



FT-IR Spectrometers

Using Your DXR Raman Instrument

269-242304 Revision A

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Introduction

Questions or Concerns

In case of emergency, follow the procedures established by your facility. If you have questions or concerns about safety or need assistance with operation, repairs or replacement parts, you can contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy.

Conventions Used

This help system includes safety precautions and other important information presented in the following format:



WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Follow instructions with this label to avoid damaging the system hardware or losing data.

Note Contains helpful supplementary information.

Safety Precautions

The DXR Raman and DXR SmartRaman spectrometers may be configured as a Class 1 laser-safe system or as a Class 3B laser product. For complete safety information, see the *DXR Site and Safety Guide*. A PDF copy is included in the electronic documentation set.



WARNING Class 3B instruments should always be operated in a laser safety area. All persons using or in the vicinity of a Class 3B instruments should wear appropriate laser safety goggles and should be aware of the potential hazards.

Use of controls or adjustments or performance of procedures other than those specified in your printed and online documentation may result in hazardous radiation exposure. Do not alter or attempt to remove the laser head from its protective housing or attempt to remove the shields that surround the laser head. Exposure to laser energy and high voltage may result.

The laser energy from the excitation lasers may be visible or invisible.

Never stare directly into the laser beam or at its bright reflection. Never tamper with the laser head. Exposure to laser light or high voltage may result.

Avoid skin and eye contact with the invisible laser radiation produced by the excitation laser beam and any reflections of that beam. If you wish to observe trained service personnel, wear properly rated laser safety goggles whenever the instrument power is on and the protective covers are open or removed.

When operating our Raman instruments, use only accessories and equipment (such as power supplies and lasers) supplied by us. Use of equipment and accessories not supplied by us can result in permanent damage to the instrument and may create a safety hazard.

Do not attempt to service a laser that is not functioning properly. If a laser is malfunctioning, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy for assistance or to order a replacement laser.

NOTICE The power connector and the USB stage and computer connectors are located on the panel on the bottom left side of the instrument (as you face the instrument). The connections to these connectors are made by our service representative during the instrument installation. Do not attempt to alter or modify the connections to these connectors.

Note See the “Manufacturer’s laser information” section in the safety notice that was included with your instrument for information about individual excitation lasers.

Using a DXR SmartRaman

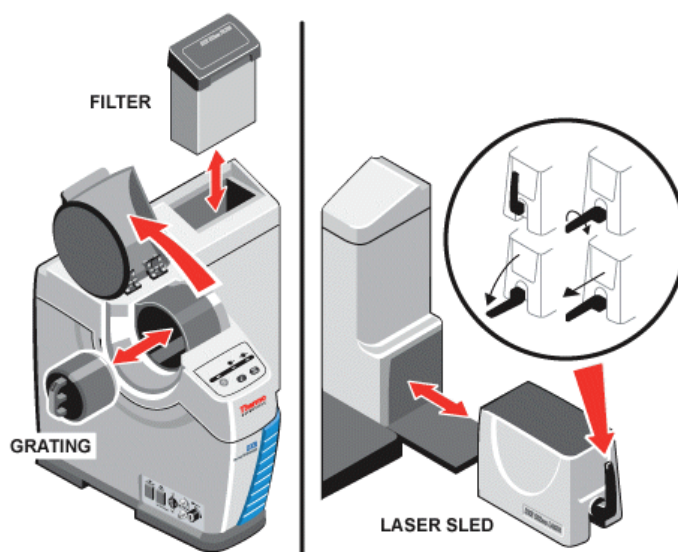
Operation

Changing the Laser, Filter, and Grating

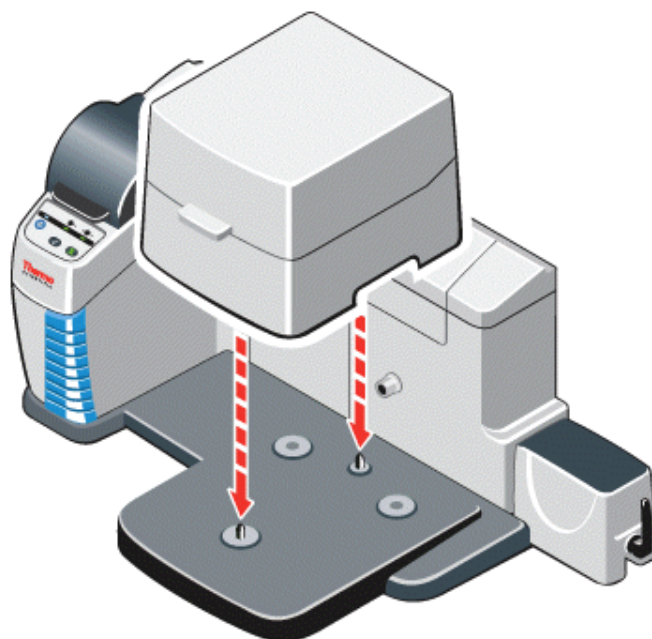


WARNING Avoid shock hazard. Make sure you turn off the spectrometer power before you replace a laser, filter, or grating.

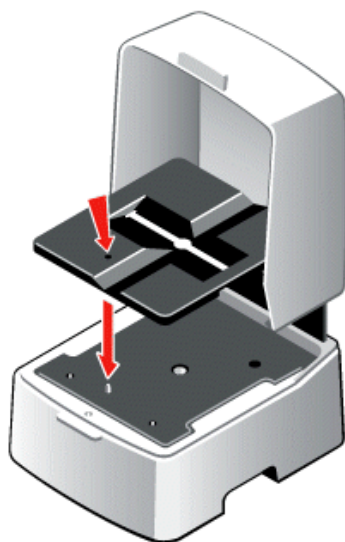
NOTICE Handle lasers, filters, and gratings gently. Do not touch any optical surfaces or the interior of a laser, filter, or grating. When a laser, filter, or grating is not in use, store it in the case that it was shipped in.



Installing an Accessory



Installing an Accessory Tool Head



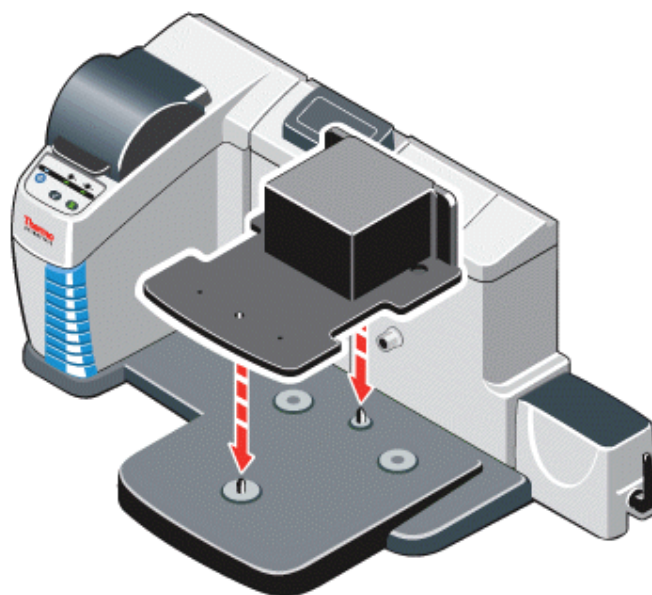
Enabling the laser

You must enable the laser before you can turn it on. To enable the laser, rotate the laser key to the locked (vertical) position as shown below. (For more information about turning on the laser, see the software help available through the **Help** menu in OMNIC.)

Note You can insert or remove the laser key only when the laser keyswitch is in the unlocked (horizontal) position. When the laser keyswitch is in the unlocked position, the laser is disabled.



Installing the Spectrometer Alignment Tool



Note For alignment and calibration instructions, please see the alignment and calibration topics in the on-line software help system.

The power connection for the spectrometer alignment tool is automatically made when you install the tool.

Installing a 455 nm Laser

Under most circumstances, your instrument has come equipped to permit user installation of a 455 nm laser. If you specifically ordered this laser wavelength with your DXR, see [Changing the Laser, Filter, and Grating](#). If you need to add this capability in the future, a service visit may be required. Contact our sales or service representative in your area or contact us.

Installing a 633 nm Laser

If you specifically ordered this laser wavelength with your system, see [Changing the Laser, Filter, and Grating](#). If you need to add this capability in the future, a service visit is required to ensure optimum alignment and performance. Contact our sales or service representative in your area.

Optional Class 3B Configuration

The DXR Raman and DXR SmartRaman spectrometers can be configured as Class 3B laser products. Class 3B laser radiation is hazardous and can cause permanent eye damage. Exposure to laser radiation should be avoided by setting up a laser safe area.

See the *DXR Raman Instruments Site and Safety Guide* that came with your instrument for a full description of necessary precautions

To support this configuration, you purchase the Class 3B Conversion Kit. If you purchased the conversion kit after your system is already installed, the Class 3B Conversion Kit and fiber optic accessory must be installed by a Thermo Scientific Field Service Engineer (FSE). The FSE will apply proper Class 3B laser rating labels to the instrument and will provide basic laser safety training.

Note The attenuator can be used to reduce the laser power below Class 1 level while the safety interlocks are defeated.

Using a Class 3B Fiber Optic Accessory



WARNING The fiber optic accessory is compatible with the Class 3B configuration of the instrument. Making adjustments, using controls, or performing procedures that are not specified in the printed or online documentation may result in exposure to hazardous visible or invisible laser radiation. Make sure you follow all safety precautions listed in the Site and Safety Guide before you operate the fiber optic accessory.

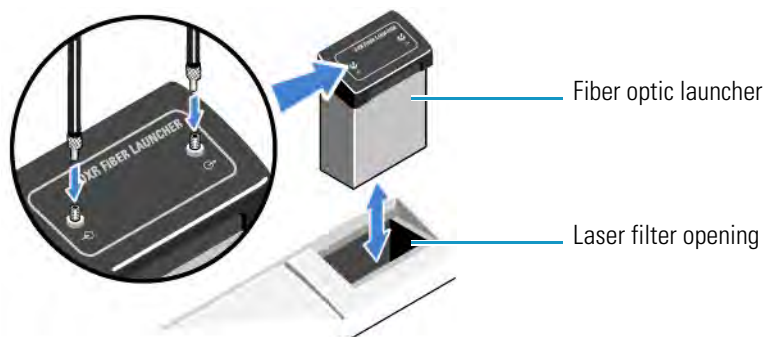
To avoid severe burns from exposure to laser radiation or permanent damage to your eyes, never put anything except samples against the tip of the fiber optic probe, and always wear laser safety goggles that meet the specifications for the laser your fiber optic launcher uses. Also, you should never look directly into the tip of a fiber optic probe or the fiber optic probe connectors, even if you are wearing laser safety goggles. The goggles will protect you for diffuse viewing only.

Always set up laser safety area in the location where you are using a fiber optic accessory.

❖ **To Install a Fiber Optic Accessory**

1. Remove the laser filter from the system and slide the fiber optic launcher into the laser filter opening.

Figure 1. Fiber optic launcher installation



CAUTION To ensure safe operation, always connect the collection probe cable to the fiber optic launcher before you connect the excitation probe cable.

2. Connect the fiber optic cables from the probe to the appropriate ports on the fiber optic launcher (see previous image).
 - a. Insert the end of the probe cable labeled “Collection” into the  connector and rotate the connector so it slides into the keyhole slot on the launcher. Tighten the knurled nut finger tight.
 - b. Insert the end of the probe cable labeled “Excitation” into the  connector and rotate the connector and tighten the nut as described above.
3. Insert the probe into the probe alignment tool to perform alignment and calibration.

Rotate the probe into the tool so that the ball inside the tool slides into the indent on the side of the probe.

Figure 2. Probe positioned for alignment and calibration

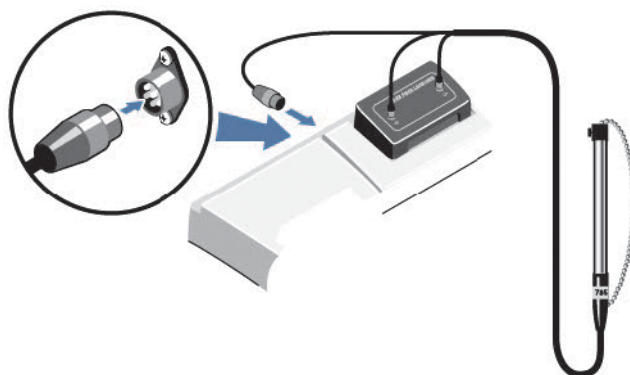


4. Connect the power cable for the probe LED.



CAUTION Always replace the cap on the end of the probe or the exit port of the fiber launcher when not in use.

Figure 3. Connect power cable for probe LED



5. Attach the strain relief hook (provided) to the microscope by inserting the two screws (provided) into the two holes at the top of the microscope back panel (behind the laser filter compartment). Tighten the two screws.
6. Attach the probe cable to the strain relief hook.
Loop the nylon strain relief attached to the probe cable (before it splits) over the hook installed in the previous step.
7. Open the Settings box in OMNIC and click Align/Calibrate and choose OK to align and calibrate the instrument with the probe.

The Fiber Launcher includes two caps to cover the ports when the accessory is not attached. Always replace the caps to cover the ports when the accessory is not in connected.



Service

Cleaning Your Instrument

If the outside of the instrument needs cleaning, turn off the power, unplug the power cable from the wall outlet, or power strip, and wipe the outside of the instrument with a damp (not wet), soft cloth and a mild soap. (Do not use harsh detergents, solvents, chemicals or abrasives.)



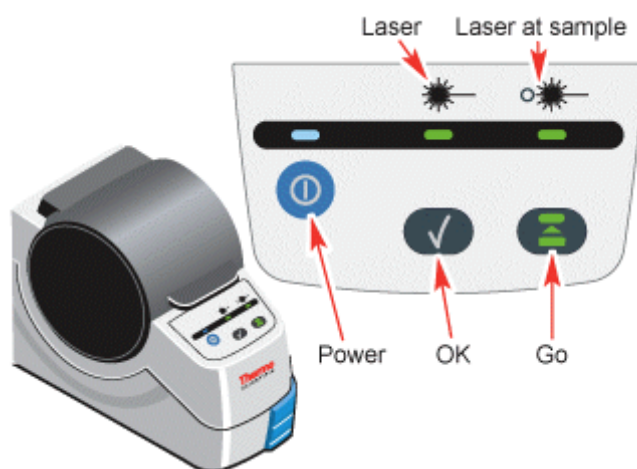
WARNING Avoid shock hazard. Do not allow liquid or any moist material to come in contact with the power supply or the inside of the instrument.

Replacing Fuses

You cannot replace the fuses in your instrument. If you suspect a fuse needs to be replaced, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy for assistance.

Safety

Indicators



Note Press the **OK** button to respond affirmatively (for example, to a software prompt) during data collection. Press the **Go** button to start a macro you have specified.

Biohazards or Radioactive Materials and Infectious Agents

Instruments, accessories, components or other associated materials may not be returned to us or other accessory manufacturers if they are contaminated with biohazard or radioactive materials, infectious agents, or any other materials and/or conditions that could constitute a health or injury hazard to employees. If you have questions about decontamination requirements, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy.

Cooling Fans

NOTICE Cooling fans are located on the back of the instrument. To avoid overheating, do not block the free flow of air around the instrument. There should be at least 2 cm (about 1 in) of clearance behind the instrument and at least 30 cm (about 12 in) of clearance on each side.

Using Corrosives and Solvents

Many standard spectroscopy methods are based on the use of solvents. Sample materials dissolved in solvents can be measured using your spectrometer, but special precautions must be taken.

Caustic or Corrosive Agents

Instrument components may be degraded by exposure to caustic or corrosive agents or their vapors. To maintain the instrument in safe working condition, do not use caustic agents. Damage to the instrument caused by the use of caustic agents is not covered by the warranty.

Volatile Solvents

If you use volatile solvents regularly, follow the guidelines listed below. These measures will help prolong the life of your instrument and will eliminate the possibility of spectral interference caused by volatile solvent vapors.

- Use sealed sample holders.
- Do not leave exposed solvent in the sample compartment for longer than necessary.
- Do not leave the solvents near the instrument.
- Be sure that your work space is properly ventilated.

Solvents Containing Halogenated Hydrocarbons

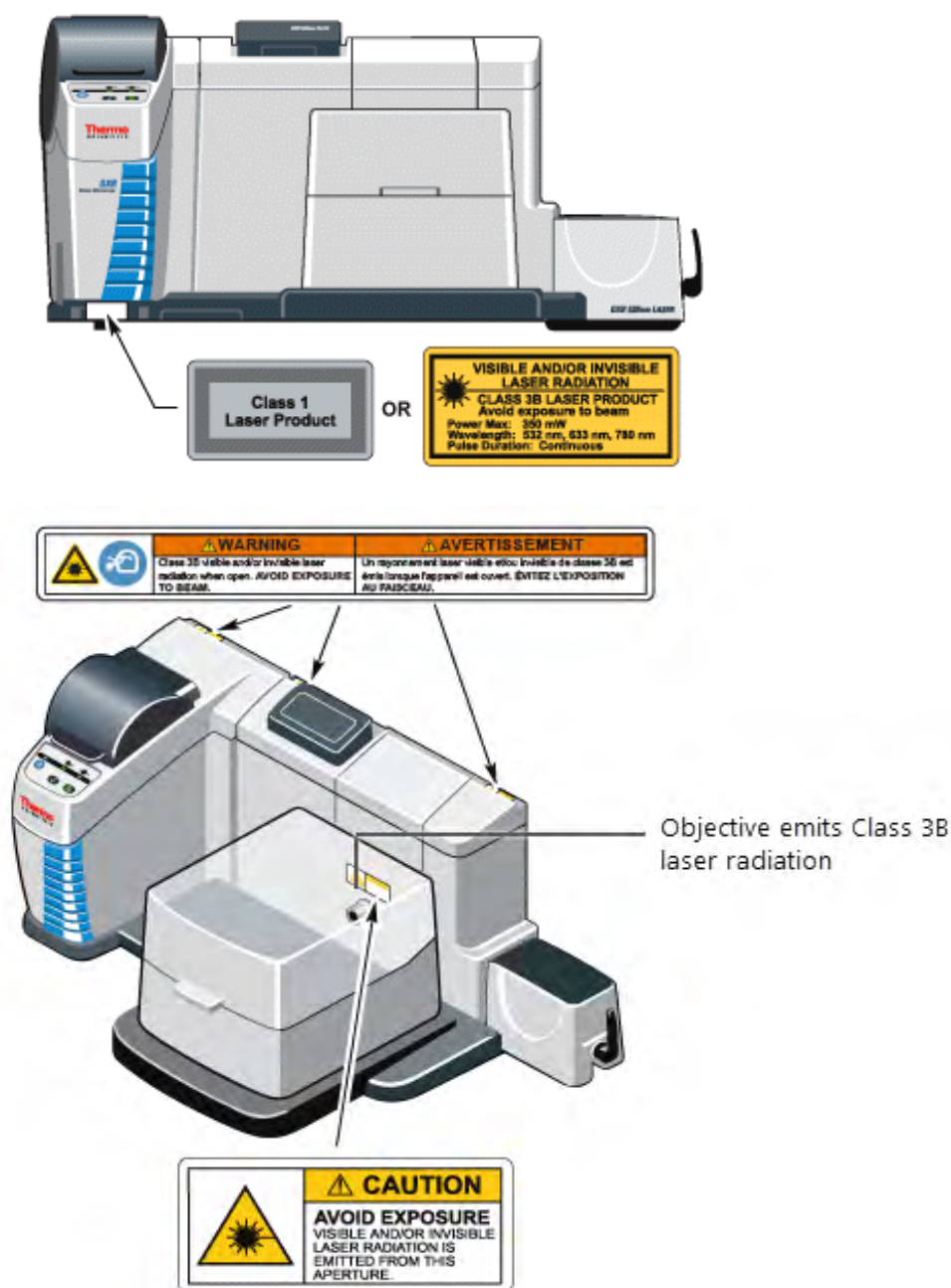
Chlorinated solvents, perfluorochlorinated solvents, and other solvents containing halogenated hydrocarbons are often used as sample solvents. The pyrolysis of these solvents by an infrared source or by excessive heating caused by laser absorption may produce hydrochloric acid (HCl), hydrofluoric acid (HF), phosgene (COCl_2), or other hazardous compounds.

Materials such as hydrochloric acid and hydrofluoric acid are highly corrosive and may cause accelerated corrosion of the metallic components in the spectrometer. Damage may be caused in any spectrometer, if the concentration level of corrosive gasses in the air is excessively high due to improper sampling techniques.



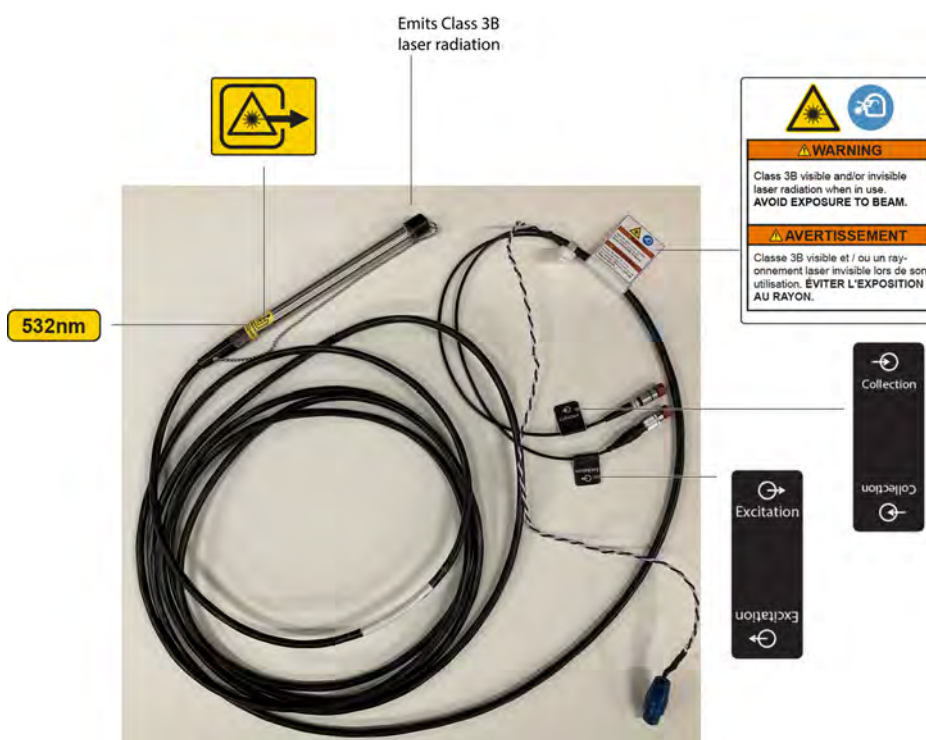
WARNING Materials such as hydrochloric acid, hydrofluoric acid and phosgene are highly toxic. If you regularly use solvents containing halogenated hydrocarbons, be sure your work area is properly ventilated. Solvents containing halogenated hydrocarbons should not be left in the sample compartment for an extended time.

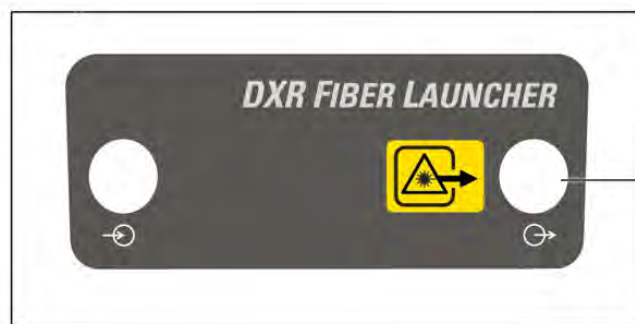
Spectrometer Safety Labels



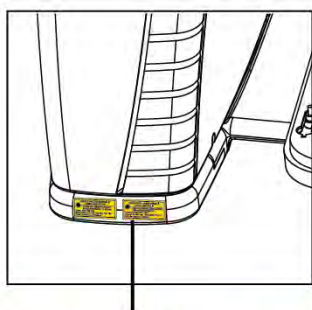
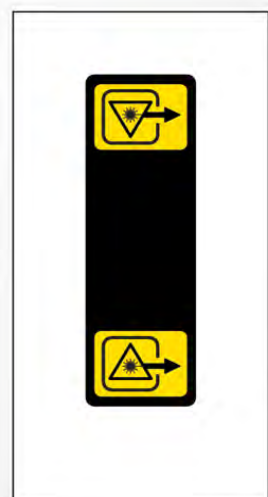
2 Using a DXR SmartRaman

Safety



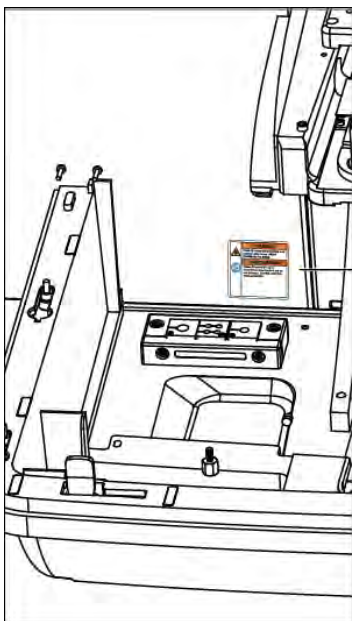


Emits Class 3B laser radiation when the fiber accessory is not connected and the covers are not installed



**VISIBLE AND/OR INVISIBLE
LASER RADIATION**
CLASS 3B LASER PRODUCT
AVOID EXPOSURE TO BEAM.
Power Max. 350 mW
Wavelength nm: 455, 532, 633, 780, 785
Pulse Duration: Continuous

**RADIATION LASER VISIBLE
ET/OU INVISIBLE**
PRODUIT LASER DE CLASSE 3B ÉVITEZ
L'EXPOSITION AU FAISCEAU.
Puissance maximum 350 mW
Longueur d'onde en nm : 455, 532, 633, 780, 785
Durée de l'impulsion : continue



Troubleshooting

Sample Bands are too Small

The Raman signal is too small. You can increase it by doing one or more of the following:

- Increase the setting of **Exposure Time** on the **Collect** tab.
- Increase the setting of **Exposures** on the **Collect** tab.
- Increase the aperture size by setting **Aperture** on the **Bench** tab.
- Select a slit aperture instead of a pinhole by setting **Aperture** on the **Bench** tab.

- Increase the setting of **Laser Power** on the **Bench** tab

Note All of the tabs mentioned here are in the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

Sample Bands Are too Large

The Raman signal is too large, which saturates the CCD. You can decrease the signal by doing one or more of the following:

- Decrease the setting of **Exposure Time** on the **Collect** tab.
- Decrease the aperture size by setting **Aperture** on the **Bench** tab.
- Select a pinhole aperture instead of a slit by setting **Aperture** on the **Bench** tab.
- Decrease the setting of **Laser Power** on the **Bench** tab.

Note All of the tabs mentioned here are in the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

No Raman Signal Appears in the Live Display

1. If you have a spectrometer and an accessory sample compartment door is open, close it.
2. If you have a microscope and the microscope compartment is open, close it.
3. If the instrument is turned off, turn it on.
4. If the laser power is off, turn on the laser.
5. If the laser is disabled, enable it in the **Bench** tab of the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

CCD Overflow Occurred

Too much light hit the CCD. To correct this problem, try either of the following:

- Use a shorter exposure time or smaller aperture.
- Reduce the laser power.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Has No Sample Bands

1. If the sample is not at the focal point, focus the sample on the microscope stage.
2. If you have a spectrometer and an accessory sample compartment door is open, close it.
3. If you have a microscope and the microscope compartment is open, close it.
4. If the laser power is off, turn on the laser.
5. If the laser is disabled, enable it in the **Bench** tab of the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Has Large Noise Spikes

Cosmic ray events occurred during data collection. Turn on **Cosmic Ray Rejection** and set it to Medium. (**Cosmic Ray Rejection** is on the **Collect** tab of the **Experiment Setup** dialog box.)

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Has a Sloping Background

The sample may be fluorescing or heating. To account for this condition try one or more of the following:

- Correct the baseline to subtract the broad background.
- Use a different laser. Shorter wavelengths heat samples less.
- If the sample looks burned, replace it or move it so the laser will strike a fresh area.
- Reduce the laser power and collect the sample again. Watch the live display to see if the sample is still heating. (Reducing the laser power reduces the Raman signal generated at the sample and therefore the quality of the data. To compensate, try increasing the number of exposures or the exposure time.)

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Baseline Is Severely Tilted or Curved

The sample fluoresced during data collection. To correct this problem, try one or more of the following:

- Purify the sample.

- Make sure the sample container is not responsible for the fluorescence.
- If fluorescence is an inherent property of the sample, correct the baseline to subtract the broad background.
- Use a longer wavelength laser or expose the sample to the laser beam for a period of time before beginning the collection of the sample spectrum (this is known as “photobleaching”). On the **Collect** tab of the **Experiment Setup** dialog box, turn on **Preview Data Collection** and type the desired exposure time in the **Preview Time** text box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Baseline Has a Severe Positive Offset

The sample is heating. To account for this condition try one or more of the following:

- Correct the baseline to subtract the broad background.
- Use a different laser. Shorter wavelengths heat samples less.
- If the sample looks burned, replace it or move it so the laser will strike a fresh area.
- Reduce the laser power and collect the sample again. Watch the live display to see if the sample is still heating. (Reducing the laser power reduces the Raman signal generated at the sample and therefore the quality of the data. To compensate, try increasing the number of exposures or the exposure time.)

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Baseline Is Severely Shifted

No background was subtracted from the sample data (the number of background exposures is set to zero or the Smart Background feature is disabled). The offset is the detector bias and dark signal. Set **Background Exposures** on the **Collect** tab of the **Experiment Setup** dialog box to an integer greater than 0.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

A Grating Does Not Appear to Be Installed or the Grating Cover Is Open

1. Make sure a grating is installed.
2. Make sure the grating cover is closed.

3. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

A Laser Does Not Appear to Be Installed

1. Make sure a laser is installed and the keyswitch is turned on.
2. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

A Filter or Fiber Optic Accessory Does Not Appear to Be Installed

1. Make sure a filter or fiber optic accessory is installed.
2. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Computer Cannot Communicate with the Instrument

1. If the instrument is turned off, turn it on.
2. Check the cable between the computer and the instrument. If it is disconnected, connect it.
3. If the front panel indicators are not on, make sure the instrument is plugged in.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

X-Axis Calibration Fails

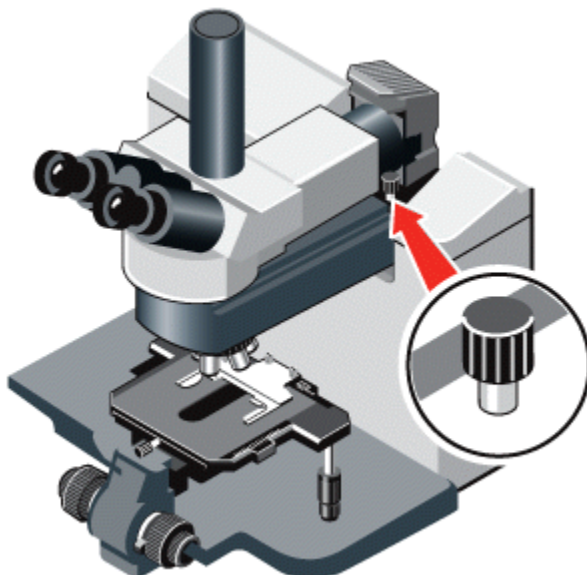
The neon bulb used for automatic x-axis calibration may have failed.

- Turn off automatic x-axis calibration and run manual calibration. Contact our service representative in your area for repair of the automatic x-axis calibration feature.

Using a DXR Raman Microscope

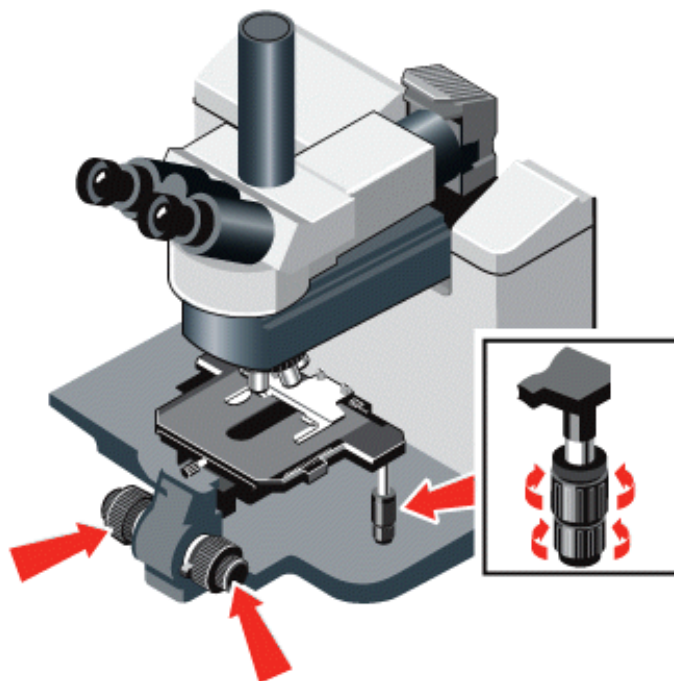
Operation

Adjusting the Illuminator Intensity



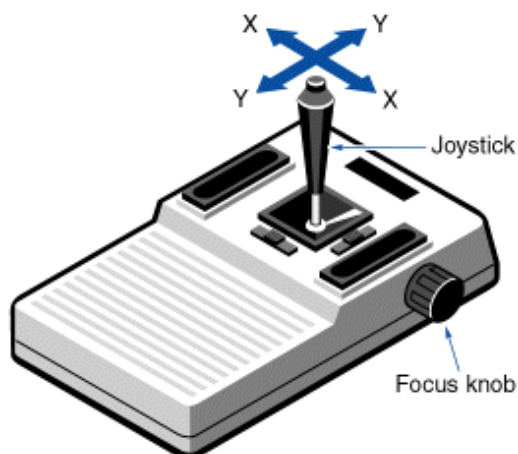
Note If you have a darkfield illuminator or a transmission illuminator, the intensity adjustment control is located on the front of the illuminator power supply.

Positioning a Manual Stage



Positioning a Motorized Stage

The joystick moves the motorized stage left and right along the X-axis or forward and back along the Y-axis. The focus knob allows you to adjust the height of the stage along the Z-axis.



Using Darkfield Illumination

Darkfield illumination switches the illumination from the top of a sample to the sides. This increases the contrast and makes it easier to view low contrast samples. To use darkfield illumination, a different illuminator, nosepiece, and objective must be installed. In addition, you must set the **Objective** parameter on the **Bench** tab of the **Experiment Setup** dialog box to the objective you have installed. For assistance or ordering information, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy for more information.

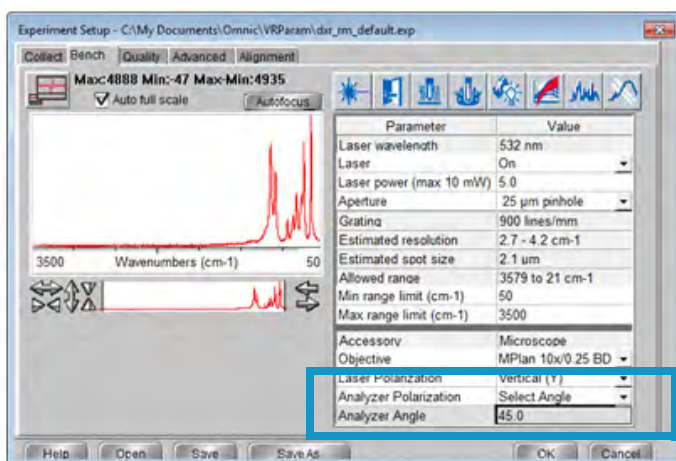
Using Confocal Operation

Confocal operation provides a well defined focus that is useful when examining layered materials or very small samples.

To make maximum use of your microscope's confocal capability, open the **Experiment Setup** dialog box in OMNIC™, click the **Bench** tab, and set **Aperture** to 25 micrometer pinhole.

Using the Raman Polarization Option

The microscope can be purchased with optional optics to collect polarized Raman measurements. If the polarization kit is installed, polarization settings will be available in the Bench tab of the Experiment Setup window within the OMNIC software as shown.



There are three laser polarization options (Depolarized, Horizontal (X), and Vertical (Y)). Raman experiments that do not require the use of polarization optics should select "Depolarized" for the Laser Polarization.

The polarization analyzer can be set to Horizontal (X) or Vertical (Y) or any angle from 0 to 180 degrees by specifying a custom angle.

The microscope employs a 180° degree back-scattering configuration. The $z(Y,Y)z$, $z(X,X)z$, $z(X,Y)z$, and $z(Y,X)z$ polarization states can be measured by selecting the appropriate laser polarization and analyzer polarization. The $z(X,X)z$ is denoted as Horizontal polarization, and the $z(Y,Y)z$ is denoted as Vertical polarization. The horizontal axis is across the stage from left to right, and the vertical axis goes from front to back.

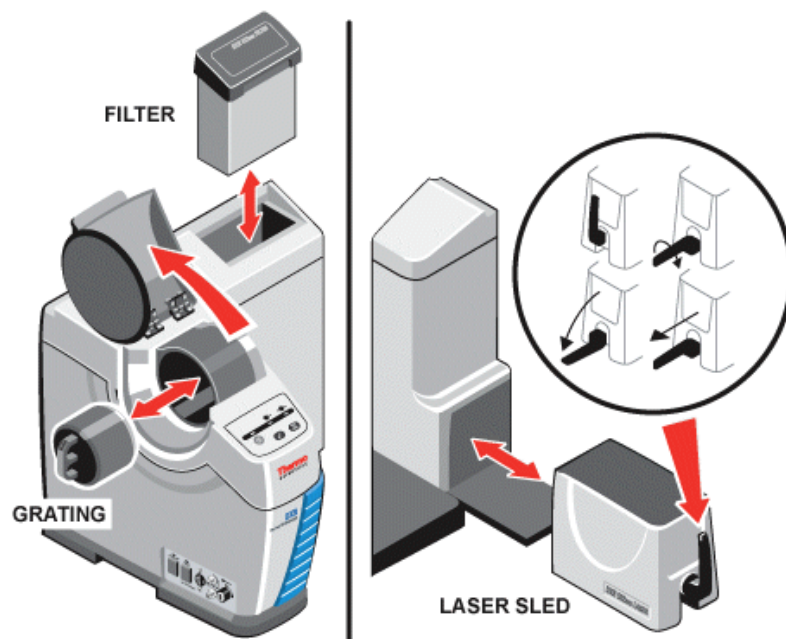
Test samples can be used to verify the performance of the polarization accessory. Recommended test samples are lithium niobate crystals (X-cut) or carbon tetrachloride.

Changing The Laser, Filter, and Grating



WARNING Avoid shock hazard. Make sure you turn off the spectrometer power before you replace a laser, filter, or grating.

NOTICE Handle lasers, filters, and gratings gently. Do not touch any optical surfaces or the interior of a laser, filter, or grating. When a laser, filter, or grating is not in use, store it in the case that it was shipped in.



Enabling the Laser

You must enable the laser before you can turn it on. To enable the laser, rotate the laser key to the locked (vertical) position as shown below. (For more information about turning on the laser, see the software help available through the **Help** menu in OMNIC.)

Note You can insert or remove the laser key only when the laser keyswitch is in the unlocked (horizontal) position. When the laser keyswitch is in the unlocked position, the laser is disabled.



Optional Class 3B Configuration

The DXR Raman and DXR SmartRaman spectrometers can be configured as Class 3B laser products. Class 3B laser radiation is hazardous and can cause permanent eye damage. Exposure to laser radiation should be avoided by setting up a laser safe area.

See the *DXR Raman Instruments Site and Safety Guide* that came with your instrument for a full description of necessary precautions

To support this configuration, you purchase the Class 3B Conversion Kit. If you purchased the conversion kit after your system is already installed, the Class 3B Conversion Kit and fiber optic accessory must be installed by a Thermo Scientific Field Service Engineer (FSE). The FSE will apply proper Class 3B laser rating labels to the instrument and will provide basic laser safety training.

Note The attenuator can be used to reduce the laser power below Class 1 level while the safety interlocks are defeated.

Using a Class 3B Fiber Optic Accessory



WARNING The fiber optic accessory is compatible with the Class 3B configuration of the instrument. Making adjustments, using controls, or performing procedures that are not specified in the printed or online documentation may result in exposure to hazardous visible or invisible laser radiation. Make sure you follow all safety precautions listed in the Site and Safety Guide before you operate the fiber optic accessory.

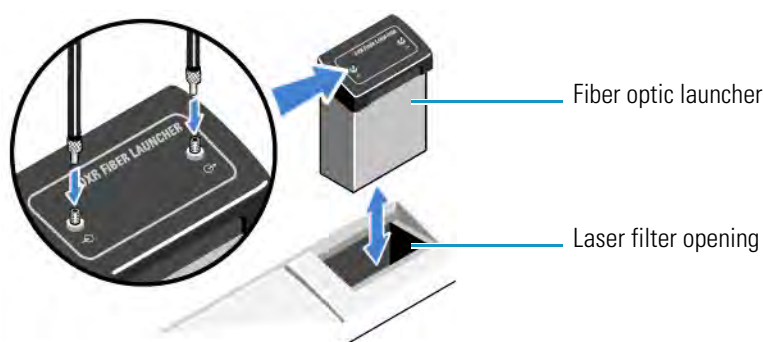
To avoid severe burns from exposure to laser radiation or permanent damage to your eyes, never put anything except samples against the tip of the fiber optic probe, and always wear laser safety goggles that meet the specifications for the laser your fiber optic launcher uses. Also, you should never look directly into the tip of a fiber optic probe or the fiber optic probe connectors, even if you are wearing laser safety goggles. The goggles will protect you for diffuse viewing only.

Always set up laser safety area in the location where you are using a fiber optic accessory.

❖ To Install a Fiber Optic Accessory

1. Remove the laser filter from the system and slide the fiber optic launcher into the laser filter opening.

Figure 4. Fiber optic launcher installation



CAUTION To ensure safe operation, always connect the collection probe cable to the fiber optic launcher before you connect the excitation probe cable.

2. Connect the fiber optic cables from the probe to the appropriate ports on the fiber optic launcher (see previous image).
 - a. Insert the end of the probe cable labeled “Collection” into the  connector and rotate the connector so it slides into the keyhole slot on the launcher. Tighten the knurled nut finger tight.
 - b. Insert the end of the probe cable labeled “Excitation” into the  connector and rotate the connector and tighten the nut as described above.
3. Insert the probe into the probe alignment tool to perform alignment and calibration.

Rotate the probe into the tool so that the ball inside the tool slides into the indent on the side of the probe.

Figure 5. Probe positioned for alignment and calibration

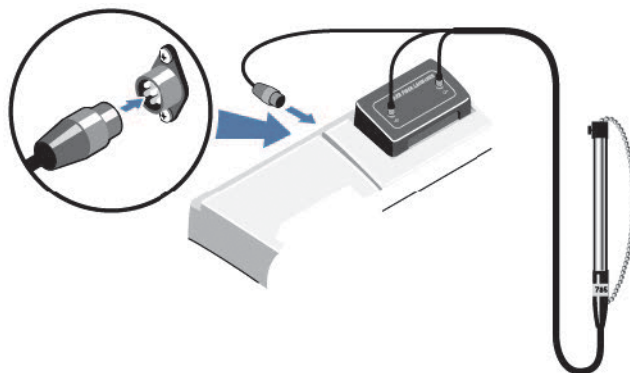


4. Connect the power cable for the probe LED.



CAUTION Always replace the cap on the end of the probe or the exit port of the fiber launcher when not in use.

Figure 6. Connect power cable for probe LED

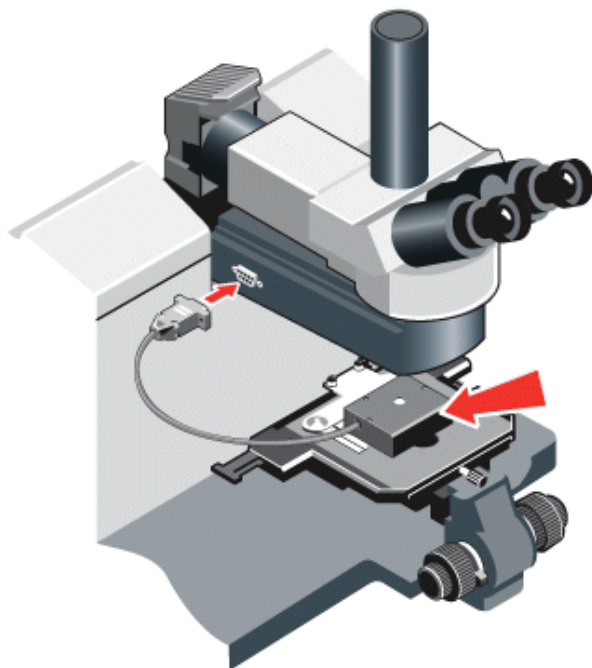


5. Attach the strain relief hook (provided) to the microscope by inserting the two screws (provided) into the two holes at the top of the microscope back panel (behind the laser filter compartment). Tighten the two screws.
6. Attach the probe cable to the strain relief hook.
Loop the nylon strain relief attached to the probe cable (before it splits) over the hook installed in the previous step.
7. Open the Settings box in OMNIC and click Align/Calibrate and choose OK to align and calibrate the instrument with the probe.

The Fiber Launcher includes two caps to cover the ports when the accessory is not attached. Always replace the caps to cover the ports when the accessory is not in connected.



Installing the Microscope Alignment Tool



Note For alignment and calibration instructions, please see the alignment and calibration topics in the on-line software help system.

Installing a 455 nm Laser

Under most circumstances, your instrument has come equipped to permit user installation of a 455 nm laser. If you specifically ordered this laser wavelength with your DXR, see [Changing The Laser, Filter, and Grating](#). If you need to add this capability in the future, a service visit may be required. Contact our sales or service representative in your area or contact us.

Installing a 633 nm Laser

If you specifically ordered this laser wavelength with your system, see [Changing the Laser, Filter, and Grating](#). If you need to add this capability in the future, a service visit is required to ensure optimum alignment and performance. Contact our sales or service representative in your area.

Service

Cleaning Your Instrument

If the outside of the instrument needs cleaning, turn off the power, unplug the power cable from the wall outlet, or power strip, and wipe the outside of the instrument with a damp (not wet), soft cloth and a mild soap. (Do not use harsh detergents, solvents, chemicals or abrasives.)

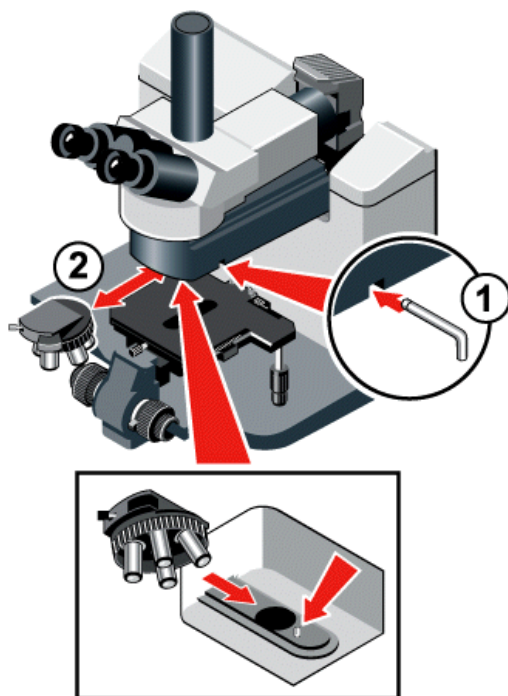


WARNING Avoid shock hazard. Do not allow liquid or any moist material to come in contact with the power supply or the inside of the instrument.

NOTICE Be extremely careful when cleaning the microscope objectives. They are delicate optical components. If an objective needs to be cleaned, use pressurized, filtered nitrogen or air to blow off dust and other particles. (Commercially prepared cleaning air like the kind used to clean electronic equipment also may be used.) If this is not sufficient, use commercial cleaning solution and lens paper that is specifically for cleaning delicate glass lenses.

To help avoid permanent damage, do not attempt to clean or touch any optical surface inside the instrument (except the microscope objectives as described above), and do not attempt to clean a filter or grating.

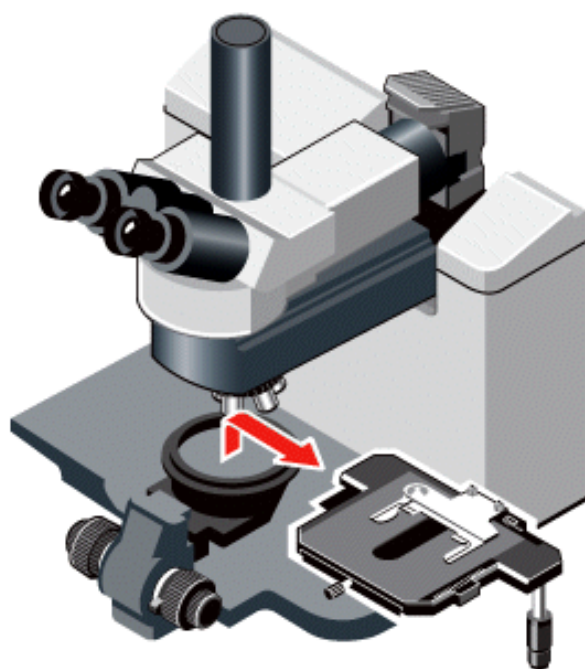
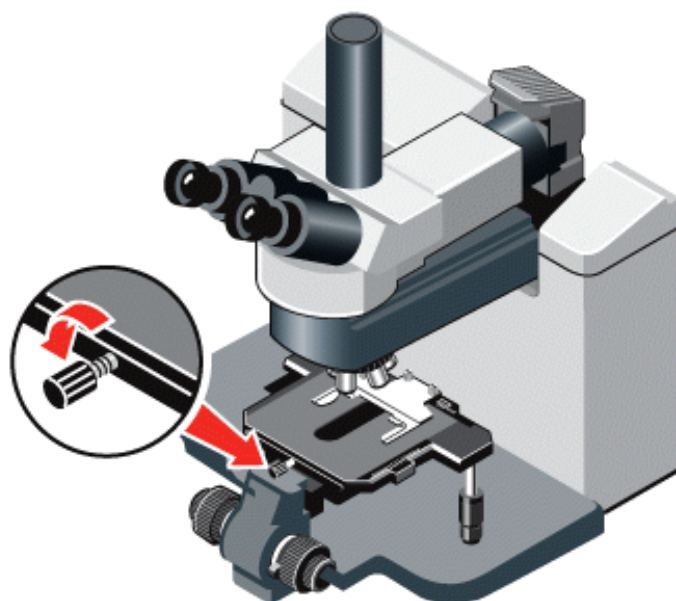
Replacing the Nosepiece



Note When you install a nosepiece, make sure you slide it in until it stops, and then tighten the screw until it is just tight. Do not over tighten.

When you install a new nosepiece, you must set the **Objective** parameter on the **Bench** tab of the **Experiment Setup** dialog box to the new objective you will be using. For assistance or ordering information, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy for more information.

Removing the Stage



Installing a New Stage

If you want to install a new stage on your microscope, please contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy for assistance.

Replacing Fuses

You cannot replace the fuses in your instrument. If you suspect a fuse needs to be replaced, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy for assistance.

Replacing an Illuminator Bulb

The following procedure shows how to replace a darkfield illuminator bulb. If you have a brightfield illuminator or transmission illuminator, the bulb is an LED and should not fail during the lifetime of the instrument. If you suspect a brightfield or transmission illuminator needs to be replaced, or if there is a problem with the illuminator, contact us.

Time needed: Approximately 10 minutes

Tools needed: A 3.0 mm hex wrench

Parts needed: Replacement illuminator bulbs (Contact us for ordering information.)

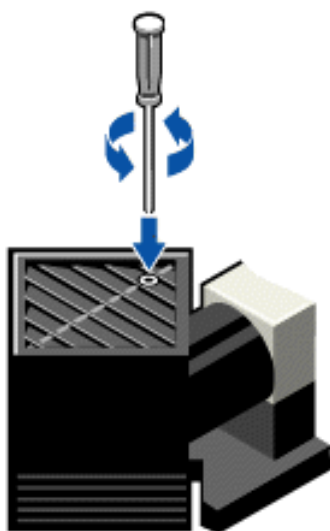


WARNING To avoid fire hazard, make sure your replacement illuminator bulbs are supplied by us and are appropriate for your instrument and illuminator. Always turn off the instrument power and unplug the power cable from the power source before replacing an illuminator bulb.

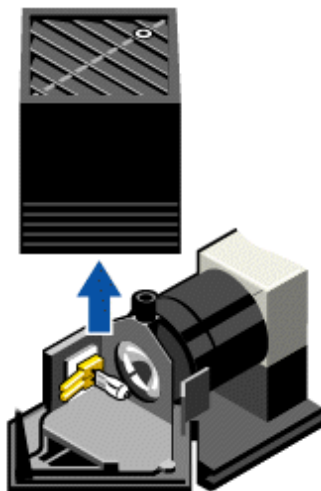
1. Turn off the instrument power and unplug the power cable from the power source.
Caution

To avoid being burned, let the illuminator cool for at least five minutes before replacing the bulb.

2. Use a 3.0 mm hex wrench to loosen, but not remove, the screw.

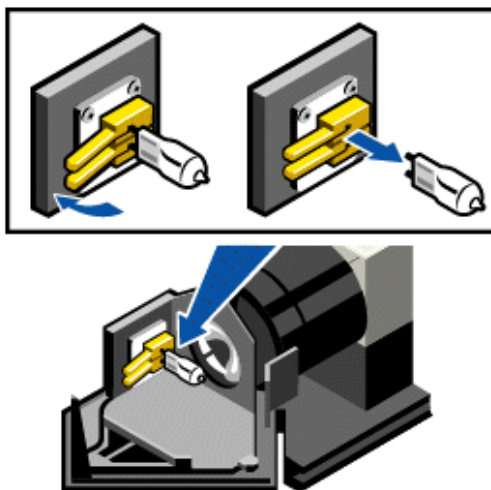


3. Lift the cover off.



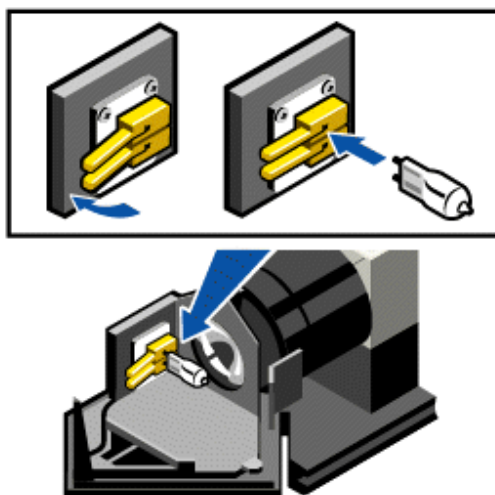
CAUTION Avoid burn hazard. Make sure the bulb is cool before removing it.

4. Squeeze the levers to release the bulb.

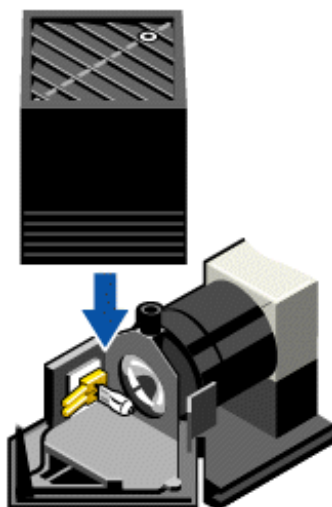


WARNING To avoid fire hazard, make sure your replacement illuminator bulbs are supplied by us and are appropriate for your instrument and illuminator.

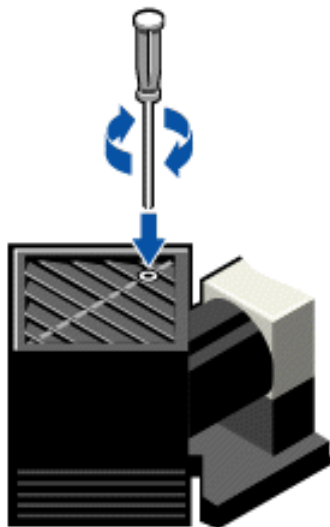
5. Squeeze the levers, insert the bulb all the way, and release the levers. (To extend bulb life, always handle a new bulb with a clean tissue or cloth.)



6. Replace the cover.



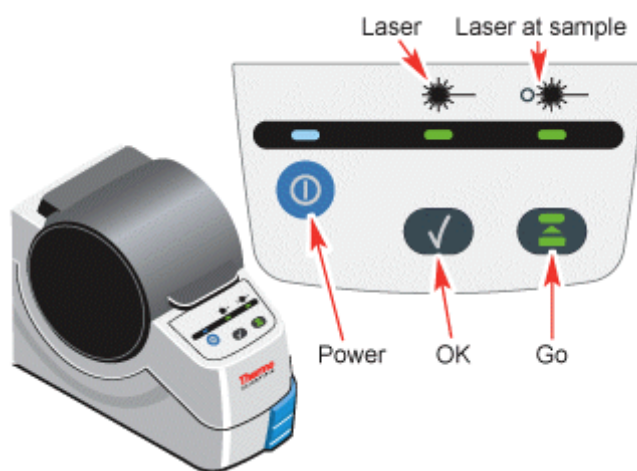
7. Use a 3.0 mm hex wrench to tighten the screw. (Do not over tighten.)



8. Connect the instrument power cable to a power source (an electrical outlet or power strip, for example), and then turn on the instrument power.

Safety

Indicators



Note Press the OK button to respond affirmatively (for example, to a software prompt) during data collection. Press the Go button to start a macro you have specified.

Biohazards or Radioactive Materials and Infectious Agents

Instruments, accessories, components or other associated materials may not be returned to us or other accessory manufacturers if they are contaminated with biohazard or radioactive materials, infectious agents, or any other materials and/or conditions that could constitute a health or injury hazard to employees. If you have questions about decontamination requirements, contact our sales or service representative in your area or visit our web site at www.thermo.com/spectroscopy.

Cooling Fans

NOTICE Cooling fans are located on the back of the instrument. To avoid overheating, do not block the free flow of air around the instrument. There should be at least 2 cm (about 1 in) of clearance behind the instrument and at least 30 cm (about 12 in) of clearance on each side.

Using Corrosives and Solvents

Many standard spectroscopy methods are based on the use of solvents. Sample materials dissolved in solvents can be measured using your spectrometer, but special precautions must be taken.

Caustic or Corrosive Agents

Instrument components may be degraded by exposure to caustic or corrosive agents or their vapors. To maintain the instrument in safe working condition, do not use caustic agents. Damage to the instrument caused by the use of caustic agents is not covered by the warranty.

Volatile Solvents

If you use volatile solvents regularly, follow the guidelines listed below. These measures will help prolong the life of your instrument and will eliminate the possibility of spectral interference caused by volatile solvent vapors.

- Use sealed sample holders.
- Do not leave exposed solvent in the sample compartment for longer than necessary.
- Do not leave the solvents near the instrument.
- Be sure that your work space is properly ventilated.

Solvents Containing Halogenated Hydrocarbons

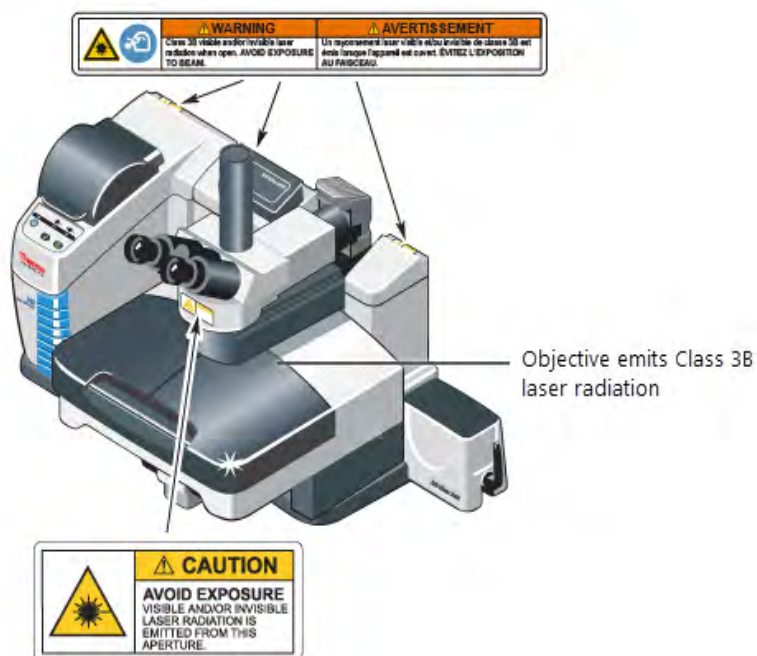
Chlorinated solvents, perfluorochlorinated solvents, and other solvents containing halogenated hydrocarbons are often used as sample solvents. The pyrolysis of these solvents by an infrared source or by excessive heating caused by laser absorption may produce hydrochloric acid (HCl), hydrofluoric acid (HF), phosgene (COCl_2), or other hazardous compounds.

Materials such as hydrochloric acid and hydrofluoric acid are highly corrosive and may cause accelerated corrosion of the metallic components in the spectrometer. Damage may be caused in any spectrometer, if the concentration level of corrosive gases in the air is excessively high due to improper sampling techniques.



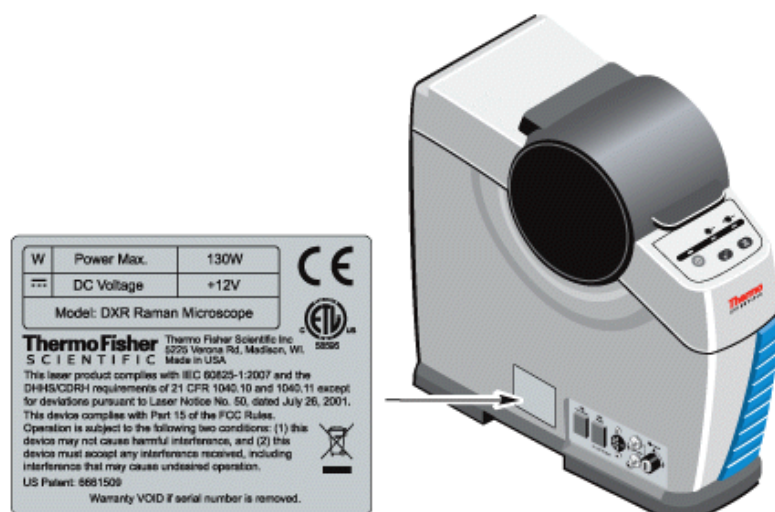
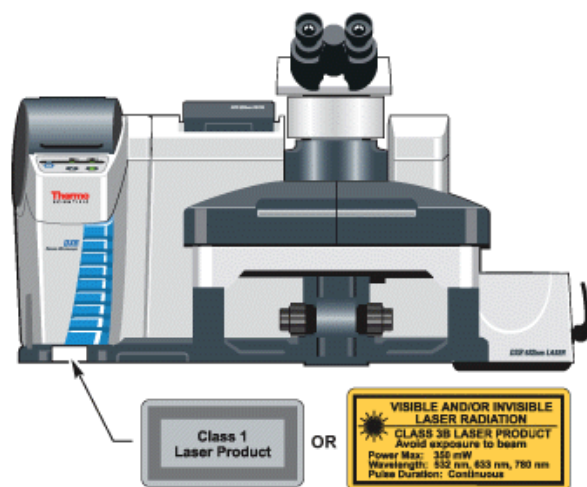
WARNING Materials such as hydrochloric acid, hydrofluoric acid and phosgene are highly toxic. If you regularly use solvents containing halogenated hydrocarbons, be sure your work area is properly ventilated. Solvents containing halogenated hydrocarbons should not be left in the sample compartment for an extended time.

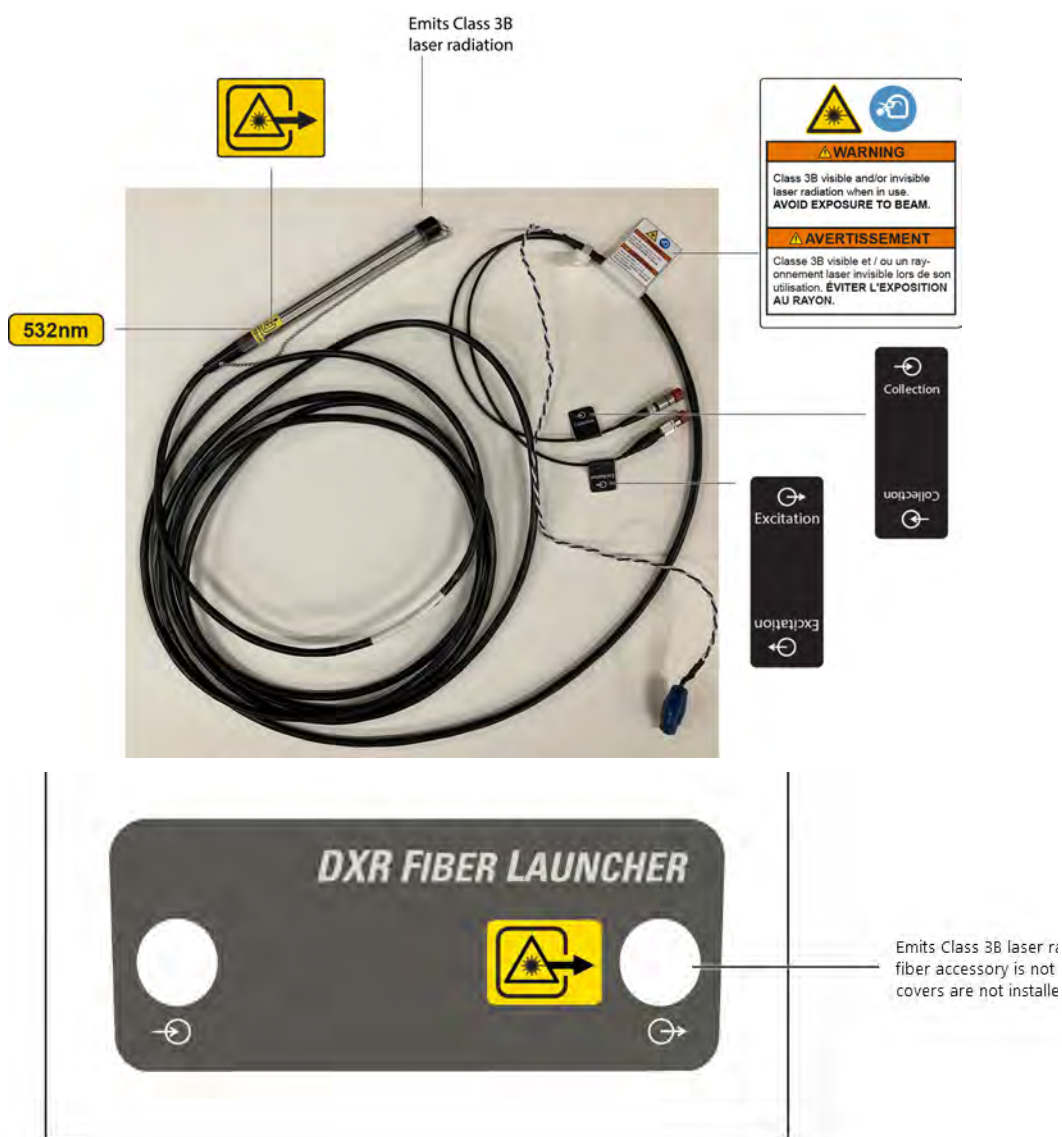
Microscope Safety Labels



3 Using a DXR Raman Microscope

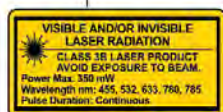
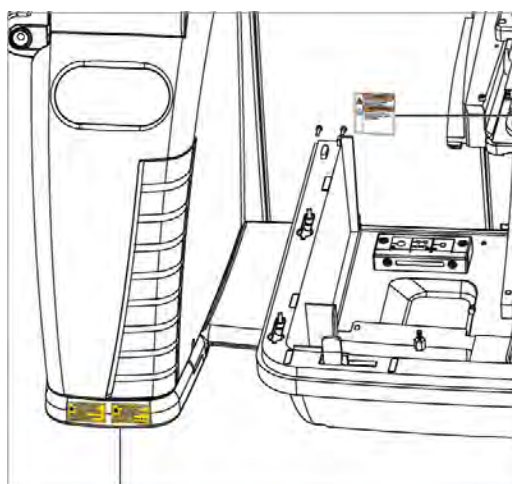
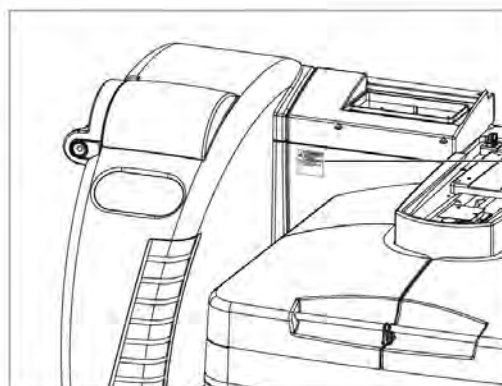
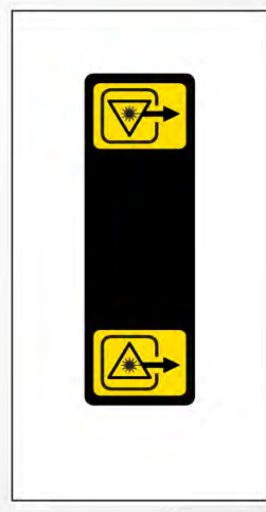
Safety





3 Using a DXR Raman Microscope

Safety



Troubleshooting

Sample Bands are too Small

The Raman signal is too small. You can increase it by doing one or more of the following:

- Increase the setting of **Exposure Time** on the **Collect** tab.
- Increase the setting of **Exposures** on the **Collect** tab.
- Increase the aperture size by setting **Aperture** on the **Bench** tab.
- Select a slit aperture instead of a pinhole by setting **Aperture** on the **Bench** tab.
- Increase the setting of **Laser Power** on the **Bench** tab.

Note All of the tabs mentioned here are in the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

Sample Bands Are too Large

The Raman signal is too large, which saturates the CCD. You can decrease the signal by doing one or more of the following:

- Decrease the setting of **Exposure Time** on the **Collect** tab.
- Decrease the aperture size by setting **Aperture** on the **Bench** tab.
- Select a pinhole aperture instead of a slit by setting **Aperture** on the **Bench** tab.
- Decrease the setting of **Laser Power** on the **Bench** tab.

Note All of the tabs mentioned here are in the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

No Raman Signal Appears in the Live Display

1. If you have a spectrometer and an accessory sample compartment door is open, close it.
2. If you have a microscope and the microscope compartment is open, close it.
3. If the instrument is turned off, turn it on.
4. If the laser power is off, turn on the laser.

5. If the laser is disabled, enable it in the **Bench** tab of the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

No Visible Image Appears in the Video Pane or Viewer

1. If the illuminator is set to low intensity, set it to higher intensity.
2. If you are in the **Bench** tab of the **Experiment Setup** dialog box, go to another tab.
3. If the viewer selection rod is all the way out, move it all the way in or to the center position.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

CCD Overflow Occurred

Too much light hit the CCD. To correct this problem, try either of the following:

- Use a shorter exposure time or smaller aperture.
- Reduce the laser power.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Has No Sample Bands

1. If the sample is not at the focal point, focus the sample on the microscope stage.
2. If you have a spectrometer and an accessory sample compartment door is open, close it.
3. If you have a microscope and the microscope compartment is open, close it.
4. If the laser power is off, turn on the laser.
5. If the laser is disabled, enable it in the **Bench** tab of the **Experiment Setup** dialog box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Has Large Noise Spikes

Cosmic ray events occurred during data collection. Turn on **Cosmic Ray Rejection** and set it to Medium. (**Cosmic Ray Rejection** is on the **Collect** tab of the **Experiment Setup** dialog box.) If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Has a Sloping Background

The sample may be fluorescing or heating. To account for this condition try one or more of the following:

- Correct the baseline to subtract the broad background.
- Use a different laser. Shorter wavelengths heat samples less.
- If the sample looks burned, replace it or move it so the laser will strike a fresh area.
- Reduce the laser power and collect the sample again. Watch the live display to see if the sample is still heating. (Reducing the laser power reduces the Raman signal generated at the sample and therefore the quality of the data. To compensate, try increasing the number of exposures or the exposure time.)

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Baseline Is Severely Tilted or Curved

The sample fluoresced during data collection. To correct this problem, try one or more of the following:

- Purify the sample.
- Make sure the sample container is not responsible for the fluorescence.
- If fluorescence is an inherent property of the sample, correct the baseline to subtract the broad background.
- Use a longer wavelength laser or expose the sample to the laser beam for a period of time before beginning the collection of the sample spectrum (this is known as “photobleaching”). On the **Collect** tab of the **Experiment Setup** dialog box, turn on **Preview Data Collection** and type the desired exposure time in the **Preview Time** text box.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Baseline Has a Severe Positive Offset

The sample is heating. To account for this condition try one or more of the following:

- Correct the baseline to subtract the broad background.
- Use a different laser. Shorter wavelengths heat samples less.
- If the sample looks burned, replace it or move it so the laser will strike a fresh area.

- Reduce the laser power and collect the sample again. Watch the live display to see if the sample is still heating. (Reducing the laser power reduces the Raman signal generated at the sample and therefore the quality of the data. To compensate, try increasing the number of exposures or the exposure time.)

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Spectrum Baseline Is Severely Shifted

No background was subtracted from the sample data (the number of background exposures is set to zero or the Smart Background feature is disabled). The offset is the detector bias and dark signal. Set **Background Exposures** on the **Collect** tab of the **Experiment Setup** dialog box to an integer greater than 0.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

A Grating Does Not Appear to Be Installed or the Grating Cover Is Open

1. Make sure a grating is installed.
2. Make sure the grating cover is closed.
3. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

A Laser Does Not Appear to Be Installed

1. Make sure a laser is installed and the keyswitch is turned on.
2. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

A Filter or Fiber Optic Accessory Does Not Appear to Be Installed

1. Make sure a filter or fiber optic accessory is installed.
2. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Nosepiece Does not Appear to be Installed

1. Make sure the nosepiece is properly installed.
2. Exit OMNIC™, shut down the computer, turn off the instrument, wait 30 seconds, and then turn on the instrument.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Image is Obscured or Distorted

If the objective is dirty or contaminated, clean it. (See the “Cleaning your instrument” topic.)

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

The Computer Cannot Communicate with the Instrument

1. If the instrument is turned off, turn it on.
2. Check the cable between the computer and the instrument. If it is disconnected, connect it.
3. If the front panel indicators are not on, make sure the instrument is plugged in.

If this problem persists, contact our sales or service representative in your area, or visit our web site at www.thermo.com/spectroscopy.

X-Axis Calibration Fails

The neon bulb used for automatic x-axis calibration may have failed.

- Turn off automatic x-axis calibration and run manual calibration. Contact our service representative in your area for repair of the automatic x-axis calibration feature.

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