Ci6X Series

Spectrophotometer
(Models: Ci60, Ci62, Ci64, and Ci64UV)

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

Hereby, X-Rite, Incorporated, declares that this Ci6X Series is in compliance with the essential requirements and other relevant provisions of Directive(s) 2014/35/EU (LVD) and 2014/30/EU (EMC).

Bluetooth equipped devices additional comply with Directive RED 2014/53/EU.

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

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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.

Transportation: This product contains a lithium-ion battery. Should you need to ship this device, you may wish to consult published guidance documents by one or more of these organizations for advice on how to comply with the regulations: IATA, ICOA, IMDG & PHMSA. The battery contained in the Ci6X series device is 107g in weight, 7.4V, 2.4 Ah, and complies with the UN 38.3 tests in effect the year it was originally shipped.

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

If your device is equipped with a Bluetooth wireless transmitter, it contains the following module.
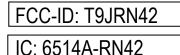
Microchip RN42

Microchip Technology Inc.

2355 West Chandler Blvd.

Chandler, Arizona 85224

TEL: 480-792-7200

Module meets the following standards:

EN 300328 V1.8.1 (2012)

EN 301489-1 V1.9.2 (2011)

EN 301489-17 V2.2.1 (2012)

EN 60950-1:2006 ITE General Requirement

EN 62479 (2010)+A11:2009+A1:2010+A12:2011

FCC RF Radiation Exposure Statement:

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Contains Microchip RN42 module:

FCC-ID: T9JRN42

IC: 6514A-RN42

Proprietary Notice

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Patents: www.xrite.com/ip

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Warranty Information

X-Rite warrants this Product against defects in material and workmanship for a period of twelve (12) months from the date of shipment from X-Rite's facility, unless mandatory law provides for longer periods. During such time, X-Rite will either replace or repair at its discretion defective parts free of charge.

X-Rite's warranties herein do not cover failure of warranted goods resulting from: (i) damage after shipment, accident, abuse, misuse, neglect, alteration or any other use not in accordance with X-Rite's recommendations, accompanying documentation, published specifications, and standard industry practice; (ii) using the device in an operating environment outside the recommended specifications or failure to follow the maintenance procedures in X-Rite's accompanying documentation or published specifications; (iii) repair or service by anyone other than X-Rite or its authorized representatives; (iv) the failure of the warranted goods caused by use of any parts or consumables not manufactured, distributed, or approved by X-Rite; (v) any attachments or modifications to the warranted goods that are not manufactured, distributed or approved by X-Rite. Consumable parts and Product cleaning are also not covered by the warranty.

X-Rite's sole and exclusive obligation for breach of the above warranties shall be the repair or replacement of any part, without charge, which within the warranty period is proven to X-Rite's reasonable satisfaction to have been defective. Repairs or replacement by X-Rite shall not revive an otherwise expired warranty, nor shall the same extend the duration of a warranty.

Customer shall be responsible for packaging and shipping the defective product to the service center designated by X-Rite. X-Rite shall pay for the return of the product to Customer if the shipment is to a location within the region in which the X-Rite service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations. Proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the unit is within the Warranty period must be presented to obtain warranty service. Do not try to dismantle the Product. Unauthorized dismantling of the equipment will void all warranty claims. Contact the X-Rite Support or the nearest X-Rite Service Center, if you believe that the unit does not work anymore or does not work correctly.

Table of Contents

INTRODUCTION AND SETUP

The spectrophotometer is a compact, rugged and reliable color measurement instrument that reports spectral data.

This manual covers the installation, operation and maintenance of the instrument. Specific instructions for using the instrument with your software application can be found in the software documentation.

Key features of the instrument are:

- Hi-resolution 240 x 320, 18-bit color display
- Navigation control for easy screen selections, measure button, and power on/off

Packaging

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.

- Ci60, Ci62, Ci64, or Ci64UV instrument
- Carrying case
- USB interface cable
- AC adapter (X-Rite P/N SE30-277) and line cord
- Calibration reference
- UV calibration plaque (Ci64UV only)

- Manuals CD
- Documentation and registration material
- Safety strap

Attaching the Safety Strap

A safety strap is included with your instrument. The strap attaches to the back of the instrument and around your wrist. The strap should not be used to carry the instrument.

1. Feed the small looped end of the strap around the post at the back of the instrument.

Small loop

2. Insert the wrist strap end through the small loop.

Wrist strap

3. Pull on the wrist strap to secure to the strap post.

Strap post

4. Use the slide to tighten the strap around your wrist.

Tighten slide
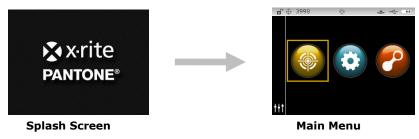
Powering On and Off

The power button is used to initiate the instrument from a power off state. Simply press and hold the button for three seconds to turn on the instrument. If the instrument does not power up after pressing the power button, the batteries may require charging. Refer to About the Battery Pack.

Power button

Powering Off
The instrument can be manually powered off by pressing and holding the power button for three seconds.

When first powered up, the instrument goes through a diagnostics test and displays a splash screen before the main menu screen appears.

Splash Screen   **Main Menu**

Locking the Navigation Control

The power button is also used to lock the navigation control. This is useful to avoid inadvertent contact with the control when taking measurements.

Pressing the power button toggles the navigation control to "locked" and "unlocked.

A padlock icon appears in the header bar of the display to indicate the status of the control.

Locked Control   **Unlocked Control**

Power Save Modes

The instrument utilizes two power save modes to conserve battery life during nonuse times. The power save mode option is preset in the Configuration Mode.

Standby Mode: The instrument is ready to measure, however the display is not on. A button press, measurement, power connection (if not connected), or USB connection will wake up the instrument.

Off Mode: The power button must be pressed to wake up the instrument before a measurement can be taken. Plugging in the AC adapter will also wake up the instrument from power off mode. Off mode does not occur when the AC adapter is attached to the instrument.

Charging the Battery Pack
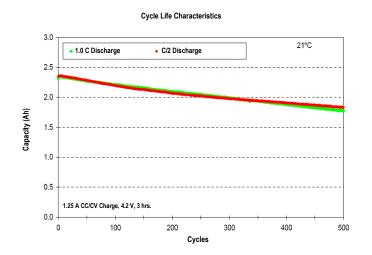
General

The battery pack for your new instrument comes in a low to medium charge state and should be charged before use (up to 4 hours for full charge).

A charged battery pack may eventually lose partial charge if not used for an extended amount of time. You should charge the battery from time to time and store in a cool environment when not in use to maintain battery performance.

Lifespan Expectations

Lithium-ion batteries typically decay to 80% capacity after 400 charge cycles (see chart on next page). A charge cycle can be defined as several partial charges equaling 100%. Partial charge and discharge cycles will help maintain the life of the battery. It is best to avoid full discharge and charge cycles. After roughly 400 charge cycles are reached, the amount of measurements you can expect to achieve from one full charge is reduced. At this point, you may wish to replace the battery pack.

Cycle Life Characteristics

Disposal

Dispose the battery pack in a designated disposal location for recycling.

Connecting the AC Adapter

NOTE: The instrument can operate from the AC adapter only. The battery pack does not need to be installed. The AC adapter (X-Rite P/N SE30-277) overrides any charge condition of the battery pack in the instrument. Measurements can be taken even with a very low battery condition when using the AC adapter.

1. Verify the voltage indicated on the AC adapter complies with the AC line voltage in your area.
2. Insert the small plug from the AC adapter into the input connector on the instrument.
3. Plug the detachable line cord in the AC adapter and plug the line cord into the wall receptacle.

AC adapter connector

AC Adapter Ratings
Input: 100-240V 50-60 Hz
Output: 12VDC @ 2.5A

⚠ Operational hazard exists if an AC adapter other than X-Rite SE30-277 is used.

Connecting the USB Cable

IMPORTANT: You must install the software before connecting the instrument to your computer.
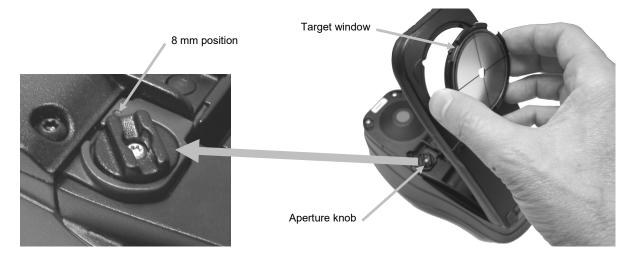
1. Install the software application if not already installed. Refer to the software documentation for additional information.
2. Turn the instrument on and plug the square end of the USB cable into the back of the instrument.
3. Plug the USB cable into an available port on your computer. The instrument should acknowledge USB presence by displaying the USB icon in the header bar of the screen.

USB connector

Changing the Aperture Setting (Ci64/Ci64UV only)

If available, the instrument can take measurements using either a 4 mm aperture or 8 mm aperture. Simply rotating the aperture knob and switching target windows changes the setting.

1. Turn the instrument over and rotate the knob to the left for 8 mm (circle indication) setting and to the right for 4 mm setting. The display indicates the switch position (refer to the display screens below).
2. Using your fingers, press the target window out from the topside of the shoe. Press against the ring and not the clear window.
3. Note the alignment of the new window and snap it into place from the bottom side of the shoe.
4. Calibrate the instrument to the new aperture setting.

8 mm position

Target window

Aperture knob

An aperture icon appears in the header bar of the display to indicate the switch position.

4 mm Switch Position   **8 mm Switch Position**

USER INTERFACE

Instrument Controls

The instrument controls are used to navigate the screen, select options, and perform measurements.

Navigation Control (up, down, left, right and center)

The navigation control moves the focus of the highlight around the screen. Tapping on the left side moves the focus to the next available item to the left. Tapping on the right side moves the focus to the next available item to the right. The up and down sides perform the same function, only in an up and down direction.

Tapping on the center of the control selects the item that has focus, such as a mode or option.
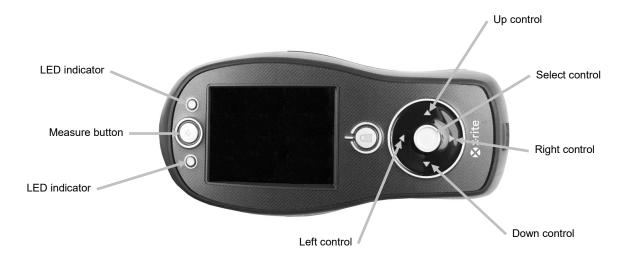
NOTE: If at any time the navigation control become non-responsive, turning the instrument off and then back on will reset their operation.

Measure Button

The Measure button is located at the front of the instrument. The button can be configured to initiate a measurement or be used in conjunction with the read switch.

> You can also use the navigation control to rapidly scroll through a list by touching the control between the arrows and circle left or right.

- Up control
- Select control
- Right control
- Down control
- Left control
- LED indicator
- Measure button
- LED indicator

LED Indicators

Multi-color LEDs located at the front of the instrument provide visual feedback on the status of a measurement. The LEDs will turn off after 5 seconds.

- Green: Indicates a successful measurement has taken place. Flashing green LEDs indicates that the instrument is at an idle state waiting for a measurement.
- Amber: Indicates a measurement is in progress.
- Red: Indicates a measurement error has occurred.

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General Sample Measurement

The instrument can take measures from just about any clean, dry surface that is reasonably flat. The instrument shoe should be able to rest flat and steady on the sample area. If the item to be measured is smaller than the shoe, you may want to make a platform—at the same height as the item—for the rest of the instrument's shoe to sit on.

Procedure:

1. Clear the sample surface of any dirt, dust, or moisture.
2. Position the target window over the sample to measure. If possible, place the entire instrument on the sample.

3. Press the instrument firmly to the shoe and hold steady until the display indicates that the measurement is complete.

4. Release the instrument and view the measurement results.

   An unsuccessful measurement will be indicated by an error message. See the Troubleshooting section for more details.

Main Screen Menu

When the instrument is powered-up, the main (top level) screen appears after the diagnostics test is complete. The main screen consists of the header bar and operation modes. The operation modes are selected by using the navigation buttons located to the side of the display screen.

Measure Mode

The measure mode is the main mode of operation. Use the Measure mode to take and analyze measurements, and select measurement options. Refer to the Measurement Mode section for information.

Job Mode (Ci64/Ci64UV only)

The job mode is used to select and run downloaded jobs. Refer to the Job Mode section for information.

Calibration Mode
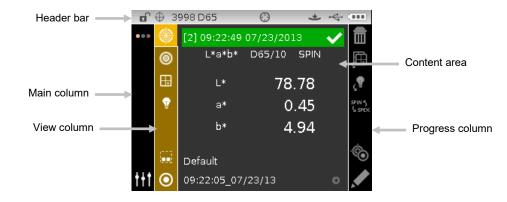
The calibration mode is used to perform white reference and black trap calibrations. Refer to the Calibration Mode section for information.

Configuration Mode

The configuration mode is used to set and edit the instruments configuration options. The configuration options should be set before you use your instrument for the first time. Refer to the Configuration Mode section for information.

Display Screen Layout

The display screen is divided into five main areas.

Header Bar

The header bar at the top displays various icons showing the current instrument setup and condition. Refer below for a description of each.

- **Controls Lock**: Displays a locked 🔒 or unlocked 🔓 icon for the instrument controls. Refer to Locking the Navigation Control earlier in this manual for an explanation.
- **Storage Capacity:** Displays an icon and the number of remaining sample storage locations ⊕ 3953. A maximum of 4000 samples can be stored.
  NOTE: Storage must be enabled in Configuration.
- **UV Instrument:** Displays the UV type selected (D65, ADj1, ADj2) if the instrument is UV.
- **Aperture Position:** Displays an icon ⊕ to indicate the aperture position. Refer to Changing the Aperture Setting earlier in this manual for an explanation.
  NOTE: The icon does not appear on large spot instruments.
- **NetProfiler:** Displays an icon 🅝🅟 that represents the NetProfiler status.
  NOTE: NetProfiler must be enabled in Configuration.

  Solid Green icon: NetProfiler subscription is currently activated.

  Solid Yellow icon: The profile has expired and updating is required.

  Solid Red icon: NetProfiler subscription is currently NOT activated.
- **Transform Method**: Displays an icon ▤ if a transform is enabled.
- **Measurement Trigger Method**: Displays the measurement method currently selected for the instrument.
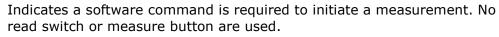
⊥	Indicates the instrument must be pressed to the shoe to activate the read switch to take a measurement.
⊤	Indicates the measure button on the top of the instrument must be pressed to take a measurement.
⊗	Indicates a software command is required to initiate a measurement. No read switch or measure button are used.
↓⊗	Indicates that both the read switch and measure button are required to take a measurement.

- **USB or Bluetooth Connection**: The USB icon appears when the instrument is plugged into the USB port on the computer. If available, the Bluetooth® icon appears dim when searching for a connection and bold when a connection is established to the computer.
- **Battery Gauge**: Depicts the current condition of the battery pack.

▮▮▮	Indicates the battery pack is fully charged.
▮▮	Indicates the battery pack has a sufficient charge for a substantial number of measurements.
▮	Indicates the battery pack is low, but measurements are still possible. Battery pack should be charged soon.
▯	Indicates the battery pack is **very** low and only a few measurements remain. Battery pack should be charged immediately.
▯/▮/▮▮/▮▮▮	Indicates the AC adapter is plugged in and the battery pack is charging (battery indication segments cycle). The battery indicator will stop cycling and display three segments when the battery pack is fully charged.

Indicates that battery pack is removed and the instrument is operating from the AC adapter only.

Main Column

The main column is used to access the main instrument screen and configuration mode.

View Column

The view column lists options that may be available for the selected mode. The highlighted option is the one that is currently displaying in the content area.

Content Area

The content area displays the data, steps, and graphs for the currently selected option.

Progress Column

The progress column displays controls supporting the currently active content area, such as step sequences, sample deletion, etc.

Wireless Operation

If available, the instrument uses Bluetooth® technology and can communicate wirelessly with your computer. Data from the software application can be transmitted within a short range (<10 m) to/from the instrument.

To utilize the Bluetooth feature in the instrument, you must pair the instrument with the Bluetooth adapter in your Windows computer. The pairing procedure is only required the very first time you use the wireless feature to establish a connection. Once complete, the instrument automatically connects to the computer when used. Please see the procedure that follows to pair your instrument to the computer.

Pairing Procedure

1. Make sure the USB cable is *not* connected to the instrument.

Bluetooth icon appears bold in the header bar while connected.

2. Start the Windows procedure for pairing a Bluetooth device. For additional information on this procedure, select **Help and Support** in the Windows **Start** menu.
3. When required, select the **Cixx_######** icon from the list of available devices and enter the pairing code **default** (lowercase) into the available field.
4. After pairing is successful, you are now ready to use the instrument in wireless mode.
5. Refer to the application for information on transferring standard and sample data.

CONFIGURATION MODE

Configuration mode is used to adjust and view the instrument's settings. You should set the configuration options before using the instrument for the first time. However, you can go back and change these settings at any time. Each configuration option is explained in detail on the following pages.

Entering Configuration Mode

1. From the Main screen, use the **Navigation** control to move the highlight focus to the Configuration icon.

2. Tap the **Select** button to access the main configuration screen. The screen displays the instrument information (model, serial number, firmware and certification date).

Configuration mode icon

Options column

Instrument information screen

3. From the Configuration screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the desired configuration icon in the Options column.
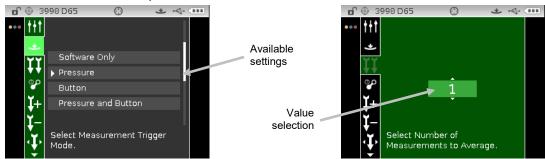
   NOTE: The arrow icon (▼ or ▲) at the end of the Options column indicates that additional options are available. Move the highlight focus to the arrow icon to advance to the additional options.

4. Tap the **Right** navigation button to enter the option settings area.

5. *For Option Selections:*
   Use the **Up** or **Down** navigation buttons to move the highlight focus to the desired setting and tap the **Select** button to change your setting. An arrow (▶) appears next to the selected setting.
   For Value Selections:
   Tap the **Select** button to activate the parameter and use the **Up** or **Down** navigation buttons to select the value. Tap the **Select** button to save the value.

Available settings

Value selection
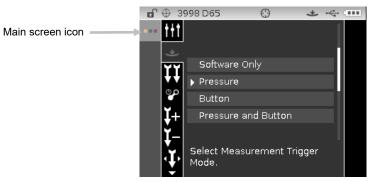
6. Tap the **Left** navigation button to return to the Options column.

Exiting Configuration Mode

After configuring options, use the **Left** navigation button to move the highlight focus to the Main screen icon in the Main column and tap the **Select** button to exit.

NOTE: If a setting has a checkmark save icon it must be selected before exiting or any changes that were made will be lost.

Main screen icon ⟶

Measurement Trigger

This option is used to determine which inputs are used to trigger a measurement on the instrument. The available settings are Software Only, Pressure (default), Button, and Pressure and Button.

Software Only: No button or read switch is required to take a measurement. This setting would be selected when software input is used to trigger a measurement.

Pressure: Shoe closing is required to take a measurement.

Button: Measure button is required to take a measurement.

Pressure and Button: Both the read switch and measure button are required to a take a measurement.

Averaging

This option is used to set the number of measurements required for calculating a single measurement. Measurements are taken at different locations on a sample to achieve average measurement values. The available settings are 1 to 99.

Calibration Timeout

This option is used to set the amount of time that elapses before a calibration is required. The available settings are: Disabled, 8 Hours, 12 Hours, 24 hours (default), 48 Hours, and 1 Week.

Sample Storage

This option is used to enable or disable (default) the storage of samples in the instrument.

Enabled: Sample storage is on.

Disabled: Sample storage is off.

Sample Deletion

This option is used to enable or disable (default) the ability to delete stored samples in the measure mode. **NOTE:** The option requires sample storage to be enabled.

Enabled: Allows sample deletion.

Disabled: Disallows sample deletion.

Sample History

This option is used to enable (default) or disable the ability to view stored samples in the measure mode. **NOTE:** The option requires sample storage to be enabled.

Enabled: Allows stored sample navigation.

Disabled: Disallows stored sample navigation.

Standard Selection Method

This option is used to set auto standard (default) or manual standard.

Auto Select: The instrument automatically selects a stored standard that is the closest to the sample being measured.

Manual Select: A standard must be selected before a measurement.

Standard Creation

This option is used to enable or disable (default) the ability to create standards in the QA mode.

Disabled: Disallows standard creation.

Measured Entry Enabled: Allows standard creation by a measurement.

Manual Entry Enabled: Allows standard creation by entry of colorimetric values.

Allowed Color Spaces

This option is used to select the allowed color spaces that appear in the Measure Mode. You can select as many color spaces as desired.

An arrow (▶) appears next to the selected color spaces.

Allowed Illuminant/Observers

This option is used to select the allowed illuminant/observer combinations that appear in the Measure Mode. You can select as many illumination/observers as desired.

An arrow (▶) appears next to the selected illuminant/observer combinations.

Beeper Volume

This option is used to adjust the volume of the instrument speaker. The instrument beeps after a measurement, calibration or navigation control touch. The available settings are: Off, Low, and High (default).

Power Management Scheme

This option is used to set the power save method. The explanation for each setting is listed below. Shut off times are ignored when the AC adapter is plugged into the instrument.

No Power Save Mode: The instrument goes into standby mode after 24 hours and shuts completely off after 48 hours of inactivity.

Minimum Power Save Mode: The instrument goes into standby mode after 45 minutes and shuts completely off after 1 hour and 45 minutes of inactivity.

Normal Power Save Mode (default)**:** The instrument goes into standby mode after 5 minutes and shuts completely off after 15 minutes of inactivity.

Maximum Power Save Mode: The instrument goes into standby mode after 1 minute and shuts completely off after 2 minutes of inactivity.

Strength Method

This option is used to select the strength calculation that will be used during strength measurements. The available methods are Apparent (default), Chromatic, and Tristimulus.

Opacity Setting

This option is used to select the opacity display method for measurements and allows K1 and K2 value editing.

Data Display: Select Over White, Over Black (default), or Color at 100%

Set K1 and **K2:** Allows you to adjust the opacity constant of K1 and K2 for SPIN and SPEX.

1. Tap the **Right** navigation button to move the highlight to the opacity editing screen.

2. Use the navigation control to highlight the data display method option. A box outline indicates that it is selected.

3. Tap the **Select** button to access the option.

4. Use the **Up** or **Down** navigation buttons to page through the display types.

5. Tap the **Select** button set the display type.

6. Use the navigation control to highlight the K1, K2 SPIN or SPEX value. A box outline indicates that it is selected.

7. Tap the **Select** button to access the option and use the **Up** or **Down** navigation buttons to select the value.

8. Tap the **Select** button to set the value.

9. Continue until all K1/K2 values are set.

10. Tap the **Right** navigation button and highlight the checkmark icon in the Progress Column.

11. Tap the **Select** button to save the opacity settings.

Metamerism Illum/Obs Pairs

and These options are used to select the illuminant/observer combinations pairs that are used in calculating the metamerism index. **NOTE:** Illum/obs combinations that appear here are the same as the combinations selected for the Allowed Illum/Obs combinations option. Metamerism index must be a selected color space for these options to appear.

Color Table

This option is used to select which illuminant weight table is used to calculate colorimetric data. The available options are Color Table 5 (default) and Color Table 6.

NetProfiler

This option is used to enable or disable (default no profile is loaded) the NetProfiler option.

Enabled: NetProfile is active.

Disabled: NetProfile is not active.

This icon only appears if a profile is loaded.

Transform Method

This option is used to select the transform method used during measurement. Transforms are used to make the data that this instrument measures emulate another instrument. The desired instrument transform is selected from the list. The default setting is Off.

This icon only appears if a transform is loaded.

555 Shade Sort

This option is used to enable or disable (default) the 555 Shade Sort option. Shade sort options are accessed through the Standard editing option and allow setting of the size and range.

Enabled: 555 Shade Sort is active.

Disabled: 555 Shade Sort is not active.

Verbal Difference

This option is used to enable or disable (default) the verbal difference option. This is an indication of the direction the sample is from the standards (e.g., lighter or darker, towards yellow, etc.). This setting is available for DL*a*b*, DL*C*H*, DEcmc, DE94, and DLab.

Enabled: Verbal Difference is active.

Disabled: Verbal Difference is not active.

Lamp Mode (Ci64UV only)

This option is used to select the Lamp Mode used during measurements. This impacts the colorimetric data due to the measurements either having or not having UV light during the measurement. The available options are Tungsten (default) and UV Included.

UV Calibration Target Value (Ci64UV only)

This option is used to set the UV whiteness value of the UV calibration plaque. The value is initially set at the factory. The value displayed here must match the value shown on the UV calibration plaque used.

This icon only appears if the Lamp Mode is set to UV Included.

UV Type (Ci64UV only)

This option is used to select which "Whiteness Calibration" the instrument will use. The D65 setting is used to select the calibration that comes with the instrument from the factory (UV enhanced plastic calibration tile). The Adj1 and Adj2 options allow you to set up custom calibrations. For example, a customer may calibrate to their own calibration tile or a UV enhanced fabric; by selecting Adj1 or Adj2, the user can now have multiple UV calibrations on the instrument. The available options are UV D65 (default), UV ADj1, and UV ADj2.

This icon only appears if the Lamp Mode is set to UV Included.

Whiteness Timeout (Ci64UV only)

This option is used to set the amount of time that elapses before a UV whiteness calibration is required. The available settings are: Disabled, 8 days, 16 days, 32 days (default), and 64 days.

This icon only appears if the Lamp Mode is set to UV Included.

Language

This option is used to set the language that is displayed on the instrument. The available settings are English (default), German, French, Spanish, Italian, Portuguese, Chinese Simplified, Chinese Traditional, Korean, and Japanese.

Instrument Orientation

This option is used to change the display direction to accommodate both right and left handed users. The available settings are Right Handed (default) and Left Handed.

Default Tolerance

This option is used to edit the parameters for the default tolerance.

NOTE: Refer to the Editing Standard Tolerances section later in this manual for the procedure on editing the tolerances.

Date Format

This option is used to adjust the date format the instrument uses. The available settings are: MM/DD/YYYY (default), DD/MM/YYYY, DD.MM.YYYY, YYYY/MM/DD, and YYYY-MM-DD.

NOTE: The date format automatically changes to the correct format for the selected language. If desired, you can change the format after selecting the language.

Instrument Date/Time

This option is used to set the instrument date and time.

1. Use the **Right/Left** and **Up/Down** buttons the select the month, day, year, hour, or minute option.
2. Tap the **Select** button to access the parameter.
3. Use the **Up** or **Down** navigation buttons to edit the parameter and then tap the **Select** button.
4. Repeat steps 1 through 3 until the date and time are set.
5. Tap the **Right** navigation button and highlight the checkmark icon in the Progress Column.
6. Tap the **Select** button to save the date and time.

Delete All Samples or Standards

This option is used to delete all samples or standards stored in the instrument. To delete all samples or standards, tap the **Right** side of the navigation control and select the desired delete option. Tap the **Right** side of the navigation control to move highlight focus to the checkmark icon in the Progress column. Tap the **Select** control to delete.

Restore Factory Settings

This option is used to restore the instrument's configuration settings back to their original factory settings. All jobs, projects, standards and samples will also be deleted.

To restore the factory settings, tap the **Right** side of the navigation control to move highlight focus to the checkmark icon in the Progress column. Tap the **Select** control.

CALIBRATION MODE

The calibration consists of a ceramic plaque for white measurements and a trap opening for black measurements. If your instrument is a UV model, a UV calibration plaque is also included.

A calibration should be performed when prompted for by the instrument or when desired. The calibration timeout is set in Configuration mode.

Refer to Cleaning section in the Appendices for information on cleaning the optics area and references.

> **NOTE:** Make sure to use the calibration reference supplied with the instrument for calibrating. Do not substitute this reference with a reference from another instrument. The serial number on the reference should match the reference (plaque) serial number on the instrument.

Calibration Notes

- Dirt or dust in the aperture area will cause an inaccurate calibration reading. Refer to the Appendices for optics cleaning procedure.

- The **white ceramic plaque in the calibration reference is dramatically affected by smudge marks, dust, and finger prints**. Refer to Appendices for calibration reference cleaning procedures.

- The **black trap should be cleaned periodically to remove any dust or contamination**. Refer to Appendices for black trap cleaning procedures.

- **Do not move instrument while taking a calibration measurement**. If motion is detected, calibration will be aborted.

- **Important:** If the lamp signal in your instrument reaches a level that is 50% below the factory level stored, the warning symbol shown at the right appears after a calibration is completed. This indicates that the illumination level is getting low and you should have your instrument serviced soon.

White and Black Calibration Procedure
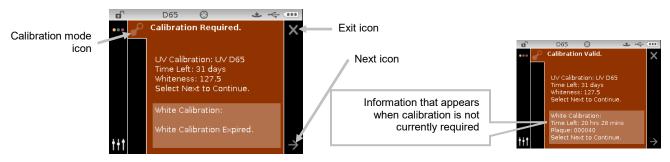
1. From the Main screen, use the **Navigation** control to move the highlight square to the Calibration icon.

2. Tap the **Select** control to access the calibration screen.

   Calibration Required appears if calibration is needed. If calibration is not currently needed, the time remaining before the next calibration along with the white reference (plaque) serial number appears. To exit calibration mode without calibrating, select the Exit icon (**x**) in the Progress column.

   NOTE: If your instrument is a Ci64UV model, you will need to use the **Down** navigation control to highlight "White Calibration" before continuing.
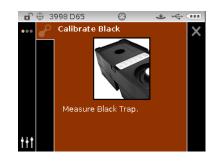
Calibration mode icon

Exit icon

Next icon

Information that appears when calibration is not currently required

3. Use the **Right** navigation control to move the highlight focus to the Progress column. Use the **Down** navigation control to highlight the Next arrow icon (→) if not highlighted and tap the **Select** button.

4. Remove the protective cap from the white ceramic plaque in the calibration reference.

5. Position the instrument target window over the white ceramic plaque.

White ceramic plaque

6. Press the instrument firmly to the shoe and hold steady until the display indicates that the reading is complete. Release the instrument.

7. Reinstall the protective cap on the white ceramic plaque.

8. Position the instrument target window over the black trap opening of the calibration reference.

Black trap opening

9. Press the instrument firmly to the shoe and hold steady until the display indicates that the reading is complete. Release the instrument.

10. Tap the **Select** control to save the calibration and exit to the main menu.

11. Store the calibration reference in a dry, dust free area, away from direct exposure to light.

    NOTE: If an error message appears during or after white calibration, tap the **Select** control to clear the message and try measuring the white reference again. If an error still occurs, clean the white calibration reference as explained in the Appendices.
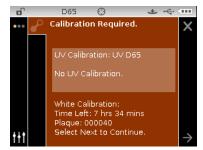
UV Calibration Procedure (Ci64UV only)

NOTE: Before performing the UV calibration, the Lamp Mode, Calibration Target Value, UV Type, and Whiteness Timeout options must be set in the Configuration mode.

1. From the Main screen, use the **Navigation** control to move the highlight square to the Calibration icon.

2. Tap the **Select** control to access the calibration screen.

3. Use the **Up**/**Down** navigation control to highlight "UV Calibration".

4. Use the **Right** navigation control to move the highlight focus to the Progress column. Use the **Down** navigation control to highlight the Next arrow icon (→) if not highlighted and tap the **Select** button.

5. Remove the protective cap from the white ceramic plaque in the calibration reference.

6. Position the instrument target window over the white ceramic plaque.

7. Press the instrument firmly to the shoe and hold steady until the display indicates that the reading is complete. Release the instrument.

8. Reinstall the protective cap on the white ceramic plaque.

9. Position the instrument target window over the black trap opening of the calibration reference.
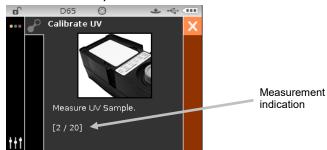
10. Press the instrument firmly to the shoe and hold steady until the display indicates that the reading is complete. Release the instrument.

11. Remove the UV calibration plaque from the protective bag and position it in the recessed area on the other side of the calibration reference. Make sure the white surface to measure is facing upward and the plaque is orientated as shown.

12. Press the instrument firmly to the shoe and hold steady until the display indicates that the reading is complete. Release the instrument.

13. Continue with additional UV sample measurements (minimum of three) until the instrument indicates that you are finished.

Measurement indication

14. Position the instrument target window over the white ceramic plaque and take the measurement.

15. After the white measurement, position the instrument target window over the black trap opening of the calibration reference and take the measurement.

16. Position the UV calibration plaque in the recessed area on the other side of the calibration reference and take the measurement. This measurement performs a UV verification.

17. When calibration is complete, return the UV calibration plaque to its protective bag, and store the calibration reference in a dry, dust free area, away from direct exposure to light.

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MEASURE MODE

The measure mode is the main operation mode of the instrument used to select the measurement mode, analyze and collect sample data. After taking a measurement, you can view the results under various color spaces and illuminant/observer combinations.
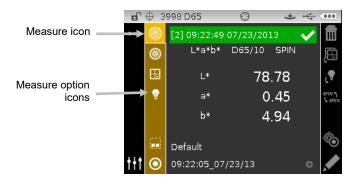
NOTE: You must select a standard if auto standard is disabled before measuring.

Entering Measure Mode

1. From the Main screen, use the **Navigation** control to move the highlight square to the Measure mode icon.

2. Tap the **Select** control to access the main measure screen.
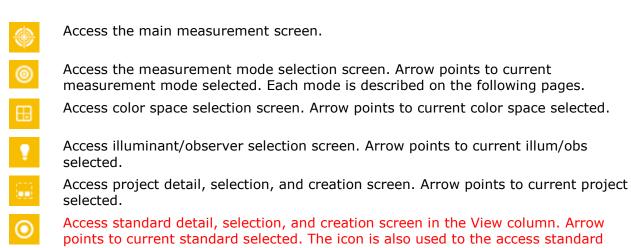
Measure Mode Icons
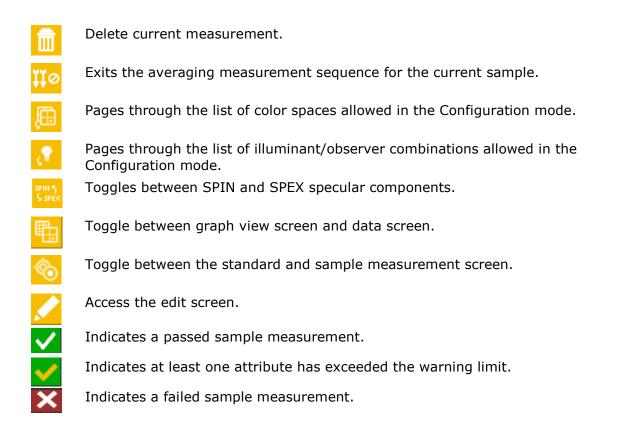
A description of the icons found in the measure mode is shown below.

Icon   Description

Access the main measurement screen.

Access the measurement mode selection screen. Arrow points to current measurement mode selected. Each mode is described on the following pages.

Access color space selection screen. Arrow points to current color space selected.

Access illuminant/observer selection screen. Arrow points to current illum/obs selected.

Access project detail, selection, and creation screen. Arrow points to current project selected.

Access standard detail, selection, and creation screen in the View column. Arrow points to current standard selected. The icon is also used to the access standard selection in the Progress column.

Delete current measurement.

Exits the averaging measurement sequence for the current sample.

Pages through the list of color spaces allowed in the Configuration mode.

Pages through the list of illuminant/observer combinations allowed in the Configuration mode.

Toggles between SPIN and SPEX specular components.

Toggle between graph view screen and data screen.

Toggle between the standard and sample measurement screen.

Access the edit screen.

Indicates a passed sample measurement.

Indicates at least one attribute has exceeded the warning limit.

Indicates a failed sample measurement.

Selecting Measurement Mode

The Measurement mode icon is used to select the mode the instrument operates in. The available modes are: QA, Compare, Strength and Opacity. The QA measurement mode is the main mode of operation and is used in conjunction with a quality assurance software package, such as Color iQC. Sample measurements are compared to stored standards and the results displayed. Stored measurement data can then be uploaded to the software program for further analysis.

Each additional measurement mode is covered in the sections that follow.

To select a Measurement mode:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Measurement Mode icon .

2. Tap the **Select** or **Right** button to access the measurement mode selection area.

3. Use the **Up** or **Down** navigation buttons to move the highlight focus to the desired mode.

4. Tap the **Select** button. An arrow (▶) appears next to the selected mode and the screen returns to the measure screen.

Measurement Mode icon

Selecting Color Space

The instrument has several colorimetric systems (absolute and difference) to choose from. Any color space can be selected after a measurement to view the measurement results under a different method. The color space page icon is used to quickly page through the list of allowed color spaces without leaving the current view. Simply tap the Enter key when the icon is highlighted to change to the next allowed color space.

Color Spaces						
[√/X]	Lab	YI1925	WI Taube	ΔEcmc	ΔLab	ΔWI73
L*a*b*	Reflectance	WI98	MI	ΔE00	ΔReflectance	ΔWI Berger
L*C*h°	Munsell Notation	WI73	MI6172	ΔE94	ΔYI98	ΔWI Hunter
XYZ	Gray Scale	WI Berger	Gloss	ΔXYZ	ΔYI73	ΔWI Stensby
Yxy	YI98	WI Hunter	ΔL*a*b*	ΔYxy	ΔYI1925	ΔWI Taube
L*u*v*	YI73	WI Stensby	ΔL*C*h°	ΔL*u*v*	ΔWI98	
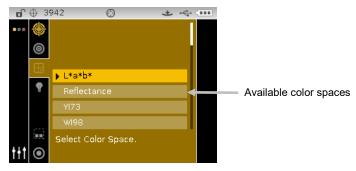
NOTE: Delta color spaces will not appear if no standard is selected. Certain color spaces may not appear if they are not allowed in the Configuration mode.

To select a color space:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Color Space icon ▦.

Color space icon

Color space page icon

2. Tap the **Select** or **Right** navigation button to access the color space selection area.

3. Use the **Up** or **Down** navigation buttons to move the highlight focus to the desired color space.

4. Tap the **Select** button. An arrow (▶) appears next to the selected color space and the screen returns to the measure screen.

Available color spaces

Selecting Illuminant/Observer

The instrument has several illuminant/observer combinations to choose from. Any combination can be selected after a measurement to view the measurement results under various conditions. The illuminant/observer page icon is used to quickly page through the list of allowed illuminant/observers without leaving the current view. Simply tap the Enter key when the icon is highlighted to change to the next allowed illuminant/observer.

Illuminant/Observers				
A/2	D50/2	D75/2	F7/2	F12/2
A/10 (default)	D50/10	D75/10 (default)	F7/10	F12/10
C/2 (default)	D65/2	F2/2	F11/2	
C/10	D65/10 (default)	F2/10 (default)	F11/10	
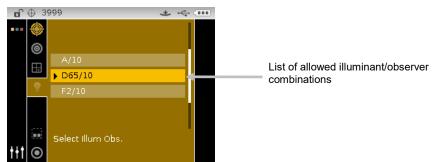
NOTE: Certain illuminant/observer combinations may not appear if they are not allowed in the Configuration mode.

To select illuminant/observer combinations:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Illuminant/Observer icon 💡.

Illuminant/observer icon

Illuminant/observer page icon

2. Tap the **Select** or **Right** navigation button to access the illuminant/observer selection area.

List of allowed illuminant/observer combinations

3. Use the **Up** or **Down** navigation buttons to move the highlight focus to the desired illuminant/observer combination.

4. Tap the **Select** button. An arrow (▶) appears next to the selected illuminant/observer and the screen returns to the measure screen.

Projects

The project icon lists available projects that contain grouped standards. Projects and standards are typically created and downloaded from a software application, such as Color iQC. When multiple projects are available, you must select the desired project before taking a measurement when using auto standard. The auto standard select function does not recognize standards across multiple projects. The selected project is used until a different project is chosen. Projects can also be created and standards added using the instrument. Refer to the procedures that follow.

Selecting a Project

To select a project:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Project icon .

2. Tap the **Select** or **Right** button to access the project selection area.

Available Projects

Project icon

3. Use the **Up** or **Down** navigation buttons to move the highlight focus to the desired project.

4. Tap the **Select** button. An arrow (▶) appears next to the selected project and the screen returns to the measure screen.
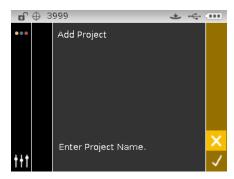
Creating a Project

To create a project:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Project icon .

2. Tap the **Right** button twice to move the focus to the Progress Column.

3. Select the Add icon and tap the **Select** button to view the Add Project screen.

4. Tap the **Left** navigation button to move the highlight to the Add Project screen.

5. Tap the **Select** button to access the option.

6. Use the **Up** or **Down** navigation buttons to page through the alphanumeric list for the first character of the name.

NOTE: You can also use the navigation control to rapidly scroll through a list by touching the control between the arrows and circle left or right.

7. Tap the **Select** button set the first character.

8. Tap the **Right** navigation button to move the two arrows to the next character space and tap the **Select** button.

9. Use the **Up** or **Down** navigation buttons as previously explained to set the character and tap the **Select** button.

10. Continue until all characters for the name are set.

11. Tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column.

12. Tap the **Select** button to save the name for the project.

NOTE: To exit the name without saving, highlight the Exit ✕ icon in the Progress Column and tap the **Select** button.

Adding Standards to a Project

Standards that are available on the instrument can be grouped into specific projects.

To add standards:

1. Select a project as previously explained and then tap the **Right** navigation button. Highlight the Edit ▱ icon in the Progress Column.

2. Tap the **Select** button and highlight the Standard ⊙ icon in the Progress Column.

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3. Tap the **Select** button and then tap the **Left** navigation button to move the highlight to the select standards screen.

4. Use the **Up** or **Down** navigation buttons and the **Select** button to choose the standards.

5. When finished, tap the **Right** navigation button and highlight the Checkmark icon ✅ in the Progress Column.

6. Tap the **Select** button to save the standards for the project.

Deleting Projects, Standards, and Samples

Projects, standards and samples can be deleted from the instrument. When a project is deleted, any standard or samples included are also deleted.

To delete a project, standards or samples:

1. Select a project as previously explained and then tap the **Right** navigation button. Highlight the Edit ✏️ icon in the Progress Column.

2. Tap the **Select** button and then tap the **Left** navigation button to move the highlight to the select option screen.

3. Use the **Up** or **Down** navigation buttons to choose Delete All Standards, Delete All Samples, or Delete This Project. Tap the **Select** button to choose the option.

4. Tap the **Right** navigation button and highlight the Checkmark icon ✅ in the Progress Column.

5. Tap the **Select** button to delete the selected option.

Locking a Project

After a project is created it can be locked to help prevent any inadvertently deleting of standards and samples.

To lock a project:

1. Select a project as previously explained and then tap the **Right** navigation button. Highlight the Edit ✏️ icon in the Progress Column.

2. Tap the **Select** button and then tap the **Left** navigation button to move the highlight to the select option screen.

3. Use the **Up** or **Down** navigation buttons to choose the Lock Project option. Tap the **Select** button to choose the option.

4. Tap the **Right** navigation button and highlight the Checkmark icon ✅ in the Progress Column.

5. Tap the **Select** button to lock the project.
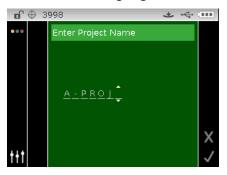
Unlocking a Project

Projects can be unlocked by selecting the Unlock Project option after the project is locked.

Editing Project Name

To rename a project:

1. Select the project (if not already selected) that you want to rename and move the highlight to the Progress Column.

2. Highlight the Edit icon and tap the **Select** button to view the select option screen.

3. Select the Edit icon and tap the **Select** button to view the Enter Project Name screen.

4. Tap the **Left** navigation button to move the highlight to the Enter Project Name screen.

NOTE: Select the backspace character (◄) and use the **Left** navigation button to delete the unwanted characters.

5. Use the **Left** or **Right** navigation buttons to move the two arrows to the character location and tap the **Select** button.

6. Use the **Up** or **Down** navigation buttons to page through the alphanumeric list for the character location of the name.

NOTE: You can also use the navigation control to rapidly scroll through a list by touching the control between the arrows and circle left or right.

7. Tap the **Select** button set the character.

8. Tap the **Left** or **Right** navigation button to move the two arrows to the next character space and tap the **Select** button.

9. Use the **Up** or **Down** navigation buttons as previously explained to set the character and tap the **Select** button.

10. Continue until all characters for the name are set.

11. Tap the **Right** navigation button and highlight the Checkmark icon in the Progress Column.

12. Tap the **Select** button to save the name for the project.

Standards
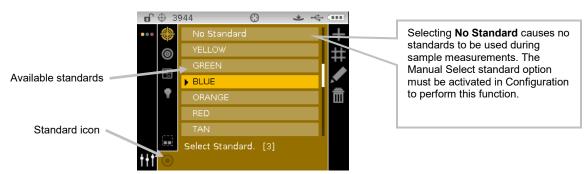
The instrument can be set to "auto select" or "manual select" a standard in the Configuration Mode. In "auto select" mode, the instrument automatically chooses the closest standard to the measured sample. In "manual select" mode, you must choose the standard before a measurement. The manually selected standard is used until a different standard is chosen. In either case, you can manually choose a different standard after a measurement. Refer to Manually Selecting Standard sections that follow.

NOTE: If you would like to create a standard with the instrument or edit the tolerance values that are used for the standard, refer to the Creating Standards procedure that follows.

Manually Selecting Standard by Name

To select standard by name:

1. Select the project where the standard is located.

2. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Standard icon ⊙.

3. Tap the **Select** or **Right** navigation button to access the standard selection area.

Available standards

Standard icon

Selecting **No Standard** causes no standards to be used during sample measurements. The Manual Select standard option must be activated in Configuration to perform this function.
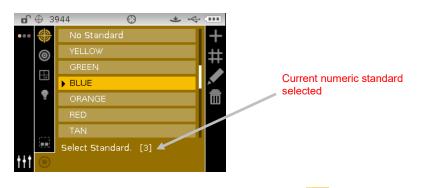
4. Use the **Up** or **Down** navigation buttons to move the highlight focus to the desired standard.

5. Tap the **Select** button. An arrow (▶) appears next to the selected standard and the screen returns to the measure screen.

Manually Selecting Standard Numerically
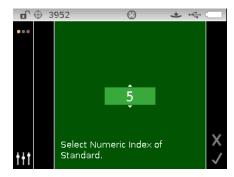
The Numeric Standard Selection feature allows you to quickly select a different standard by entering a numeric value. This is useful if there are many standards available in the project. Standards are listed numerically from top to bottom.

To select a standard numerically:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Standard icon ⊙.

2. Tap the **Select** or **Right** navigation button to access the standard selection area.

Current numeric standard selected

3. Tap the **Right** navigation button and highlight the **Numeric Select** icon ▦ in the Progress Column.

4. Tap the **Select** button to access the Numeric Index option.

5. Use the **Up** or **Down** navigation buttons to page through the available standards by number.

6. Tap the **Select** button to set the standard number.

7. Tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column.

8. Tap the **Select** button to save the selected standard and return to the measure screen.

Creating Standards

NOTE: A create standard method (measurement or manual) must be enabled in the Configuration to create standards using the instrument.
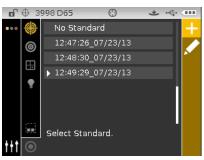
Standards are typically downloaded to the instrument from a software application, such as Color iQC (Ci62 and Ci64 only). However, a standard can be created using the instrument if desired. A maximum of 1000 standards can be stored in the instrument. The measure entry method is shown first followed by the manual entry method.

Tolerances can be edited after the standard is created. Refer to Editing Standard Tolerances on the following pages.

The instrument automatically labels the created standard with the date and time. These automatically generated timestamps can be changed on the instrument if required. Refer to Renaming the Standard later in this section.

To create a standard:

1. If applicable, select the project where the standard will be grouped.

2. After the project is selected, use the **Navigation** buttons to move the highlight focus back to the View column and then to the Standard icon ⊙.

3. Tap the **Right** button twice to move the focus to the Progress Column.

4. Refer to the Measured Entry Method or Manual Entry Method that follows.

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Measured Entry Method:

1. Select the Add icon ➕ and tap the **Select** button to view the Measure Standard screen.
   NOTE: The Add icon does not appear if the maximum of 1000 standards is reached in the instrument.

2. Position the target window over the sample and take the measurement.

3. Tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column.

4. Tap the **Select** button to save the standard. The Enter Standard Name screen appears. Edit the default name if desired. Refer to Editing the Standard Name section that follows.

5. When finished, tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column.

6. Tap the **Select** button to save the standard name. The edit tolerance screen appears. Edit the tolerances as needed. Refer to Editing Standard Tolerances section that follows.

CI6X SERIES SPECTROPHOTOMETER

7. When finished, tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column. The new standard now appears in the selected project.

The newly created standard can now be used for sample comparison.

8. Tap the **Left** navigation button to return to the View column.

Manual Entry Method:

The manual entry method supports up to 10 unique sets of color space attributes for each standard.

1. Select the Add icon ➕ and tap the Select button to view the Enter Standard screen.
   NOTE: The Add icon does not appear if the maximum of 1000 standards is reached in the instrument.

2. Use the navigation control to highlight the color space option with a default of "No Standard". A box outline indicates that it is selected.
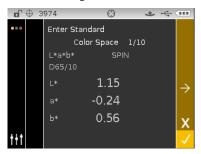
3. Tap the **Select** button to access the option.

4. Use the **Up** or **Down** navigation buttons to page through the available color space. **NOTE:** Color spaces that appear here are the same that were selected for the Allowed Color Space.

5. Tap the **Select** button to set the color space.

6. Use the navigation control to highlight illum/obs, SPIN/SPEX, or color space attribute.

7. Tap the **Select** button to access the option and use the **Up** or **Down** navigation buttons to select option/value.

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8. Tap the **Select** button to set the color space option/value.

9. Continue until all attributes for the color space are set.

10. If additional color spaces (up to 10) are required for the selected standard, highlight the right arrow icon → is the Progress Column and tap the **Select** button. Edit the next color space attributes as explained above.

11. When finished with color space entries for the standard, tap the **Right** navigation button and highlight the checkmark icon ✓ in the Progress Column.
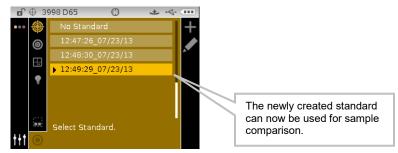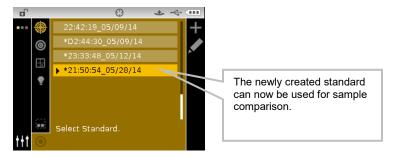

12. Tap the **Select** button to save the standard. The Enter Standard Name screen appears. Edit the default name if desired. Refer to Editing the Standard Name section that follows.

13. When finished, tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column.

14. Tap the **Select** button to save the standard name. The edit tolerance screen appears. Edit the tolerances as needed. Refer to Editing Standard Tolerances section that follows.

15. When finished, tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column. The new standard now appears in the selected project. Manually created standards are indicated with an asterisk (*).
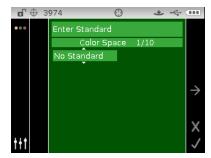
The newly created standard can now be used for sample comparison.

16. Tap the **Left** navigation button to return to the View column.

Editing an Existing Manually Entered Standard

NOTE: Only standards that were measured or manually entered on the instrument can be edited. Standards that were downloaded from the software cannot be edited from the instrument.

To edit a standard:

1. Select the manually entered standard (if not already selected) that you want to edit and move the highlight to the Progress Column.

2. Highlight the Edit icon and tap the **Select** button to display the Standard screen.

3. If more than one color space exists for the standard, use the Next icon to advance to the desired color space.

4. Use the navigation control to highlight the color space, illum/obs, SPIN/SPEX, or color space attribute and edit as previously explained.

5. When finished with the standard edits, tap the **Right** navigation button and highlight the checkmark icon in the Progress Column.

6. Tap the **Select** button to save the standard edits.

Deleting a Standard

NOTE: Only standards that were measured or manually entered on the instrument can be deleted. Standards that were downloaded from the software cannot be deleted from the instrument.

To delete a standard:

1. Select the standard (if not already selected) that you want to delete and move the highlight to the Progress Column.

2. Highlight the Delete icon and tap the **Select** button to display the Delete Standard screen.
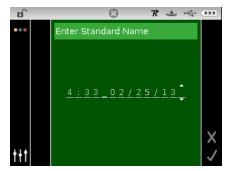
3. Highlight the Checkmark icon ☑ in the Progress Column on the confirm screen.

4. Tap the **Select** button to delete the selected standard.

Editing Standard Name

To rename a standard:

1. Select the standard (if not already selected) that you want to rename and move the highlight to the Progress Column.

2. Highlight the Edit icon ☑ and tap the **Select** button to view the tolerance screen.

3. Select the Edit icon ☑ and tap the **Select** button to enter the standard name screen.

NOTE: Select the backspace character (◄) and use the **Left** navigation button to delete the unwanted characters.

4. Use the **Left** or **Right** navigation buttons to move the two arrows to character location and tap the **Select** button.

5. Use the **Up** or **Down** navigation buttons to page through the alphanumeric list for the character location of the name.

NOTE: You can also use the navigation control to rapidly scroll through a list by touching the control between the arrows and circle left or right.

6. Tap the **Select** button set the character.

7. Tap the **Left** or **Right** navigation button to move the two arrows to the next character space and tap the **Select** button.

8. Use the **Up** or **Down** navigation buttons as previously explained to set the character and tap the **Select** button.

9. Continue until all characters for the name are set.

10. Tap the **Right** navigation button and highlight the Checkmark icon ✓ in the Progress Column.

11. Tap the **Select** button to save the name for the standard.

Editing Standard Tolerances

Tolerances for newly created standards can be edited. Downloaded standard tolerances cannot be changed. New standards created on the instrument use the default tolerance set in the instrument configuration. Up to six tolerances can be created for each standard.

The tolerance limit is the maximum allowable difference from the standard color values that is considered acceptable. The tolerances are used to test your sample's acceptability by displaying a pass or fail signal, based on the pass/fail margin limits. Plus and minus limits can be set symmetrically or individually for allowable color space attributes. Pass/fail indication appears in QA, Strength and Opacity functions when set.

Tolerance Editing Icons

Descriptions of the various icons found for tolerance editing are shown below.

Access the editing screen where the standard is edited including the name.

Exit the editing screen and return to the standard selection screen.

Access the screen where the standard can be remeasured.

Indicates that the tolerance plus and minus attributes change symmetric (locked) when edited.

Indicates that the tolerance plus and minus attributes change asymmetric (not locked) when edited.

Access previous screen when browsing tolerances.

Access next screen when browsing tolerances.

Save changes to the current tolerance screen edits.

Editing Tolerances

To edit standard tolerances:

1. Select the standard (if not already selected) that you want to rename and move the highlight to the Progress Column.

2. Highlight the Edit icon and tap the **Select** button to view the tolerance screen.

3. Use the navigation control to highlight the tolerance type option. A box outline indicates that it is selected.

Selected tolerance type

4. Tap the **Select** button to access the option.

5. Use the **Up** or **Down** navigation buttons to page through the tolerance types. **NOTE:** For a 555 Shade Sort selection, refer to Editing 555 Shade Sort Values section that follows.

6. Tap the **Select** button to set the tolerance type.

    NOTE: Color spaces and illum/obs combinations that appear here are the same that were selected for the Allowed Color Space and Allowed Illum/Obs combinations options.

7. Use the navigation control to highlight illum/obs, SPIN/SPEX, or +/-tolerance value.

    NOTE: Make sure the symmetric icon is displayed if +/- tolerance attribute values are going to be set as the same value. Highlighting the icon and tapping the **Select** button will toggle between the two options.

8. Tap the **Select** button to access the option and use the **Up** or **Down** navigation buttons to select option/value.

9. Tap the **Select** button to set the tolerance option/value.

10. Continue until all attributes for the first tolerance are set.
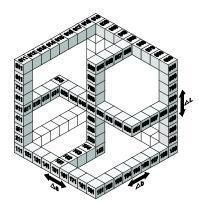
11. Tap the **Right** navigation button and highlight the checkmark icon in the Progress Column.

12. Tap the **Select** button to save the edits for the first tolerance set.

NOTE: If additional tolerance sets (up to six) are required for the selected standard, highlight the right arrow icon is the Progress bar and tap the **Select** button. Edit the next tolerance set as explained above.

Editing 555 Shade Sort Values

NOTE: The 555 Shade Sort option must be enabled in the Configuration for this option to appear.

The shade sort size is based on the dimensions placed on the color space attributes. The value represents a three-dimensional box in space. These boxes are layered nine deep on each axis and at the center is the 555 reference box. This box represents the reference color. The value in the fields determines the reference box size. A smaller value is entered for a tighter tolerance. Values range from .01 to 9.99.

The shade sort range determines the range of the 555 shade tag boxes to be used and displayed. The range can be set from 1 to 9 in the three dimensional space.
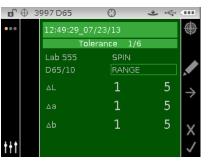
The 555 indication appears on the QA mode when set.

1. Select the standard (if not already selected) and the 555 tolerance type as explained above.

2. Use the navigation control to highlight illum/obs and specular component (SPIN or SPEX) and set as previously explained.

3. Use the navigation control to highlight SIZE or RANGE and tap the **Select** button.

4. For SIZE, use the **Up** or **Down** navigation buttons to select the attribute value and edit as required. Values range from .01 to 9.99.

5. For RANGE, use the **Up** or **Down** navigation buttons to select attribute value and edit as required. Lower attribute value can range from 1 to 5 and the upper attribute value can range from 5 to 9.

6. When finished, tap the **Right** navigation button and highlight the checkmark icon ✓ in the Progress Column.

7. Tap the **Select** button to save the edit for the shade sort tolerance.

Basic Operation

Measuring a Sample

The measurement results displayed depend on how the instrument configuration is set, and color space and illuminant/observer selections. Measurement results can display as absolute or color difference compared to a standard. If tolerance values are included with the standard, pass/fail status appears for each measured sample.

To measure a sample:

1. Select the project, standard (if required), illum/obs, and color space as previous explained.

2. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Measure icon .

3. Position the instrument on the sample using the techniques previously explained.

4. Take a measurement via read switch and/or the measure button.

5. If averaging is used, reposition the instrument on the sample and take additional measurements. Refer to Using Measurement Averaging later in this section for information.

6. View measurement results on the display. Refer to the following pages for additional information on viewing pass/fail and reflectance sample data.

NOTE: If you would like to see the list of the next closest standards to the measured sample, refer to the Next Best Standard Selection section that follows.

Measure icon

Measurement number and timestamp appear for each measurement. The Sample Storage option must be activated in Configuration to display the measurement number..

Current project selected

Current standard selected

The white check mark indicates a passed within tolerance.

You can delete the currently displayed sample by moving the highlight to the trash can icon and tapping the **Select** button. The Delete Sample option must be activated in Configuration to perform this function.

Indicates Auto Standard is selected in Configuration.

NOTE: If an error occurs during a measurement, try measuring the sample again. If the error still occurs, refer to the Troubleshooting section in the Appendices.

Next Best Standard Selection

The Next Best Standard Selection feature allows you to view and select the next closest standard to the measured sample. The instrument will return the best five standards based on the delta differences. Standards are displayed closest from top to bottom in the list. Each standard in the list displays the standard name and approximate difference delta value.

NOTE: Five is the default number of best standards displayed. The number of standards available is software configurable.

To view and select the next closest standard after a sample measurement:
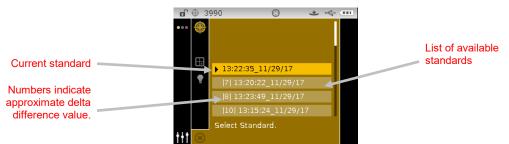
1. Tap the **Right** navigation button to highlight the Progress column.

2. Use the **Up** or **Down** navigation buttons to select the Standard/Sample toggle icon and tap the **Select** button.

3. Use the **Down** navigation button to select the Standard icon in the Progress column and tap the **Select** button.

4. The current standard and list of next closest standards are shown. Use the **Up** or **Down** navigation buttons to scroll through the list of next closest standards.

Current standard

Numbers indicate approximate delta difference value.

List of available standards
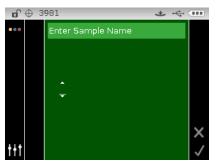
5. When the desired standard is highlighted, tap the **Select** button. The instrument returns to the measurement screen with the selected standard active.

Renaming a Sample

The last measured sample can be renamed from the default time and date stamp if desired.

To rename a sample:

1. Select the Edit icon [✎] and tap the **Select** button.

2. Tap the **Left** navigation button to move the highlight to the Enter Sample Name screen.

3. Tap the **Select** button to access the option.

4. Use the **Up** or **Down** navigation buttons to page through the alphanumeric list for the first character of the name.

NOTE: You can also use the navigation control to rapidly scroll through a list by touching the control between the arrows and circle left or right.

5. Tap the **Select** button set the first character.

6. Tap the **Right** navigation button to move the two arrows to the next character space and tap the **Select** button.

7. Use the **Up** or **Down** navigation buttons as previously explained to set the character and tap the **Select** button.

8. Continue until all characters for the name are set.

9. Tap the **Right** navigation button and highlight the Checkmark icon [✓] in the Progress Column.

10. Tap the Select button to save the name for the sample.

NOTE: To exit the name without saving, highlight the Exit [✕] icon in the Progress Column and tap the **Select** button.

Measurement Averaging
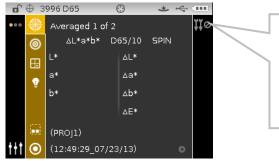
NOTE: Measurement Averaging must be activated in Configuration before averaging can be performed. Refer to the Configuration Mode for procedure on setting averaging.

When the averaging function is activated, all modes (except calibration) require multiple measurements per sample. Measurements are typically taken at various locations on a sample to achieve average data values. Averaging should be used when measuring non-uniform samples, textured materials, and any dark or high chroma colors.

The following example has an average setting of **2**.
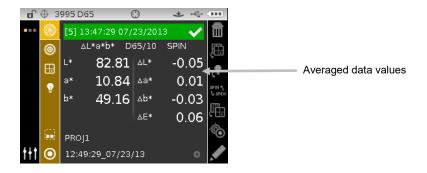
To measure using averaging:

1. Select the project, standard (if required), measurement mode, illum/obs, and color space as previous explained.

2. Position the instrument on the first area of the sample and take a measurement. After the measurement, the instrument displays "Averaged 1 of 2" in the screen, indicating one more measurement is required for results.

If you want to exit sample averaging, move the highlight to the exit icon [icon] and tap the **Select** button. The display returns to the previous measurement.

3. Position the instrument on the second area of the sample and take a measurement. After the measurement, the instrument momentarily displays "Processing" and then the averaged data values.

Averaged data values

Viewing Stored Measurements

NOTE: Sample Storage must be enabled in Configuration to view stored data. Refer to the Configuration Mode for procedure on enabling sample storage.

Measurements stored can be retrieved on the instrument for viewing at a later time. The data will display under the last color space and illuminant/observer combination selected.

To view stored data:

1. Select the desired project.

2. From the Measure screen, use the **Right** navigation button to move the highlight focus to the Content area.

3. Use the **Up** or **Down** navigation buttons to scroll through the stored samples.

Content area highlighted
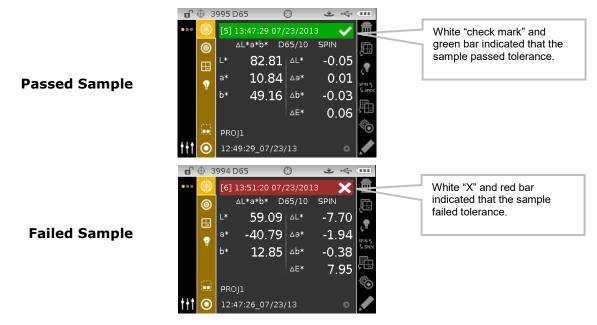
Viewing Pass/Fail Data

A red or green bar displays for a sample on the instrument screen, based on the tolerances assigned to the standard. Two "green" or "red" lights also illuminates, indicating the sample's acceptability.

ΔL*a*b* Color Space (pass/fail)

The following two pass/fail samples are using the ΔL*a*b* color space and D65/10 illum/obs. Tolerance limits of "+/-1.00" were set on DL*, Da*, and Db* for the SPIN and SPEX spectral components.

Passed Sample

White "check mark" and green bar indicated that the sample passed tolerance.

Failed Sample

White "X" and red bar indicated that the sample failed tolerance.

ΔL*a*b* Color Space (pass/warning)

The following is a pass/warning example using ΔL*a*b* color space. Tolerance limits of "1.00" were set to DL* Da*, and Db* for the SPIN and SPEX spectral components. In this example, the 80% warning limit for the tolerance has been exceeded. This is indicated by a yellow highlighted checkmark and green status bar.

Pass/Warning Example

Yellow checkmark and green bar indicated at least one attribute has exceeded the warning limit.

The "L* attribute exceeded the 80% warning for the 1.00 tolerance set.

Pass/Fail Option

The Pass/Fail display option located in the color space group gives you a quick pass/fail view of a sample. Select the **[✓/X]** option to activate the pass/fail display screen.

Passed	Failed	Passed with Warning

Graph View

The graph view allows you to display L*a*b* color space coordinates and associated tolerances for ∆L*a*b*, ∆L*C*H*, ∆Ecmc, ∆E00, ∆E94, and ∆Lab measurements.

To activate the graph view:

1. From the Measure screen, use the **Right** navigation button to move the highlight focus to the Progress column.

2. Use the **Up** or **Down** navigation buttons to highlight the Graph View icon and tap **Select**.

   Note: The Graph icon will not appear in the Progress column unless one of the delta color spaces listed above is first selected.

Current color space selected

Graph view icon

3. To exit the graph view, highlight the Graph View icon and tap **Select**. The screen returns back to the data display.
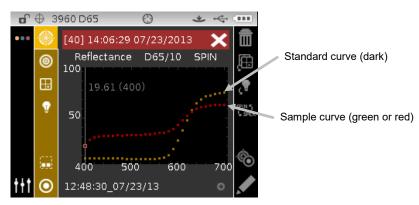
Reflectance View

The instrument can display reflectance graphs for the standard and sample at the same time. Reflectance values (actual or difference) are displayed in 10 nm increments, from 400 to 700 nanometers. Reference data can also be viewed with specular included or excluded.

Measurements can be taken with the reflectance graph displayed in all modes.

NOTE: The reflectance graph is auto scaling and could change when switching between SPIN and SPEX components. Reflectance must also be selected as an allowed color space in Configuration.
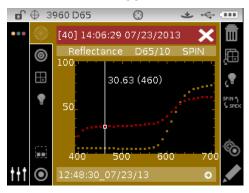
To select reflectance view:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Color Space icon .

2. Tap the **Right** navigation button to access the color space selection area and select Reflectance.

3. Tap the **Left** navigation button and select the Measure icon to view the reflectance graph.

Standard curve (dark)

Sample curve (green or red)

To view individual reflectance points on the standard and sample curve:

1. Tap the **Right** navigation button to highlight the Content area.

2. Tap the **Select** button to activate the selection mode. The value and nanometer point turn white when activated.

3. Use the **Left** and **Right** navigation buttons to view values in 10 nm increment.

4. Tap the **Up** or **Down** navigation buttons to toggle between the standard and sample curve.

5. After viewing is complete, tap the **Select** button to deactivate the selection mode (data point turns gray) allowing you to exit the Content area.

Verbal Difference View

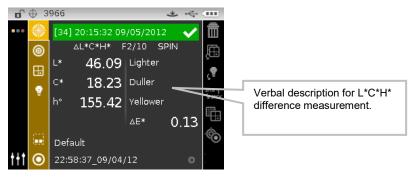The instrument can display color differences numerically (default setting) or as a verbal description, depending on the setting in Configuration. When verbal descriptions are used, the "L*" attribute for L*a*b* or L*C*H* displays as "Lighter" or "Darker" from the standard. The "a*" and "b*" attributes for L*a*b* and the "H*" (hue) attribute for L*C*H* display as "Redder", "Greener", "Bluer", or "Yellower." This is an indication of what color direction the attribute is towards. For L*C*H*, the "C*" (chroma) attribute will display as "Brighter" or "Duller." Verbal indication only appear for L*a*b*, L*C*h°, and Lab (Hunter) color space selections.
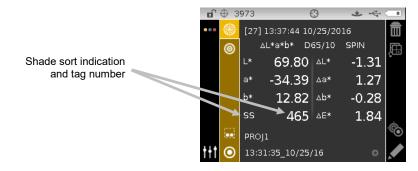
Verbal indication does not display for an attribute that is less than 1/7th of the ΔE value. A value less than this amount is considered insignificant compared to the total difference.

If the delta value for any attribute is greater than "10.00", the display changes to numeric values.

Verbal description for L*C*H* difference measurement.
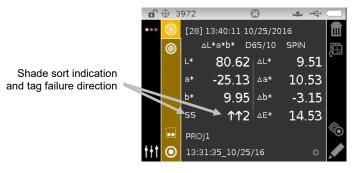
Shade Sort View

The Shade Sort function displays a three-digit number for the sample on the instrument screen, based on the shade size and shade range. The Shade Sort option must be activated in the Instrument Configuration and the size and range set for the standard.

Shade sort indication and tag number

Shade Sort Out of Range Indication

If an up arrow or a down arrow appears in the place of a shade sort number, this indicates that the number is out of range. The way the arrow is pointing indicates the failure direction. An up arrow indicates above and a down arrow indicates below.

Shade sort indication
and tag failure direction

COMPARE MODE

The Compare mode is a quick method for comparing measurements without storing the data. After entering the mode, the first measurement is set as the standard and each measurement thereafter is compared to it. The standard can be remeasured whenever desired.

Compare Measurement

To perform a compare measurement:
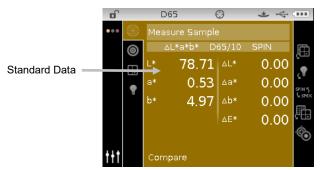
1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Measurement Mode icon .

2. Select the Compare mode as previously explained.

Measurement Mode icon
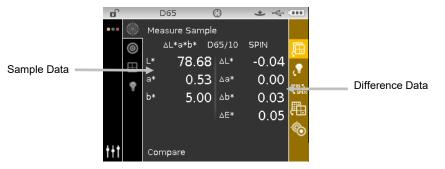
3. Select the illum/obs and color space as previously explained.

4. Position the instrument on the standard and take the measurement.

Standard Data

5. Position the instrument on the sample to compare and take the measurement.

Sample Data

Difference Data

6. Continue with additional sample measurements if required.

To measure a different standard:

1. Tap the **Right** navigation button to highlight the Progress column.

2. Use the **Up** or **Down** navigation buttons to select the Standard/Sample toggle icon .

Standard/Sample
toggle icon

3. Tap the **Select** button to change to the Measure Standard screen.

4. Measure the standard.

   Tapping the **Select** button with the Standard/Sample icon highlighted will toggle the measurement screen between Measure Standard and Measure Sample.

STRENGTH MODE

The Strength mode calculates the color strength of the measured sample compared to the current standard. Strength is calculated using the method selected in the instrument configuration (Apparent, Chromatic, or Tristimulus). Once measured, the color data can be calculated and displayed for color at equivalent strength (@ 100%) and minimum Delta E*. Chromatic display is Str @ wavelength (e.g. 440 nm) and Str @ Min dE*.
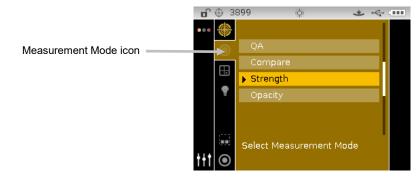
Several operations available in Strength mode are identical to those available in QA Mode. For information covering Color Space, Illuminant/Observer, Project, and Standard selection refer to the Measure Mode section.

Strength Measurement

The Strength mode displays the color strength of the measured sample. Difference data from the standard is also displayed if a difference color space is selected.

To perform a strength measurement:

1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Measurement Mode icon ⊚.

2. Select the Strength mode as previously explained.

Measurement Mode icon →

3. Select the project, standard (if required), color space and illuminant/observer as previously explained.

4. Position the instrument on the sample and take the measurement.

5. View measurement results.

. This area displays the sample's strength % and method. If Chromatic is set, a wavelength (e.g., 420 nm) appears indicating the calculation wavelength.

.Predicted strength to achieve minimum color values.

OPACITY MODE

The Opacity mode is used for making multiple measurement calculations to determine Contrast Ratio or Percent Opacity. Each measurement requires three readings (over-black, over-white, and a measurement of the white backing). The final data can be stored and displayed either as over-white, over-black, or color at 100%. This is determined by the configuration setting.
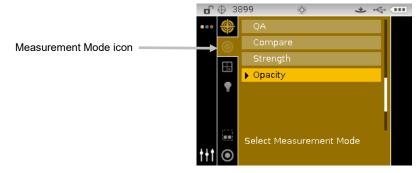
Several operations available in Opacity mode are identical to those available in QA Mode. For information covering Color Space, Illuminant/Observer, Project, and Standard selection refer to Measure Mode.

Opacity Measurement
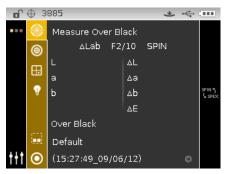
The Opacity mode displays the percent opacity of a drawn down sample on an opacity card.

To perform an opacity measurement:
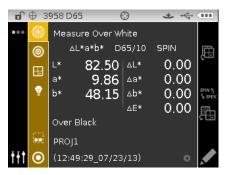
1. From the Measure screen, use the **Up** or **Down** navigation buttons to move the highlight focus to the Measurement Mode icon .

2. Select the Opacity mode as previously explained.

3. Select the project, standard (if required), color space, and illuminant/observer as previously explained.

4. Press the instrument to the shoe to set the screen for the first measurement.

5. Measure the sample over the black portion of the opacity card. Release the instrument after data is displayed.

6. Measure the sample over the white portion of the opacity card. Release the instrument after data is displayed.

7. Measure the white backing of the opacity card. Release the instrument after data is displayed.

Data display type (over black, over white or color at 100%)

Sample opacity percentage

JOB MODE (Ci64/Ci64UV only)

The Job mode is used to select and run a job downloaded from a software application, such as Color iQC. A typical job displays a sequence of measurement steps on the instrument screen followed by measurement results in the color space selected for the step. A graphically image can also be included with each measurement step if required. You can also view the job step sequence without performing actual measurements. Refer to the software application for specific information on creating and downloading jobs to the instrument, and uploading job data to the software application.

Job Mode Icons

A description of the various icons found in the job mode is shown below.

Icon	Description
⚙	Access the main job screen.
👁	Used to view the steps of the selected job without measuring samples.
→	Used to move the display to the next step in the job sequence.
←	Used to go back one step in the job.
✕	Used to exit the selected job.

Accessing Job Mode

1. From the Main screen, use the **Navigation** buttons to move the highlight square to the Job icon.

2. Tap the **Select** button to access the main job screen.

Selecting and Running a Job
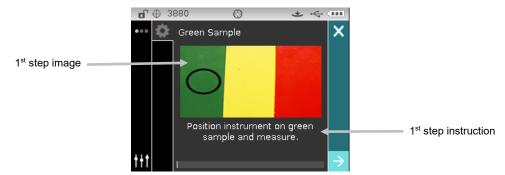
The following sample job downloaded from Color iQC consists of three measurement steps.

NOTE: If required, you can remeasure the sample before proceeding to the next step. This option must be activated when the job is created in the software application.
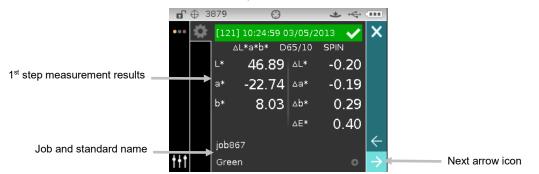
1. Use the **Up** and **Down** navigation buttons to move the highlight focus to the desired job and tap the **Select** button. An arrow (▶) appears next to the selected job.
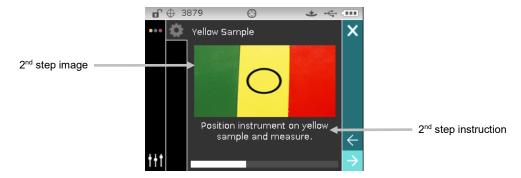
Selected job

2. Use the **Right** navigation button to move the highlight focus to the Progress column. Use the **Down** navigation button to highlight the Next arrow icon → if not selected and tap the **Select** button to open the job. The first step in the job sequence is displayed.

3. Position the instrument on the sample as described on the screen and take the measurement.

1st step image

1st step instruction

4. Data for the first measurement appears on the display in the color space selected. Make sure the Next arrow icon → is selected and tap the **Select** button.

1st step measurement results

Job and standard name

Next arrow icon

5. Position the instrument on the sample as described on the screen and take the measurement.

2nd step image

2nd step instruction
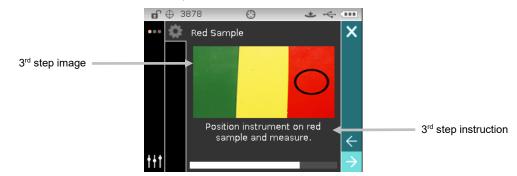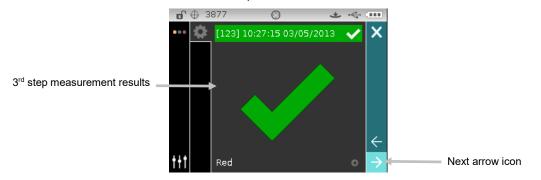
6. Data for the second measurement appears on the display in the color space selected. Make sure the Next arrow icon → is selected and tap the **Select** button.

2nd step measurement results

Next arrow icon

7. Position the instrument on the sample as described on the screen and take the measurement.

3rd step image

3rd step instruction

8. Data for the third measurement appears on the display in the color space selected. Make sure the Next arrow icon → is selected and tap the **Select** button.

3rd step measurement results

Next arrow icon

9. The job is now completed. Make sure the Next arrow icon → is selected and tap the **Select** button to return to the main job screen.

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.
- 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: casupport@xrite.com detailing your problem and listing your contact information.
- 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 to your local X-Rite office listed on our web site.

CI6X SERIES SPECTROPHOTOMETER

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.

General Cleaning

The exterior of the instrument may be wiped clean with a cloth dampened in water or mild cleaner.

⚠ **NOTE: DO NOT use any solvents to the clean the instrument, this will cause damage to the cover.**

Cleaning the Optics

The optics should be cleaned once a week in a normal environment. If the instrument is used in a dirty or dusty environment, more frequent cleaning may be required.

Carefully lift the instrument, open the shoe and blow short bursts of clean, dry air into the measurement port. This should remove any accumulated debris from the optics.
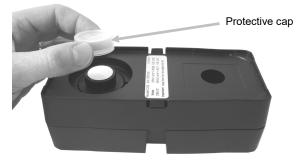
IMPORTANT: If can air is used for cleaning, do not invert or tilt the can during use. This could cause damage to the optics.

Cleaning the Calibration Reference

The calibration reference consists of white and green ceramic plaques, and a black trap opening. The calibration reference should be cleaned periodically.
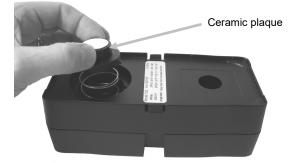
Ceramic Plaque Cleaning Procedure

1. Remove the protective plastic cap from the ceramic plaque.

Protective cap

2. **Important:** Always grip the ceramic plaque from the edges, being careful not to touch the white/green surface.
   Press downward on the ceramic plaque and turn counterclockwise until it stops. Lift upward and remove the ceramic plaque from the base.

Ceramic plaque

3. Clean the plaque using a mild soap and warm water solution. Thoroughly rinse with warm water and wipe dry with a lint-free cloth. Do not use solvents or cleaners of any kind.

4. After the ceramic plaque is completely dry, align the large tab on the side of the ceramic plaque with the large notch in the base. Compress the spring downward with the ceramic plaque until it stops. Holding the ceramic plaque down, rotate clockwise until it stops. Slowly allow the plaque to rise. The arrow on the ceramic plaque and the arrow on the base should be aligned when properly positioned.

5. Reinstall the protective cap over the ceramic plaque when not in use.

Large notch

Align arrows

Black Trap Cleaning Procedure

1. Take apart the two sections by compressing the two locking tabs on both sides with your fingers and separating.
2. Clean with clean, dry air, or wipe clean with a lint-free cloth to remove any dust or contamination.

White ceramic plaque with protective cap

Locking tabs

3. After cleaning, align the two arrows on the end before reassembling the sections.
   Note: The tabs will not lock correctly if assembled in the opposite direction.

Alignment arrows

Cleaning the UV Calibration Plaque (UV model only)

Do not use solvents or cleaners of any kind.

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

Replacing the Battery Pack

⚠ Use the rechargeable Li-ion battery pack provided (X-Rite P/N SE15-40); other types may burst causing personal injury.

1. Carefully turn the instrument over and rotate the shoe back until it is completely open.
2. Using your finger, pull back on the battery access cover latch while lifting upwards on the cover to remove it from the instrument housing.
3. Remove the old battery pack and dispose in a designated disposal location for recycling.
4. Insert the new battery pack into the instrument with the battery contacts facing down and towards the back of the instrument.

Latch

Access cover

Battery contact end

5. Reinstall the battery access cover by inserting the back edge first and then pressing downward until the access cover locks into position.

6. Return the shoe to the closed position.

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 display or beep during measurements).	*Battery pack is very low or bad.* Charge the battery. If battery pack is bad, replace using the procedure in the Appendix.
	No battery pack installed. Install batteries or plug in AC adapter.
Measurement error or results appear inaccurate.	*Measurement or calibration failed.* If error persists, clean instrument optics and calibration reference (see General Cleaning). Turn instrument power off and then on.
Navigation control buttons are non-responsive.	Turn the instrument off and then back on to reset their operation.
Calibration procedure fails.	*Calibration reference is dirty or damaged.* Clean the reference per procedure in Appendix, or replace if damaged.
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. Remove power from the instrument, reapply power 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 read in accordance with your software's documentation. Close and restart the software application. Perform a calibration on the instrument (see Calibration section).

Screen Messages

Screen messages can appear on the display during error conditions or for informational purposes. Messages may also be accompanied by a number to indicate a specific condition. If an error condition persists, please contact our technical support using one of the methods listed in the Service Information section.

Sample Error Message

Technical Specifications

Measurement Geometrics	d/8°, DRS spectral engine, choice of optical aperture: 4 mm measurement area/6.5 mm target window 8 mm measurement area/14 mm target window 14 mm measurement area/20 mm target window
Receiver	Blue-enhanced silicon photodiodes
Light Source	Gas-filled tungsten lamp
Illuminant Type	A, C, D50, D65, D75, F2, F7, F11, and F12
Standard Observer	2° and 10°
Spectral Range	400nm – 700nm
Spectral Interval	10nm – measured, 10nm – output
Measurement Range	0 to 200% reflectance
Measuring Time	Approx. 2 seconds
Inter-Instrument Agreement (Ci60)	CIE L*a*b*: Avg. 0.40 ΔE^*_{ab}, based on avg. of 12 BCRA series II tiles (specular component included) Max. 0.60 ΔE^*_{ab} on any tile (specular component included)
Inter-Instrument Agreement (Ci62)	CIE L*a*b*: Avg. 0.20 ΔE^*_{ab}, based on avg. of 12 BCRA series II tiles (specular component included) Max. 0.40 ΔE^*_{ab} on any tile (specular component included)
Inter-Instrument Agreement (Ci64)	8 mm/14 mm CIE L*a*b*: Avg. 0.13 ΔE^*_{ab}, based on avg. of 12 BCRA series II tiles (specular component included) Max 0.25 ΔE^*_{ab} on any tile (specular component included)
Short-Term Repeatability (Ci60)	.10 ΔE^*_{ab} on white ceramic (standard deviation)
Short-Term Repeatability (Ci62)	.05 ΔE^*_{ab} on white ceramic (standard deviation)
Short-Term Repeatability (Ci64)	.04 ΔE^*_{ab} on white ceramic (standard deviation)
Lamp Life	Approx. 500,000 measurements
Power Supply	Removable Li-ion battery pack; 7.4 VDC rated @ 2400 mAh
AC Adapter Requirements	Input 100-240 VAC, 50/60Hz Output 12 VDC @ 2.5 A
Charge Time	Approx. 4 hours – 100% capacity
Measurements Per Charge	1,000 measurements typical
Data Interface	USB 2.0
Operating Temperature Range	50° to 104°F (10° to 40°C) 85% relative humidity maximum (non-condensing)
Storage Temperature Range	-4° to 122°F (-20° to 50°C)
Dimensions	4.3"H (10.9 cm) 3.6"W (9.1 cm) 8.4"L (21.3 cm)
Weight	2.32 lbs. (1.05 kg)
Accessories Provided	Calibration Standard, Manual, AC Adapter, Carrying Case
Usage	Indoor only
Altitude	2000m
Pollution Degree	2
Overvoltage	Category II

Specifications and design subject to change without notice.

Green Tile Color Check (Ci62/Ci64 only)

1. Perform a calibration procedure if you have not already done so. Refer to the Calibrating section.
2. Select the appropriate option in the application to initiate the green tile color check.
3. Remove the protective cap from the green tile in the calibration reference.
4. Position the instrument's target window over the green tile.

Protective cap

Green tile

5. Press the instrument firmly to the shoe. Hold steady until the display indicates that reading is complete.
6. Release the instrument.
7. Reinstall the protective cap on the green tile.
8. Store the calibration reference in a dry, dust free area, away from direct exposure to light.

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