Ci7XX0
Benchtop Spectrophotometer

User Guide

x·rite

Consult this documentation in all cases where the Attention symbol ⚠ appears.
This symbol is used to inform you of any potential HAZARD or actions that may require your attention.

CE Declaration

CE Hereby, X-Rite, Incorporated, declares that this Ci7XX0 series is in compliance with the essential requirements and other relevant provisions of Directive(s) 2014/35/EU (LVD), 2014/30/EU (EMC), and RoHS 2011/65/EU.

US & Canadian Approvals

This product conforms to ANSI/UL 61010-1:2012 and is listed by Intertek; Control No. 3050828
This product is certified to CAN/CSA C22.2 No. 1010.1

Federal Communications Commission Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada Compliance Statement

CAN ICES-3 (A) / NMB-3 (A)

Equipment Information

⚠ Use of this equipment in a manner other than that specified by X-Rite, Incorporated may compromise design integrity and become unsafe.

WARNING: This instrument is not for use in explosive environments.

Do not look directly into the measurement optics when the instrument is on.

For indoor use only.

CLASS 1 LASER PRODUCT

IEC 60825-1:2007

Notice: This device emits class 1 laser radiation. Class 1 laser products are classified to be safe during normal operation.
Laser emission specifications: continuous wave 532 nm, ≤ 0.39 mw

No user serviceable parts in this product. All warranty and non warranty repairs should be referred to an authorized X-Rite service center.
CAUTION– Class 3B Laser Radiation from internal laser module is present when instrument cover is removed. Avoid exposure to the beam.

Instructions for disposal: Please dispose of Waste Electrical and Electronic Equipment (WEEE) at designated collection points for the recycling of such equipment.

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Grand Rapids, Michigan 49512

Phone:
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Table of Contents

OVERVIEW

The Ci7XX0 is a reflectance / transmittance sphere benchtop spectrophotometer offering agreement with these X-Rite/GretagMacbeth instruments: 7000A, Color i7, and Color i5. The Ci7XX0 Spectrophotometer includes these features:

- Multiple areas of sample view in both reflectance and transmittance.
- Self-adjusting, dual zoom lens to manage the measurement area and eliminate configuration errors between aperture plates and lens position.
- External video monitor viewing, preview video in the software application, and hinged sample door preview for measurement accuracy and targeting purposes.
- Haze measurement mode (excludes Ci7500 series).
- Automated ultra violet (UV) adjustment for measuring fluorescent or optically brightened samples.
- USB interface to PC and software applications.
- Indicator panel display with dual buttons for standard and sample measurements, and warning indicators for calibration interval.
- Dampened sample arm holder that prevents sample damage.
- Embedded white sample holder ceramic. Ideal for reflectance measurements that require a white backing, such as textiles, plastics or other less than opaque samples (Standard on Ci7800/Ci7860 instrument and optional on the other models).
- Supports embedded NetProfiler.

Locking pin

Transmission access cover

Button and indicator membrane label (refer to Front Panel for a description)

Rear lifting grip

Front lifting grip

Communication, line cord and power switch

Sample holder

Accessory drawer (white tile, green tile, black trap, aperture plates, UV cal plaque)

Sample door

Ci7XX0 instrument can also operate in the upright position with optional kit.

Packaging Information

If you are reading this documentation, you have already followed the instructions detailed in the Ci7XX0 installation sheet that was included in the shipping carton. Please keep the installation sheet for reference. Keep your shipping carton in case you need to return your instrument to the factory for service.

Your instrument packaging should contain all the items listed below. If any of these items are missing or damaged, contact X-Rite or your Authorized Representative.

- Software box containing the Ci7XX0 Driver and Documentation CD along with any other optional software you may have ordered such as Color iControl and NetProfiler.
- Ci7500 Series, Ci7600 Series, or Ci7800 Series Spectrophotometer
- Certificate of performance
- Installation instructions sheet
- USB cable
- AC power cord
- Sample shelf with thumb screws
- Transmission kit (optional on Ci7800 Series & Ci7600 Series)

The following accessories are stored in the instrument accessory drawer.

- Round white calibration tile
- Round green performance tile
- Black trap for calibration
- Ci7800 Series aperture plates: 25 mm, 17 mm, 10 mm, 6 mm, (3.5 mm optional)
  Ci7600 Series aperture plates: 25 mm, 10 mm, 6 mm, (3.5 mm optional), (17 mm optional)
  Ci7500 Series aperture plates: 25 mm, 10 mm
- White UV plaque

Instrument Setup

Please follow the instructions detailed in the Ci7XX0 Installation Instructions sheet found as the first item in your shipping box when you opened it. A PDF file of the Installation Instructions also can be found on the Ci7XX0 Driver and Documentation CD.

Powering the Instrument

The power on-off AC switch is located on the back of the instrument. Press the top of the rocker switch to turn on the instrument and wait 50 seconds for the instrument to boot up. If the instrument does not power up after approximately 50 seconds, check the power connections to the unit and main power availability (breakers, fuses). If these connections are fine, check the instrument's fuse. Refer to "Fuse Replacement" in the Appendix.

A power "standby" button is located on the front panel of the instrument. This button is used to power down the instrument into a low power state, or wake the instrument after it goes into a power down state. A power on condition is designated by a solid green light indicator. Simply press the power "standby" button to wake or power down the instrument into "standby" mode.

⚠ Discontinue use if AC cord is damaged.
Ensure AC cord ratings meet or exceed the instrument ratings (see Specifications section in the Appendices).

Sample Preview Method

The instrument has three sample preview methods:

Sample Door

This method enables you to open the sample door and look at the sample position in the viewport. You can make manual adjustments if necessary to obtain optimum sample alignment. Refer to the instructions on using the Sample Door Preview Method.

External Video Monitor Feature

This method requires an external preview video monitor. The monitor is plugged into the video connector located on the back of the instrument. After the monitor is connected, the **Preview** button on the spectrophotometer can be pushed to turn live preview video on and off. Video on/off is the default functionality of the **Preview** button when using a reflectance measurement mode. However, your software application may assign a different behavior to the button for various reasons.

Live Preview Video in PC Software Application

This method requires a software application, such as Color iQC to provide a means to view video within the application. Follow the instructions in your application to preview video for sample alignment.

Note: DO NOT power down the instrument into "Standby" mode when preview video is actively streaming in the application. Doing so may result in an unstable operation condition.

Front Panel

The front panel is used to initiate measurements and also indicate a variety of instrument conditions, such as calibration status, measurement status, etc. Below is description for each indicator and button.

11
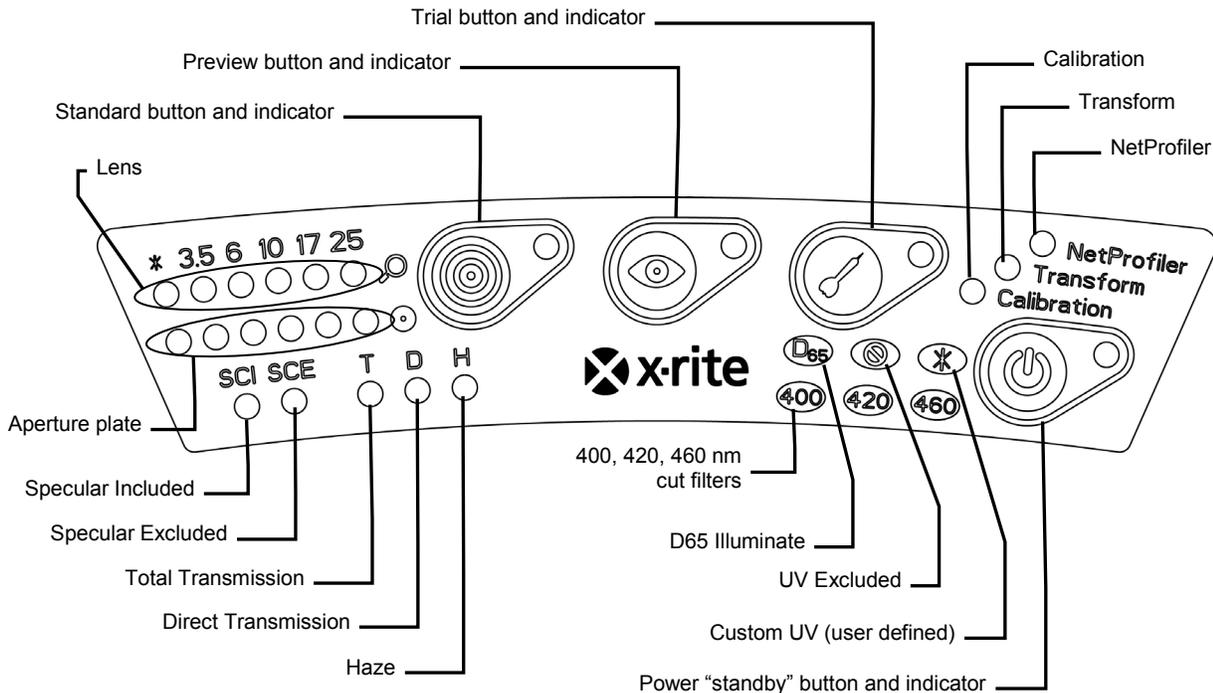
Lens and Aperture Plate Indicators (*, 3.5, 6, 10, 17, 25)
- The top row of LEDs illuminates to indicate the current lens position. The "*" illuminates when the lens is in a custom position. The LED will light red if the unit is configured with a lens position larger than the installed aperture plate size.
- The bottom row of LEDs illuminates to indicate the currently installed aperture plate. The "*" illuminates for custom plates and transmission aperture plates (with white reflective ring), and blinks if the instrument could not detect the installed plate. If auto is enabled for the lens, then the installation of an aperture plate automatically sets the lens to match the aperture plate.

Standard Button and Indicator
- The standard button is used to initiate a standard measurement. Note: The button must be supported by your application software and function as programmed.
- The indicator illuminates green when programmed to perform a measurement. It may also be programmed to flash green to support features in your application.

Preview Button and Indicator
- The preview button is used in conjunction with the external video monitor preview feature.
- The indicator illuminates green when it is activated.
- The video preview is toggled when a reflectance measurement mode is selected. When a transmission measurement mode is selected, the button will toggle the green transmission targeting laser on and off.
- The behavior of the button may also be programmed in your software application.

Trial Button and Indicator
- The trial button is used to initiate a trial measurement. Note: The button must be supported by your software application and function as programmed.
- The indicator illuminates green when programmed to perform a measurement. It may also be programmed to flash green to support features in your application.

NetProfiler
- *Indicator Off:* NetProfiler feature is not enabled.
- *Solid Green:* NetProfiler subscription is currently activated.
- *Solid Amber:* The profile has expired and updating is recommended.

Calibration
- *Solid Red:* Calibration is required
- *Solid Green:* White, black, and UV calibration are not required at this time
- *Solid Amber:* White and black calibration are not needed, but UV calibration has expired. Measurements can still be taken in this condition. It is up to the user to decide if the UV calibration should be updated at this time.

Transform
- *Indicator Off:* Transform feature in not enabled
- *Solid Green:* Transform feature is activated

Specular Included (SCI)
- Illuminates when a specular included measurement is selected.

Specular Excluded (SCE)
- Illuminates when a specular excluded measurement is selected.

Total (T) – excludes Ci7500 series
- Illuminates when a total transmission measurement is selected.

Direct (D) - excludes Ci7500 series
- Illuminates when a direct transmission measurement is selected.

Haze (H) - excludes Ci7500 series
- Illuminates when a haze measurement is selected.

D65 Illuminate
- Illuminates when it is UV calibrated to a D65 UV illumination condition.

UV Excluded (◎)
- Illuminated when one of the UV filters fully blocks the UV component in the lamp to fully exclude UV illumination.

Custom (∗)

- Illuminated when a user-defined D65 or other UV condition is selected.

400
- The 400 nm UV cutoff filter is in use. This filter is adjustable and can be used to calibrate UV conditions.

420 - excludes Ci7500 series
- The 420 nm UV cutoff filter is in use. This optional filter is adjustable and can be used to calibrate UV conditions.

460 - excludes Ci7500 series
- The 460 nm UV cutoff filter is in use. This optional filter is not adjustable and can only be set to fully exclude UV illumination.

**Power "standby" button and indicator**
- Refer to Powering the Instrument earlier in this section.

Sample Shelf

A sample shelf is provided to help align a sample with the measurement port. It is also useful for providing consistent sample placement when multiple samples require a measurement at the same location.

To install the sample shelf, position the shelf's elongated slots over the two holes in the sample door and attach it with the thumb screws provided.

Adjust the shelf by loosening the thumbscrews and sliding the shelf up or down.
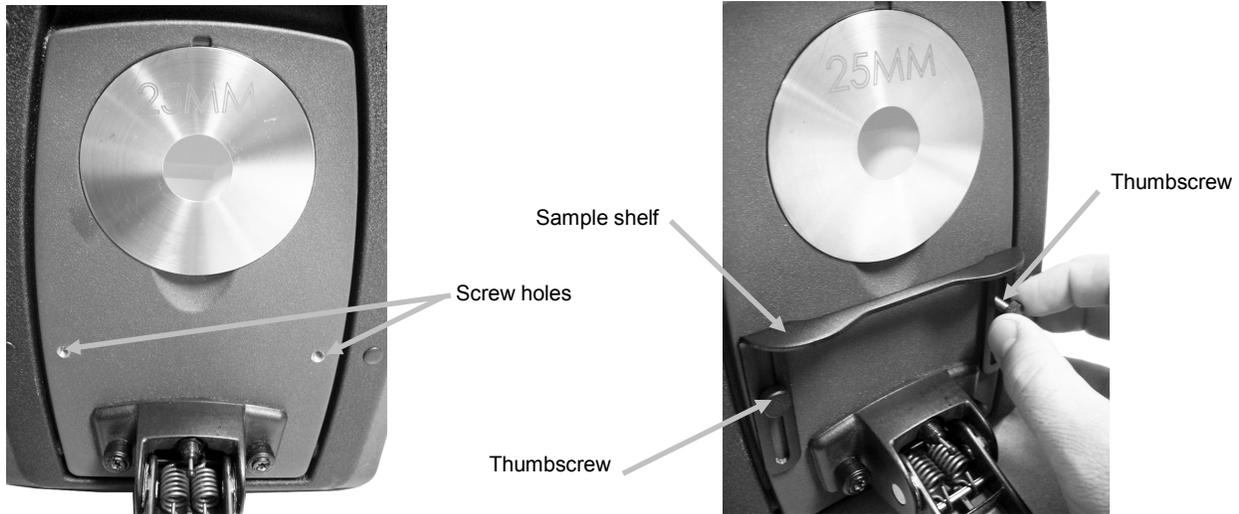
Sample Holder

The sample holder can be locked in a down position. This is convenient when large samples are measured, or when the aperture plate is changed or the sample holder is removed.

Simply open the sample holder to its maximum position to lock into position.

Sample Door

The sample door can be opened for a completely unobstructed view of the sample presented at the view port. When completely open, the sample door allows you to adjust the sample at the view port for optimal placement.

To use the sample door:

1. Open the sample holder by pulling it towards you. Place your sample at the view port and close the sample holder.

2. Open the door from the top by using your fingers, and gently lower the door to the complete open position. See the figure below.

Pull from top

Sample door

Sample holder
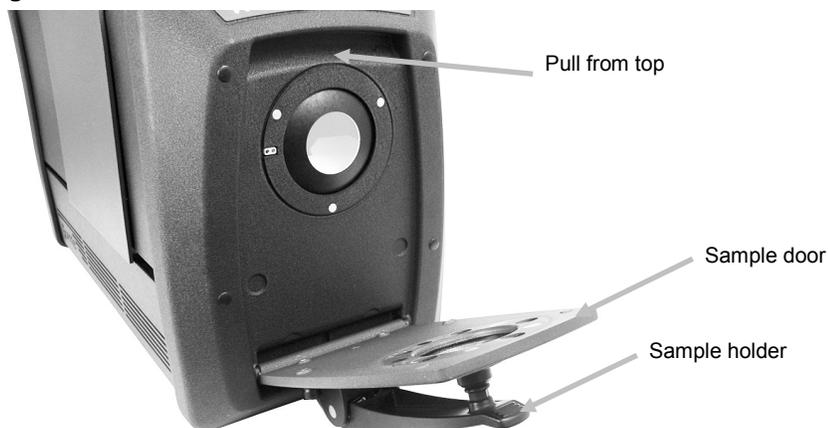
3. With the sample door completely open, view the sample at the view port and make sure the sample is in an optimal position for measuring.

Observe sample here through viewport opening

4. Close the sample door and prepare for the measurement.

Specular Control

You can change the specular component setting on the spectrophotometer for reflectance measurements using your software application. Select the desired specular component measurement mode; Included (SCI), Excluded (SCE), or Dual Mode (SCE/SCI). The indicator for

either setting (or both if you have dual mode) on the front panel becomes illuminated based on your selection. The instrument simultaneously measures specular included and specular excluded for all reflectance measurements. Your software application should decide which measurement data to request from the spectrophotometer according to the user requirements.

UV Control

Your spectrophotometer is equipped with an automated 400nm UV filter. This can be set to fully exclude the UV portion of the light source in the spectrophotometer or can be used to calibrate and adjust the UV level, for instance to match the UV component of D65 daylight. The instrument supports built-in UV calibration positions for UV included, UV excluded, and D65. The instrument also supports an unlimited number of user-defined UV positions which are set up, calibrated, and managed using the PC software application. A UV calibration plaque is provided in the accessory drawer that has been calibrated in the factory with a CIE whiteness value for true D65. Your system includes a 400 nm UV filter, and may optionally include a 420 and/or 460 nm UV filter as well.

Aperture Control

By default, the spectrophotometer is configured to auto-recognize an aperture plate when installed at the measurement port, and to auto-drive the lens to the matching size. The lens position is also dependant on the measurement mode. If for example the instrument is configured with the 10 mm aperture plate in a reflectance measurement mode and the user switches to a transmission measurement mode, the instrument auto-drives the lens to create the measurement size at the transmission measurement location.

> **Note:** The automatic lens behavior can be overridden by the user in software if desired. If you prefer to not have matching aperture and lens settings (to have an over illumination setup), you can use your software application to configure the instrument. Keep in mind that a valid measurement size is less than or equal to the aperture plate size. If the lens position and the installed aperture plate do not match, the lens LED will illuminate red to indicate this discrepancy. Auto recognition is applicable to Reflectance mode only.

To install an aperture plate on the instrument:

1. Open the sample holder to the fully open position.
2. Using your fingers, remove the aperture by lifting outward from the notch below the existing aperture plate.

Aperture plate

Notch below plate

3. Locate the plate to be installed in the accessory drawer and fit the aperture over the rim on the sample door. The plate is held in place by magnets.

4. Gently close the sample holder.

5. The aperture plate will be automatically recognized when the door is closed, and activate the auto-zoom lens if set to the auto mode. Auto recognition is only valid for Reflectance mode aperture plates. For transmission aperture plates, the asterisk LED lights up green.

CALIBRATING

The spectrophotometer should be calibrated every eight hours of operation.

Each spectrophotometer configuration that is used should be calibrated. A configuration consists of the following components:

- Measurement mode: Transmission, Reflectance, R/T, or Haze
- Aperture size (3.5 mm, 6 mm, 10 mm, 17 mm, or 25 mm)
- Lens position
- Specular included or excluded condition (SCI or SCE)
- UV included, D65 calibration or excluded condition

Calibration Notes

- **Dirt or dust in the optics area will cause an inaccurate calibration reading**. Refer to the Appendices for optics cleaning procedure.
- **The white calibration tile is dramatically affected by smudge marks, dust, and finger prints**. Refer to Appendices for calibration tile cleaning procedures.
- **The black trap should be cleaned periodically to remove any dust or contamination**. Refer to Appendices for black trap cleaning procedures.

Reflectance Calibration Procedure

To calibrate your spectrophotometer in reflectance measurement mode you need to use your software application. Follow these steps:

1. Verify the 25 mm aperture plate is installed.
2. Launch the calibration procedure from the software application.
3. Remove the white calibration tile from the accessory drawer. Pull down on the sample holder and position the tile on the sample holder clamp. Make sure the white ceramic side is facing the aperture plate.
4. While holding the tile in place, close the sample holder to the aperture plate.

White calibration tile
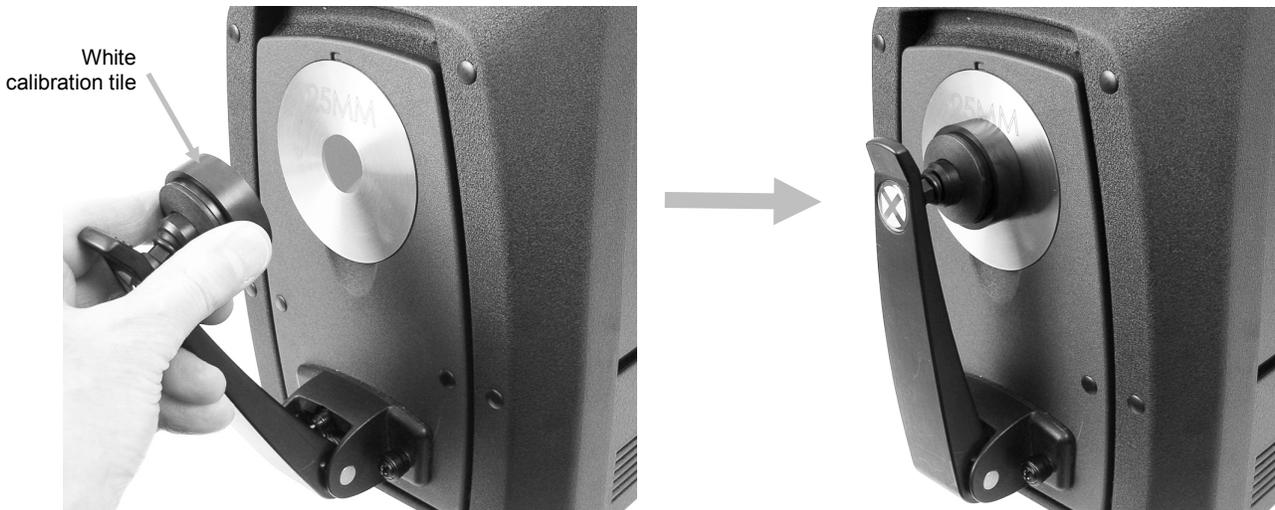
5. Initiate the calibration tile measurement from the software. After the measurement, remove the calibration tile and return it to the accessory drawer.
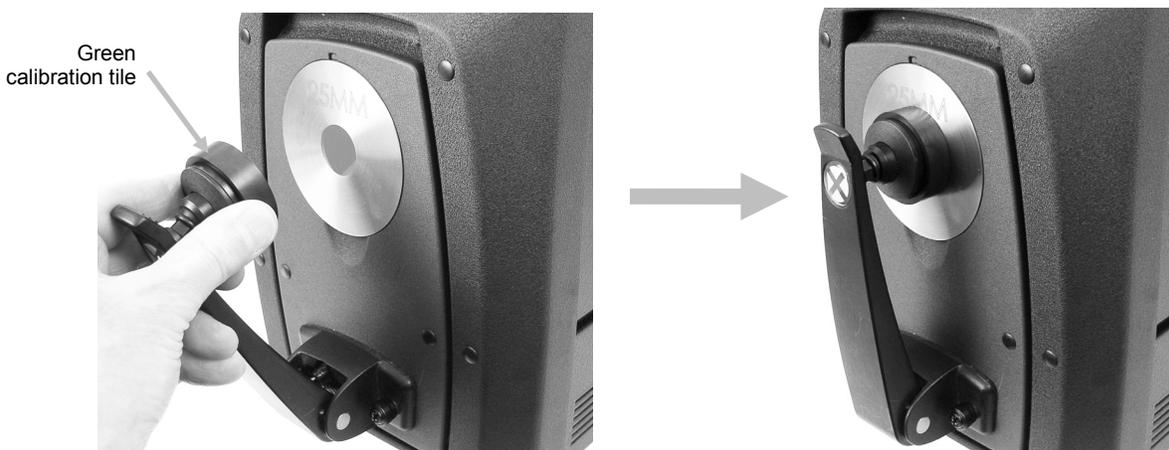
6. Remove the black trap from the accessory drawer and position it on the aperture plate. Make sure to align the tab at the top edge of the trap with the notch at the top of the aperture plate.

Align
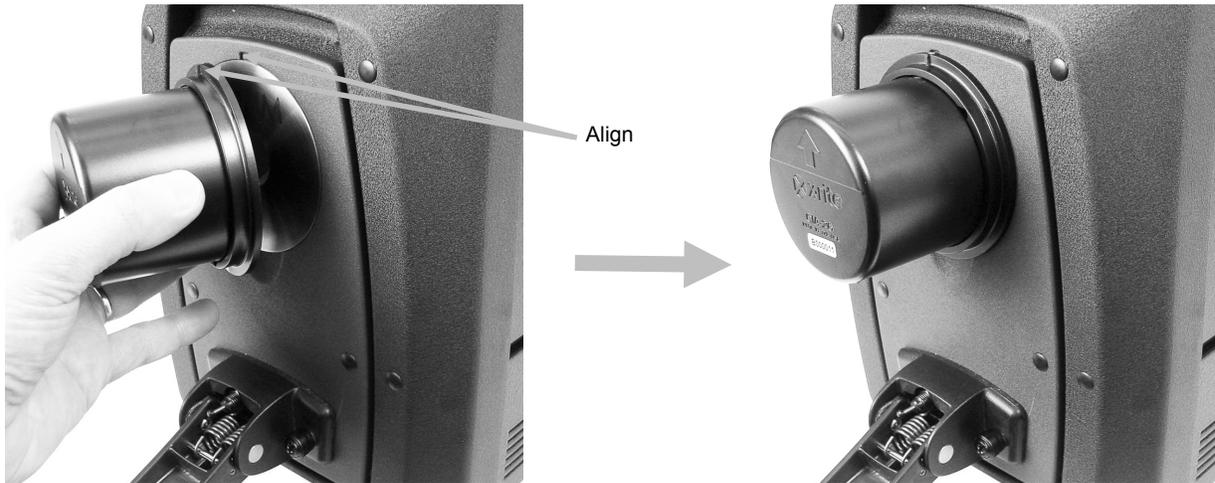
7. Initiate the black trap measurement from the software.

8. Remove the black trap and return it to the accessory drawer.

9. Once the calibration process is complete, the calibration indicator becomes lit. Any change to the spectrophotometer configuration may result in the calibration indicator changing from green (calibrated) to red (not calibrated).

10. Continue with additional configuration calibrations as required.

Green Tile Color Check (optional)

1. Perform a calibration procedure if you have not already done so. Refer to the Calibrating section.

2. Remove the green tile from the accessory drawer. Pull down on the sample holder and position the tile on the sample holder clamp. Make sure the green ceramic side is facing the aperture plate.

3. While holding the tile in place, close the sample holder to the aperture plate.

Green calibration tile

4. Initiate the green tile check procedure from the software application. After the measurement, remove the green tile and return it to the accessory drawer.

Note: Tile values are generated at a temperature of 22°C. Refer to the software application for additional information.

Transmission Calibration Procedure (excludes Ci7500 series)

To calibrate your spectrophotometer in transmission measurement mode, you need to first locate the following items in your optional transmission kit:

Aperture plates 6 mm, 10 mm, 17 mm, or 25 mm (with white reflective ring). The plate can be used for both transmission and reflection measurements in the R/T and haze modes.		Transmission sample holder	
Transmission white plaque		Black plastic blocking panel	

Note: NEVER use the black trap for black calibration when performing Transmission calibration.

Transmission Calibration Setup

Note: For R/T (Reflection/ Total Transmission), perform a Reflectance Calibration before continuing.

1. Using your software application, launch the calibration process from the software interface.
2. Mount the 25 mm aperture plate (with white reflective ring) to the measurement port at the front of the instrument.
3. Position the transmission white plaque on the sample holder.
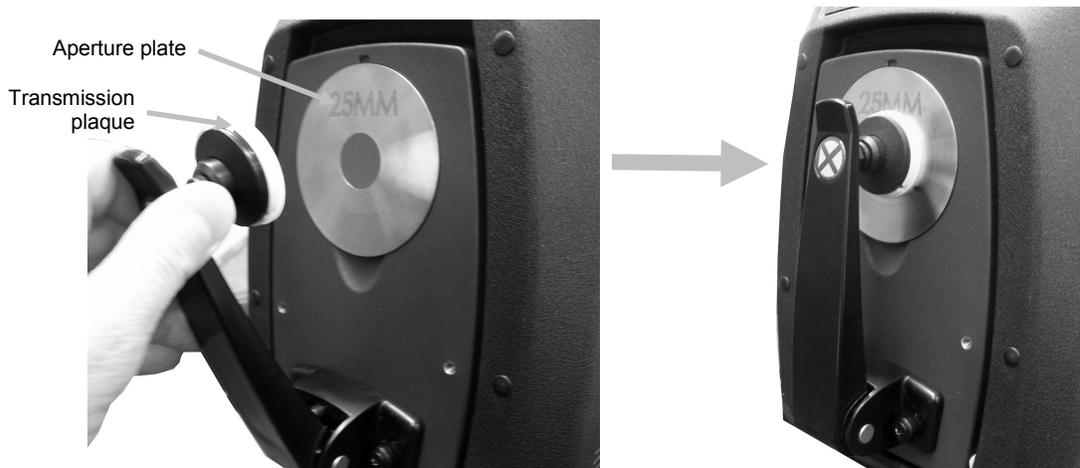
4. Follow any prompts from the software regarding the white calibration.
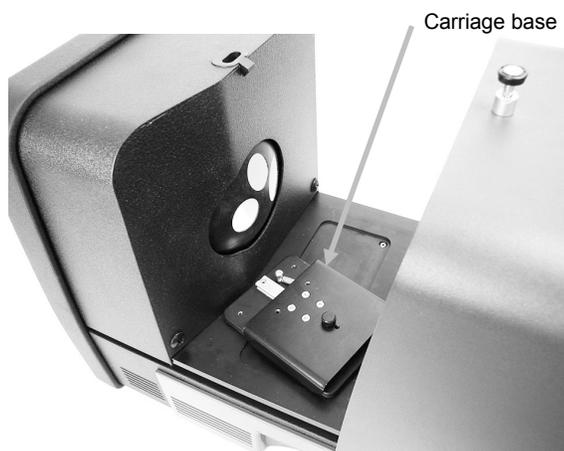5. Open the transmission cover by lifting up on the locking pin while sliding the cover to the back.
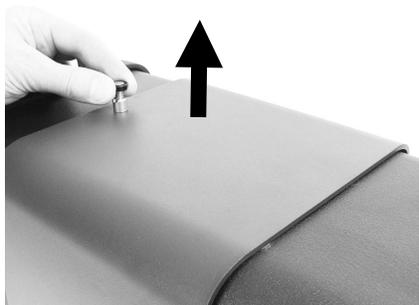
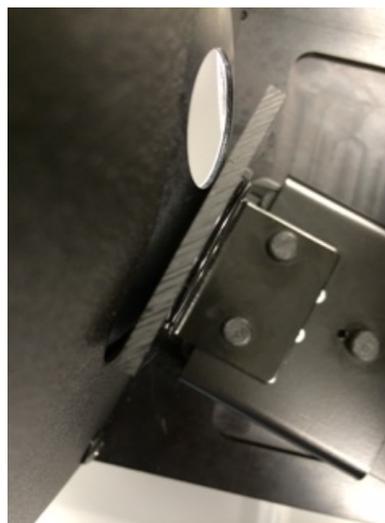**6.** Refer to the remaining Total, Direct, or R/T Calibration procedures that follow.

Total Calibration

1. Place the sample transmission holder base inside the transmission compartment.

Carriage base

Total transmission calibration shown

2. Attach the appropriate clamp and stop to the base with the thumb screws.

3. Center the black plastic blocking panel in the transmission sample holder and place between the stop and clamp toward the sphere.
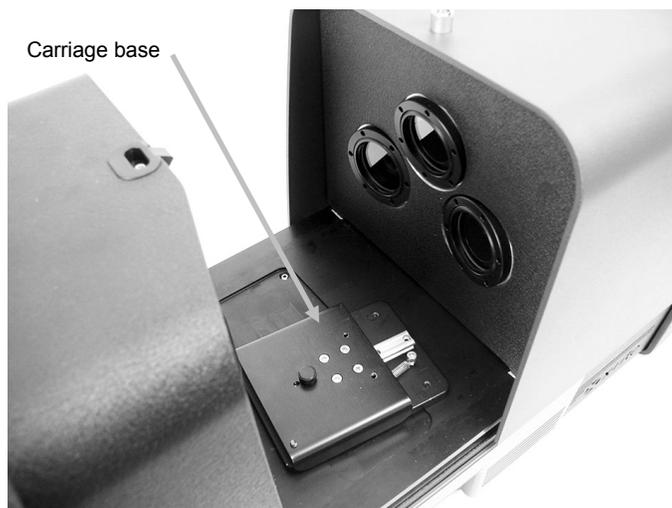

Black plastic blocking panel

4. Close the cover and continue with calibration.

5. Once the calibration process is complete, the calibration LED becomes lit. Any change to the spectrophotometer configuration may result in the calibration LED turning from green (calibrated) to red (not calibrated). Remember that each configuration needs to be calibrated.
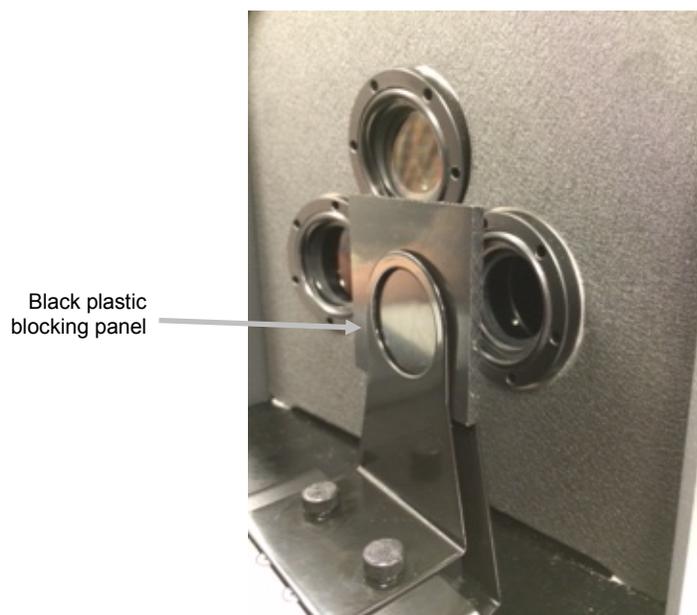
Direct Calibration

1. Place the sample transmission holder base inside the transmission compartment.

Carriage base

Direct transmission calibration shown

2. Attach the appropriate clamp and stop to the carriage base with the thumb screws.

3. Center the black plastic blocking panel in the transmission sample holder and position toward the lens side.
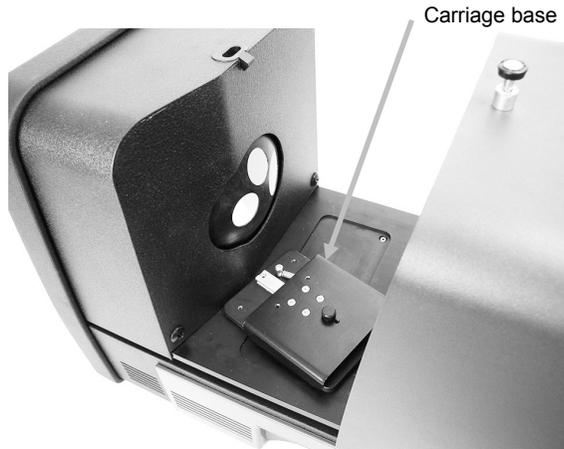

Black plastic blocking panel

4. Close the cover and continue with calibration.

5. Once the calibration process is complete, the calibration LED becomes lit. Any change to the spectrophotometer configuration may result in the calibration LED turning from green (calibrated) to red (not calibrated). Remember that each configuration needs to be calibrated.
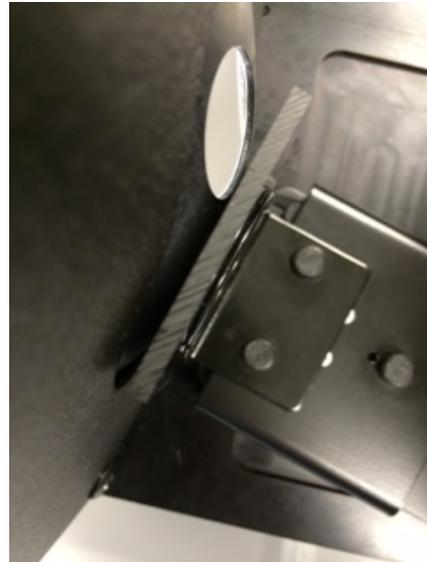
R/T Calibration

1. Place the sample transmission holder base inside the transmission compartment.

Carriage base

R/T calibration shown

2. Attach the appropriate clamp and stop to the carriage base with the thumb screws.

3. Center the black plastic blocking panel in the transmission sample holder and position toward the sphere.


Black plastic blocking panel

4. Close the cover and continue with calibration.

5. Once the calibration process is complete, the calibration LED becomes lit. Any change to the spectrophotometer configuration may result in the calibration LED turning from green (calibrated) to red (not calibrated). Remember that each configuration needs to be calibrated.

Note: The green LED will never appear for any Calibration Mode configured to include a UV Cal option. UV cannot be calibrated in this mode.

UV Calibration Procedure

Note: UV Calibration requires the configured reflectance aperture plate to be installed.

1. Perform a white and black calibration as previously explained.
2. Initiate the UV calibration procedure from the software application.
3. Enter the calibration whiteness value in the appropriate field.
4. Remove the UV calibration plaque from the protective bag in the accessory drawer.
5. Pull down on the sample holder and position the UV calibration plaque against the 25 mm aperture plate. Make sure the white surface is facing the aperture plate.
6. Close the sample holder clamp to the UV calibration plaque.

UV calibration plaque
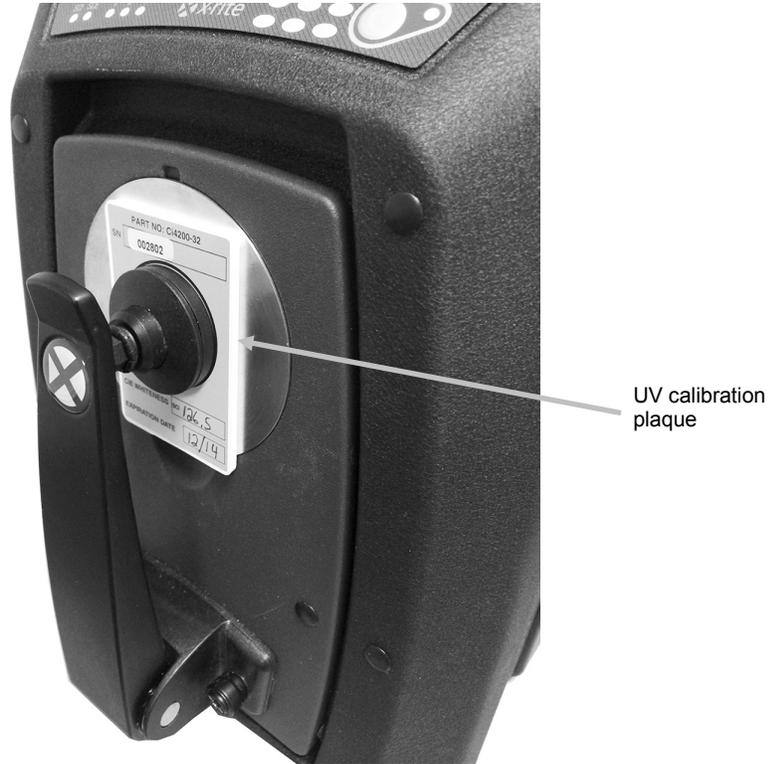
7. Initiate the UV calibration measurement from the software.
8. Follow the procedure in the application.
9. Remove the UV calibration plaque, place in protective bag and return it to the accessory drawer.
10. If required, repeat the normal white and black calibration procedure as before.

MEASURING

You should refer to the documentation or online help for the software application that you are using with your instrument. All applications that use the instrument must be running during measurements.

Reflectance Measurements

To take a measurement using your spectrophotometer, follow these steps to ensure an accurate reading.

1. Ensure the desired aperture plate is installed.
2. Edit the current configuration or load appropriate configuration from the application.
3. Calibrate for the current configuration if needed.
4. Prepare your sample for measurement.
5. Open the sample holder on the spectrophotometer to the fully open position. Position the sample at the view port and slowly close the sample holder. The sample holder is dampened to prevent the holder from closing with too much force and possibly damaging the sample.

6. Use the computer screen or the drop down door to view the sample and adjust the sample measurement targeting area.

   Caution: Do not look directly into the measurement optics when the instrument is on.
7. Trigger the measurement using one of the following methods:
   a. Select "Measure Standard" or "Measure Trial" from your software. Follow the software instructions for loading the sample at the view port.

<div align="center">**OR**</div>

   b. Press the Standard or Trial button on the instrument front panel.
8. The measurement is taken. The data is displayed in your application. Follow the instructions for saving the data in the software.

   Note:

   When measuring large or oddly-shaped samples you can open the sample holder completely or remove the sample holder if necessary. The sample is then held securely against the view port. It is also recommended that you remove the four outer hole plugs from the front of the instrument to ensure that large samples remain flat during measurements.

   When holding a sample for measurement yourself, remember to keep the sample perfectly still. Also, the sample surface should be able to rest completely flat against the aperture plate, preventing any light from entering the view port.

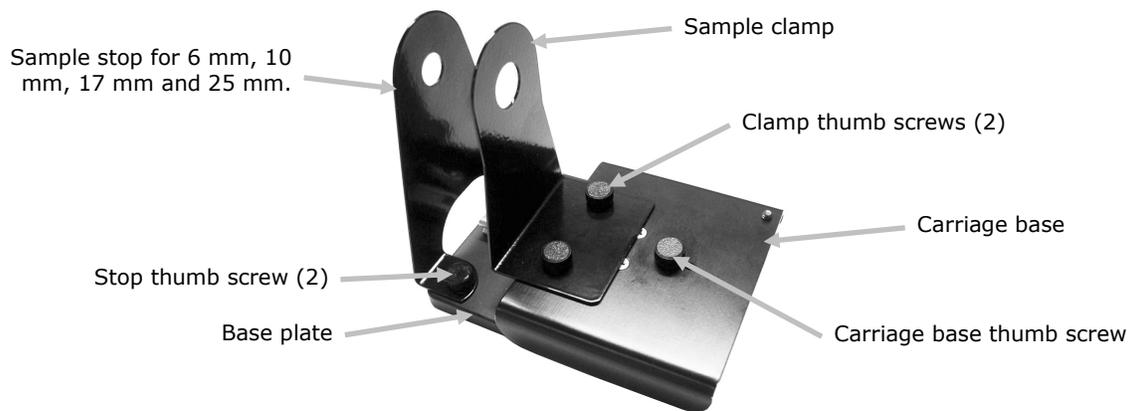## Transmission Measurements (excludes Ci7500 series)

A transmission indicator illuminates on the front panel based on your selection in the software. The transmission sample holder is designed to mount inside the transmission compartment. It is used to measure thin films at both the sphere (total transmission) and at the lens (direct transmission). Direct transmission is 25 mm measurements only. Each transmission kit contains: four sample stops and clamps, four aperture plates with white reflective ring, one transmission white plaque, one black plastic blocking panel, and one cuvette sample holder. Choose the sample stop and clamp appropriate for your application.

Before taking a transmission measurement, make sure the instrument is calibrated for the measurement mode and set the instrument to transmission mode using your application.

Measurement Notes:

- Liquids are measured using the cuvette sample holder
- Always make certain that the sample is flush and parallel to the opening in the sphere or the lens
- If transmission white plaque gets soiled, it must be replaced
- Close the cover when measuring
- Use aperture plates with white reflective ring
- Use the transmission white plaque, not smooth glossy calibration tile

Transmission Sample Holder Description

Sample stop for 6 mm, 10 mm, 17 mm and 25 mm.

Sample clamp

Clamp thumb screws (2)

Carriage base

Stop thumb screw (2)

Base plate

Carriage base thumb screw

Total Transmission Measurement

Total measurements are taken with the sample positioned between the stop and clamp toward the sphere. Total Transmission is appropriate for measuring translucent samples which exhibit some scattering of the light. A total transmission measurement will make certain that all transmitted light is measured for an accurate reading.

1. Mount the appropriate aperture plate (with white reflective ring) to the measurement port at the front of the instrument.
2. Position the transmission white plaque on the sample holder as previously explained in the calibration section.

3. Open the transmission cover by lifting up on the locking pin while sliding the cover to the back.

4. Align the sample holder base plate pins to the base plate mounting channel holes inside the transmission area.

Position the base plate with the clamp mounting holes on the sphere side. Be careful to get the angle correct. Care should be taken to properly align the base plate so that the sample is positioned between the stop and clamp toward the sphere.

Sphere Side

Lens Side

Clamp mounting holes

Base plate in total transmission position
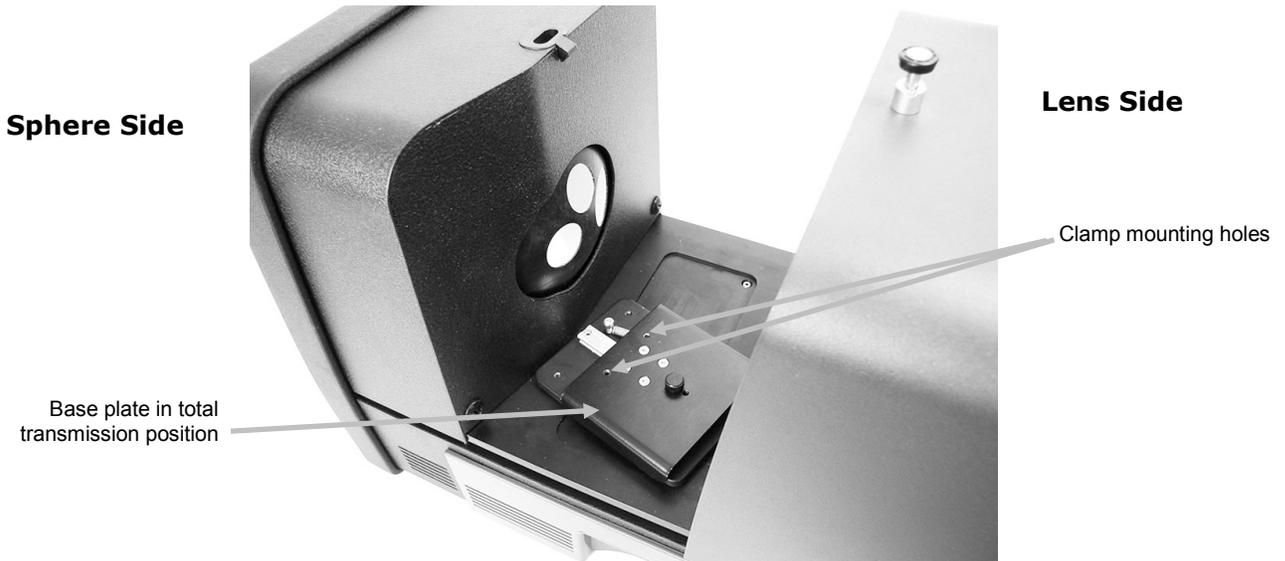
5. Attach the appropriate sample stop to the base plate and clamp to the carriage base with the thumb screws. We recommend using a stop plate with all sizes including 25 mm.

The sample is held in position using a sample stop on the sphere side of the sample, and a spring loaded clamp on the side of the sample away from the sphere.

Care should be taken to properly align this holder so that the stop plate is positioned flush and tight against the opening in the sphere. Do not tighten the thumb screws until the sample has been positioned tight against this opening.

6. Pull the clamp back and position the sample between the clamp and stop. You may want to temporarily tighten the carriage base thumb screw to hold the clamp in place while positioning the sample. Slowly release the sample clamp/carriage base to secure the sample.

Transmission holder with sample at the sphere (<u>total measurement</u>) for 25 mm, 17 mm, 10 mm, and 6 mm, measurements

7. Once properly position, tighten the thumb screws and close the transmission cover.
8. Initiate the measurement by selecting "Measure Standard" or "Measure Trial" from your software application, or press the Standard or Trial button on the front panel.
9. The measurement is taken. The data is displayed in your application.
10. Follow the instructions for saving the data in the application.

Direct Transmission Measurement

Direct measurements are taken with the sample positioned towards the lens in the back of the instrument. Direct Transmission is appropriate for measuring transparent samples which exhibit no scattering of the light. This would generally be samples colored with dyes rather than pigments. When measuring with this method the diffuse light is collimated, this means that the light rays are travelling in a parallel fashion as they pass through the sample.

Note: When performing Direct Transmission measurements, only the 25mm clamp, stop, and aperture plate (with white reflective ring) should be used.

1. Mount the 25 mm aperture plate (with white reflective ring) to the measurement port at the front of the instrument.
2. Position the transmission white plaque on the sample holder as previously explained in the calibration section.
3. Open the transmission cover by lifting up on the locking pin while sliding the cover to the back.

4. Align the sample holder base plate pins to the base plate mounting channel holes inside the transmission area.

Position the base plate with the clamp mounting holes on the lens side. Be careful to get the angle correct. Care should be taken to properly align this base plate so that the sample is positioned towards the lens. It does not sit flush against the lens. Verify the angle is correct by looking through the front aperture plate.

Sphere Side

Lens Side

Clamp mounting holes

Base plate in direct transmission position
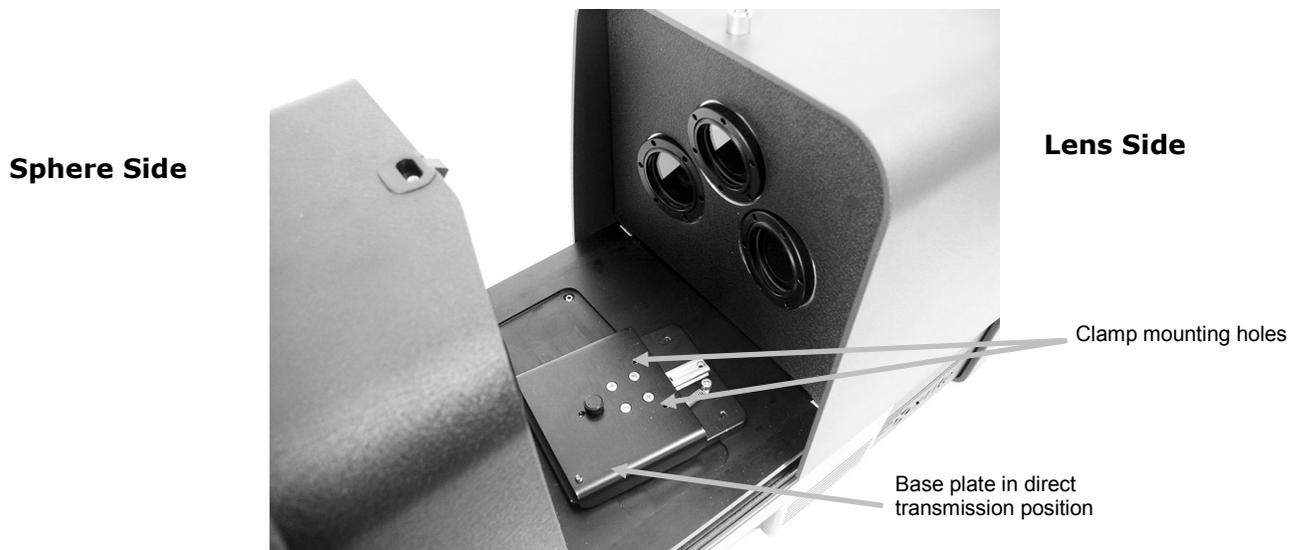
5. Attach the 25 mm sample stop to the base plate and 25 mm clamp to the carriage base with the thumb screws.

The sample is held in position using a sample stop on the lens side of the sample, and a spring loaded clamp on the side of the sample away from the lens.

Do not tighten the thumb screws until the sample has been positioned tight against this opening.

6. Pull the clamp back and position the sample between the clamp and stop. You may want to temporarily tighten the carriage base thumb screw to hold the clamp in place while positioning the sample. Slowly release the sample clamp/carriage base to secure the sample.

Transmission holder with sample at the lens (<u>direct measurement</u>) for 25 mm measurements

7. Once properly position, tighten the thumb screws and close the transmission cover.

8. Initiate the measurement by selecting "Measure Standard" or "Measure Trial" from your software application, or press the Standard or Trial button on the front panel.

9. The measurement is taken. The data is displayed in your application.

10. Follow the instructions for saving the data in the application.

R/T (Reflection/Total Transmission) Measurement

R/T measurements provide the ability to compensate for light lost through the sample (as opposed to light absorbed). When using R/T mode for plastic formulation the formulation software will attempt to match opacity of the standard as well as color.

Two measurements are taken to create this value. One measurement is taken with the sample positioned at the reflection port (reflection measurement). The second measurement is taken with the sample positioned flush against the stop at the back of the sphere (total transmission measurement). When measuring with this method the diffuse light travels through the object from all angles. Again the sample is illuminated from all possible angles with a diffuse light source.

1. Mount the aperture plate (with white reflective ring) to the measurement port at the front of the instrument.

2. Position the transmission white plaque on the sample holder as previously explained in the calibration section.

3. Position the sample at the reflection port as previously explained in the Reflectance Measurement section.

4. Initiate the measurement by selecting "Measure Standard" or "Measure Trial" from your software application, or press the Standard or Trial button on the front panel. The measurement is taken.

5. Open the transmission cover by lifting up on the locking pin while sliding the cover to the back.
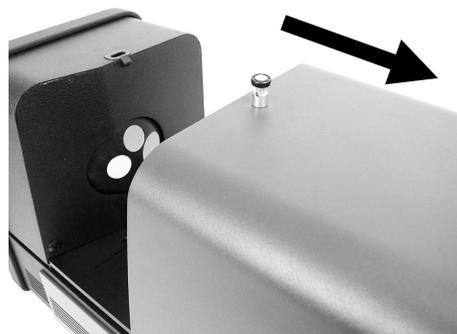
6. When taking the transmission measurement the sample is held in position using the transmission holder with a stop plate on the sphere side of the sample, and a spring loaded clamping plate on the side of the sample away from the sphere.

7. Attach the appropriate sample stop to the base plate and clamp to the carriage base with the thumb screws. We recommend using a stop plate with all sizes including 25 mm.

8. Remove the sample from the sample holder. Care should be taken to properly align the base plate so that the sample is positioned between the stop and clamp toward the sphere. When setting up for measurements, do not tighten the thumb screws until the sample has been positioned properly.

9. Once properly position, tighten the thumb screws and close the transmission cover.

10. Initiate the measurement by selecting "Measure Standard" or "Measure Trial" from your software application, or press the Standard or Trial button on the front panel. The measurement is taken.

11. Follow the instructions for saving the data in the application.

R/T correlation - Ci7XX0 to Ci7000A

Testing has shown that to achieve the best correlation between a Ci7XX0 to a Ci7000A the following combinations of transmission port, stops, and aperture plates should be used:

- 25mm transmission port, with 25 mm stop and 25 mm aperture plate with white reflective ring

  or

- 17mm transmission port, with 17 mm stop and 17 mm aperture plate with white reflective ring

Liquid Measurements

Measurement and Calibration Notes

- Liquids should be measured using the total transmission technique, never use direct transmission for liquids
- Be very careful with placement of the cuvette, make certain it is positioned square and flush to the sphere opening
- Make sure the cuvette's position is centered over the opening in the sphere
- Perform white calibration with cuvette and clear liquid in the sample holder
- The clear liquid should be the base of whatever material you are working with
- When performing black calibration the blocker should be positioned between the cuvette and the opening in the sphere

Cuvette Cleaning and Handling

- Care should be taken to ensure the cuvette and holder is kept clean. Carefully wash the holder and cuvette in warm, soapy water and rinse thoroughly.
- Never touch the cuvette windows with your fingers as the oils in your skin will etch the windows. Handle the cuvette by the edges.
- Always leave an air gap between the bottom of the lid and the top of the liquid sample. The force of pressing the lid against the liquid sample can cause the windows to be weakened and crack.
- Extreme care should be taken to prevent the sample liquid from being spilled into the transmittance chamber. NEVER FILL THE CELL WHILE IT IS IN THE TRANSMISSION COMPARTMENT.

Procedure:

1. Loosely attached the cell stand assembly to the carriage base with two thumb screws. A clamp is not required for this measurement.
2. Slide the cell stand forward and tighten the thumb screws.
3. Make sure the cuvette is clean (see Cleaning and Handling). Carefully fill the cuvette with the sample liquid until the liquid is approximately 8 mm from the top. If any liquid spills on the sides of the cuvette, wipe it off with a clean cloth.
4. Insert the cuvette into the cell stand.

Cuvette in the cell stand (total measurement)

5. Initiate the measurement by selecting "Measure Standard" or "Measure Trial" from your software application, or press the Standard or Trial button on the front panel.
6. The measurement is taken. The data is displayed in your software application.
7. Follow the instructions for saving the data in the software.

Haze Measurements

Measurement and Calibration Notes

- To obtain a true haze measurement requires a haze meter (ASTM D1003). It is possible, however, to use a sphere geometry spectrophotometer capable of transmission measurements to obtain an index, known as correlated haze, with good correlation to a haze meter.
- The sample to be measured is placed against the sphere.
- To calibrate use the 25 mm aperture plate (with white reflective ring), transmission white plaque and black trap positioned at the reflectance port.
- Before you can take a Haze measurement you need to calibrate for the haze measurement first, unless you are already in Haze Measurement mode using a current haze calibration.

Procedure:

1. Mount the 25 mm aperture plate with the white ring at the measurement port as previously explained.
2. Select "Haze" as the measurement type within your software.
3. A haze calibration is automatically launched. Follow the prompts from the software regarding calibration.
4. Once the haze calibration is complete you can begin to take haze measurements.
5. Load your sample in the transmission sample holder at the sphere within the transmission compartment.
6. Select "Measure Standard", "Measure Trial", or press the appropriate measure button on the instrument.
7. If you later change the measurement mode to another measurement type than Haze you may be prompted to calibrate the instrument.

APPENDICES

Service Information

X-Rite provides repair service to their customers. Because of the complexity of the circuitry, all warranty and non warranty repairs should be referred to an authorized service center. For non warranty repairs, the customer shall pay shipping and repair cost to the authorized service center, and the instrument shall be submitted in the original carton, as a complete unaltered unit, along with all the supplied accessories.

X-Rite, Incorporated has offices around the world. You can contact us using one of the following methods:

- To identify the X-Rite service center nearest you, please visit our web site at: www.xrite.com and click the **Contact Us** link.
- For online help, visit our web site (www.xrite.com) and click the **Support** link. Here you can search for software or firmware updates, white papers, or frequently asked questions which can quickly resolve many common user problems.
- Send an e-mail to Technical Support detailing your problem and listing your contact information. For the Americas email CASupport@xrite.com, for Europe email EMEAtechsupport@xrite.com, for Asia email TechSupportAsiaDist@xrite.com.
- For sales questions or to order cables and accessories, visit our web site (www.xrite.com) or contact your nearest X-Rite dealer or service center.
- Problems and questions can also be faxed or emailed to your local X-Rite office listed on our website.

Cleaning the Instrument

Your instrument requires very little maintenance to achieve years of reliable operation. However, to protect your investment and maintain reading accuracy, a few simple-cleaning procedures should be performed from time to time.

⚠️ **IMPORTANT:**

Remove AC power from the instrument before performing any of these cleaning procedures.

CAUTION: DO NOT use any solvents to the clean the instrument.

CAUTION: Use proper personal protective equipment (e.g., safety glasses) when using compressed air.

If can air is used for any of the cleaning procedures that recommend air, do not invert or tilt the can during use. This could cause damage.

CAUTION: When using chemicals, always follow the manufacturer's personal protection equipment recommendations in the chemical SDS.

Cleaning Quick Reference Table

Below is a quick reference to help you determine the proper cleaning methods. Refer to the following pages for a more detailed description of the individual cleaning procedures.

	Cleaning Requirement			
	Clean, Compressed Air	Mild Cleaner with Water	Lint-free Cloth	Personal Protection Equipment (per SDS)
Exterior			✓	
Transmission Compartment	✓			✓
Black Plastic Blocking Panel	✓			✓
Sphere	✓			✓
Aperture Plates		✓	✓	✓
Transmission White Plaque	✓			✓
Black Trap	✓			✓
UV Calibration Plaque	✓			✓

General Exterior Cleaning

The case, front panel, sample holder and surface of your instrument should be kept clean and free of dust. This can be accomplished by dusting these components with a lint-free cloth. General cleaning should be performed on a weekly basis or more often if the unit is used in a dusty operating environment.

Cleaning the Transmission Compartment

Use clean, dry compressed air to blow any dust, dirt or other contamination out of the transmission compartment.

Cleaning the Calibration Tiles

Ceramic standards (calibration tiles) are widely used in color science as standards of reflectance factor. Their principal virtue is the stability of their reflection properties. If they are to serve their intended purpose, it is necessary that the surfaces of these tiles be maintained in a stable condition. The cleaning of any precision optic risks degrading the surface. Therefore, the need for cleaning should be minimized by returning the tile to its storage case or covering it with a protective bag when it is not in use. If cleaning is required, the following procedure is recommended.

Materials Required

- Isopropyl alcohol, Glass cleaner, Lint-free wipes, and Distilled water

To remove dust, lint, and invisible particles, proceed as follows:

1. Place the tile on a stable surface and hold the tile by its edges.
2. Spray a small amount of Isopropyl Alcohol onto a portion of a lint free wipe, then wipe with a circular motion making sure to clean the entire surface. Use a dry portion of the wipe to wipe the surface of the tile until dry. Discard the wipe.
3. Spray a liberal amount of glass cleaner onto the surface of the tile. Using a clean lint-free wipe, allow the wipe to become saturated with the glass cleaner on the tile, then wipe the tile in a circular motion, making sure to clean the entire surface of the tile. Discard the wipe. Excess glass cleaner will remain on the tile. Quickly move to the next step before it dries.
4. Hold tile vertically and spray a liberal amount of distilled water onto surface of tile allowing to run off, rinsing off the remaining glass cleaner. Dry the surface using a lint-free wipe in a circular motion. Discard the wipe.

Cleaning the Black Plastic Blocking Panel

Dust on the black plastic blocking panel can be very tightly bound by static electricity. To remove the dust, blow canned air across the surface.

Cleaning the Sphere

NOTE: Do not touch the inside surface of the sphere or stick anything into the sphere.

The sphere should be inspected for any debris that may be present. Follow the procedure to clean the sphere.

1. Open the sample door to the fully open position.
2. Use clean, dry compressed air and blow short bursts into the sphere. This should remove any dust, dirt or other contamination off the inside surface of the sphere.

3. Close the sample door.

Cleaning the Aperture Plates

The surface of the aperture plate may be wiped clean with a cloth dampened in water or a mild cleaner.

Cleaning the Transmission White Plaque

Care should be taken not to touch the front surface when handling the plaque.

Blow short burst of clean, dry air, across the surface to remove any dust or contamination.

Cleaning the Black Trap

The black trap should be cleaned from time to time to remove and dust or contamination that may collect inside.

**1.** Remove the base (1) from the trap (2) by turning to the left and lifting upwards.
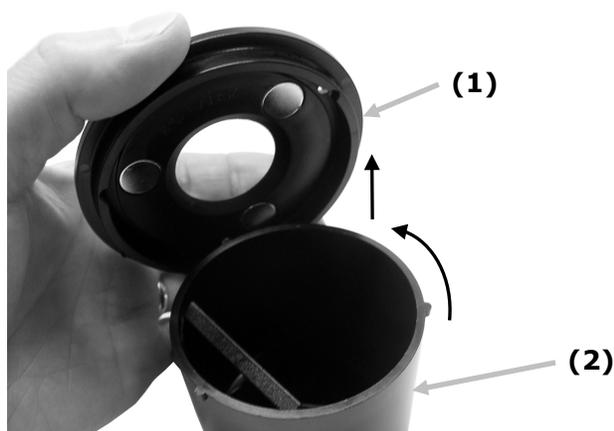
2. Look inside of the black trap to reference how the trap glass is positioned. This is important to remember when it comes time to reinstall it after cleaning.

3. Using your fingers, carefully remove the trap glass from the trap by the edges. Avoid touching the surface of the glass with your fingers.

(3)
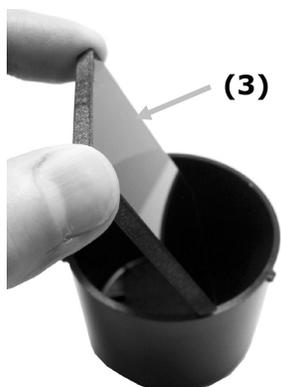
4. Blow short bursts of clean, dry air (4) across the both surface of the trap glass and inside of the trap.

(4)

(4)
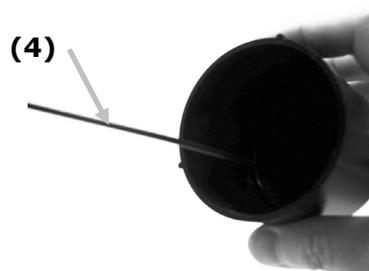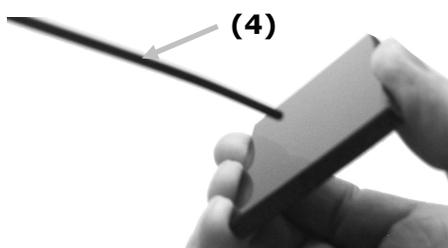
5. Reinstall the black glass in the trap. The bottom edge of the black glass should be resting against the felt pad (5) in the bottom of the trap when positioned properly.

(5)
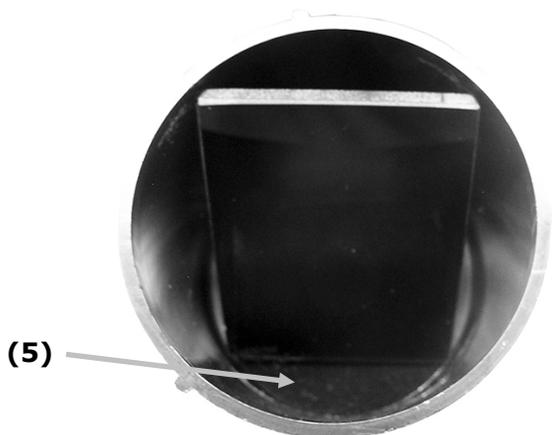
6. Align the base notches over the tabs in the trap and turn to the right until it snaps into position. NOTE: The base tabs are keyed to only allow installation in one position. Make sure you do not force it on the trap.

Cleaning the UV Calibration Plaque

Do not use solvents or cleaners of any kind.

Blow short burst of clean, dry air onto the UV calibration plaque.

Replacing the Fuse

In the event the instrument does *not* turn ON when power is applied, make certain that power is available at the plug. If power is available, replace the instrument fuse as follows.

Replacement fuse (5mm x 20mm 2.5A, 250V time-delay fuse type).

1. Turn the power off and unplug the detachable line cord.
2. Insert a flat-blade screwdriver into the right edge of the fuse carrier and pry out.
3. Remove the blown fuse from the carrier clip and discard.

Fuse

Carrier clip

Flat-blade
screwdriver
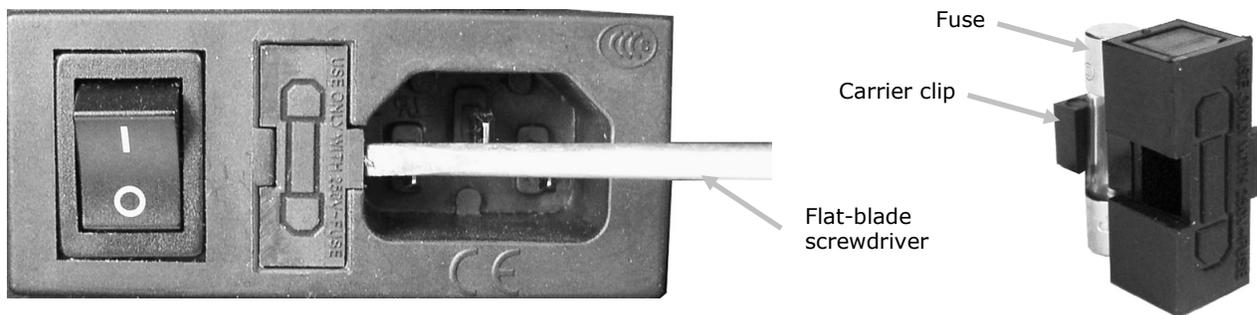
4. Place the new fuse in the clip and reinsert fuse carrier into the fuse cavity. Make sure the carrier is firmly seated.
5. Reinstall the detachable line cord.

Adjusting the Sample Holder Dampening

If required, the sample holder dampening effect can be changed when closing the sample holder. Simply adjust the pin in the sample holder to increase or decrease dampening.

1. Remove the sample holder from the front of the instrument by loosening the two screws. Refer to the Ci7XX0 Installation Instructions for details.
2. Loosen the locking nut on the front side of the dampening pin.
3. Adjust the dampening pin located on the back of the holder using a flat-blade screwdriver to change the dampening effect.
4. Tighten the dampening pin locking nut after the adjustment is completed and reinstall the sample holder.

Dampening pin locking
nut location

Dampening
adjustment pin

Troubleshooting

Prior to contacting the support department for instrument problems, try the applicable solution(s) described below. If the condition persists, contact us using one of the methods listed in the Service Information section.

Problem	Cause/Solution
Instrument not responding (no indicator lights).	*AC not connected.* Plug in AC adapter. *Fuse is blown.* Replace fuse (see Replacing the Fuse).
Calibration procedure fails.	*Calibration tile is dirty or damaged.* Clean the white tile per procedure in Appendix, or replace if damaged. If damaged, arrange for replacement by contacting X-Rite Support.
Instrument and software not communicating.	*Interface cable not connected.* Connect the interface cable between the computer and the instrument. Close and restart the software application. If this does not work, reboot the computer. Turn the instrument off, wait 30 seconds, then turn the instrument on and see if the condition is corrected. Check for proper configuration setting from the software provider.
Repeated sample measurement failures.	Ensure that the sample is being measured in accordance with your software's documentation. Close and restart the software application. Perform a calibration on the instrument (see Calibration section). Clean instrument sphere (see Cleaning).

Specifications

Performance Specifications

	Ci7860 Series	Ci7800 Series	Ci7600 Series	Ci7500 Series
Repeatability	0.01 RMS ΔE CIELAB Spectralon Tile	0.01 RMS ΔE CIELAB Spectralon Tile	0.03 RMS ΔE CIELAB Spectralon Tile	0.03 RMS ΔE CIELAB Spectralon Tile
Inter-Instrument Agreement	0.06 Avg. 13 BCRA Series II tiles SCI (25 mm only)	0.08 Avg. 13 BCRA Series II tiles SCI (25 mm only)	0.15 Avg. 13 BCRA Series II tiles SCI (25 mm only)	0.15 Avg. 13 BCRA Series II tiles SCI (25 mm only)
Geometry	D\8 Tri-beam simultaneous SCE\SCI	D\8 Tri-beam simultaneous SCE\SCI	D\8 Tri-beam simultaneous SCE\SCI	D\8 Tri-beam simultaneous SCE\SCI
Illumination	Pulsed Xenon, D65 Calibrated	Pulsed Xenon, D65 Calibrated	Pulsed Xenon, D65 Calibrated	Pulsed Xenon, D65 Calibrated
Measurement time	2.7 – 4.0 seconds (flash & data acquisition)	2.7 – 4.0 seconds (flash & data acquisition)	2.7 – 4.0 seconds (flash & data acquisition)	2.7 – 4.0 seconds (flash & data acquisition)
Duty cycle	480 measurements per hour max	480 measurements per hour max	480 measurements per hour max	480 measurements per hour max
Spectral Range	360 to 750 nm standard reporting with 360 to 780 nm extended range	360 to 750 nm standard reporting with 360 to 780 nm extended range	360 to 750 nm standard reporting	360 to 750 nm standard reporting
Wavelength Interval	5 nm, 10 nm, and 20 nm	5 nm, 10 nm, and 20 nm	10 nm and 20 nm	10 nm and 20 nm
Photometric range	0.0% to 200%	0.0% to 200%	0.0% to 200%	0.0% to 200%
Photometric resolution	0.001% reflectance	0.001% reflectance	0.01% reflectance	0.01% reflectance

Environmental Specifications

Electrical Requirements   100-240 VAC/50-60 Hz
AC line input is 1.1 Amps max
Class 1, protective earth

Overvoltage Category   Category II

EMC Compliance   IEC (EN) 61326-1

Operating Temperature   5º C to 40º C
Storage Temperature   -40º C to 70º C

Altitude, operating   2000 m

Pollution Degree   2

Operating Humidity   5% to 85% relative, non-condensing
Storage Humidity   5% to 85% relative, non-condensing

Dimensions   23 cm W x 25 cm H x 47 cm D

Weight   20.5 kg

Interface   USB

Design and specifications subject to change without notice.

Spare Parts and Accessories

The Ci7XX0 Spectrophotometer has optional accessories that you may order by calling the Customer Service Department in the US at 1-800-248-9748. The following accessories are available:

Ci7600 Transmission kit: this kit includes a calibration standard, a transmission cuvette with holder, a transmission sample holder, and a storage case.	CIA-800-02
Ci7800/Ci7860 Transmission kit: this kit includes a calibration standard, a transmission cuvette with holder, a transmission sample holder, and a storage case.	CIA-800-01
25 mm Glass Aperture	A-AP/GLAV57
NetProfiler 3 Industrial Benchtops – 1 Year License	NP3/IB1
NetProfiler 3 Industrial Benchtops – 1 Year License without Tile Set	NP3/IB1NT
NetProfiler 3 Industrial Benchtop Calibration Tiles	NP3/IBT
Flow Through Cell Holder kit	Ci7-801
Transmission Preform Holder kit	Ci7-802
Reflectance Cuvette Holder kit	CIA-803
Reflectance Preform Holder kit	CIA-802

System Repacking Instructions

Refer to the following instructions to repack your system in the event shipment is required. If the original carton and packing materials are not available, contact X-Rite to have a replacement shipped to your location.

Items to repackage with original shipped instrument:
- Original box and foam packaging (including large instrument bag)
- Aperture plates
- Black trap
- Sample holder
- Sample shelf (w/ thumb screws)
- Power line cord
- USB cable
- White calibration standard
- Green calibration standard
- UV calibration standard
- Black rubber shim

Repackaging Instructions:

1. **Repackage contents of Transmission Kit (if installed)**
   a. Remove any transmission components from the inside of the instrument.
   b. Place all transmission kit components into the original transmission case.

2. **Prepare instrument for repackaging**
   a. Lock instrument optics for shipment.
      i. Power on your instrument and connect to PC via USB.
      ii. Insert the "Ci7XX0 Benchtop Spectrophotometer" CD into your optical drive. If the main startup menu does not automatically launch, run the "start.exe" program from the Setup Tool folder of the CD.
      iii. Select "Setup Tool" from under the "Utilities" section of the software CD main menu. Run the Setup program.
      iv. Select "Lock Optics" from the main menu of the Setup program. (You can hear the instrument position the optics into the safe transport position.)
      v. Close the Setup program after the instrument optics has completed movement into a position that is safe for transport.
      vi. Power off the instrument using the rear power switch.
      vii. Remove the CD from the optical drive and place into the envelope.
   b. Disconnect and package the power line cord and USB cable.
      i. Fold the power cord and place into the bubble bag (if available from original packaging).
      ii. Fold the USB cable and place into the plastic bag (if available from original packaging).
   c. Package the instrument sample holder arm.
      i. Loosen each screw using a flat blade screwdriver or T25 Torx wrench.
      ii. Place sample holder arm into the bubble bag and seal (if available from original packaging).

d. Package sample shelf (if installed on your instrument).
  i. Loosen thumb screws and remove sample shelf from front of instrument.
  ii. Place in plastic bag and tape shut (if available from original packaging).
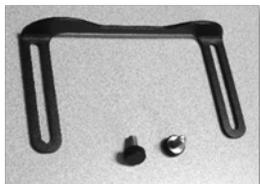
e. Bag all aperture plates.
  i. Remove and package all apertures from instrument drawer and front of instrument.
  ii. Place each aperture into its own bag (if available from original packaging).
  iii. Insert all of the bagged apertures into a single bag (combined).

f. Install protective bag over instrument's front plate.
  i. Open front sample door from top (not through sphere opening).
  ii. Slide protective bag over front plate (if available from original packaging).
  iii. Close sample door.

g. Insert rubber shim on door latch (if available from original packaging).
  i. Lift top door latch and rotate to lock in the "up" position.
  ii. Install shim. If shim is not available, simply leave the door latch in the locked "up" position.
  iii. Slide door completely shut.

h. Insert the white shipping wedges under the edges of the instrument cover as shown
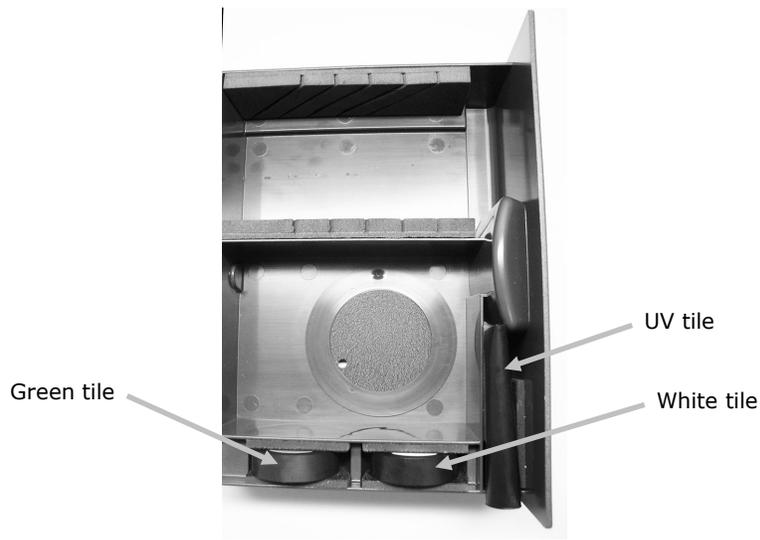   below (if available from original packaging).

i. Package black trap.
    i.   Remove black trap from instrument drawer.
   ii. Place black trap into plastic bag (if available from original packaging).

j. Prepare accessory drawer.
    i.   Open accessory drawer.
    ii. Ensure all apertures and black trap are removed (see steps above).
    iii. Return white calibration standard into drawer.
    iv. Return green calibration standard into drawer.
    v.   Place UV calibration standard into its small bag (if available from original
         packaging) and insert UV calibration standard into front of drawer (near handle).

vi. Close the accessory drawer.

Green tile

UV tile

White tile

3. Prepare box for instrument
a. Install bottom foam piece into shipping box.
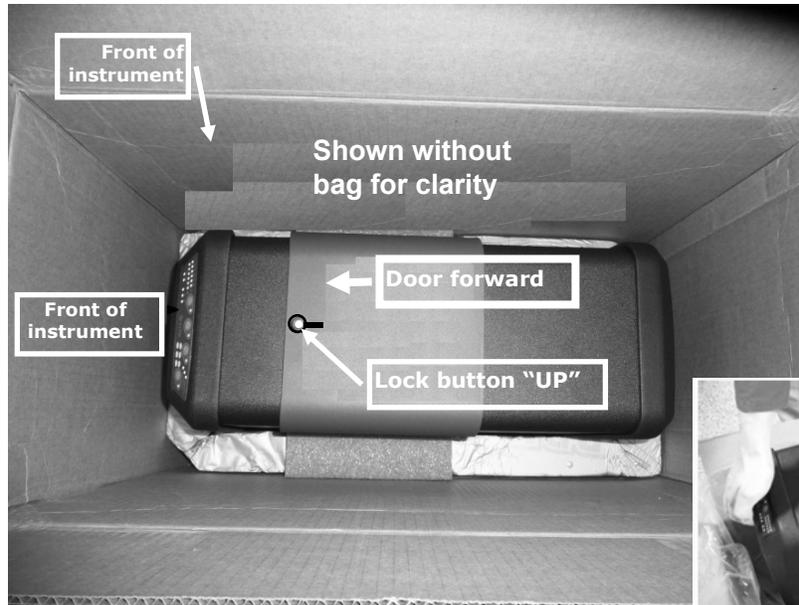

Carton seam

Back of foam insert
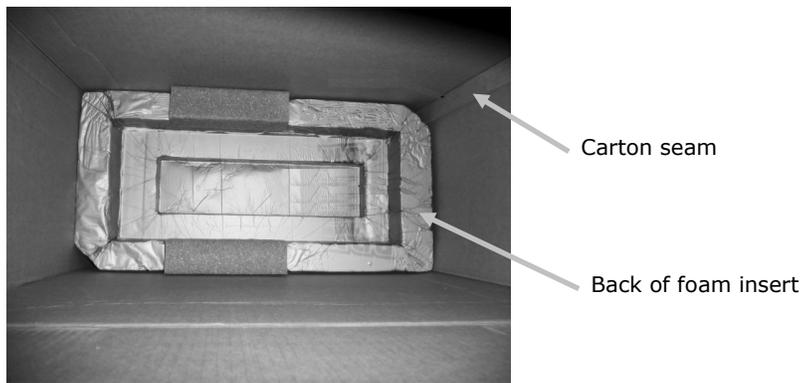
b. Place bag in box.
i. Insert large bag (for instrument) into box (if available from original packaging).
ii. Open bag over top of box.

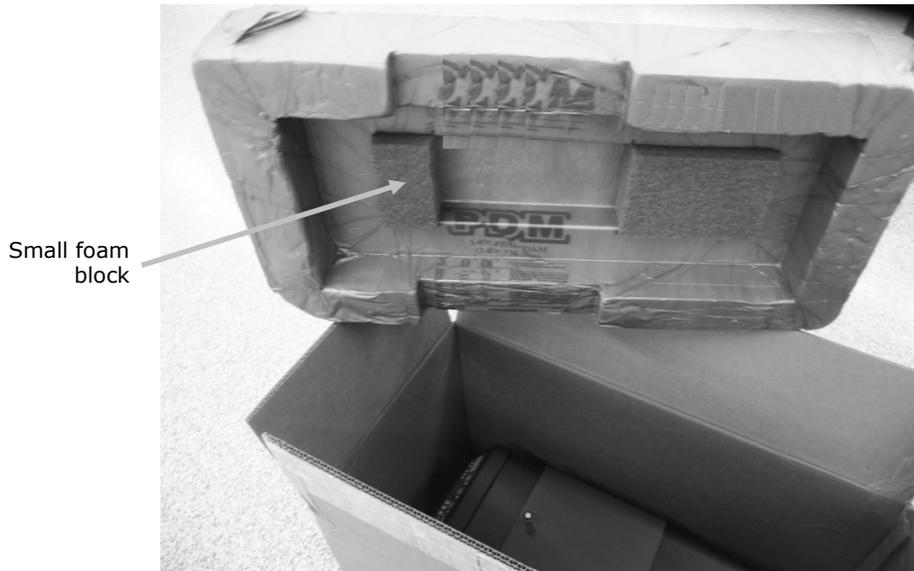### 4. Insert Instrument into box
   a. Lower instrument into box.
      i. Hold instrument by front and rear grips.
      ii. Lift and lower instrument into box oriented in foam as shown.

   b. Wrap bag around instrument.
   c. Place the top instrument foam piece on top of instrument and position the foam to the instrument as shown.

5. Install contents into foam tray compartments as shown and place tray into the box.
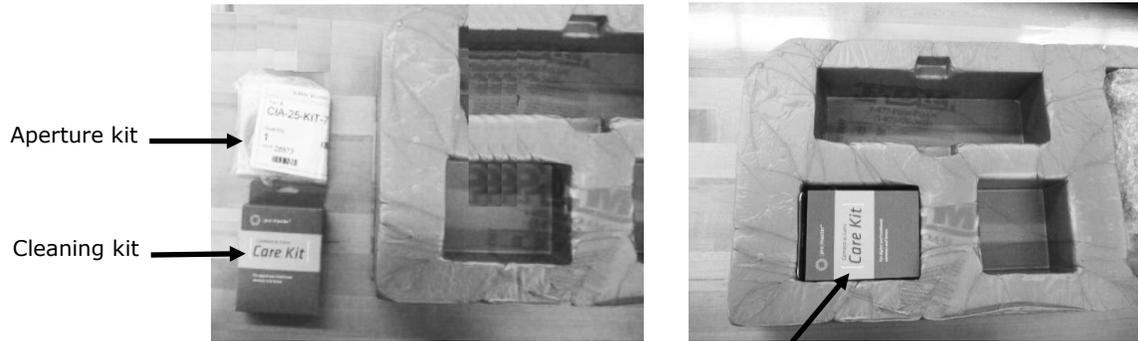
Aperture kit

Cleaning kit

Place these items in
this compartment

Sample shelf

Line cord

Sample holder

Place these items in
this compartment

USB cable

Black trap

6. **Place top cardboard protective sheet on top of foam tray** (if available from original packaging).

7. **Close and tape the box**.

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