

UltraScan® PRO

Supplemental Manual for EasyMatch® QC



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Caution: If the equipment is used in a manner not specified by HunterLab, the overall safety may be impaired. This instrument is for indoor use only and not suitable for a wet location.



Caution: There is a potential of a UV Light hazard in using this instrument. Please avoid looking directly at the light.

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UltraScan PRO Features

The UltraScan PRO is a dual beam xenon flash spectrophotometer with a wavelength range from 350 to 1050 nanometers (nm). All tristimulus integrations are based on a triangular bandpass having a full width half max of five nm and are calculated per Paragraph 7.3.1 of ASTM Standard E308. The wavelength interval is five nm.

The sensor uses an integrating sphere that is six inches in diameter and coated with Spectrafect™ to diffuse the light from the three installed xenon flash lamps. One of the lamps provides light in the UV region only, one provides IR light only, and the third provides light across the spectral range. The instrument can measure both reflected and transmitted color of products.



Figure 1. The UltraScan PRO

Note: Dropping the instrument or using it in a manner not specified by the manufacturer may impair the protection afforded by the equipment. Danger of electric shock if liquids are spilled and fire if volatile liquids are spilled. Use care when measuring liquid samples.

The UltraScan PRO possesses the following default features:

- Reflectance port
- Sample Clamp
- Transmittance compartment
- Specular-Included/Excluded Port

Reflectance Port

The reflectance port is located at the front of the sensor. The port is covered by a spring-loaded sample clamp which is used to hold the specimen in place during measurement. Two guidance holes are present to aid in placement of the white tile and light trap at the reflectance port. When the small area of view lens is in use, the small area or large area port plate is installed at the reflectance port.



The reflectance port with the large area view port plate installed.

Figure 2. Reflectance Port

Sample Clamp

The UltraScan PRO includes a spring-loaded sample clamp that can be used to hold samples flat and securely at the reflectance port. The clamp has two buttons, one which raises and lowers the arm, and one that moves the clamp toward and away from the reflectance port. The white line at the bottom of the clamp marks the appropriate clamp position for standardization; in this position both the light trap and white tile may be placed at the reflectance port by simply pulling back the spring-loaded head of the clamp.

A magnetic white ceramic disk on the face of the clamp provides a consistent white background for measurements. A non-slip, magnetic black pad is also included that can be used to replace the white disk for applications that require a non-slip or dark backing. To change to the pad, simply pop out the white disk and insert the non-slip pad.



Figure 3. Port Clamp

Transmittance Compartment



Figure 4. Transmittance Compartment

The transmittance compartment located in the middle of the sensor is used for measuring the transmitted color of transparent solids and liquids. The transmittance compartment door should be closed while standardizing and taking measurements¹.

Specular Included/Excluded Port

The UltraScan PRO sphere contains a specular exclusion port door which is closed during specular included and transmittance measurements and opened during specular excluded measurements. The position of the door is controlled through the software. See the **ULTRASCAN PRO STANDARDIZATION** section for more information on the various measurement modes.

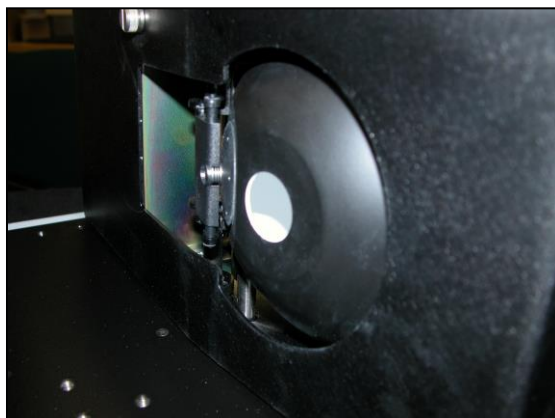


Figure 5. Specular Exclusion Port Closed

¹ Closing the transmission compartment door while making both reflectance and transmittance measurements is the best practice for this instrument. For more information, see the note in the UltraScan PRO Standardization section.



Figure 6. Specular Exclusion Port Open

The UltraScan PRO features automated specular included/excluded port control and sensing. This feature allows you to set the port to the desired position from EasyMatch QC. The software reports the position, thereby allowing errorless measurements.

Indicator Lights

The UltraScan PRO's indicator lights let you know what mode of standardization is currently in use. The top light indicates that power is on. The second light indicates that the specular exclusion port is open. The third light indicates that small or medium area view is in use, and the bottom light indicates that the Ganz-Griesser UV filter calibration is in use.

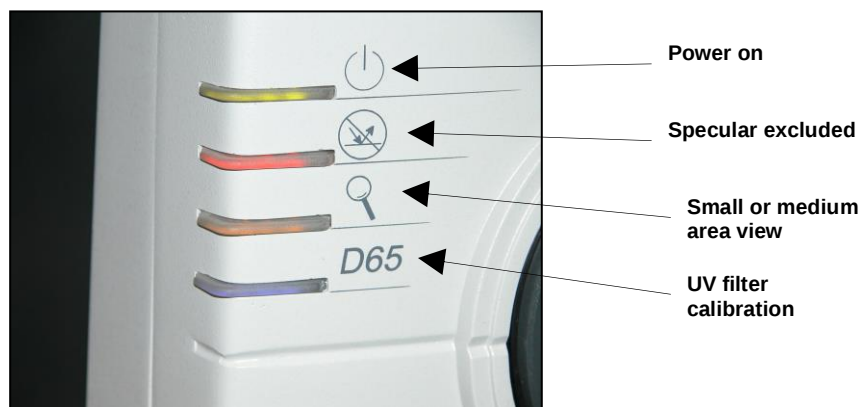


Figure 7. Indicator Lights

Automated UV Control

The UltraScan PRO performs a Ganz-Griesser calibration, which uses a 400-nm UV filter to achieve and maintain the proper ratio of the energy in the UV region of the electromagnetic spectrum to that in the visible region of the spectrum. This improves the agreement of the illumination between different instruments and keeps illumination constant as the instrument's lamp ages. This calibration should be used when measuring colors that fluoresce due to illumination by light in the UV range of the electromagnetic spectrum (such as optically-brightened whites).

For the Ganz-Griesser calibration, a stable, fluorescent white transfer standard marked with an assigned Ganz whiteness (normally assigned in reflectance-specular excluded mode) is used to set the correct illumination conditions. The assigned value is traceable to a four-step cotton white scale

calibrated by the Hohenstein Institute in Germany. Instructions for using UV control are described in the Standardization section.

Medium Area View and Small Area View

The medium area view (MAV)/small area view (SAV) feature includes MAV and SAV lenses, port plates, and a retroviewer (lamp in the sphere that allows viewing of the sample in a flip-up mirror for determining the proper placement of samples). To use the MAV/SAV feature:

1. Remove the original port plate from the reflectance port and replace it with the MAV or SAV port plate, as desired.
2. Standardize the instrument. Be sure to select 0.390 inch (9.906 mm) [MAV] or 0.190 inch (4.826 mm) [SAV] as the area view in the Setup Mode window in EasyMatch QC. The lens will automatically adjust.
3. Place the sample at the reflectance port.
4. Press the retroviewer switch on the top left of the sensor (about halfway back). The sample is illuminated, and an image appears on the screen on the top of the sensor. If necessary, adjust the door above the screen to see a mirror image of the screen display.
5. Be sure that the sample completely covers the reflectance port. Adjust the position of the sample if necessary.
6. Read the sample.

The **RETROVIEWER** lamp has two modes of operation. Select the desired mode of operation using the retroviewer button as follows:

1. **Lamp Stay on Mode:** Press and hold the retroviewer button until a beep is heard. To turn the lamp off, press and immediately release the retroviewer button three times in a row.
2. **Lamp Turn Off Mode:** Press and immediately release the retroviewer button. The lamp will automatically turn itself off when you take a reading.

Note: To prevent heat build-up, the lamp will turn off automatically after four minutes of inactivity, regardless of the selected mode.

Macro Button

The macro button, also known as the 'Sensor button', activates a sample measurement.

UltraScan PRO Accessories

The following accessories are provided with the UltraScan PRO system and can be found in the standards case:

- White calibrated tile - an everwhite tile placed at the reflectance port (with pegs in the guidance holes) during standardization. This tile is traceable to the National Institutes of Standards and Technology (NIST).
- Light trap - placed at the reflectance port (with pegs in the guidance holes) during standardization in reflectance modes.
- Black card device - placed in the transmittance compartment during standardization in a transmittance mode.
- Fluorescent standard - used to calibrate the position of the UV filter.
- Green tile - placed at the reflectance port (with pegs in the guidance holes) to check instrument performance.
- Didymium filter - screwed into the lens as a check for wavelength accuracy.
- Tile data sheet - Gives calibration information for the standard tiles.
- Non-slip pad for sample clamp - can be placed into the sample clamp as a replacement for the white disk for applications that require a non-slip or dark backing.
- Standards care card - gives instructions on how to clean the standards.
- Fuses - two fuses are provided as spares.
- Allen wrench - one 1/8" wrench is provided.
- RS-232 communications cable.
- USB to serial adapter cable.
- Power cord.
- Certificate of traceability for the standard tile.

UltraScan PRO Installation

The UltraScan PRO is simple to set up and attach to your computer. The following instructions guide you through the initial installation of your UltraScan PRO 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 PRO on a flat working surface where the measurements will be made. Place the computer near 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.
5. Connect the female end of the 9-pin communications cable to the appropriate computer port. Connect the male end of the 9-pin cable to the sensor. To use USB communications, connect the USB cable from the computer to a USB to serial adapter and then the serial cable to the instrument.

Note: The UltraScan PRO 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. Do not block the vents in the top cover of the UltraScan PRO or the instrument may overheat.

Note: Refer to the UltraScan PRO Specifications section for recommendations concerning the powerline and its conditioning.

CAUTION: Use only the power cord included with this instrument or a replacement obtained from HunterLab (HL#A13-1002-655 for 110V, A13-1002-656 for 220V). Be certain that the power cord is in good condition before connecting it. The UltraScan PRO 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 PRO Specifications section.

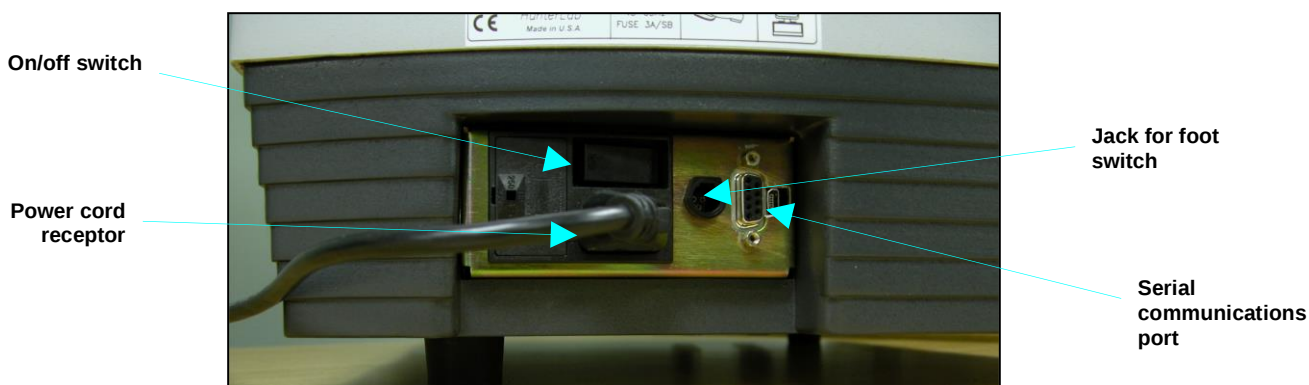


Figure 8. Connectors and Power

Install EasyMatch QC Software

Complete the following steps:

1. Log into the system using an account that has **ADMINISTRATOR** privileges for the PC — network or local.
2. Insert the installation CD into the CD-ROM drive. If the system is setup to automatically run CD programs, the menu will appear and you may skip to Step 5. Otherwise, continue with Step 3.
3. Select the Easy Match QC Icon or from Windows, go to **START > RUN > EZMQC_MENU** and **OPEN**. The following screen will be shown.

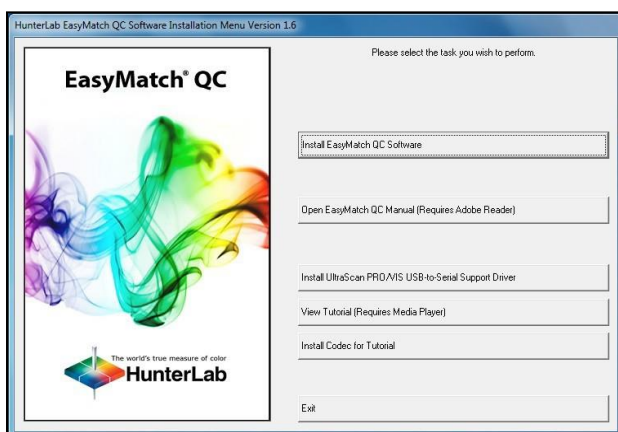


Figure 9. EasyMatch Installation

4. Select **INSTALL EASYMATCH QC SOFTWARE** and follow the screen prompts.
5. Select **SOFTKEY LICENSE** as the type of key to use with the software.

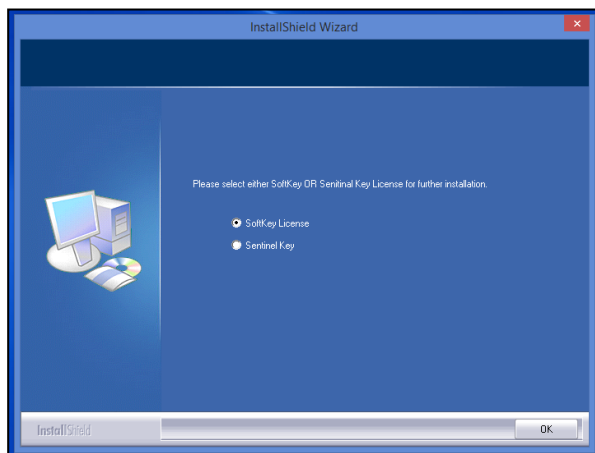


Figure 10. Software Key License

6. When the EasyMatch QC installation is finished, select the **OPTION BUTTON** next to **Yes, I want to restart my computer now** and then **FINISH** to restart the computer and log back in.

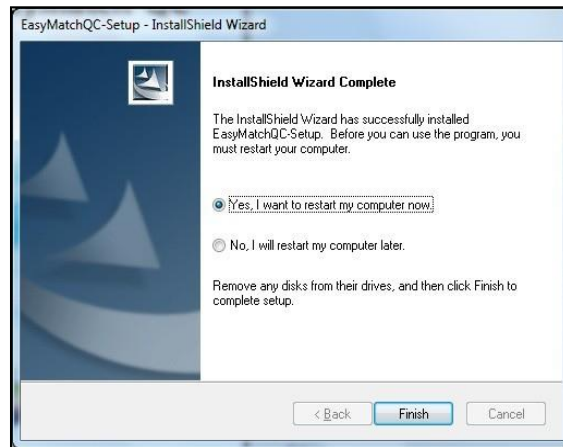


Figure 11. Completed Install

7. The CD can now be removed.

Activate the SoftKey License

1. From the Desktop, select the EasyMatch QC Icon or from the Windows Start menu, choose the following to open the software:

START > PROGRAMS > HUNTERLAB > EASYMATCH QC

2. A warning message to activate the license will be displayed as shown in the Figure below.

Note: EasyMatch QC functions are unavailable before key activation.

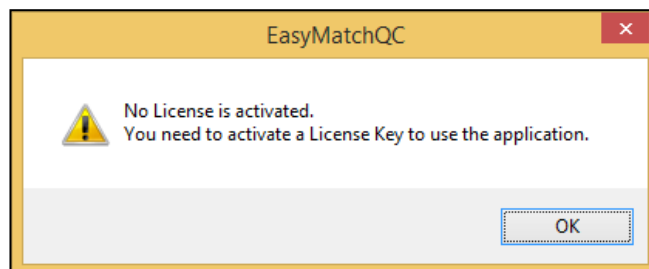


Figure 12. No License Warning

3. The SoftKey License is uniquely associated with the sensor serial number and is provided on a thumb drive supplied with EasyMatch QC or via email from HunterLab.
4. Go to ***HELP> LICENSE REGISTRATION > ACTIVATION.***
5. Select ***ACTIVATE LICENSE.***

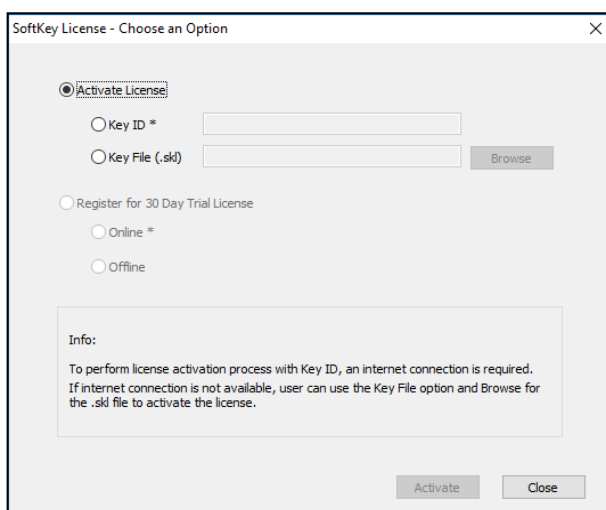


Figure 13. Activate License

i. Option #1: Key ID.

This method is for copying the ID from an email or writing down the 32-digit code. This requires an internet connection.

- a. From the **CHOOSE AN OPTION** page (Figure 13), select **KEY ID**.
- b. Paste-in or type-in the License Key ID and click **ACTIVATE**.
- c. An acknowledgement will be displayed showing the activation status.

ii. Option #2: Key File (.skl)

This method is for using the SoftKey License (.skl file) on the thumb drive.

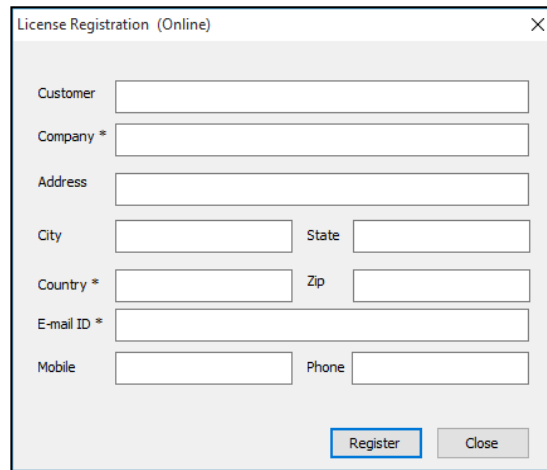
- a. Place the thumb drive with the SoftKey License in the USB port.
- b. From the **CHOOSE AN OPTION** page (Figure 13), select **KEY FILE (.skl)**.
- c. Browse the USB to find the SoftKey License (.skl) file, then click **ACTIVATE**.
- d. An acknowledgement will be displayed showing the activation status.

iii. Option #3: Sentinel Key

- a. If the user has a HunterLab USB hardware key, then it can be used with a new sensor on the same computer. Return to **INSTALL THE SOFTWARE**, Step 5 (Figure 10) and select **SENTINEL KEY** to continue.

iv. Option #4: 30-day trial

- a. Fill out the registration form provided for the 30-day trial. Connect to the internet. HunterLab will approve the trial and email the SoftKey license back. Follow the directions for Option #1 or #2 to complete.



License Registration (Online) dialog box with the following fields:

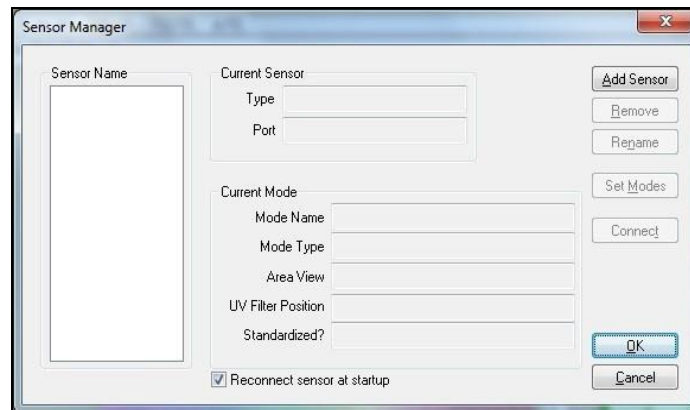
- Customer
- Company *
- Address
- City
- State
- Country *
- Zip
- E-mail ID *
- Mobile
- Phone

Buttons: Register, Close

Figure 14. Request 30-day Trial

Add the Sensor

1. Upon initial startup, the following message will be displayed: **SENSOR NOT YET INSTALLED. PLEASE INSTALL A SENSOR TO TAKE MEASUREMENTS.** This message will remain until you proceed to the Install/ Configure command in the Sensor menu and install a new sensor.
2. The Sensor Manager appears first:



Sensor Manager dialog box with the following sections:

- Sensor Name:** A large text area for entering the sensor name.
- Current Sensor:**
 - Type
 - Port
- Current Mode:**
 - Mode Name
 - Mode Type
 - Area View
 - UV Filter Position
 - Standardized?
- ☒ Reconnect sensor at startup

Buttons: Add Sensor, Remove, Rename, Set Modes, Connect, OK, Cancel

Figure 15. Sensor Manager

3. Select **ADD SENSOR** to install a new sensor. The Setup Sensor screen allows selection of the instrument model and the communications port. Select **NEXT** when ready.

Note: If using a typical 9-pin serial cable for communications between the sensor and PC, select COM1. If using USB-to-serial adapter, then select the highest number COM Port No. offered.

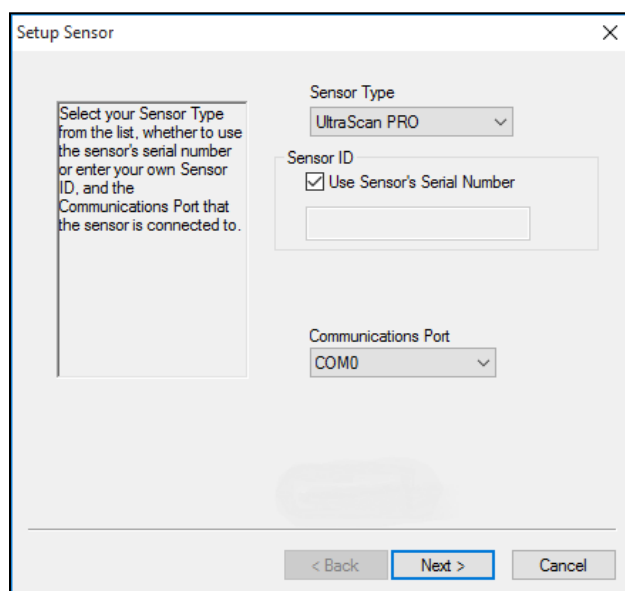


Figure 16. Setup Sensor

4. Remove the tape covering the reflectance port and the exterior of the sphere in the transmittance compartment.
5. Place the desired port plate at the reflectance port and snap it into place.
6. Locate the reflectance port sample clamp 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.
7. Turn on the UltraScan PRO 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.

UltraScan PRO Functions

The UltraScan PRO must be standardized on a regular basis to keep it operating properly. Standardization sets the top and bottom of the photometric scale. During standardization, the bottom of scale is set first. For this, you simulate the case where all the light is absorbed by the sample. For UltraScan PRO, the bottom of scale is set with the light trap for reflectance. The light blocker (a.k.a. black card) is used to set the bottom of scale for transmittance measurements.

Top of 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. For top of scale in transmittance, 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 transmittance 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.

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 any environmental changes, such as temperature.

Sensor > Standardization

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

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

With varying hardware configurations such as UV filter in/out and the different areas of view, there are many ways to standardize the UltraScan PRO. The instrument can be standardized at any time by selecting **SENSOR > STANDARDIZE** or by clicking the **STANDARDIZE** button on the default toolbar. You are first prompted to indicate the instrument configuration.

Place the cell in the transmittance compartment as **close to the sphere** as possible for measuring total transmittance. Place it as close to the **lens** as possible when measuring regular transmittance.

Sensor > Configure Multi Mode

This command is used to set up the process by which the instrument can standardize and read in two separate but similar modes when the standardization and read commands, respectively, are given.

The following screen first appears that allows you to indicate how you would like the multimode readings to be performed.

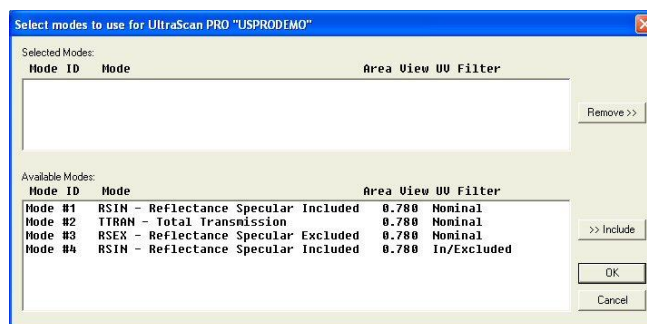


Figure 17. Configure Multi-Mode

When this screen first opens, the standardization modes you have configured for your instrument (using **SENSOR > SET MODES**) are listed in the **AVAILABLE MODES** box. Click on the first mode you wish to use and then click the **INCLUDE** button to move the mode from the Available Modes box to the Selected Modes box. Only modes that are similar enough to the already-selected mode that no user intervention is required for the dual measurements will remain available. Select the second desired mode and click **INCLUDE** again to include it. Click **OK**. Then, when the **OPTIONS > READ METHOD** menu is set as **MULTIPLE READ MODE**, the instrument will be standardized in the two modes when you initiate standardization and will read in the two modes when you initiate readings. The multiple readings are placed in the job as separate measurements.

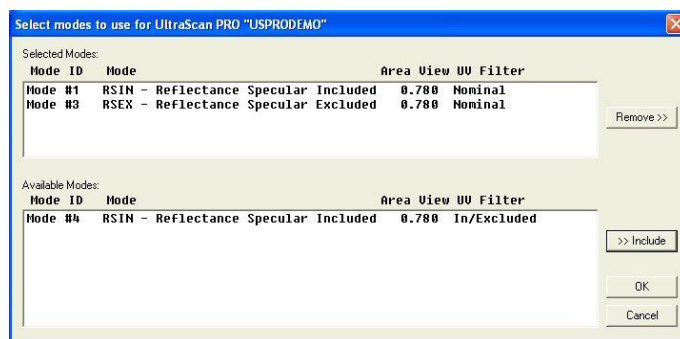


Figure 18. Select Modes

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



Figure 19. Setting Top of Scale TTRAN

Note: Closing the transmittance 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 transmittance 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.

Sensor > Setup Mode (UV Filter)

Each UltraScan PRO is factory fitted with a UV filter to exclude UV content in a measurement. The procedure is to standardize in 2 modes – one with the UV Filter Out-Of-View and one with the UV Filter In-View for comparison. In this way, a numerical value for the ultraviolet contribution can be documented.

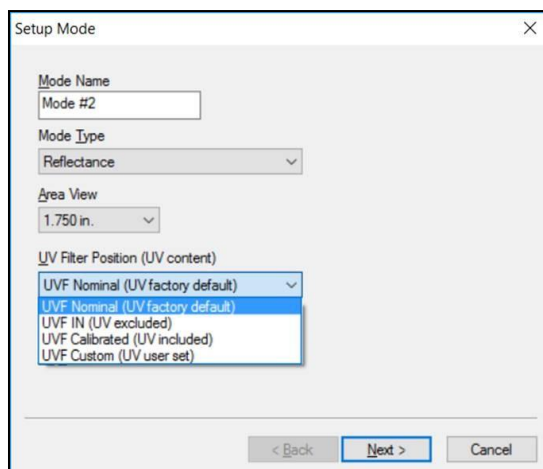


Figure 20. UV Calibration Mode Settings

- **UV Filter Nominal** position is set at factory and never changed. All Diagnostic test programs are run with the UV Filter in the Nominal position to establish a consistent optical path for the test across a model line. Some instrument models have motorized UV Control as an option. If the instrument does not have the option, the UV Filter will be fixed at the Nominal

position. The instruments with motorized UV Control move the UV Filter insertion to that position.

- **UV Filter IN** creates a UV-excluded measurement for UV optically-brightened agents. The UV Filter is inserted 100% to exclude UV. This option allows the user to negate the effect of optically-brightened agents or when used in multimode with UV Filter Nominal or UV Filter Calibrated, determines the amount of optical brightening agents present.
- **UV Filter Calibrated** creates a UV-included measurement for UV optically-brightened agents). This UV calibration procedure optimizes the UV content to match D65 Daylight over time using a Fluorescent Standard with an assigned WI Ganz value. Once calibrated to the Fluorescent standard (available as an option) with the UV filter inserted into the light path such that the measured WI Ganz value matches assigned WI Ganz value for the Fluorescent standard. This UV CAL filter position is fixed and user-set until the next UV Calibration.
- **UV Filter Custom** can create one of more UV Filter states where the UV Filter insertion point is custom set by the User.

UV filter calibration should be performed weekly and after lamp replacement. Once **SENSOR > UV FILTER CALIBRATION** is chosen, the following screen appears.

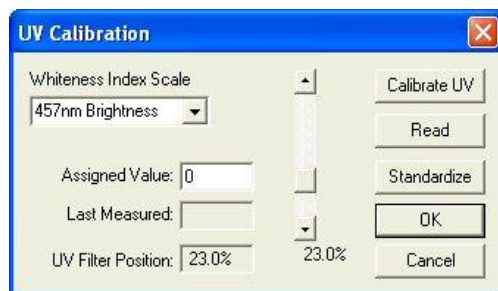


Figure 21. UV Calibration

Enter the standard's **ASSIGNED VALUE** into the appropriate box on the UV Calibration screen. This value has been assigned at the factory if you are using the HunterLab-supplied fluorescent standard. Also choose whether the value is for **BRIGHTNESS 457**, **WHITENESS INDEX CIE** (and the illuminant/observer combination), **WHITENESS INDEX GANZ**, or **Z%**. The scale used in the example will be WI Ganz for a HunterLab standard.

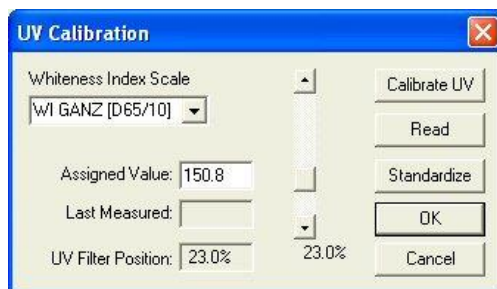


Figure 22. UV Calibration with WI Ganz

Select **CALIBRATE UV** to automatically adjust the UV filter to the appropriate position after several readings of the fluorescent standard. First you are prompted to place the fluorescent standard at the port.

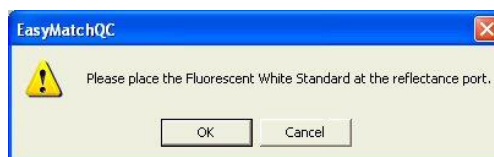


Figure 23. Prompt for Fluorescent Standard

Place the fluorescent standard at the instrument port, centering spot 3 at the reflectance port. Use the dotted guides on the labeled side of the standard to properly center the standard under the sample clamp. Select **READ** to read the fluorescent standard with the UV filter in the position indicated at the bottom of the screen. If desired, the slider bar may be used to change the filter position between manual readings.

Click **STANDARDIZE** to initiate standardization. You will be returned to the UV Calibration screen after standardization is complete.

Note: Before calibrating the UV filter, standardize the instrument in the mode referenced on the label of the fluorescent standard. If the label does not specify a standardization mode, standardize in RSEX.

Measure both spot 3 and spot 4 of the fluorescent standard every six months. Compare the results. If spot 3 has faded beyond tolerable limits for your application, use spot 4 for UV filter calibration from this point on and order a new fluorescent standard (HL#A02-1011-126 [calibrated]).

Note: If you choose to employ the calibrated filter position, this position should be employed for all routine measurements using this instrument. If you calibrated the UV filter with an open port and then you wish to use a cover glass, you must recalibrate the UV filter with the cover glass in place.

Haze Measurements

A transmission haze measurement is a ratio of the diffuse light to the total light transmitted by a specimen. Useful measurements of haze can be made on the HunterLab instruments listed below, although the results do not conform exactly to ASTM method D1003 because of differences in instrument geometry. Haze is calculated as follows:

$$\text{Haze} = \frac{Y_{\text{Diffuse Transmission}}}{Y_{\text{Total Transmission}}} \times 100 .$$

Haze measurements can be made only in a transmission mode on a benchtop sphere instrument (UltraScan PRO, UltraScan VIS, or Vista).

To measure and display haze values, follow the steps outlined below:

1. Select **OPTIONS > READ METHOD**.
2. Select **HAZE** from the dialog box that appears. The screen changes to allow additional options.

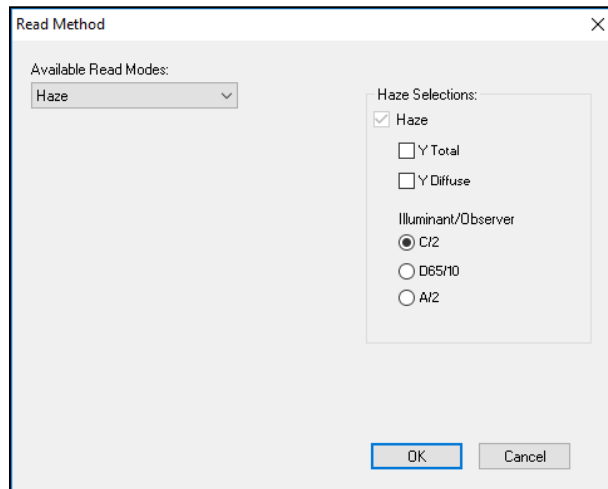


Figure 24. Read method: Haze

3. Haze is automatically selected for display in your Color Data Table. **CHECK THE BOXES** next to **Y TOTAL** and/or **Y DIFFUSE** to also show these components of the haze calculation. Click the radio button next to the **ILLUMINANT/OBSERVER** combination you wish to use. Then click **OK**.
4. **STANDARDIZE** the instrument in **TTRAN** mode. There are three parts to standardization for haze measurements:
 - a) Place white tile at reflectance port and **READ THE BLACK CARD** in front of the lens.
 - b) Remove the black card and leave the **WHITE TILE** at the reflectance port.
 - c) Remove the white tile and replace with the **LIGHT TRAP**.

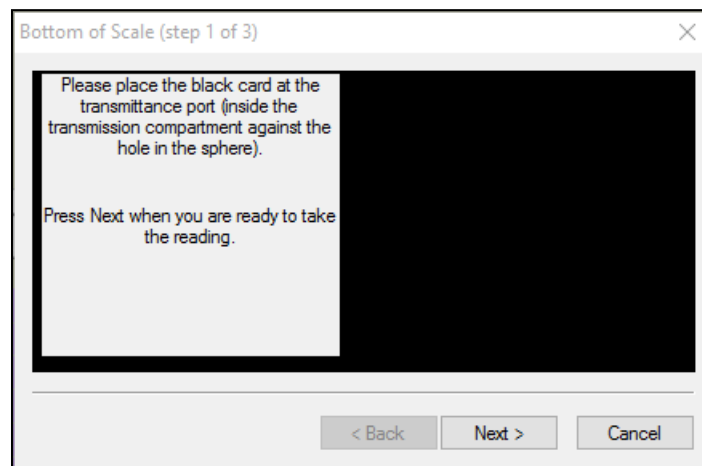


Figure 25. Haze Standardization: Black Card

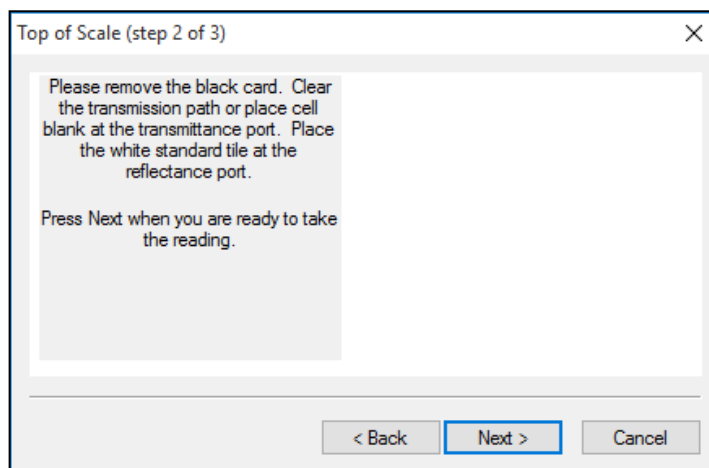


Figure 26. Haze Standardization: White Tile

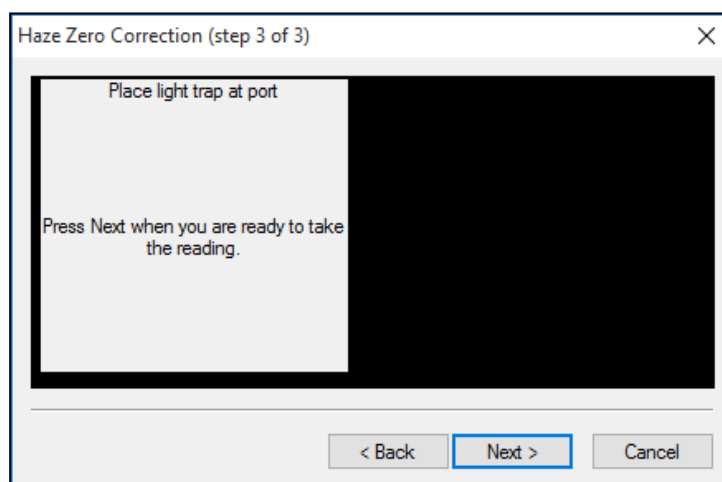


Figure 27. Haze Standardization: Light Trap

5. Read the standard or sample by choosing **MEASUREMENTS > READ STANDARD** or **MEASUREMENTS > READ SAMPLE**, clicking the **READ STANDARD** or **READ SAMPLE** button on the toolbar, or pressing **F2** or **F3**. The following prompt appears.
6. Place your sample against the transmission port (the hole in the sphere inside the transmission compartment) and place the white calibration tile at the reflectance port. Click **READ**. The instrument reads and then the following prompt appears.

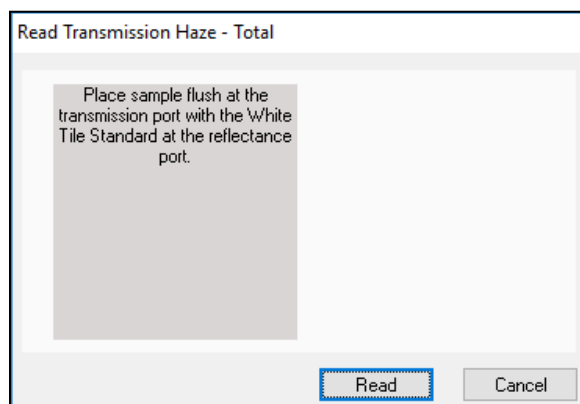


Figure 28. Read Sample with White Tile

7. Leave your sample at the transmission port and replace the white calibration tile with the light trap. Click **READ**.

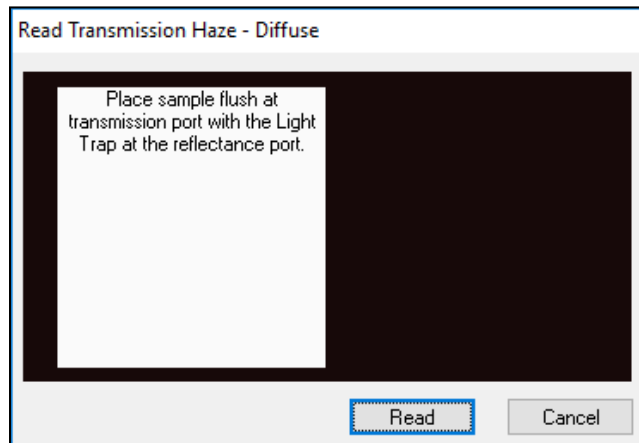


Figure 29. Read Sample with Light Trap

8. When the instrument takes the reading, you may be prompted to **ENTER AN ID** for the measurement as usual. After you do so, Haze and the other parameters you chose to display will be shown in your Color Data Table.

ID	L*	a*	b*	Haze % C/2	Y Total C/2	Y Diffuse C/2
Haze sample	94.96	0.00	2.88	10.78	87.73	9.46

Figure 30. Haze Readings Reported

UltraScan PRO Maintenance and Testing

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

Note: 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 PRO 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 > 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 as described in the **SENSOR MENU > DIAGNOSTICS** section once a week. You can then examine all green tile readings periodically and see any trends that develop over time.

The UltraScan PRO 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 test will configure these job settings.



Figure 31. 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.

Running the Didymium Filter Test

The didymium filter can be used to check the wavelength accuracy of the UltraScan PRO. 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 ***DIAGNOSTICS > SENSOR MENU*** in the EasyMatch QC Manual.

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#D02-1012-222.

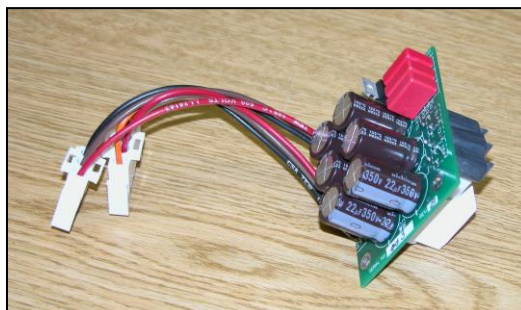


Figure 32. Source Lamp Assembly

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 current standardization mode. If the mode indicates that the filter is in a position other than ***Nominal***, you must re-standardize the sensor in a mode with the UV filter nominal. (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 PRO 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 on the front cover with a flat-head screwdriver.



Figure 33. Front Screws

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

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

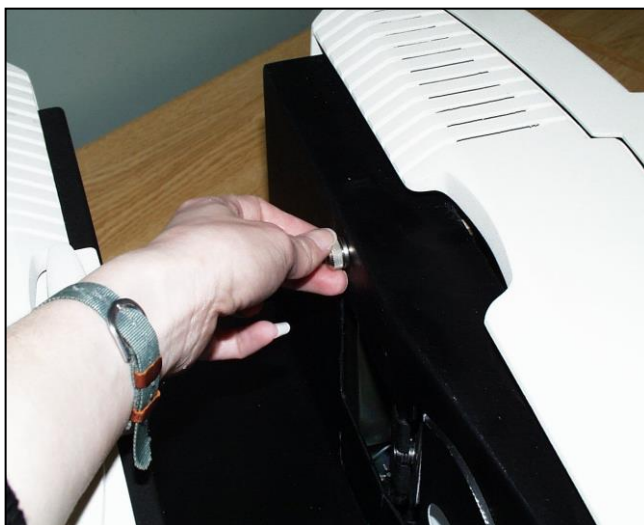


Figure 34. Inside Screws

6. Remove the front cover from the instrument and unplug the harnesses which connect the indicator lights and the macro button to the front cover.

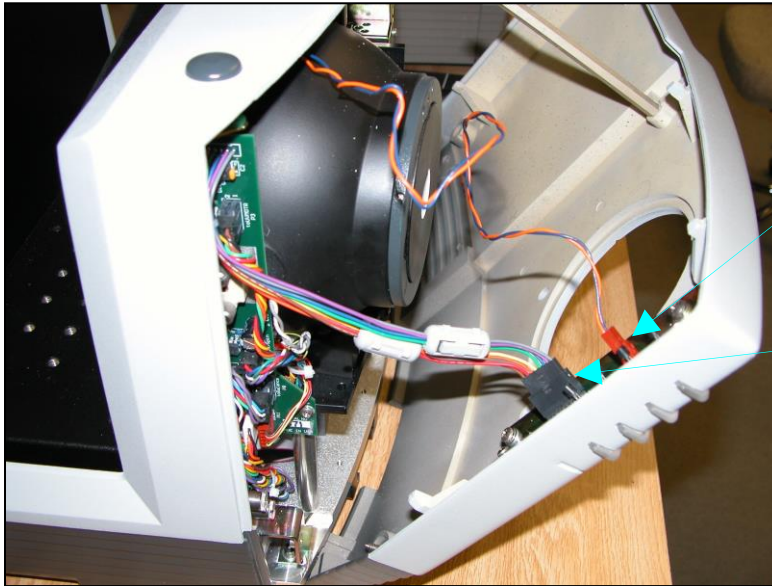


Figure 35. Remove Front Cover

7. Remove the two screws and cover from the lamp housing using a Phillips-head screwdriver.

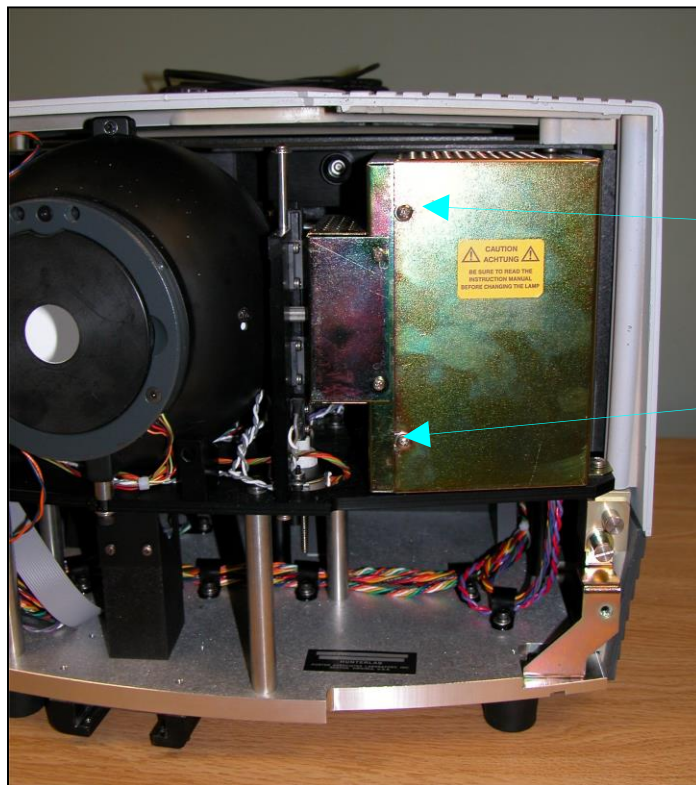


Figure 36. Lamp Cover Screws



Figure 37. Remove Lamp Housing

8. Unplug the two white connectors of the lamp assembly by squeezing the latches on the sides of the connectors.

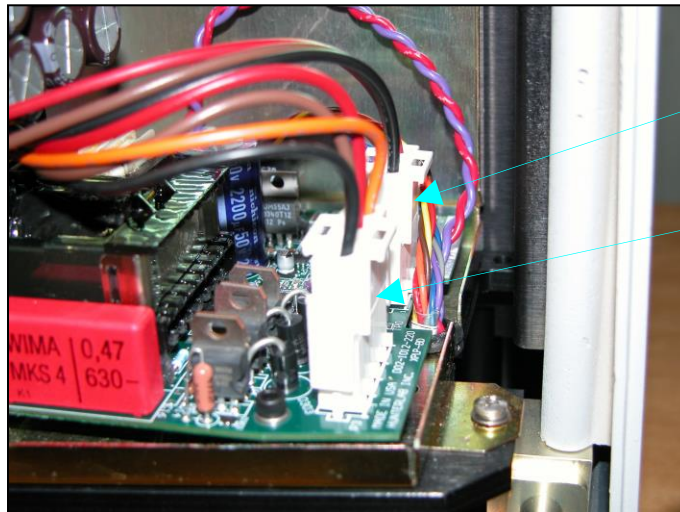


Figure 38. Unplug White Connectors

9. Release the three captive screws on the vertical board next to the sphere.

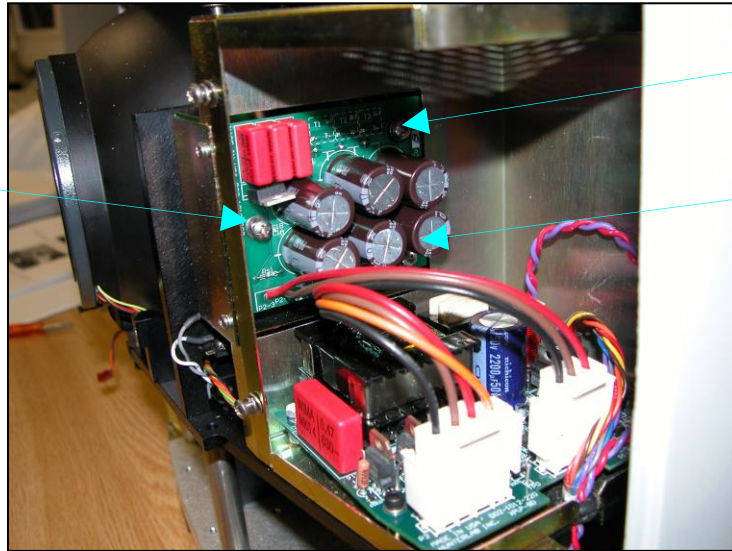


Figure 39. Three Captive Screws

10. Remove the lamp assembly (the board you just unscrewed) and replace with a new assembly. Secure the three screws.
11. Plug in the white connectors of the new lamp.
12. Replace the cover and screws on the lamp housing.
13. Plug the harnesses back into the front panel.
14. Line the cover up with the guides on the bottom of the instrument.
15. Replace the front cover on the instrument and tighten the two front screws as well as the inner bezel thumb screw.
16. Turn the UltraScan PRO power on.
17. 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 PRO Specifications section.

1. Disconnect the UltraScan PRO 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.



Figure 40. Fuse Cartridge

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



Figure 41. Fuse Holder

4. Remove the fuses and replace with new ones.

Note: 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.

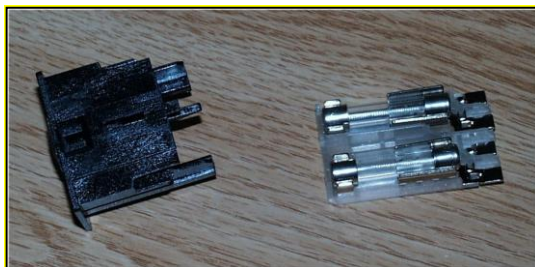


Figure 42. Fuse Holder

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. To replace the lamp, obtain part number HL#A13-1004-022.



Figure 43. Retroviewer Lamp Part

To change the view lamp:

1. Disconnect the UltraScan PRO 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 on the front cover with a flat-head screwdriver.



Figure 44. Front Cover Screws

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

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

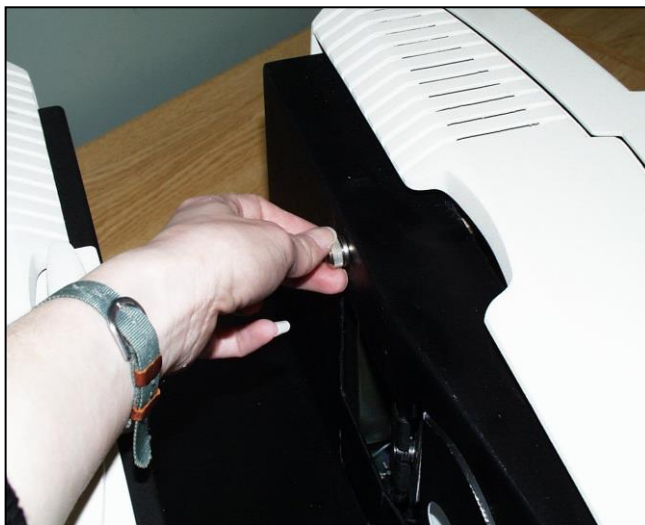


Figure 45. Inside Thumb Screw

6. Remove the front cover from the instrument and unplug the harnesses which connect the indicator lights and the macro button to the front cover.

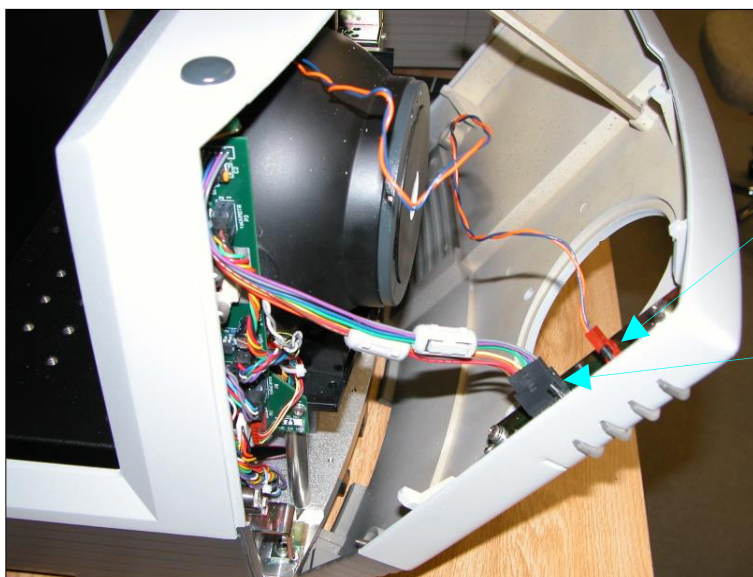


Figure 46. Front Cover Removal

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.

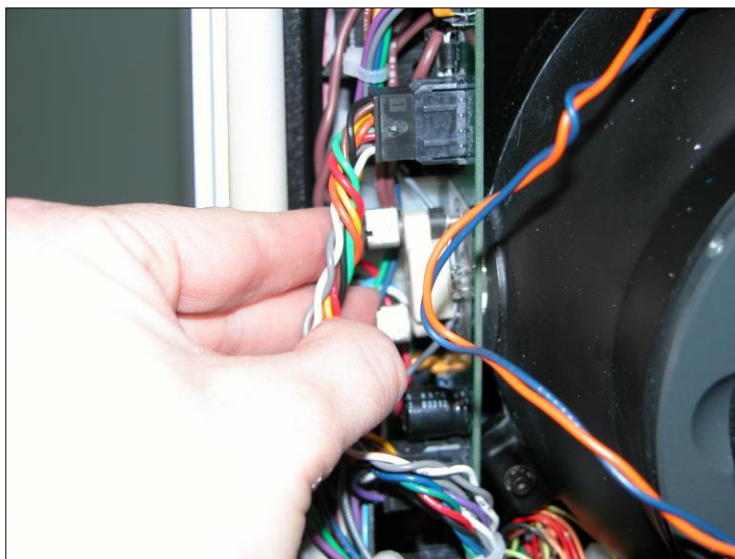


Figure 47. Replace View Assembly

8. Plug the harnesses back into 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.

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 transmittance 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 Spectrafect™ 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 transmittance 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 PRO, 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.

UltraScan PRO Specifications

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

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 32°C (90°F) [38°C (100°F) for sensor only]. For specification performance, the recommended temperature range is 21-28°C (70-82°F).

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

Dimensions	Width: 42 cm (16.5 in) Height: 32.3 cm (12.7 in) Depth: 49.8 cm (19.6 in) Weight: 25.9 kg (57 lbs) not including the sample clamp
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Environmental Requirements

Operating Temperature	4°C - 38°C (40°F - 100°F)
Operating Humidity	up to 85% relative, non-condensing
Storage Temperature	-21°C - 66°C (-5°F - 150°F) for up to three weeks

Power Required

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

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 more than 5VAC at 110V input power, or more than 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 152.4 mm (6 in) integrating sphere coated with Spectrafect™, port plate and specular exclusion port door coated with Duraflect™.
Illumination	Xenon lamps with 500,000 flashes minimum life
Polychromators (2)	Holographic grating
Detectors (2)	512 element diode array
Interface Mode	Serial RS-232
Area of View	Large area of view port size: 25.4 mm (1 in) diameter Large area of view measured area: 19 mm (.75 in) diameter Medium area of view port size: 13 mm (.5 in) diameter Medium area of view measured area: 9 mm (0.35 in) diameter Small area of view port size: 7 mm (.25 in) diameter Small area of view measured area: 4 mm (0.156 in) diameter

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
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Instrument Performance

Wavelength Range	350-1050 nm
Wavelength Bandpass	Effective 5 nm triangular for 5 nm output
Wavelength Interval	5 nm
Wavelength Accuracy	0.75 nm
Photometric Range	0-150% reflectance or transmittance

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

Note: Use of this equipment in a manner not specified by the manufacturer may impair the protection afforded by the equipment. Danger of electric shock if liquids are spilled and fire if volatile or flammable liquids are spilled. Use care when measuring liquid samples.

Regulatory Notice

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



HunterLab
ISO 9001 Certified

Declaration of Conformity

Application of Council Directive: 2004/108/EC (EMC)
2006/95/EC (LVD)

Standards to which Conformity is Declared: EN 61326-1:2013
EN 61010-1:2010

Manufacturer: Hunter Associates Laboratory, Inc.
11491 Sunset Hills Rd, Reston, VA, USA

European Representative: Christian Jansen
Representative's Address: Christian Jansen, Griesbraeustrasse 11, 82418 Murnau, Germany

Type of Equipment: Spectrophotometer

Model No.: UltraScanPro

*I, the undersigned, hereby declare that the equipment specified above
conforms to the Directive(s) and Standard(s) above*

Place: Reston, VA, USA

Signature 

Date: August 31, 2014

Full Name Tim Barrett

Position Systems Engineer

UltraScan PRO Options and Sample Devices

There are many options and devices available for positioning samples at the measurement ports of the UltraScan PRO and for making the instrument easier to use. For the latest information, please refer to <https://hunterlab.com/solutions/color-measurement/ultra-scan-pro/>.

Reflectance Options

Port Plate, 4-mm Round (A02-1011-184)

This option provides a modified port plate with a 4-mm round opening. This port plate should only be used when the small area view option is available and in use.

Port Plate, Glass Port Insert 25mm (1in) (A02-1011-124)

This option provides a snap-in port plate with an opening one inch in diameter that is covered with glass. The glass insert protects the inside of the instrument from sample and airborne particles.



Figure 48. Glass Port Insert

Port Plate, Diffuse port, Sample Cup Holder (D02-1003-739)

This port plate sample cup holder consists of 25-mm (1-in) port plate with a holder for centering the 04-7209-00 64mm (2.5-in) Glass Sample Cup designed for use on side-facing sphere instruments.

Port Plate, 3mm Round (D02-1019-172)

The 3mm round port plate requires small area view (SAV) option.

Compression Clamp Kit (L02-1012-387)

The compression clamp kit provides an air-driven compression clamp assembly to be used in place of existing sample clamp. This accessory is used for compressing fibers into a compact mass that permits repeatable color analysis. The assembly, modified port insert and glass sample cup, may also be used to hold carpet, fabric, and other soft samples at the reflectance port with constant pressure.



Figure 49. Modified Port Insert, Cap and Sample Cup



Figure 50. Sample Compression

Sample Clamp Assembly (D02-1003-739)

This sample clamps allows good positioning of the sample at the reflectance port.

Sample Holder, Reflectance Preform Holder (D02-1011-841)

This option provides an adjustable holder for measuring translucent and opaque preforms at the reflectance port of the instrument. The holder is appropriate for preforms with a shaft diameter between 15 and 40 mm and a length of at least 50 mm.

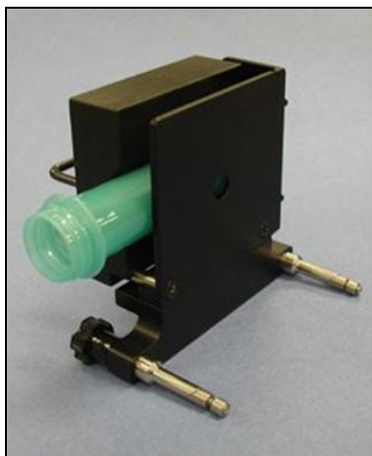


Figure 51. Preform Holder

Reflectance Sample Shelf with Light Cover (B02-1005-172)

The optional reflectance sample shelf with light cover can be placed at the reflectance port for measurement of powders, granules, pastes, or liquids held in a Transmittance cell (10-mm, 20-mm, 33-mm, or 50-mm cell). An opaque cover is also available to prevent ambient room light from affecting the measurement.



Figure 52. Insert Shelf

Sample Holder, Semi-Micro Port Plate with Powder Holder (D02-2012-931)

The Semi-Micro Port Plate with Powder Holder provides a holder, plunger and special port plate that allow the measurement of small quantities (approximately 0.4 cc) of packed powder. Requires MAV - Medium Area of View instrument option on USPRO. Also includes an extra A02-1011-145 SAV Port Plate to standardize with an open port in MAV mode. Then the D02-1012-931 USPRO Semi-Micro Powder Holder replaces this SAV Port Plate to measure small quantities of powder. Replacement optical glass windows for the holder assembly can be ordered as A04-1012-026 Optical Window, 17mm Dia. X 1.5mm Thick..



Figure 53. Insert Powder Holder in Port Plate

Skein/Swatch Holder (02-7396-00)

This is a device for measuring yarn skeins.



Figure 54. Skein Holder

Sample clamp, Non-Slip Pad Assembly (A02-1005-628)

Transmittance

Cell Holder, Round Glass Vials 24mm (D02-1011-550)

This option provides a transmittance holder for 24mm ID (27-mm to 30-mm OD) round glass vials with volumes of 20, 40 or 60 mL. Vials are available from third party source. Four (4) adjustable screws align the vial securely in the holder.



Figure 55. Cell Holder, Round Glass Vials

Cell Holder, Flow-Through Transmittance Cells (D02-1009-960)

This option provides an optically clear, 2-inch diameter, 10 mm, 20 mm, or 50 mm-pathlength flow-through cell for use with the flow-through cell holder.

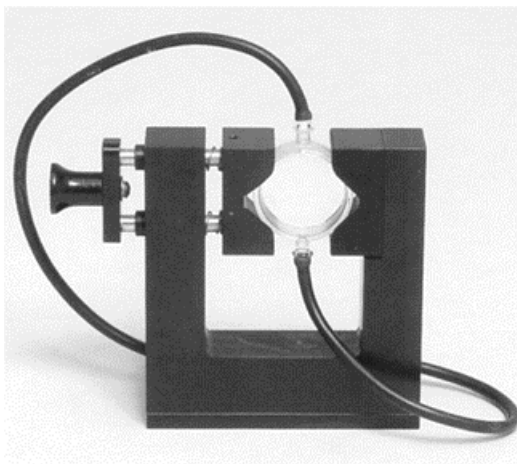


Figure 56. Flow Through Cell

The dimensions and volumes of the various flow-through transmittance cells are as shown in the table. The flow-through transmittance cell can be used with manual or automated pumps, such as peristaltic pumps, to inject the liquid into or extract the liquid from the cell.

Path Length (mm)	Minimum Sample Volume for Measurement (mL)	Diameter of Measurement Face (mm)	Part Number
10	20	51	C04-1001-958
20	35	51	C04-1001-959
50	90	51	C04-1001-960

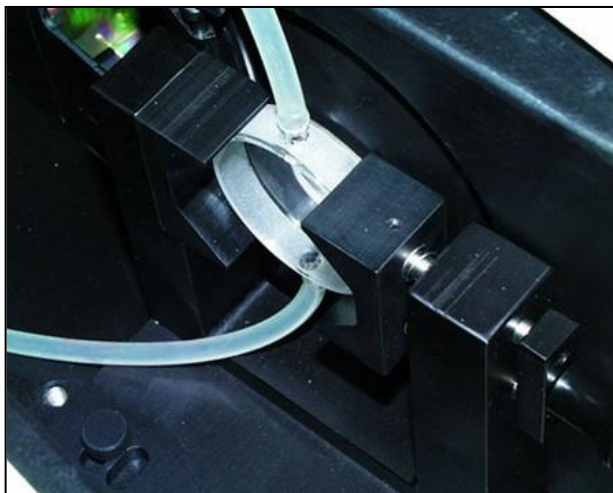


Figure 57. Flow Cell Installed

Cell Holder, Base Assembly (D02-1016-956)

This Cell Holder Base Assembly with one or more clip-on holders (ordered separately) centers macro, semi-micro and ultra-micro, as well as other precision analytical cell holders in the transmission compartment of HunterLab sphere instruments. This assembly ensures repeatable transmission color measurements of very small volumes of clear liquids. Select one or more of the available precision cell holders by matching cell holder specifications with the desired glass or plastic analytical cells.

Analytical cells are purchased separately by the customer. (Works with Precision Cell Holders: D02-1016-912, D02-1016-913, D02-1017-048, D02-1017-050, D02-1017-051).



Figure 58. Cell Holder Base Assembly

To install:

1. There are two rows of holes in the transmission compartment Precision Cell Holder uses the row closest to the sphere.
2. There is either an 'S' mark or a 'Δ' mark on one of the vertical walls. Orient so that the mark is closest to the sphere.

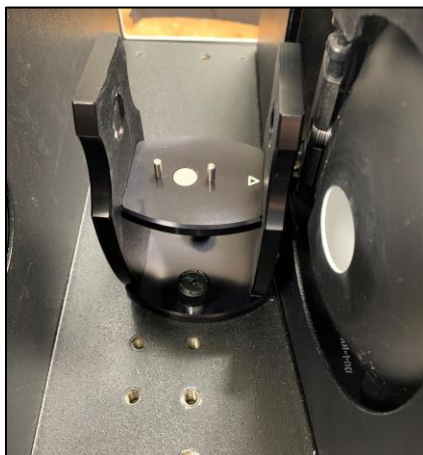


Figure 59. Orient the Holder as Shown.

3. There is a mark on the optional cell holders, place the cell so the mark is on the same side as the mark on the vertical wall.



Figure 60. Cell Holder Installed

4. When installed correctly the cuvette is centered in the transmission compartment.

Cell Holder, Small Volume Cell for Transmittance (D02-1011-886) & Small Volume Cell with Two Screw Caps & A13-1011-613)

This option provides a holder for a cylindrical, small volume transmittance cell. Each cell is shipped with two caps, one that is solid and screws on, and one that is threaded and covered with injectable Teflon™. The cell and holder together are used for total transmittance measurements of small quantities of liquids.



Figure 61. Small Volume Transmittance Cell & Holder

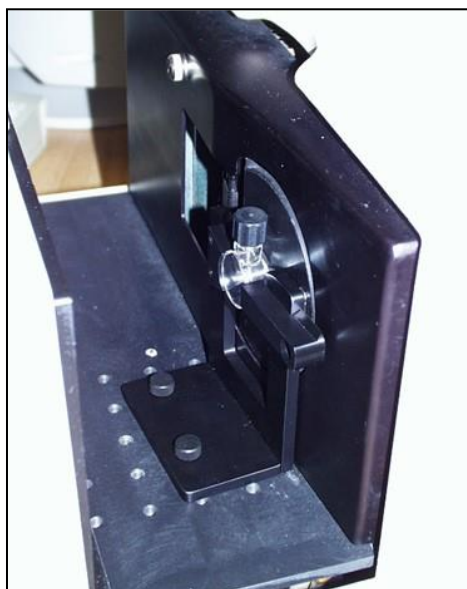


Figure 62. Measuring with Small Volume Cell

Cell Holder, Transmittance (C02-1005-481)

The optional Transmittance cell holder permits measurement of liquids in 10-mm, 20-mm, 33-mm, or 50-mm Transmittance cells.

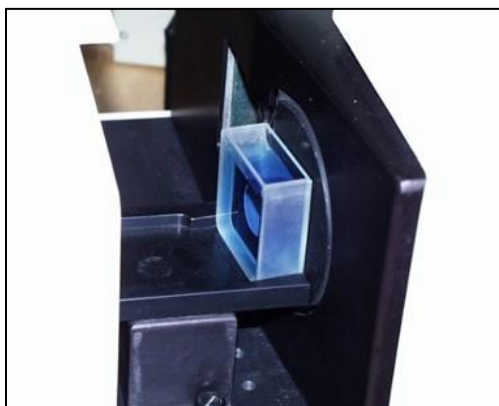


Figure 63. Cell at Sphere Opening

Transmittance Cells – 50mm, 33mm, 20mm, 10mm

The Transmittance cell option provides an optically-clear glass cell with a fixed path length of 50 mm, 33 mm, 20 mm, or 10 mm. Transmittance cells are recommended for Transmittance measurements of lightly-pigmented materials and some reflectance measurements. When used for Transmittance measurements of liquids, the cell filled with distilled water or another clear solvent should be used during standardization to set the top of the scale.

PathLength (mm)	Transmittance Cell Type	Minimum Sample Volume for Measurement (mL)	Name	Part Number
10	Open Top	20	Transmittance Cell, 10mm	13-8573-40
20	Open Top	40	Transmittance Cell, 20mm	04-4592-00
33	Open Top	70	Transmittance Cell, 33mm	B04-1003-801
50	Open Top	100	Transmittance Cell, 50mm	13-8573-20
10	Screw Top		Transmittance Cell, 10mm with 2 screw tops	D12-1011-893
20	Screw Top		Transmittance Cell, 20mm with 2 screw tops	D12-1011-890
33	Screw Top		Transmittance Cell, 33mm with 2 screw tops	D12-1011-891
50	Screw Top		Transmittance Cell, 50mm With 2 screw tops	D12-1011-892

Transmittance Cells with Two Screw Tops

This option provides an optically-clear glass transmittance cell with a fixed path length of 50 mm, 33 mm, 20 mm, or 10 mm that is enclosed and has two Teflon-lined screw caps for injecting and removing volatile liquids from the cell.



Figure 64. Transmittance Cell with Top

Sample Holder, Transmittance Preform Holder (D02-1011-833)

The adjustable transmission preform holder measures transparent preforms with a shaft diameter from 15 mm to 40 mm on the above sensors.



Figure 65. Preform Holder

Sample Holder, Transmittance Clamp (C02-1005-444)

The optional Transmittance Clamp holds transparent film or sheets in position for Regular or Total Transmittance measurements.

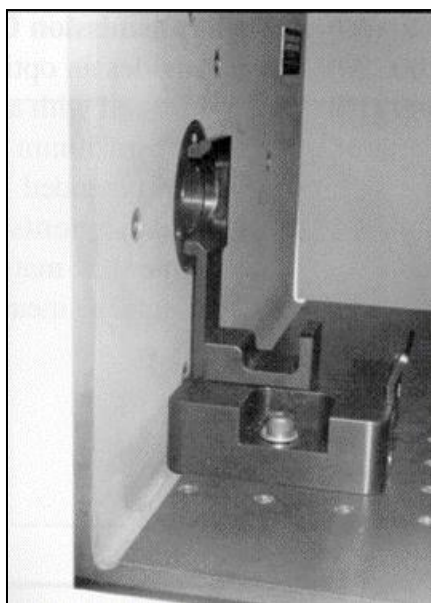


Figure 66. Transmittance Sample Clamp

Cell Holder, Transmittance with Spill Tray (D02-1011-568)

The Transmittance Cell Holder with Spill Tray, when installed in the transmittance compartment, permits the measurement of liquids in 10, 20, 33 or 50mm pathlength transmittance cells and protects the compartment from spills of liquid samples. The tray can hold up to 600 mL of liquid.



Figure 67. Spill Tray

Cell Holder, Base Assembly (D01-1016-956)

The cell holder is designed to precisely position 10mm macro plastic cells with max outside path length dimensions not exceeding 12.42 x 12.50mm (0.489 x 0.492 in.) for repeatable regular transmission measurements. Used in combination with the Cell Holder Base Assembly (USPRO and USVIS PN# D02-1016-956 or Vista PN# D02-1017-224), sold separately. A starter kit of three PMMA plastic cells is included with this cell holder.



Figure 68. Typical Semi-Micro Cell and Macro Cell Holder

**Note: When placing the cell holder in the instrument, the placement is directional.
The triangle must point to the sphere.**

Cell Holder	Description	Cell Volumes	Cell Outside Dimensions	Tested Cells (	Cell Type
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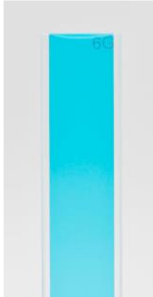
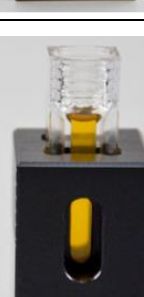
D02-1016-913 Cell Holder, Plastic Macro Cells		Macro Plastic (Min-2.5mL) (Max-4.5mL)	12.32 x 12.35 mm 0.484 x 0.490 in	Brand (759081D)	
D02-1017-051 Cell Holder, Ultra- Micro Plastic Cells		Ultra-Micro Plastic (Min-0.6mL) (Max-0.7mL)	12.50 x 12.50 mm 0.492 x 0.492 in	Brand (759200)	
D02-1017-048 Cell Holder, Glass Macro Cells		Macro Glass (Min-2.5mL) (Max-4.5mL)	12.50 x 12.50 mm 0.492 x 0.492 in	Hellma (100-10-20) Starna (1-G-10)	
D02-1017-050 Cell Holder, Semi- Micro Cells		Semi-Micro Glass (Min- 0.6mL) (Max- 1.5mL)	12.47 x 12.50 mm 0.491 x 0.492 inches	Hellma (104-10-20) Starna (9-SOG-10)	



Figure 69. Insert Cell in Holder

Transmittance Aperture Receiver Ring (D02-1019-305)

The Receiver Ring is affixed at the sphere exit of the transmission compartment. The Transmission Aperture Receiver Ring allows correct alignment of aperture inserts (purchased separately).

Insert, Glass Cover with Holder (D02-1019-341)

The Glass Cover Insert attaches with a magnet to the Transmission Aperture Receiver Ring (purchased separately) and seals the sphere from the transmission compartment.

Insert, 6mm Aperture with Holder (D02-1019-350)

The 6mm Aperture Insert provides a magnetically attached insert to the Transmission Aperture Receiver Ring (purchased separately) and reduces the optical beam to 6mm.

Insert, 3mm Aperture with Holder (D02-1019-491)

The 3mm Aperture Insert provides a magnetically attached insert to the Transmission Aperture Receiver Ring (purchased separately) and reduces the optical beam to 3mm.

Other

Foot Switch Assembly (D02-1010-327)

Pressing the foot switch performs the same function as using the macro switch on the front of the sensor.



Figure 70. Foot Switch

When You Need Assistance

If you need for technical or sales assistance on applications, troubleshooting, , service, warranty, accessory pricing and more, please contact the office nearest you:

For the Americas, Support@hunterlab.com

For Asia, AsiaSupport@hunterlab.com

For Europe, EuropeSupport@hunterlab.com

For India, Middle East and Africa, IMEASupport@hunterlab.com

For all other regions, Support@hunterlab.com

Additionally, our global support website offers 24/7 assistance with a library of information on various color measurement and appearance topics such as applications, instrument operation, and troubleshooting. The HunterLab global support website is located at support.hunterlab.com. For personalized assistance, go to support.hunterlab.com and locate the [Create A Ticket](#) button on the menu. A subsequent form gathers information on your request for response from our Customer Experience Teams around the globe.

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