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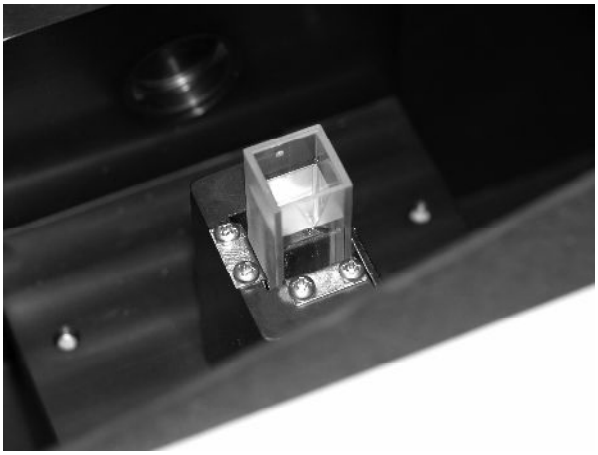
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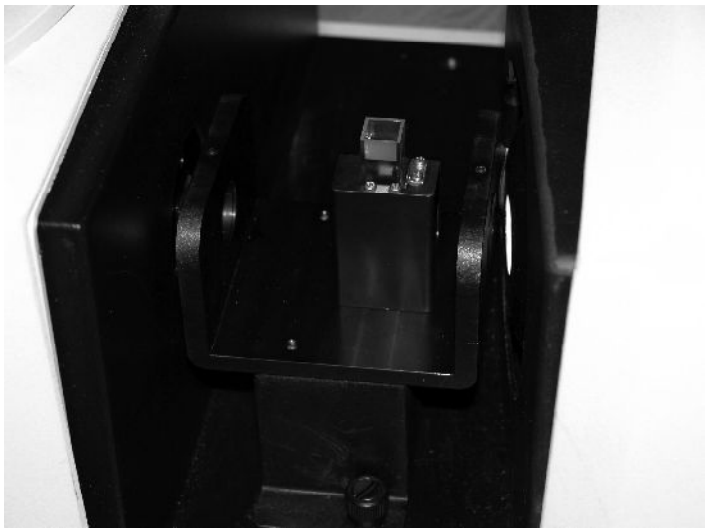
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Find the *HunterLab Ultrascan XE* at our website: *Click HERE*







6. Complete the standardization by measuring the cell blank as the top of scale.

7. Remove the cell from the cell holder and rinse it with the sample to be measured. Fill the cell with the sample and measure it the same way you did the blank.

Note: It is important, particularly when using disposable cells, that the same cell used during standardization be used for sample measurements.

8. Periodically clean the two lenses on the cell holder with isopropyl alcohol and a cotton swab.

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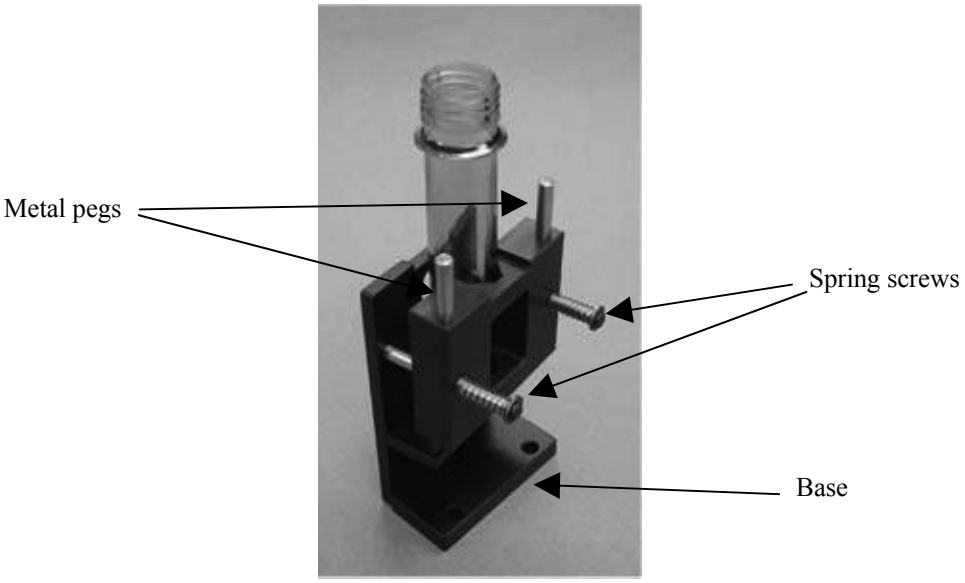
Transmission Preform Holder

This option provides an adjustable holder for measuring transparent preforms at the transmission port of the UltraScan XE. The holder is appropriate for preforms with a shaft diameter between 10 and 40 mm and a length of at least 50 mm.

Complete the following steps to install the holder into the instrument.

1. Position the holder so that the flat side is aligned at the opening of the sphere at the front of the transmission compartment. The base should be down on the floor of the transmission compartment with the spring screws facing out into the transmission compartment.

2. When properly aligned, the holes in the base of the holder will align with holes in the floor of the transmission compartment. Place a thumbscrew in each of the holes and tighten until snug.



Use the preform holder as follows:

1. Standardize the instrument in TTRAN mode on air, using **0.375 inch (9.525 mm) as the area view**. When prompted for the black card, slide it between the preform holder and the transmission port.

2. Open the holder. It is easiest to do this by placing an index finger between one of the metal pegs on top of the holder and the transmission port and resting the thumb of the same hand on the end of the corresponding spring screw. Pull the index finger toward the thumb until the holder provides an opening large enough for insertion of the desired preform.

3. Insert the preform into the holder as far as the preform will go with the threads up. Then close the holder and confirm that the preform is held securely in place.

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4. If possible, close the transmission compartment door, and then make your measurement.
5. Open the transmission compartment door, rotate the preform, and measure it again.
6. Repeat step 5 until the preform has been measured the desired number of times.

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UltraScan XE Installation

Notice: The UltraScan XE should be lifted from under the base plate, near the center of the unit. It should not be carried by grasping any part of the plastic housing.

The UltraScan XE is simple to set up and attach to your computer. The following instructions guide you through the initial installation of your UltraScan XE system.

1. Unpack all cartons and remove wrappings and cable ties. Inspect for damage and notify the carrier and HunterLab immediately if any is discovered. Save the packing material in case it becomes necessary to return the instrument to the factory.

2. Place the UltraScan XE on a flat working surface where the measurements will be made. Place the computer in close proximity to the sensor.

3. Ensure that the on/off switch on the back of the sensor is set to off.

4. Connect the power cord to the sensor and to a power outlet.

   Note: Refer to the UltraScan XE Specifications section of this chapter for recommendations concerning the power line and its conditioning.

   CAUTION
   Use only the power cord included with this instrument or a replacement obtained from HunterLab (HL#10-0000-55 for 110V, A13-1002-656 for 220V). Be certain that the power cord is in good condition before connecting it.

   The UltraScan XE is grounded using the grounding portion of this power cord. Only plug this cord into a properly grounded power outlet. Do not use an inappropriate adapter to plug the instrument into an ungrounded outlet or electric shock may occur. More information on the wiring of the power cord can be found in the UltraScan XE Specifications section of this chapter.

5. Connect the female end of the 9-pin communications cable to the appropriate communications port of the computer. Connect the male end of the 9-pin cable to the sensor.

6. Remove the tape covering the reflectance port and the exterior of the sphere in the transmission compartment.

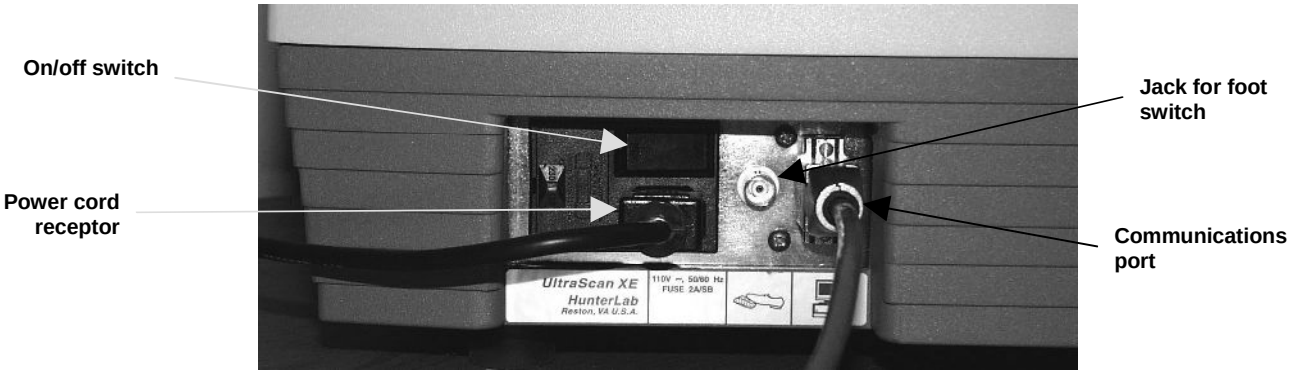
7. Place the desired port plate at the reflectance port and snap it into place.

8. Locate the reflectance port sample clamp in the standards box and slide it into place at the reflectance port. Depress the back button to slide the clamp all the way in. Depress the front button to move the sample clamp up against the sphere. Covering the sample port when the instrument is not in use prevents dust from accumulating inside the sphere.

9. Turn on the UltraScan XE by switching the on/off switch on the back of the sensor to the on position. Allow the instrument to warm up for two hours prior to standardizing and making measurements.

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Notice: Do not block the vents in the top cover of the UltraScan XE or the instrument may overheat.



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UltraScan XE Standardization

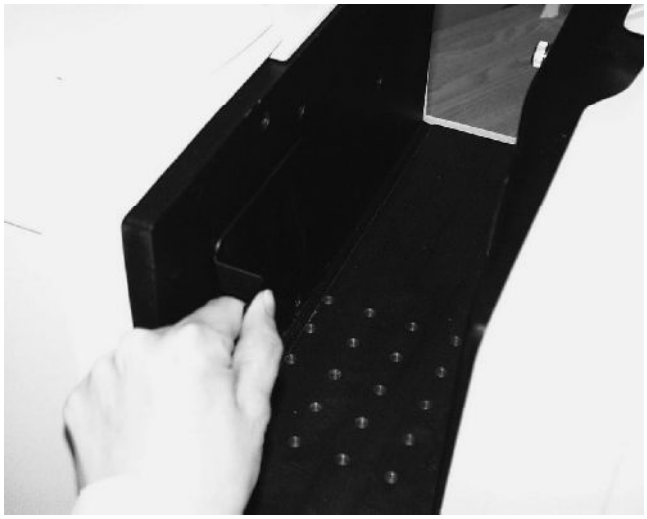
The UltraScan XE must be standardized on a regular basis to keep it operating properly.

General

Standardization sets the top and bottom of the scale for the photometric scale. During standardization the bottom of the scale is set first. For this, you simulate the case where all the light is absorbed by the sample. For UltraScan XE, the bottom of the scale is set with the light trap for reflectance modes. The black card device is used to set the bottom of the scale for transmittance measurements.



Standardizing on the black card device for TTRAN mode. (The transmission compartment door may be closed down to the device handle.)



Standardizing on the black card device for RTRAN mode.

The top of the scale is then set by scaling the light which is reflected or transmitted to a calibrated standard. This is done using a calibrated white tile for reflectance measurements and air or a solvent-filled cell for transmittance measurements. On-screen messages prompt you through the standardization procedure.

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Standardizing on the white tile

It is recommended that the instrument be standardized at least once every eight hours. Also, standardize the instrument whenever the hardware changes, such as the placement of the UV filter, or with environmental, such as temperature, changes. Then you may proceed with sample measurement.

Standardization Modes

Four modes of measurement are available when you standardize the UltraScan XE:

- RSIN: Reflectance - Specular Included
- RSEX: Reflectance - Specular Excluded
- TTRAN: Total Transmittance
- RTRAN: Regular Transmittance

Taking into account varying hardware configurations such as UV filter in/out and small area/large area view, there are many ways to standardize the UltraScan XE. The instrument can be standardized at any time by selecting **Standardize** from the **Sensor** menu or by clicking the **Standardize** button on the default toolbar.

When standardizing in transmittance modes you are prompted to place the white calibrated standard at the reflectance port. Alternatively, a plug of barium sulfate ($BaSO_4$) or magnesium oxide (MgO) may be used to more closely approximate the actual sphere wall reflectance. When taking transmittance measurements, the calibrated white tile or the plug used during standardization must be kept at the reflectance port. When the instrument is to be used for transmission measurements of liquids, a clear liquid (distilled water for water-based samples, toluene or benzene for resins, or mineral oil for oils) in a cell of the desired size should be used to set the top of the scale.

Place the cell in the transmission compartment as close to the **sphere** as possible for measuring total transmittance.

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Setting the top of scale for TTRAN



Place it as close to the **lens** as possible when measuring regular transmittance.

Note: Closing the transmission compartment door while making transmittance measurements is the best practice for this instrument. However, when measuring the transmittance of liquids that are volatile and/or toxic, it may be more important to measure the samples quickly than to eliminate ambient room light. To see if leaving the door open will adversely affect your color measurements, standardize the instrument in the desired transmittance mode with the transmission compartment door closed, then measure either air or a typical sample with the door open and then with the door closed. Compare the measurements. If the difference is acceptable under your measurement method, you may measure your samples with the door open. This test should be repeated if the instrument is moved to a new location.

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UltraScan XE Maintenance and Testing

The UltraScan XE does require some maintenance. This section outlines the parts of the UltraScan XE you must maintain in order for the instrument to function properly and tests you may run to assess its performance.

Notice: Do not disassemble the instrument and attempt to clean the optical components. Do not open the instrument or remove any covers except using the instructions given in this User's Manual, the EasyMatch QC help file, or under the direction of HunterLab Technical Support.

Running the Repeatability Test

You may test the repeatability of your instrument as follows:

1. Turn the UltraScan XE on and allow it to warm up for two hours. Meanwhile, clean the white tile and allow it to return to room temperature.

2. Follow the instructions given in the Sensor Menu chapter, Diagnostics section to run the repeatability test that is built into EasyMatch QC.

Running the Green Tile Test

The green tile is not used during the standardization process. Instead, the green tile is used to verify the long-term performance of your instrument. Perform the green tile test described in the Sensor Menu chapter, Diagnostics section once a week. You can then examine all green tile readings periodically and see any trends that develop over time.

The UltraScan XE should be in its standard configuration, RSIN mode with the large area view port plate installed and UV filter nominal, when these readings are made. The illuminant and observer used in your display must match those on the green tile.



The green tile reading should vary by no more than **±0.15** XYZ units from the values given on the tile. If your reading is out of this specification, first clean the standard tiles. Then standardize and measure the green tile again. If the reading still does not meet this specification, contact HunterLab Technical Support for assistance. Please read "When You Need Assistance" prior to contacting HunterLab.

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Running the Didymium Filter Test

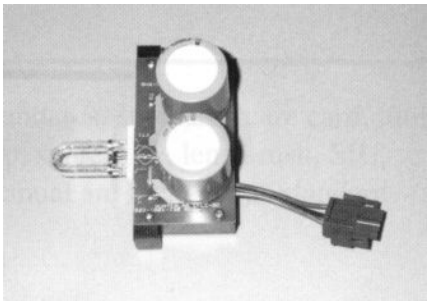
The didymium filter can be used to check the wavelength accuracy of the UltraScan XE. This check should be done on a regular basis (i.e., weekly or bi-weekly) as part of your routine instrument performance check.

To perform the wavelength check, follow the steps described in the Sensor Menu chapter, Diagnostics section.

Replacing the Source Lamp

The xenon flash lamp provides over one million flashes. When the lamp no longer flashes or instrument repeatability has become unacceptable, it must be replaced.

CAUTION
Replace only with a specified xenon flash lamp assembly, HL#B02-1004-159 for instruments with serial numbers beginning with "2" or B02-1008-337 for instruments with serial numbers beginning with "3".



Before you attempt to change the source lamp, ensure that the UV filter is out. If the UV filter is left in, the filter may be broken during the process of removing and re-inserting the bezel. Check the UV Excluded indicator light. If the indicator light is on, you must restandardize the sensor in a mode with the UV filter out. (The filter can also be manually removed from the path, if necessary, by a trained representative of HunterLab.)



To change the source lamp:

1. Disconnect the UltraScan XE from its power source.
2. Wait two minutes for complete discharge of the capacitors.
3. Disengage and remove the sample clamp.
4. Loosen the two screws from the front cover with a flat-head screwdriver.

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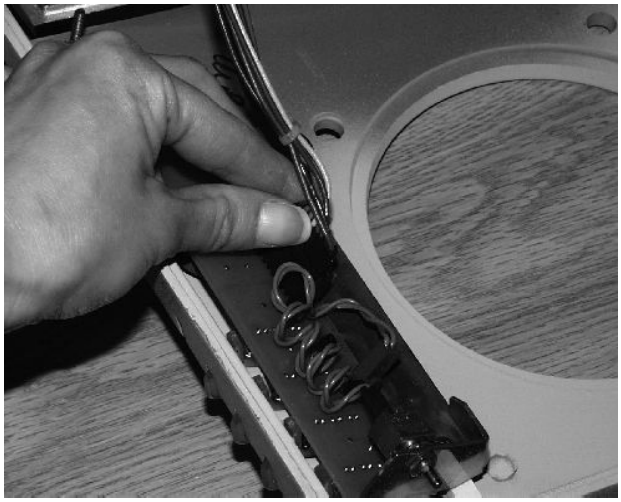
Note: These screws are captive within the instrument cover housing and cannot be removed.

5. Loosen the thumb screw on the inner panel bezel.

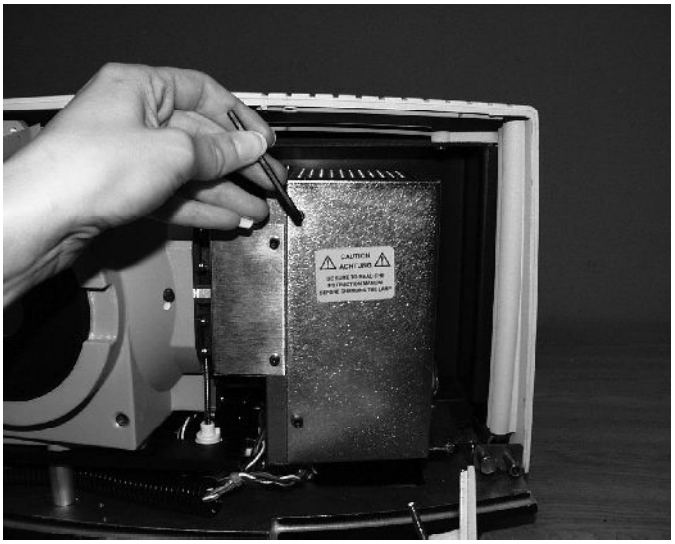


6. Remove the front cover from the instrument and unplug the harness which connects the indicator lights of the front cover to the instrument.

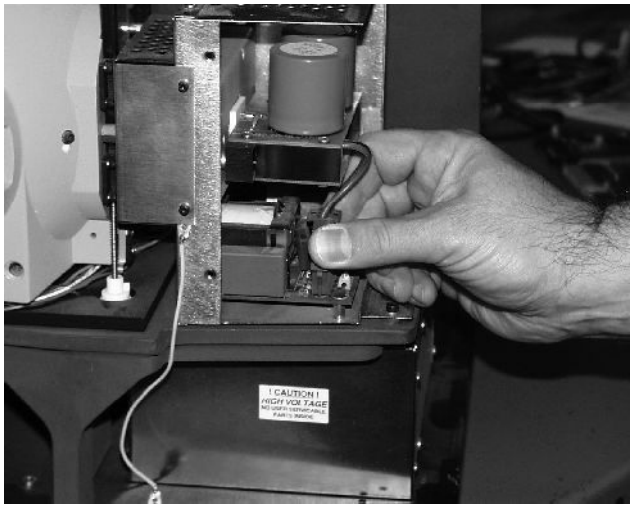
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7. Remove the screws and cover from the lamp housing using an Allen wrench.

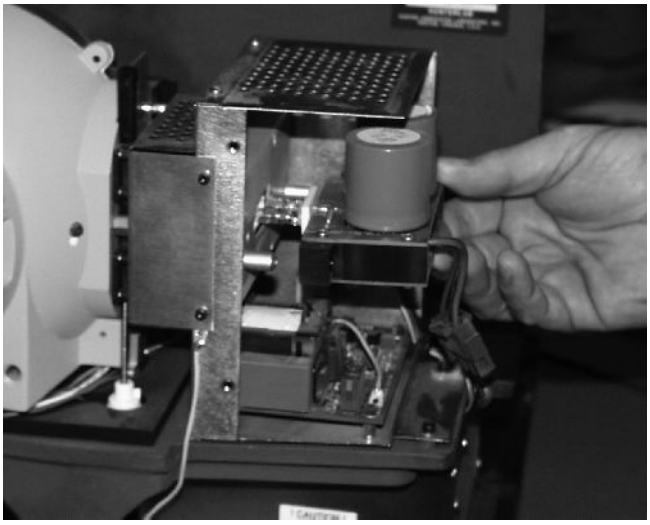


8. Unplug the red connector of the lamp assembly by squeezing the latches on the sides of the connector.



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9. Remove the lamp assembly and replace with a new assembly. Be sure not to touch the bulb of the lamp, as fingerprints reduce lamp efficiency. If a fingerprint is deposited, remove it using a clean wipe and isopropyl alcohol.



10. Plug in the red connector of the new lamp.

11. Replace the cover and screws on the lamp housing.

12. Plug the harness from the instrument into the indicator lights of the front panel.

13. Line the cover up with the guides on the bottom of the instrument.

14. Replace the front cover on the instrument and tighten the two front screws as well as the inner bezel thumb screw.

15. Turn the UltraScan XE power on.

16. Standardize the instrument.

Replacing the Fuses

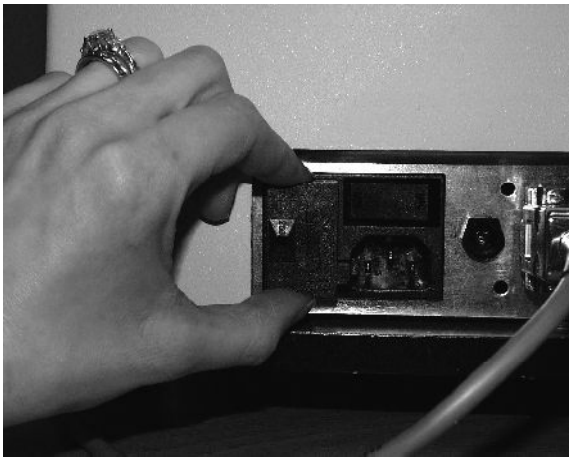
The fuses are located on the back panel of the instrument. Follow the instructions given below to replace the fuses.

CAUTION
Replace only with specified fuses, HL#13-2600-30, or equivalent. More information concerning this fuse can be found in the UltraScan XE Specifications section of this chapter.

1. Disconnect the UltraScan XE from its power source by unplugging the power cord.

2. Remove the fuse cartridge from the back panel of the instrument You may want to use a small, flat screwdriver to help you pry it out.

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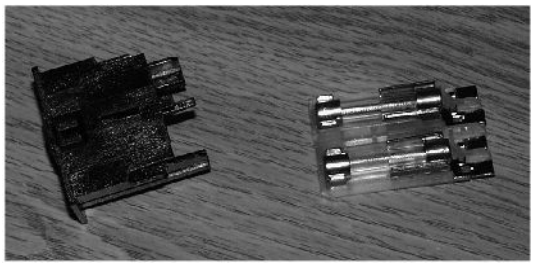


3. Pull back the tab to release the fuse holder.



4. Remove the fuses and replace with new ones.

Notice: Use only the fuse specified above for your instrument or one which is identical in type, voltage rating, and current rating. Otherwise, there may be a risk of fire.



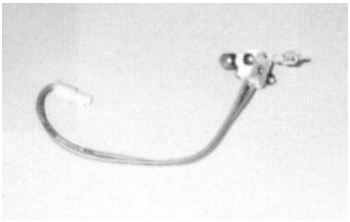
5. Replace the fuse holder in the cartridge.
6. Replace the cartridge in the back panel of the instrument.

Replacing the View Lamp

The view lamp is used to illuminate the sample when using the retroviewer feature.

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Note: Replace it with a specified lamp, HL#A13-1004-022.



To change the view lamp:

1. Disconnect the UltraScan XE from its power source.
2. Wait two minutes for complete discharge of the capacitors.
3. Disengage and remove the sample clamp.
4. Loosen the two screws from the front cover with a flat screwdriver.



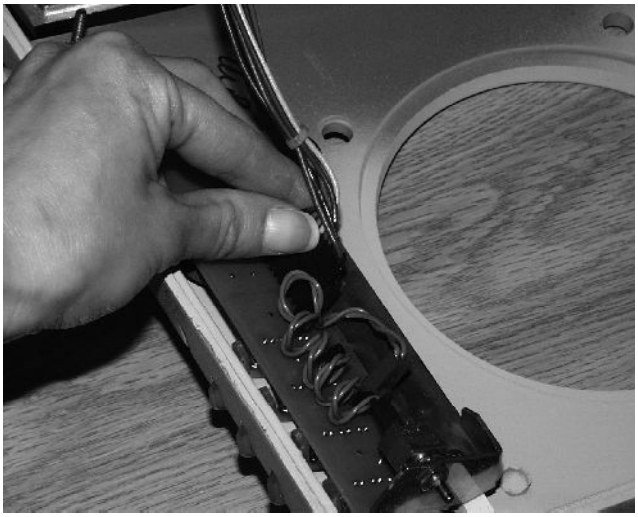
Note: These screws are captive within the instrument cover housing and cannot be removed.

5. Loosen the thumbscrew on the inner panel bezel.

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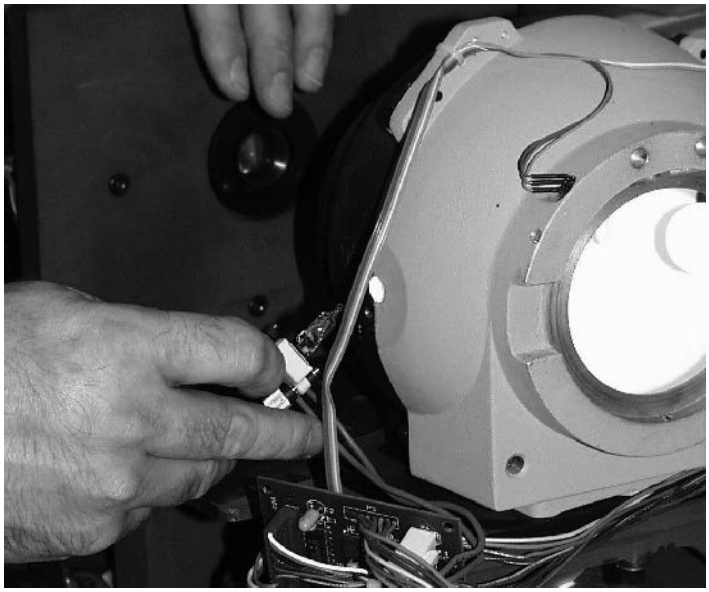


6. Remove the front cover from the instrument by sliding it forward and unplug the harness which connects the indicator lights of the front cover to the instrument.



7. Remove the view lamp assembly and replace it with a new one. Be sure not to touch the bulb of the lamp as fingerprints reduce lamp efficiency. If a fingerprint is deposited, remove it using a clean wipe and isopropyl alcohol.

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8. Plug the harness from the instrument into the indicator lights of the front panel.

9. Line the cover up with the guides on the bottom of the instrument.

10. Replace the front cover on the instrument and tighten the two front screws as well as the inner bezel thumbscrew.

Maintaining the Instrument Standards

It is important that the standards be treated with extreme care. When a standard is used, center it carefully at the reflectance port. Never use a calibrated standard to back samples being measured. The sample clamp or a white uncalibrated tile should be used as a backing.

When not using the standards, keep them in the standards box. Inspect the standards for dust and fingerprints before standardizing the UltraScan XE.

The **white and green tiles** can be cleaned using a soft nylon-bristle brush, warm water, and laboratory-grade detergent such as SPARKLEEN. Wipe the tiles dry using a clean, non-optically-brightened, lint-free paper towel.

> *Note: SPARKLEEN is manufacturer by Fisher Scientific Co., Pittsburgh, PA 15219, and may be ordered from them using catalog number 4-320-4. Add one tablespoon of SPARKLEEN to a gallon of water.*

Keep the **light trap** in the standards box when not in use to prevent it from becoming scratched or collecting dust. Before standardizing the UltraScan XE, check the light trap for scratches and dust. Significant scratches may cause standardization to be in error. If the light trap is scratched, call the HunterLab Order Processing Department or contact your local HunterLab representative to order a replacement. Please read "When You Need Assistance" prior to contacting HunterLab.

The **fluorescent standard** used with the UV control feature must be cleaned as well. This plastic standard can be cleaned with a weak liquid detergent solution and rinsed with distilled water.

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Cleaning the Lens Surface and Didymium Filter

The lens and filter may be cleaned using photographic-quality lens solution and lens paper. Put a few drops of solution on the lens paper and gently wipe the lens or filter in a circular motion for a few seconds. Then wipe the lens or filter with a dry lens paper to remove streaks and any hazy film.

Cleaning the Sphere

Care should be taken to keep foreign materials from entering the sphere. The transmission compartment should be closed and the sample clamp placed against the reflectance port when the instrument is not in use. The sphere is coated with Spectraflect™ which can be damaged by putting any objects into the sphere. If any foreign material (dust, lint, etc.) falls into the sphere, use the following steps to remove the material.

1. Move the sample clamp away from the reflectance port.

2. Open the transmission compartment and place a vacuum cleaner hose at the sphere opening but do not insert the hose directly into the sphere. Cup your hand around the end of the hose to provide a good seal.

3. Quickly cover and uncover the reflectance port with your other hand. This creates gentle air currents to swirl the foreign matter around and out of the sphere.

When shipping the UltraScan XE, remove the sample clamp and tape a pad of foam rubber at the reflectance port. Failure to do so may cause severe damage to the instrument.

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UltraScan XE Specifications

The specifications and characteristics of your instrument are given in this section.

Note: Every attempt at accuracy is made, but specifications are subject to change without notice.

For best performance, your instrument should be placed where there is ample work space with medium or subdued illumination and no drafts. For optimum results, a clean, air-conditioned area is recommended with a relative noncondensing humidity of 20-80% [10-85% for sensor only] and relatively constant temperature not exceeding 90°F (32°C) [100°F (38°C) for sensor only]. For specification performance, the recommended temperature range is 70-82°F (21-28°C).

The instrument should be connected to a stable, instrument-grade power line. If other equipment is connected to the same power line, a transient power surge may be produced when the other equipment is turned on. If this happens, restandardize the instrument before making measurements. HunterLab recommends using a line conditioner with a minimum 600 VA rating and a battery back-up system.

Physical Characteristics

Optical Sensor: approximately 16" (40.6 cm) wide, 19.6" (49.8 cm) deep, 12" (30.4 cm) high, 50 lbs. (22.7 kg) not including the sample clamp.

Computer system: depends upon system selected. Refer to manufacturer's documentation for information.

Communications interface: RS-232C serial DB-9.

Environmental Requirements

Operating Temperature	40°F - 100°F (4°C - 38°C)
Operating Humidity	up to 85% relative, non-condensing

Power Required

Voltage - 90-250 VAC, 50/60 Hz
Single Phase
100 VA maximum
Fuse - 2A, SB (110 V) or 1A, SB (220 V)
Installation Category (Over Voltage) - II

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Power Cord Wire Color Code:

	Color	Definition
220V Cord	Brown	LINE
	Blue	NEUTRAL
	Green/Yellow	SAFETY
110V Cord	Black	LINE
	White	NEUTRAL
	Green	SAFETY

Instrument-Computer Ground Potential Check:

Perform this check if the power cord wiring is being changed, such as for replacement of the cord or if changing the plug.

The instrument serial port ground connection is referenced to the instrument's internal frame and safety ground. Before connecting the communication cable to the instrument serial port, apply power to the instrument and the host computer. Check the ground potential (voltage) between the serial port ground pins on the computer and the instrument. The ground connection is pin 5 on DB-9 connectors and pin 7 on DB-25 connectors. Voltages in excess of 5VAC at 110V input power, or in excess of 10VAC at 220V input power may indicate a difference in ground wiring and can damage the instrument and/or the computer. Check the wiring and take other steps as needed to reduce this difference before connecting the communications cable. You may also use a data optoisolator.

Conditions of Illumination and Viewing

Geometry	Diffuse illumination, 8° viewing using a 6" (152.4 mm) integrating sphere coated with Spectraflect™
Illumination	Xenon lamp with 1,000,000 flashes minimum life UV absorbing filters for 420-nm and 460-nm cutoff
Monochromator	Diffraction grating
Detector	40 element diode array
Interface Mode	Serial RS-232
Area of View	Large area view port size: 1" (25.4 mm) diameter Large area view measured area: 3/4" (19.0 mm) diameter Small area view port size: 3/8" (9.5 mm) diameter Small area view measured area: 1/4" (6 mm) diameter

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Measurement Modes	Reflectance - Specular Included (RSIN) Reflectance - Specular Excluded (RSEX) Total Transmittance (TTRAN) for path lengths up to 80 mm Regular Transmittance (RTRAN) for path lengths up to 80 mm

Instrument Performance

Wavelength Range	360-750 nm
Wavelength Bandpass	Effective 10 nm triangular for 10 nm output
Wavelength Interval	10 nm
Wavelength Accuracy	0.75 nm
Photometric Range	0-200% reflectance or transmittance

Regulatory Notice

A copy of the UltraScan XE's Declaration of Conformity according to ISO/IEC Guide 22 and EN 45014 follows on the next page.

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DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hunter Associates Laboratory, Inc.

Manufacturer's Address: 11491 Sunset Hills Road
Reston, Virginia U.S.A. 20190

Declares that the Product:

Product Name: UltraScan XE

Model: USXE/SAV/UV, USXE/SAV/UV-2

Options Included: UV Exclusion Filter, Motorized (D02-1008-367)
Small Area View, Motorized (D02-1003-778)

Conforms to the following Product Specifications:

Safety: EN 61010-1

EMC: EN55011 / CISPR 11 (1990-09) Class A Group 1
IEC 801-2 (1991-04), 6 KV CD, 8 KV AD
IEC 801-3 (1984), 3 V/m
IEC 801-4 (1988), 1 KV PL, 0.5 KV SL
IEC 801-5 (1991), 2 KV

Supplementary Information:

This product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC, and carries the CE marking accordingly.

(1) This product was tested using an IBM compatible computer.

European Contact: **Your local Hunter Associates Laboratory representative,
or Christian Jansen
Griesbraeustrasse 11
82418 Murnau
Germany
Telephone: +49 (0) 8841 9464
Fax: +49 (0) 8841 99472**

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Color Measurement Notes

The UltraScan XE can be used to measure virtually any kind of product. Opaque and translucent materials can be placed at the reflectance port on the front of the sensor for measurement of reflected color. Transparent samples such as films and liquids can be placed in the transmission compartment for measurement of transmitted color.

When measuring samples it is important to select samples appropriately, use an established measurement method, and handle all samples in a consistent manner. The following guidelines will help you while taking measurements.

Selecting, Preparing, and Presenting Samples

1. Choose samples that are representative of the material used. If samples are non-representative of the batch or are spoiled, damaged, or irregular, then the result may be biased. When choosing a sample, select randomly and examine the sample to avoid biased results. If your sampling procedure is adequate, a different sample selected from the same batch should result in comparable measurement values.

2. Prepare samples in exactly the same manner each time they are measured. Follow standard methods if they exist, such as ASTM or TAPPI methods.

3. Present the samples to the instrument in a standard, repeatable manner. Results obtained depend on the condition of the samples and their presentation. If you establish a method so that the same procedure is used each time specific samples or types of samples are measured, then you will have a valid basis for comparison of measured results. This also ensures repeatability of results when measuring the same sample. Make a checklist so that operators may simply check each step. The checklist will also help in the training of new operators.

More on Sample Presentation to the Instrument

There are a variety of techniques that can be used in handling various forms of objects and materials so that the most valid and repeatable measurement of their appearance results. For example, when measuring the color of a sample, such as fabric, that is translucent, the sample should be folded into multiple layers to make it appear more opaque. Other materials, such as liquids or semi-solids, might be read through the glass of a sample cell which presents a flat surface to the instrument.

Examples of ways to measure several types of samples are given below.

Directional Samples

Directionality can be minimized by averaging several measurements with rotation of the sample between readings. Examination of the standard deviation displayed with the averaging function can guide you in selecting the appropriate number of readings to average.

Non-opaque Samples

Non-opaque samples must have a consistent backing. A white uncalibrated tile or sample clamp is recommended. If the sample is such that it can be folded to give multiple layers, like tissue or lace, the number of layers used for each measurement should be noted.

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Transparent Samples

When measuring transparent samples (such as iced tea) where the color is dependent on the transmission of light, place the liquid in a special optical cell with flat parallel surfaces. The path length of the sample presented should be chosen to maximize the color or haze difference.

Fluorescing Samples

For some applications, the elimination of fluorescence from a measurement is important. Fluorescence is caused by ultraviolet (UV) excitation of the sample, where a material absorbs nonvisible wavelengths of energy and re-emits the energy as light in the visible spectrum. Since UV light is part of the normal sample illumination, measurements may include UV excitation. To eliminate fluorescence from the measurement, place the UV filter over the sample port or employ the UV control feature.

Reflectance Measurements

There are two types of reflectance measurements available. The first type, reflectance - specular included (RSIN), measures the diffuse plus specular reflectance of the sample at the port. These measurements are made with the specular exclusion port door closed. The specular included mode is recommended for interlaboratory measurement comparisons.

The other type, reflectance - specular excluded (RSEX), measures the sample excluding a substantial part of the specular component reflected by the sample. These measurements are made with the specular exclusion port door open.

The UltraScan XE measuring a textile sample in reflectance mode.



Transmittance Measurements

There are two types of transmittance measurements available. The first, total transmittance (TTRAN), includes both the light that is transmitted directly through the sample and the light that is diffusely scattered. When measuring total transmittance, place the sample in the transmission compartment as close to the **sphere** as possible.

The second type, regular transmittance (RTRAN), measures the light that passes directly through the sample. When measuring regular transmittance, place the sample in the transmission compartment as close to the **lens** as possible.

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