User's Manual for ColorFlex® L2 Citrus and EasyMatch® Essentials



The world's true measure of color
HunterLab

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A60-1021-653 Version 1.0
For EasyMatch Essentials 2.28 and Above

Preface

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Safety Notes



Caution: If the equipment is used in a manner not specified by HunterLab, its overall safety and protection may be impaired. The instrument is for indoor use only and unsuitable for wet locations.



For your safety when using the ColorFlex L2, you should pay attention to the following types of statements in this User's Manual:

- ***General safety instructions that should always be observed while operating the instrument.***
- ***Specific safety instruction critical to the type of instrument operation being explained in the manual where the caution appears.***
- ***Use of this equipment in a manner not specified by the manufacturer may impair the protection afforded by the equipment.***
- ***Danger of electric shock if liquids are spilled and fire if volatile or flammable liquids are spilled. Use care when measuring liquid samples.***

Legal Disclaimers: Instrumental – Visual Evaluation

The HunterLab ColorFlex L2 Colorimetric Spectrophotometer is designed for precision color and appearance measurement. It measures numerical color and related data in absolute and relative terms.

HunterLab cannot guarantee the accuracy, completeness, efficacy, and timeliness of the data due to inherent uncertainties in instrumental readings, variations in sample presentation, and

potential inconsistencies in human color perception. Users are strongly advised to verify the instrumental data with meticulous visual evaluation.

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Instrument Setup and Overview

What is HunterLab ColorFlex L2 Citrus & EasyMatch Essentials?

ColorFlex L2 Citrus system is a multi-purpose 45/0 color and appearance measurement system that provides users with 400-700nm reflectance color and sample imaging capabilities in either port-up or port-forward configurations. ColorFlex L2 Citrus instrument provides Citrus score values, colorimetric and spectral data. This instrument can also be used to measure the reflectance color of other products. Controlled D65 (Daylight) illumination Xenon illumination provides superior color accuracy and repeatability on standard and fluorescing samples.

An internal camera provides on-screen 45/0 sample viewing during the measurement preparation and captures a sample image for retrieval with the sample data. All measurement results are displayed on a 7" high-resolution touchscreen interface through the embedded EasyMatch Essentials user interface, which includes most color scales, indices, and Illuminant/observer combinations desired for industrial applications. With Ethernet and USB connectivity, data results can be saved and streamed to LIMS and SPC systems.

Standard Accessories

The ColorFlex L2 Citrus includes the following standard accessories :

- Standards Case with ColorFlex L2 Instrument Standard, Reflectance Black Glass and Diagnostic Check Tile
- 31.8mm (1.25'') Port Insert
- Orange Juice tube holder :
- HunterLab Citrus Reference Standard
- Certificate of Traceability
- Power Supply
- Initial Customer Instruction before Unpacking Guide
- ColorFlex L2 Citrus Quick Start Guide
- ColorFlex Citrus User's Manual (www.hunterlab.com)
- Citrus license file on USB Flash.

Selecting an Installation Location

To achieve optimal performance and accurate measurements, the ColorFlex L2 Citrus should be installed in a controlled laboratory environment that adheres to the following guidelines.

Installation Environment

- Choose a stable location with consistent temperature and humidity within operational ranges.
- Ensure the WorkSpace is clean and free from airborne contaminants such as dust,

particulate matter, and aerosols.

- Avoid areas with drafts or vibration that could interfere with measurements.
- Provide proper room lighting to ensure visibility during operation.

Placement and Access

- Place the instrument on a stable, vibration-isolated surface to minimize disruptions.
- Maintain clear access to the rear connectors for power and network connections.

Power Requirements

The instrument requires: Voltage: 100-240 VAC; Current: 3.75A; Frequency: 47/63 Hz; Single Phase power with a maximum load of 60 VA; Compliance with Installation Category (Over Voltage): II. .

Sample Handling and cleanliness

- Follow strict protocols for handling and preparing samples to prevent contamination of the instrument.
- Use clean tools and materials to avoid introducing dust or debris into the measurement area.
- Train laboratory personnel in cleanroom-like protocols, including appropriate attire and mindful handling of samples and equipment.

Safety Guidelines

To operate the ColorFlex L2 Citrus safely:

- Avoid submerging the instrument in water to prevent damage.
- Do not attempt to disassemble the instrument, as it contains no user-serviceable parts.
- Do not clean or access optical components without proper guidance or instructions.
- Only open the instrument or remove covers as instructed in this manual or under the guidance of HunterLab Technical Support.

For more information, please refer to **SPECIFICATIONS**.

Note: As outlined in this document, failure to comply with these conditions and protocols may adversely affect the instrument's performance

Unpacking your Box

Place the ColorFlex L2 Citrus on a stable bench. It can be positioned with the port forward for Citrus application.

Retain the packaging in case the instrument is returned to HunterLab.

The ColorFlex L2 screen is set by default to a port-up configuration. To switch to a port-forward configuration, adjust the settings in the Essentials user interface: Go to the Tool Bar and select ***SYSTEM MENU> INSTRUMENT SETTINGS/DISPLAY & BRIGHTNESS***, check "Reverse Screen

Orientation"

Note: The ColorFlex L2 Citrus does not support port-down configuration.

User-Facing Features

Touchscreen Display

The ColorFlex L2 Citrus features a seven-inch high-resolution touchscreen display, which serves as the primary interface for operating the instrument. The screen provides intuitive access to the EasyMatch Essentials user interface, allowing users to view sample data, manage workflows, and adjust instrument settings.

Sample Port and Light Ring

The ColorFlex L2 Citrus supports many of the same port inserts used with the ColorFlex EZ, providing compatibility and continuity for users transitioning from the previous model to this advanced version.

Surrounding the Sample Port is a Light Ring, which provides a visual indication of the instrument's status. The ring displays different colors to communicate operational states, such as readiness, ongoing measurements, or errors. This feature enhances usability by giving immediate, at-a-glance feedback about the instrument's current status.

Power Input and Rear I/O Features

The instrument is supplied with a 24 VDC (3.75A) power supply. Plug the power supply into the power input located at the back bottom of the ColorFlex L2.

The Rear I/O board includes the following components:

- **Power Input:** Plug the power supply into the power input.
- **Power Switch:** Use the rocker switch to turn the instrument on or off.
- **HDMI Port:** Connect an HDMI cable to display the interface on an external monitor. Touch-screen monitors are compatible with Essentials user interface and require an additional USB cable plugged into the USB-A connector.
- **Ethernet Port:** Connects the ColorFlex L2 Citrus to a network for data output when connected with HunterLab Essentials on a PC, and other networked plant systems.
- **Service Port:** Connect the instrument to a PC directly using a USB-A to USB-B device cable for service or user interface purposes.
- **Footswitch Port:** Connect a foot switch here to trigger measurements conveniently.

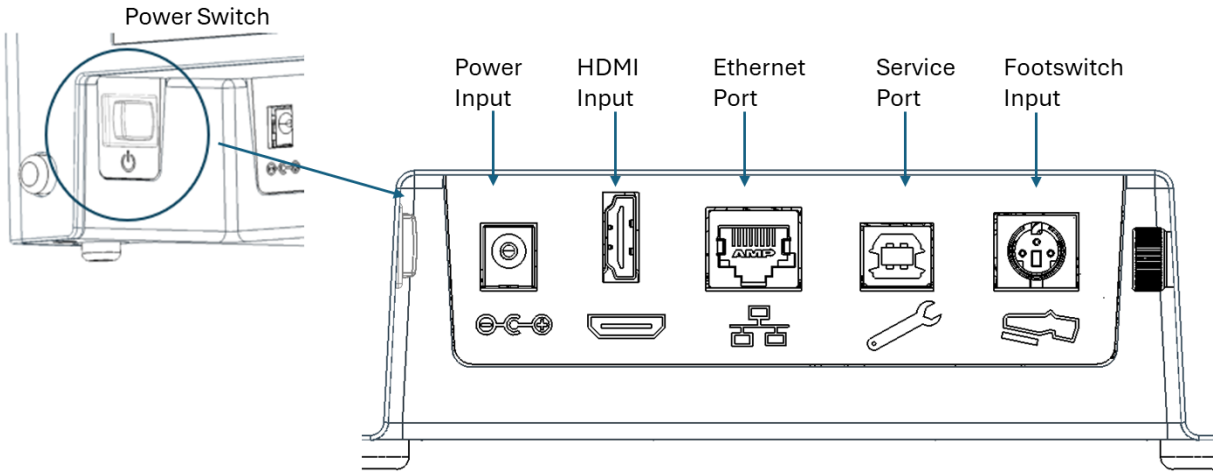

Figure 1. Ports on the Back of the ColorFlex L2

CAUTION

Note: Use only the power cord included with this instrument or a replacement obtained from HunterLab. Be certain that the power cord is in good condition before connecting it.

Physical Action button

Located on the right side of the sample port, the round physical action button is marked with a lightning icon. This button replicates the functionality of the green action button in the Essentials user interface. It allows users to perform key operations, such as standardization, initiating measurements, or advancing to the next step in a workflow.

Side USB Connectors

The ColorFlex L2 Citrus has two USB-A connectors on the left side. These ports are typically used for connecting flash drives or keyboards. A USB hub can be attached to connect multiple devices simultaneously. Either port can be used to Export Jobs, WorkSpaces, and update user interface through a flash drive. .

The instrument is compatible with the **L02-1017-434 Wireless Keyboard and Mouse Kit**.

Initial Essentials Setup and Measurement Guide

Powering On the Instrument

After unpacking and setting up the instrument, turn on the power using the power switch on the back of the instrument base.

First Time Setup and Introductory Tutorial

When the Essentials user interface launches for the first time, it displays the **FIRST TIME SETUP** dialog. Configure the language, region, date, and time, then tap DONE to proceed.

Next, the ***WELCOME WIZARD*** guides you through an overview of the instrument and user interface features. To exit the wizard, tap the X in the top-right corner. Relaunch the wizard anytime by tapping the HunterLab icon in the top-right corner.

Citrus License Activation

Mount the flash drive with the Citrus license file to the ColorFlex L2 Citrus. Essentials will automatically recognize the license file on the flash drive and launch a dialog. Click **ENABLE** to load the ColorFlex L2 Citrus Essentials.

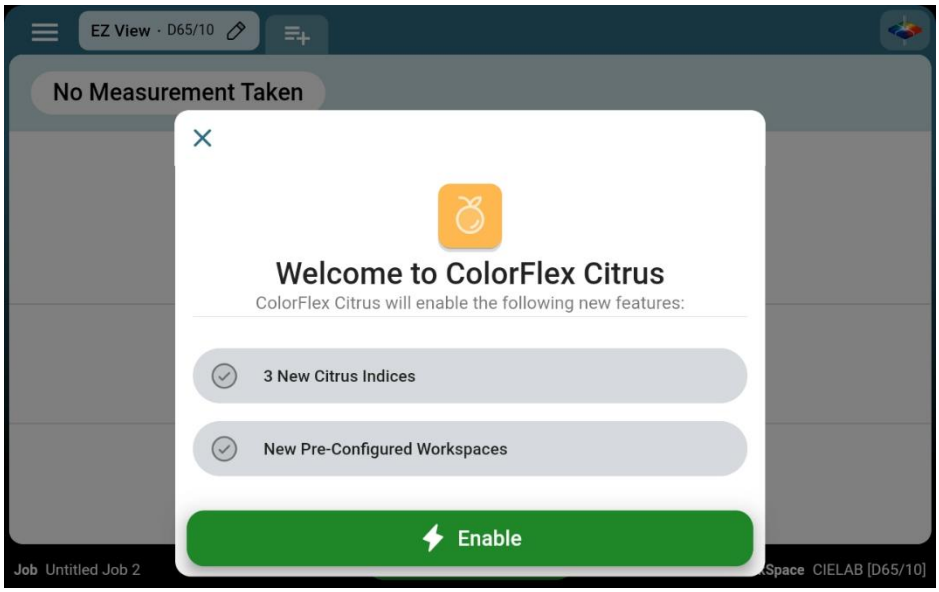

Figure 2. Welcome Screen

Default WorkSpace Settings for Citrus

After activating the Citrus License, the main measurement screen, EZ View, is displayed. The user must click the green action button "Setup Hitch" to hitch the instrument to the Citrus tile supplied with the instrument. Essentials loads with '**Citrus [C/2]**' default WorkSpace configured as follows:

Table 1. Default WorkSpace Settings for ColorFlex L2 Citrus

Color Scale:	Hunter Lab
Indices	Citrus Redness (CR), Citrus Yellowness(CY), Citrus Number (CN)
Differences	None
Illuminant/Observer:	C/2°(CIE 1931 standard observer)
Port:	Citrus Tube Holder
Views	EZ View & Color Data Table
Standard Type	Hitch Standard

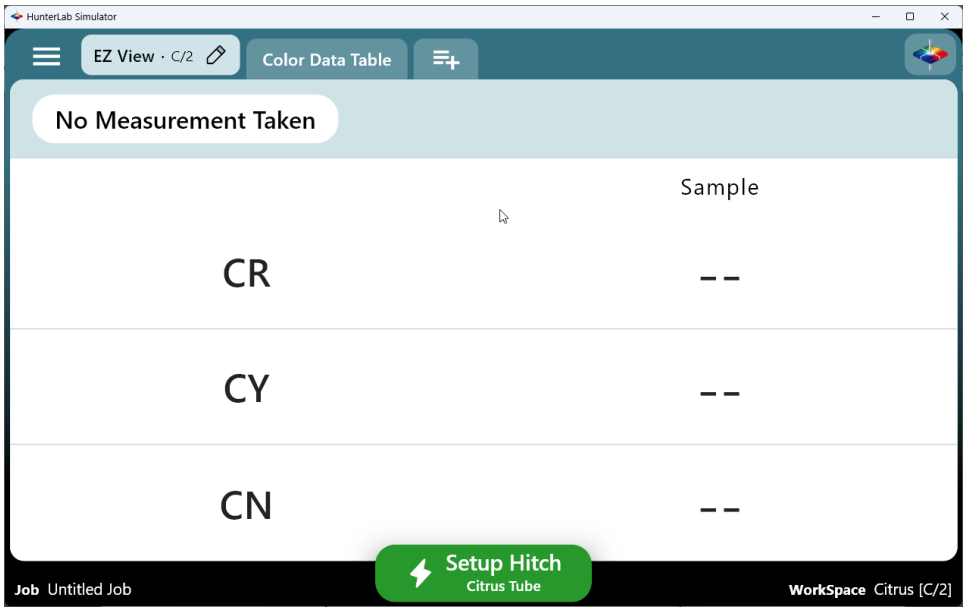

Figure 3. EZ View Default Settings

Note: Essentials user interface also includes two other default WorkSpaces, 'CIELAB [D65/10]' and 'HunterLab [C/2]'. Citrus WorkSpace can be edited while these two WorkSpaces cannot be modified directly. However, you can edit them and save them as new ones or create a new WorkSpace and then edit there.

Hitch Setup

The HunterLab **Citrus Standard** improves instrument agreement to USDA and international Citrus standard and across multiple sites or between buyers and sellers of processed Citrus products. Hitching is essential for ensuring accuracy in the ColorFlex L2 Citrus instrument.

Hitch Configuration Steps:

1. Tap ***SETUP HITCH*** green action button on the bottom of the screen. Follow the on-screen prompts to standardize first, then read the Citrus Reference Standard to complete the hitch setup.

2. **STANDARDIZATION**.

   - Install the standard port plate. Press the ***STANDARDIZE*** button**.**
   - Place the **Reflectance Black Glass** at the sensor port and press ***MEASURE***.
   - Replace the reflectance black glass with the **Instrument Standard (White Tile)** and press ***MEASURE.***
   - Replace the Instrument Standard and place the **Diagnostics Check Tile (Green Tile)** and Press ***MEASURE***. The Diagnostics Check Tile values were entered at the factory and are also listed on the back of the tile.
   - After a valid standardization, please take off the standard port plate and mount the Citrus Tube Holder for standard/sample measurements.

Optional: To skip the Diagnostics Check Tile test, tap ***SKIP CHECK TILE***. Skipping may impact instrument performance, and a warning message will be displayed.

Note: If the Diagnostics Check Tile fails, clean the instrument White Reference Tile, Check Tile, and/or Black Glass, and run the test again. Contact HunterLab Support if the issue persists.

3. **Hitch/Transfer Standard**

   After a valid standardization, ensure that the Citrus Tube Holder is mounted for measurement.

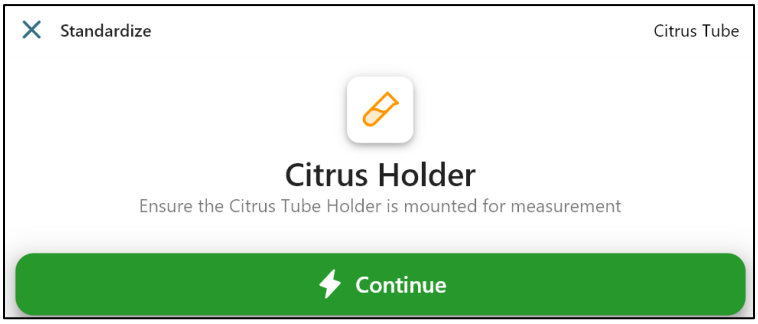

Figure 4. Install Citrus Tube Holder

   in this Hitch/Transfer setting dialog, choose **HITCH TO STANDARD**. **Hitch to Standard** refers to using a standard that has already been assigned with a reference value; **Hitch to Instrument** involves using a sample that was previously measured on the other Instrument.

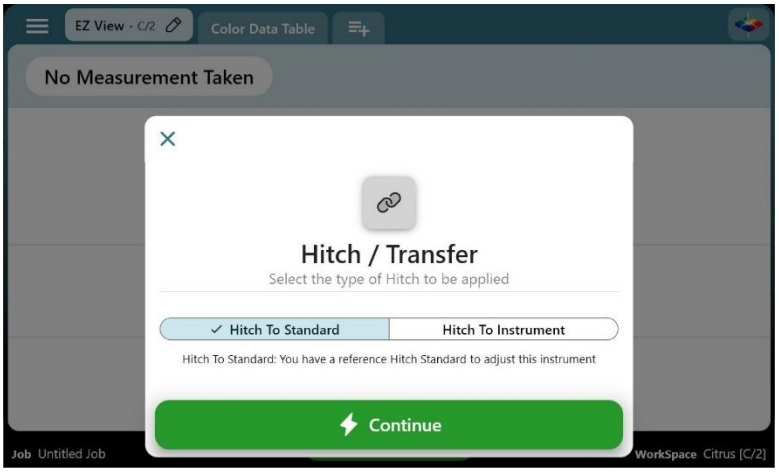

Figure 5. Select Hitch to Standard or to Instrument

4. Insert the Citrus Reference Standard. Press ***MEASURE***.
5. Enter the values of the **Citrus Reference Standard** found on the lip of the tube**.**

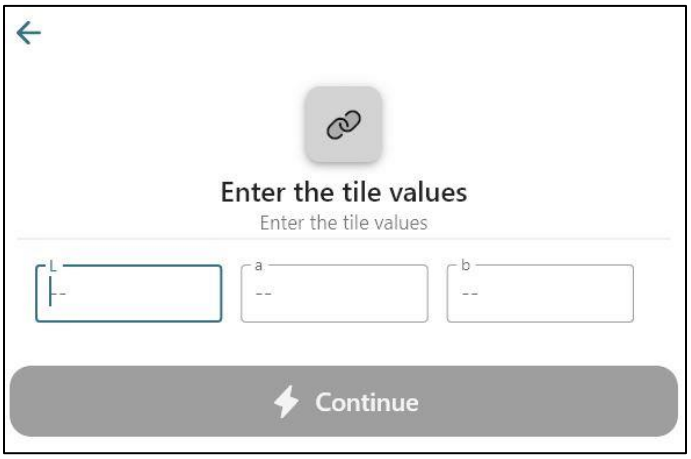

Figure 6. Enter the Citrus Reference Standard Values

6. Select **ADDITIVE** Hitch Calculations and press ***CONTINUE***. To update the hitch, tap WorkSpace on the bottom right, select Edit Current WorkSpace, and then edit the hitch in Standard & Tolerances step.

Note: The Hitch Adjustment is shown on the Edit WorkSpace/ STANDARDS AND TOLERANCE.

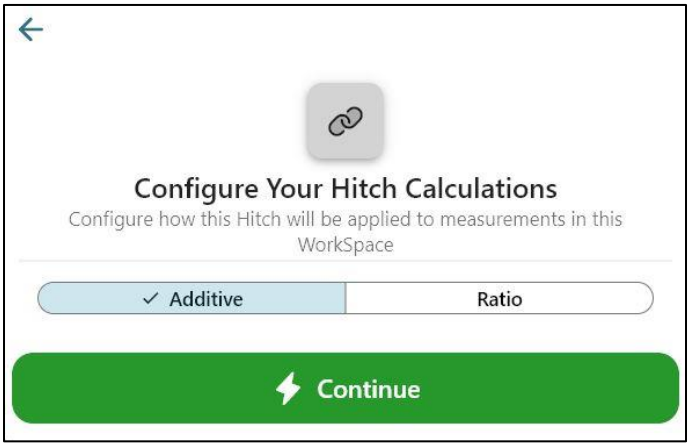

Figure 7. Select from Additive Hitch Calculations

Reading a Sample

1. Prepare the sample and place it into a test tube.
2. Place the sample into the tube holder.
3. Press ***MEASURE***.

Setting Up a Standard and Citrus Indices

A numeric standard can be applied under Hitch/Transfer standard type. Steps:

1. Press ***WORKSPACE*** at the bottom right side of the screen.

   Select ***EDIT CURRENT WORKSPACE***. Press ***NEXT STEP*** to go to ***STANDARD & TOLERANCES*** step and then enter the standard and tolerances in Hunter Lab C/2.

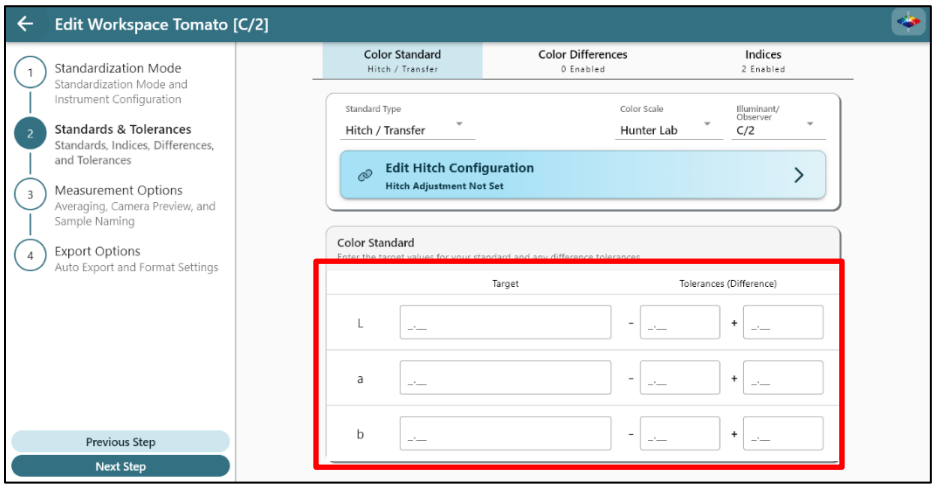

Figure 8. Setup a Simple Standard

To edit Citrus indices:

- Tap the ***INDICES TAB*** and then scroll down to the Citrus Scores(∨). Check the desired Citrus Indices from Citrus Number (CN), Citrus Redness (CR) and Citrus Yellowness (CY). Add tolerances using the pencil icon. Choose between Absolute or Difference Tolerances.

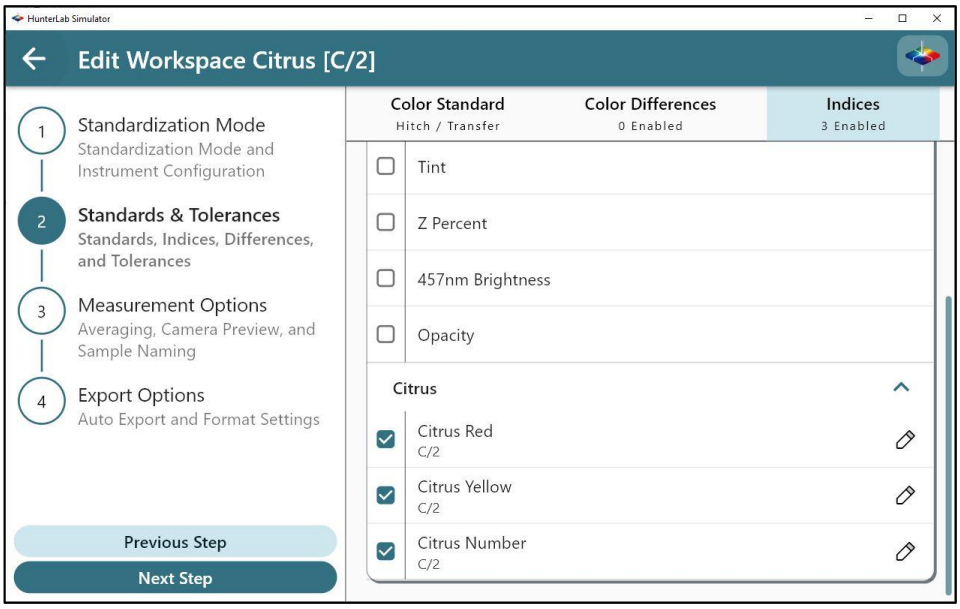

Figure 9. Select Citrus Scores

Tap **NEXT STEP** and follow on-screen instructions to **SAVE** the Citrus WorkSpace.

Editing EZ VIEW

Sample Name Box

Located at the top-left corner of the screen, this box allows you to edit the sample name, delete it, or set it as the standard by tapping on it. The box is highlighted with a color corresponding to the measured color, offering a quick visual reference. .

Information Area

Located at the top-right corner of the screen, this area displays the instrument's serial number, time, date, and Pass/Fail status. If the measurement is a standard, it will be labeled as a Standard in this area.

Display Options

Tap the pencil icon in the EZ View box and select ***DISPLAY OPTIONS***. Choose the radio buttons next to ***SHOW STANDARD*** and ***SHOW DIFFERENCES*** to display the differences. All changes to the view are automatically saved to the current WorkSpace. For more details on view editing, refer to **VIEWS**. .

Changing or Adding WorkSpaces and Jobs

WorkSpaces in Essentials are similar to product setups in ColorFlex EZ. Jobs under a WorkSpace serve as associated data files. Once a WorkSpace is launched, you can create a new job or open existing jobs under this WorkSpace.

To change or add a **WORKSPACE**, tap the WorkSpace name at the bottom-right of the screen. Edit settings such as **DIFFERENCES/INDICES**, **READ OPTIONS**, and **DATA EXPORT OPTIONS**. To manage jobs, tap the **JOB** name on the bottom left side of the screen to create a **NEW JOB** or tap one existing job to **EDIT JOB NAME, DELETE JOB** and **EXPORT JOB** (.csv file).

Alternately, tap the ***SYSTEM MENU*** at the top left corner of screen and select **JOBS/ WORKSPACE** to change or add new Jobs/WorkSpaces.

Jobs can be exported in CSV, PDF and XLS formats to make it easy to open jobs in Microsoft Excel and automation user interface. When exporting a PDF, you can select either the color data table or spectral data table to export.



Figure 10. Export PDF File

Additional settings including **INSTRUMENT SETTINGS**, **DATA MANAGEMENT**, **PERIODIC DIAGNOSTICS** and **STANDARDIZATION**, are available in the **SYSTEM MENU.**

Navigating the Essentials Screen

The main screen of EasyMatch Essentials is shown below.

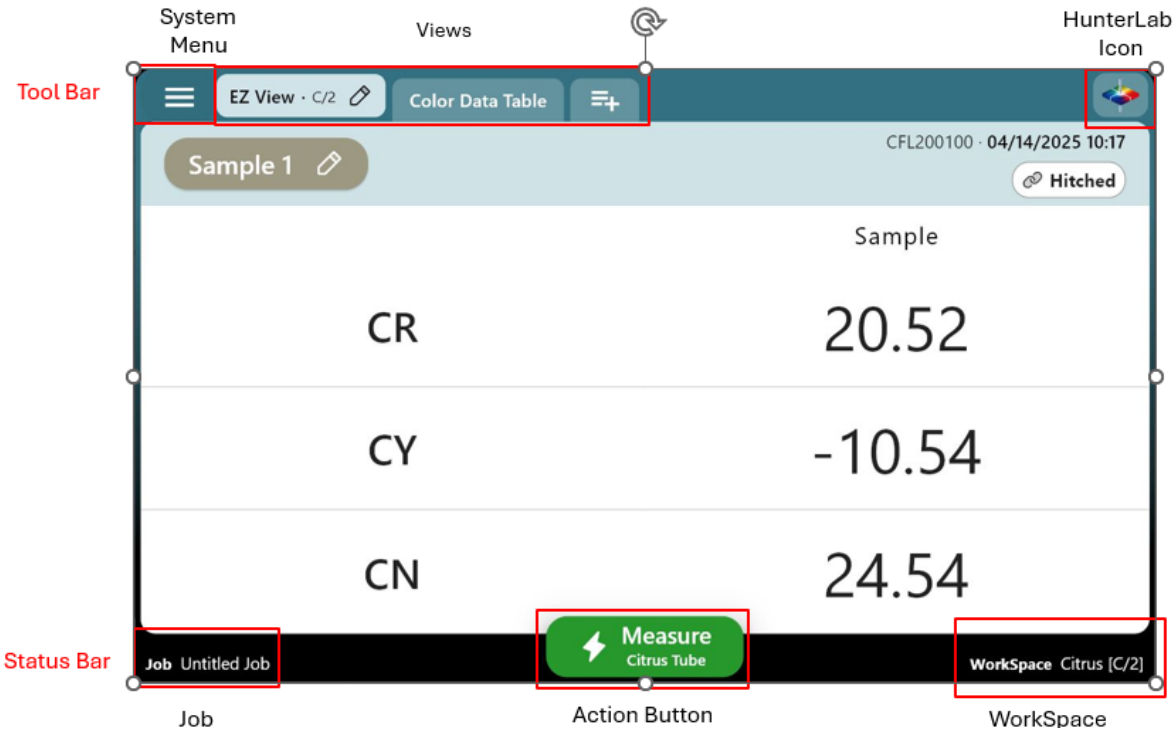

Figure 11. User Interface Screen of ColorFlex L2 Essentials

Status Bar – Job, Action Button, and WorkSpace

The Status bar at the bottom of screen includes the following features:

Status Bar: Job

It displays the name of the current job. Tap this button to create a new job or select an existing job to rename, delete, or export as a .csv file.

To manage multiple jobs:

1. Press and hold a job to enable ***MULTIPLE JOB MANAGEMENT MODE***.
2. Both the **TRASH CAN** icon and **EXPORT** icon will appear, allowing you to select multiple jobs for deletion or export.

Note: Each Job files can contain up to 2000 measurement. The measure button will change to a "New Job" button when this limit is reached.

Status Bar: Action Button

The Action Button allows users to perform key operations, such as standardization, taking measurements, or advancing to the next step in a workflow. The physical action button located next to the instrument port serves the same purpose as the on-screen Action Button.

Status Bar: WorkSpace

To change or create a new WorkSpace, press ***WORKSPACES*** in the Status Bar. This action opens a list of all available WorkSpaces.

- The **current WorkSpace** is always listed first.
- Remaining WorkSpaces are displayed either by **Last Used** or in **Alphabetical** Order. Click Search icon to search for a WorkSpace by name.
- For WorkSpaces with non-Ad hoc/Working standard types, the WorkSpace is highlighted with a color corresponding to the standard it contains, providing a quick visual reference.

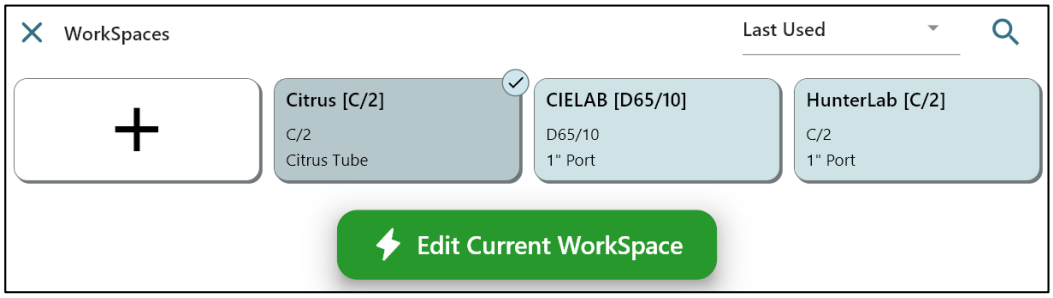

Figure 12. Edit or Create New WorkSpace

Managing WorkSpaces

Launch a WorkSpace

- Tap an existing WorkSpace displayed in the WorkSpaces dialog.
- Click the ***LAUNCH BUTTON*** to load the selected WorkSpace.

Create a New WorkSpace

- Tap the + icon to create a ***NEW WORKSPACE***. Select an existing WorkSpace as a template and press ***CONTINUE***..
- Modify the settings for the new WorkSpace as prompted. See ***SYSTEM MENU > WORKSPACE EDIT*** for details.
- NAME and ***SAVE*** the new WorkSpace.

Delete a WorkSpace
Press and hold a WorkSpace to enable deletion mode. A trash can icon will appear, allowing you to select multiple WorkSpaces for deletion. To disable deletion mode, unselect all WorkSpaces. .

Note: Default WorkSpaces and the active WorkSpace cannot be deleted.

Tool Bar – System Menu, Views and HunterLab Icon

The Tool bar at the top of screen includes **SYSTEM MENU**, **VIEWS**, and **HUNTERLAB ICON**.

Tool Bar: System Menu

The **System Menu** is located in the top-left corner of the screen. Tap the three-bar icon to access the following options: .

Jobs/WorkSpaces
Alternate ways to open the Job or WorkSpace dialogs for managing data and configurations.

Instrument Settings
Configure key settings such as Standardization Interval, importing product setups from another instrument, changing date and time, selecting a language, reversing screen orientation, and setting up security. See **Instrument Settings** for more details.

Data Management
Export Jobs and WorkSpaces to a flash drive.

Periodic Diagnostics
View the status of diagnostics and run diagnostic tests, including Signal Levels, Repeatability, and Diagnostic Check Tile tests. See **Instrument Settings/Diagnostics** for additional information. .

Standardization
Displays the status of diagnostics and enables users to run standardization.

Tool Bar: Views

The Views section in the Tool Bar displays the current view(s) in the center of the Tool Bar. Available views include:

- **EZ View,**
- **Color Data Table View,**
- **Spectra Data View,**
- **Spectra Plot View,**
- **Color Plot View**
- **Trend View.**

For detailed information about each view, see **VIEWS**.

Managing Views

- **Adding/Removing Views**

  Tap the  icon and select the desired views from the list. ..
- **Reordering Views**

  Tap and hold a selected view, then drag it to the desired position. .
- **Saving Changes**

  Press **SAVE** to apply changes. Once saved, use the tabs in the Tool Bar to navigate between views. .

Note: Each view can only be opened in one tab. Essentials does not support multiple tabs with the same type of view.

Editing Views

- The view currently displayed on the screen is the active view in Essentials.
- Only the active view shows a pencil icon in its tab. Tap the pencil icon to edit the view. .
- If a view is not active, tap it first to display it, then tap it again to access its editing options.
- Press the left arrow at the top of the screen, or anywhere on the view screen to exit View Options.

Tool Bar: HunterLab Icon

The **HunterLab Icon** is located at the top-right corner of the screen. This can also be accessed by swiping up with 3 fingers on any page.

Wizard Access

Tap the HunterLab icon to start the wizard. This feature guides you through a series of screens highlighting the user interface's features. To exit the Wizard, tap any blank area on the screen. .

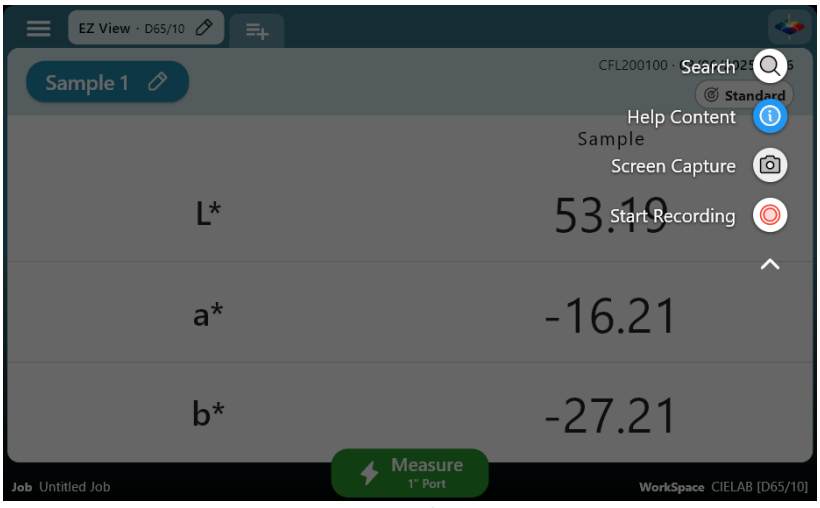

Figure 13. HunterLab Icon Functions

Global Search

With this tool, the user can quickly find jobs, or WorkSpaces or instrument settings.

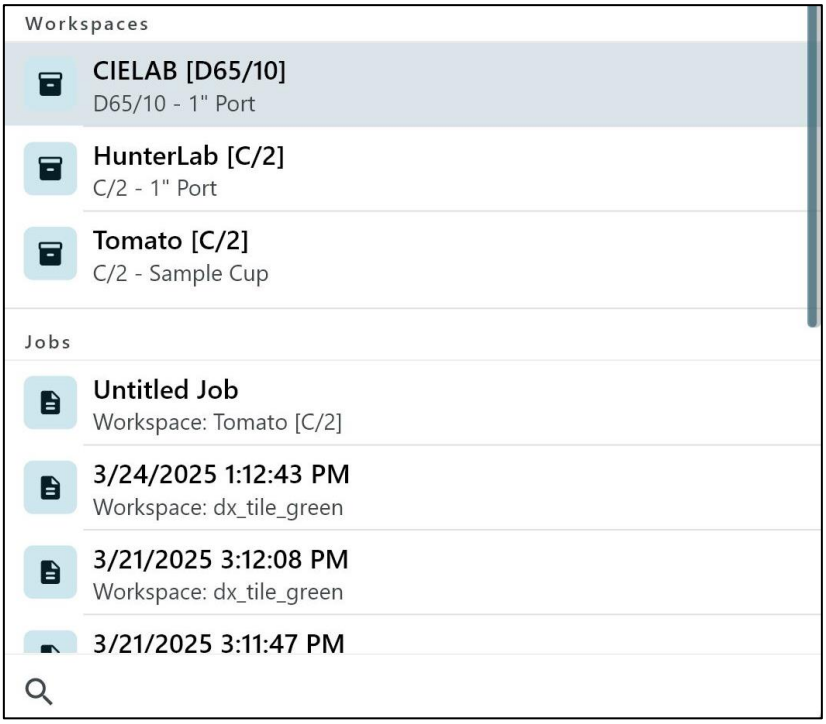

Figure 14. Global Search for Jobs and WorkSpaces

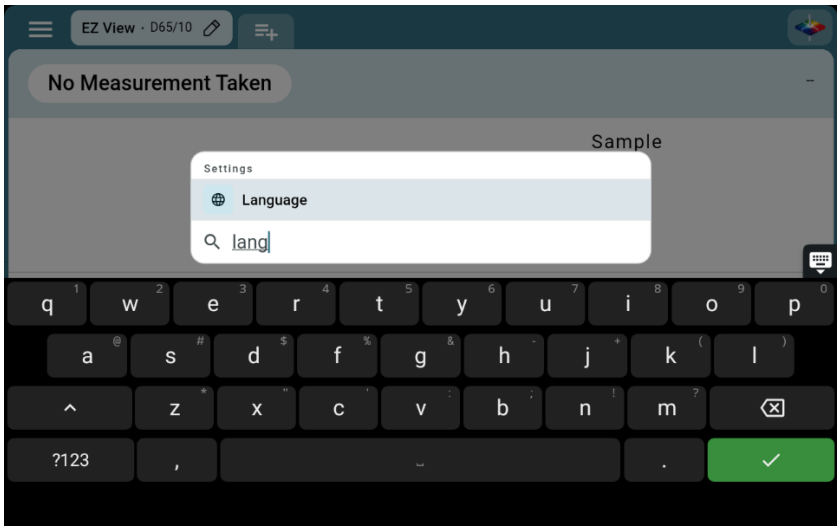

Figure 15. Search Languages

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Screen Capture

Press and hold the HunterLab icon to enable the screen capture function. Tap ***SCREEN CAPTURE***, and the image of the current screen will be saved to an attached flash drive. .

Recording

The Recording feature will allow you to record the Essentials screens. Use this feature to

record program steps as a video. This is very useful for setting up a standard method for analysis.

Tap ***START*** Recording to begin. To stop, tap the HunterLab Icon again and select ***STOP RECORDING***. The video will be saved to an attached flash drive.

WorkSpace Edit

In the WorkSpaces main dialog, a check mark (✓) appears in the upper-right corner of the current WorkSpace box. All of the WorkSpaces are shown in boxes. If there is a physical or numeric standard saved in a WorkSpace, the WorkSpace box will be shown with corresponding color rendering.

To manage a WorkSpace, tap its box. The three dot menu provides options to **RENAME, MARK AS FABORITE, PRINT A SEARCH LABEL** or **DELETE** the WorkSpace if it is not a default WorkSpace. The Print Label option generates a unique barcode for the selected WorkSpace, allowing users to switch to it by scanning the barcode

How to print and use a workspace search label:

- Plug the label printer into the USB-A port on the left side of the ColorFlex L2. The **Brother QL-800 High-Speed Professional Label Printer** is the recommended and supported model for use with ColorFlex L2 Essentials.
- In WorkSpace dialog, tap the workspace box which you want to print. Tap the three-dot menu (⋮) and choose **Print Search Label** option to generate a unique QR code for the selected WorkSpace.
- Scan the label with ColorFlex L2 to load the associated WorkSpace instantly.

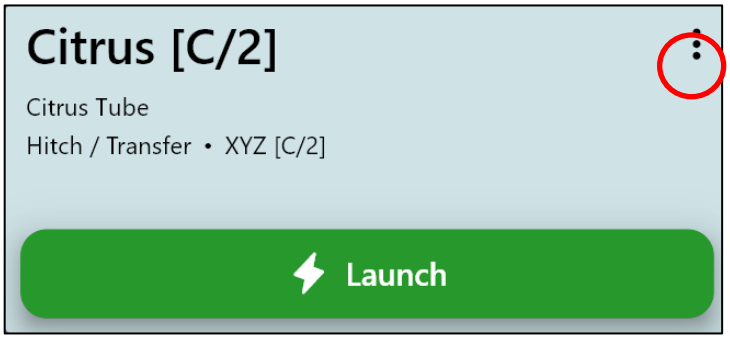

Figure 16. WorkSpace 3 Dots

Edit a WorkSpace

To edit the current WorkSpace, tap **EDIT CURRENT WORKSPACE**, then modify the setting as needed.

To create a new WorkSpace, tap the + icon and follow the on=-screen instructions to configure and customize it

To edit another existing Workspace:

1. Tap the desired WorkSpace in the dialog.
2. Tap LAUNCH to load the WorkSpace.
3. Return to the main dialog and tap EDIT CURRENT WORKSPACE to modify the selected WorkSpace.

In the **EDIT WORKSPACE** dialog, follow the steps listed in the left panel: **STANDARDIZATION**

MODE, STANDARDS AND TOLERANCES, MEASUREMENT OPTIONS and **EXPORT OPTIONS**. After completing the setup, save and exit the WorkSpace configuration.

WorkSpace Edit: Standardization Mode

This screen displays fixed options such as **MEASUREMENT TYPE, MODE**, and **D65 ILLUMINATION STATUS** for ColorFlex L2. The user can select a port type, **STANDARD PORT PLATE, SAMPLE CUP PORT INSERT** or a **CUSTOM PORT**. Press ***NEXT*** to continue. **.**

Note: that most measurements of Citrus products use the Test Tube Holder.

WorkSpace Edit: Standards & Tolerances

The table below shows all the available selections in Standard &Tolerances dialog.

Table 2. Available WorkSpace Selections

Standard Type	Color Scale	Color Differences	Indices	Illuminants	Observers
Ad Hoc/ Working	CIELAB	dE	a/b Ratio	A	2˚
Physical	CIELCh	dE*	Y	C	10˚
Numeric	HunterLab	dC*	YI D1925 (YID)	D50	
Hitch/Transfer	XYZ	dH*	YI E313 (YIE)	D55	
	Yxy	dE CMC	WI E313 (WI E313)	D65	
	Rdab	dE * 2000	Tint	D75	
		Grey Scale Color (GSC)	Z Percent (Z%)	F2	
		Grey Scale Stain (GSS)	457 nm Brightness (457B)	F7	
		Strength at Max Absorbance (SMA)	Opacity (OP)	F11	
		Strength Weighted (SW)	Citrus Scores (CR CY, CN)		
		Metamerism Index (MI)			

Color Standard Tab

Configure **STANDARD TYPE**, **TRISTIMULUS COLOR SCALES**, and **ILLUMINANTS/OBSERVERS**. Following are available **STANDARD TYPES**:

Ad hoc/ Working Standard

The first sample measurement is automatically assigned as an Ad Hoc/Working standard. Tolerances can be entered after standard selection. The other sample in a job can be manually set as standard if needed.

Physical Standard

Measure a physical standard in this dialog and use it as standard. Use the Green action button in this dialog to standardize (if there is no valid standardization) and measure the standard. Multiple measurement and their average can also be used as the standard target.

Numeric Standard

This type of standard is defined by numeric values representing standard values. This feature can be used when no physical standard is available. Enter the values for the color scale and tolerances.

Hitch/Transfer Standard
A hitch standard links the values of the current instrument to a Master instrument/standard. This feature allows multiple instruments to read the same values for one product.

Hitch Configuration:

- When Hitch/Transfer is selected, tap **EDIT THE HITCH CONFIGURATION,** the blue highlighted area, and follow the instructions to setup hitch.
- Choose between **HITCH TO TILE** or **HITCH TO INSTRUMENT**. Hitch to Tile refers to using a tile that has already been assigned with a reference value; Hitch to Instrument involves using a sample that was previously measured on the other Instrument.
- Steps **to Configure Hitch:**
  - Press ***CONTINUE***. Place the tile/sample at the port and ***MEASURE***. When measuring a sample, multiple measurements for averaging are available.
  - Enter the values of the **TILE** or the **SAMPLE** from the reference or the compared instrument.
  - Select **ADDITIVE** or **RATIO** Hitch Calculations.
  - Press ***CONTINUE***. The Hitch Adjustment is shown on the **STANDARDS AND TOLERANCE** page.

Color Differences Tab

Tap the **COLOR DIFFERENCES TAB** and check **DIFFERENCES**. As a differences is checked, the pencil icon is displayed at the right side. Tap the pencil icon to configure Tolerances. Scroll down to find additional differences.

Indices Tab

Tap the **INDICES** tab and select the indices needed for the measurement.

- If an index is available with multiple Illuminant/Observer options, the **Index Configuration** dialog will appear to select the appropriate Illuminant/Observer. Tap **CONTINUE** to confirm.
- A pencil icon appears on the right side of each checked index. Tap the pencil icon to:
  - **Set Tolerances**: Configure absolute or difference tolerances.
  - **Settings**: Adjust bias, gains, or change the Illuminant/Observer settings (based on the index).

WorkSpaces Edit: MEASUREMENT OPTIONS

Measurement Configuration:

Three reading modes are provided: **MANUAL**, **AUTOMATIC READINGS**, and **AVERAGING**. Follow the instructions on the Essentials screen to set up the reading mode.

Measurement Prompt Settings:

Edit a default sample name, enable or disable prompts for **SAMPLE NAME, PRODUCT ID, NOTES,** and **SHOW SAMPLE PREVIEW**.

Sample Preview and Images

- When Sample Preview is checked, the system will prompt the sample preview option before taking the measurement. The preview will last for 15 seconds and then stop. To update the preview, simply tap the preview screen.
- Click ***NEXT*** to take the sample color measurement.
- After the color measurement, the image is saved alongside the measurement data and can be viewed under the **SAMPLE NAME BOX** in **EZ View** and **Color Data Table View.**
- Sample image files within a job can be configured to export along with the job file during export.
- **WHEN ALWAYS SAVE WITH SAMPLE IMAGE** is enabled, the system automatically captures an image of the sample before taking the measurement.

AutoSearch Settings

Check ***INCLUDE IN AUTOSEARCH STANDARD*** to include the WorkSpace for AutoSearch standard mode.

WorkSpaces Edit: EXPORT OPTIONS

Auto Export

Configure **AUTO EXPORT** to simultaneously send the data string per measurement to a data collection system. Ensure both the ColorFlex L2 and the data collection system are on the same network. Check details in instrument Settings/Network Settings.

Tap ***EDIT*** button in TCP Auto Export to:

- Choose what data is going to be exported in these categories, Color Scales, Differences and Indices, and Other fields. Drag fields in the configuration list to reorder. To remove a field, click the Trash Can icon on the left side.
- Select a delimiter type
- Press ***SAVE*** when finished.
- ENABLE**/DISABLE** Auto Export
- Auto Export Port is fixed as 9001.

In the data collection system, configure the TCP/IP method: Set ColorFlex L2 IP as the server IP and port 9001 to collect data from the ColorFlex L2.

Sample Label Printing

Sample Label Printing is supported in Essentials when a compatible label printer is connected. The **Brother QL-800 High-Speed Professional Label Printer** is the recommended and supported model for use with ColorFlex L2 Essentials. This printer is not sold by HunterLab and must be purchased separately by the customer. We recommend the following label sizes:

- 29x90 mm (Address Label)
- 62x100 mm (Shipping Label)
- 62 mm width Roll (Shipping Label continuous)

1. Plug the label printer into the USB-A port on the left side of the ColorFlex L2.
2. Within the Label Settings menu, users can configure the label orientation (portrait or landscape), and select options such as:
   - ➢ Auto Cut Labels
   - ➢ Auto Print for Each ample
   - ➢ Include Barcode

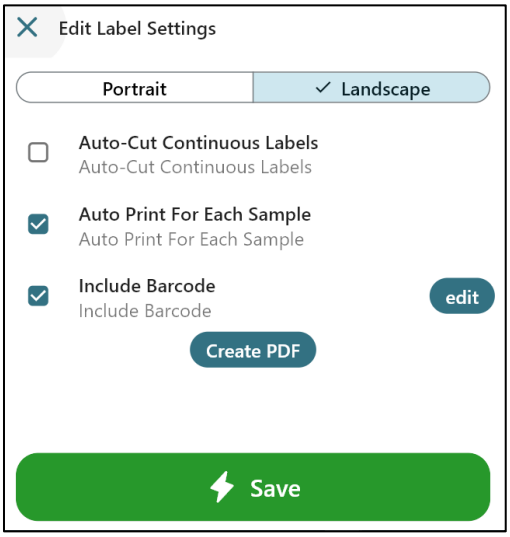

Figure 17. Sample Label Settings

3. After adjusting the desired settings, click the ***CREATE PDF*** button. A sample label will be displayed on the right side of the screen for preview. Save the WorkSpace when finished.

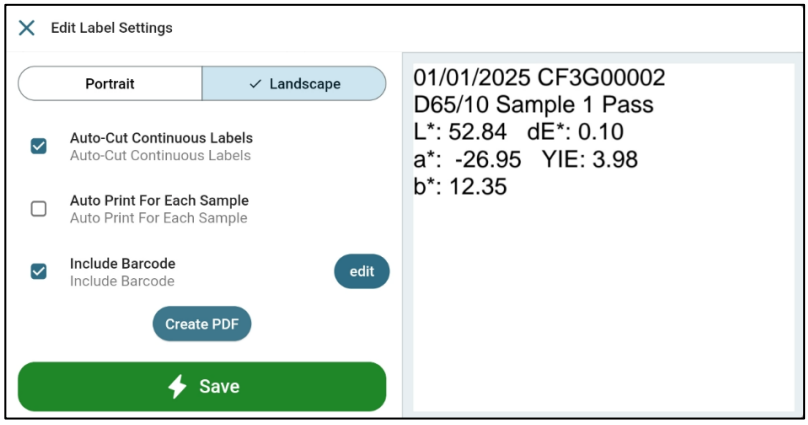

Figure 18. Print Preview

4. Users can tap a sample name in EZ View, Color Data Table View or Spectral Data Table View. This will open the Sample Measurement Details dialog where users can click ***PRINT LABEL*** to print the label for that specific sample.

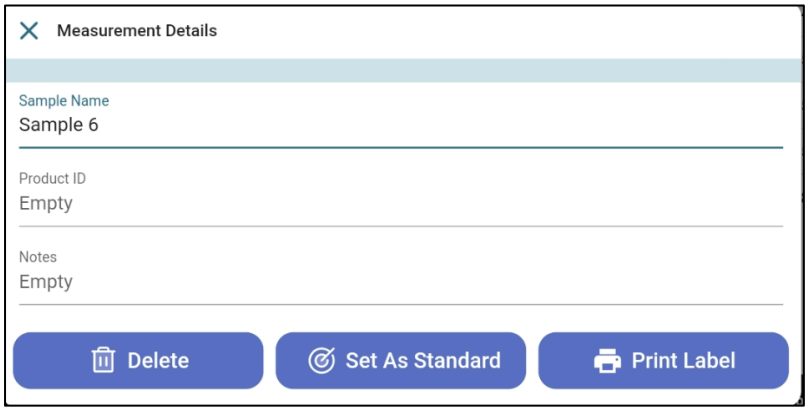

Figure 19. Sample Measurement Details

Views

All views are displayed in the middle of the Tool Bar.

- **View Editing**: Tap the current view (with the pencil icon) to edit. Alternatively, tap another view to load it first, then tap again to open the view options. After editing, press the left arrow at the top of the screen or tap anywhere on the view screen to exit.
- **Add/Remove**: tap the plus icon to change or add views.

Views: EZ VIEW

This view provides a straightforward display of ***STANDARD vs. SAMPLE*** comparisons and **PASS/FAIL** results.

Overview

Sample Name Box
Located at the top-left corner of the screen, this box allows you to edit the sample name, delete it, or set it as the standard by tapping on it. The box is highlighted with a color corresponding to the measured color, offering a quick visual reference.

Information Area
Located at the top-right corner of the screen, this area displays the instrument's serial number, time, date, and Pass/Fail status. If the measurement is a standard, it will be labeled as Standard in this area.

Edit EZ View

To edit, click the pencil icon in the ***EZ VIEW*** tab. At the bottom of the screen, you will find options to edit settings including:

Color Scales:

Select one or multiple tristimulus Color Scales to display.

DIFFERENCES And INDICES:
To select **DIFFERENCES** and **INDICES** to display (go to WorkSpace to add first If not already selected in WorkSpace).

Display Options:
Includes **SHOW STANDARD, SHOW DIFFERENCES, SHOW COLOR PLOT**, and adjusting **PRECISION**. To display a simple difference (sample minus standard), select ***SHOW DIFFERENCES***.

Color Difference Plot
Selecting **SHOW COLOR PLOT** displays the color difference plot in EZ View, which auto-scales to show differences. Tapping the plot also initiates auto-scaling.

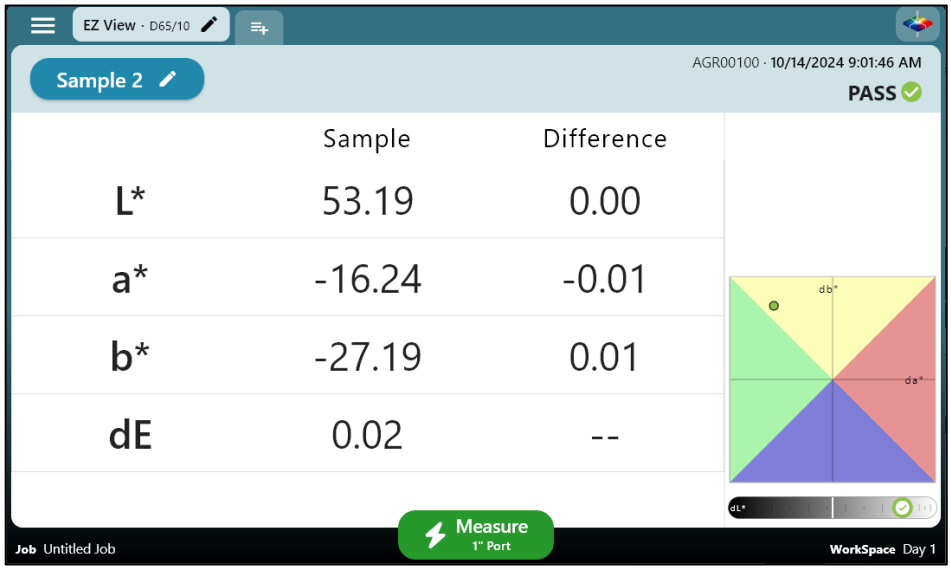

Figure 20. EZ View Display with New Options

Views: COLOR DATA TABLE

The **COLOR DATA TABLE** displays **COLOR SCALE**, **COLOR DIFFERENCE**, and **INDEX DATA** for the standards and all samples in the job. Press and hold a column (except the Name column) to drag and reorder the fields.

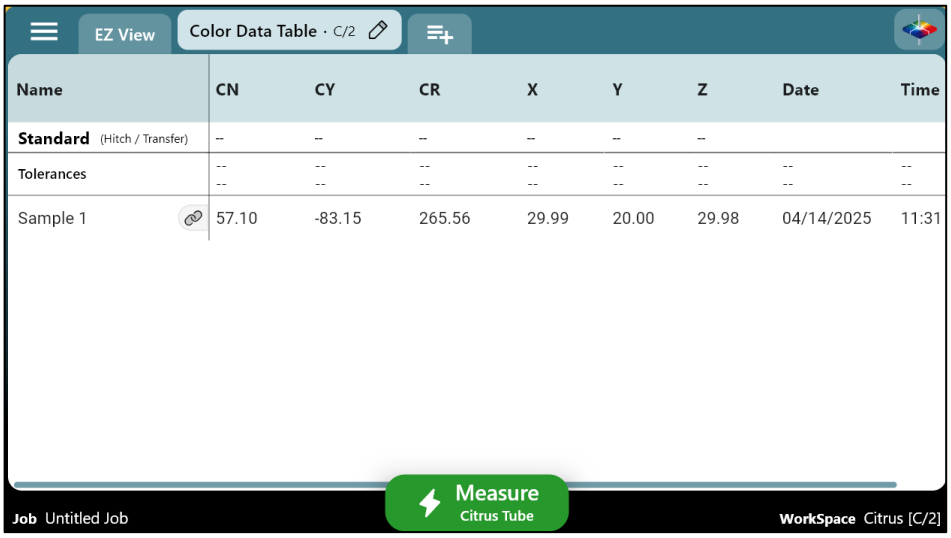

Figure 21. Color Data Display

Settings

Press the edit icon (pencil) in the **COLOR DATA TABLE VIEW TAB**. At the bottom of the screen, you will find options to edit the view settings including:

COLOR SCALES
Select one or multiple tristimulus Color Scales to display.

DIFFERENCES and INDICES:
To select Differences and Indices to display (If not already selected in WorkSpace, go to WorkSpace to add them first.).

DISPLAY OPTIONS:
Includes **SHOW STANDARD, SHOW SERIAL NUMBER, SHOW DATE, SHOW TIME, SHOW PASS/FAIL, SHOW PRODUCT ID, SHOW NOTES,** and edit **PRECISION**.

Views: SPECTRAL DATA TABLE

The **SPECTRAL DATA TABLE** displays the percent reflectance for each selected measurement at the measured wavelengths. A sliding bar at the bottom of the screen provides access to all measurements.

DISPLAY OPTIONS can be accessed using the edit icon (pencil) in the Spectral Data tab. The options include showing the Standard and changing the precision of the measurement data.

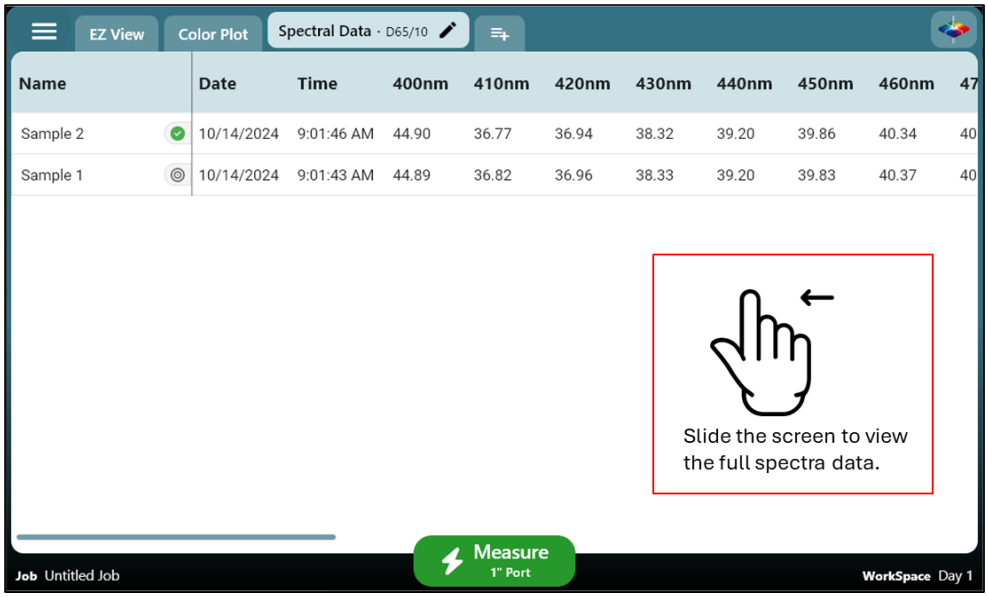

Figure 22. Spectral Data Table

Views: SPECTRAL PLOT

This view displays a graph of reflectance percentage versus wavelength. Use the + button to enlarge the plot or the – button to reduce its size.

SPECTRAL PLOT OPTIONS: SAMPLE LIMIT

This setting controls the number of samples displayed simultaneously, with a maximum limit of 10 samples.



Figure 23.Spectral Plot View

Views: COLOR PLOT

This view displays the sample's position in a two-dimensional Color Space relative to the standard. The standard is the center point for difference measurements, plotting each sample to show variation. Each sample's position is shown without referencing a standard for absolute measurements.

Sample List

The samples displayed on the Color Plot are listed in a box on the left side of the screen.

- **Scaling and Detail:** The Color Plot is automatically scaled . Clicking the data points allows for detailed viewing of each point's information.
- Display options include **SHOW DIFFERENCES** and **SET LIMIT** of samples to show on the plot. The Upper Limit is 10.

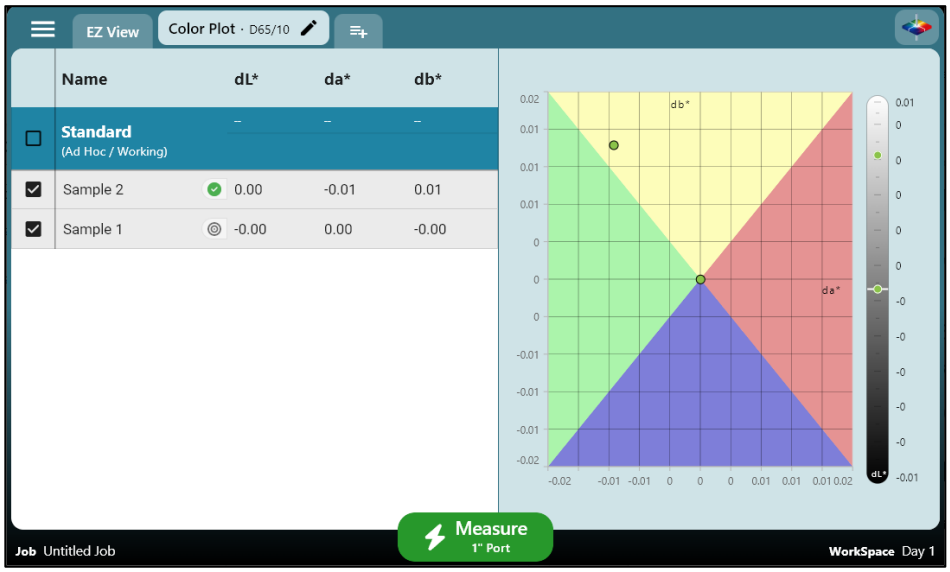

Figure 24. Color Plot View

Instrument Settings

Press ***INSTRUMENT SETTINGS*** under System Menu to edit the current settings for **INFORMATION, GENERAL, DISPLAY & BRIGHTNESS, NETWORKING, AUTOSEARCH STANDARD, DIAGNOSTICS**, and **SECURITY SETTINGS**...

Instrument Settings: INFORMATION

The **INFORMATION** screen provides HunterLab Certification, the Instrument Serial Number, Version number, and Networking Addresses.

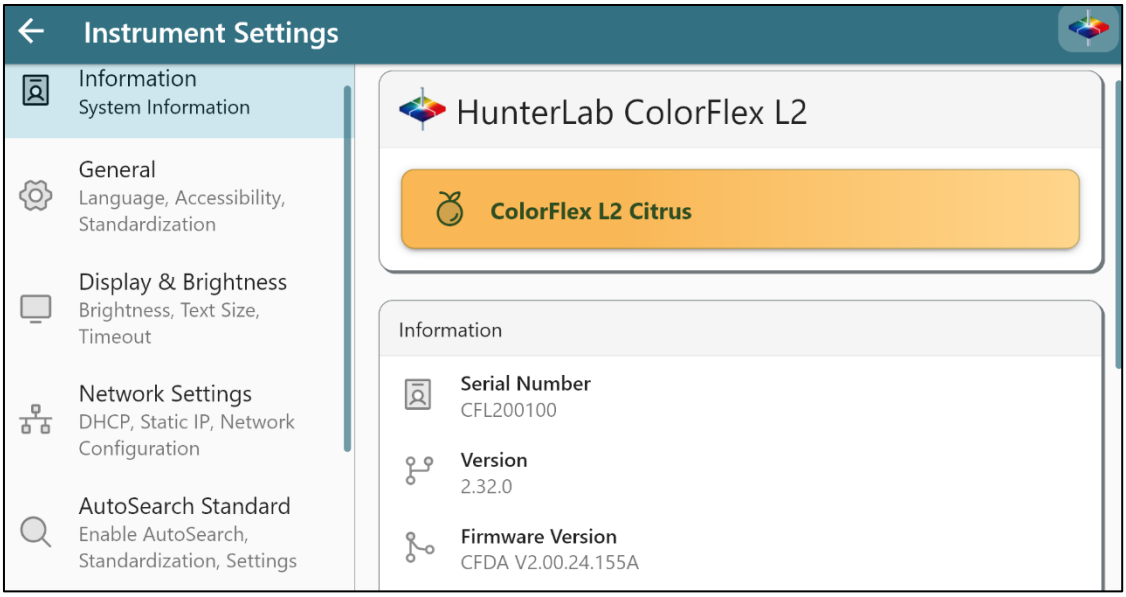

Figure 25. Instrument Information

Instrument Settings: GENERAL

On this screen, you can set the **STANDARDIZATION INTERVAL** to 8, 12, or 24 hours. Additionally, **SYSTEM SETTINGS** allow you to adjust **DATE/TIME** and **LANGUAGE**, **and IMPORT DATA FROM PREVIOUS INSTRUMENT.**

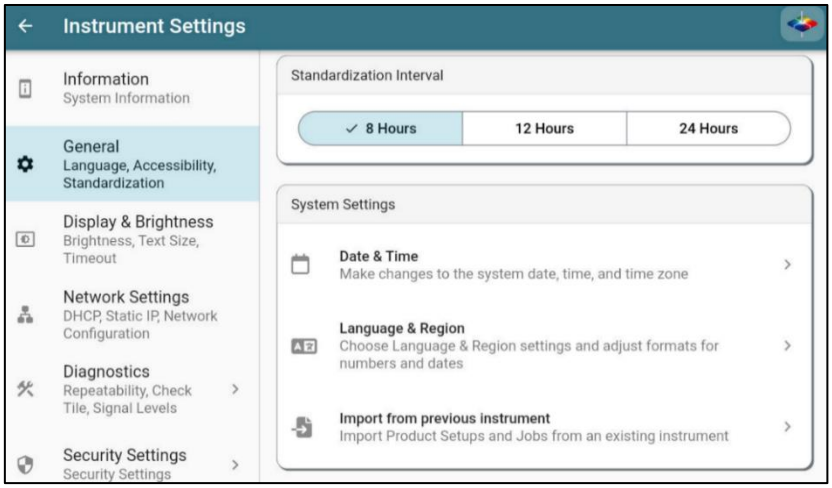

Figure 26. General Instrument Settings

Import Data From Another Instrument

To import data (Product Setups and Saved Measurements) from a ColorFlex EZ instruments, use the USB cable to connect between ColorFlex EZ and ColorFlex L2. Then tap this feature and follow the prompts to import data from ColorFlex EZ.

Instrument Settings: DISPLAY AND BRIGHTNESS

Appearance

Changes the display background from white to black.

Text Size

Press the arrow on the right size to change the Font Size. Use the sliding tool at the bottom of the screen to change the font size, or press ***RESET*** to return the font to the original size.

Inactivity Timeout

Lowers the screen brightness when the time is reached.

Reverse Screen Orientation

Changes the screen orientation.

Instrument Settings: NETWORKING

The network settings enable the ColorFlex L2 to automatically export data to a shared network location, connect with HunterLab Essentials for PC on a computer, and support other network functionalities. Network Settings offers the choice between DHCP for automatic IP configuration or Static IP for manual IP entry.

Method 1: Connect CFL2 to a network hub using Ethernet cables

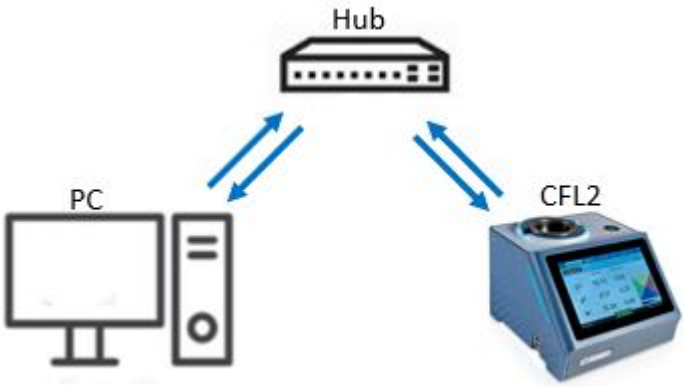

Figure 27. Network Connection Method 1

Connect a CFL2 and PC to the same network hub using an Ethernet cable. Alternatively, connect a CFL2 and PC using an Ethernet cable to a stand-alone router with DHCP server features. .

1. Plug the Ethernet cable into the back of the CFL2 and the other end to a network hub. Plug the PC to this network hub as well.

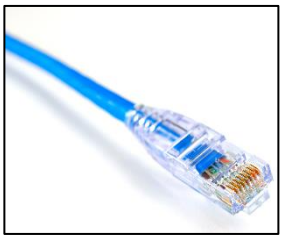

Figure 28. Ethernet Cable

2. In the CFL2, go to ***SYSTEM MENU > INSTRUMENT SETTINGS > NETWORK SETTINGS***. Select "Edit". **CONFIGURE ETHERNET SETTINGS**.
3. Check **USE *DHCP* FOR ETHERNET** and click ***APPLY NETWORK SETTINGS***, then close the Network Settings window.

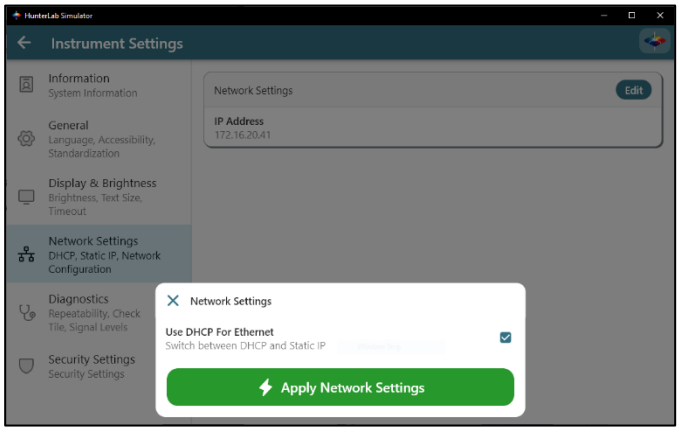

Figure 29. DHCP Network Settings

Method 2: Direct connection between CFL2 and computer

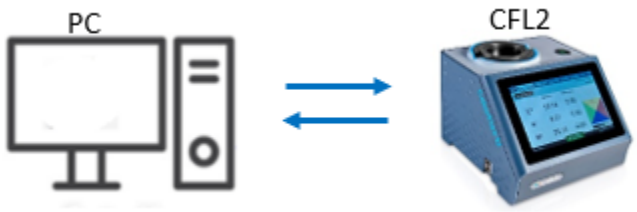

Figure 30. Network Connection Method 2

1. Plug the Ethernet cable into the back of the CFL2 and the other end to the PC. If the PC does not have any available ethernet ports, a USB-Ethernet adapter can be applied. .



Figure 31. USB to Ethernet Adapter

2. Check the PC IP settings:
   a. For Windows computers, open the command prompt by clicking the Start menu, type "cmd" in the search bar, and select "Command Prompt".
   b. Type in ipconfig and press Enter.
   c. Find the right Ethernet connection (in this case, it is Ethernet Adapter 2) and write down the value under "Autoconfiguration IPv4 Address" and "Subnet Mask".

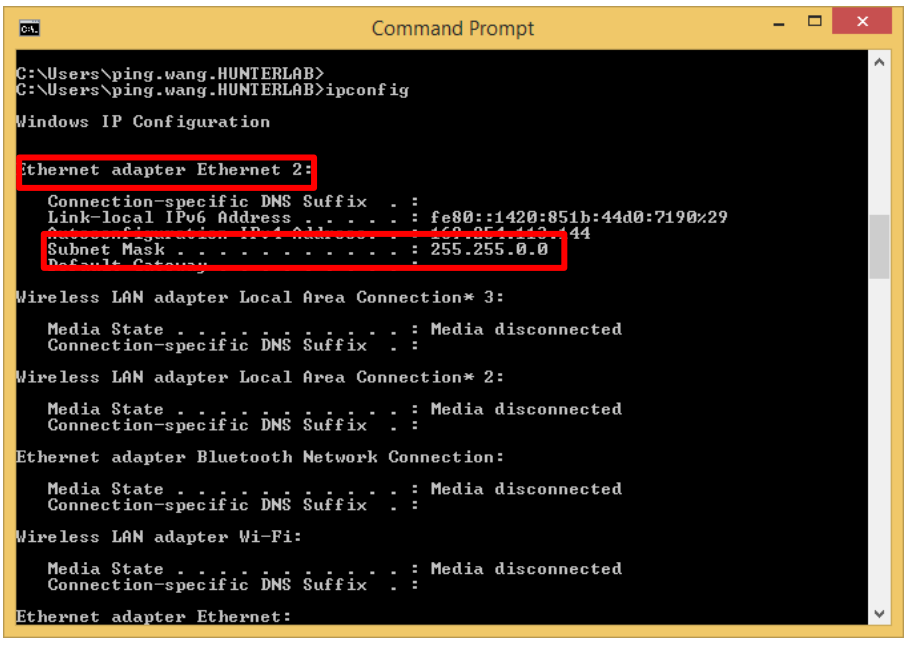

Figure 32. Command Prompt – Ethernet Adapter

3. In the CFL2, go *to* ***SYSTEM MENU > INSTRUMENT SETTINGS > NETWORK SETTINGS***. Select "Edit". ***CONFIGURE ETHERNET SETTINGS***. .
4. Uncheck **USE *DHCP* FOR ETHERNET**.
5. Type in the **IP Address**, **Subnet Mask**, **Gateway**, and **Preferred DNS** manually.
   a. The **IP Address** is equal to the IPv4 of the Ethernet Adapter. Change the last digit to any number from 1-10 that differs from the Ethernet Adapter IPv4 address, for example, 169.254.113.145.
   b. The Subnet Mask is equal to Ethernet Adapter. For example, 255.255.0.0.
   c. Leave the Gateway empty.
   d. Leave the Preferred DNS empty.

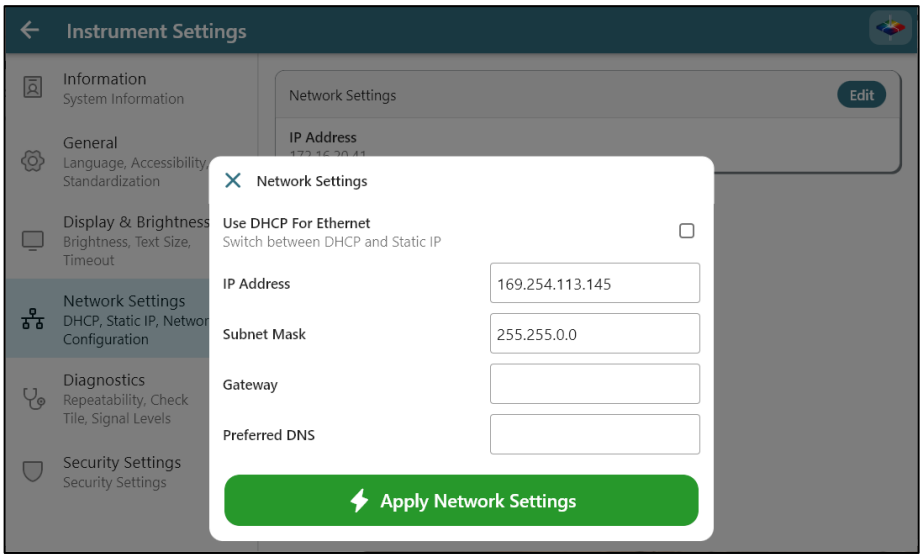

Figure 33. Network Settings

6. Select ***APPLY NETWORK SETTINGS***, then close the Network Settings window.

Instrument Settings: AUTOSEARCH STANDARD

The AutoSearch Standard feature automatically identifies any WorkSpace with passing tolerances each time a measurement is taken.
To enable and use Auto1search Standard mode:

Enable AutoSearch Standard:

- Go to ***SYSTEM MENU → INSTRUMENT SETTINGS → AUTOSEARCH STANDARD***.
- Check "AutoSearch Standard Enabled" and configure the standardization mode and measurement options.
- Note: Once enabled, the measurement options (configuration and prompt settings) set here will override those in WorkSpace settings.

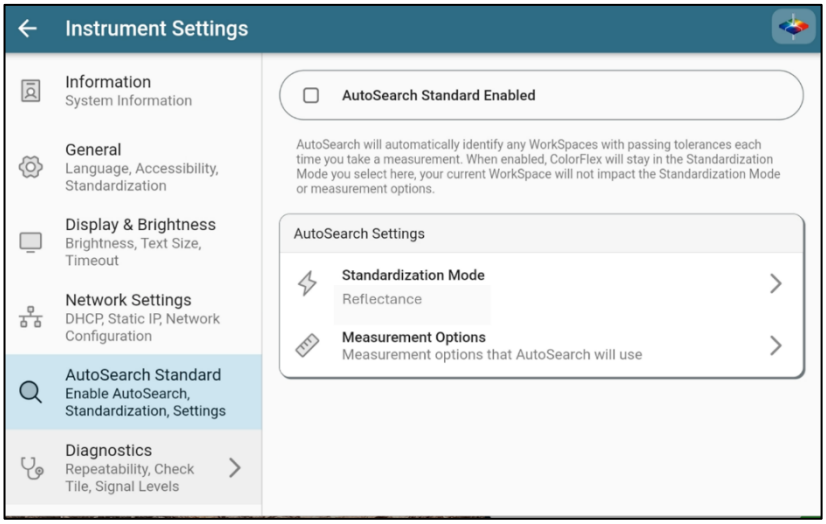

Figure 34. AutoSearch Settings

Select Workspaces for AutoSearch:

- Open ***EDIT WORKSPACE → MEASUREMENT OPTIONS*** for each Workspace you want to include.
- Check "***INCLUDE IN AUTOSEARCH STANDARD***" to add it to the AutoSearch process.

Note:Only WorkSpaces with Physical, Numeric, or Hitch standards will be included in AutoSearch. Your WorkSpace must also have at least one tolerance applied. If you want to exclude a WorkSpace from AutoSearch, you can always exclude it in the WorkSpace settings page for that WorkSpace.

Take a Measurement:

- The green action button will update to "AutoSearch."
- Place the sample and tap the ***MEASURE*** action button.
- Essentials will search the configured Workspaces, listing those with the same standardization mode as the current measurement and tolerances that pass.
- If multiple Workspaces are listed, select one to save.
- If no WorkSpace Standard Pass for this sample, you will still be able to save the sample to the "No Match" Workspace for later review.

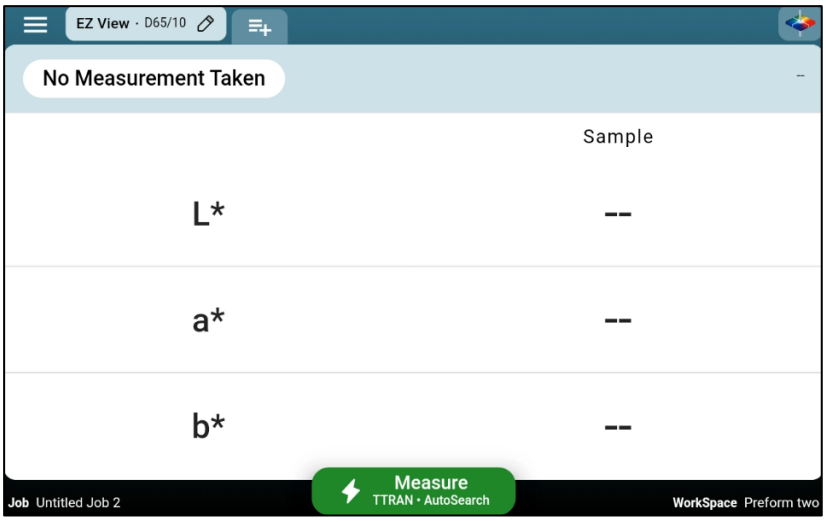

Figure 35. Measurement

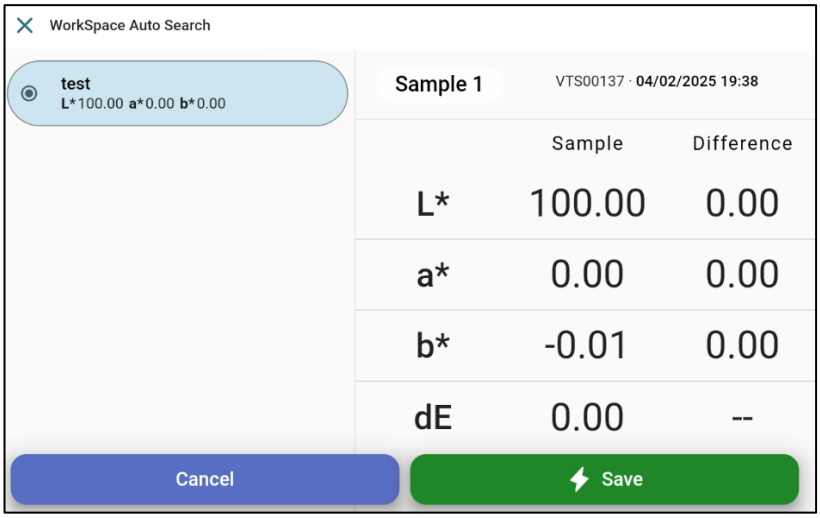

Figure 36. WorkSpace AutoSearch

- **Save and View Results:**
  - Click ***SAVE*** to load the selected WorkSpace and display the measurement results.

Instrument Settings: DIAGNOSTICS

The Diagnostics menu shows the overall health of the instrument, **LAST DIAGNOSTIC TEST RESULTS,** and **INSTRUMENT DETAILS**. . To exit this menu, use the arrow at the top left side of the screen.

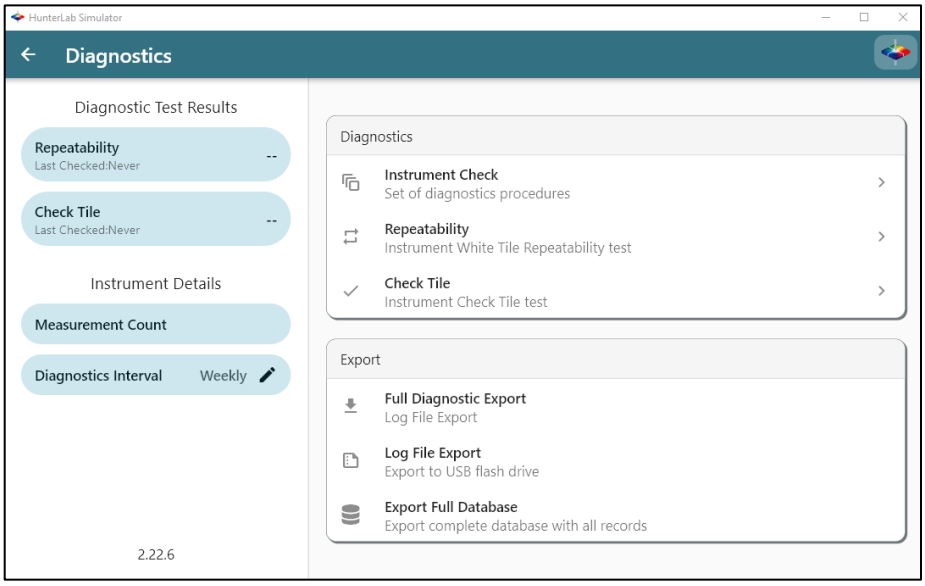

Figure 37. Instrument Health

Instrument Check

Select the **INSTRUMENT CHECK** to run a series of tests: signal levels, repeatability, and check tile. Follow instructions to continue. Instrument Check can be initiated by tapping ***SYSTEM MENU > DIAGNOSTICS STATUS***.

Repeatability

Select this test to run a group of 30 readings compared to 1 standard reading on the white tile. Ensure that the one-inch port plate is utilized. Tap the Green action button to **STANDARDIZE** and run the test.

Check Tile

Use this test to measure the green tile and confirm that the readings match the factory-set tolerance values. First, attach the 1-inch standard port plate. Tap the Green action button to **STANDARDIZE** the instrument. Then, position the green tile at the port and press ***START*** to measure.

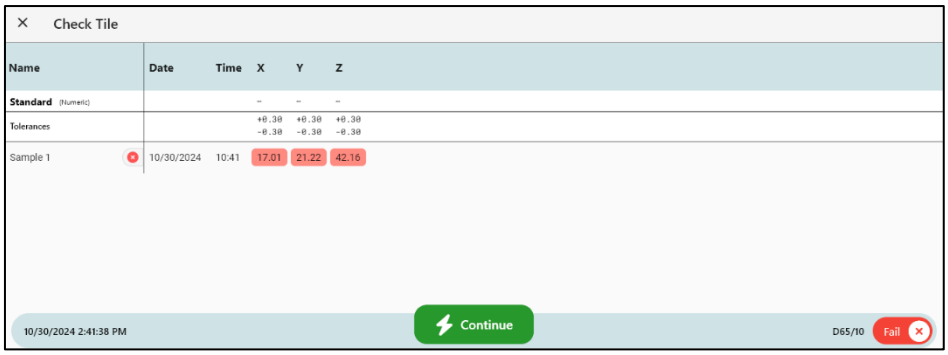

Figure 38. Check Tile Reading

The green tile will be read 5 times and the average displayed.

Export Diagnostic Results, Log File And Full Database

Attach a flash drive into the instrument and press the export options here to export data.

- Full Diagnostics Export: export the signal level, repeatability, and check tile results report.
- Log File Export: Attach a flash drive into the instrument to export the log file.
- Export Full Database: Attach a flash drive into the instrument to export the complete database with all records.

Instrument Settings: SECURITY SETTINGS

This function provides a way to enable/disable password protection.

- Follow the instructions on the screen to setup the passcode.
- Select the Secured Functions required passcode, Standardization and/or Data View Editor.
- After this, a password will be required to perform the secured functions.

How to Update Essentials in ColorFlex L2

Please find the latest version of the ColorFlex L2 Essentials user interface, along with a document outlining the major changes in HunterLab support website. .

Instructions

1. Download the **HUNTERLAB-type file** onto a flash drive (e.g., *2024.4.2.hunterlab*, where *2024.4.2* is the release number).

Note: You can rename the file if needed. CFL2 Essentials will automatically recognize the file based on its type, not its name.

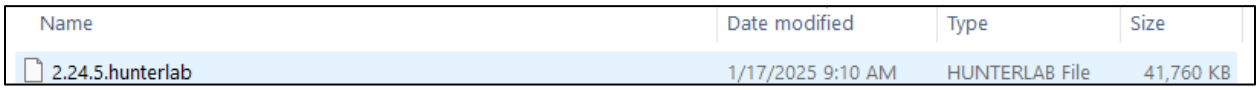

Figure 39. Essential Update File

2. Insert the flash drive into the ColorFlex L2.
   - Essentials will automatically detect the file on the drive.
   - If the file is a newer version than the currently installed one, Essentials will display a prompt to update.
3. Follow the on-screen instructions to complete the installation of the new Essentials user interface.

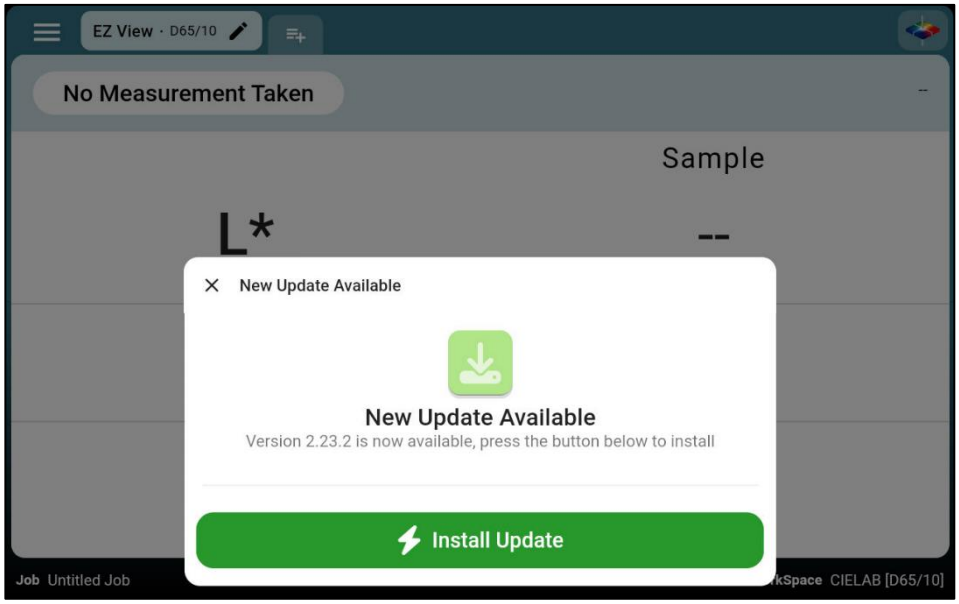

Figure 40. Install Update

Specifications

Instrument Specifications and Setup: This chapter provides detailed specifications and characteristics of the instrument. Place the instrument in a location with sufficient space for optimal performance, moderate or subdued lighting, and no drafts. Recommended operating conditions, including temperature and humidity ranges, are listed in the *Operating Conditions* section below.

Note: Do not leave ColorFlex L2 in an area where temperature or humidity extremes are possible.

Operating Conditions

Storage Temperature (3weeks)	-20°C to 65°C (-4°F to 149°F)
Operating Temperature	10°C to 30°C (50°F to 86°F)
Noncondensing Humidity	10% to 90%

Physical Characteristics

Weight	2.75 kg (6 lbs.)
Dimensions (Height x width x depth)	16 cm x 21 cm x 24 cm (6.25 in x 8.75 in x 9.5 in)
Interface	2 USB ports, HDMI Video Output, Footswitch Input, Ethernet connection, USB Service Port, Convenient measurement action button: ground terminal
System Power	90 – 240 VAC, 47 – 63 Hz to universal power supply @ 24 VDC/3.75A
Display	7-in Touch screen, high resolution 1280x800
External PC User interface	Compatible with HunterLab Essentials for PC

Conditions of Illumination and Viewing

Light Source	Full spectrum Xenon Flash Lamp
Geometry	45°/0° annular in accordance with ASTM E1164
Measurement Conditions	Port Forward, Port Up

Instrument Performance

Dual Beam Spectrophotometer	Sealed optics; 256 element diode array and high resolution concave holographic grating
Spectral Range	400 nm – 700 nm
Spectral Resolution	<3 nm
Effective Bandwidth	10 nm equivalent triangular
Photometric Range	0 to150%
Measurement Duration	<1 second
Xenon Lamp Life	10 years typical
Inter-instrument Agreement	Color: ΔE* 2000 < 0.15 CIE L*a*b* (Avg) D65/10° on BCRA II Tiles
Colorimetric Repeatability	Color: ΔE* 2000 < 0.05 CIE L*a*b* (Max) D65/10° on White Tile
D65 Illumination	Calibrated, Controlled D65 (Daylight) Illumination

Measurement

Data Views	Color Data Table, Spectral Plot, EZ View, Tristimulus Color Plot, Pass/Fail Color indication, time and date stamp, auto-naming, auto-saving, data backup, and recovery; Image capture via High-resolution camera.
Illuminants	A, C, D50, D55, D65, D75, F02, F07, F11
Observers	2° and 10°
Color Scales	CIE L*a*b*, Hunter Lab, CIE L*C*h, CIE Yxy, CIE XYZ , Rd,a,b
Color Difference	ΔL*a*b*, ΔLab, ΔL*C*h, ΔYxy, ΔXYZ, ΔE*, ΔC*, ΔH*, ΔE, ΔE CMC, ΔE* 2000
Indices and Metrics	E313 Whiteness and Tint (C/2°, C/10°, D65/2° or D65/10°), E313 Yellowness (C/2°, C/10°, D65/2° or D65/10°), D1925 Yellowness (C/2°), Y Brightness, Z%, 457nm Brightness, Opacity, Color Strength (Average and Single Wavelength), Gray Scale, Gray Stain, Metamerism Index, Citrus Number, Citrus Red, Citrus Yellowness
Data Storage	1 million Records max; 8 GB
Languages	English, German, Traditional and Simplified Chinese, Spanish, Italian

Standard Accessories

Standard Accessories	Calibrated Instrument White Standard with Certificate of Traceability, Reflectance Black Glass, Diagnostic Check Tile, HunterLab Citrus Reference Standard, 31.8 mm (1.25") Port Plate measures 25.4 mm (1"), Citrus Tube Holder, Power Supply, Initial Customer Setup Guide, Quick Start Guide, and ColorFlex L2 User's Manual (www.hunterlab.com).

Standards Conformance

Standards	CIE 15:2018, ASTM E1164, DIN 5033, Teil 7, JIS Z 8722 Condition C

Regulatory Notice

The world's true measure of color
HunterLab

Declaration of Conformance

Applicable Directives:	**2014/30/EU Electromagnetic Compatibility** **2014/53/EU Radio Equipment Directive** **2011/65/EU RoHS** **2014/35/EU Low Voltage Directive**
Standard to which Conformity is Declared:	**IEC 61326-1: 2020 EMC** **IEC 61010-1: 2010 Product Safety**
Manufacturer:	**Hunter Associates Laboratory, Inc.** **11491 Sunset Hills Rd, Reston, VA, USA**
European Representative: Representative's Address:	**Christian Jansen** **HunterLab Europe GmbH** **D-82418 Murnau, Germany**
Type of Equipment:	**Reflectance Spectrophotometer**
Model No.:	**ColorFlex L2®**

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

Place:	*Reston, VA, USA*	Signature	Tim Barrett
Date:	*December 31, 2024*	Full Name	*Tim Barrett*
		Position	*Electrical Engineer*

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ColorFlex L2 Maintenance & Safety

Maintenance for the ColorFlex L2

The ColorFlex L2 is designed to require minimal maintenance. This section highlights the few components of the sensor that need occasional upkeep to ensure the instrument operates correctly.

- The ColorFlex L2 is NOT waterproof, but the case's exterior may be wiped with a damp cloth.
- When cleaning the optical window, take precautions without scratching the optical window glass or the coating. Use a soft microfiber cloth or lens wipe.
- Instrument Standard Tiles should be handled the same way as other optical surfaces. Although the material of the white tile is very durable, care should be taken to prevent contaminants such as finger oils from contacting the material's surface. Always keep tiles in the Standards case when not in use.

Cleaning the Instrument White Tile, Black Glass, and Green Tile

- The Instrument White Tile, Green tile and Black Glass can be cleaned using a soft nylon bristle brush, warm water, and laboratory-grade detergent such as SPARKLEEN, Alconox, or Isopropyl Alcohol. After cleaning, wipe the tiles dry using a clean, non-optically brightened, lint-free paper towel, or use warm water as a rinse and let stand to air-dry for a few minutes.

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

Alconox is manufactured by Alconox, Inc., White Plains, NY 10603, and may be ordered using catalog number 1104-1. Add one tablespoon of Alconox to a gallon of water.

Keep the **Instrument Tiles** in the standard case when not in use to prevent scratching or collecting dust. Before standardizing the instrument, check the tiles for scratches, dust, fingerprints or other contaminants. Significant scratches or dirt will result in appearance degradation that may cause a standardization error. If any of the tiles are scratched or soiled beyond cleaning, contact HunterLab at Support@hunterlab.com or contact your local HunterLab representative to order a replacement.

When You Need Assistance

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

For the Americas, Support@hunterlab.com

For Asia, AsiaSupport@hunterlab.com

For Europe, EuropeSupport@hunterlab.com

For all other regions, Support@hunterlab.com

Additionally, our global support website offers 24/7 assistance with a library of information on various color measurement and appearance topics, such as applications, instrument operation, and troubleshooting. The HunterLab global support website is located at **support.hunterlab.com**.

For personalized assistance, go to support.hunterlab.com and locate the **Create A Ticket** button on the menu. Your information is gathered and registered. Our Customer Experience Teams will respond to your inquiry.

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