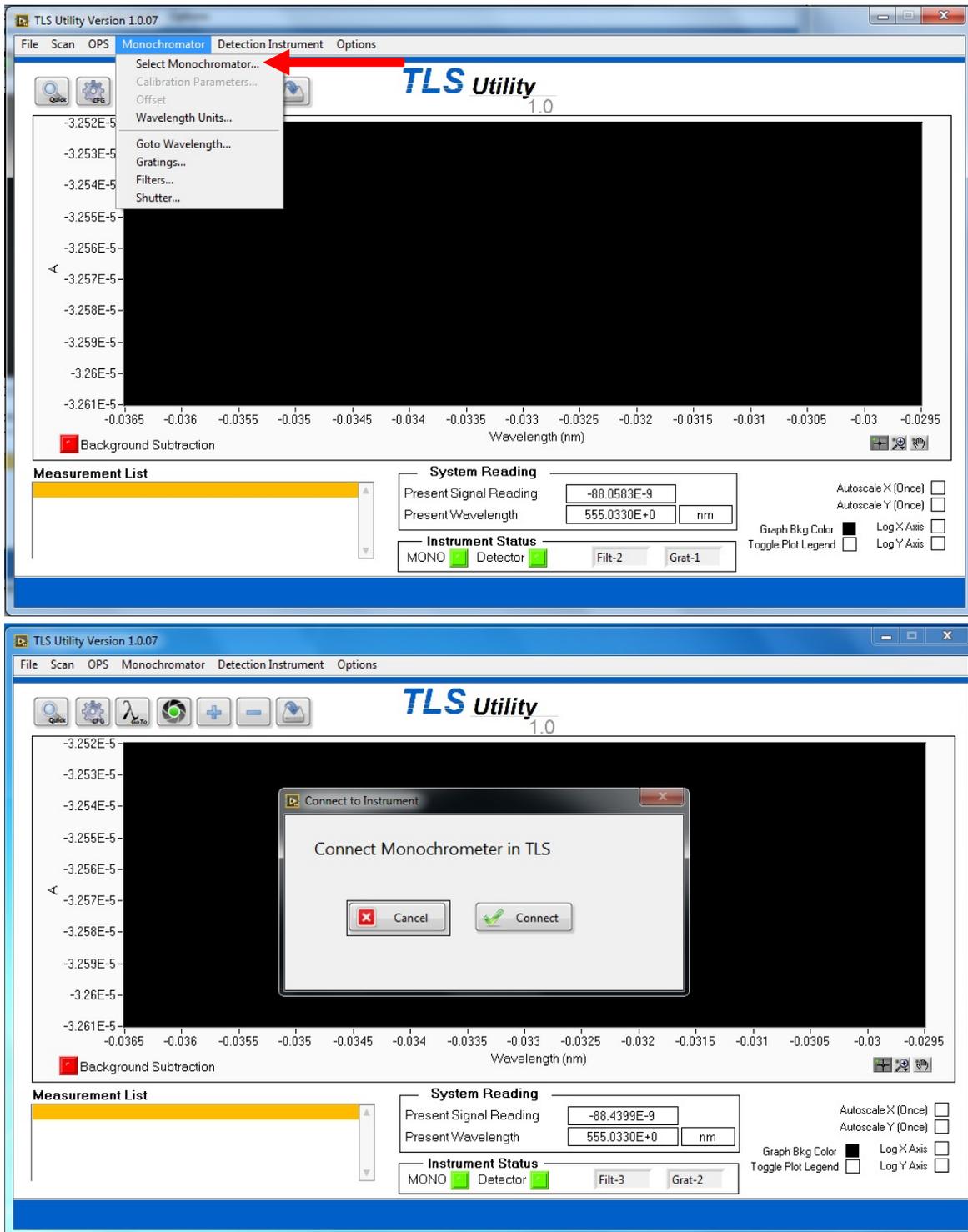


Figure 25: Connecting the monochromator to TLS Utility.

## 7.6 ESTABLISHING DETECTOR COMMUNICATION

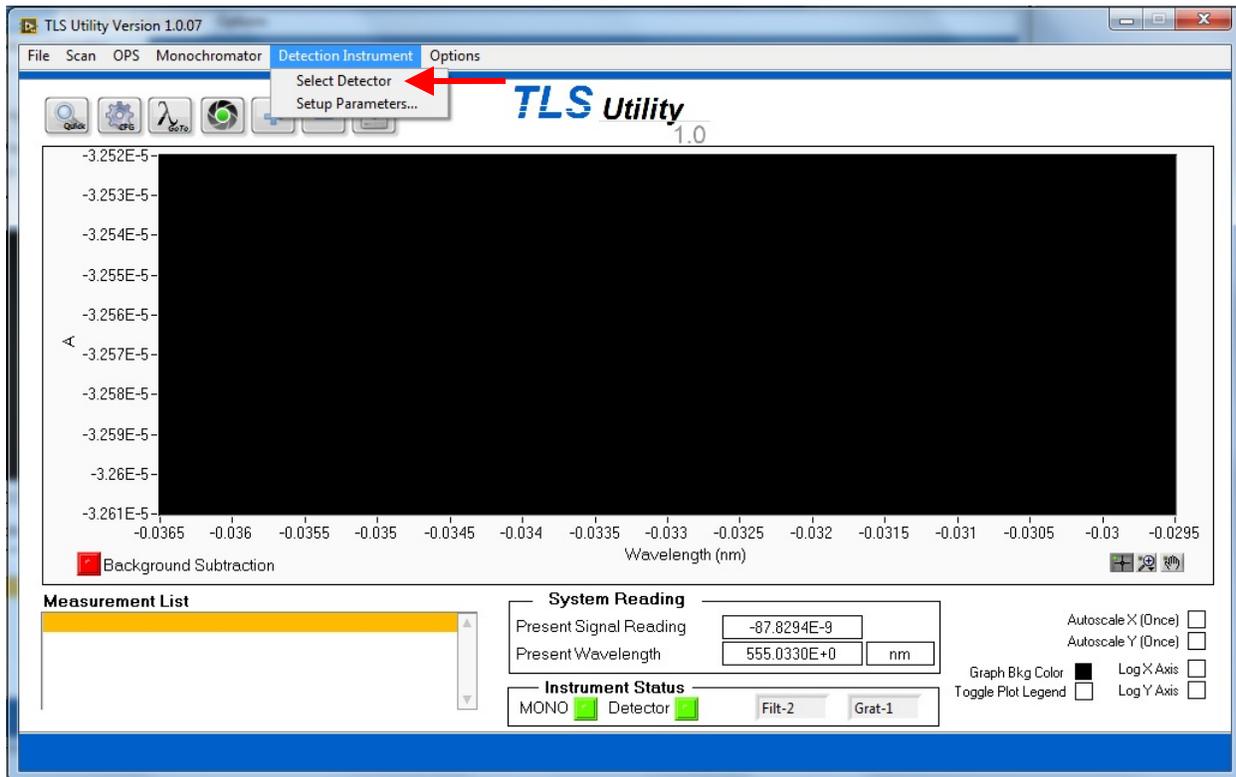
TLS Utility is able to read and acquire data through an external Newport power meter, or the current output data from an Oriel unamplified detector connected directly to the OPS power supply.

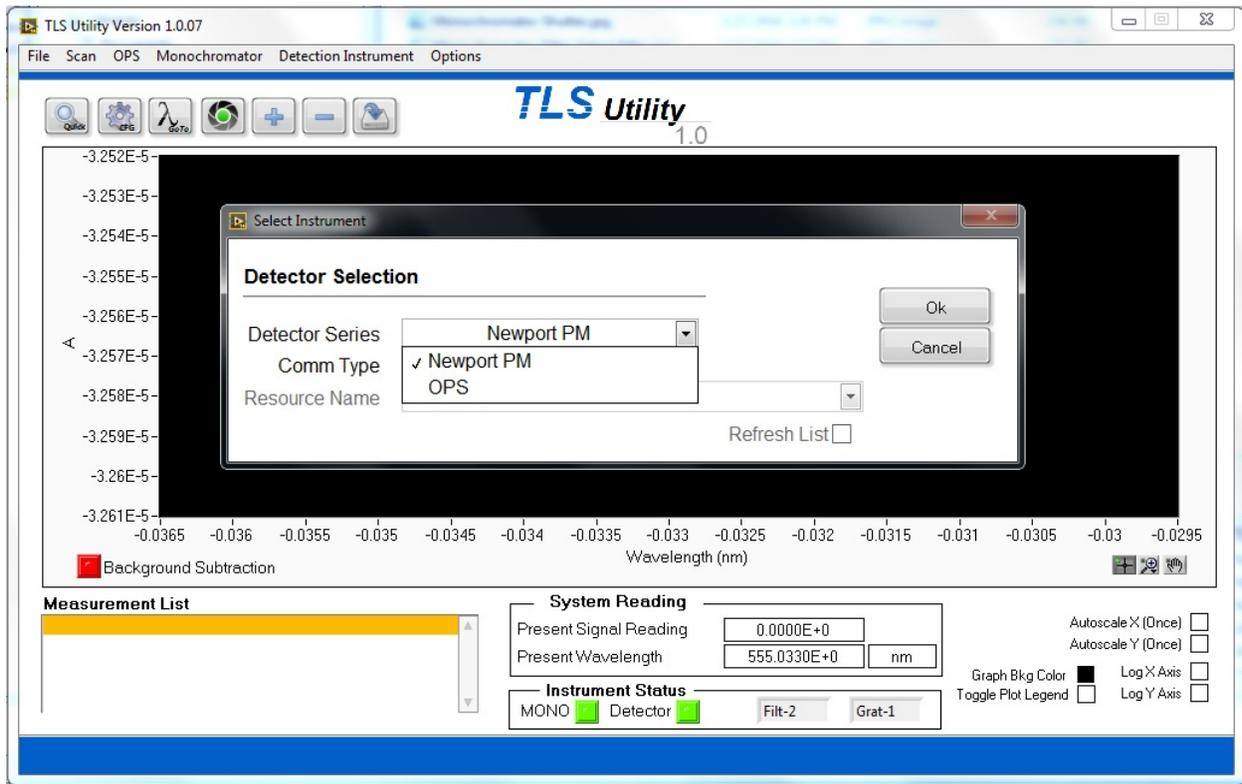
See **SECTION 12 CONNECTING A DETECTOR** for instructions on connecting an Oriel unamplified detector to the baseplate of the TLS.

For connecting a detector via an external power meter, connect the detector, power meter, and computer as instructed by the manual for the power meter. All necessary drivers for the power meter should be installed on the computer. TLS Utility is capable of communicating with the following Newport power meters:

- 1918-C
- 1918-R
- 1936-C
- 2936-C
- 2936-R

Use the Select Detector function from the Detection Instrument pulldown menu. If connecting to a detector via an external power meter, select Newport PM from the Detector Series pulldown menu. If connecting to an Oriel detector via the BNC connector on the TLS260 baseplate, select OPS.

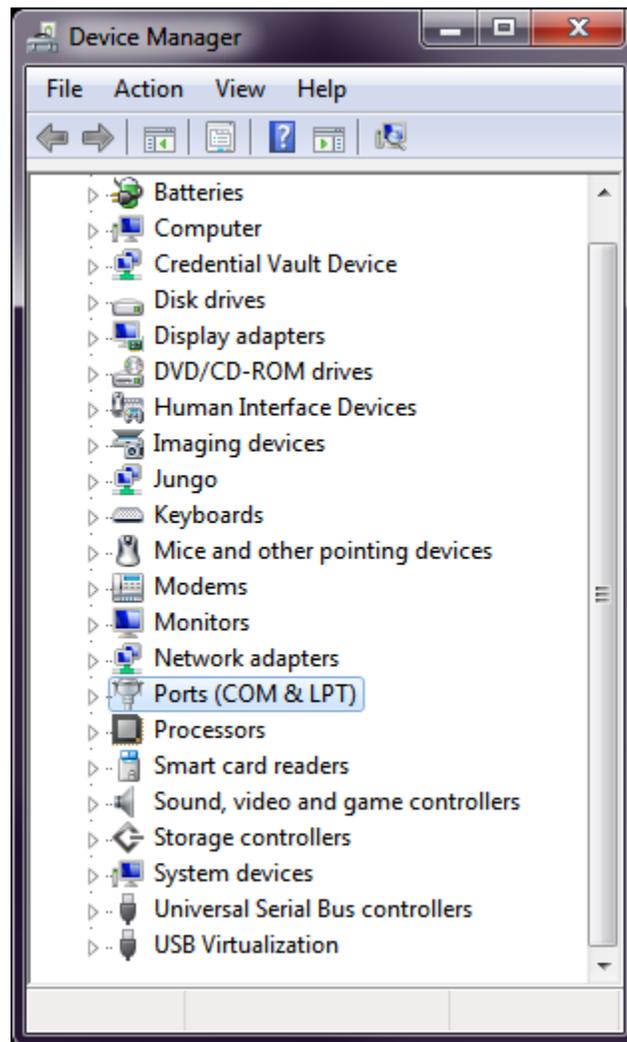




**Figure 26: Connecting a detector to TLS Utility**

If an external power meter is being used, select USB or RS232 on the pulldown menu next to Comm Type. RS232 requires the Com Port to be specified in TLS Utility by using the pulldown menu next to Resource Name.

A Com Port number may be determined using the Windows Device Manager. If multiple devices are listed, turning the instrument off and back on will help to determine which Com Port applies to which instrument. When the instrument is turned off, it will no longer be listed in the Device Manager. It will reappear when the instrument is turned back on.



**Figure 27: Finding a COM Port**

When the COM port the power meter has been plugged in has been confirmed, select the proper COM port in the pulldown menu next to Resource Name in TLS Utility.

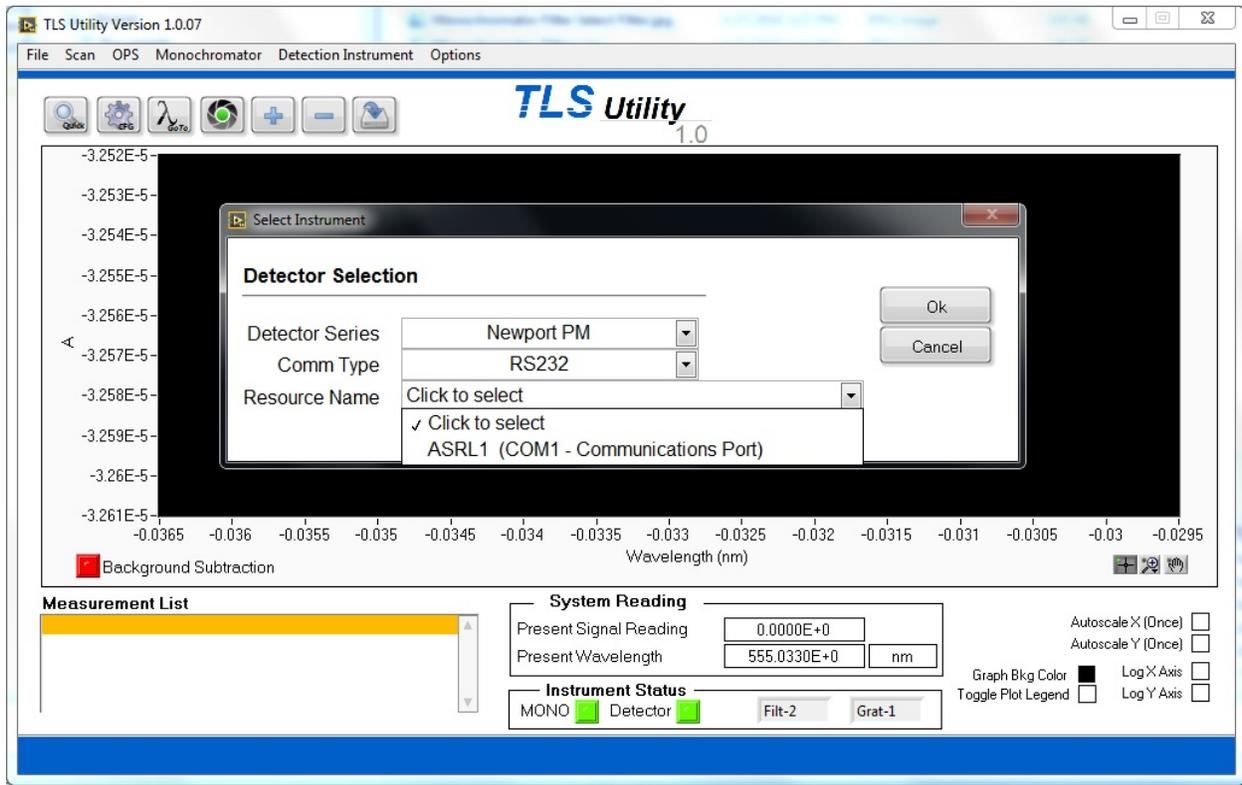


Figure 28: Selecting the proper Com Port for an RS232 power meter

## 7.7 POWER METER PARAMETER SETUP

To access and set up the features for an external power meter, go to the Detection Instrument pulldown menu and select Setup Parameters... A number of Mode and Filter choices are available, with DC Continuous and no filtering as the defaults. Consult the power meter's user manual for more information on these settings.

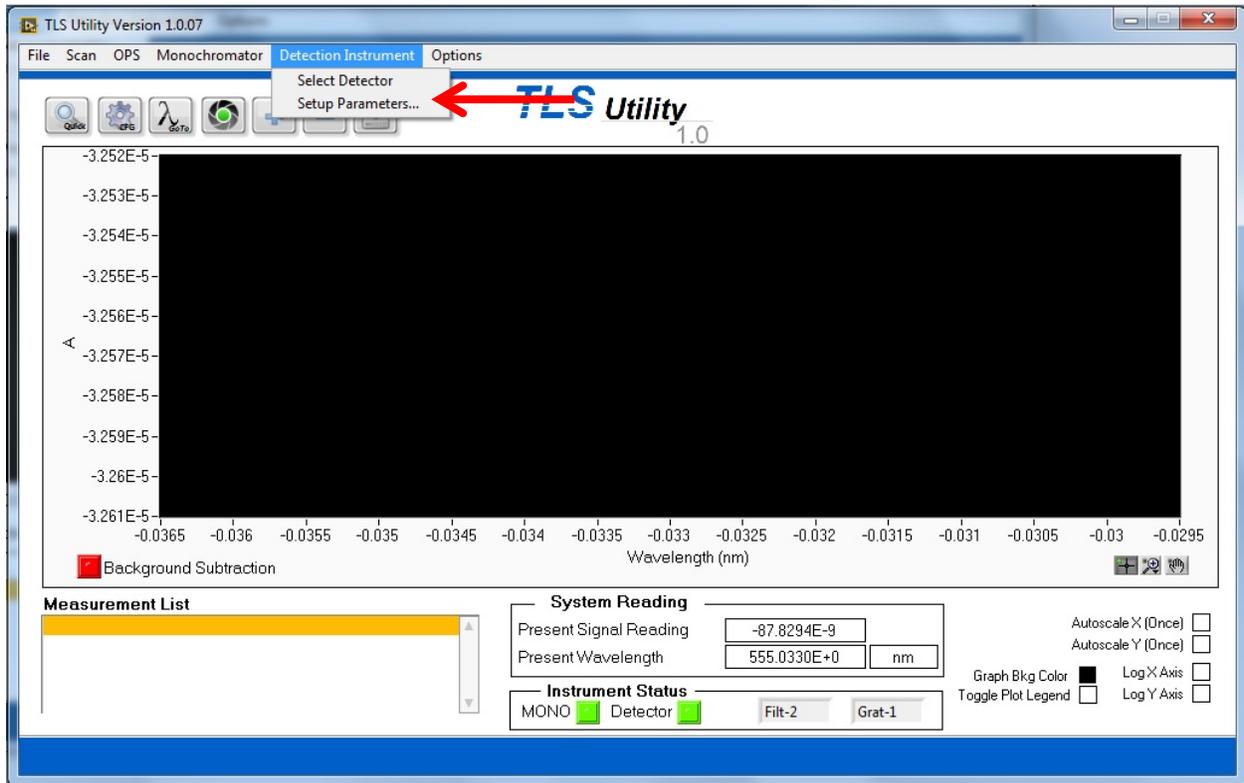


Figure 29: Detection Instrument pulldown menu

Units may be selected as amps, volts, watts, watts/cm<sup>2</sup>, joules, joules/cm<sup>2</sup> or dBm. The use of watts requires that the detector be calibrated with the calibration data contained in the PROM module used by the meter. If that is not available, the Detector Radiometry scans also may be used to obtain power measurements.

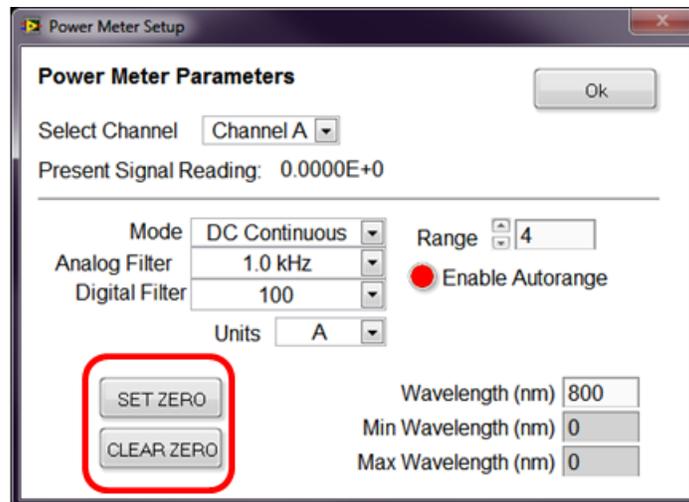


Figure 30: External Power Meter parameter setup

### 7.7.1 Zeroing a Detector

Zeroing a detector minimizes the contribution of dark output, or output response from the detector in the absence of incident light, on the output scan data. To zero the detector, close the shutter. Then, click SET ZERO in the Power Meter Setup menu. Be sure to open the shutter before beginning a scan.

## 7.8 GRAPH CONTROLS

Graph controls are located below the plot window as shown in Figure 31. To pan across the plot, click the hand icon. The magnifying glass icon is used to access six additional icons for zoom control, shown in Figure 32.

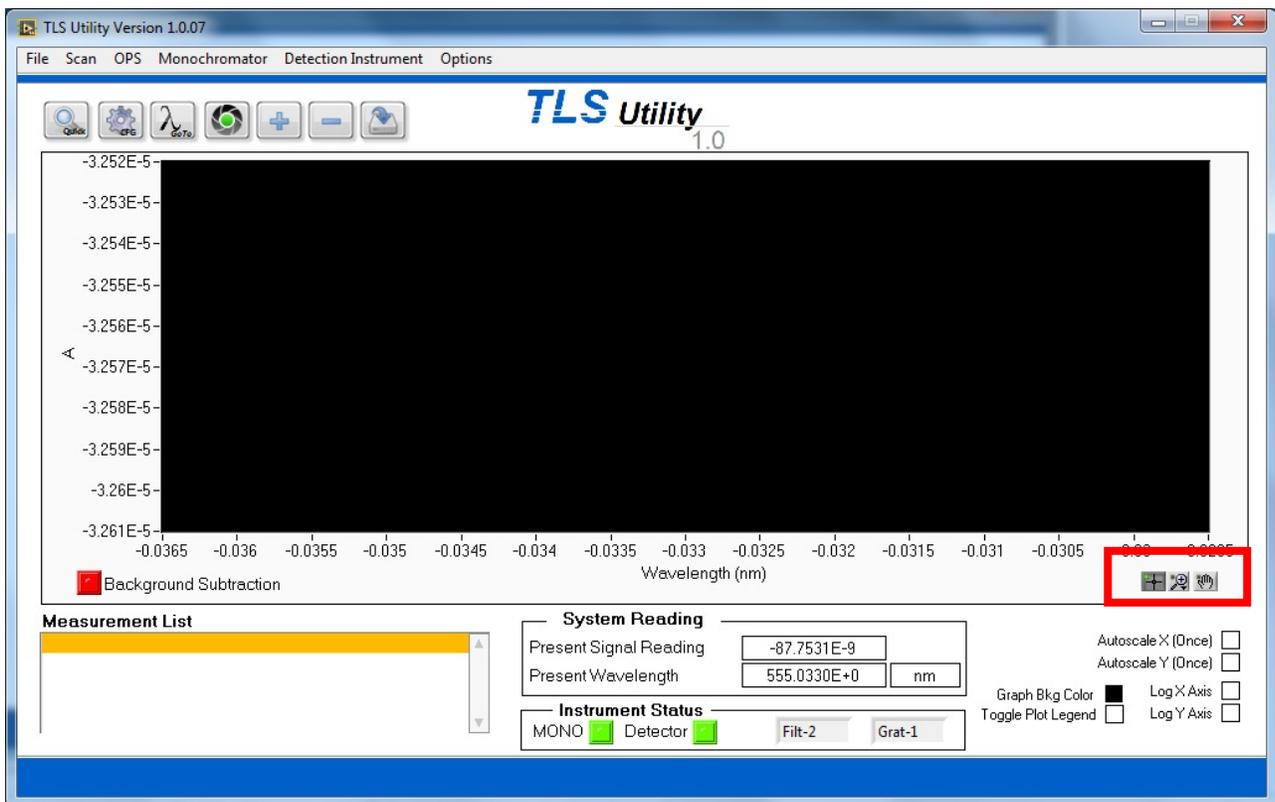
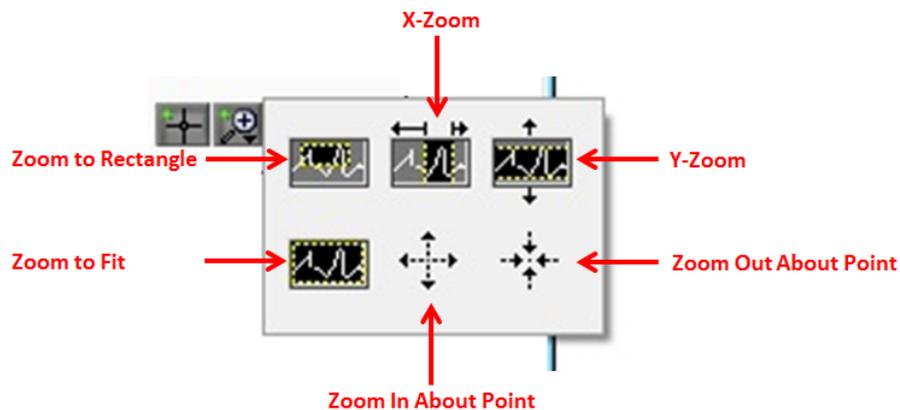


Figure 31: Pan and Zoom Graph Control icons in main TLS Utility Interface.



**Figure 32: Pan and Zoom Icons.**

**Zoom to Rectangle:** changes the viewing window. Click in one corner of the desired viewing window, and then drag the mouse to form a rectangular viewing area.

**X-Zoom:** zooms in on a specific range on the x-axis.

**Y-Zoom:** zooms in on a specific range on the y-axis.

**Zoom to Fit:** automatically fits entire plot to window.

**Zoom In About Point:** zooms in on a specific point. Hold down the Shift on the keyboard to zoom out.

**Zoom Out About Point:** zooms out from a specific point. Hold down the Shift on the keyboard to zoom in.

Alternatively, X-Zoom and Y-Zoom may be accomplished by highlighting and retyping the starting and ending values of the plot in x and y-axes, respectively. This is a useful feature when it is desired to zoom in to a very specific range. An example is shown in Figure 33. The scan shows a Xenon lamp output as captured by a silicon detector. The lowest wavelength of 100 nm was retyped to be 700 nm. The highest wavelength of 1200 nm was retyped to be 1100 nm.

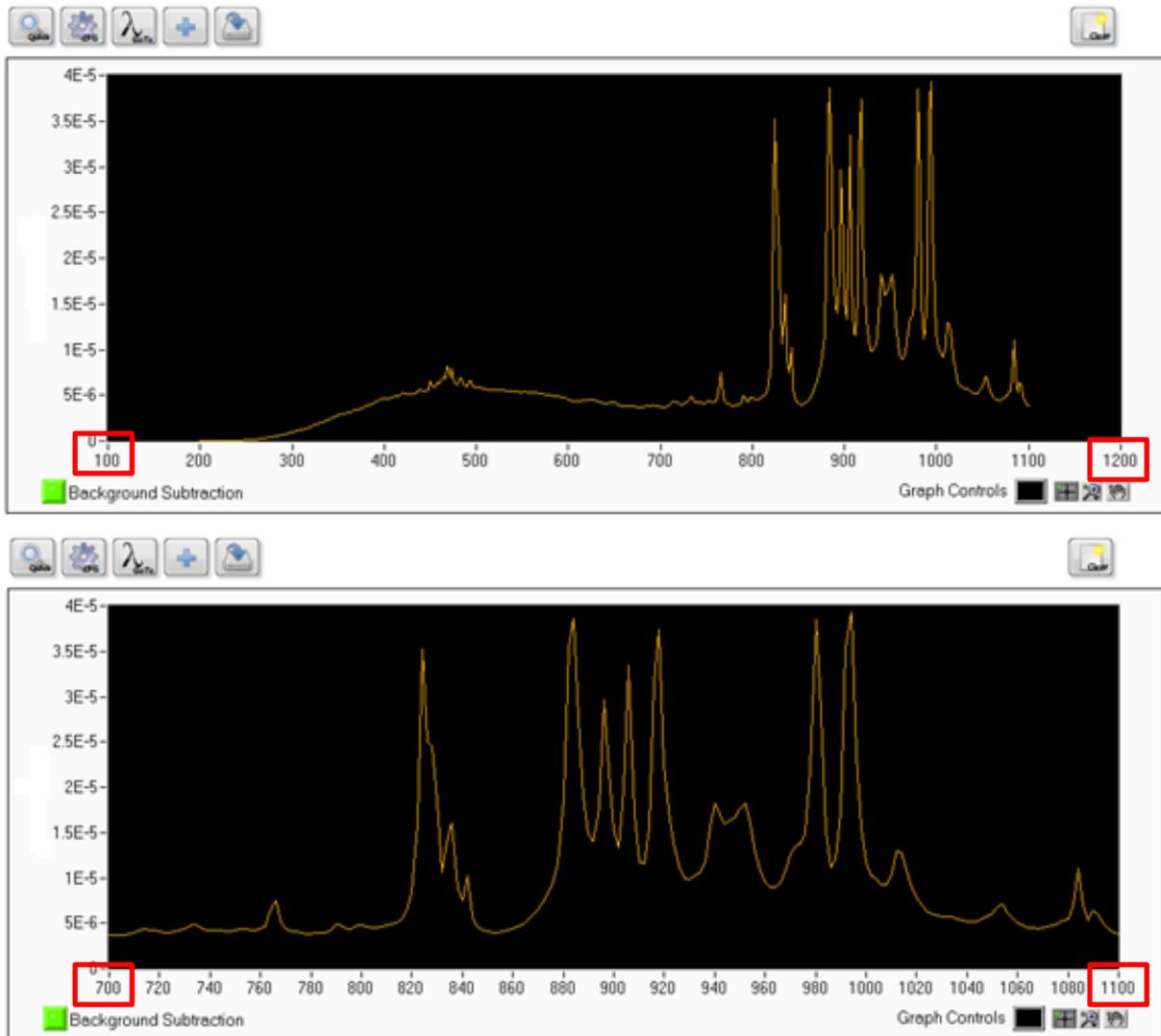


Figure 33: Graph Scale customization

## 7.9 SELECTING WAVELENGTH UNITS

TLS Utility scans may be taken and data displayed in nanometers, micrometers or wavenumber. The default value is nanometers. To select the wavelength units, go to the Monochromator pulldown menu and select Wavelength Units.

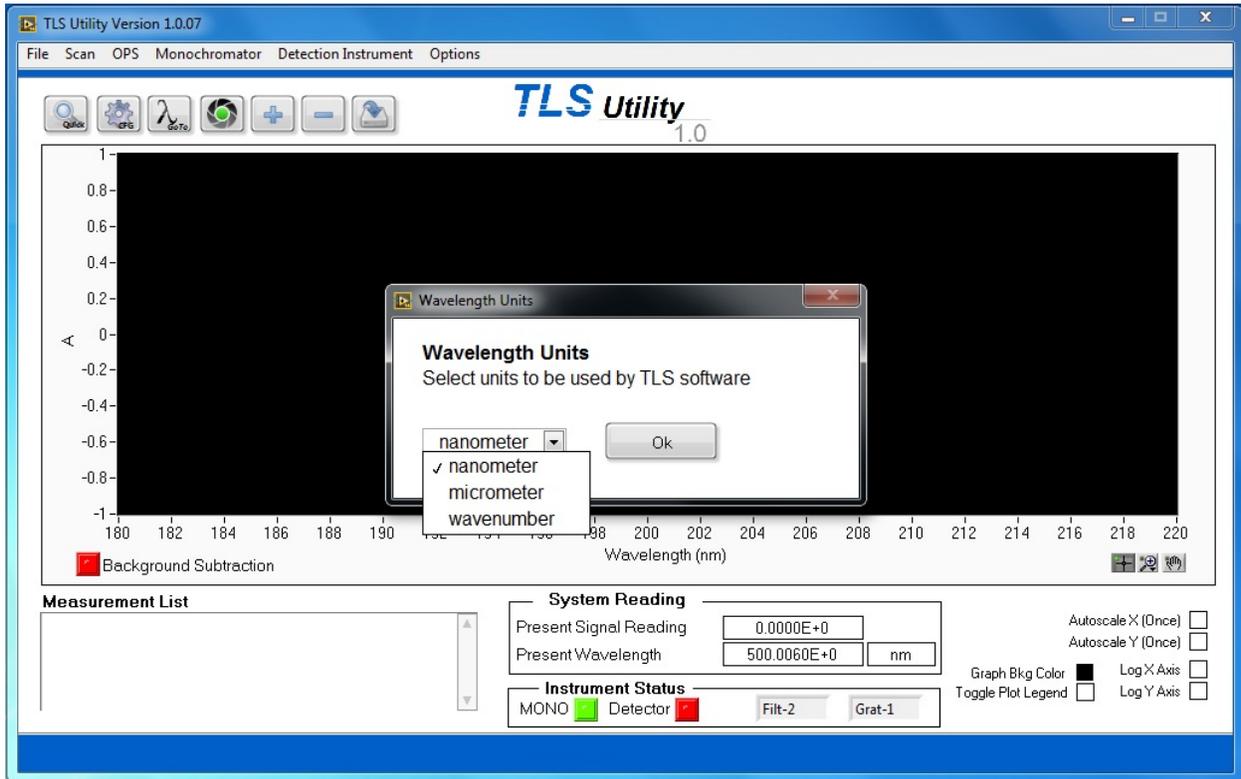


Figure 34: Selecting wavelength units

## 7.10 MAIN INTERFACE WINDOW

Figure 35 shows the main interface window of TLS Utility. Seven icons are horizontally displayed above the plot for easy access to common functions of the utility software.

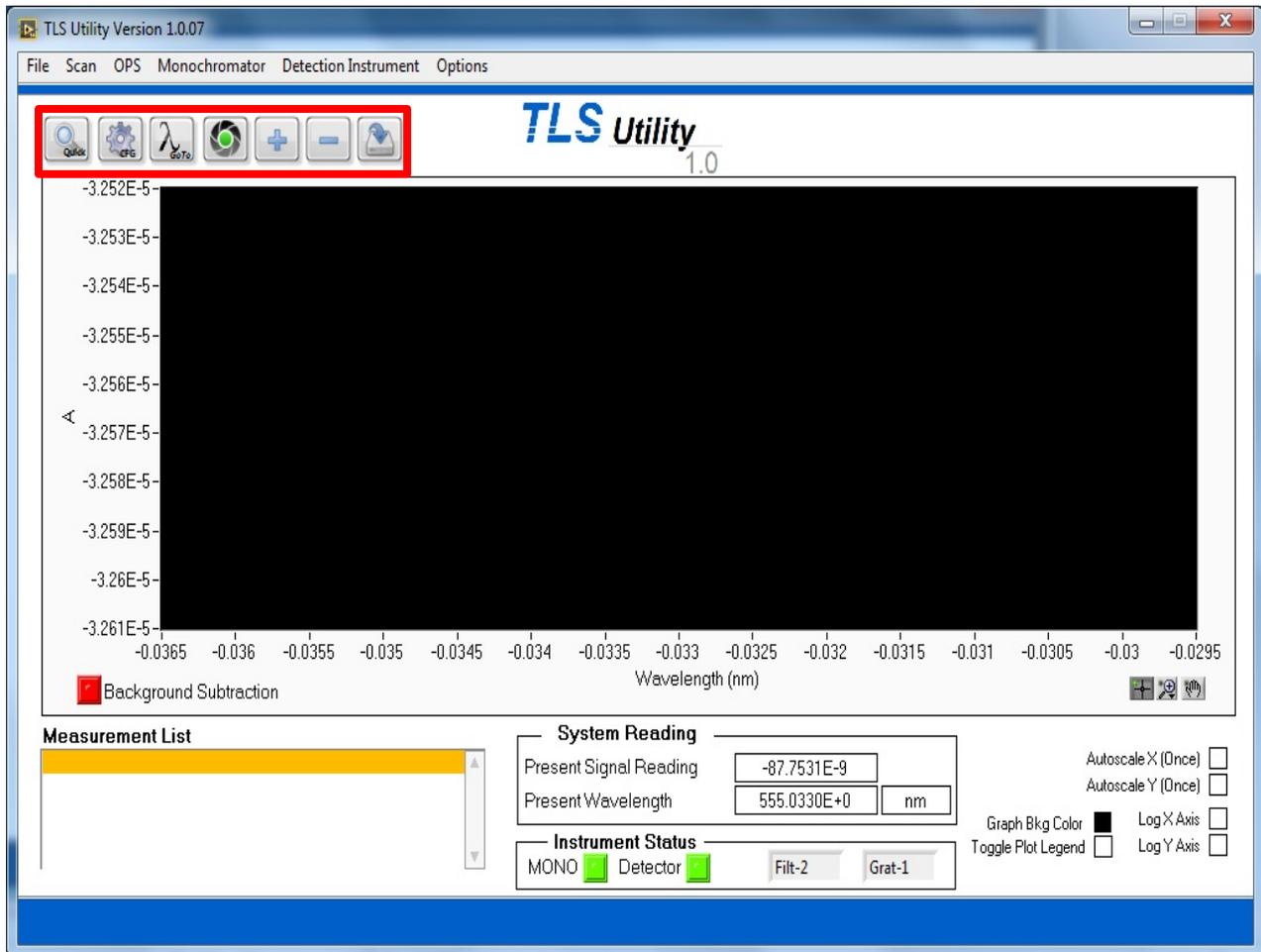


Figure 35: Main interface Window of TLS Utility



Quick Scan – To perform the scan selected in the Setup Scan window, click the Quick Scan icon.



Configure Scan – To select the desired scan type and configure the parameters, click the Configure Scan icon. See **SECTION 7.21 SETUP SCAN** for more information.



Go to Wavelength – Use Go to Wavelength to instruct the TLS to output a desired wavelength. See **SECTION 7.11 SETTING MONOCHROMATOR WAVELENGTH OUTPUT** for more information.



Shutter- To quickly open or close the shutter, click the shutter icon. See **SECTION 7.12 CONTROLLING THE SHUTTER** for more information.



**Load Scan** – To load a previously saved scan or other data so that it is visible in the plot, click the Load Scan icon.



**Clear Graph** - To clear the plot of completed graphs, highlight the scan to be deleted under Measurement List, then click the Clear Graph icon. If the data is needed for future reference, always ensure the scan is saved before clearing it. Clearing the plot avoids too many plots from being displayed at once.



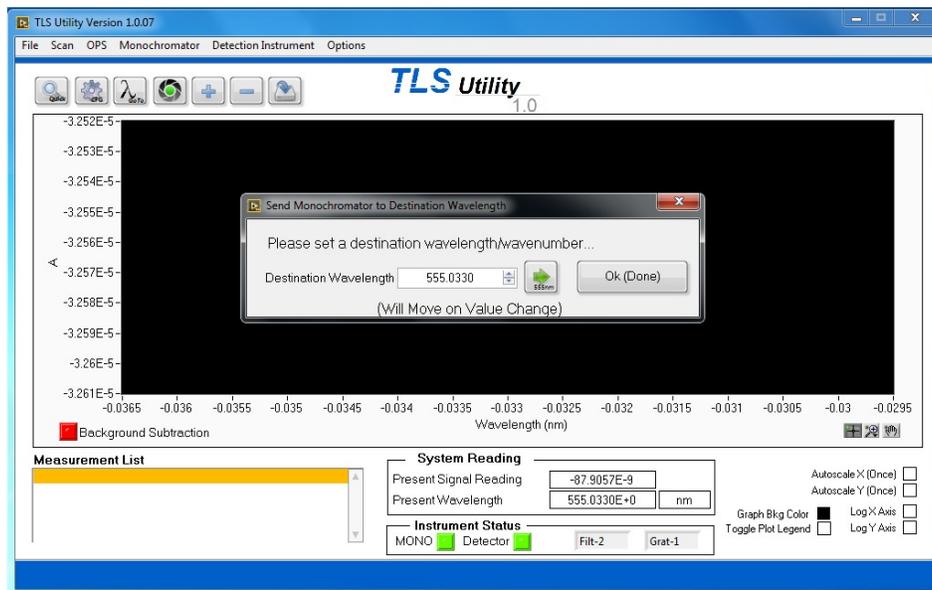
**Save Scan** – All scans that have not been aborted and run to completion are visible in the plot unless cleared. To save a file, click the Save Scan icon. Files are saved in text tab delimited format. When multiple scans exist on the plot, a window asking the user to select the scan to be saved appears. Previously unsaved scans are listed by the order they were taken and what type of scan they were saved, for example Scan#1 – Wavelength. Clicking once on the scan name allows the scan to be previewed. After clicking “OK,” navigate to the desired file location and enter the desired file name. Please note that any scan that was aborted before completion will display in the plotting window until it is cleared. However, it cannot be saved.

## 7.11 SETTING MONOCHROMATOR WAVELENGTH OUTPUT

Selecting a specific wavelength for the TLS to output is useful when positioning a detector or sample. The default wavelength is 555 nm, as it is very easily seen by the human eye. Select Goto Wavelength from the Monochromator pulldown menu. Click on the “555 nm” icon or type in another wavelength if



desired. Note that this may also be accessed from the  icon in the main application window.



**Figure 36: Selecting a monochromator output wavelength**

## 7.12 CONTROLLING THE SHUTTER

The shutter of the Cornerstone monochromator can be opened in TLS Utility by selecting Shutter... from the Monochromator pulldown menu. At the Shutter Control popup menu shown in Figure 37, select from the Shutter pulldown menu to open or close the shutter.

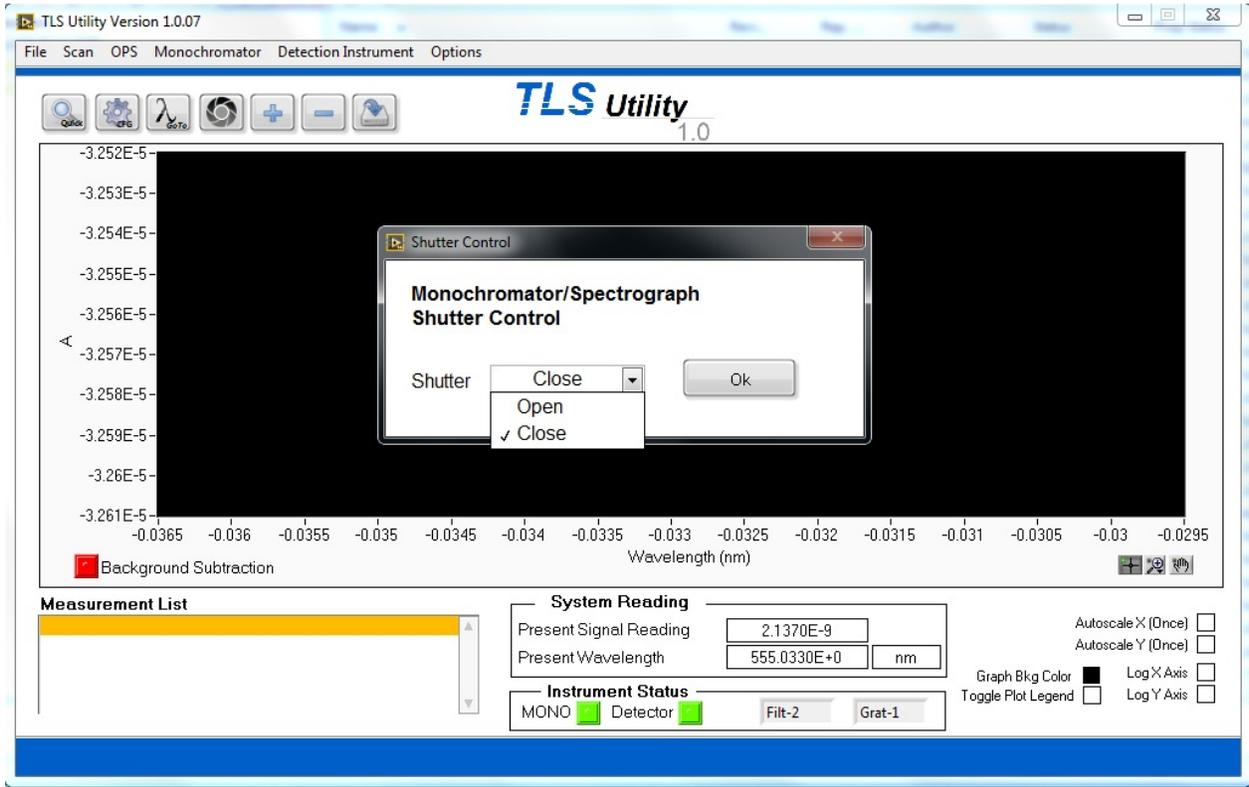


Figure 37: Controlling the shutter

The shutter can also be controlled through the  icon over the graph of the main interface. This icon also indicates the shutter's open or closed status, with  indicating an open shutter and  indicating a closed shutter.

Be aware that when operating the shutter through TLS Utility, the shutter indicator icon on the front panel of the OPS Power Supply will not change and may not properly represent the shutter's open or closed status. TLS Utility should be used exclusively to open or close or check the status of the shutter.

## 7.13 ABORTING A SCAN

When a scan is being performed, the Abort icon will appear in the main interface window as shown in Figure 38. Click this icon to cancel the scan at any time.

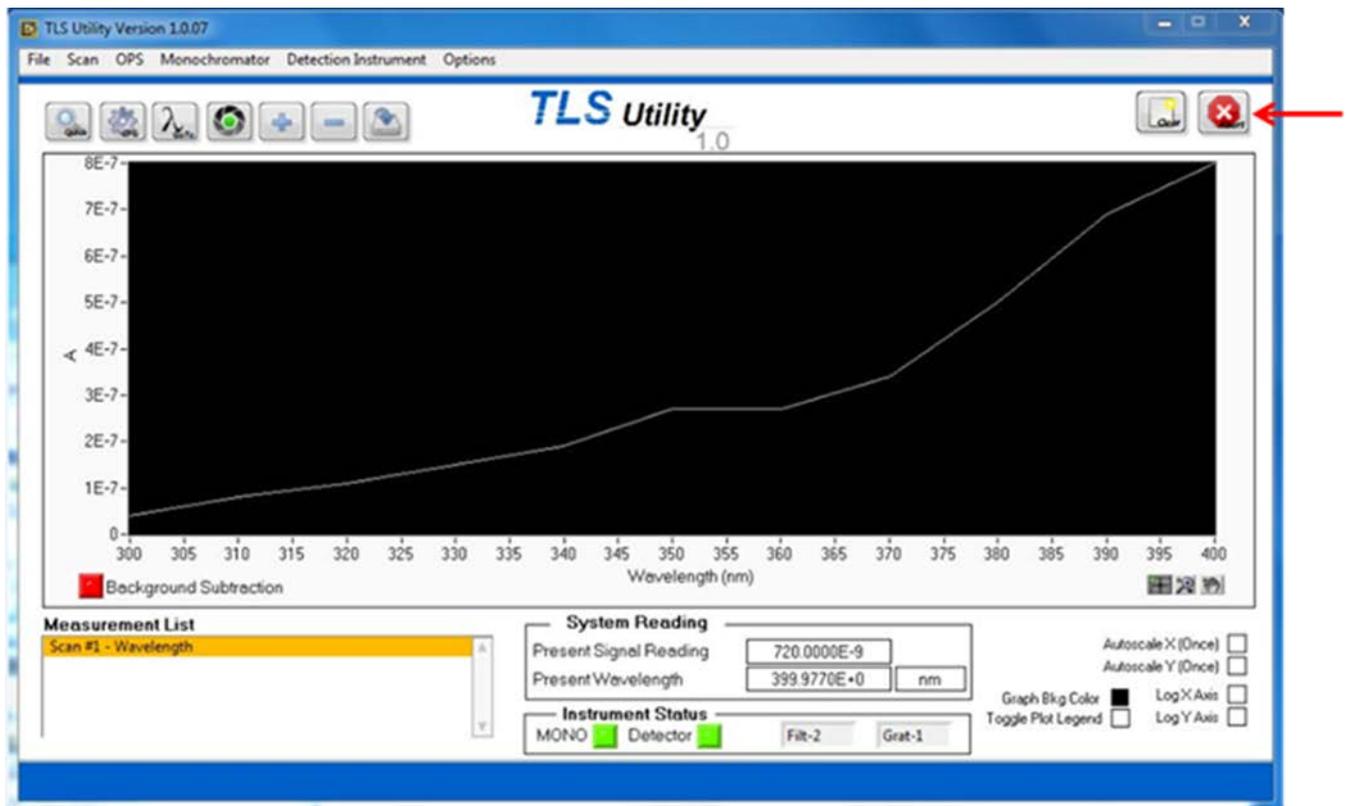


Figure 38: Aborting a scan

## 7.14 MONOCHROMATOR CALIBRATION PARAMETERS

Calibration Parameters... has been grayed out and disabled in the Monochromator pulldown menu. Editing these settings can adversely affect monochromator operation and thus TLS260 system performance. See **SECTION 7.31 EXPERT MODE** for more information.

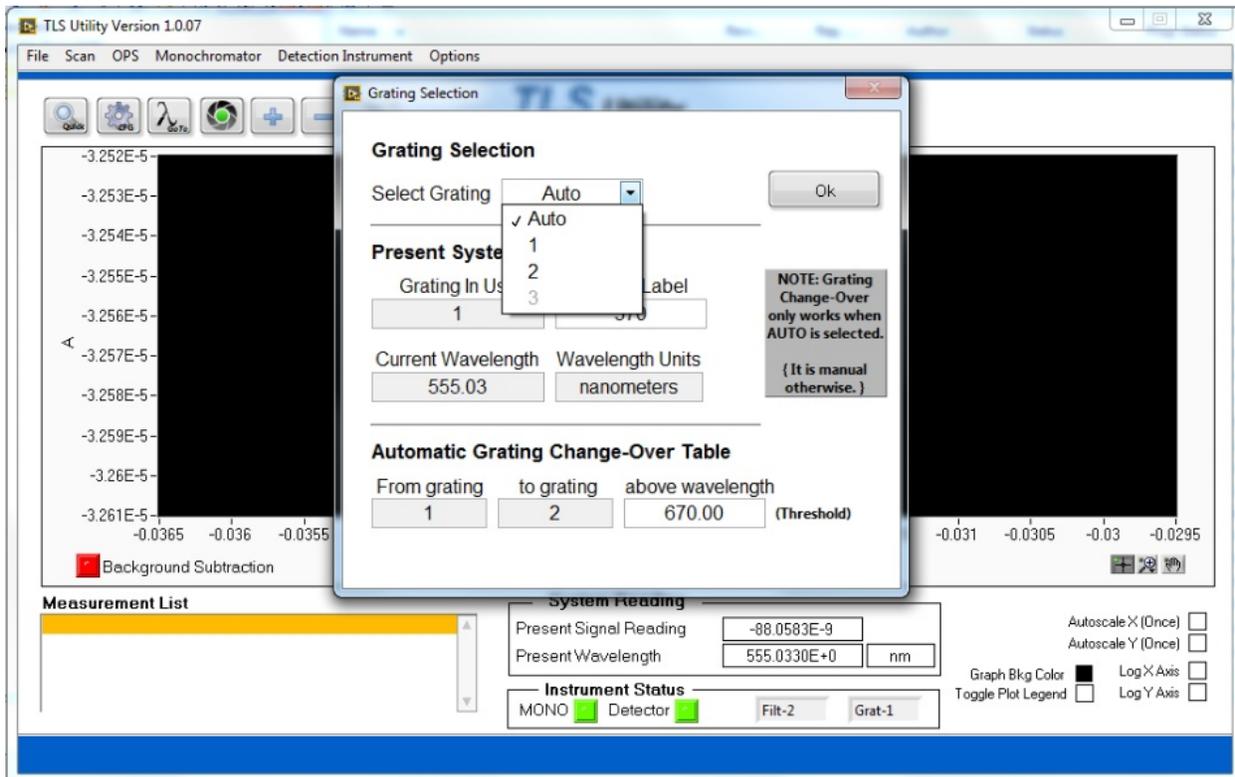
## 7.15 MONOCHROMATOR OFFSET

Offset has been grayed out and disabled in the Monochromator pulldown menu. Editing these settings can adversely affect monochromator operation and thus TLS260 system performance. See **SECTION 7.31 EXPERT MODE** for more information.

## 7.16 GRATING SELECTION

In order to produce monochromatic light over the full wavelength range specified for a TLS, Oriel's Cornerstone 260 monochromator contains two ruled diffraction gratings. Each grating is capable of working over a certain wavelength range based upon its design. By setting the grating parameters in the TLS Utility software, the monochromator will automatically select the appropriate grating for any desired wavelength. Select Gratings from the Monochromator pulldown menu.

Adjust the settings as shown in Figure 39.



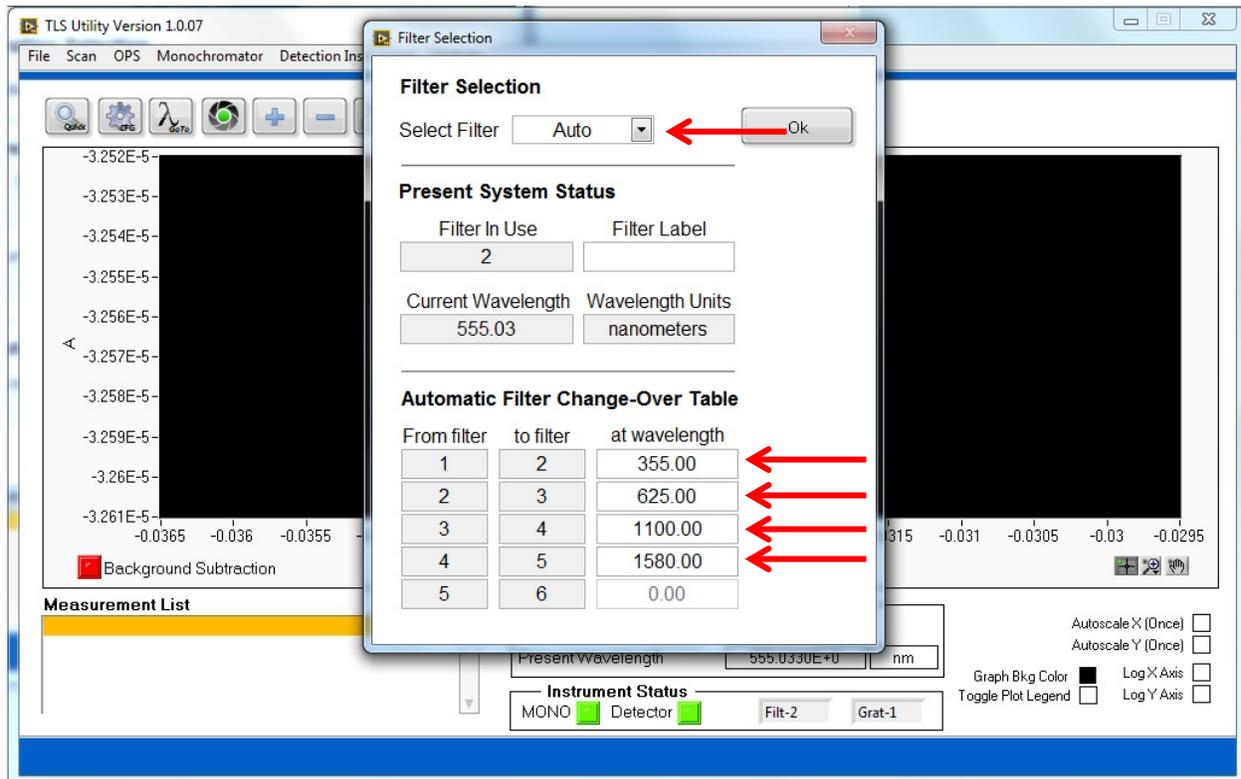
**Figure 39: Grating Selection table**

If a particular grating is desired to be used exclusively, select Grating 1 or 2 from the Select Grating pulldown menu. For the TLS260 series instruments, 675 nm is the optimum wavelength at which Grating 2 should be used instead of Grating 1. It is not recommended to change this Automatic Grating Change parameter during scans.

## 7.17 FILTER SELECTION PARAMETERS

In order to ensure that the light produced by the TLS system is monochromatic, it is necessary to incorporate optical filters into the design. The physics of diffraction gratings is such that higher order wavelengths need to be blocked. The filters selected for the Tunable Light Source have been chosen to block unwanted wavelengths.

By setting the filter parameters to those shown in Figure 40, the monochromator will automatically select the appropriate filter for any desired wavelength. To access Filter Selection, select Filters from the Monochromator pulldown menu.



**Figure 40: Filter Selection table**

If a particular filter is desired to be fixed in the light path, choose the filter's position in the filter wheel by selecting 1-6 from the Select Filter pull-down menu.

## 7.18 OPS SETTINGS

To monitor the status and operating parameters of the lamp, click Settings in the OPS pull-down menu.



**Figure 41: OPS Pulldown menu**

Starting or igniting the lamp will cause the indicator next to Light Power to turn green and change from OFF to ON as seen in Figure 42.

The voltage and current being supplied to the lamp by the OPS Power Supply is also visible through this window. Lamp Hours displays how long the lamp has been ignited or used, to help determine when a lamp is nearing the end of its lifetime.

Be advised that the OPS Settings window is for display only. This window does not allow the lamp to be ignited or started, voltage or current supply to the lamp to be changed, or lamp operating hours to be reset. These parameters must be changed by using the OPS Power Supply. For information how to perform these functions safely, see the OPS Power Supply Manual.

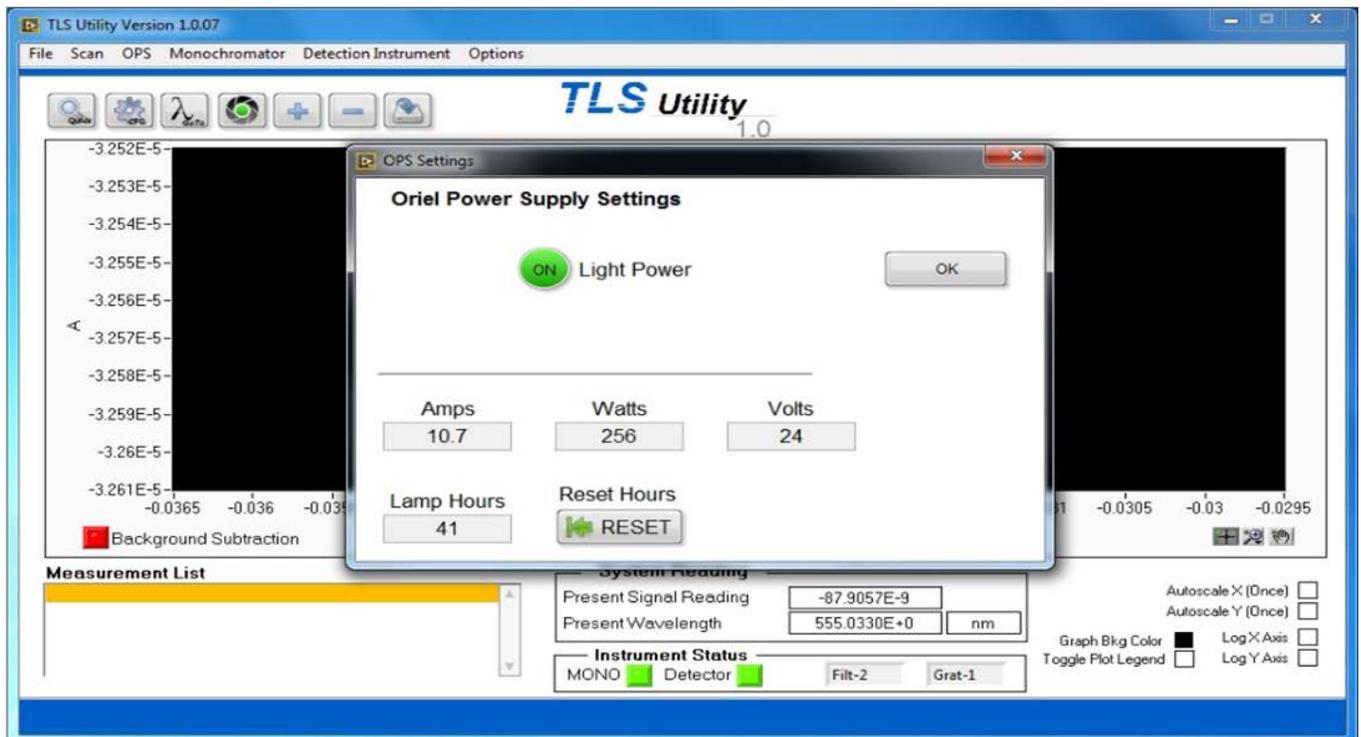
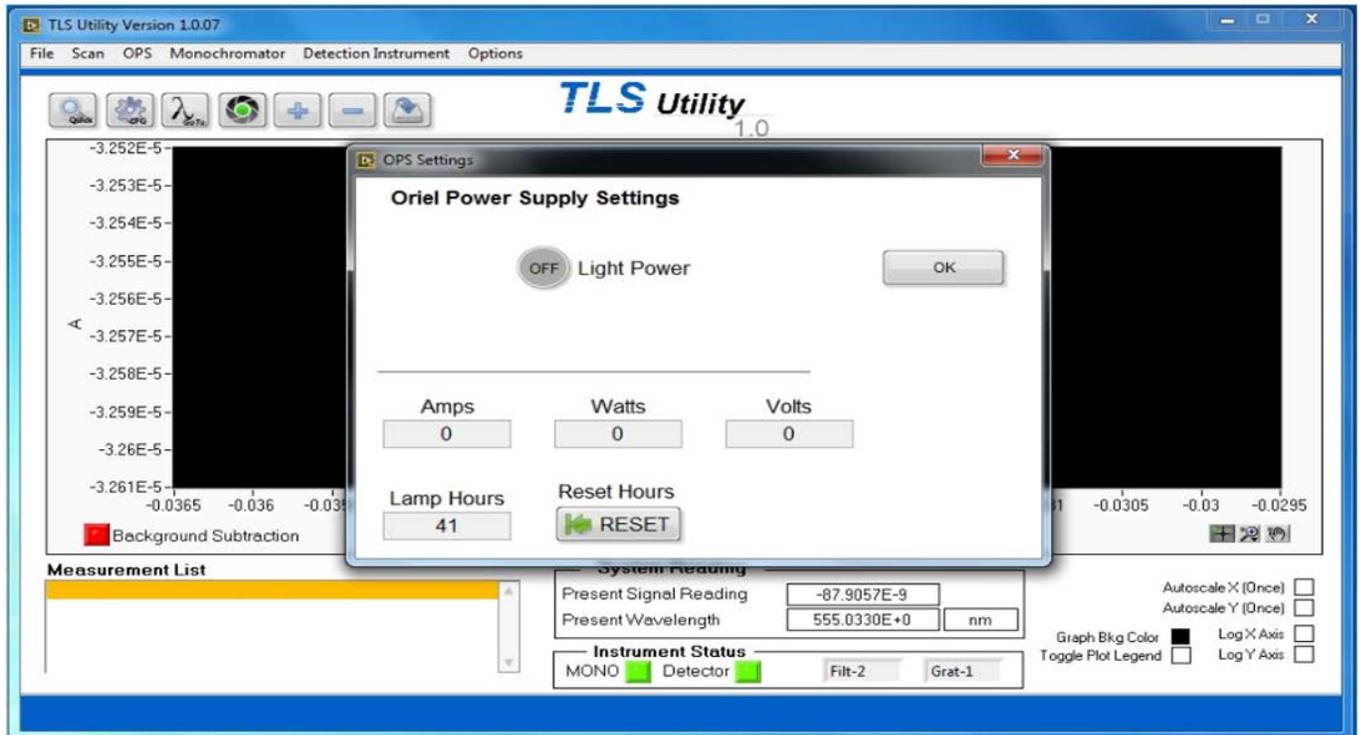


Figure 42: OPS Settings menu

## 7.19 LABELING A SCAN

To differentiate multiple scans in the Measurement List window, double click the desired scan under Measurement List. When the Measurement Name Dialog appears, type the desired name in the box next to New Name then click OK.

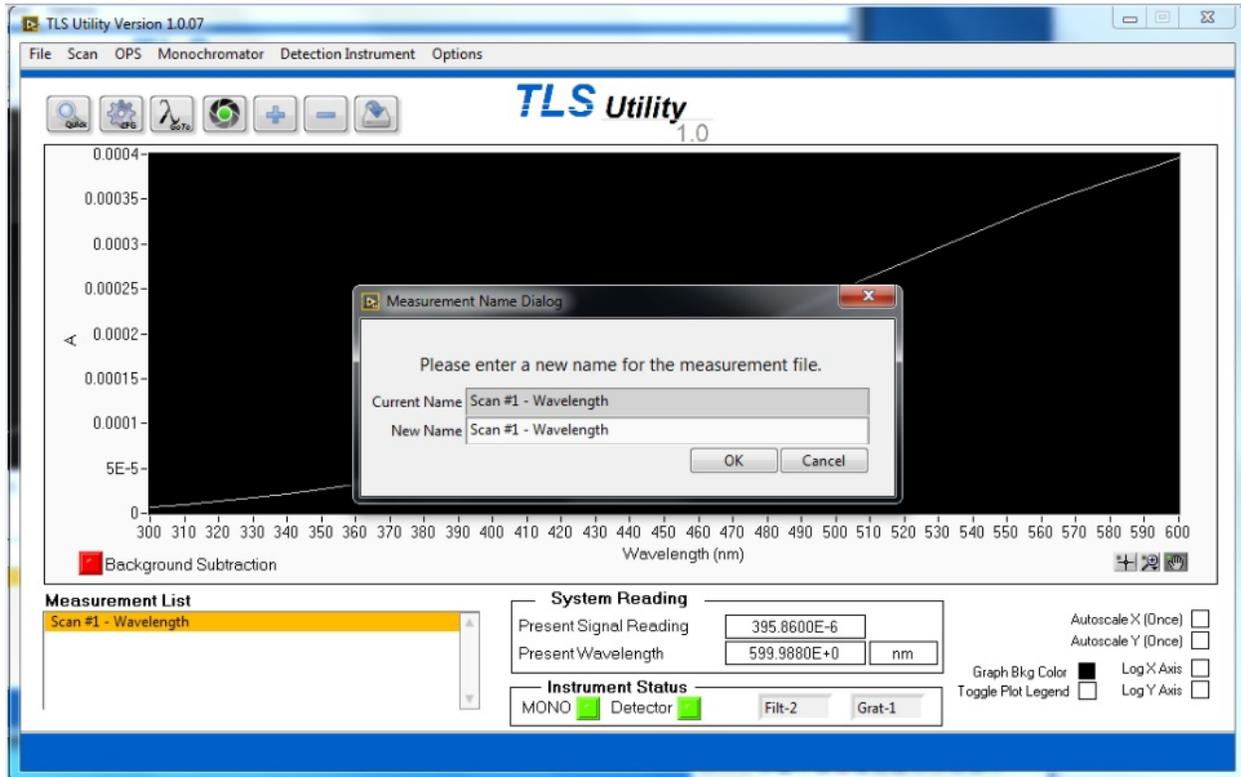


Figure 43: Labeling a scan

## 7.20 PLOT APPEARANCE CUSTOMIZATION

Changing the background color is accomplished by clicking on the square icon to the right of Graph Bkg Color. A color control selector appears. Click on the desired color, and the background color of the plot window shall be updated immediately.

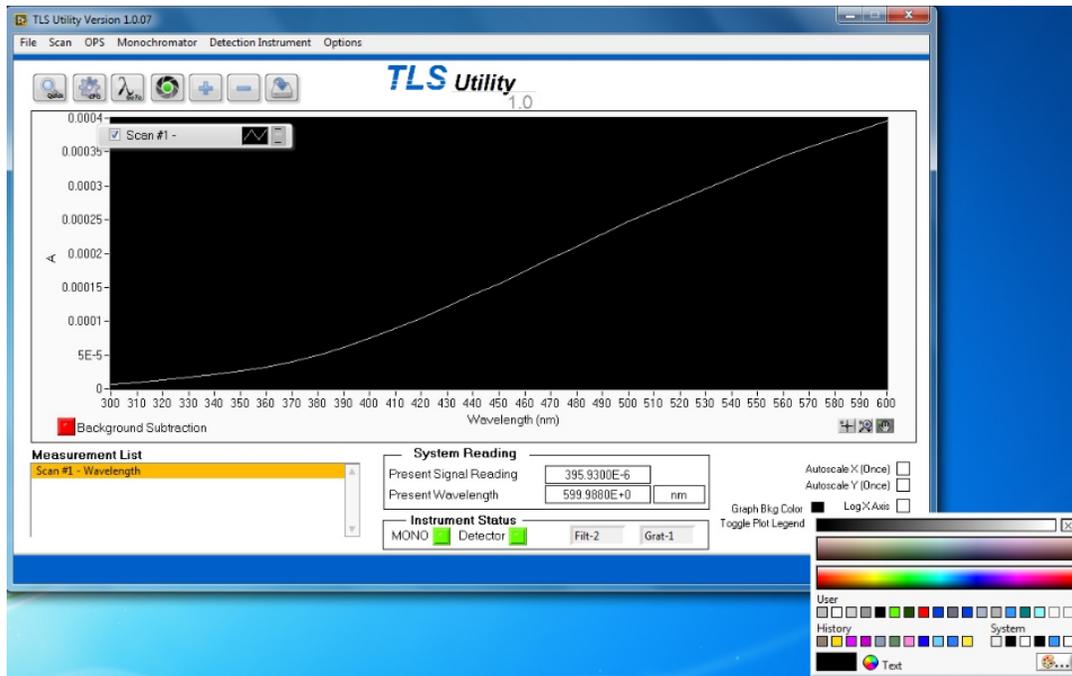


Figure 44: Changing the graph background color

To update the graph color, click the box next to Toggle Plot Legend. When the plot legend showing all plots currently on the Plot Window appears, right click once on the graph color shown next to the plot name. This will bring up choices for adjusting the line appearance or data point style.

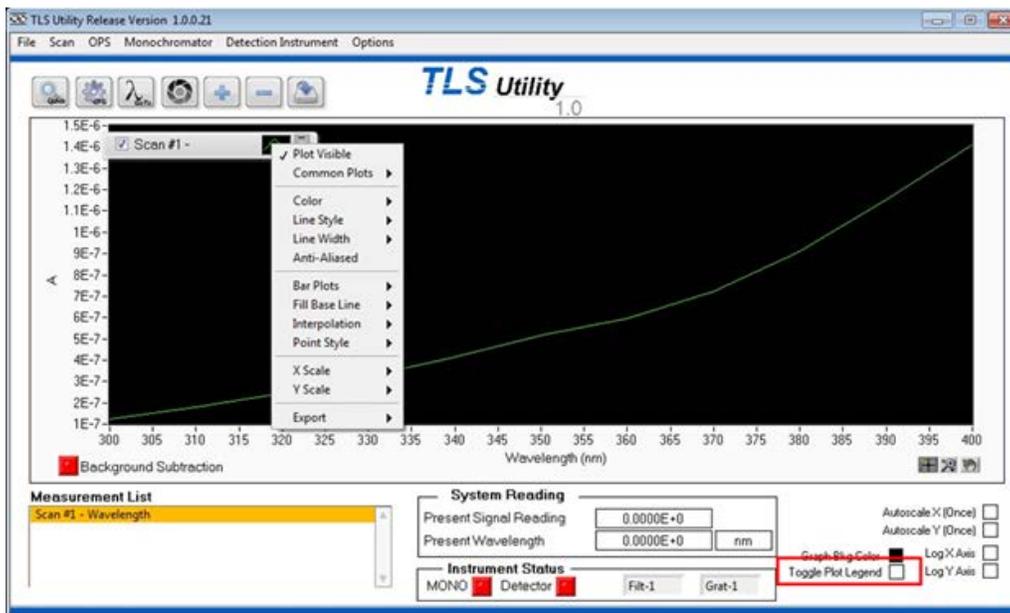
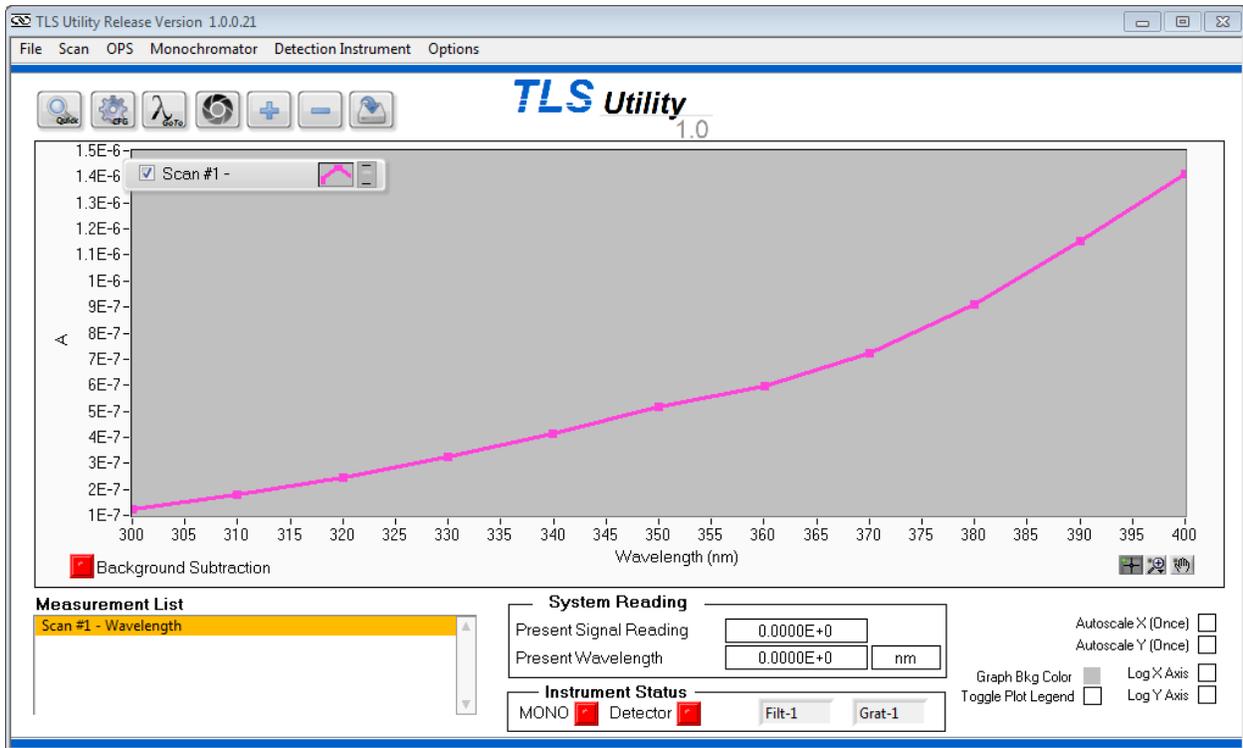


Figure 45: Using Toggle Plot Legend to adjust the appearance of a scan

An example of customization is shown in Figure 46. The background was changed to light grey, data points were added and the graph color and line thickness were customized.



**Figure 46: Example customized plot**

Log X Axis and Log Y Axis icons are also available. Clicking the box next to these options adjusts the scaling of the x and y axis to a logarithmic scale, respectively.

## 7.21 SETUP SCAN

To select a scan and setup desired scan parameters, select Setup Scan from the Scan pulldown menu. The Enter Scan Parameters menu in Figure 48 will appear.

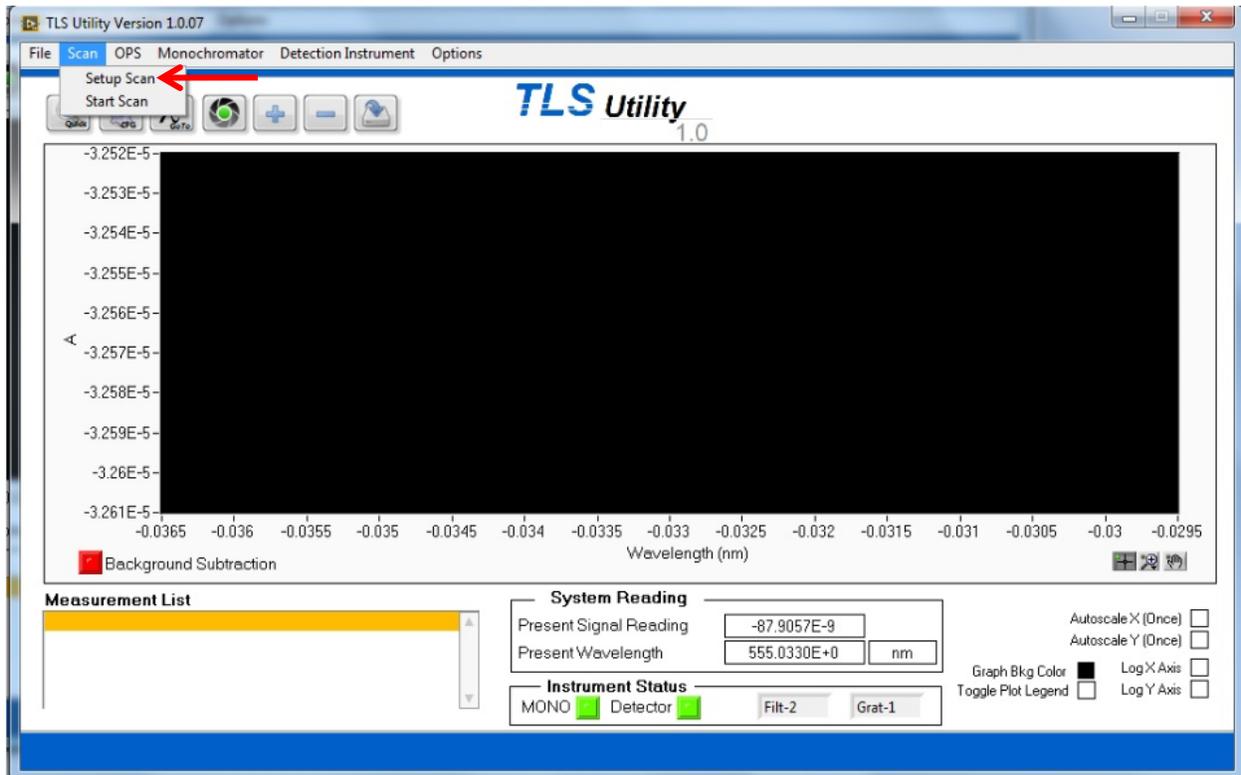


Figure 47: Setup Scan

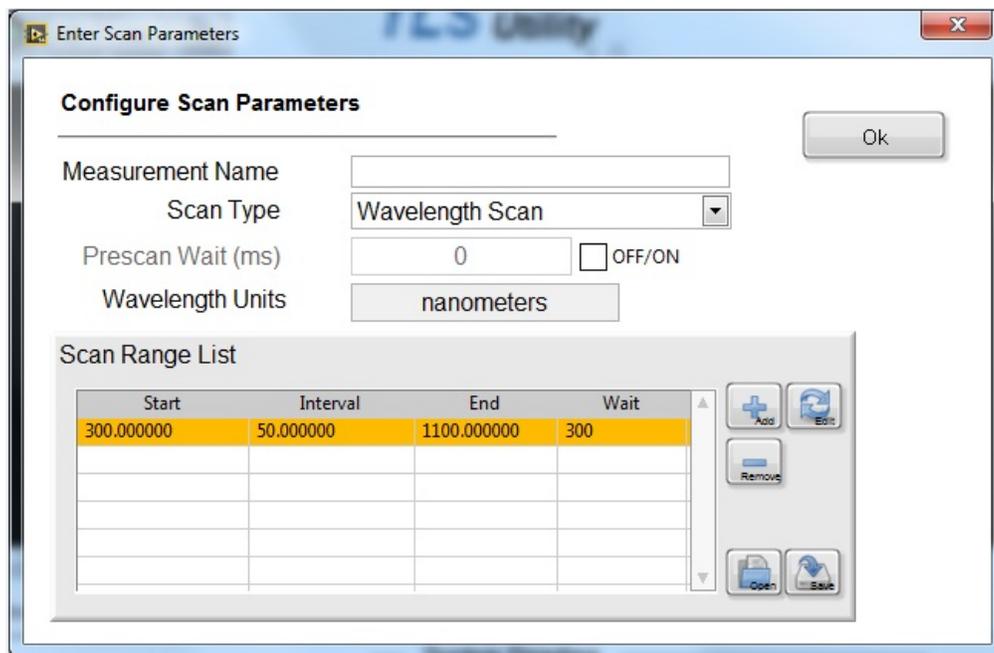
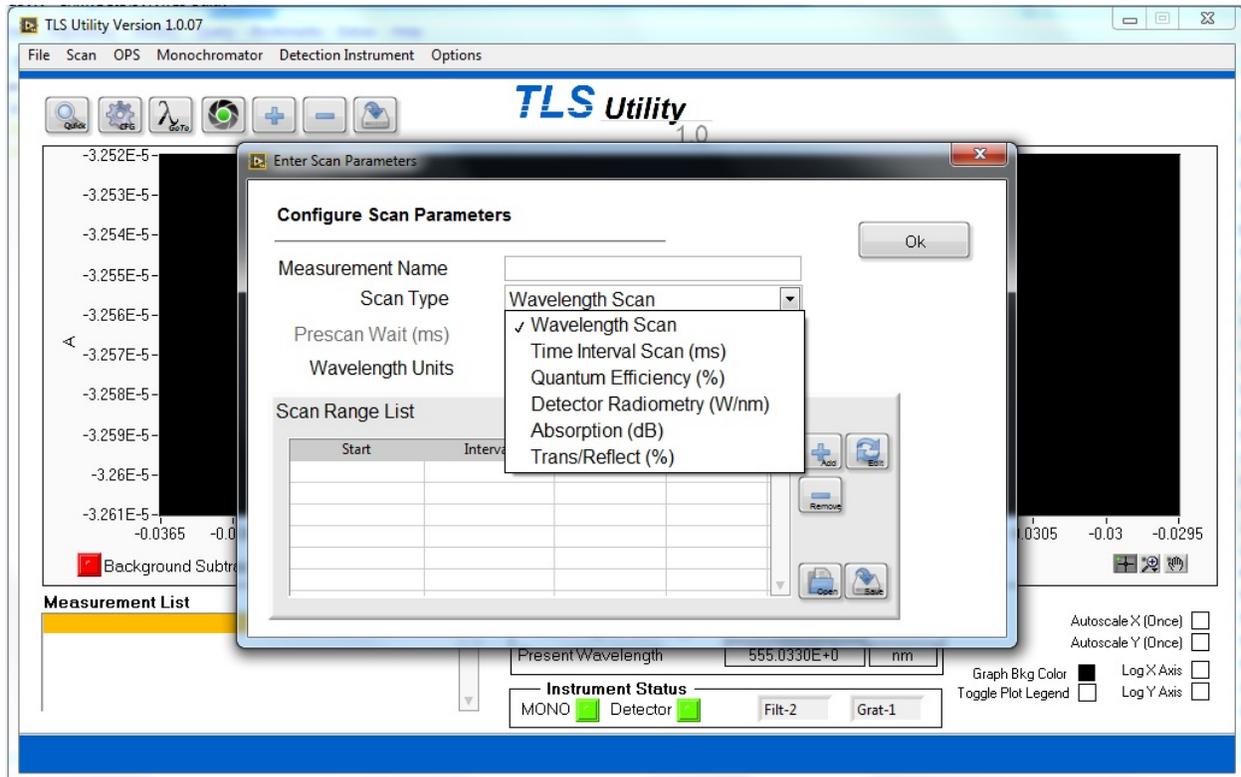


Figure 48: Enter Scan Parameters menu

The Enter Scan Parameters popup menu gives the following fields to fill and options to choose from:

Measurement Name – A name can be entered to label the scan for future reference.

Scan Type – A pulldown menu appears with the following options for which type of scan to perform.



**Figure 49: Scan Type pulldown menu**

Prescan Wait (ms) – This option will be grayed out or inaccessible until the box on the right of the bar is clicked, filling the box with an x to indicate Prescan Wait is on. Enter the time in ms for the desired time delay from clicking Start Scan to the scan beginning. This is useful for situations that we require a spectroscopy sample to settle or stabilize prior to data acquisition.

Wavelength Units – Wavelength units is automatically set to the option chosen in the Monochromator pulldown menu. See **SECTION 7.9 SELECTING WAVELENGTH UNITS** for more information.



Add Scan - To add the configured scan to the Scan Range List for future use, use the Add Scan icon.



Edit Scan - To edit the parameters of an existing scan in the Scan Range List, click that scan to highlight it, then select Edit Scan



Remove Scan – To remove a scan from the Scan Range list, click that scan to highlight it, then select Remove Scan.



Open Scan – To add a saved scan to the Scan Range List, click Open Scan, then navigate to the folder to which the desired scan saved. The scan must be saved as a .SLF file.



Save Scan – To save a scan to the computer, click Save Scan, then navigate to the folder where the scan is to be saved. The scan will save as an .SLF file.

## 7.22 SCAN TYPES

### 7.22.1 WAVELENGTH SCAN

A basic wavelength scan is commonly used as a reference scan when performing many different types of measurements. It is also used to create a scan for background subtraction. A basic wavelength scan is a plot of the detector's reading over a series of wavelengths.

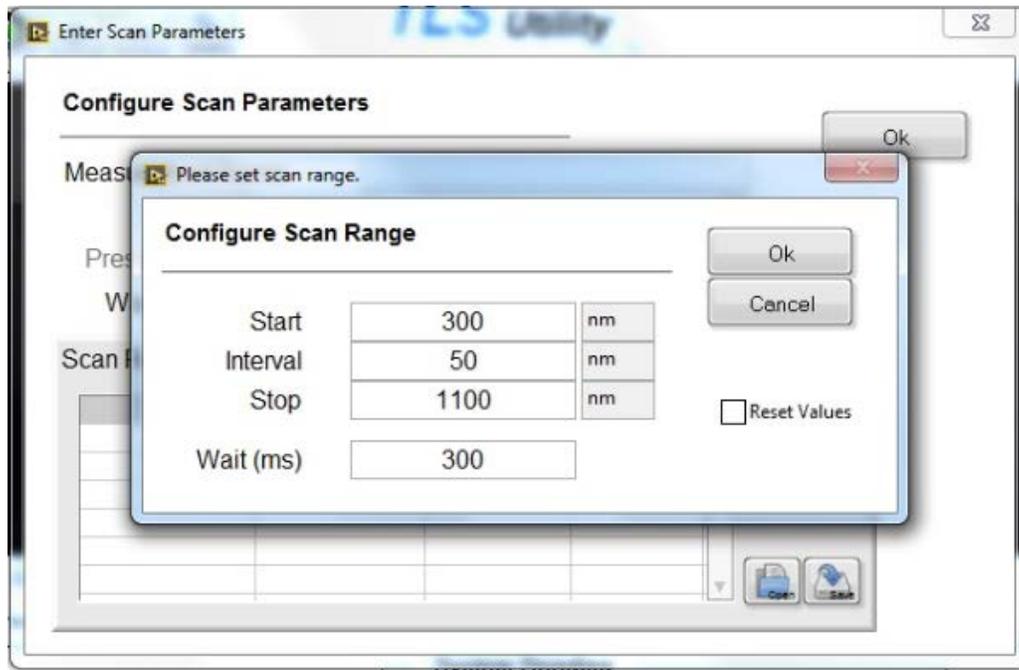
When using the wavelength scan as a reference for another scan, such as Quantum Efficiency, Transmittance, etc. the parameters entered should be the same for both scans. The starting and ending wavelengths must be within the operating range of the detector. When data scans require calibration files, the wavelength range of this information must include the wavelengths requested by the scan. For example, if a scan is performed from 200 to 400 nm and the detector calibration file has spectral responsivity data from 300 to 1100 nm, this will result in an error.

TLS Utility graphs the wavelength scan with the y-axis labeled as current by default, for the photocurrent output of a detector. Newport's 19xx series power meters may read voltage, current, or power. Volts are frequently used, as this is the output generated by a detector coupled to a transimpedance amplifier. Voltage readings also provide an advantage of greater dynamic range of the detection instrument. Power readings require a Newport detector with a calibrated PROM connected to the power meter.

### 7.22.2 SETTING UP A WAVELENGTH SCAN



To set up a wavelength scan, click the  icon or select Setup Scan from the Scan pulldown menu, and select Wavelength Scan.



**Figure 50: Setting up a Wavelength Scan**

Start and Stop are the wavelengths at which the scan should begin and end, respectively. Interval is the wavelength increment by which the TLS will output light and acquire data. For example, entering parameters of 800 nm for Start, 10 nm for Interval, and 850 nm for Stop will instruct the TLS to output and take data at the following wavelengths: 800, 810, 820, 830, 840, and 850 nm.

Wait in ms is the time the system will wait before acquiring and displaying data at its next programmed wavelength. Select Reset Values will set all parameters to their last used values.

Deciding upon an appropriate interval wavelength is dictated by the needs of the application as well as the resolution of the system. Without taking the resolution of the system into account, a scan performed with many data points may not add to the accuracy of the data and will increase the time required for completion.

The resolution at the grating's blaze wavelength may be calculated as the slit width multiplied by the reciprocal dispersion, as provided with each Oriel grating. This does not take into account aberrations when using very narrow slits, but it is a good approximation in general. Knowing this information helps to determine the Interval wavelength as limited by the capability of the system. For example, with a 600  $\mu\text{m}$  exit slit, the monochromator of the TLS260 is limited to 3.9 nm. Therefore, it is not helpful to select an Interval wavelength less than this 3.9 nm.

When the desired parameters have been entered, click OK to exit the Please set scan range. window and Ok again to exit the Enter Scan Parameters window. Start the scan by selecting Start Scan from the

Scan pulldown menu or clicking the  icon.

## 7.23 BACKGROUND SUBTRACTION

Background light in the environment or light leakage in a system may result in data inaccuracy. For example, a dark box must be constructed to perform quantum efficiency measurements on a dye-sensitized solar cell. If the dark box is not completely light tight, light leakage will introduce an offset into the measurements. In this situation, measurements should be taken for the background light and saved. When background subtraction is enabled, these background measurements are subtracted from the reference or data scan.

Background scans take time to perform and must be periodically retaken as light levels may vary over time. To save time, it is suggested to check the background light levels by running a basic wavelength scan with the light source turned off. If the light levels in the background scan will have a measurable effect on the final data, then enabling background subtraction is strongly suggested. Otherwise, it is not necessary.

Please note that in the case of very high background light levels, the detector will saturate. Any background light, if intense enough, will essentially overwhelm the detector's sensor and negatively affect its ability to take readings. In cases such as this, enabling background subtraction will not resolve the situation. Excessively high background light levels must be eliminated by either using a closed optical path or making changes to the testing environment.

The time interval scan does not support background subtraction. In the case where background radiation is to be separated from the signal, an offset may be entered. This option is only available when using a Newport 19xx or 29xx power meter. See **SECTION 7.7 POWER METER PARAMETER SETUP** for more information.

### 7.23.1 PERFORMING A BACKGROUND SCAN

The first step in performing a background scan is to prevent the signal from the light source used in the data taking process to reach the detector. If a monochromator is utilized, the built-in shutter must be closed. If a laser is used, it should not be on. If a broadband source is used, the source must be off and completely cooled. It should be noted that the filament or electrodes in a lamp continue to glow for some time until it is completely cooled off.

Set up the basic wavelength scan parameters to be the same as the reference and data scans that shall be performed afterwards. Then run the scan and save the data. To locate this scan easily, it is suggested to include the word "background" in the file name.

### 7.23.2 ENABLING BACKGROUND SUBTRACTION

To load the background scan data, go to the Options pulldown menu, select Background file, then click Load. The menu is shown in Figure 51. This will automatically enable background subtraction, which is shown by the green indicator light in per Figure 52.

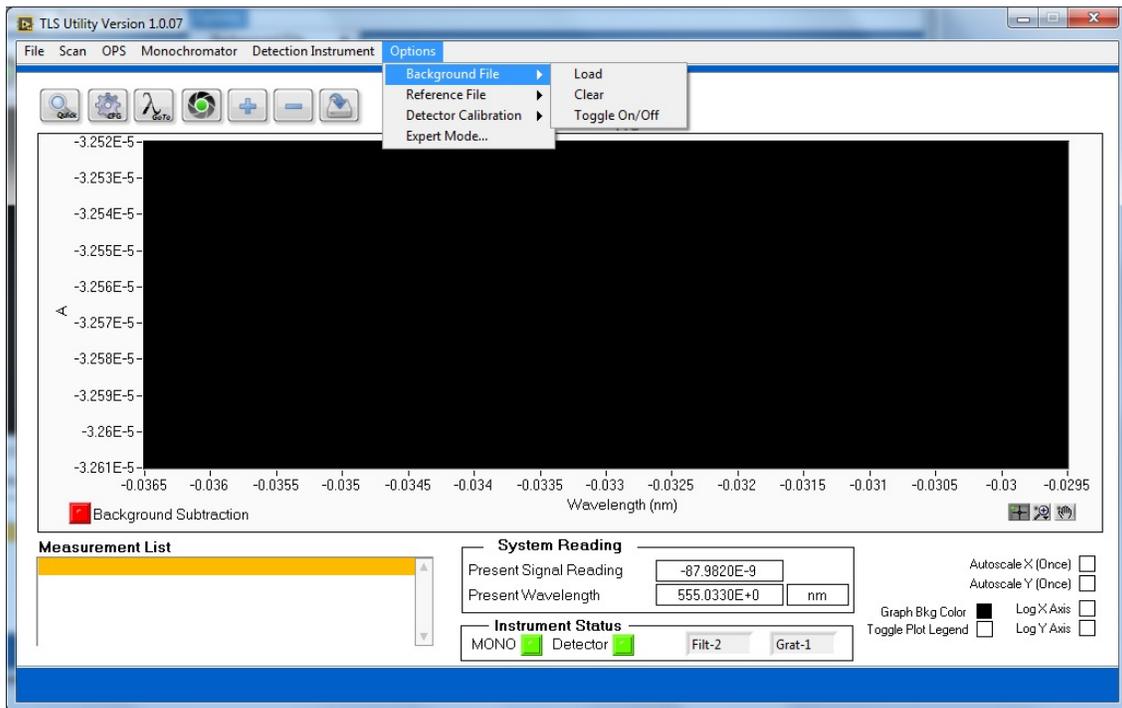


Figure 51: Loading a Background Scan

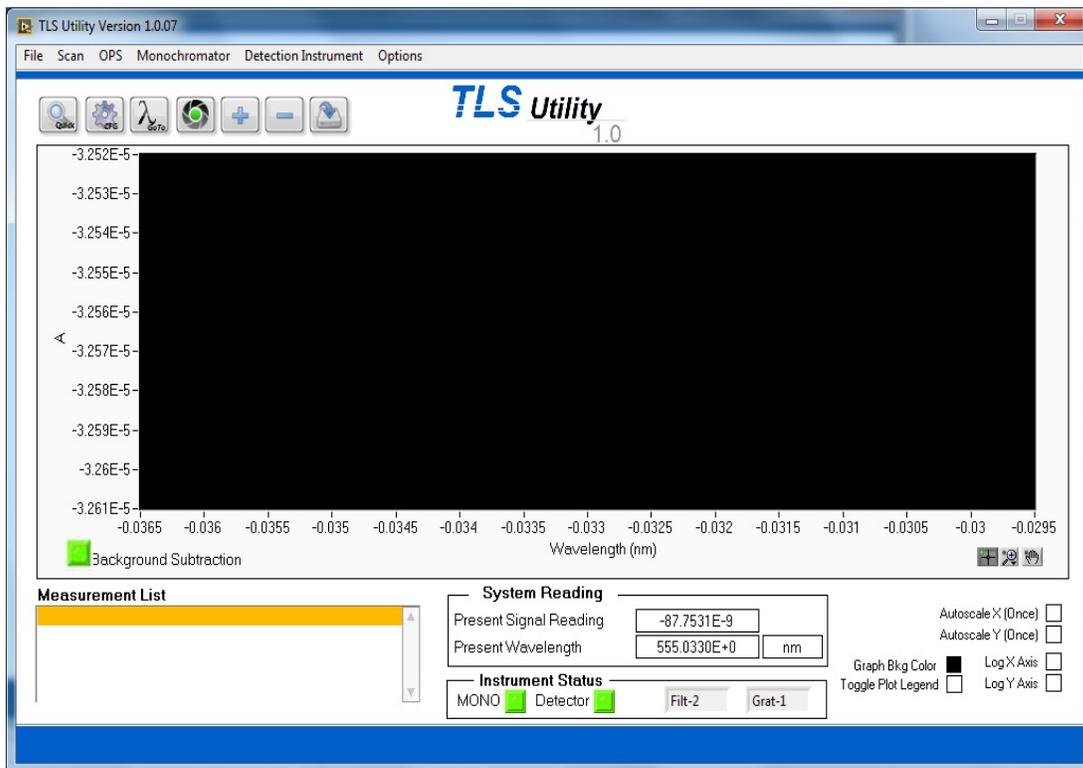


Figure 52: Background Subtraction enabled

Once the scan has been loaded, it may be toggled on or off as shown in the pulldown menu. This is convenient when making comparisons to determine whether background subtraction makes a measurable difference in scan data.

When the software is exited and settings are saved, the background file remains loaded. Upon restarting TLS Utility, background subtraction is toggled off. To continue using the loaded background scan, toggle on the background subtraction.

When the background subtraction file is no longer valid, it should be cleared. Reasons for invalidation include changes to the application setup (i.e. different monochromator slit widths) or changes in the background environment, such as switching on additional room lights. If it is desired to continue using background subtraction after conditions have changed, the background scan should be re-taken and the new background scan data loaded into TLS Utility.

## 7.24 REFERENCE SCAN

Set up the scan wavelength parameters as described in **SECTION 7.22.2 SETTING UP A WAVELENGTH SCAN** with wavelength units in nanometers. Load the reference detector calibration file into TLS Utility, as shown in Figure 53. Position this detector in the path of light, and then perform a basic wavelength scan.

Once the reference scan is saved, Clear it from the plot.

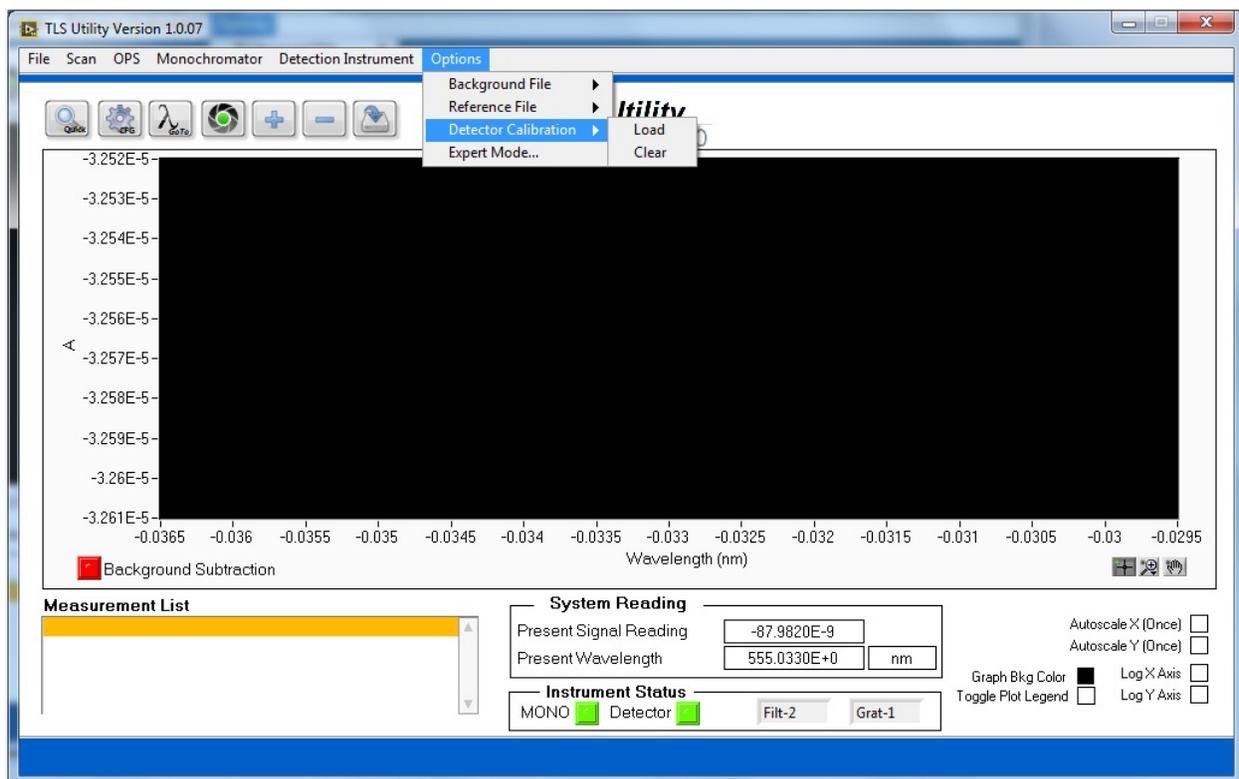


Figure 53: Loading a Detector Calibration file

To reload this scan in the future as a required reference scan for QE, Absorption, and Transmittance/Reflectance scans, select Reference File from the Options pulldown menu and select Load as shown in Figure 54. Select Clear from this menu to remove the Reference Scan data from TLS Utility.

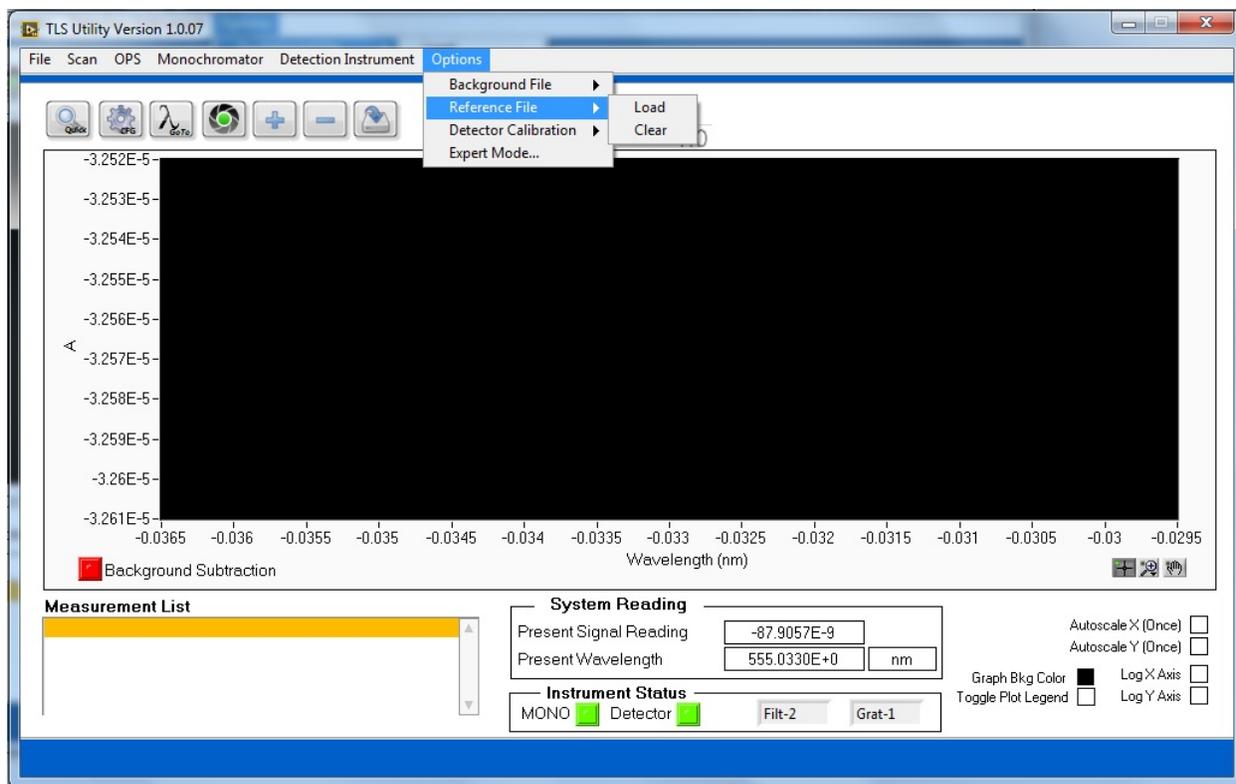


Figure 54: Loading a Reference File

## 7.25 TIME INTERVAL SCAN

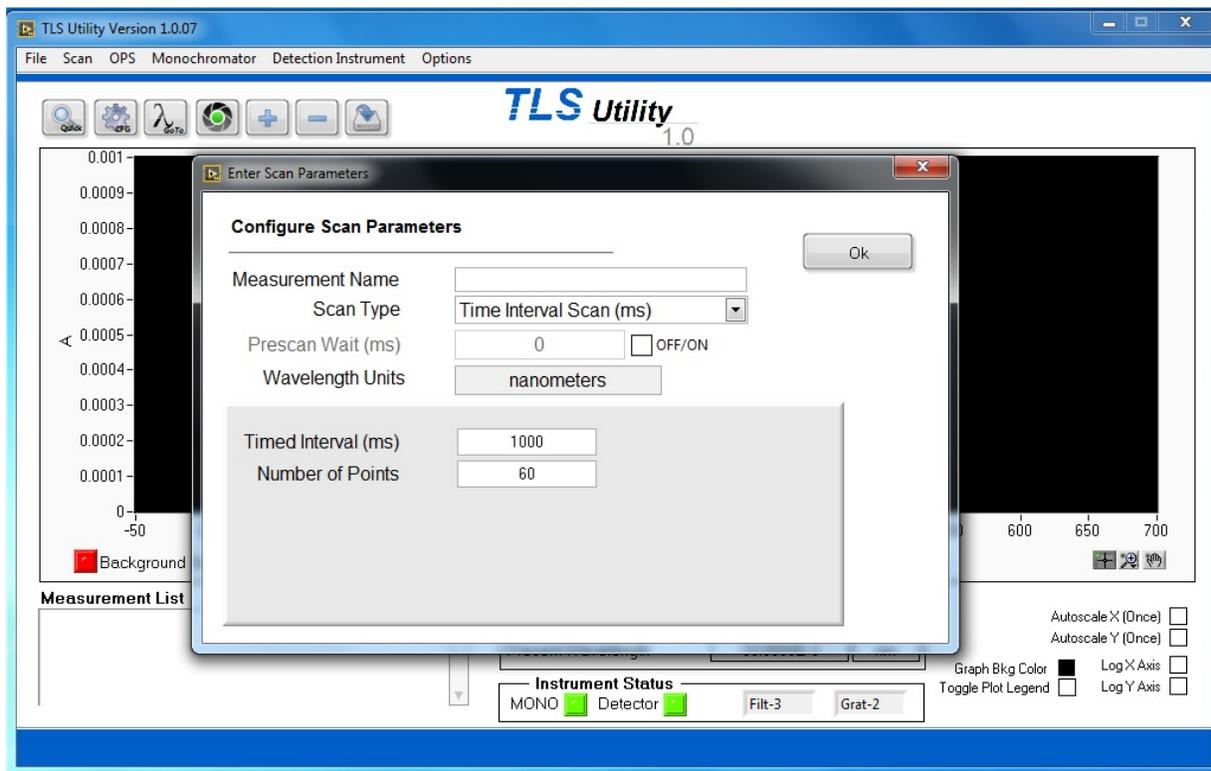
A time interval scan records the signal produced when a light source is read by a detector. The signal is read over a specified time range, with the user able to select how many times the signal is sampled within this time.

A time interval scan requires the use of a detection instrument to read the signal. This type of scan may be used to determine the stability or lifetime of light emission from a sample. Unlike other types of data scans, a reference scan is not needed. For the TLS260, this scan is performed at a single wavelength.

### 7.25.1 SETTING UP A TIME INTERVAL SCAN



Click the icon or select Setup Scan from the Scan pulldown menu, and select Time Interval Scan.



**Figure 55: Setting up a Time Interval scan**

Timed Interval is the interval in ms the TLS will wait before taking another data point. Number of Points is the amount of points the TLS will take for the duration of the scan. For example, if a Timed Interval scan 1 minute in duration is desired, with a data reading from the detector every second, the Timed Interval will be 1000 (ms) and the Number of Points will be 60. Prescan Wait can be enabled if necessary by clicking the box to the left of OFF/ON. When this box has been clicked, type in in ms the desired Prescan Wait.

When the desired parameters have been entered, click OK to exit the Enter Scan Parameters window.

Start the scan by selecting Start Scan from the Scan pulldown menu or clicking the  icon.

## 7.26 QUANTUM EFFICIENCY (QE SCAN)

There are two types of optoelectronic devices: one that creates photons by converting electrons and one that creates electrons by converting photon energy. Examples of the latter include a photodiode or a diode array, an imaging device such as a CCD or a CMOS camera, and a solar cell. Due to the band gap structure of these devices, light measurement is an essential to characterize the materials used to fabricate the device and the device themselves. The result is typically expressed as a plot of quantum efficiency (QE) or incident photon to charge carrier conversion efficiency (IPCE) as a function of wavelength.

The band gap structure in a semiconductor device introduces wavelength dependent absorptivity. A photon with energy larger than the band gap is typically absorbed by the material, while a photon with

energy smaller than the band gap is transparent. The absorbed photon energy creates an electron-hole pair charge, which leads to creation of electricity.

The terms QE and IPCE indicate the ratio of the number of photons to the number of generated charge carriers. More specifically, QE can be divided into internal QE (IQE) or external QE (EQE). In the photovoltaics field IPCE and EQE are considered identical. Since the number of quanta (photons and charge carriers) is compared in QE measurements, percentage is used as the unit of measure. Typically, the result is recorded as a function of wavelength. When selecting a QE scan, TLS Utility measures EQE.

Requirements:

Performing a QE scan requires the use of a detector that has been calibrated over the wavelength range to be examined. This data must be available in a text tab delimited file, with the wavelengths in nanometers. Calibrated detectors are available from Newport at [www.Newport.com](http://www.Newport.com).

Below is a summary of steps required to complete a QE scan:

1. Set up the scan wavelength parameters
2. Load reference detector calibration file
3. Place reference detector in light path
4. Take a basic wavelength scan
5. Save as a reference file
6. Place sample to be tested in light path
7. Load reference file
8. Select Quantum Efficiency (%) Scan
9. Enter preamplifier gain for sample and reference detector.
10. Save completed QE scan data.

Prior to taking QE data, it is important to read **SECTION 7.24 REFERENCE SCAN** in order to perform a reference scan, as well as **SECTION 7.23 BACKGROUND SUBTRACTION** in regards to background subtraction.

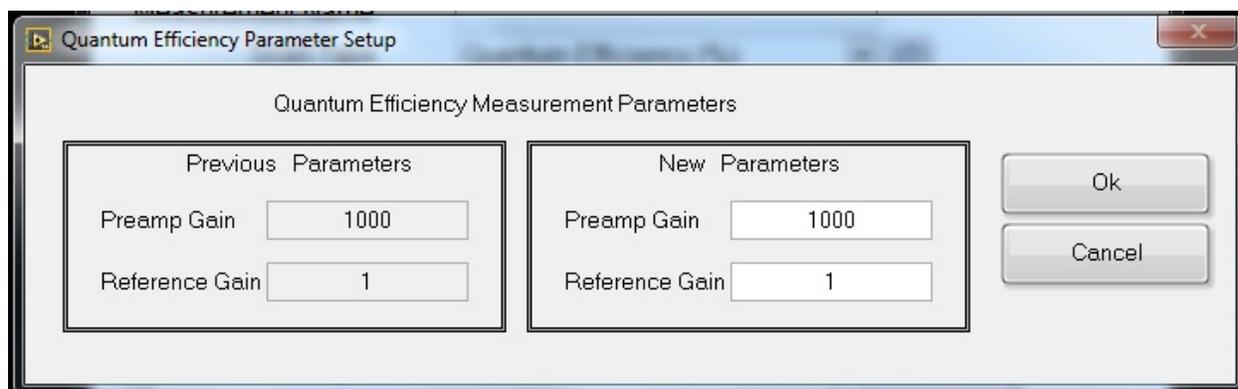
It is important that the reference detector and sample be placed so that their active areas are the same distance from the output of the monochromator. The light cannot overfill either the reference detector or the sample, as the mathematics assumes that both are receiving the same amount of light.

## 7.27 PERFORMING A QE SCAN



To proceed with the QE Scan, click the  icon or select Setup Scan from the Scan pulldown menu,

and select Quantum Efficiency (%) Scan. When Quantum Efficiency (%) is selected, the  icon will appear next to the pulldown menu. Click this icon to setup Quantum Efficiency Measurement Parameters.



**Figure 56: Quantum Efficiency measurement parameters window**

When the Quantum Efficiency Measurement Parameters window appears, enter the gain values for the reference detector in the Reference Gain slot and the sample in the Preamp gain slot, respectively. If the gain values for both the reference detector and sample are the same, 1 can be entered as both values.

When the desired parameters have been entered, click OK to exit the Quantum Efficiency Parameters Setup window and Ok again to exit the Enter Scan Parameters window. Start the scan by selecting Start

Scan from the Scan pulldown menu or clicking the  icon.

## 7.28 DETECTOR RADIOMETRY SCAN

A detector radiometry scan measures optical power using an optical detector with a known electrical response to specific wavelengths.

An unamplified detector produces a current output. Models with a built-in preamplifier or a separate preamplifier connected to the detector output produce a voltage output. For voltage output measurement, it is necessary to use an external power meter, as the integrated detector readout feature of the TLS260 can only read current output signals from unamplified detectors. In order to measure power, it is necessary to know the detector's spectral responsivity over the wavelength(s) being measured. Detectors that have been characterized in terms of their spectral responsivity are referred to as "calibrated" detectors.

Requirements:

Performing a detector radiometry scan requires the use of a detector that has been calibrated over the wavelength range to be examined. This data must be available in a text tab delimited file, with the spectral responsivities listed with respect to wavelength in nanometers. Calibrated detectors are available from Newport at [www.Newport.com](http://www.Newport.com).

Below is a summary of steps required to complete a detector radiometry scan:

1. Set up the scan wavelength parameters
2. Load reference detector calibration file
3. Place reference detector in light path
4. Take a basic wavelength scan
5. Save the scan

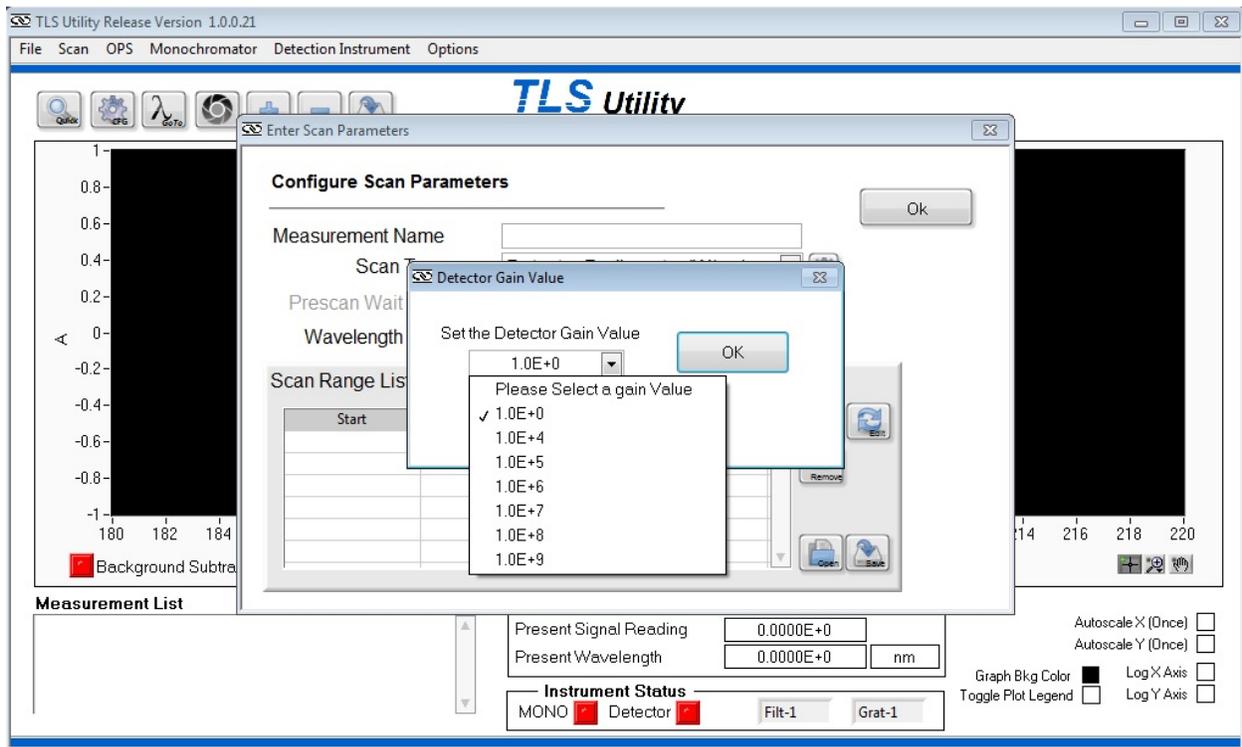
Prior to taking detector radiometry data, it is important to read **SECTION 7.24 REFERENCE SCAN** in order to perform a reference scan, as well as **SECTION 7.23 BACKGROUND SUBTRACTION** in regards to background subtraction.

Set up the scan wavelength parameters as described in **SECTION 7.22.1 WAVELENGTH SCAN**. Load the reference detector calibration file into TLS Utility, as shown in Figure 53. Position this detector in the path of light.



Click the  icon or select Setup Scan from the Scan pulldown menu, and select Detector

Radiometry Scan. When Detector Radiometry (W/nm) is selected, the  icon will appear next to the pulldown menu. Click this icon to setup if a detector with a built-in preamplifier or external preamplifier is being used. Select the proper gain setting for the calibrated detector. Available gain value selections are shown in Figure 57. These values correspond to unamplified detectors, Oriel amplified calibrated detectors, and unamplified detectors coupled to the Oriel model 70710 Current Preamplifier.



**Figure 57: Setting Detector Gain value**

Start the scan by selecting Start Scan from the Scan pulldown menu or clicking the  icon.

## 7.29 ABSORPTION SCAN

Absorption measurements are performed to quantify the amount light is absorbed by a sample at various wavelengths. Light is shone through a sample, after which is placed an optical detector. Absorbance (A) is related to transmittance (T) as  $A=20\log_{10}T$ . Absorption scans are frequently performed to quantify the concentration of a substance in a solvent, although absorption measurements may be performed on any number of materials permeable to light.

Absorption is related not only to the concentration of a solution, but also to the cell path length, per Beer's Law. When measuring absorbance of a solution vs. the solvent, it is important to use cuvettes or other vessels with the same path length.

Below is a summary of steps required to complete an absorption scan:

1. Set up the scan wavelength parameters
2. Load reference detector calibration file
3. Place the reference solvent in light path
4. Take a basic wavelength scan
5. Save the reference scan
6. Clear the graph from the plot window
7. Load reference file into TLS Utility
8. Place sample in the light path
9. Take an absorption scan
10. Save completed absorption scan data

Prior to taking absorbance data, it is important to read **SECTION 7.24 REFERENCE SCAN** in order to perform a reference scan, as well as **SECTION 7.23 BACKGROUND SUBTRACTION** in regards to background subtraction.

Absorption scans typically involve a solution created by dissolving a substance into an appropriate solvent. The baseline, or reference, measurement is obtained by placing a cuvette or other vessel containing only the solvent into the output path of a monochromator, followed by a calibrated detector sensitive to the wavelength range of interest. When the detector has been placed in the optimum position for light collection, load its calibration file into TLS Utility.

Perform a reference scan by setting up the scan wavelength parameters as described in **SECTION 7.22.1 WAVELENGTH SCAN**. Once the scan is completed, it must be saved before proceeding with absorbance measurements. Once the reference scan has been saved, it should be cleared from the plot window.

Load the reference scan file into TLS Utility, as shown in Figure 54. Remove the vessel containing the plain solvent from the light path and install the sample to be tested in its place. Ensure the path length is the same for the solution as was used for the reference scan.



Click the  icon or select Setup Scan from the Scan pulldown menu, and select Absorption (dB).



Start the scan by selecting Start Scan from the Scan pulldown menu or clicking the  icon.

## 7.30 TRANSMITTANCE/REFLECTANCE SCAN

Transmittance/reflectance measurements are performed to quantify the amount light capable of passing through a sample, or is reflected by a sample at various wavelengths. Light is shone through a sample, after which is placed an optical detector. Transmittance/Reflectance is expressed as a percentage, with 100% indicating that all light passes through a sample. Prior to performing the transmittance/reflectance scan, a reference scan is performed with no sample in the light path as a baseline measurement.

It is important to note that the light must reach the detector when the sample is in place. Leaving the detector in the same location as the reference scan assumes the index of refraction equals 1, so that the light is not bent (which would miss the active area of the detector). It should also be noted that with samples that diffuse light, both the reference and sample scans should be performed by collecting the light with an integrating sphere.

Set up the scan wavelength parameters as described in **SECTION 7.22.1 WAVELENGTH SCAN**. Load the detector's calibration file into TLS Utility. Position this detector in the path of light. Once the scan is completed, it must be saved before proceeding with transmittance measurements. Once the reference scan is saved, it should be cleared from the plot window.

Load the reference scan file into TLS Utility, as shown in Figure 54. Place the sample to be tested between the light source and the detector.



Click the  icon or select Setup Scan from the Scan pulldown menu, and select Trans/Reflect (%).



Start the scan by selecting Start Scan from the Scan pulldown menu or clicking the  icon.

## 7.31 EXPERT MODE

Expert Mode is a choice from the Options pulldown menu, when changing the pre-programmed monochromator offset and grating calibration parameters is required. This should only be done in rare cases, such as when the Cornerstone 260's monochromator becomes corrupted and these parameters need to be re-entered to ensure proper monochromator function. Because changing these parameters can adversely affect monochromator and thus TLS260 system performance, Monochromator Calibration... and Offset have been disabled from in the Monochromator pulldown menu. In order to enable these options to edit these parameters, the password must be entered in Expert Mode. Contact your Technical Sales Engineer or call (800)-222-6440 if such assistance is required.

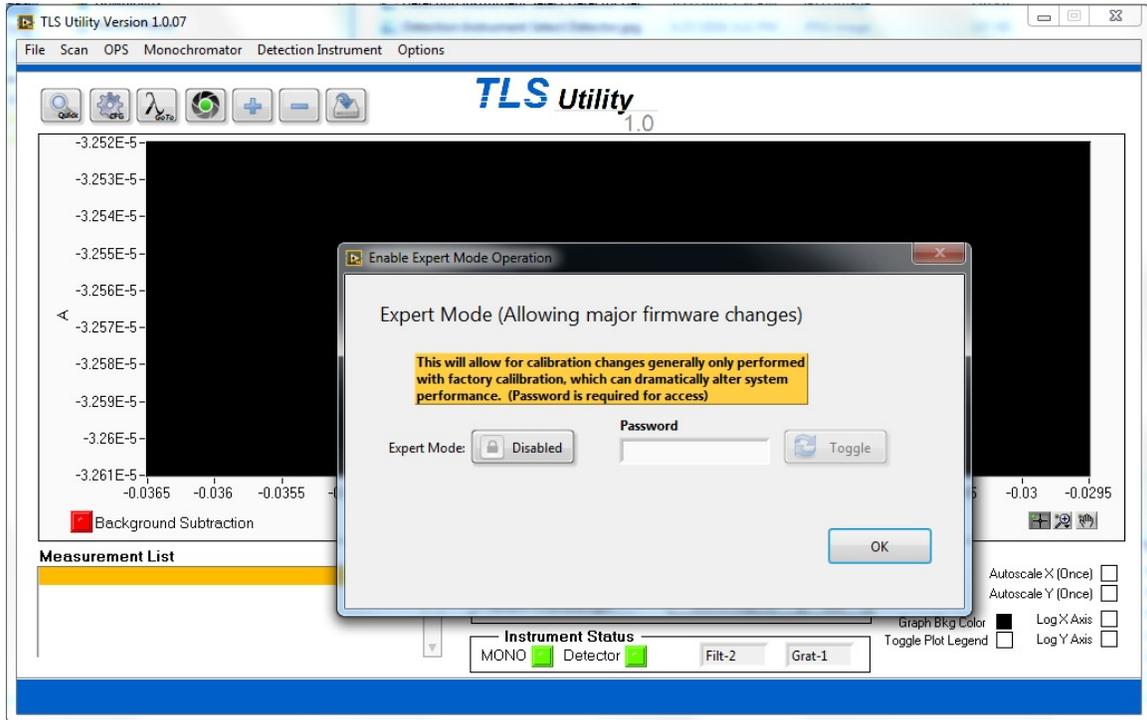


Figure 58: Expert Mode

## 8 LAMP ALIGNMENT

The Newport Tunable Light Source family of products is designed to provide high-quality light output. To achieve optimal performance, proper alignment of the lamp is required. Lamp alignment consists of properly positioning the lamp, adjusting the lamp housing rear reflector position and locking the lamp housing condenser lens assembly in its optimized location.

Lamp alignment must be performed when receiving the Tunable Light Source (TLS), any time the lamp is removed and reinserted (such as when transporting the unit), and when installing a replacement lamp.

Failure to align or properly align the lamp with the focusing lens of the lamp housing results in:

- An asymmetrical, non-uniform output beam
- Diminished output intensity

Always wear eye protection suitable for use with UV radiation during the lamp alignment process. The light output will heat up any surface or object to which it is aimed, particularly when the light is focused onto a small area. The lamp housing's condenser assembly will become hot while the lamp is on and will remain hot for some time after the lamp is turned off.

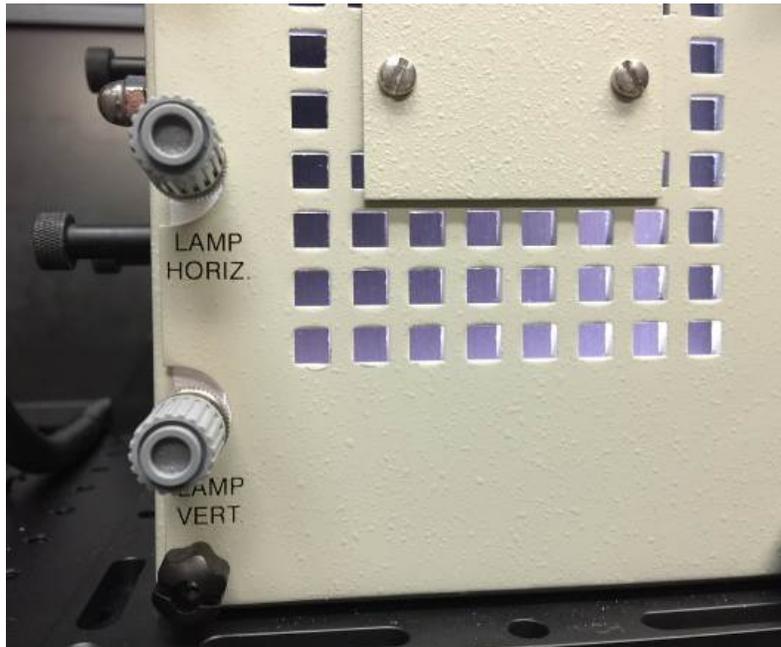
Do not leave the lamp unattended while performing this procedure. Ensure the light cannot cause injury or damage to persons or objects in the general area. A full list of precautions is available in each of the user manuals provided with the Tunable Light Source.

A flat, non-reflective vertical surface is required as a backdrop to image the output of the TLS when performing the alignment procedure. Ensure the surface is non-flammable and will not be damaged by the heat produced from the lamp. To view the image clearly, it may be necessary to turn off the room lighting.

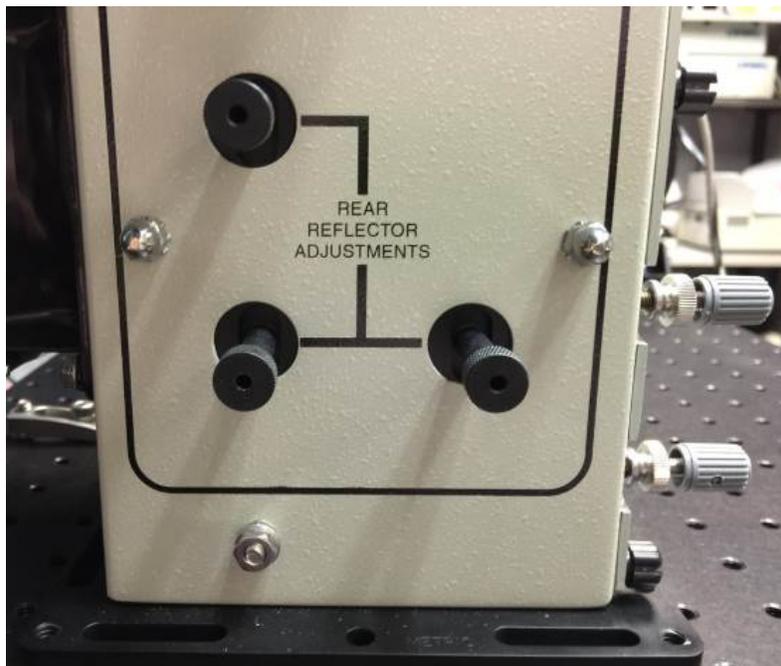
This procedure applies to the following Tunable Light Sources. The exact steps required to perform the lamp alignment depend on the type of lamp being utilized. Refer to the section in this procedure specific to the lamp type noted in the table below.

Model	Lamp Type
TLS260-300X	Xenon arc (Xe)
TLS260-250Q	Quartz Tungsten Halogen (QTH)

Prior to turning on the TLS, the system must be inspected to confirm the lamp is installed, the lamp housing door is secured in place using all hardware provided, and the lamp housing interconnection cable is firmly connected to both the lamp housing and the power supply.



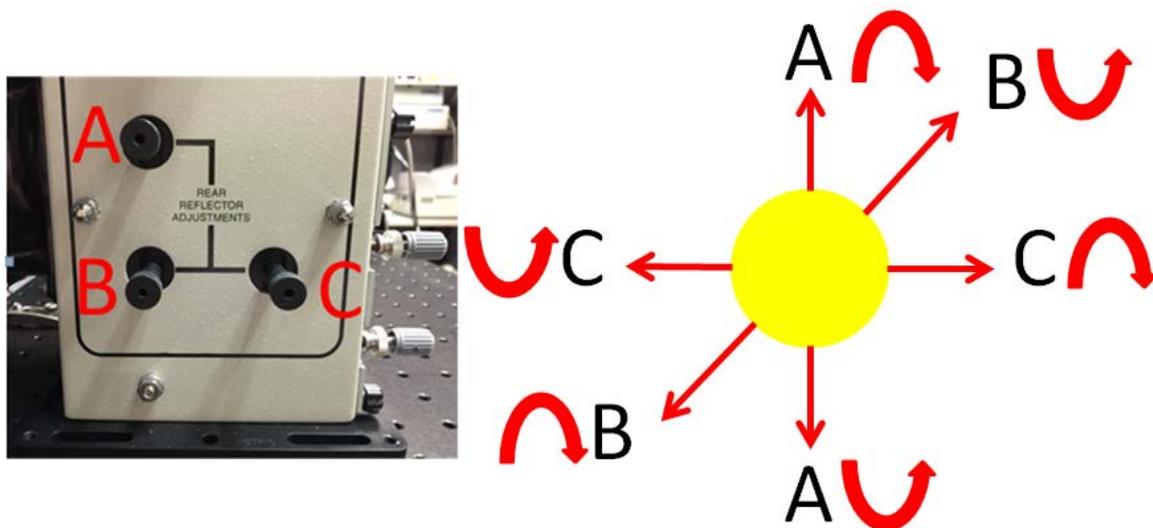
**Figure 59: Lamp Horizontal and vertical position adjustment Knobs at the lamp housing door**



**Figure 60: Rear reflector adjustment knobs on the side of the lamp housing**



focusing lens housed in the 6195 lens holder coupled to the output of the collimating lens assembly of the Research Lamp Housing. By moving the adjustment knob shown in Figure 61, the distance from the collimating lens and the focusing lens is increased or decreased, defocusing or focusing the anode and cathode (Xe arc lamp) or filament (QTH lamp) of the lamp being housed. This optical configuration is designed to allow the user to precisely focus the anode and cathode or filament of the lamp for alignment purposes, and focus the output of a properly aligned lamp into the filter wheel and thus the input aperture of the monochromator.



**Figure 63: The yellow image at the right represents the secondary image of the QTH/arc lamp from the rear reflector of the Lamp Housing. To move this secondary image in the desired direction, rotate each Rear Reflector Adjustment knob as indicated in the image on the left (counter)clockwise to achieve the desired image displacement as indicated in the figure on the right.**

## 8.1 QTH LAMP ALIGNMENT

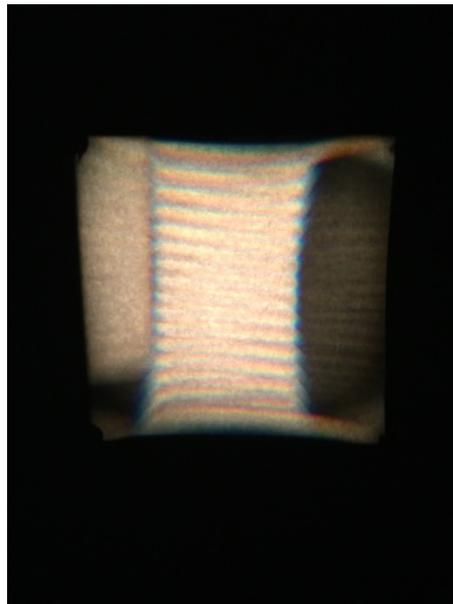
During the lamp alignment process, the lamp must be operated at its rated operating power or current. This is required in order to achieve a light output bright enough to visibly confirm each step of the lamp alignment procedure has been completed correctly. For QTH lamps, it is recommended that the power supply be operated in Constant Current mode, to allow for a consistent light intensity output throughout the lifetime of the lamp. The appropriate settings are noted in the table below.

Model	Power	Current
TLS260-250Q	250 W	10.42 A

No fixed slit should be installed into the monochromator input slit and the output slit width and height should be adjusted to its maximum values, in order to allow the maximum light output from the TLS. To maximize the slit width of the micrometer driven output slit of the monochromator, turn the dial at the top of the micrometer clockwise until it is at its lowest position on the sleeve. The slide of the micrometer should also be moved to its leftmost position to maximize slit height (See **SECTION 9.2 OUTPUT SLIT**

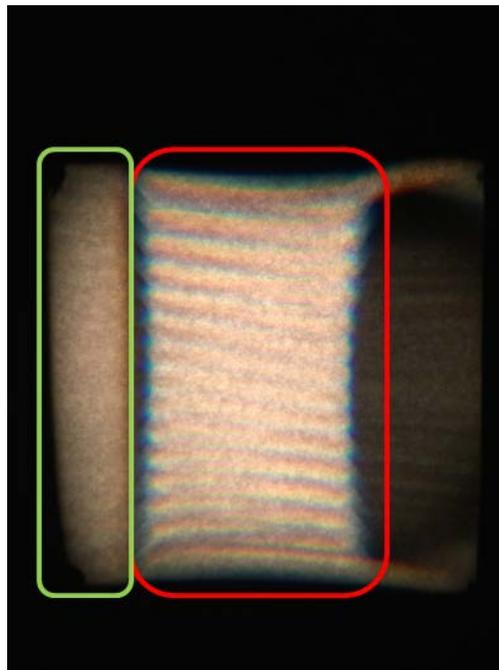
**WIDTH ADJUSTMENT** for more information). The output optical assembly should also be removed to allow for maximum visibility of the output beam. See **SECTION 10 OPTICAL OUTPUT ASSEMBLY** for more information on removing the optical output assembly.

1. Turn on the TLS power supply and verify the settings shown in the table.
2. Connect the monochromator to a computer with TLS Utility software installed. The optional model 74009 hand controller may be used if a computer is not present.
3. Turn on the monochromator. Use the software or hand controller to go to wavelength "0".
4. Turn on the TLS lamp.
5. Position the backdrop in front of the output of the TLS. The image of the output slit will expand as the distance the backdrop is placed from the output port of the TLS increases. Select a distance which allows the entire profile of the slit and the QTH lamp filament to clearly be seen when moving the adjustment lever as described in Step 7.
6. Loosen the adjustment lever on the condenser lens assembly shown in Figure 61, by turning the adjustment knob at the top of the lever counterclockwise, so that it can be moved closer to or farther from the lamp housing. The loosened adjustment lever may be pushed or pulled so that it rotates about the cylindrical condenser lens assembly.
7. Move the adjustment lever so that it rotates about the cylindrical condenser lens assembly until the filament of the QTH lamp can be clearly seen on the backdrop placed in front of the TLS. The final position of the Adjustment Lever should be at the position which outputs the sharpest filament image on the backdrop, which is usually closest to the lamp housing as possible. The spiral shape of the lamp filament should be visible on the backdrop, as shown in Figure 64. This image is referred to as the "primary image".
8. Tighten the condenser adjustment knob to lock it into position.

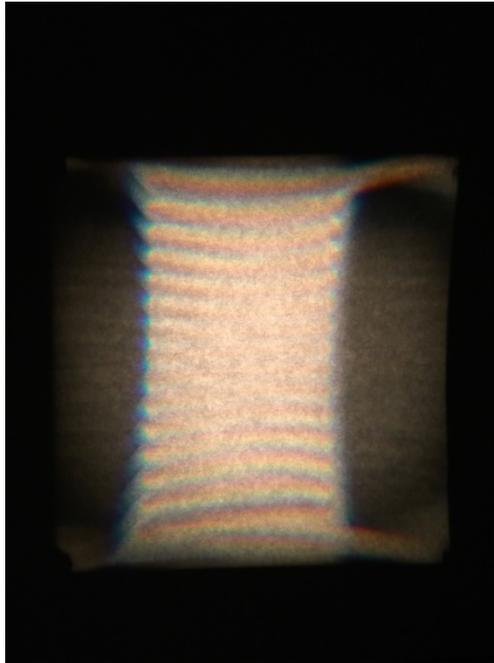


**Figure 64: Primary image of QTH lamp filament after adjusting condenser lens assembly**

9. Rotate the grey horizontal and vertical lamp position knobs (Figure 59) to move the primary image of the filament until it is horizontally and vertically centered within the rectangular output slit profile of the TLS.
10. When the primary filament image is centered, lock both lamp position adjustment knobs in place by tightening the silver locking screws behind each grey knob. Rotate the silver locking screws clockwise to tighten.
11. A reflector is located behind the lamp inside the lamp housing. The position of the reflector is adjusted using the knobs located on the side of the lamp housing, as shown in Figure 60. The lamp's reflected image is referred to as the "secondary image". Figure 65 shows the lamp's primary image in the red box and the secondary image in the green box. Using the reflector adjustment knobs, ensure the secondary image is as sharp as possible. This may require loosening the condenser lens assembly adjustment knob and defocusing the primary image of the lamp filament, in order to achieve a sharper image of the filament's secondary image. Then overlay or superimpose the reflector's secondary image of the lamp onto the primary image of the lamp filament (see Figure 66). See Figure 63 for reference on how the secondary image is displaced relative to which knob is adjusted in each direction.

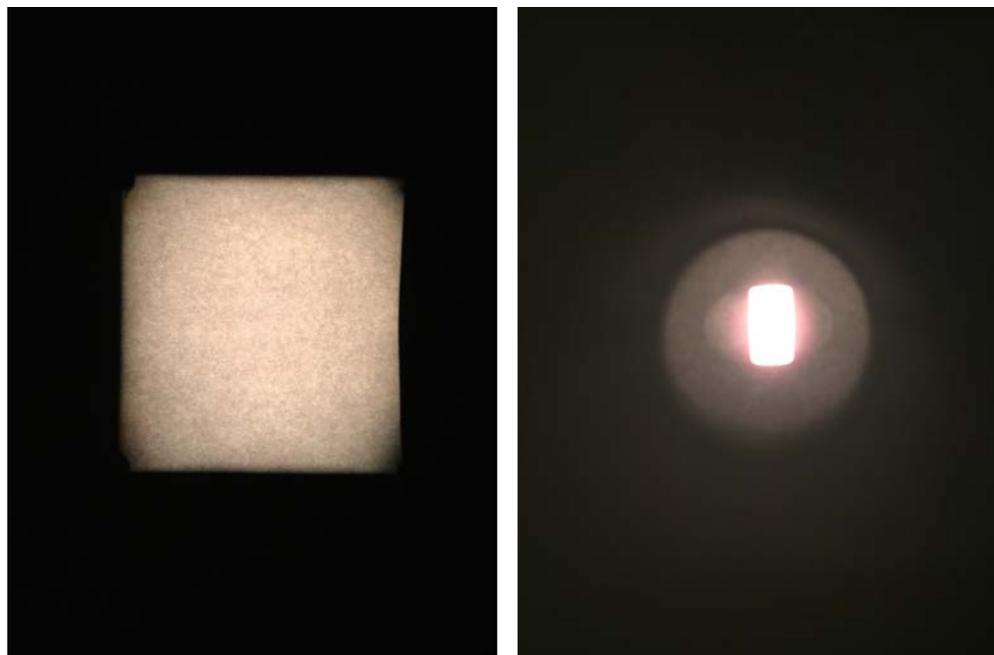


**Figure 65: QTH lamp primary image (red box) and secondary reflected image (green box)**



**Figure 66: QTH lamp reflected secondary image superimposed onto primary image**

12. Loosen the adjustment lever on the condenser lens assembly shown in Figure 61 so that it can be moved closer to or farther from the lamp housing. The loosened adjustment lever may be pushed or pulled so that it rotates about the cylindrical condenser lens assembly.
13. Move the lever so that it rotates about the cylindrical condenser lens assembly until a uniform, rectangular light profile is seen on the backdrop. This is done by defocusing the beam, or moving the adjustment lever to what is usually its farthest position from the lamp housing. The light profile as seen from the slit will appear as seen in Figure 67.



**Figure 67: The uniform, rectangular output of a properly aligned QTH lamp as seen on the backdrop (left) and the slit output (right)**

14. Tighten the adjustment knob to lock it into position when the image seen on the backdrop matches Figure 67. If there are any dark spots or inconsistencies in brightness, repeat steps 7 through 13 for QTH lamp alignment.

## 8.2 XENON ARC LAMP ALIGNMENT

During the lamp alignment process, the lamp must be operated at its rated operating power or current. This is required in order to achieve a light output bright enough to visibly confirm each step of the lamp alignment procedure has been completed correctly. For arc lamps, it is recommended to operate the lamp with the power supply in Constant Power mode for better long term output stability and lamp lifetime. The appropriate settings are noted in the table below.

Model	Power	Current
TLS260-300X	300 W	15 A

No fixed slit should be installed into the monochromator input slit and the output slit width and height should be adjusted to its maximum values, in order to allow the most light output from the TLS. To maximize the slit width of the micrometer driven output slit of the monochromator, turn the dial at the top of the micrometer clockwise until it is at its lowest position on the sleeve. The slide of the micrometer

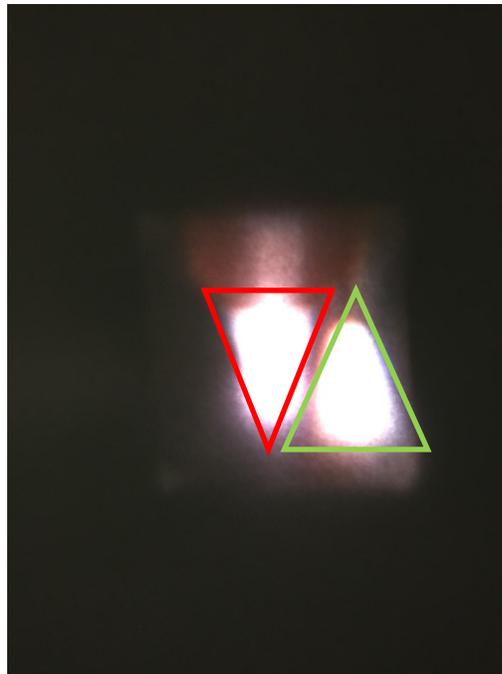
should also be moved to its leftmost position to maximize slit height (See **SECTION 9.2 OUTPUT SLIT WIDTH ADJUSTMENT** for more information). The output optical assembly should also be removed to allow for maximum visibility of the output beam. See **SECTION 10 OPTICAL OUTPUT ASSEMBLY** for more information on removing the optical output assembly.

1. Turn on the TLS power supply and verify the settings shown in the table.
2. Connect the monochromator to a computer with TLS Utility software installed. The optional model 74009 hand controller may be used if a computer is not present.
3. Turn on the monochromator. Use the software or hand controller to go to wavelength "0".
4. Ignite the TLS lamp.
5. Position the backdrop in front of the output of the TLS. The image of the output slit will expand as the distance the backdrop is placed from the output port of the TLS increases. Select a distance which allows the entire profile of the slit and the arc of the lamp to clearly be seen when moving the adjustment lever as described in Step 7.
6. Loosen the adjustment lever on the condenser lens assembly shown in Figure 61, by turning the knob at the top of the lever counterclockwise, so that it can be moved closer to or farther from the lamp housing. The loosened adjustment lever may be pushed or pulled so that it rotates about the cylindrical condenser lens assembly.
7. Move the lever so that it rotates about the cylindrical condenser lens assembly until the Xenon arc lamp can be clearly seen on the backdrop placed in front of the TLS. Move the adjustment lever to obtain the sharpest image possible of the lamp's electrodes, which are referred to as the anode and cathode. This is usually achieved when the adjustment lever is as close to the lamp housing as possible. Both the anode and cathode of the lamp should be visible on the backdrop, as shown in Figure 68. This image is referred to as the "primary image".

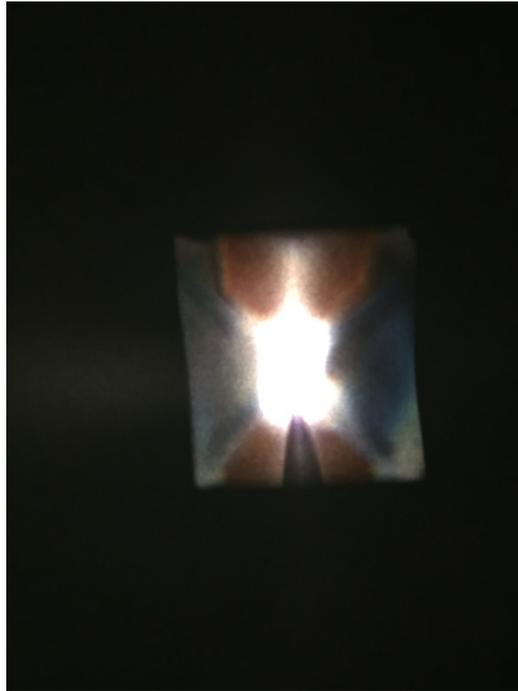


**Figure 68: The anode and cathode of the Xe lamp with visible arc**

8. Tighten the condenser adjustment knob to lock it into position.
9. Rotate the grey horizontal and vertical lamp position knobs (Figure 59) to move the primary image of the lamp until the arc between the anode and cathode is horizontally and vertically centered within the circular output of the TLS.
10. When the primary arc is centered, lock both lamp position adjustment knobs in place by tightening the silver locking screws behind each grey knob. Rotate the silver locking screws clockwise to tighten.
11. A reflector is located behind the lamp inside the lamp housing. The position of the reflector is adjusted using the knobs located on the side of the lamp housing, as shown in Figure 60. The lamp's reflected image is referred to as the "secondary image". Figure 69 shows the lamp arc's primary image in the red box and the secondary image in the green box. Using the reflector adjustment knobs, ensure the secondary image is as sharp as possible. This may require loosening the condenser lens assembly adjustment knob and defocusing the primary image of the lamp anode and cathode, in order to achieve a sharper secondary image of the arc between the anode and cathode. Then overlay or superimpose the reflector's secondary image of the arc onto the primary image of the arc (see Figure 70). See Figure 63 for reference on how the secondary image is displaced relative to which knob is adjusted in each direction.



**Figure 69: Xe arc lamp primary image (red) and secondary reflected image (green)**



**Figure 70: Xe arc lamp reflected secondary image superimposed onto primary image**

12. Loosen the adjustment lever on the condenser lens assembly shown in Figure 61 so that it can be moved closer to or farther from the lamp housing. The loosened adjustment lever may be pushed or pulled so that it rotates about the cylindrical condenser lens assembly.
13. Move the lever so that it rotates about the cylindrical condenser lens assembly until a uniform, rectangular light profile is seen on the backdrop. This is done by defocusing the beam, or moving the adjustment lever to what is usually its farthest position from the lamp housing. The light profile as seen from the slit will appear as seen in Figure 71. Tighten the adjustment knob to lock it into position when the image seen on the backdrop matches Figure 71. If there are any dark spots or inconsistencies in brightness, repeat steps 7 through 13 for Xenon arc lamp alignment.



Figure 71: Uniform output of a properly aligned Xe lamp

## 9 SLIT WIDTH ADJUSTMENT

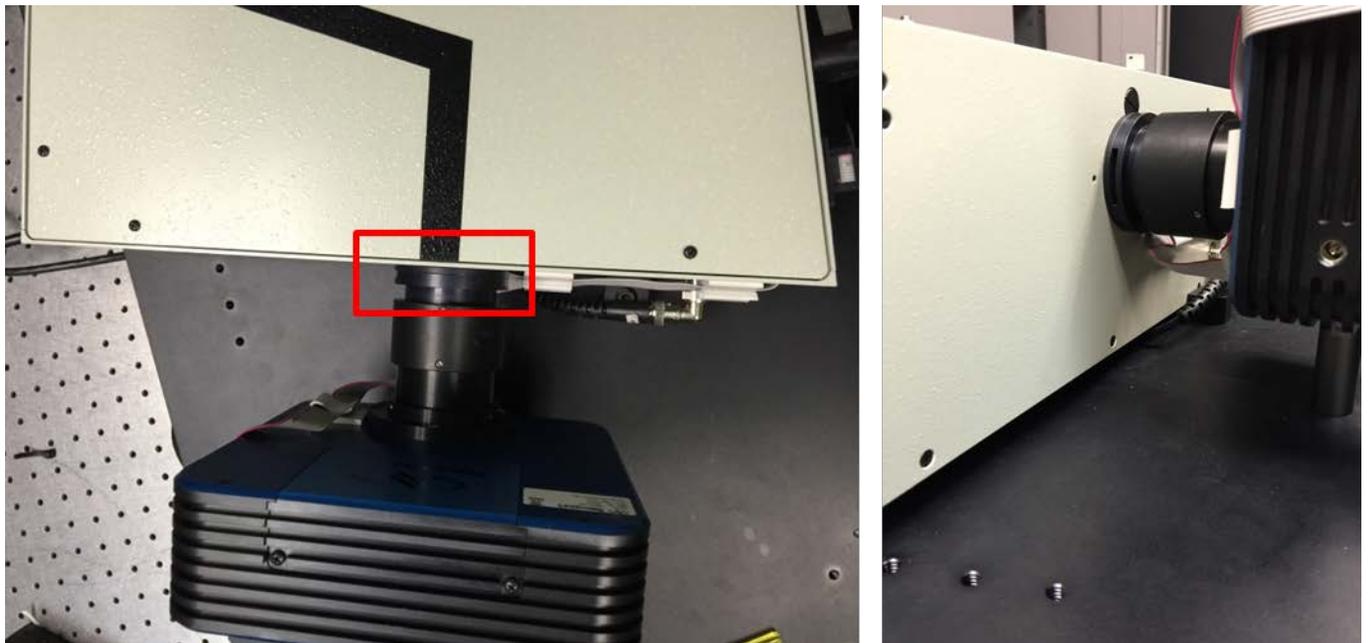
### 9.1 INPUT SLIT WIDTH ADJUSTMENT

A fixed slit holder is mounted to the input port of the monochromator. The TLS includes the following slits:

Fixed Slit Model	Width	Height
77216	600 $\mu\text{m}$	18 mm*
77214	1240 $\mu\text{m}$	18 mm*

\*Actual slit height is 18 mm, usable height is 12 mm.

The fixed slit holder at the input port of the monochromator is located between the filter wheel and the monochromator.



**Figure 72: The fixed slit holder at the input port of the monochromator**

Remove the fixed slit (if necessary) currently in the fixed slit holder at the input port of the monochromator.

When inserting a slit into its holder, it is important that the reflective side of the slit be facing the incoming light or the filter wheel, with the black, non-reflective side facing the monochromator. Inserting a slit incorrectly will prevent the slit from being fully inserted into the fixed slit holder and block the path of light into the monochromator.



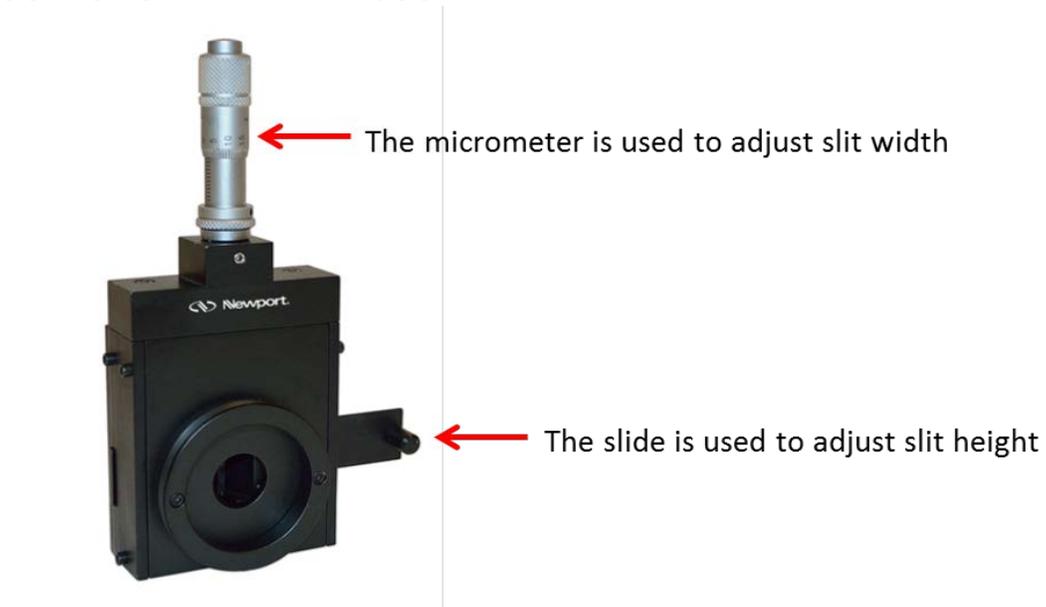
**Figure 73: A 600  $\mu\text{m}$  fixed slit oriented properly for installation**

The following fixed slit models/slit widths are also available separately from Oriel Products. See the Newport website (<http://www.newport.com/>) for ordering information.

Part Number	Width	Height
77222	10 $\mu\text{m}$	2 mm
77220	25 $\mu\text{m}$	3 mm
77725	25 $\mu\text{m}$	6 mm
77221	50 $\mu\text{m}$	3 mm
77219	50 $\mu\text{m}$	6 mm
77728	100 $\mu\text{m}$	3 mm
77729	100 $\mu\text{m}$	10 mm
77218	120 $\mu\text{m}$	18 mm*
77730	200 $\mu\text{m}$	3 mm
77731	200 $\mu\text{m}$	10 mm
77217	280 $\mu\text{m}$	18 mm*
77215	760 $\mu\text{m}$	18 mm*
77213	1.56 $\mu\text{m}$	18 mm*
77212	3.16 $\mu\text{m}$	18 mm*
77211	6.32 $\mu\text{m}$	18 mm*

\*Actual slit height is 18 mm, usable height is 12 mm.

## 9.2 OUTPUT SLIT WIDTH ADJUSTMENT



**Figure 74: A micrometer adjustable slit**

For versatility and convenience in adjusting resolution and throughput, a micrometer driven slit is mounted to the output port of the monochromator. This slit assembly is adjustable from fully closed to 3 mm in width, and 2 to 12 mm in height.

The slit width setting is read and adjusted by the vertically mounted micrometer at the top of the slit assembly. There is a set of numbers on the turning dial and the shaft. When the zeroes in both of these locations are aligned, the slit is fully closed. Turning the dial clockwise moves the dial further down the shaft, closer to the body of the slit assembly. This opens the slit or increases the slit width.

Use a 10x multiplier to convert the micrometer reading to the actual slit opening size. For example, turning the dial one full revolution starting from the fully closed position will give a reading of 50 on the micrometer. Using the multiplier, this indicates the micrometer width is set at 500  $\mu\text{m}$ . If unsure of the current slit width, begin at the fully closed position (shown in Figure 75) and count each full revolution made by the dial, with each revolution corresponding to a slit width increase of 500  $\mu\text{m}$ .



**Figure 75: A micrometer at fully closed slit setting**

The slit height is continuously adjustable. Use the knob protruding from the slide to adjust the slit height. Moving the slide all the way to the right, where it is protruding from the slit assembly closes the slit to its shortest height at 2 mm. Moving the slide all the way to the left, where it is fully inserted in the slit assembly opens the slit to its greatest height at 12 mm.



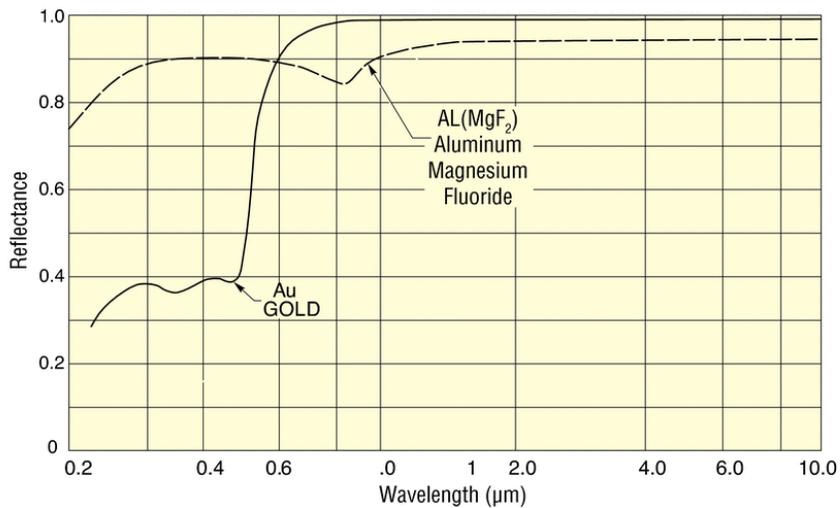
**Figure 76: Using the slide to adjust the micrometer driven slit to its minimum (left) or maximum (right) height**

## 10 OPTICAL OUTPUT ASSEMBLY

The optical output assembly has been packaged separately from the TLS260 unit to protect it from damage during shipping. This output assembly features an off-axis replicated parabolic mirror, coated in protected aluminum. An off-axis parabolic mirror is used because the design features the focal point displaced from its mechanical axis, eliminating the typical shadow effect observed when a detector or light source is placed at its focal point.

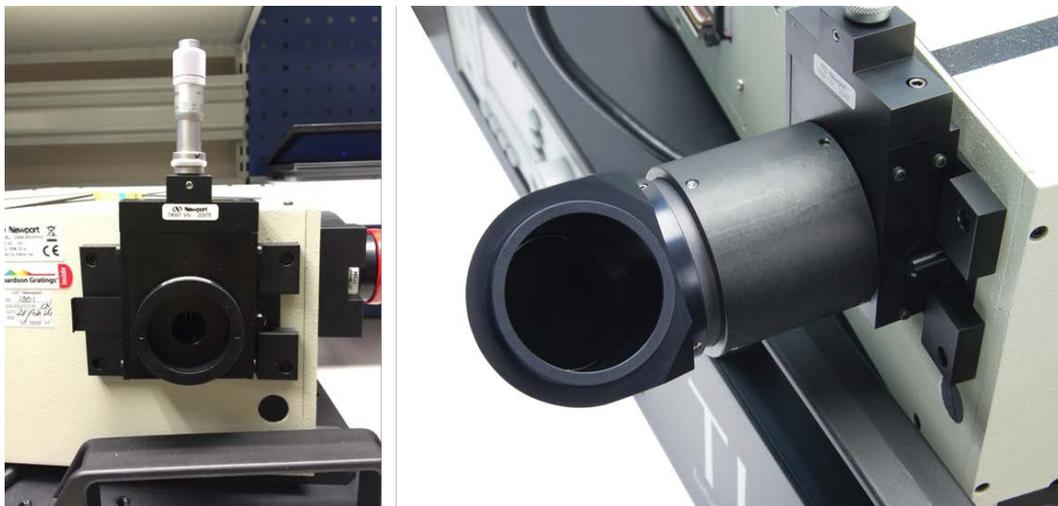


**Figure 77: Optical output assembly as a separate component**



**Figure 78: Reflectance Efficiency curve of the off-axis parabolic mirror integrated into the optical output assembly**

To attach the output assembly, place the female flange at the end of the light shield over the male flange of the Cornerstone 260 monochromator's output slit in a position that correlates to the desired output beam orientation. The optical assembly can be mounted in any 360° orientation, giving 360° freedom of rotation over the output beam orientation. When the desired output flange orientation is achieved, use the included 1/16 hex wrench to tighten the three set screws in the optical assembly to secure it in place.



**Figure 79: The bare output slit of the Cornerstone 260 monochromator (left) and properly mounted optical output assembly (right)**

## 11 UNIVERSAL FILTER WHEEL

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Integrated into the TLS260 is Oriel's USFW-100 Universal Filter Wheel. This filter wheel contains four pre-installed order sorting filters that prevent second order wavelength emission to ensure true monochromatic light is output from the TLS unit. The TLS260 is already programmed to place the correct order sorting filter into the light path when an output wavelength command is sent to the unit, without requiring any direct filter change command from the user. As the filter wheel receives commands and input power from the Cornerstone 260 monochromator, there is no need for an external power supply. Both the filter wheel's power on switch and manual pushbutton control will be unresponsive, and the LED filter position indicator of the TLS will not be active while the TLS is in use. The filter wheel is powered on when the monochromator is powered on, and completely controlled and automated by the monochromator when necessary.

### 11.1 MANUALLY SELECTING A FILTER

If necessary, the desired filter wheel position can be selected manually using TLS Utility (see **SECTION 7.17 FILTER SELECTION PARAMETERS**) or 74009 Monochromator Hand Controller (see the CORNERSTONE 260™ MOTORIZED 1/4m MONOCHROMATOR manual for more instructions). TLS Utility can also be used to change the pre-programmed wavelengths at which each filter wheel position is placed within the light path.

### 11.2 LIGHT STOPPER ELEMENT

A light stopper element is placed in Position 6 of the filter wheel. This is a useful alternative to the shutter in blocking light output. For example, if a change in experimental setup is necessary, the light stopper element can be used to shield the user from potentially harmful UV light and avoid exposing the experimental setup to undesired light output. Using the light stopper element minimizes the amount of times the lamp must be started or ignited during these instances. Frequent starts or ignitions of the lamp places unnecessary stress on the lamp and can cause the lamp to have a lifetime much shorter than its specified lifetime.

### 11.3 FILTER REMOVAL

Although it is not recommended to remove the pre-installed order sorting filters Oriel has specifically selected for the TLS260, unique application requirements may require a user to remove these filters and install more suitable ones.

At the top of the filter wheel, two 4-40 socket cap screws secure the filter wheel access panel in place. Remove these screws, and slide the access panel upward to remove it. Set the access panel aside.



**Figure 80: Removing the access plate to add/remove filters**

The filter wheel is designed to hold 6 of Newport's LT10-05 or ½ inch length, 1 inch LT series Lens Tubes. Each Lens Tube is designed to hold a 1 inch diameter filter of 0.390 inch minimum thickness and 0.600 inch maximum thickness.

Rotate the lens tube counterclockwise to remove it from the filter wheel. It is ideal to purchase new lens tubes for use with the filters that will be installed into the filter wheel to avoid frequent removal/re-installation of filters into the lens tube. However, if the filter must be removed from its lens tube, use a spanner wrench such as Newport's LT10-WR. Insert the prongs of the wrench into the correlating notches on the retaining ring of the LT10-05 Lens Tube. Rotate the wrench counterclockwise until the retaining ring is removed from the Lens Tube as shown in Figure 81. It is suggested to write down the filter wheel position each filter or filter and lens tube pair was removed from, so they can be easily re-installed to their proper filter wheel position in the future.



**Figure 81: Removing the retaining ring from the LT10-05 (Sold Separately)**

Once the retaining ring has been removed from the lens tube, remove the current filter and install the desired filter. Secure the filter in place by rotating the retaining ring clockwise with the spanner wrench.

When the filter has been installed in the lens tube, screw the lens tube into the desired slot on the filter wheel by rotating the filter wheel to the desired numerical filter position and rotating the lens tube clockwise into place. It is suggested to write down which filter has been installed into which filter wheel position as each one is installed.



**Figure 82: Exploded filter removal/installation**

When filter installation is completed, replace the filter wheel access panel by sliding it into place and replace the two 4-40 socket cap screws to secure it. Additional filters, lens tubes, and the spanner wrench are all available at [www.newport.com](http://www.newport.com).

## 12 CONNECTING A DETECTOR

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The TLS260 has a BNC connector built into its baseplate for connecting an Oriel unamplified photodetector. This detector readout capability is built into the firmware of the OPS Power Supply and does not require an external power meter or other hardware for real-time current output display.



**Figure 83: The BNC connector on the TLS260 baseplate for detector readout**

To view the real time current output readout of the Oriel detector, use a BNC cable to connect the output of the detector to the BNC connector on the TLS baseplate shown in Figure 83.

On the front panel of the OPS Power Supply press the horizontal menu button under the Display indicator on the LCD screen and observe the vertical Display menu appear on the right of the screen. Use the knob to the right of the LCD screen to toggle the display to Lamp Intensity as indicated by the red dot to the left of each option. Then, press the CLEAR button to clear the Display menu and observe the current output of the photodetector.

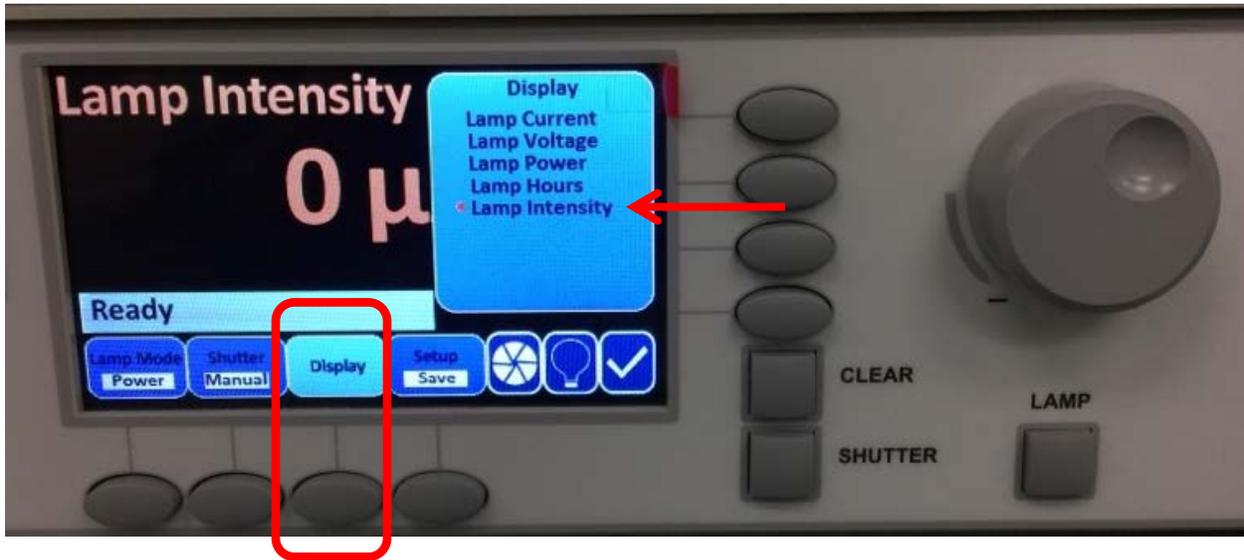


Figure 84: Changing the OPS Power Supply display to real time detector readout

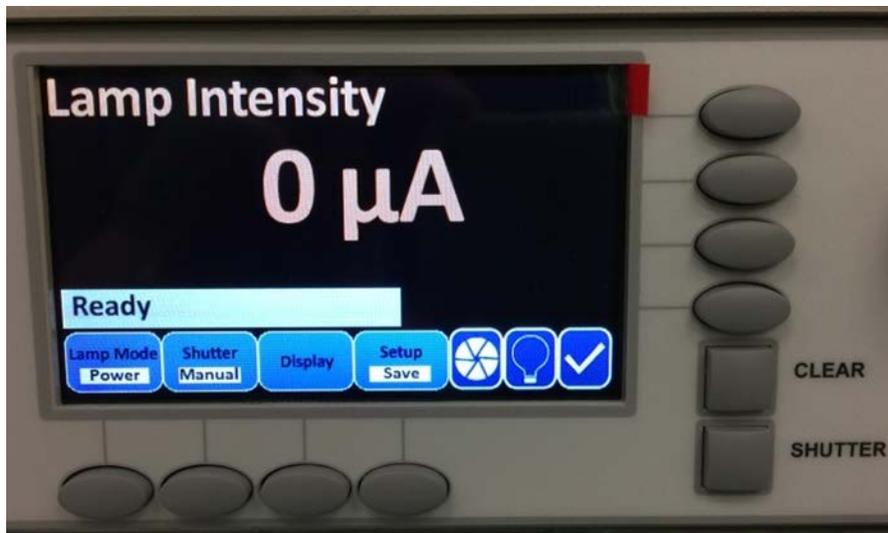


Figure 85: OPS Power Supply displaying detector readout current

The OPS Power Supply is capable of displaying output current from 1-2450  $\mu\text{A}$  with a 1  $\mu\text{A}$  resolution.

### 13 MONOCHROMATOR REMOVAL

In order to ensure the same wavelength accuracy and repeatability the TLS260 demonstrated out of the box, the Cornerstone 260 monochromator must be routinely calibrated based on its age and condition of the instrument. Newport offers a three-tier, non-warranty calibration service for the Cornerstone 260 monochromator:

**CS260-MCAL-OPT1:** It is recommended the monochromator be returned to Newport each year for this service. This procedure includes recalibration of the gratings, replacement of the clock spring, and gear lubrication. A routine quality check is also performed to make sure the instrument is in good condition.

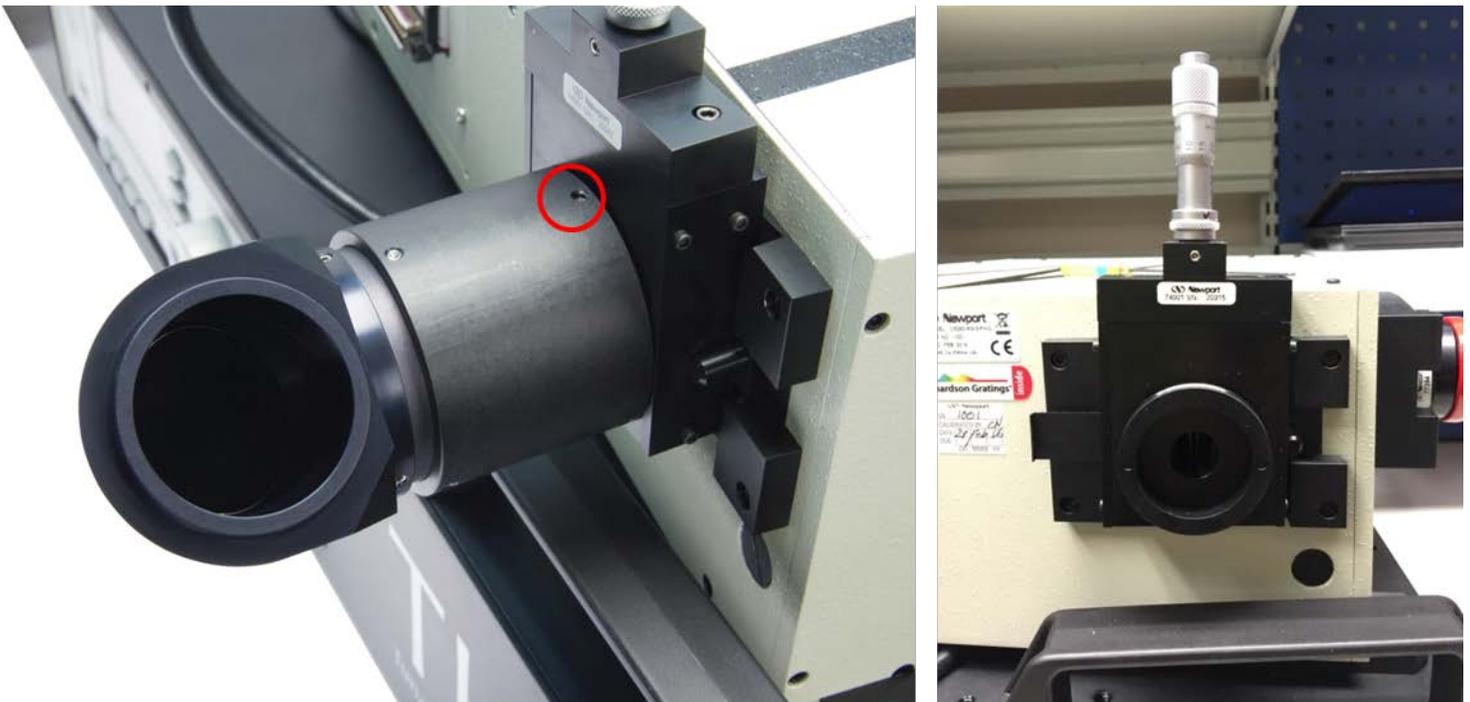
**CS260-MCAL-OPT2:** It is recommended the monochromator be returned to Newport every three years for this service. The diffraction gratings and internal spherical mirror are replaced, as these components often become degraded due to UV light exposure and oxidation. The clock spring is replaced as well and internal gears are lubricated.

**CS260-MCAL-OPT3:** For non-functioning units, this service is available. This is a complete troubleshooting and repair process that turns previously non-working monochromators into a fully-functioning unit performing like new.

Only the Cornerstone 260 monochromator, not the entire TLS260 unit needs to be returned for these calibration services.

**To begin, make sure both the Cornerstone 260 monochromator and OPS Power Supply are powered off and unplugged. Disconnecting electrical components while the monochromator or power supply is powered on can cause permanent damage to multiple components of the system.**

Using a 6-32 hex driver, loosen the three socket set screws that fix the optical output assembly to the output flange of the Cornerstone 260 monochromator to expose the bare slit.

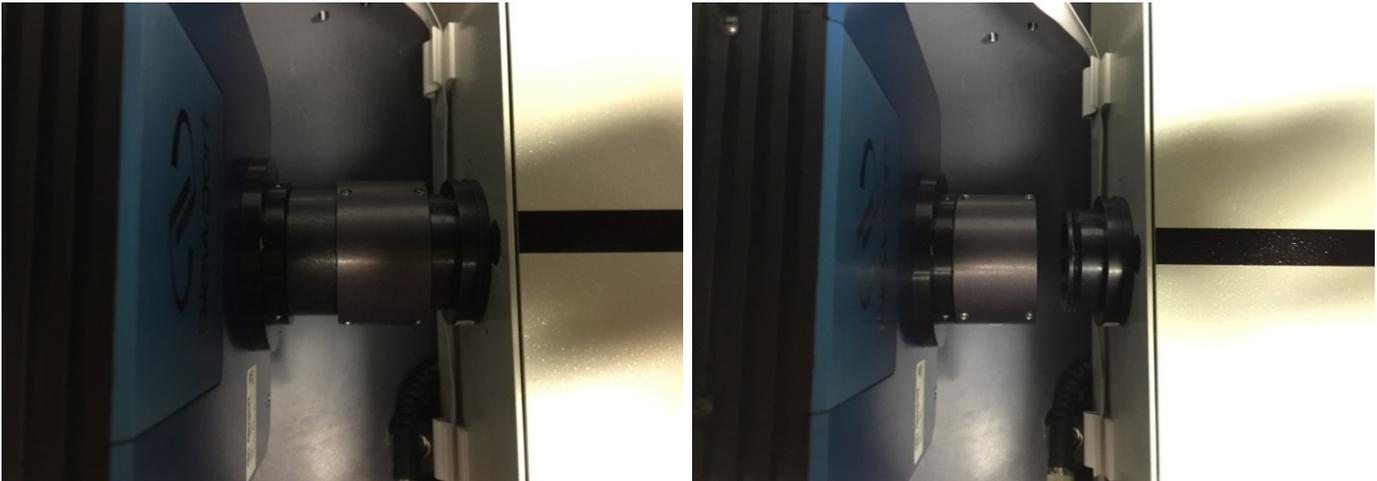


**Figure 86: Removing the optical output assembly from the Cornerstone 260 monochromator**

Loosen the six socket set screws (#6-32) on the extended light shield that couple the filter wheel to the monochromator. When the screws have been loosened enough to allow the locking collar to move,

disconnect the collar from the input flange of the monochromator and slide it toward the filter wheel as shown in Figure 87.

On the interface panel of the monochromator, disconnect the ribbon cables from the RS-232 and FILTER WHEEL terminals, and disconnect the monochromator power cable from the POWER terminal. A small Phillips or flathead screwdriver will be required to remove the RS-232 cable.

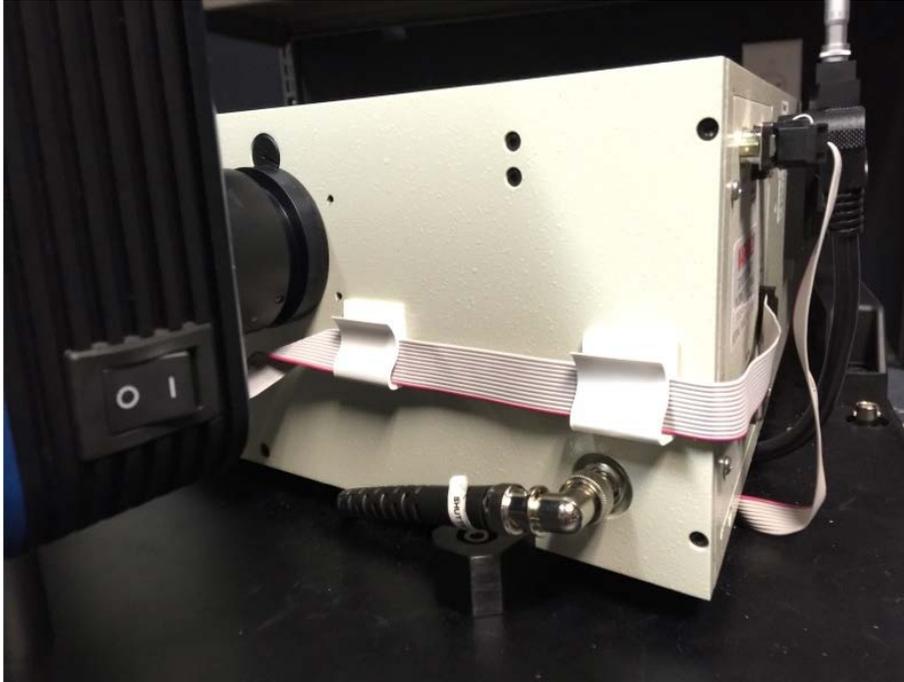


**Figure 87: Loosening the locking collar from the input flange of the monochromator**



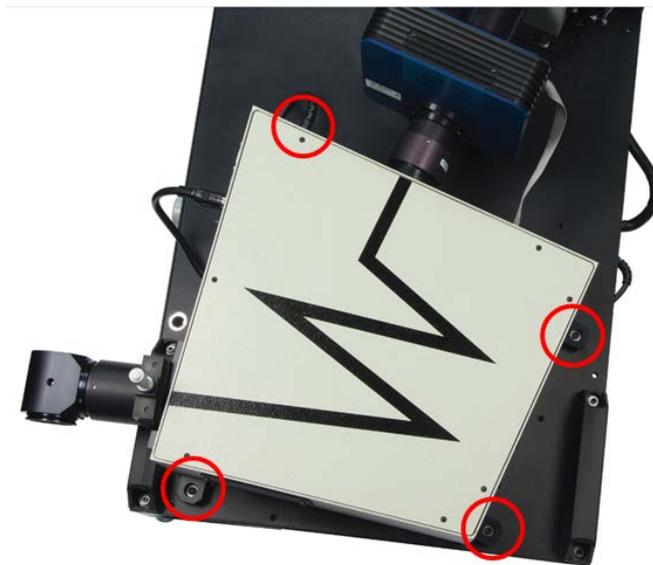
**Figure 88: AC Power and component connections to the Cornerstone 260 monochromator**

On the side wall of the monochromator bordering the interface panel the electrical components were disconnected from, disconnect the BNC cable from the monochromator. Remove the ribbon cable from the clips attached to the side wall of the monochromator as well.



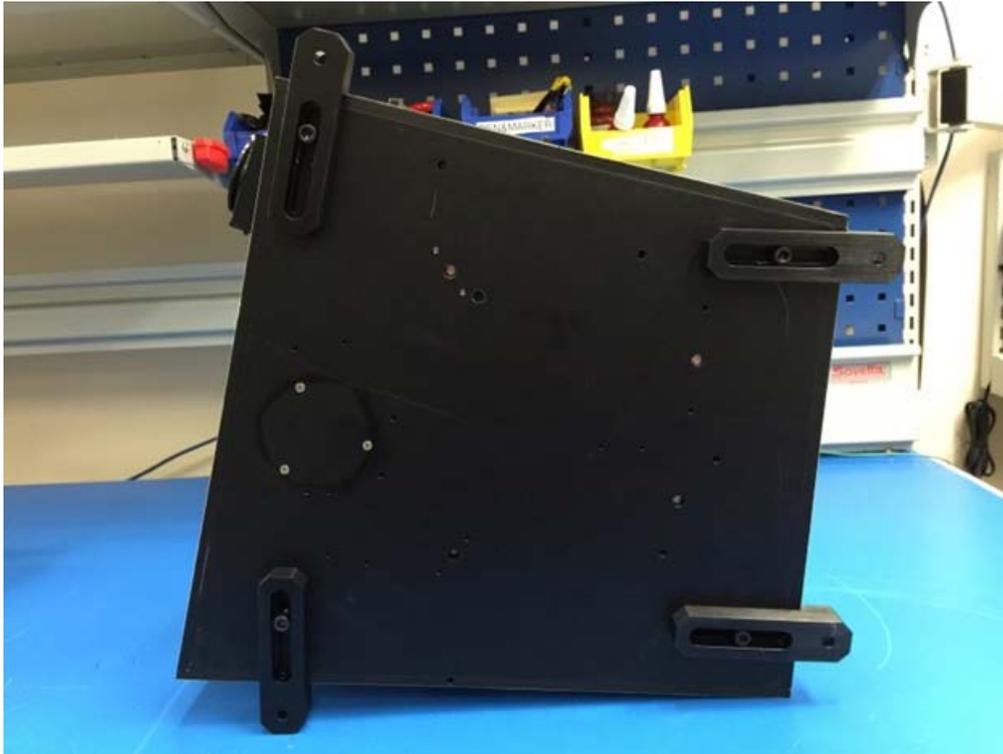
**Figure 89: BNC cable and filter wheel ribbon cable coupled to the side wall of the monochromator.**

There are four spacer feet that hold the monochromator in place in the TLS260 base plate. Their positions are circled in red in Figure 90.



**Figure 90: Spacer feet locations on the monochromator/baseplate.**

Using a 10-32 hex driver, the socket head cap screw, lock washer, and flat washer from each spacer foot can be removed. When these have been removed from all four spacer feet, vertically lift the monochromator to remove it from the baseplate. On the bottom plate of the monochromator, there are four socket head cap screws that fix the spacer feet to the monochromator. Use a 3/16 hex driver to remove these feet. Set all screws, washers, and spacer feet aside re-attaching the monochromator to the base plate.



**Figure 91: Spacer feet fixed on the bottom plate of the monochromator**

To request a monochromator calibration service, contact your Technical Sales Engineer or call (949) 253-1727. Please have your Cornerstone 260 monochromator model number, serial number, and requested procedure number ready when ordering calibration services.

Follow this procedure in reverse to re-attach the monochromator to the TLS260 baseplate.

## **14 COUPLING ADDITIONAL COMPONENTS TO THE TLS**

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If additional optics or an optical fiber is required to be added to the TLS, Newport offers all necessary mechanical and optical components required.

### **14.1 MOUNTING A LENS/FILTER**

Newport Corporation offers additional bandpass filters, neutral density filters, and focusing lenses if the output light of the TLS needs to be additionally altered to meet the specific requirements of a unique application.

Users may find the 77330 Focusing Lens Assembly especially useful for focusing the output of the TLS. By using the lever on the assembly, the user can focus the light output of the TLS at a single point and adjust this focal point over a range of distances from the end of the TLS. Focusing lens must be purchased separately and installed by the user.



**Figure 92: The 77330 Focusing Lens Assembly**

Lens/Filter Holders	
Part Number	Description
77730	Focusing Lens Assembly, Requires 1.0 in. diameter optics, 1.5 in. female/1.5 in. male flanges
7123	Flange Mounted Cell, 1.0 in. Diameter Optics, 1.5 in. female/1.5 in. male flanges
71306	Quick Connect Flange Mounted Cell, 1.0 in. Diameter Optics, 1.5 in. female/1.5 in. male flanges
6195	Flanged Lens Holder, 1.5 in. Diameter Optics, 1.5 in. female/1.5. inch male flanges
Mechanical Coupling	
Part Number	Description
77790	Quick Connect Flange Converter, 1.5 Inch Flange, Double Female
77791	Quick Connect Coupling Ring, 1.5 Inch Flange, Double Female
77792	Quick Connect Coupling Ring, 1.5 Inch Flange, Double Male

More information about these parts can be found at [Newport.com](http://Newport.com)

## 14.2 INTEGRATING SPHERE

Integrating spheres are helpful for projecting a uniformly illuminated, flat field of light onto target illumination area. Newport offers a complete line of integrating spheres for optimizing the output light of the TLS for this purpose. A Spectralon coated sphere is recommended for its high reflectance over the entire output wavelength spectrum of the TLS. The SPH-UADPT is required for coupling the TLS output to an integrating sphere a 1 inch diameter port. See Newport.com for coupling adapters suitable for other diameter ports.



Figure 93: Using the SPH-UADPT to couple an integrating sphere to the TLS260 output

Integrating Sphere Coupling Flange	
Part Number	Description
SPH-UADPT	Male Oriel 1.5 inch Flange Adaptor for 819C/D integrating sphere 1 inch port
Integrating Spheres	
Part Number	Description
819C-SL-2	4-Port Integrating Sphere, 2 in., Spectralon
819D-SL-2	3-Port Integrating Sphere, 2 in., Spectralon
819C-SL-3.3	4-Port Integrating Sphere, 3.3 in., Spectralon
819D-SL-3.3	3-Port Integrating Sphere, 3.3 in., Spectralon
819C-SL-5.3	4-Port Integrating Sphere, 5.3 in., Spectralon
819D-SL-5.3	3-Port Integrating Sphere, 5.3 in., Spectralon

### 14.3 FIBER COUPLING

For applications requiring a small, uniform spot size of illumination, the RF-ADAPT is recommended for optimally coupling Oriel’s rectangular fiber bundle light guides to the output slit of the TLS260. A fused silica fiber optic bundle is recommended for its broad wavelength transmission range matching that of the TLS wavelength output. Ferrule converters are also available for converting Oriel’s 11 mm fiber ferrule system to that of an SMA or ST terminated output.

Rectangular Fiber Coupler	
RF-ADAPT	Rectangular Fiber Bundle Coupler
Rectangular Fiber Bundles	
77538	Glass Fiber Bundle, 11mm Ferrule to 0.8 x 9.7mm Slit, 36 in. length
77539	Fused Silica Fiber Bundle, 11mm Ferrule to 0.8x9.7mm Slit, 36 in. length
Ferrule Converters	
77670	Ferrule Converter, SMA Termination to 11mm Standard Ferrule
77675	Ferrule Converter, ST Termination to 11mm Standard Ferrule

## 15 MAINTENANCE

### 15.1 LAMP REPLACEMENT

The average life of each lamp type is noted below. Note that the lifetime of the lamp can be affected by the manner in which it is used. Frequent ignitions, contamination of the lamp envelope and an excessively hot operating environment can all lead to reduced lamp life.

To avoid system down time, consider purchasing a replacement lamp as the lamp nears the end of its useful life.

<u>Lamp</u>	<u>Model</u>	<u>Average Lifetime</u>
250W QTH	6335	300 hours
300W Xe	6258	900 hours

The hours of lamp use should be regularly monitored on the lamp's power supply, and reset when the lamp is replaced. To check the lamp hours on the power supply, press the horizontal menu button under the icon on the LCD display marked Display. When the corresponding Display menu appears, use the scroll wheel until the red indicator is to the left of Lamp Hours. Then, press the horizontal menu button Display or the button marked CLEAR observe the number of hours the currently installed lamp has been operated.

Always wear powder-free gloves and eye protection when handling a lamp and read all precautions that came with the replacement lamp. The system should be powered off and unplugged. During lamp replacement, it is an ideal time to inspect the lamp housing for signs of wear. Refer to the next section for more information.

When an arc lamp is to be replaced, remove the old lamp and unscrew the brass socket adapter from the bottom terminal. On the replacement lamp, remove the thumbscrew on the bottom terminal and screw on the brass socket adapter. Refer to **SECTION 6.3 XENON LAMP INSTALLATION** of this manual for more information.

To reset the lamp hours on the power supply, the power supply must be turned on while the lamp is off.

1. Press the horizontal menu button under the Setup indicator on the LCD display until the Reset menu is displayed.
2. Press the vertical menu button to the right of the Lamp Hours icon on the LCD display to reset the lamp hours displayed on the power supply.

## **15.2 CLEANING**

Clean the exterior of the system using a clean, dry cloth. Ensure that the ventilation holes are not blocked with dust. Vacuum the openings, if necessary.

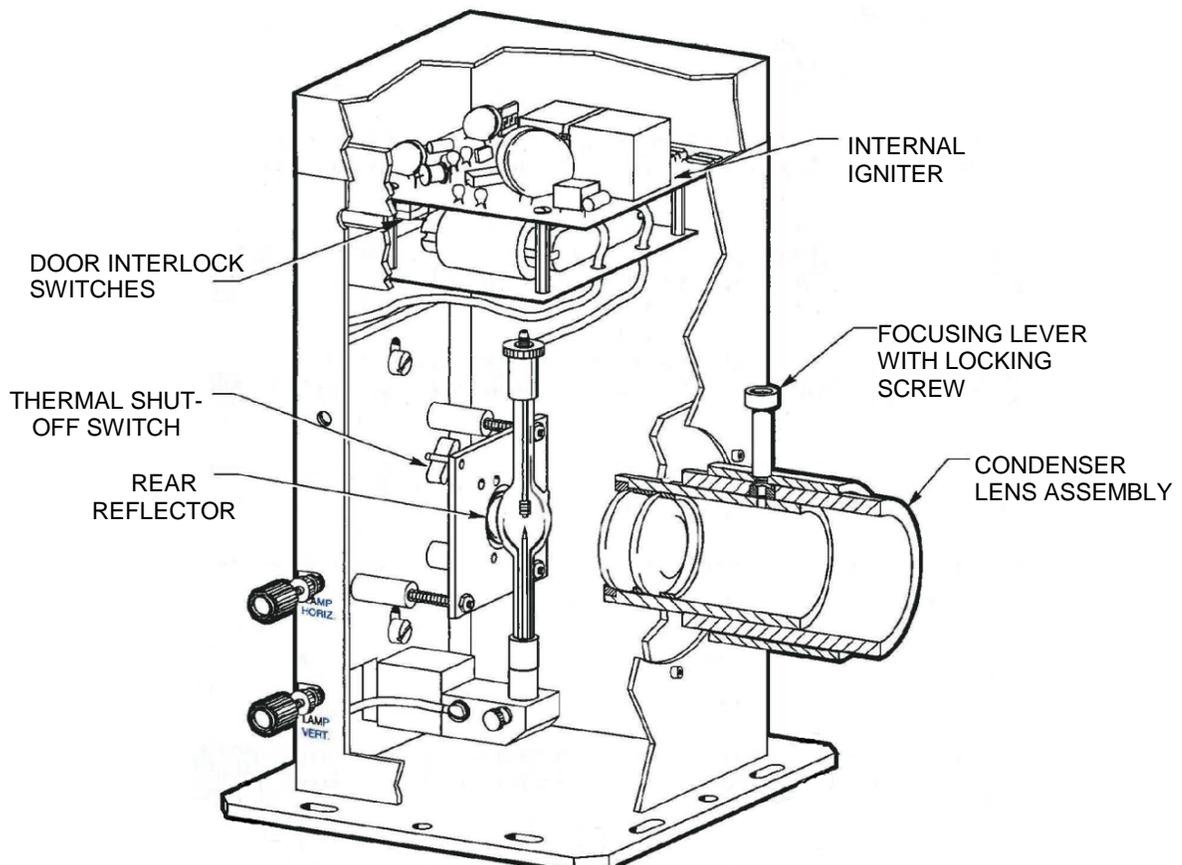
When not in use, cover the output port of the Tunable Light Source.

## **15.3 ARC LAMP HOUSING INSPECTION**

The material used inside arc lamp housing is subjected to UV light whenever the lamp is powered. UV light will eventually cause degradation of materials.

When the lamp is being replaced, one can examine the interior of the lamp housing to check for signs of wear. Particular attention should be paid to all wiring and the white high voltage cables. These items are visible during normal lamp replacement. Never remove the top cover of the lamp housing. The ignitor circuit contains high voltages, even when not powered up.

The rear reflector should not be cleaned. It has a special coating on it to enhance UV throughput, this coating will be damaged if it is wiped. If the reflector became coated with contaminants that were ingested by the lamp housing's fan, it must be replaced.



**Figure 94: Arc lamp housing construction**

If the rear reflector or wiring requires replacement, contact Oriel Instruments or the representative through whom this equipment was purchased for servicing. A Repair Material Authorization (RMA) number is required before sending any item in for servicing.

#### **15.4 QTH LAMP HOUSING INSPECTION**

The material used inside arc lamp housing is subjected to UV light whenever the lamp is powered. UV light will eventually cause degradation of materials.

When the lamp housing door has been removed to replace the lamp, it is the ideal time to examine the lamp housing for signs of wear.

The rear reflector should not be cleaned. It has a special coating on it to enhance UV throughput, this coating will be damaged if it is wiped. If the reflector became coated with contaminants that were ingested by the lamp housing's fan, it must be replaced.

The socket adapter that the lamp plugs into will eventually become worn. Consider replacing this item periodically. The frequency at which a replacement should be installed will vary depending on the operator, environment and usage.

The field-replaceable QTH lamp socket adapter is model 60043.

Contact Oriel Instruments or the representative through whom this equipment was purchased for servicing. A Repair Material Authorization (RMA) number is required before sending any item in for servicing.

## 16 TROUBLESHOOTING

### 16.1 POWER SUPPLY ERROR MESSAGES

The power supply will display an error message to indicate various reasons as to why a lamp cannot be ignited. Only one message can be displayed at one time.

Symptom	Action
Fault light <ul style="list-style-type: none"> <li>• Display shows “Interlock Open”</li> </ul>	Turn off AC power and check <ul style="list-style-type: none"> <li>• Lamp interconnection connection cable(s) are firmly fixed to connectors on power supply and lamp housing</li> <li>• Door to lamp housing is closed. If necessary, loosen the door screws, push the door upward and re-tighten the screws.</li> <li>• If the lamp was running before this error message appeared and the cooling fan of the lamp housing was operational, this indicates too high a temperature inside the lamp housing. Confirm there is no blockage of the cooling fan or vents of the lamp housing.</li> </ul>
Fault light <ul style="list-style-type: none"> <li>• Display shows “Ignition Failed”</li> <li>• Ticking sound heard from top of lamp housing during ignition cycle approximately once per second</li> </ul>	This message is displayed usually when trying to ignite and ignition fails. It is a result of no current flow from supply after 5 second of trying to ignite the lamp. <ul style="list-style-type: none"> <li>• Turn off the power supply and disconnect the Lamp Interconnection Cable(s) between the lamp housing and the power supply.</li> <li>• Check lamp connection and polarity inside the lamp housing. A lamp installed upside down or with reversed polarity should be removed and replaced immediately.</li> <li>• Reconnect the Lamp Ignition Cable(s) between the lamp housing and power supply. Turn on the power supply. Re-attempt lamp ignition.</li> <li>• Confirm the hours of usage on the lamp. A lamp approaching the end of its rated lifetime will be difficult to ignite.</li> <li>• Attempt ignition with a new lamp.</li> <li>• If fault repeats contact Newport for RMA information.</li> </ul>

Fault light Display shows “Power Supply Failed”	This message is displayed when the power supply cannot be enabled for the lamp or there is a short in the Lamp Housing Interconnection Cable. <ul style="list-style-type: none"><li>• Turn off the power supply and replace the Lamp Housing Interconnection Cable with one confirmed to be working.</li><li>• If fault repeats contact Newport for RMA information</li></ul>
---	---

If all items are in place, contact Oriel Instruments or the representative from whom this system was purchased for service.

There are no user serviceable parts inside of the power supply. Do not open and attempt to troubleshoot this unit. Contact Oriel Instruments or the representative from whom this system was purchased for service.

## 16.2 DIFFICULTY IGNITING ARC LAMP

If the arc lamp does not ignite, an error message starting “Ignition Failed” will appear on the power supply display. Ignition failure can be due to a number of causes.

The system is designed to operate in a typical laboratory atmosphere. Excessive humidity or condensation on the igniter will cause an “Ignition Failed”. A clicking noise is heard when ignitions are attempted. If the clicking noise is absent, there may be a problem with a component on the igniter itself.

If a replacement lamp is installed upside down, it will likely ignite. However, the lifespan of the lamp is greatly reduced. If the lamp’s electrode has a ball formed on the end, this indicates that the lamp was used incorrectly (shown in Figure 95). This situation is not covered under warranty.

Discoloration of the terminals of the lamp – particularly the top one – can indicate overheating. Normally the fan on the lamp housing begins to operate a few minutes after the lamp is ignited. The fan speed is regulated so that the lamp is maintained at its optimal temperature.

If the lamp envelope is completely black inside, it may indicate that the seal at one of the terminal end caps has broken. This could be due to rough handling, a lamp defect or a failure when overheated.

Some arc lamps are shipped with a wire around its envelope. This is referred to as a “starter wire”, which helps to ignite the lamp. Do not remove this wire.

## 16.3 LAMP CARE AND HANDLING

Do not allow any contaminants or fingerprints to get onto the lamp envelope. Always wear powder-free gloves. If the lamp becomes contaminated, do not use it before cleaning it with isopropyl alcohol. Dry completely before using. If contaminants are not removed, it may lead to reduced light output, overheating, damage to the envelope and premature failure.

## 16.4 LAMP HOUSING THERMOSTAT

The lamp housing is equipped with a shut-off switch, which will activate when the lamp housing becomes too hot. The lamp will be shut off and an “Interlock Open” error message will appear on the power supply display. When the lamp housing temperature returns to normal, the “Interlock Open” error will disappear.

The lamp housing will require servicing before the lamp is ignited again. Note that overheating will reduce the lamp's life.

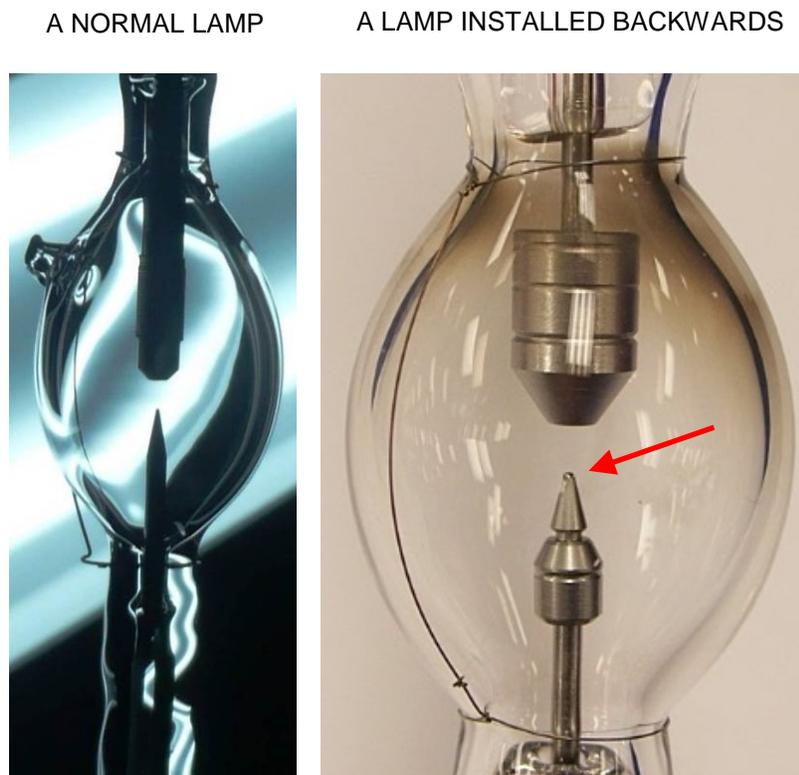


Figure 95: Normal vs. damaged arc lamp

## 16.5 TLS UTILITY

The following troubleshoot section details potential sources of error with respect to using TLS Utility. Please refer to the user manuals for each instrument being utilized for information on hardware troubleshooting. If the documentation provided does not resolve the issue, please contact Newport Corporation or the representative through whom the equipment was purchased for assistance.

### 16.5.1 Software Installation Difficulties

- Ensure the user installing the software has administrator privileges. Check with the facility's IT department if unsure.
- Plug the USB memory stick containing the TLS Utility installation software into a different USB port.

- Install the software on another computer

#### **16.5.2 Instrument Communication Errors**

- Ensure all instruments are plugged in and turned on before starting TLS Utility.
- If a USB cable is used to convert from RS232, ensure its driver is installed and is compatible with National Instruments software.
- For an RS232 instrument, or when using a USB converter cable, check the Windows Device Manager and/or NI Max to check the port or addresses used by the instruments.
- If utilizing a monochromator hand controller, press the Local key to resume computer control. If communication is lost, re-connect to the monochromator in TLS Utility or restart both TLS Utility and the instrument.

#### **16.5.3 File Message Errors**

- Any file utilized by TLS Utility must be in text tab delimited format. Open the file in Windows Notepad to check the file type.
- Certain types of scans require a calibration or reference file to be loaded prior to initiating the scan. The requirement for each scan type is detailed in this user manual.
- A scan reported as being out of range has a wavelength range that does not match the calibration or reference file that is loaded. Recheck the scan parameters or load the correct file(s).

#### **16.5.4 Graph Display Errors**

- Data displaying incorrectly may be due to extra empty lines at the bottom of the file. Clear the graph, open the file in Notepad and delete any blank lines at the bottom of the file. Then re-load the scan.

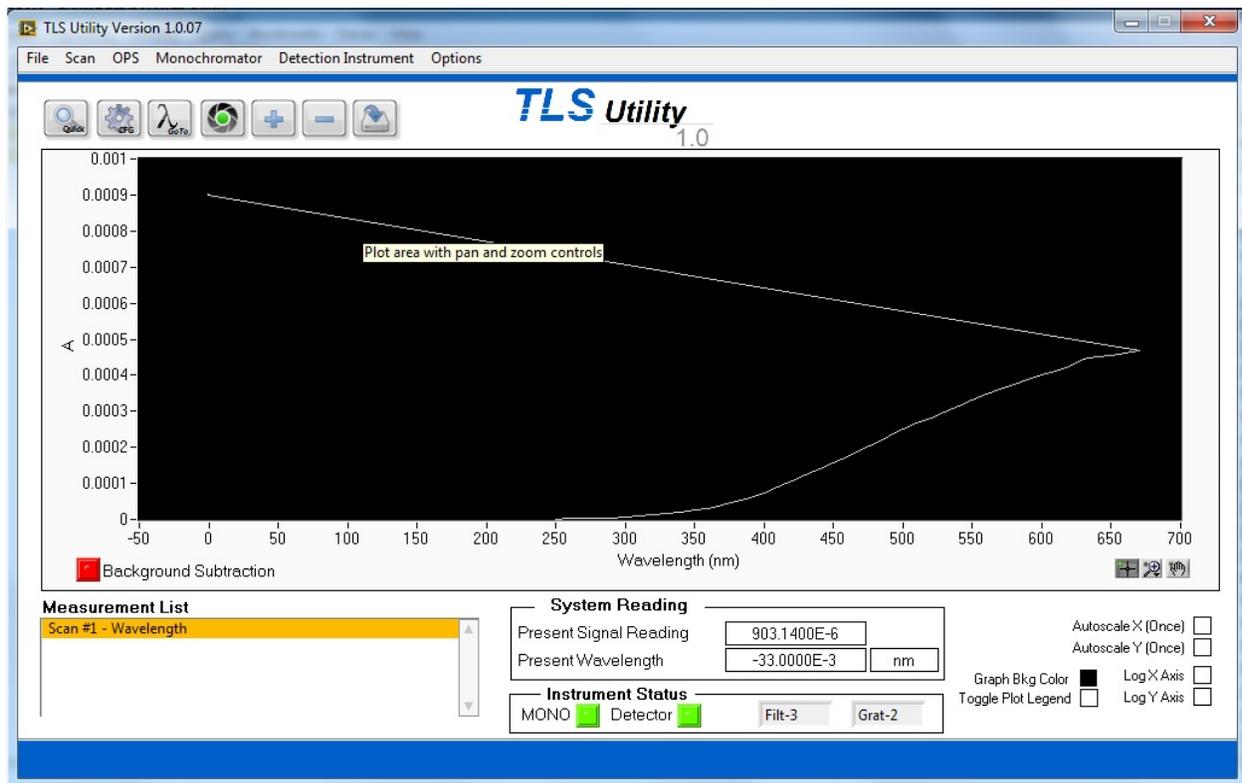


Figure 96: Graph display error

### 16.5.5 No Light or Incorrect Wavelength Output

- Ensure the light source has been turned on.
- Check that the monochromator shutter is open.
- Ensure the monochromator is set to a visible wavelength in TLS Utility.
- If wavelength output is not correct, when automatic filter and grating tables are utilized, ensure the tables are filled out correctly and “Auto” is select for both the grating and the filter.
- Ensure filters are correctly selected, installed into the filter wheel(s) and in the expected positions.

### 16.5.6 Scanned Data Errors

- Ensure calibration, reference or background files were not inadvertently overwritten. Any text tab delimited file may be loaded in TLS Utility and viewed directly.
- Check if the correct files are loaded for the type of scan being performed.
- Check if background subtraction is enabled.
- An open system with high levels of unchopped background light may saturate the detector.
- Ensure detector and sample are not overfilled when performing QE scans.

### 16.5.7 Inconsistent Data

- Ensure the light source was given enough time to warm up and stabilize. If the light source is not needed for short amounts of time, close the shutter rather than turn off the lamp. This allows the lamp to remain warmed up and extends lamp life.

- Determine if the calibrated detector requires recalibration. Spectral responsivity changes over time, particularly when the detector is subjected to UV light. Newport suggests annual recalibration of detectors.
- Determine if the monochromator is due for recalibration. Newport suggests annually recalibrating the instrument.
- Ensure the lamp is aligned correctly, particularly if the lamp was replaced prior to the data inconsistencies appearing.
- Lamp output may change as it ages, particularly at UV wavelengths. Replace the lamp when it is at the end of its life and consider using the light intensity control feature provided with the Newport OPS series power supplies.

## 17 SPECIFICATIONS

Model	TLS260-300X	TLS260-250Q
Lamp Type	300 W Ozone Free Xenon	250 W DC Quartz Tungsten Halogen
Replacement Lamp	6258	6335
Computer Interface	USB	
Tunable Range	300-1800 nm	350-1800 nm
Beam Uniformity <sup>1</sup>	±15%	
Output Beam Divergence	Horizontal 0.5° max. (slit width axis) Vertical 7.5° max. (slit height axis)	
Light Ripple	< 1%	
Wavelength Repeatability <sup>2</sup>	± 0.11 nm	
Wavelength Accuracy <sup>3</sup>	< 1 nm	
Spectral Resolution <sup>4</sup>	5 nm	
Grating	600 lines/mm ruled diffraction grating, quantity 2 installed	
Integrated Filter Wheel	Automated, 6-position motorized filter wheel	
Filter Wheel Speed	< 1 second per position	
Order Sorting Filters	Quantity 4 installed	
Slit	Quantity 1, 600 µm (W) x 18mm (H) fixed slit Quantity 1, 1240 µm (W) x 18mm (H) fixed slit Quantity 1 micrometer driven exit slit	
Beam Coupling	1.5" Oriel Female Flange	
Optical Height <sup>5</sup> (in. [mm])	4.6 [116.8]	
Detector Signal Input	1-2450 µA, 1 µA resolution	

<b>Tuning Speed</b>	102 nm/s
<b>Collimated Beam Size @ 3.5" from Exit Flange</b>	0.625" minimum @ white light output
<b>AC Input</b>	Monochromator and OPS Power Supply: 100 to 240 VAC; 47 to 63 Hz 95-264 VAC; 47-63 Hz (OPS-A500), 90-264 VAC; 47-63 Hz (OPS-Q250)
<b>Operating Environment</b>	5°C to 40°C; <80% relative humidity non-condensing; <3000m Altitude; Indoor Use only; Installation Category II; Pollution degree 2
<b>Storage Temperature</b>	5°C to 40°C; <80% relative humidity non-condensing; <3000m Altitude; Indoor Use only; Installation Category II; Pollution degree 2
<b>Dimensions (in. [mm])</b>	22.5 x 30.0 x 15.6 [571.5 x 762 x 396.2]
<b>Weight (lbs [kg])</b>	74 [33.6]
<b>CE Certification</b>	Safety: EN61010-1:2013 EMC: EN61326-1:2013
<b>RoHS</b>	All components RoHS compliant

<sup>1</sup>Beam uniformity measured with beam profiler at 550nm wavelength.

<sup>2</sup>Ability of a wavelength to be consistently reproduced.

<sup>3</sup>Capability of the monochromator to output the desired wavelength.

<sup>4</sup>Spectral resolution based on 600 μm slit.

<sup>5</sup>Height measured from baseplate.

## 18 SOFTWARE FUNCTION AND REQUIREMENTS

Software Parameters	Specification
Software	TLS Utility 1.0
Set General Scan Parameters	Starting and ending wavelength, interval, wait between intervals, pre-scan wait, Slow & Full scan
Scan Types	Short, Full, & Interval Wavelength vs. External Signal (Optical Power, Quantum Efficiency, Transmittance, Absorbance, Irradiance, Interval & Background)
Set Monochromator Parameters	Auto grating and filter change, open/close shutter
Wavelength Calibration	Adjustment of grating calibration factor and offset parameters
Communication Settings	USB
Operating System	Microsoft Windows 7, 8, 10 (32-bit or 64bit)

## 19 APPENDIX A: OPTIONAL HAND CONTROLLER

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If it is desired to operate the tunable light source without requiring a computer, the model 74009 Cornerstone Hand Controller may be purchased. It can be used to perform all the same basic functions as the software.

Note: when selecting a wavelength, the grating and filter must also be selected via the hand controller. Automatic changeover tables are available only through software.



Figure 97: 74009 Monochromator Hand Controller

## 20 APPENDIX B: EQUATIONS

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The equations in this Appendix are the equations used by TLS Utility to calculate the results of its specialty scans (Quantum Efficiency, Absorbance/Transmittance, etc.). Depending on the setup, the detector readings may be in volts, watts or amps. Volts are frequently used, as this is the output generated by a detector coupled to a transimpedance amplifier. However, voltage readings also provide an advantage due to the greater dynamic range of the detection instrument when reading this type of signal. Newport's 19xx series power meters may read voltage, current or power. Power readings require a Newport detector with a calibrated PROM connected to the meter.

The equations listed use voltages as the unit of measure for reference and data scans as a default. In the cases where the units cancel out, voltage may be replaced by current or power measurements. Both the reference and QE scans are conducted in nanometers as the chosen wavelength unit.

## 20.1 QUANTUM EFFICIENCY

$$QE = \left[ \frac{(V)(1240)}{\lambda} \right] \left[ \frac{SR_{det}}{V_{ref}} \right] \left[ \frac{G_{ref}}{G_{preamp}} \right]$$

**Equation 1: Quantum Efficiency**

$V$	Background subtracted voltage as read from the device under test
$CR\lambda$	Wavelength in nanometers
$SR_{det}$	Wavelength interpolated spectral responsivity value for a calibrated detector in Amps/Watt
$V_{ref}$	Voltage loaded from a reference scan performed with a calibrated detector
$G_{ref}$	Gain set for the calibrated detector when performing the reference measurement
$G_{preamp}$	Preamp gain set for the sample detector cell

## 20.2 DETECTOR RADIOMETRY

$$E = \left[ \frac{V}{G} \right] \left[ \frac{1}{SR_{det}} \right]$$

**Equation 2: Detector Radiometry**

$V$	Background subtracted voltage as read from the detector
$G$	Gain of the detector
$SR_{det}$	Spectral responsivity of the detector

### 20.3 ABSORPTION

$$ABS = \log_{10} \left[ \frac{V}{V_{ref}} \right]$$

**Equation 3: Absorption**

$V$	Background subtracted voltage
$V_{ref}$	Measured voltage from a reference scan

### 20.4 TRANSMITTANCE/REFLECTANCE

$$T = 100 \times \left[ \frac{V}{V_{ref}} \right]$$

**Equation 4: Transmittance/Reflectance**

$V$	Background subtracted voltage
$V_{ref}$	Measured voltage from a reference scan

## 21 CE DECLARATION

### EC DECLARATION OF CONFORMITY

**Manufacturer's name:** Newport Corporation

**Manufacturer's address:** 1791 Deere Ave  
Irvine, CA 92606 USA

**Declares that the product:**

**Product Name:** TLS260 Series Tunable Light Source

**Model Numbers:** TLS260-300X & TLS260-250Q

**Type of equipment:** Electrical equipment for measurement, control and laboratory use in industrial locations

**conforms to the following Product Specifications:**

**Safety:** EN 61010-1:2010

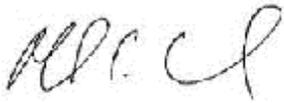
**EMC:** EN 61326-1:2012

**complies with the following Directives:**

2004/108/EC EMC Directive  
2006/95/EC Low Voltage Directive

and accordingly, carries the 

 mark affixed: 04/20/2015



Mark Carrol  
VP, Instruments Business  
Newport Corporation  
1791 Deere Ave  
Irvine, CA 92606 USA

## 22 WARRANTY AND SERVICE

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### 22.1 CONTACTING ORIEL INSTRUMENTS

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 9 international subsidiaries and 24 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 Oriel Instruments directly.

Oriel Instruments  
1791 Deere Avenue  
Irvine CA 92606 USA

Telephone: 800-222-6440 (toll-free in United States)  
949-253-1727

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 Oriel's website: <http://www.newport.com/oriel>.

### 22.2 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 Oriel'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?

## **22.3 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 Oriel Instruments.

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

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

Oriel 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 Oriel's facility. Oriel is not responsible for product damage once it has left the facility after repair or replacement has been completed.

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

## **22.4 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.

Oriel 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.

## **22.5 WARRANTY REPAIR**

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

Except as otherwise expressly stated in Oriel's quote or in the current operating manual or other written guarantee for any of the Products, Oriel 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. Oriel shall repair or replace, at Oriel's sole option, any defective or nonconforming Product or part thereof which is returned at Buyer's expense to Oriel facility, provided, that Buyer notifies Oriel 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 Oriel, with freight prepaid by Buyer. Oriel shall not be responsible for any damage occurring in transit or obligated to accept Products returned for warranty repair without an RMA number. Buyer bears all risk of loss or damage to the Products until delivery at Oriel's facility. Oriel 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 Oriel; (b) used in conjunction with equipment not provided or authorized by Oriel; (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

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES. EXCEPT AS EXPRESSLY PROVIDED HEREIN, ORIEL MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, REGARDING THE PRODUCTS, SOFTWARE OR SERVICES. NEWPORT EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE FOR THE PRODUCTS, SOFTWARE OR SERVICES. THE OBLIGATIONS OF ORIEL SET FORTH IN THIS SECTION SHALL BE ORIEL'S SOLE LIABILITY, AND BUYER'S SOLE REMEDY, FOR BREACH OF THE FOREGOING WARRANTY. Representations and warranties made by any person including distributors, dealers and representatives of Oriel / Newport Corporation which are inconsistent or in conflict with the terms of this warranty shall not be binding on Oriel unless reduced to writing and approved by an expressly an authorized officer of Newport.

## **22.6 LOANER / DEMO MATERIAL**

Persons receiving goods for demonstrations or temporary use or in any manner in which title is not transferred from Newport shall assume full responsibility for any and all damage while in their care, custody and control. If damage occurs, unrelated to the proper and warranted use and performance of the goods, recipient of the goods accepts full responsibility for restoring the goods to their original condition upon delivery, and for assuming all costs and charges.

Confidentiality & Proprietary Rights

#### **Reservation of Title:**

The Newport programs and all materials furnished or produced in connection with them ("Related Materials") contain trade secrets of Newport and are for use only in the manner expressly permitted. Newport claims and reserves all rights and benefits afforded under law in the Programs provided by Newport Corporation.

Newport shall retain full ownership of Intellectual Property Rights in and to all development, process, align or assembly technologies developed and other derivative work that may be developed by Newport. Customer shall not challenge, or cause any third party to challenge the rights of Newport.

**Preservation of Secrecy and Confidentiality and Restrictions to Access:**

Customer shall protect the Newport Programs and Related Materials as trade secrets of Newport, and shall devote its best efforts to ensure that all its personnel protect the Newport Programs as trade secrets of Newport Corporation. Customer shall not at any time disclose Newport's trade secrets to any other person, firm, organization, or employee that does not need (consistent with Customer's right of use hereunder) to obtain access to the Newport Programs and Related Materials. These restrictions shall not apply to information (1) generally known to the public or obtainable from public sources; (2) readily apparent from the keyboard operations, visual display, or output reports of the Programs; 3) previously in the possession of Customer or subsequently developed or acquired without reliance on the Newport Programs; or (4) approved by Newport for release without restriction.

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Newport Corporation 1791 Deere Avenue Irvine, CA, 92606 USA