

UltraScan[®] VIS

Supplemental Manual for EasyMatch[®] QC



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Caution: If the equipment is used in a manner not specified by the HunterLab, the overall safety may be impaired. The UltraScan VIS 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.

Contents

ULTRASCAN VIS FEATURES	5
Reflectance Port.....	6
Small Area View	6
Retro-viewer	7
Sample Clamp	7
Transmittance Compartment.....	8
Specular Included/Excluded Port.....	8
Automated UV Control	9
Indicator Lights	9
Macro Button.....	10
UltraScan VIS Accessories	10
ULTRASCAN VIS INSTALLATION.....	13
Install EasyMatch QC Software	13
Activate the SoftKey License.....	15
Add the Sensor.....	16
ULTRASCAN VIS FUNCTIONS	19
Sensor > Standardize.....	19
Sensor > Standardization Modes	20
Sensor > Configure Multi Mode	21
Sensor > UV Filter Calibration	23
Sensor > Setup Mode (UV Filter)	24
Haze Measurements (Options > Read Method > Haze).....	26
ULTRASCAN VIS MAINTENANCE AND TESTING	31
Running the Repeatability Test.....	31
Running the Green Tile Test	31
Running the Didymium Filter Test	32
Replacing the Source Lamp	32
Replacing the Fuses.....	35
Replacing the Optional View Lamp	37
Cleaning the Lens Surface and Didymium Filter	39
Cleaning the Sphere	39
ULTRASCAN VIS SPECIFICATIONS	41
Physical Characteristics.....	41
Environmental Requirements	41
Power Required	41
Power Cord Wire Color Code:	42
Instrument-Computer Ground Potential Check:	42
Conditions of Illumination and Viewing.....	42
Instrument Performance.....	43

Regulatory Notice 43

UltraScan VIS Options and Sample Devices 44

 4-mm Port Plate (A02-1011-184) 44

 Installation 44

 Sample Measurements 44

 Compression Clamp Kit (L02-(D02-1011-131) 45

 Cylindrical Cell Holder (D02-1011-550) 47

 Flow-Through Transmittance Cell Holder and Cells (D02-1009-960) 48

 Foot Switch Assembly (D02-1010-327) 50

 Glass Port Insert (A02-1011-124) 51

 Reflectance Preform Holder (D02-1011-841) 51

 Reflectance Sample Shelf with Light Cover (B02-1005-172) 52

 Precision Cell Holder for Plastic Micro Cells 54

 Semi-Micro Powder Holder (D02-2012-313) 59

 Skein Holder Option (02-7396-00) 60

 Holder & 10mm Small Volume Transmittance Cells (D02-1011-886 & A13-1011-613) 61

 Transmittance Cell Holder (C02-1005-481) 63

 Transmittance Cells – 50mm, 33mm, 20mm, 10mm 63

 Transmittance Cells with Two Screw Tops 64

 Tall Transmittance Cells 64

 Transmittance Preform Holder (D02-1011-833) 65

 Transmittance Clamp (C02-1005-444) 66

 Transmittance Spill Tray (D02-1011-568) 68

WHEN YOU NEED ASSISTANCE 69

INDEX 71

UltraScan VIS Features

The UltraScan VIS is a dual beam xenon flash spectrophotometer with a wavelength range from 360 to 780 nanometers (nm). All tristimulus integrations are based on a triangular bandpass of ten nm and a wavelength interval of ten nanometers. The instrument can measure both reflected and transmitted color of a product.

The sensor uses a plastic integrating sphere that is six inches (152.4 mm) in diameter and coated with Spectrafect™, which diffuses the light from the lamp. The light illuminates the sample and is either reflected from it or transmitted through it. A lens is located at an angle of 8° from the perpendicular to the sample surface. The lens collects the reflected or transmitted light and directs it to a diffraction grating which separates the light into its component wavelengths. These components are then measured by dual diode arrays and converted into usable data.



Figure 1. UltraScan VIS

Note: Use of this equipment in a manner not specified by the manufacturer may impair the protection afforded by the equipment.

Note: Danger of electric shock if liquids are spilled and fire if volatile or flammable liquids are spilled. Use care when measuring liquid samples.

The UltraScan VIS 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 also present to aid in placement of the white tile and light trap at the reflectance port. When the small area view lens is in use, the small area or the large area port plate can be used at the reflectance port.



The reflectance port with the large area view port plate installed

Figure 2. Reflectance Port

Small Area View

The small area view feature includes a small area view lens and port plate. To use the small area of view:

1. Remove the original port plate from the reflectance port and replace it with the small area port plate.



Figure 3. Small Area of View

2. Standardize the instrument. Be sure to select 0.375 inch (9.525 mm) 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. Be sure that the sample completely covers the reflectance port. (Use the retroviewer to confirm.) Adjust the position of the sample if necessary.

5. Read the sample.

Note: The instrument flashes multiple times per measurement when the small area view option is employed.

Retro-viewer

The retro-viewer is a lamp in the sphere that allows you to view the sample that is currently at the reflectance port on a screen. This helps you to determine when the sample is properly placed for measurement. Turn the lamp on as described below. The sample at the reflectance port is then illuminated and an image of it appears on the retro-viewer screen. If necessary, adjust the door above the screen to see a mirror image of the screen display. The retro-viewer lamp must be installed at the factory.

The retro-viewer lamp has two modes of operation. Select the desired mode of operation using the retroviewer button as follows:

- **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.
- **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 one minute of inactivity, regardless of the mode selected.

Sample Clamp

The UltraScan VIS includes a spring-loaded sample clamp that can be used to hold samples flat and secure 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.



Figure 4. Sample 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 included 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.

Transmittance Compartment

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



Figure 5. Open Transmittance Compartment

Specular Included/Excluded Port

The UltraScan VIS 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 EasyMatch QC. See the **ULTRASCAN VIS STANDARDIZATION** section for more information on the various measurement modes.

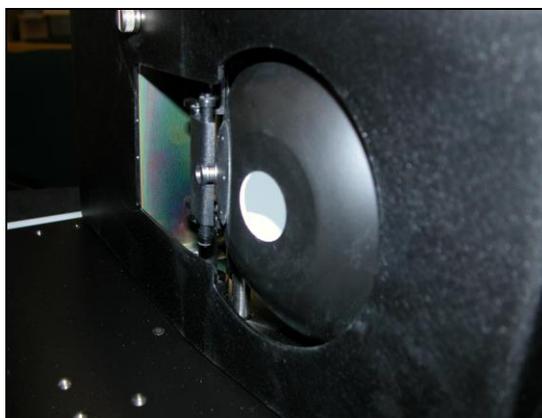


Figure 6. Specular Exclusion Port Closed

¹ Closing the transmittance 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 VIS Standardization section.

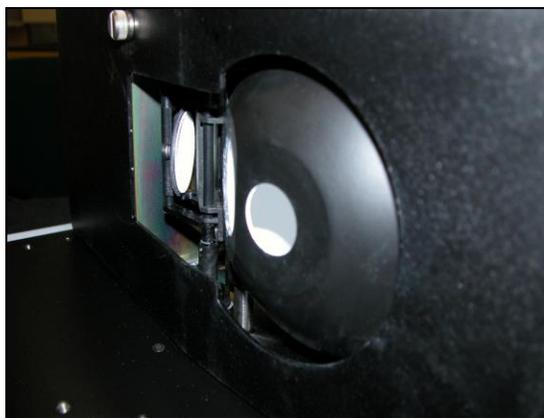


Figure 7. Specular Exclusion Port Open

Automated UV Control

The UltraScan VIS can perform a Ganz-Griesser calibration, by using a 400-nm UV filter. This filter maintains the proper ratio of the electromagnetic energy in the UV region to that of the visible region. 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 **SENSOR MENU** section.

Note: It is important to know what type of fluorescence is involved for the samples being measured. Some materials fluoresce due to excitation by visible rather than ultraviolet wavelengths. The UV-absorbing filter does not eliminate this type of fluorescence.

Indicator Lights

The UltraScan VIS's indicator light feature lets 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 area view is in use, and the bottom light indicates that the UV cut-off filter is 100% inserted.

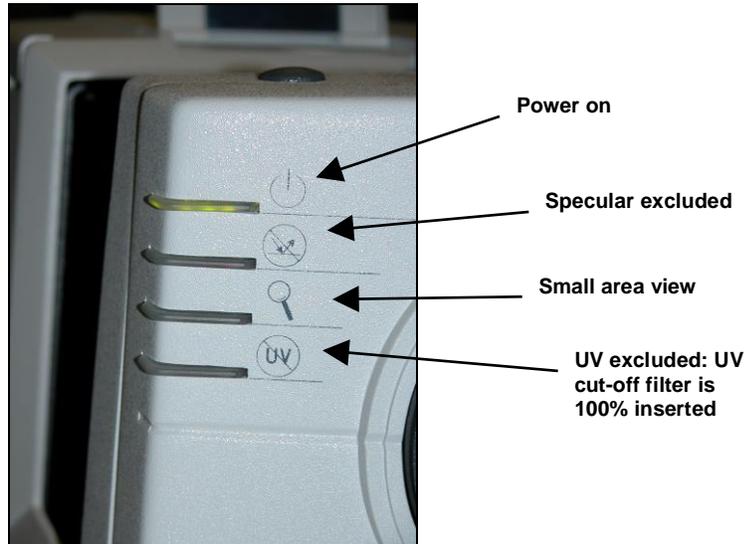


Figure 8. Indicator Lights

Macro Button

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

UltraScan VIS Accessories

The following accessories are provided in the standards case:

- **White calibrated tile** - placed at the reflectance port (with pegs in the guidance holes) during standardization. This tile is traceable to National Institute of Standards & 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 transmittance modes.
- **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 black backing.
- **Standards care card** - gives instructions on how to clean the standards.
- **Fuses** - two 3-amp fuses (3A, SB 250 V, T) 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.
- Diagnostics software CD.

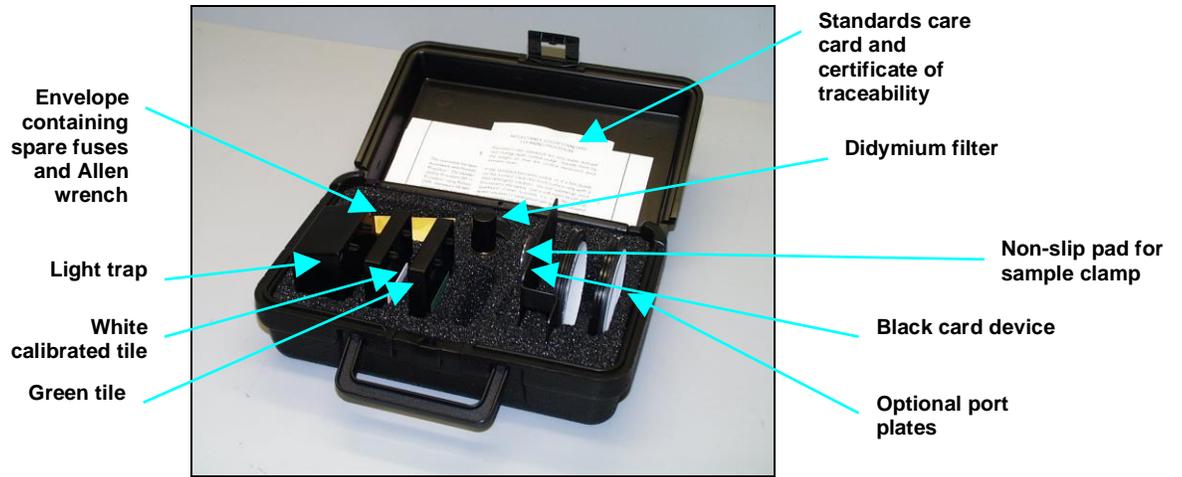


Figure 9. Accessory Case

UltraScan VIS Installation

The UltraScan VIS is simple to set up and attach to your computer. The following instructions guide you through the initial installation of your UltraScan VIS 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 VIS 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 plug it into a power outlet.

Note: Refer to the UltraScan VIS Specifications section 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#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 VIS 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 VIS Specifications section.

5. If you are using **SERIAL COMMUNICATIONS**, 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. If you are using **USB COMMUNICATIONS**, connect the computer via a USB cable to the serial adapter and then to the serial cable connected to serial port on the UltraScan VIS. It does not matter if the instrument is turned on or off.

Note: The UltraScan VIS 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.

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.

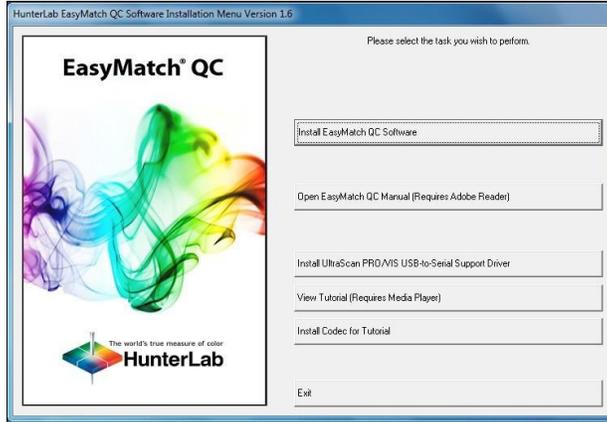


Figure 10. EasyMatch Installation

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.

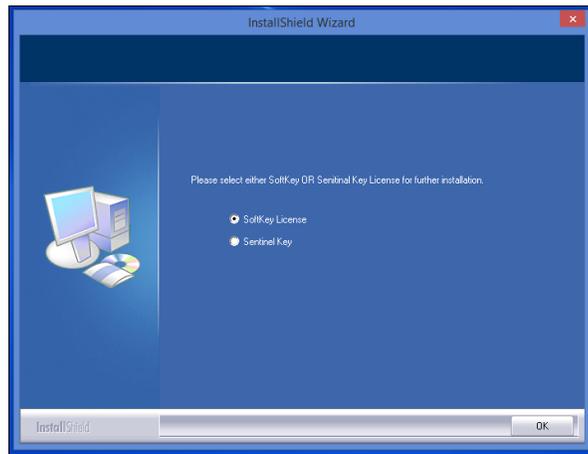


Figure 11. Software Key License

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.

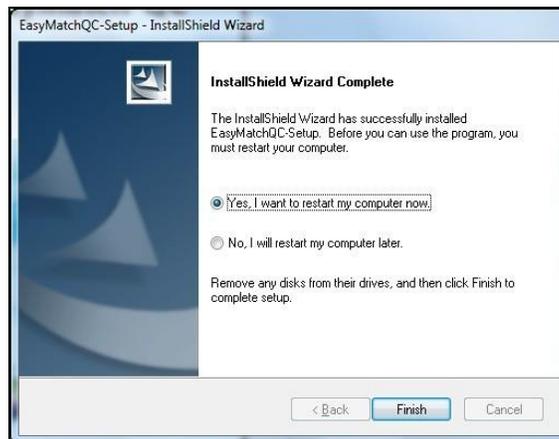


Figure 12. Completed Install

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.

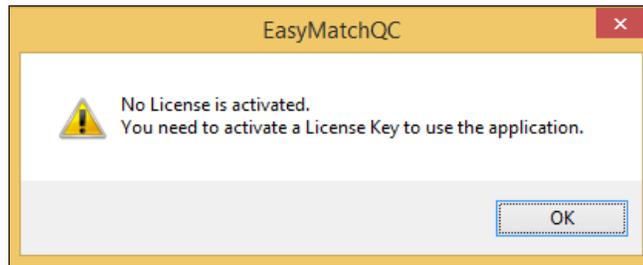


Figure 13. No License Warning

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**.

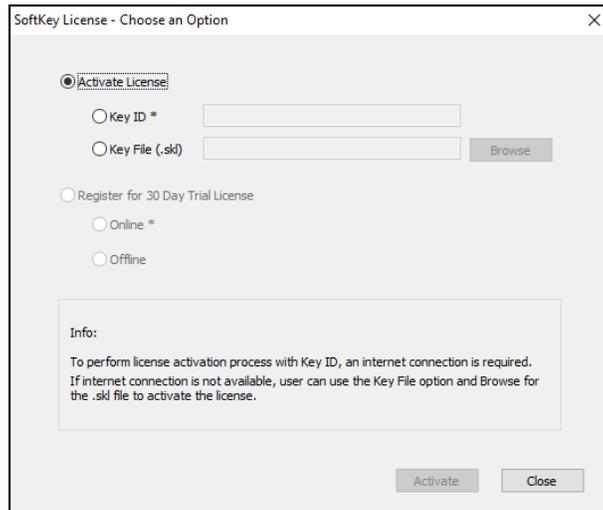


Figure 14. Activate License

1. 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 14), 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.

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

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

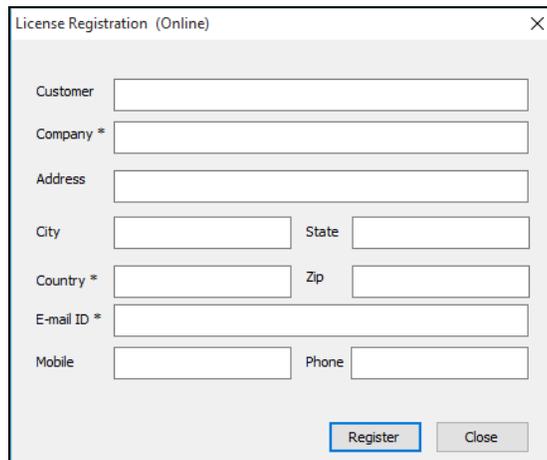
- a. Place the thumb drive with the SoftKey License in the USB port.
- b. From the **CHOOSE AN OPTION** page (Figure 14), select **KEY FILE (.skl)**.
- c. Browse the USB to find the SoftKey License (.skl) file, then click **ACTIVATE**.
- d. An acknowledgement will be displayed showing the activation status.

3. 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 11) and select **SENTINEL KEY** to continue.

4. 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.



The screenshot shows a window titled "License Registration (Online)" with a close button (X) in the top right corner. The form contains the following fields:

- Customer: [Text Input]
- Company *: [Text Input]
- Address: [Text Input]
- City: [Text Input] State: [Text Input]
- Country *: [Text Input] Zip: [Text Input]
- E-mail ID *: [Text Input]
- Mobile: [Text Input] Phone: [Text Input]

At the bottom right, there are two buttons: "Register" (highlighted with a blue border) and "Close".

Figure 15. 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:

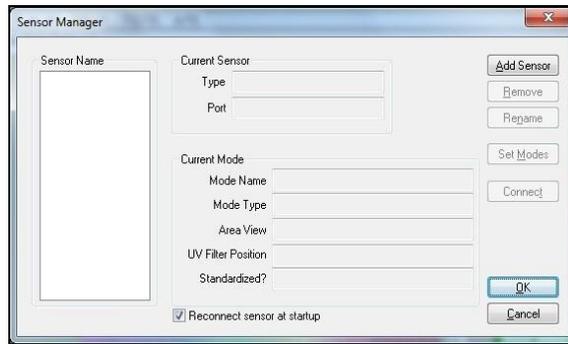


Figure 16. Sensor Manager

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.

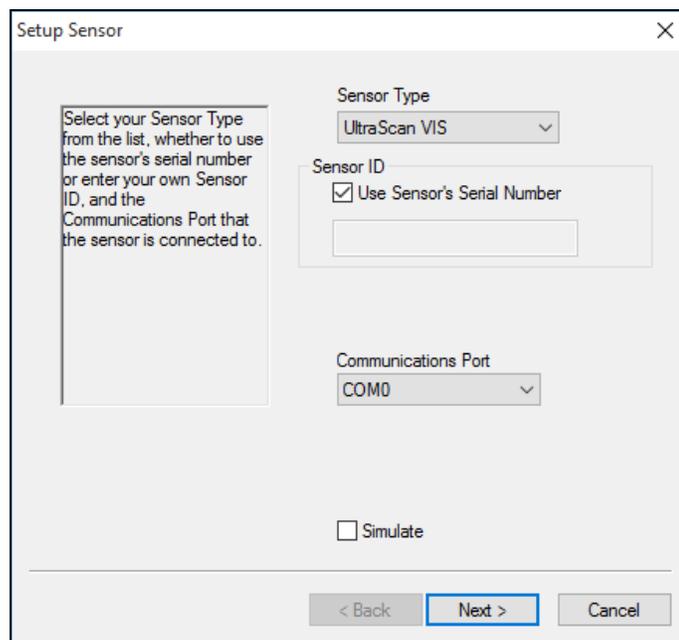


Figure 17. Setup Sensor

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. If using USB communications, the COM port will automatically be selected.

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 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.

7. Turn on the UltraScan VIS 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.

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

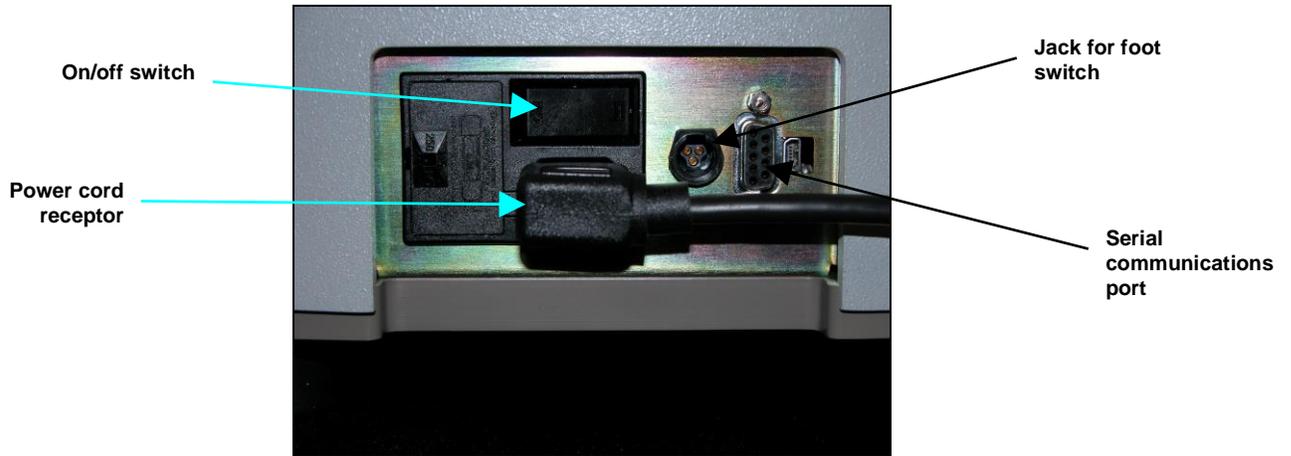


Figure 18. Rear View of UltraScan VIS

UltraScan VIS Functions

Sensor > Standardize

The UltraScan VIS must be standardized on a regular basis to keep it operating properly. 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 VIS, the bottom of the scale is set with the light trap for reflectance modes. The light blocker (a.k.a. black card) device is used to set the bottom of the scale for transmittance measurements.



Figure 19. Setting Zero for TTRAN



Figure 20. Setting Zero for RTRAN

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.



Figure 21. Standardizing with the Light Trap



Figure 22. 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.

Sensor > Standardization Modes

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

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

Considering varying hardware configurations such as UV filter in/out and the different areas of view, there are many ways to standardize the UltraScan VIS. 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.

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 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.

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



Figure 23. Top of Scale for TTRAN

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

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 > 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.

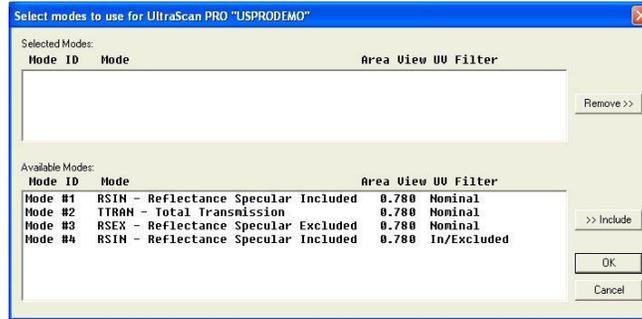


Figure 24. Configure Multi-Mode

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.

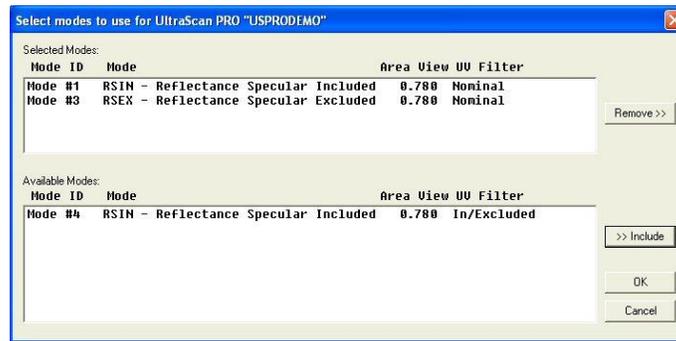


Figure 25. Select Modes



Figure 26. Setting Top of Scale TTRAN

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

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 > UV Filter Calibration

If the UV option is installed, the instrument is standardized in a mode for which the UV Filter Position is indicated as Calibrated.

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.

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

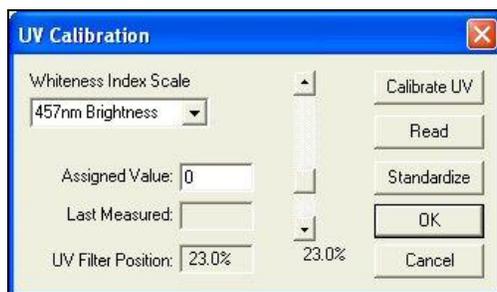


Figure 27. Calibration of UV Filter: 457 Brightness

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. Choose whether the value is for **BRIGHTNESS 457**, **WHITENESS INDEX CIE** (and the illuminant/observer combination), **WHITENESS INDEX GANZ**, or **Z%**. The scale used will be WI Ganz for a HunterLab standard.

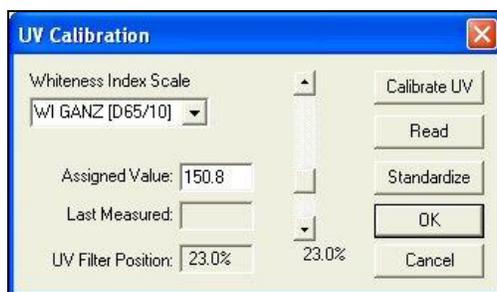


Figure 28. Calibration of WI GANZ

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.

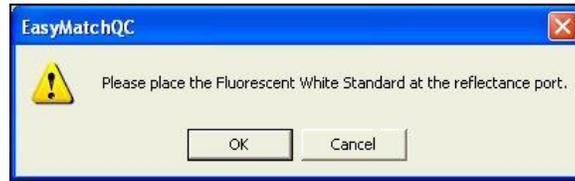


Figure 29. Prompt for Calibration of UV Filter

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.

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.

Sensor > Setup Mode (UV Filter)

When your instrument 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.

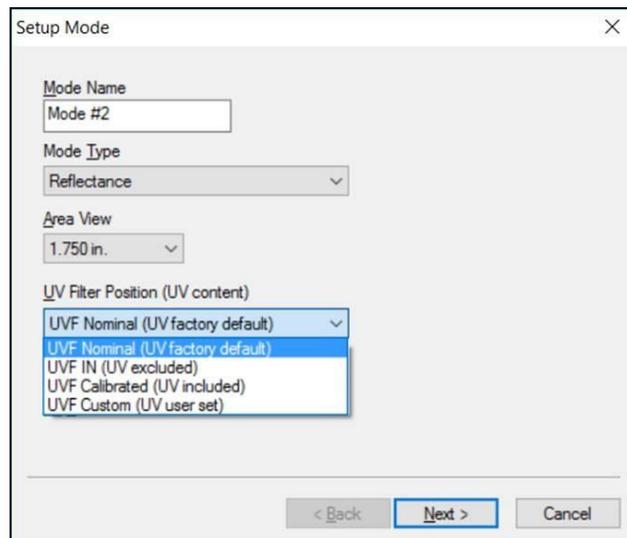


Figure 30. UV Calibration Mode Settings

- **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.

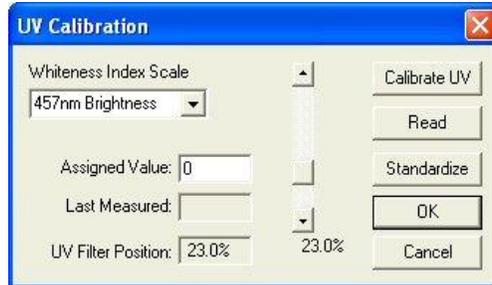


Figure 31. UV Calibration

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.

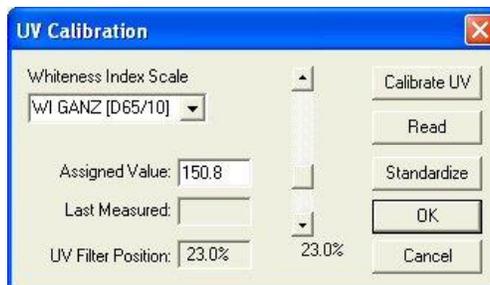


Figure 32. UV Calibration with WI Ganz

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.

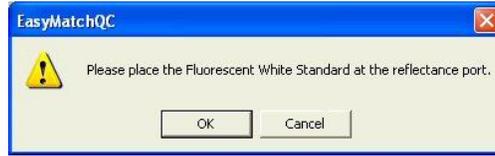


Figure 33. Prompt for Fluorescent Standard

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: When using the calibrated filter position, this position should be employed for all routine measurements using this instrument.

Note: 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 (Options > Read Method > Haze)

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).

In order 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.

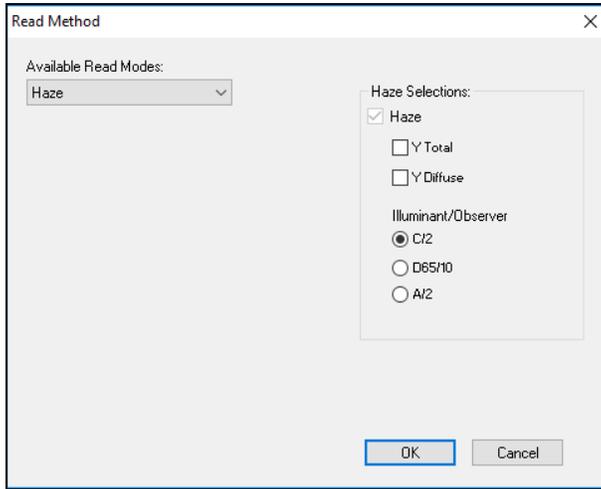


Figure 34. Read method: Haze

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**.

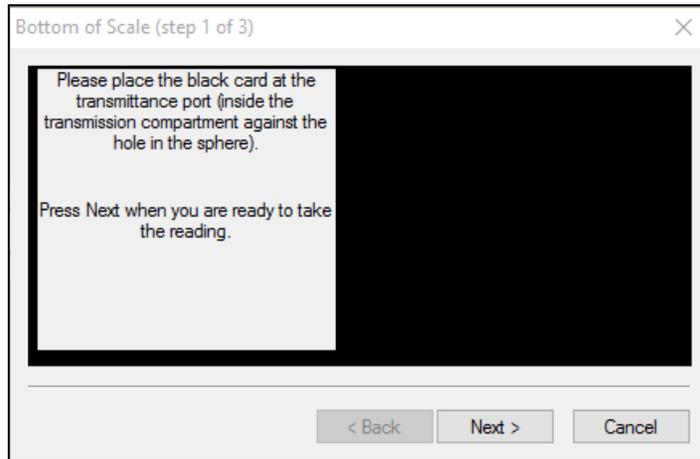


Figure 35. Haze Standardization: Black Card

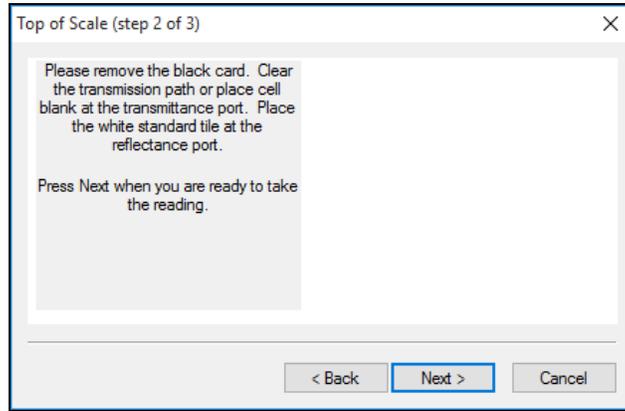


Figure 36. Haze Standardization: White Tile

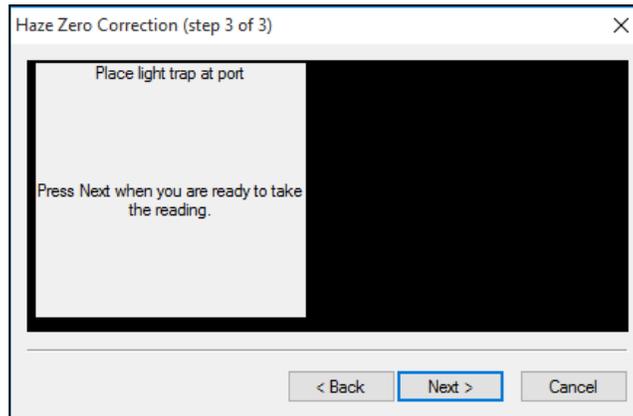


Figure 37. Haze Standardization: Light Trap

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.

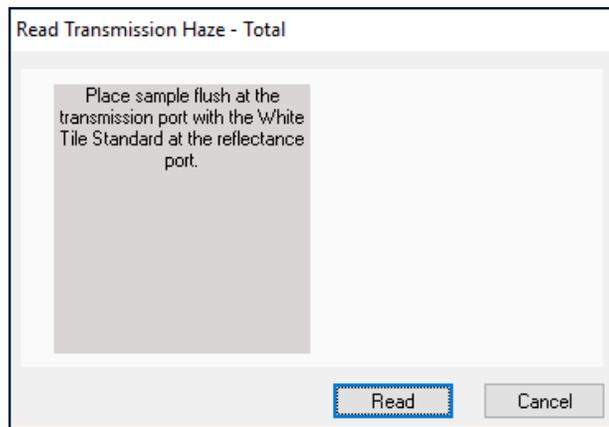


Figure 38. Read Sample with White Tile

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

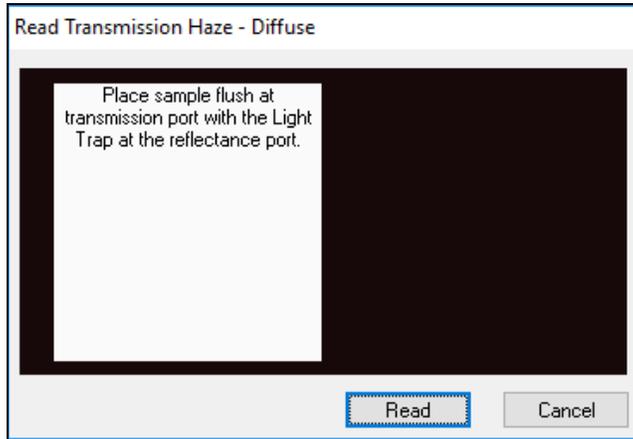


Figure 39. Read Sample with Light Trap

8. When the instrument takes a 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 40. Haze Readings Reported

UltraScan VIS Maintenance and Testing

This section outlines the parts of the UltraScan VIS you must maintain for the instrument to function properly and tests that 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 VIS on and allow it to warm it up for 2 hours. Meanwhile, clean the white tile in the User's Manual for EasyMatch QC and allow the tile 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 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 VIS should be in its standard configuration, RSIN mode with the large area view (1.000-inch/25.400 mm) 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 Job will configure these settings.



Figure 41. Green Tile at Reflectance Port

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 your UltraScan VIS. 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 > DIAGNOSTICS*** section of 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 module, HL#D02-1010-930.

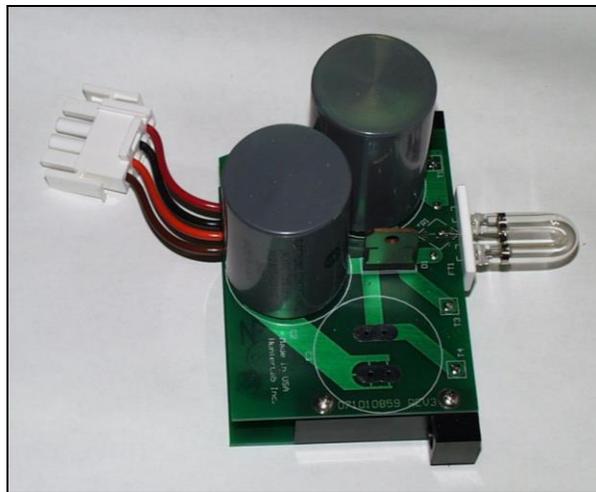


Figure 42. Photo of Xenon Flash Lamp Assembly

Before you attempt to change the source lamp, ensure that the UV filter is nominal. 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 in the nominal position. (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 VIS 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 screwdriver.



Figure 43. 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.

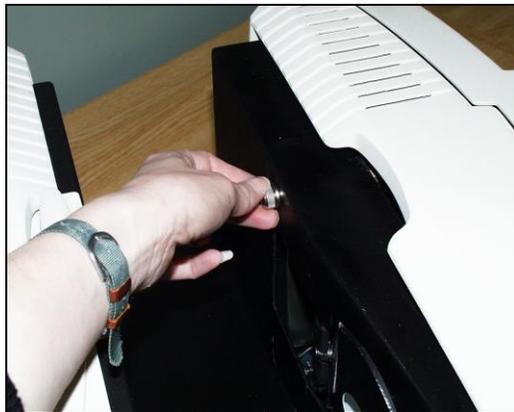


Figure 44. Inside Panel Screws

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.

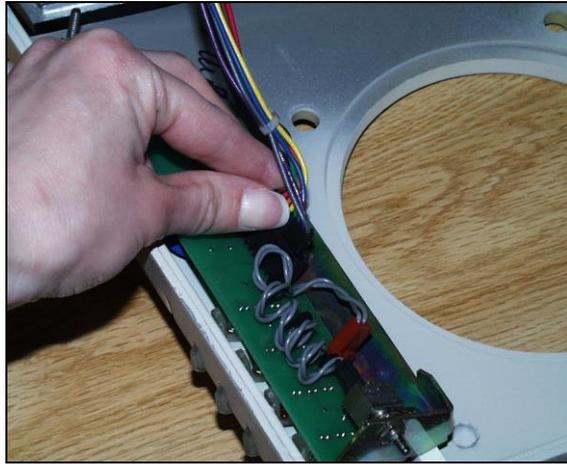


Figure 45. Disconnect Indicator Lights

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

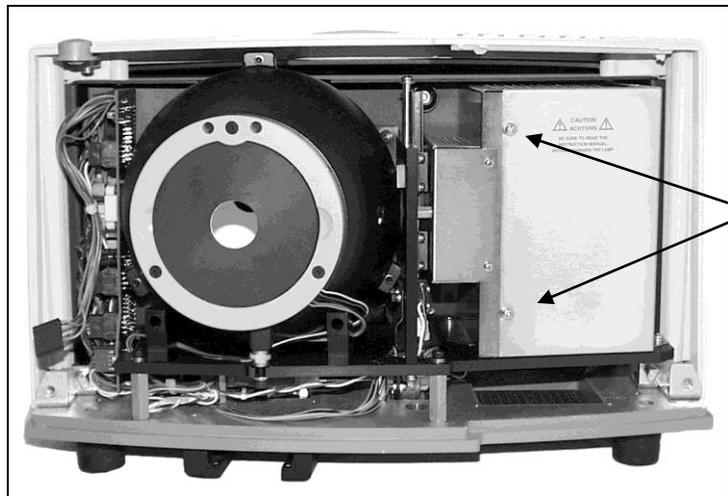


Figure 46. Screws on Outside of Lamp Housing

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

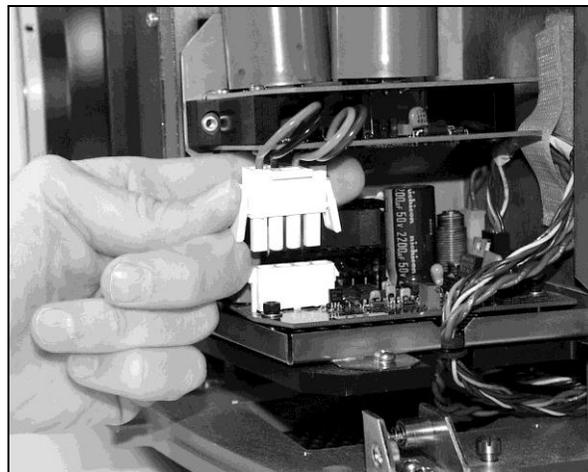


Figure 47. Lamp Assembly Connector

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 and weaken the glass. If a fingerprint is deposited, remove it using a clean wipe and isopropyl alcohol.

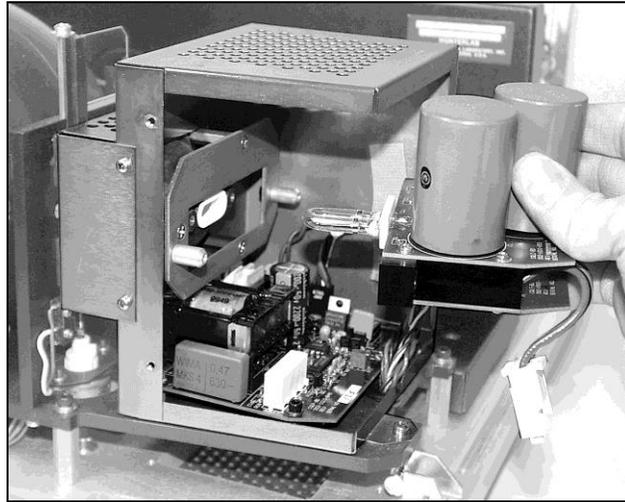


Figure 48. Replace Lamp Assembly

10. Plug in the white 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 power on.
16. Standardize the instrument.

Replacing the Fuses

The fuses (3A, SB (250 V), T) are located on the back panel of the instrument. Follow the instructions below to replace the fuses.

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

1. Disconnect the UltraScan VIS 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.

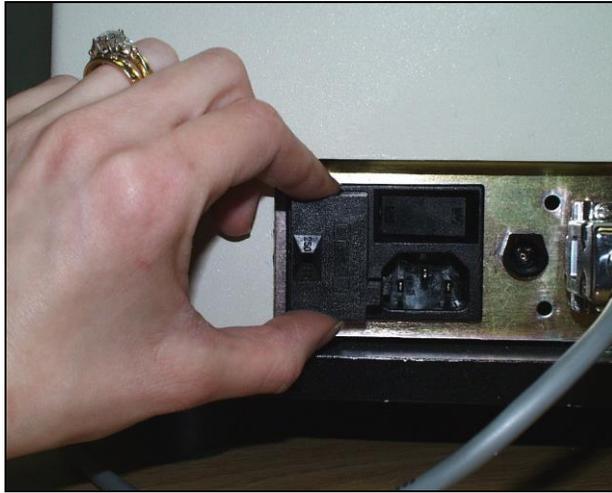


Figure 49. Fuse Holder

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



Figure 50. Replace Fuses

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.

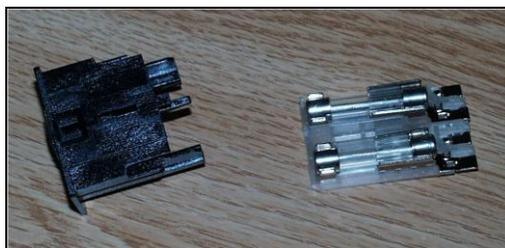


Figure 51. Fuse Holder with Fuses

5. Replace the fuse holder in the cartridge.
6. Replace the cartridge in the back panel of the instrument.
7. Turn the power on.

Replacing the Optional View Lamp

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

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



Figure 52. View Lamp Assembly

To change the view lamp:

1. Disconnect the UltraScan VIS 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 screwdriver.



Figure 53. Front Cover Screws

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

5. Loosen the thumbscrew on the inner panel bezel.



Figure 54. Inside Cover Screws

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

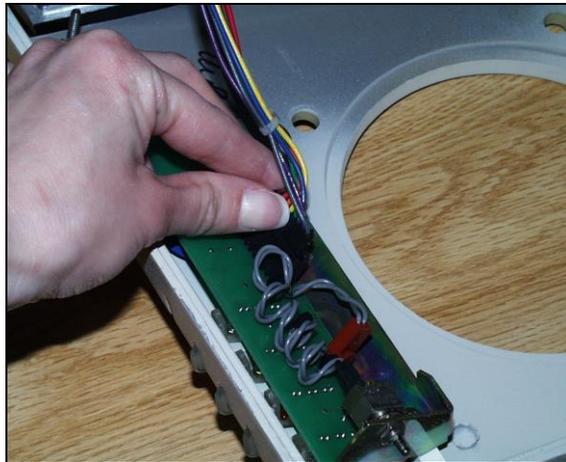


Figure 55. Disconnect the Indicator Lights

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.

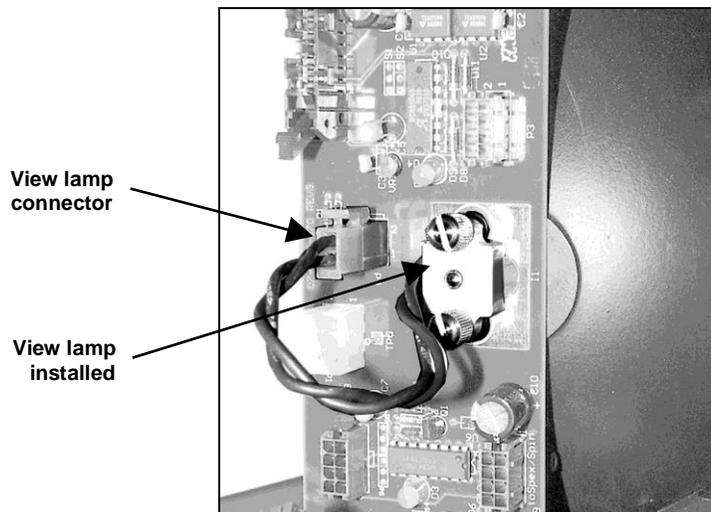


Figure 56. View Lamp

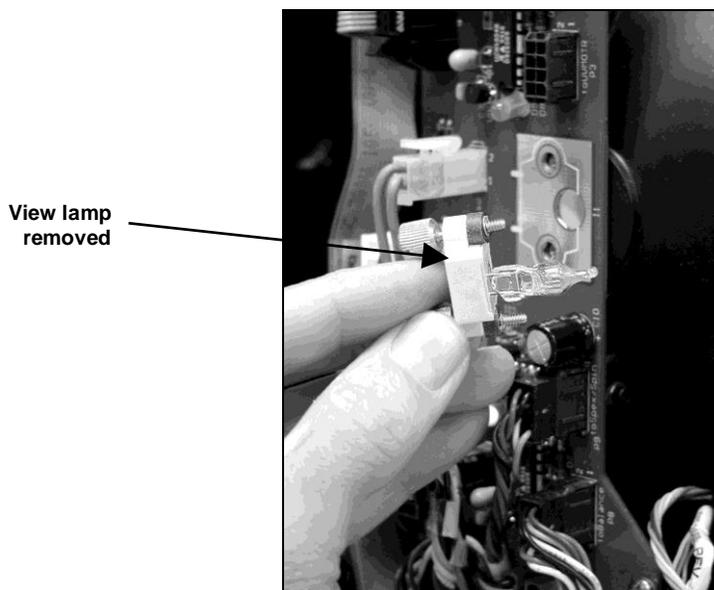


Figure 57. View Lamp Disconnected

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.
11. Turn the power on.

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.

4. When shipping the UltraScan VIS, 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 VIS 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% [10-90% for sensor only] and relatively constant temperature not exceeding 90°F (32°C) [104°F (40°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

Dimensions	Width: 42 cm (16.5 in) Height: 27.9 cm (11 in) Depth: 49.8 cm (19.6 in), Weight: 20.4 kg (45 lbs) not including the sample clamp
Communications interface:	RS-232C serial DB-9 or USB.

Environmental Requirements

Operating Temperature	10°C - 40°C (50°F - 104°F)
Operating Humidity	Up to 90% relative, non-condensing
Storage Temperature	-21°C - 66°C (-5°F - 150°F) for up to three weeks

Power Required

Voltage	100-240VAC, 47/63 Hz.
Single Phase	100 VA maximum
Fuse	3A, SB (250 V), T

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 152.44 mm (6 in) plastic integrating sphere coated with Spectrafect™
Illumination	Xenon lamp with 1,000,000 flashes minimum life UV-absorbing filter for 400-nm cutoff and control
Monochromator	Diffraction grating, dual channel
Detector	Dual diode array detectors
Interface Mode	Serial RS-232, USB
Area of View	Large area view port size: 25.4 mm (1 in) diameter Large area view measured area: 19.0 mm (0.75 in) diameter Small area view port size: 9.5 mm (0.375 in) diameter Small area view measured area: 6 mm (0.25 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	360-780 nm
Wavelength Resolution	<2 nm
Wavelength Bandpass	10 nm equivalent triangular
Wavelength Interval	10 nm
Wavelength Accuracy	0.75 nm
Photometric Range	0-150% reflectance or transmittance
Photometric Resolution	0.01% reflectance
Spectral Repeatability	Standard deviation within 0.1% in LAV and SAV modes

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 Declaration of Conformity per ISO/IEC Guide 22 and EN 45014 follows on the next page.

Note: This port plate has an opening that is smaller than the usual 1-inch port plate. Performance specifications (i.e., factory-supplied color values, stability, accuracy) are based on the standard 1-inch round port plate. These specifications will not be met with the modified port plate. The change of geometry that occurs will cause a slight shift in the color values of the calibration standards.

Compression Clamp Kit (L02-(D02-1011-131)

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. The option consists of the following components:



Figure 58. Compression Clamp Kit

- Modified port insert
- Protective cap for port plate
- Glass 2.5-inch (64-mm) sample cup
- Modified sample clamp
- Ten feet of 1/4-inch tubing line
- Pressure valve
- Required: A compressed air source and filter dryer are also required.



Figure 59. Modified Port Insert, Cap and Sample Cup

Installation

1. Remove the original port insert and replace it with the modified port insert (after removing the protective cap). The white lining of the insert should face in toward the instrument.

2. Replace the original sample clamp with the modified sample clamp.
3. Connect the air compressor to the lower input port of the modified sample clamp assembly using the 1/4" tubing. Also connect the compressor to a power source.

Sample Measurement

1. Temporarily replace the modified port insert with the original port insert.
4. Standardize the instrument and then return the modified port insert to the port.
5. Weigh the specified amount of sample material into the sample cup. The fibers should completely fill the sample cup. For comparability of measurements, the same weight of sample should always be used.
6. Place the sample cup into the cup holder port plate. Adjust the location of the sample clamp to hold the cup in place. The front button on the arm raises and lowers the arm, while the back button moves the clamp in and out.
7. Turn on the flow of clean, dry, compressed air to the clamp. You should attach a filter dryer to the assembly.
8. Pull out the knob on the sample clamp and turn it until the desired pressure is obtained as shown on the pressure gauge. The recommended pressure is 30-40 psi, but must not exceed 100 psi. Push the knob back in. For comparability of measurements, all samples should be measured under the same pressure. Monitor the pressure so that fluctuations that might affect measurements are known.
9. Flip the pressure switch on the sample clamp to the on position (up). The clamp will compress the sample into the sample cup.
10. Initiate a reading.
11. Turn off the air pressure, remove the sample from the port, and continue with measurement of additional samples.



Figure 60. Sample Compression

Note: Always return the modified port insert to its protective cap after use

Cylindrical Cell Holder (D02-1011-550)

This option provides a holder for 27-mm to 30-mm (OD) cylindrical sample tubes at the instrument transmittance port. This holder may be used for measurement of transparent liquids in cylindrical glass tubes with 20-mL, 40-mL, or 60-mL volumes (not sold by HunterLab).



Figure 61. Cylindrical Cell Holder

Installation

1. Place the tube holder in the transmittance compartment, orienting the holder so that the slotted portion of the base faces away from the sphere with the flat side at the sphere. The open viewing hole in the holder must be centered over the hole in the sphere.
2. Locate the appropriate two mounting holes in the transmittance compartment floor and fasten the tube holder to the instrument using the two thumb screws provided.
3. Standardize the instrument in TTRAN mode using the large area of view and 25.4 mm (-1.00 in) port size. When prompted to read the black card, slide it between the tube holder and the transmittance port. Use a tube of the type you will be using for samples filled with distilled water (for water solution samples) or a clear organic solvent (for organic solution samples) as your standardization blank.
4. Remove the blank liquid and fill the glass tube with sample and then insert the tube into the open column in the tube holder. If needed, adjust the ball detent screws until the tube is held snugly in place. Read the sample.



Figure 62. Tube Holder Installed

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

This option provides an optically clear, 2-inch diameter, 10 mm, 20 mm, or 50 mm-path length flow-through cell for use with the flow-through cell holder. The flow-through cell is placed in the holder at the sphere transmittance port or at the lens. Flexible plastic tubing with an inside diameter of 9 mm (not sold by HunterLab) is connected from the liquid source to the inlet (lower) tube of the cell and from the outlet (upper) tube to a drain. Using a pump (not sold by HunterLab), the liquid is pumped into the cell until the cell is filled. A sample reading is then taken and the liquid pumped from the cell to the drain.

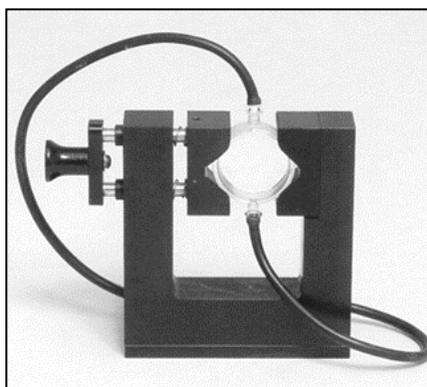


Figure 63. Flow Through Cell

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-

Installation

1. Place the instrument on a level surface.
2. Open the instrument transmittance compartment door. If you have a transmittance sample holder installed, remove it. Be sure that the specular exclusion port door is closed.
3. Place the flow-through transmittance cell in the cell holder using the handle on the right side of the cell holder to open and close the holder. Orient the inlet and outlet tubes vertically.
4. If you wish to make total transmittance measurements, place the cell holder into the instrument transmittance compartment and orient the cell holder so that the cell is almost touching the sphere. The cell must be centered over the instrument transmittance port. If you will be making regular transmittance measurements, place the cell holder against the lens in the opposite orientation.
5. Locate the two 1/4-20 tapped mounting holes inside the instrument transmittance compartment and fasten the cell holder to the instrument with the two thumb screws. Be sure that the screws are snug and that the cell holder is held securely in place.

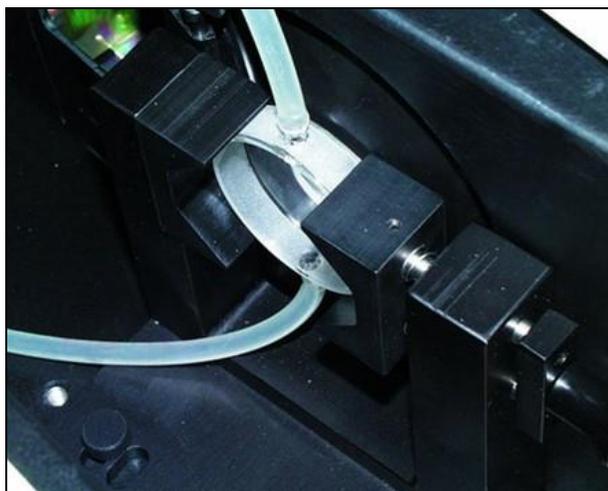


Figure 64. Flow Cell Installed

Sample Measurements

1. Standardize the instrument in a transmittance mode. The flow-through cell should be filled with distilled water or another clear solvent to set the top of scale.
2. Inject the sample to be measured into the cell.
3. Proceed with sample measurement.
4. Drain the sample from the cell.

Note: The pressure used to inject the liquid into the cell should not exceed 1 atmosphere (14.7 lbs/in²).

Caution: Do not standardize in RSEX mode with the flow-through cell assembly in place. This may damage the cell and/or instrument.

Note: The flow-through Transmittance cell may need to be cleaned periodically. Use a glass cleaner on the exterior of the cell and distilled water pumped through the cell for the interior.

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.

Installation

Install the foot switch by plugging it into the round connector on the back of the instrument.



Figure 65. Foot Switch

Glass Port Insert (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.

Installation

Remove the standard port insert by pulling it out of the port insert retainer. Replace it with the glass port insert. Make sure that the flat portion of the insert is facing outward with the beveled portion toward the interior of the sensor.

Sample Measurements

Standardize the instrument with the glass in place. Check the measurements of the green and white tiles before performing any other diagnostics without the glass cover. Difference measurements using a glass cover will be more accurate than absolute measurements.



Figure 66. Glass Port Insert

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 67. Preform Holder

Installation

1. Lower the sample clamp as far as it will go.
2. Insert the two finger clamps of the preform holder into the guidance holes located below the reflectance port on the front of the instrument.
3. Tighten the holder into place by turning both knobs clockwise.

Sample Measurement:

1. Standardize the instrument in RSIN mode using **0.375 inch (9.525 mm) as the area view**. You will need to remove the preform holder to standardize or else standardize before installing the holder.
2. Open the holder. It is easiest to do this by placing your fingers around the handle and resting the thumb of the same hand on the end of one of the spring screws. Pull the handle toward the thumb until the holder provides an opening large enough for insertion of the desired preform. Insert the preform into the holder as far as the preform will go with the threads to the right. Then close the holder and confirm that the preform is held securely in place.



Figure 68. Preform Holder Installed

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.

Installation

1. Lower the sample clamp as far as it will go.
2. Insert the two finger clamps of the sample shelf into the guidance holes located below the reflectance port on the front of the instrument.
3. Tighten the sample shelf into place by turning both knobs clockwise.



Figure 69. Insert Shelf

Sample Measurement

1. Place your sample on the shelf and cover it with the light cover (if included).



Figure 70. Sample Placed on Shelf



Figure 71. Light Cover over Sample Container

2. Measure the sample.

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 72. Cell Holder Base Assembly

Installation

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.

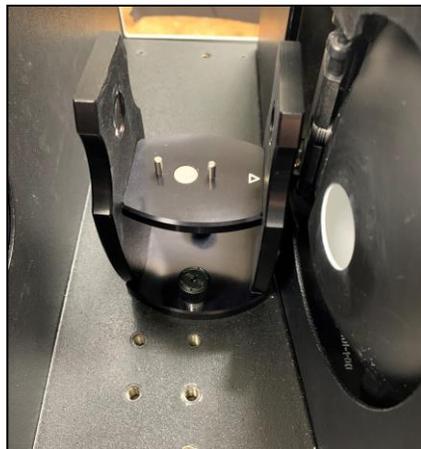


Figure 73. Orient the Holder as Shown.

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 74. Cell Holder Installed

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

Precision Cell Holder for Plastic Micro Cells

This Cell Holder Base Assembly with one or more precision cell 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 end---users 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) (Used on: UltraScan PRO, UltraScan VIS).



Figure 75. Typical Semi-Micro Cell and Macro Cell Holder

D02-1016-912 Precision Cell Holder for Semi-Micro Cells (Brand Plastic Cells) This precision cell holder positions **semi-micro** analytical plastic cells in combination with the Cell Holder Base Assembly (D02-1016-956, sold separately). This assembly provides accurate positioning for repeatable transmission color measurements. This cell holder is precisely designed to hold **semi-micro** 10mm Plastic cells with outside path length dimension not exceeding 12.42 (path

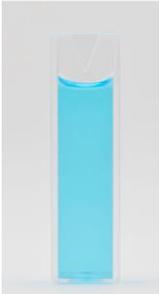
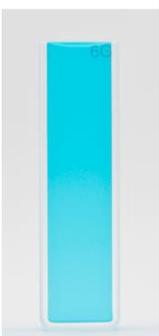
length) x 12.50mm (0.489 X 0.492 inches). A Starter kit of three PMMA Plastic cells is included with this cell holder.

D02-1016-913 Precision Cell Holder for Macro Cells (Brand Plastic Cells). This precision cell holder positions **macro** analytical plastic cells in combination with the Cell Holder Base Assembly (D02-1016-956, sold separately). This assembly provides accurate positioning for repeatable transmission color measurements. This cell holder is precisely designed to hold **macro** 10mm plastic cells with outside path length dimension not exceeding 12.32 (pathlength) x 12.35mm (0.484 x 0.490 inches). A starter kit of three PMMA plastic cells is included with this cell holder.

D02-1017-048 Precision Cell Holder for Macro Cells, (Hellma/Starna Glass Cells). This precision cell holder positions **macro** analytical glass cells in combination with the Cell Holder Base Assembly (D02-1016-956, sold separately). This assembly provides accurate positioning for repeatable transmission color measurements. This cell holder is precisely designed to hold **macro** 10mm glass cells with outside path length dimension not exceeding 12.50 (path length) x 12.50mm (0.492 x 0.492 inches). Please ensure that your cell type matches the dimensional specification listed for each cell.

D02-1017-050 Precision Cell Holder for Semi-Micro Cells, (Hellma/Starna Glass Cells). This precision cell holder positions **semi-micro** analytical glass cells in combination with the Cell Holder Base Assembly (D02-1016-956, sold separately). This assembly provides accurate positioning for repeatable transmission color measurements. This cell holder is precisely designed to hold **semi-micro** 10mm glass cells with outside path length dimension not exceeding 12.47 (path length) x 12.50mm (0.492 x 0.492 inches). Please ensure that your cell type matches the dimensional specification listed for each cell.

D02-1017-051 Precision Cell Holder for Ultra-Micro Cells, (Brand Plastic Cells) This precision cell holder positions **ultra-micro** analytical plastic cells in combination with the Cell Holder Base Assembly (D02-1016-956, sold separately). This assembly provides accurate positioning for repeatable transmission color measurements. This cell holder is precisely designed to hold **ultra-micro** 10mm plastic cells with outside path length dimension not exceeding 12.50 (path length) x 12.50mm (0.492 x 0.492 inches). A starter kit of three plastic cells is included with this cell holder.

Cell Holder	Description	Cell Volumes	Cell Outside Dimensions	Tested Cells (Purchased Separately)	Cell Type
D02-1016-912 Cell Holder, Semi-Micro for use with 10mm plastic cells		Semi-Micro Plastic (Min -0.6mL) (Max 1.5mL)	12.42 x 12.50 mm 0.489 x 0.492 in	Brand (759086D)	
D02-1016-913 Cell Holder, Macro for use with 10mm plastic 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 (For use with 10 mm 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, Macro (For use With 10 mm Glass 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)	

<p>D02-1017-050</p> <p>Cell Holder, Semi-Micro (For use with 10 mm Glass Cells)</p>		<p>Semi-Micro Glass</p> <p>(Min- 0.6mL) (Max- 1.5mL)</p>	<p>12.47 x 12.50 mm</p> <p>0.491 x 0.492 inches</p>	<p>Hellma (104-10-20)</p> <p>Starna (9-SOG-10)</p>	
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Installation

1. Slide the precision cell holder into the transmittance compartment at the center, widest part of the transmittance compartment.
2. Depress and turn the captive thumbscrews clockwise into holes in the transmittance compartment floor.

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



Figure 76. Insert Cell Holder

Sample Measurements

1. Snap in a cell holder and initiate standardization in TTRAN mode sliding the black card device between the cell holder and the hole in the sphere when prompted for the black card.
2. When prompted for the cell blank, fill the desired analytical cell with distilled water or another clear liquid you would like to use as your top of scale. Some cells will have a fill line. The liquid should at least reach this line.
3. Slide the transmittance cell into the cell holder as far as it will go. If your cell has an indicator arrow, point it toward the hole in the instrument sphere.
4. Complete the standardization by measuring the cell blank as the top of scale.

5. 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.
6. 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.



Figure 77. Insert Cell in Holder

Semi-Micro Powder Holder (D02-2012-313)

This option provides a holder and special port plate that allow the measurement of small quantities (approximately 0.4 cc) of packed powder.

Installation

1. Install the small area view port plate and standardize the in a reflectance mode for the 0.375-inch (9.575 mm) area view.
2. Replace the standard port plate with the modified port plate.



Figure 78. Insert Port Plate

Sample Measurement

1. Place the powder to be read into the powder holder.

2. Pack the powder down using the plunger. Do not overtighten the powder holder. The powder should be at least 1/2-cm deep in the holder.
3. Place the powder holder into the port plate and measure the sample.



Figure 79. Pack the Powder with the Plunger

Note: The powder holder should be used ONLY for color difference measurements.



Figure 80. Insert Powder Holder in Port Plate

4. Between measurements, remove the powder holder, unscrew the top, and clean the glass. The glass insert may be removed from the powder holder for cleaning or replacement. Replacement inserts may be purchased from HunterLab. No adhesive is required

Skein Holder Option (02-7396-00)

This is a device for measuring yarn skeins. Wind the yarn around the skein holder in multiple taut layers until it is effectively opaque and is as flat as possible.

Place the skein holder at the sample port and back it with the sample clamp or a white backing tile to provide a consistent background and pressure. Make several measurements of the skein, rotating the holder 90° between measurements and averaging the readings for the final result.



Figure 81. Skein Holder

Holder & 10mm Small Volume Transmittance Cells (D02-1011-886 & 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 has an outside diameter of 28 mm, an inside diameter of 25 mm, and a 10-mm path length. The cell and holder together are used for total transmittance measurements of small quantities of liquids.



Figure 82. Small Volume Transmittance Cell & Holder

Installation

To install the holder, position it so that the holes in its base are down toward the floor of the transmittance compartment and the cutout in the vertical section is at the transmittance port (hole in the sphere). The base holes should be positioned over two of the threaded holes in the transmittance compartment floor. Insert the two thumbscrews provided and tighten.

Sample Measurement

To operate, fill the cylindrical cell with the clear solvent that is to be used as a blank for standardization. Then, slide the lever of the cell holder out to open the space for the cell. Insert the cell into the holder and gently release the lever until the cell is held securely in place. Standardize the instrument in TTRAN mode using the blank to set the top of scale. Remove the solvent from the cell and replace it with the sample liquid. Return the cell to the holder and measure the sample.

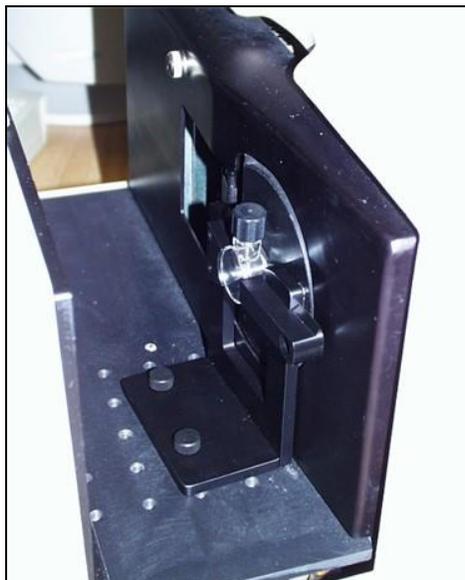


Figure 83. Measuring with Small Volume Cell

CAUTION

Do not standardize in RSEX mode with the small volume cell holder in place. This may damage the cell and/or instrument.

Transmittance Cell Holder (C02-1005-481)

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

Installation

To install it, slide the Transmittance cell holder into the Transmittance compartment at the center, widest part of the Transmittance compartment. To use the Transmittance cell holder, position the holder inside the Transmittance compartment so that the flat end of the holder is aligned with the rear wall of the Transmittance compartment. The slanted end will be at the sphere wall at the front of the compartment. Ensure that the holder is flush against the sphere wall. Depress and turn the captive screws clockwise. If the holder is slightly off-line, reposition it so that the screws align properly in the holes on the floor of the Transmittance compartment.

Sample Measurements

You may use the holder for measurements in either total or regular Transmittance by following the software prompts to standardize in the desired mode. If you are using total Transmittance (TTRAN), place the cell at the **sphere** opening at the front of the Transmittance compartment. If you are using regular Transmittance (RTRAN), place the cell at the **lens port** at the rear of the Transmittance compartment.

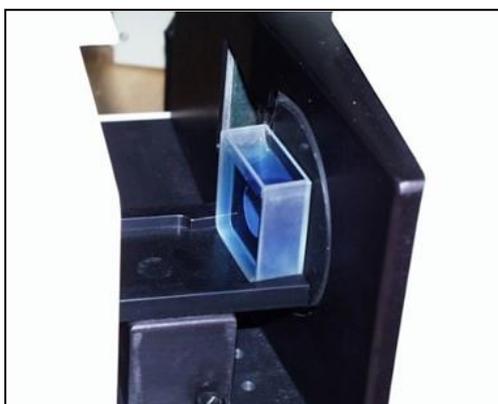


Figure 84. Cell at Sphere Opening

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.

For Transmittance measurements, use the cell size recommended by your measurement specification (such as an ASTM method), or use the general rule that smaller path lengths should be used for more concentrated colorants. The dimensions and volumes of the various Transmittance cells are as follows:

Cell Type	Path Length (mm)	Minimum Sample Volume for Measurement (mL)	Dimensions of Measurement Face (Width x Height in mm)	Part Number
Open Top	10	20	55 x 57	13-8573-40
Open Top	20	40	55 x 57	04-4592-00
Open Top	33	70	55 x 57	B04-1003-801
Open Top	50	100	55 x 57	13-8573-20
Screw Top	10			D12-1011-893
Screw Top	20			D12-1011-890
Screw Top	33			D12-1011-891
Screw Top	50			D12-1011-892
Tall Cells (3)	20		40x204	B04-1002-672

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. Otherwise, these transmittance cells are used in exactly the same manner



as those described above.

Figure 85. Transmittance Cell with Top

Tall Transmittance Cells

This option provides a set of three transmittance cells that have path lengths of 20-mm, but that are 40-mm wide and 204 mm tall, quite a bit taller than the standard transmittance cells.

Transmittance Preform Holder (D02-1011-833)

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

Installation

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



Figure 86. Preform Holder

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

Sample Measurement

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 transmittance 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 transmittance 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.
4. If possible, close the transmittance compartment door, and then make your measurement.

5. Open the transmittance compartment door, rotate the preform, and measure it again.
6. Repeat step 5 until the preform has been measured the desired number of times.

Transmittance Clamp (C02-1005-444)

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

Sample Measurements in Regular Transmittance:

1. Position the Transmittance clamp so that the curved opening is aligned at the lens port located at the rear of the Transmittance compartment. The inner curvature of the clamp should align with the outer curvature of the lens.
2. When properly aligned, the holes in the bottom of the clamp assembly will align with holes in the floor of the Transmittance compartment. Place a washer and one 1/4-20 7/8-inch screw in each of the holes and tighten by turning the screw clockwise. (You may finger-tighten the screws or you may use the Allen wrench that is included with the Transmittance clamp.)
3. Follow the software prompts to standardize in regular Transmittance (RTRAN).
4. Place the film sample at the lens port by pulling forward on the tab at the bottom of the clamp and sliding the Transmittance clamp holder forward. Place the film at the lens and release the tab. The rubber grommet at the rear of the Transmittance clamp will firmly hold the sample in place for measurement.
5. Close the Transmittance compartment door and make the measurement.

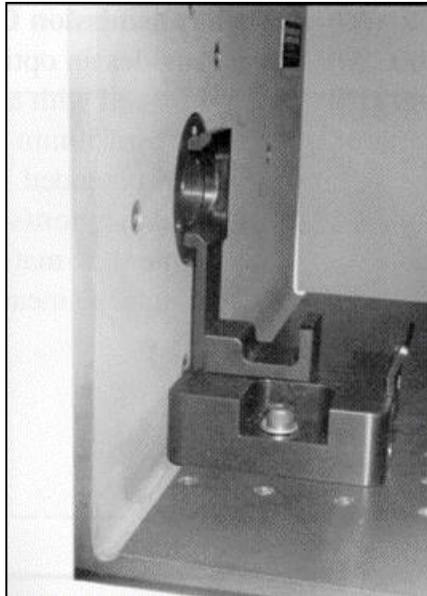


Figure 87. Transmittance Sample Clamp

Sample Measurements in Total Transmittance:

1. Position the Transmittance clamp so that the curved opening is aligned at the opening of the sphere at the front of the Transmittance compartment. The inner curvature of the clamp should align with the outer curvature of the sphere.

2. When properly aligned, the holes in the bottom of the clamp assembly will align with holes in the floor of the Transmittance compartment. Place a washer and one 1/4-20 7/8-inch screw in each of the holes and tighten by turning the screw clockwise. (You may finger-tighten the screws or you may use the Allen wrench that is included with the Transmittance clamp.)
3. Follow the software prompts to standardize in total Transmittance (TTRAN).
4. Place the film sample at the sphere opening by pulling back on the tab at the bottom of the clamp and sliding the Transmittance clamp holder backward. Place the film at the sphere opening and release the tab. The rubber grommet at the front of the Transmittance clamp will firmly hold the sample in place for measurement.
5. Close the Transmittance compartment door and make the measurement.

Transmittance Spill Tray (D02-1011-568)

The Transmittance spill tray, when installed in the transmittance compartment, protects the compartment from spills of liquid samples. The tray can hold up to 600 mL of liquid. The top portion of the spill tray simulates the function of the transmittance cell holder.

Installation

Slide the spill tray into the transmittance compartment at the center, widest part of the transmittance compartment. Position it so that the flat end of the transmittance cell holder portion is aligned with the rear wall of the Transmittance compartment. The slanted end will be at the sphere wall at the front of the compartment. Ensure that the holder is flush against the sphere wall. Depress and turn the spill tray's captive screws clockwise. If it is slightly off-line, reposition it so that the screws align properly in the holes on the floor of the Transmittance compartment. Then use the transmittance cell holder portion as you would the normal transmittance cell holder device.



Figure 88. Spill Tray

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.

Index

- Accessories, 10
- Allen wrench, 10
- Automated UV control, 9
- Black card, 10
- Certificate of traceability, 11
- Communications cable, 11
- Configure Multi Mode, 22
- Diagnostics software CD, 11
- Didymium filter, 10
- Didymium filter cleaning, 39
- Didymium filter test, 32
- Environmental requirements, 41
- Features, 5
- Fuses, 10, 35
- Ganz-Griesser calibration, 9
- Green tile, 10
- Green tile test, 31
- Haze Measurements, 26
- Illumination, 42
- Indicator lights, 9
- Installation, 13
- Instrument performance, 43
- Lens surface, 39
- Light trap, 10
- Macro button, 10
- Maintenance, 31
- Non-slip pad for sample clamp, 10
- Options, 44
- Physical characteristics, 41
- Power cord, 11
- Power required, 41
- Reflectance port, 6
- Regulatory notice, 43
- Repeatability test, 31
- Retro-viewer, 7
- RS-232 communications cable, 11
- RSEX, 20
- RSIN, 20
- RTRAN, 20
- Sample clamp, 7
- Sample devices, 44
- Small area view, 6
- Source lamp, 32
- Specifications, 41
- Specular included/excluded port, 8
- Sphere, 39
- Standardization, 19
- Standardization modes, 20
- Standards care card, 10
- Testing, 31
- Tile data sheet, 10
- Transmittance compartment, 8
- TTRAN, 20
- USB adapter cable, 11
- UV control, 9
- UV Filter Calibration, 23
- View lamp, 37
- Viewing, 42
- White calibrated tile, 10