ColorFlex EZ
User's Manual

The world's true measure of color
HunterLab

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Safety Notes

For safety when using the ColorFlex EZ, pay particular attention to the following types of statements in this User's Guide. Each description is shown in its representative typeface.

Notice: General safety instruction that should be observed at all times while operating the instrument.

CAUTION
Specific instruction critical to the type of instrument operation being explained in the area of the manual where the caution appears.

Note: Additional clarification of instructions, not safety-related.

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CHAPTER ONE

Introduction to the ColorFlex EZ System

The ColorFlex EZ spectrophotometer is a versatile color measurement instrument that can be used on products of virtually any size, and in industries as diverse as paint, food, and textiles.

The instrument uses a xenon flash lamp to illuminate the sample. The light reflected from the sample is then separated into its component wavelengths through a dispersion grating. The relative intensities of the light at different wavelengths along the visible spectrum (400-700 nm) are then analyzed to produce numeric results indicative of the color of the sample. This is an objective means of quantifying what was once considered a subjective aspect of a sample's appearance—its color.

ColorFlex EZ is available with a large viewing area and a 45°/0° geometry. The label on the bottom of the instrument provides this information and a unique serial number, which is outlined below.

Model	Geometry	Viewing Area
45/0 LAV	45°/0°	Large

Accessories

The following accessories are included with the ColorFlex EZ:

- Calibration tiles - A NIST traceable white calibrated tile that is placed at the sample port during standardization to set the top of scale, the Black Glass that is placed at the sample port during standardization to set the zero, and the Green Check Tile that is used to assess long-term instrument performance during the Green Tile Test.
- Certificate of traceability for the standard White Tile.
- Tile data sheet - provides NIST-traceable calibrated values for the standard White Tile and values read at factory for the Green Tile.
- USB cable for connecting the ColorFlex EZ to a computer.
- Standards care card - gives instructions on how to clean the standards.
- Lens wipes

- Lens brush
- USB Flash Drive for data transfer
- AC adapter, 12 W/9V.
- ColorFlex EZ User's Manual.

Options and Sample Devices

There are many options and devices available for positioning samples at the measurement port of the ColorFlex EZ and for making the instrument easier to use. Any or all of the following options and sample devices may be purchased for use with the ColorFlex EZ. HunterLab part numbers are provided for convenience in ordering.

- Carrying case (D02-1010-619),
- Foot switch (D02-1010-327),
- External serial printer (L01-1010-678 for 110V, L01-1010-679 for 220V),
- Sample clamp/port-forward stand (D02-1010-459),
- Skein holder (02-7396-00),
- Port inserts (various part numbers),
- 1.25-inch glass port insert (02-6624-05),
- 1.25-inch UV port insert (D02-1010-618),

- Sample cup set for translucent liquids (CFLX-SC-ASSY for 45/0),
- Sample cup port plate for 45/0 (04-6622-00),
- 2.5-inch glass sample cup (04-7209-00),
- Sample cup opaque cover (04-4000-00),
- Ring and disk set (02-4579-00).

External Printer (A13-1014-259)

The external thermal printer connects to the ColorFlex EZ's USB port and prints measurement data or product setup parameters on request. The communications cable supplied with the printer must be used to connect the printer to the ColorFlex EZ. More information on the external printer is provided in its separate User's Manual.

The printer is automatically detected by the ColorFlex EZ once connected.

Keyboard (A13-1014-294)

The optional flexible keyboard connects to the ColorFlex EZ's USB port to allow easy entry of any alphanumeric information (such as setup names) required.

The up, down, left, and right arrow keys on the keyboard correspond to the same buttons on the ColorFlex EZ button pad. The Enter key on the keyboard emulates the center Go button on the ColorFlex EZ's button pad. Numbers and letters may be typed on the keyboard as usual.

The keyboard is automatically detected by the ColorFlex EZ once connected.

Bar Code Scanner (A13-1014-254)

The optional bar code scanner connects to the ColorFlex EZ's USB port to allow scanning of a bar code for the ID tag of a reading after the reading is made.

The bar code reader is automatically detected by the ColorFlex EZ once connected.

USB Flash Drive for Data Transfer (A10-1013-423)

Supplied as standardm this USB Flash Drive provides a way to transfer data from the CFEZ Datalog to a USB flash drive for viewing in Microsoft Excel or EasyMatch QC software. This can also be used to save product setups and transfer the setups to another CFEZ or EasyMatch QC software.

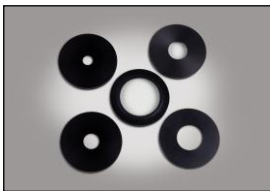
Sample Clamp & Port-Forward Stand

The port-forward stand holds the instrument securely in the port-forward position and the sample clamp holds samples flat at the sample port. To attach the stand to the ColorFlex EZ, lay the instrument on its side and install the two screws through the stand into the bottom of the instrument using the Allen wrench provided. To use the sample clamp, pull the spring-loaded clamp away from the sample port, insert the sample, and gently release the clamp.

Skein Holder

This is a device for measuring yarn skeins. Wind the yarn around the skein holder in multiple taut layers until it is effectively opaque and is as flat as possible. Secure it in place with the detachable arms on the sides of the skein holder. Place the skein holder at the sample port and back it with the sample clamp or a white backing tile to provide a consistent background and pressure. Make several measurements of the skein, rotating the holder 90° between measurements and averaging the readings for the final result.

Port Inserts



Port inserts with various-sized openings may be purchased and placed at the reflectance port to change the area of view Remove the standard port insert by pulling it out of the port insert retainer. Replace it with the special port insert. Make sure that the flat portion of the insert is facing outward with the beveled portion toward the interior of the sensor. Then standardize the instrument. Any change in port size must be followed by standardization on both the Black Glass and the calibrated White Tile.

Glass Port Insert (D02-6624-05)

This option provides a snap-in port plate with an opening one inch in diameter that is covered with glass. Also available is a CMR-2587 Port Insert with polycarbonate. The glass insert protects the inside of the instrument from sample and airborne particles. Remove the standard port insert by pulling it out of the port insert retainer. Replace it with the glass port insert. Make sure that the flat portion of the insert is facing outward with the beveled portion toward the interior of the sensor. Then standardize the instrument with the glass in place. Check the measurements of the Green and White Tiles before performing any other diagnostics without the glass cover. Difference measurements using a glass cover will be more accurate than absolute measurements.

420 nm UV Port Insert (D02-1010-618)

This port insert contains a 420-nm filter to prevent UV illuminaton from hitting the sample. This is important for UV-optically brightened samples. Also available are CMR-2591 400 nm and CMR-2592 460 nm UV

Port Inserts. Remove the standard port insert by pulling it out of the port insert retainer. Replace it with the UV port insert. Make sure that the flat portion of the insert is facing outward with the beveled portion toward the interior of the sensor. Then standardize the instrument with the UV filter in place. Check the measurements of the Green and White Tiles before performing any other diagnostics without the UV filter.

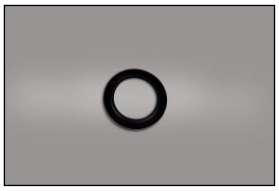
Sample Cup Set for Translucent Liquids

This set provides a device for holding powders, pellets, granules, and translucent liquids at the sample port. It includes a 64 mm (2.5 inch) glass sample cup, plastic ring and ceramic disk set, special port plate insert, and sample cup cover.

The ring and disk set are provided for translucent liquids, transparent liquids, and semi-solids where the path length is related to color concentration and must be fixed. First, the sample cup port plate should be installed to hold the sample cup in the proper position. Place the ring inside the sample cup and fill the cup with sample to a level above the ring. Then place the ceramic disk on top of the sample (until it rests on top of the ring) with the white portion facing the sample. Cover with the sample cup cover to exclude external light. Measure the sample at the sample port through the glass bottom of the sample cup with the instrument in the port-up orientation.

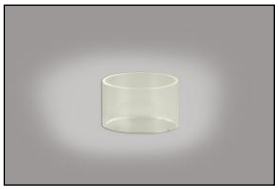
Sample Cup Port Plate

This port insert is specially designed to accommodate the 64 mm (2.5 in) glass sample cup and to hold it in the proper position at the measurement port. Remove the standard port insert by pulling it out of the port insert retainer. Replace it with the sample cup port insert, then standardize the instrument.



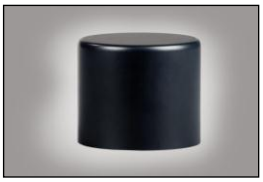
64 mm (2.5 in) Glass Sample Cup

The sample cup is ideal for the analysis of powders, granules, pellets, and translucent samples. It is recommended for use with the instrument in the port-up orientation. The cup can be filled with the desired sample and placed at the measurement port so that the sample is measured through the glass bottom of the cup.



Sample Cup Opaque Cover

The opaque cover provides a light trap to exclude the interference of external light on a sample contained in the 64 mm (2.5-in) sample cup. It is placed over the filled cup at the sample port as shown below.



Ring and Disk Set

The ring and disk set includes a plastic ring and ceramic disk designed for use inside the 64 mm (2.5-in) glass sample cup (sold separately). The ring and disk set are recommended for use when measuring translucent liquids, transparent liquids, and semi-solids to exclude external light and provide a consistent white background and sample path length.

Place the ring inside the sample cup and fill the cup with the sample to a level above the ring. Then place the ceramic disk on top of the sample (until it rests on top of the ring) with the white portion facing the sample. If desired, cover the entire assembly with the opaque cover (sold separately). Measure the sample at the sample port through the glass bottom of the sample cup with the instrument in the port-up orientation.

EasyMatch QC Software (EZMQC-CFLX)

EasyMatch QC is a Windows-based computer program that performs numerical calculations on data measured by the ColorFlex EZ, stores sample measurements, and provides graphical representations of data. Measurements may be made and stored in the ColorFlex EZ memory and then uploaded into the software, or the ColorFlex EZ may be directly controlled by the software. Instructions for EasyMatch QC are provided in its separate User's Manual.

The Basics of ColorFlex EZ Operation

Commands are given to the ColorFlex EZ using the five buttons on its button pad, and instructional prompts and measurements are displayed on the 320 x 240 pixel on color liquid crystal display (LCD) screen.

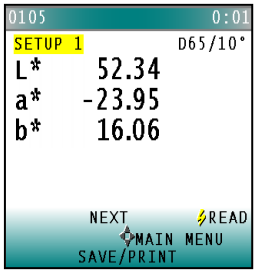
When an item is to be measured using the ColorFlex EZ, the area of interest should be placed flush at the sample port with the side of the sample to be measured toward the instrument. The sample must completely cover the sample port.

When the read command is given using the button pad, the xenon flash lamp illuminates the sample, and the light reflected back to the detector by the sample is evaluated. The calculated measurement is then shown on the LCD.

Up to 2000 readings and 250 product setups may be stored in the ColorFlex EZ's memory.

The Button Pad and LCD Display

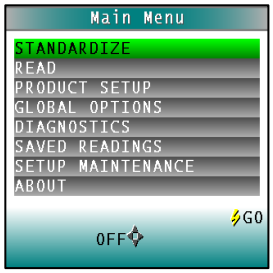
The five buttons on the button pad can be loosely defined as the left, right, up, and down buttons, with the "Go" (lightning bolt) button located to the right of the arrows. In actuality, however, these buttons perform slightly different functions depending on the current operation. Consult the miniature map of the button pad shown at the bottom of the LCD display for the relevant definitions of the buttons at any particular time.



Across the top of each measurement screen are numbers indicating (left to right) the Datalog number for this reading if it was saved to the ColorFlex EZ's memory, and the number of hours and minutes since the instrument was last standardized.

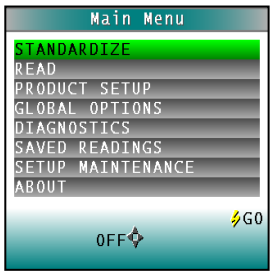
Menus and Prompts

All ColorFlex EZ functions may be accessed through its main menu. The main menu commands lead to prompts (such as for standardization and reading), setup screens (for product setup and global options), or an additional menu (such as the Diagnostics, Saved Readings, and Setup Maintenance choices), depending on the function requested.



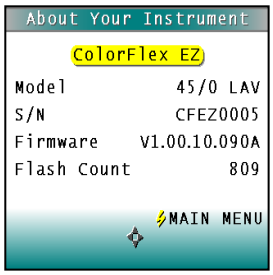
When Return is shown as an available button command on the main menu screen, choose Return to go back to the last screen used before the instrument shut down.

When Off is shown as an available button command on the main menu screen, choose Off to immediately turn the instrument off.



About The Instrument

Information specific to the instrument may be viewed on the About Your Instrument screen, which can be obtained by choosing About from the main menu. The instrument model, serial number, firmware version, and total flash count for this instrument lamp are displayed.



More details on ColorFlex EZ operation are given in Chapters 2 through 4.

Terminology Used

Throughout this user's guide and within the ColorFlex EZ's firmware, several terms will be used repeatedly. These terms are defined below.

Product Standard

A product standard (or "standard") is an object that represents the ideal target color for the product. This object is the one to which others will be compared and deemed acceptable or unacceptable. The product standard may either be a physical item that is measured using the ColorFlex EZ or a set of color values that is entered into the ColorFlex EZ's memory.

Sample

A sample is an object that will be measured with the ColorFlex EZ and compared to the product standard. The color of the sample is generally similar to the color of the product standard.

Tolerances

Tolerances are limits that indicate how different a sample can be from the product standard and still be acceptable. Positive and negative tolerances may be set for each color scale and index parameter chosen for display. Then, the ColorFlex EZ can show a pass or fail indicator after a sample is read.

Samples that differ from the standard by no more than the entered tolerance are said to pass. Samples that exceed the tolerance for one or more parameter are said to fail.

Installation

Before operating the ColorFlex EZ, connect the instrument to a power source, a computer or to an optional component, such as a printer. Instructions are provided below.

1. Unpack the cartons and remove wrappings and cable ties. Inspect for damage and notify the carrier and HunterLab immediately if any is discovered. Save the packing materials in case it becomes necessary to return the instrument to the factory.

2. Place the ColorFlex EZ on a flat, stable surface near and electrical outlet.

3. Connect the connector of the AC adapter to the acceptor on the left back of the ColorFlex EZ.

4. Plug the female end of the power cord into the AC Adapter and the male end into a wall outlet.

5. If the instrument is to be used connected to a computer, printer, or other USB device, plug the hexagonal end of the USB cable into the USB port on the ColorFlex EZ.

6. Plug the flat end of the USB cable into the appropriate USB port on the computer or device. If connecting to a computer, Windows' plug and play feature should automatically find and install the ColorFlex EZ. Let it do so until the "Found new hardware" message disappears. Other devices, such as the printer, bar code reader, and keyboard, are automatically detected by the ColorFlex EZ.

7. Turn the ColorFlex EZ on by pressing the Go button on the button pad.

CHAPTER TWO

Configuring Options and Setups

Before using the ColorFlex EZ to make measurements, configure the instrument's various options, such as the language, screen angle, and the date and time.

A product setup is a set of operating parameters that describe the operation of the ColorFlex EZ for a specific product. Up to 250 setups may be stored in the instrument's memory. The parameters that must be defined for each product include the color scale for display, target color values for the product, and the acceptable tolerances applied to the standard values. Each product setup is saved in the ColorFlex EZ memory with a setup number and name.

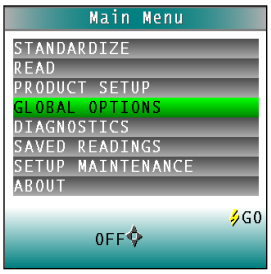
The instrument options and product setups are retained in the ColorFlex EZ's memory even when the instrument is turned off.

Maintenance may be performed on the product setups, such as resetting or printing them. This chapter describes how to configure and maintain the instrument options and product setups.

Global Options

Global Options is selected from the main menu by moving the cursor highlight to the "Global Options" position using the up and down arrow buttons and then pressing the Go button.

The Global Options screen appears.



Configure each parameter by moving the cursor highlight to its position using the up and down arrow buttons. When the desired parameter is highlighted, press the left or right arrow button to scroll through the available choices for the parameter. When the appropriate choice is displayed, stop scrolling. Move onto configure more options in the same manner.

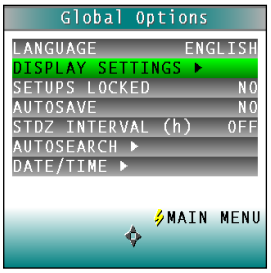
When all options are as desired, press the lightning bolt (Main Menu) button to accept the settings and return to the main menu.

The global options that may be configured are as follows:

Language

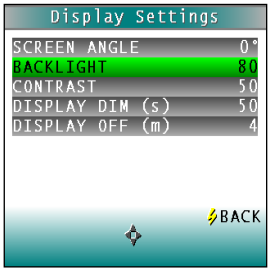
ColorFlex EZ can display screens and prompts in English, French, German, Italian, Japanese, Spanish and Simple Chinese.

Display Settings ▸



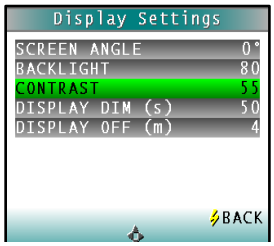
When Display Settings is highlighted and the right arrow button is pressed, a submenu appears. In this submenu, the following parameters can be set:

- **Screen angle:** Rotate the text on the ColorFlex EZ screen so that it may be easily read from either side of the instrument. 0° keeps the text in its normal position and 180° flips the text upside down. Please note that the functions of the buttons also rotate when the screen text rotates (i.e., what was previously the up arrow will become the down arrow if the text is flipped upside down).Each press of the right arrow button increases the displayed value 180°.

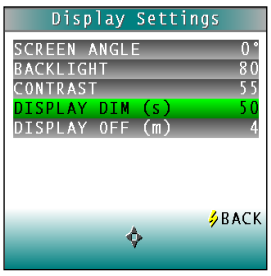


- **Backlight:** Press the right arrow button to increase the brightness of the LCD's backlight or the left arrow button to decrease the brightness. Values between 0 and 100 may be selected in increments of 5.

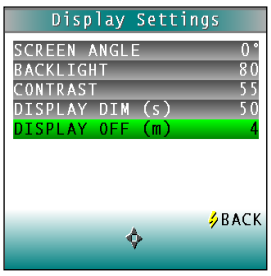
- **Contrast :**
Press the right arrow button to increase the LCD's contrast or the left arrow button to decrease the contrast. Values between 0 and 100 may be selected in increments of 5.



- **Display Dim:** Press the right arrow button to increase the time that must elapse (in seconds) after the last button press before the LCD backlight automatically dims. Press the left arrow button to decrease that time. Values between 10 and 50 seconds may be selected in increments of 10. When the backlight dims, the display may still be seen, and the press of any button on the button pad causes the backlight to turn back on.



Display Off: Press the right arrow button to increase the time that must elapse (in minutes) after the last button press before the ColorFlex EZ's LCD automatically turns itself off. Press the left arrow button to decrease that time. Values between 1 and 4 minutes may be selected in increments of 1. When the display turns off, it may no longer be seen, but the press of any button on the button pad causes the display to turn back on.

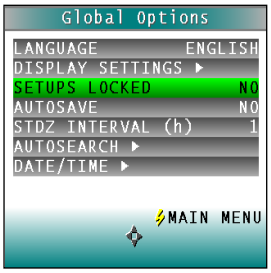


- **Note:** The ColorFlex EZ will turn off entirely (dsiplay and processor) once 5 minutes has elapsed since the last button press. Press any button to re-activate.

Press Back (the lightning bolt) to return to the Global Options screen.

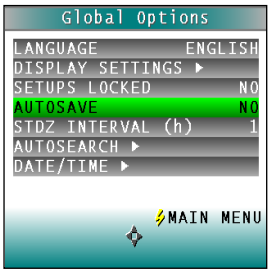
Setups Locked?

Choose YES to lock the product setups so that changes cannot be made. Choose NO to allow changes to the product setups. Each press of the right arrow button toggles between YES and NO.



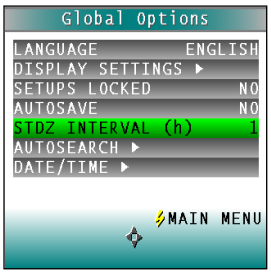
AutoSave

Choose YES to save each measurement automatically to the instrument's Datalog. Choose NO to save the measurements manually, only on demand.



Stdz Interval

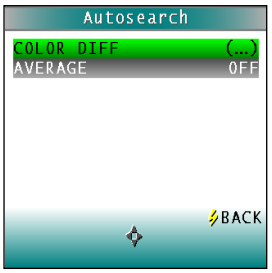
Indicate the amount of time that must elapse (in hours) after the last standardization and before the instrument prompts for re-standardization . Press the right arrow button to increase the number of hours or the left arrow button to decrease the number. Values between 1 and 16 may be selected in increments of 1. Selecting 4 is suggested. The choice of OFF disables prompting for standardization, but its use is not recommended.



AutoSearch ▸

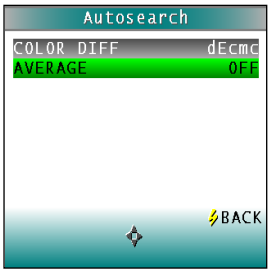
One of the features of the ColorFlex EZ is that it can find the closest physical, numeric, or hitch standard stored in the instrument's memory to a sample read.

When AutoSearch is highlighted and the right arrow button is pressed, a submenu appears. In this submenu, may set the following parameters:



- **Color Diff:** To deselect the AutoSearch feature, set this parameter to (...). To use this feature, select the color difference index for comparison of the sample/standard. The choices are dE, dE*, and dEcmc. This index and the illuminant/observer set in each product setup searched will be used for the comparison.

  Each press of the right arrow button changes the color difference index to the next one available.



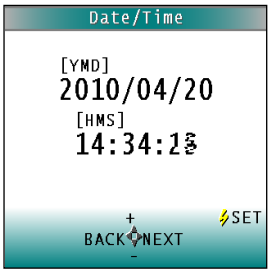
- **Average:** To select this feature, choose the number of readings to average for each sample before the AutoSearch comparison to available standards is made. This applies to all setups selected for AutoSearch. Press the right arrow button to increase the number of readings or the left arrow button to decrease the number. Values between 2 and 20 may be selected in increments of 1. To deselect the average measurements used in

- AutoSearch, set this parameter to OFF. Press Back (the Go button) to return to the Global Options screen.

Date/Time ▸

When Date/Time is highlighted and the right arrow button is pressed, a submenu appears. In this submenu, set the current date and time.

Refer to the button pad map at the bottom of the screen for selection options.



Press Next to move to another parameter to set. Year is set first, then month, then day, followed by the hour and minutes. (Seconds are not set.)

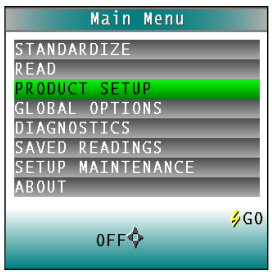
Press + to increase the value of the current parameter or - to decrease it.

Press Set to accept the entered date and time and leave the Date/Time screen.

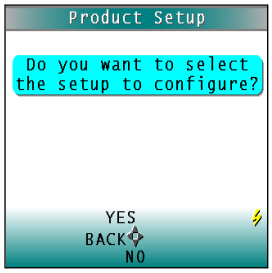
Press Back to discard the entered date and time and leave the Date/Time screen.

Product Setups

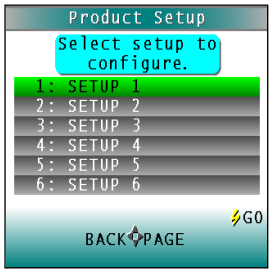
Product Setup is selected from the main menu by moving the cursor highlight to the Product Setup position using the up and down arrow buttons and then pressing the Go button.



The Product Setup screen appears. On this screen, choose to select the product setup from a list (Yes) or configure the last setup used (No).



If Yes is chosen, the Select setup to configure screen is shown. Move the cursor highlight to the position of the setup by using the up and down arrow buttons or by scrolling through the pages using the right arrow button (Page). Then press the Go button to select it.
The screen that allows configuration of the setup selected (or the last setup used appears next.



Configure each desired parameter by moving the cursor highlight to its position using the up and down arrow buttons. When the parameter is highlighted, press the right arrow button to scroll through the available choices for the parameter. When the choice desired is displayed, stop scrolling. More parameters may be configured in the same manner.

When all parameters are as desired, press the Go (Main Menu) button to accept the settings and return to the main menu or

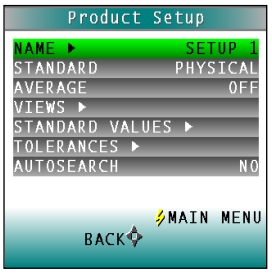
left arrow (Back) to select another setup to configure.

Setups may be saved to a USB drive and uploaded into other instruments of the same model or to the EasyMatch QC Software. The product setups are saved as ASCII Hex (.stp)

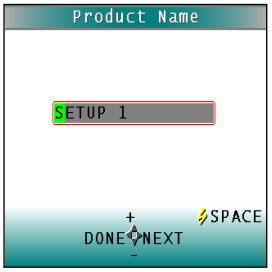
The product setup parameters that may be configured are as follows:

Setup Name ▸

Press the right arrow button to obtain the Product Name screen and enter any descriptive name for the product setup. Up to 15 characters may be entered using all the letters and numbers, as well as the space character.

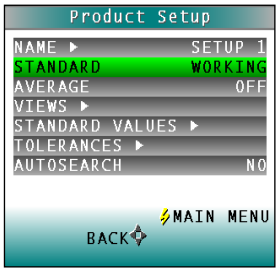


As shown on the button pad map at the bottom of the screen, use the up and down arrow buttons to scroll up (+) and down (-) through the list of available characters. Press the Go button to add a space character. Press the right arrow button to move to the next character in the name. Press the left arrow button when the entire name has been entered.



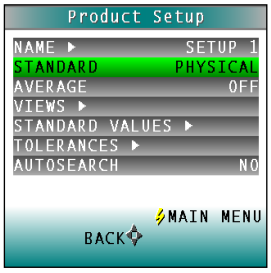
Standard

Four types of standards are available for selection depending on the measurements and data needed. Choose **Working** when a number of different standards and samples are

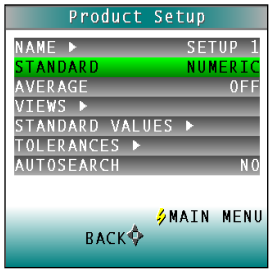


measured in a single session. A working standard is measured immediately prior to measuring its corresponding samples, such as comparing the end of one roll to the beginning of another. Its measurement values will be overwritten the next time a standard is read using this product setup.

Choose **Physical** when an actual product specimen is available that represents the target color to which samples will be compared on a regular basis. A physical standard is measured and stored in the product setup for as long as desired.

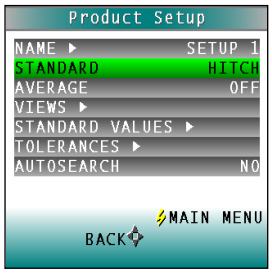


Choose **Numeric** when an physical specimen does not exist for measurement, but the target color values are known from previous measurements. The color values for a numeric standard are entered and stored in the product setup for as long as desired.



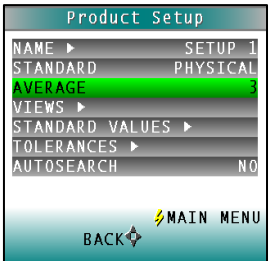
Choose **Hitch** when to alter the readings made on the ColorFlex EZ to better correlate to another color measurement instrument.

A specific standard with known color values from the other (reference) instrument will then be read with the ColorFlex EZ and that reading manually adjusted within the product setup to match the reference instrument. The modified standard is stored in the product setup for as long as desired.



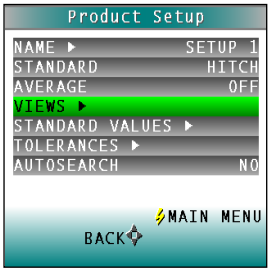
Press the right arrow button to move through the list of available standard types.

Averaging



Select OFF if to make only one reading of each standard and sample. To average several readings into a single measurement, indicate the number of readings to be averaged, up to 20.

Views ▸



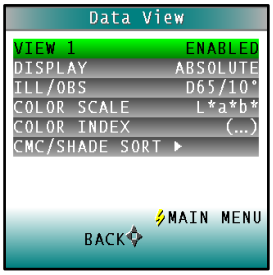
The settings made under Views indicate what will be shown on the ColorFlex EZ's LCD screen after a measurement is made.

Press the right arrow button to obtain the Data Views screen.

Up to eight different views may be displayed for each measurement made with the ColorFlex EZ. This is particularly helpful when you need to report in more than one color scale for each measurement.

Use the up and down arrow buttons to highlight the desired view number. Then press the right arrow button to obtain the Data View screen for that view.

The parameters that may be set are as follows:



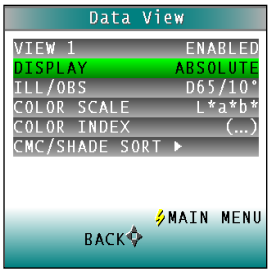
- View: Use the up and down arrow buttons to move to the View parameter, then toggle between Enabled (view on)

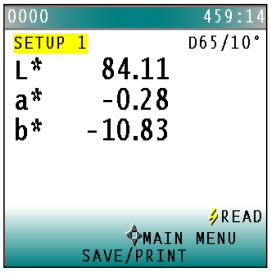
and Disabled (view off) using the right arrow button. View 1 is always automatically enabled and may not be disabled.

- **Display:** Use the down arrow button to move down to the Display parameter, then scroll through the choices using the right arrow button.

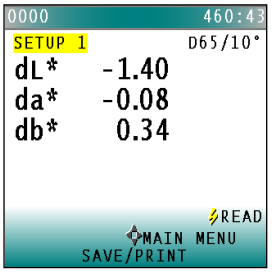
  The display choices are as follows:

  - **Absolute**, which causes raw color scale values (such as L, a, and b) to be displayed for the most recent standard or sample read.

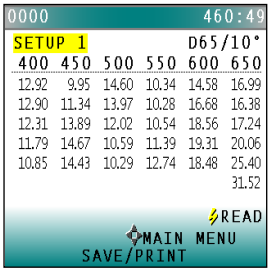




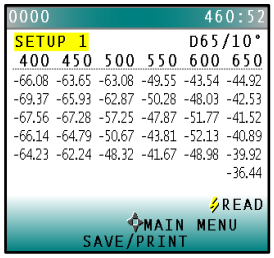
  - **Difference,** which causes the most recent sample read to be compared to the standard and the difference in color between them (such as dL, da, db) to be displayed.



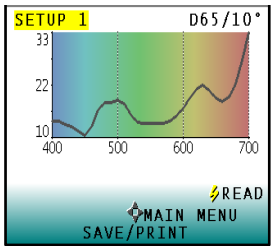
  - **Spectral Data** which causes the raw reflectance values for each wavelength read by the instrument to be displayed for the most recent standard or sample



- **Spectral Difference**, which causes the difference between the standard and the most recent sample read to be displayed in raw reflectance values for each wavelength read by the instrument.

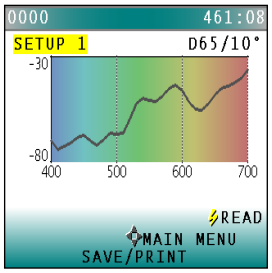


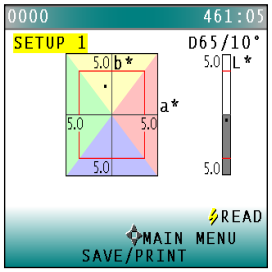
- **Spectral Plot**, which causes the raw reflectance values for each wavelength read by the instrument to be plotted for the most recent standard or sample.



- **Diff Plot**, which causes the difference between the standard and the most recent sample read to be plotted in raw reflectance values for each wavelength read by the instrument.

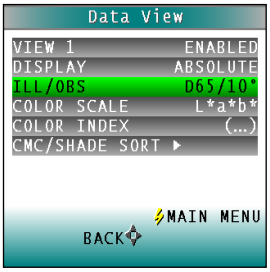
- **Color Plot**, which displays the sample's location in color space relative to the standard, which is plotted in the center of the a-b and L plots.



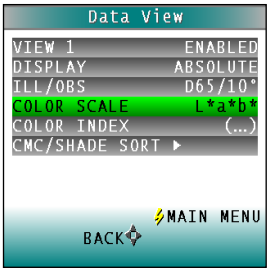


- **<u>Ill/Obs:</u>** Choose the illuminant/ observer combination under which color values will be calculated. Use the down arrow button to move down to the Ill/Obs parameter, then scroll through the choices using the right arrow button

The available choices are A/2, C/2, D50/2, D55/2, D65/2, D75/2, F2/2, F7/2, F11/2, A/10, C/10, D50/10, D55/10, D65/10, D75/10, F2/10, F7/10, and F11/10.

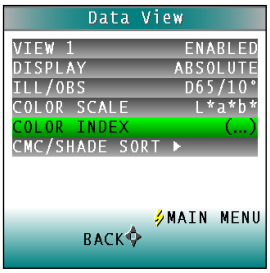


- **Color Scale**: . Choose the color scale to be used. Use the down arrow button to move down to the Color Scale parameter, then scroll through the choices using the right arrow button.



  The available choices are XYZ, Yxy, Lab, L*a*b*, L*C*h, and dLdCdH (dLdCdH available only with Difference display type). If the display type chosen was Difference, the color scale will be expressed on the read screen as dXdYdZ, dYdxdy, dLdadb, dL*da*db*, or dL*dC*dh instead. The choice of (...) [none] is also available.

- **Color Index:** Choose the color index to be used. Use the down arrow button to move down to the Color Index parameter. Then scroll through the choices using the right arrow button.



  The choices are Y, YID, YIE, WIE, Tint, Z%, 457B, MI, SMA, SW, OP, GSC, GSS, dE*, dEc, dE, dC*, dC, and SSN. If the display type chosen was Difference, the color index may be expressed on the

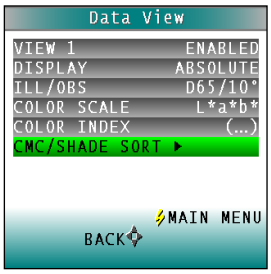
read screen as a difference value, such as dY, dYIE, dWIE, etc. instead. The choice of (...) [none] is also available.

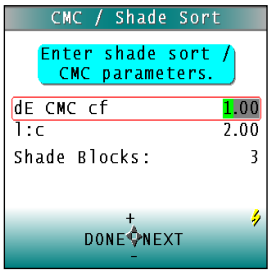
Some indices may not display until both a standard and a sample are read.

- **CMC/Shade Sort:** The CMC/Shade Sort parameter applies only if the color index chosen is dEc or SSN. Use the down arrow button to move down to the CMC/Shade Sort parameter, then press the right arrow button to obtain the CMC/Shade Sort screen.

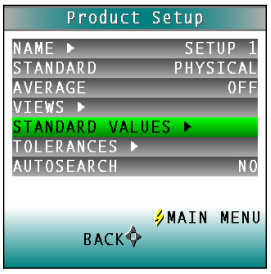
  As shown on the button pad map at the bottom of the screen, use the up and down arrow buttons to scroll up (+) and down (-) through the numbers for the digit that is currently highlighted. Press the right arrow button to move to the next digit in the value and then to move from the commercial factor to the l:c ratio and then to the Shade Blocks. Press the left arrow button when the needed values have been entered.

  Press the left arrow button (Back) twice to return to the Product Setup screen.

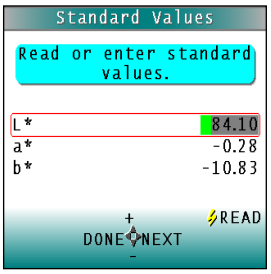




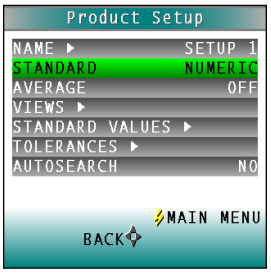
Standard Values ▸



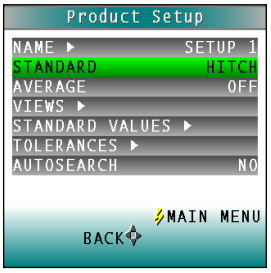
The Standard Values parameter is only relevant when the Standard Type is physical, numeric, or hitch. When Standard Values is highlighted, press the right arrow button to move to the Standard Values configuration screen.



For a **physical** standard, place the standard at the sample port and press the Go button (Read) to read the standard and place its measurement values (in the selected color scale) in the product setup. Then press the left arrow button (Done) to return to the product setup configuration screen.



For a **numeric** standard, change the highlighted digit of the selected color scale value using the up and down arrow buttons. When the desired digit is shown, press Next to move to the next digit. When all digits are as desired, press Done to return to the product setup configuration screen.



For a **hitch** standard, place the hitch standard (with known values from a reference instrument) at the sample port and press the Go button (Read) to read the standard and place its measurement values (in the selected color scale) in the product setup.

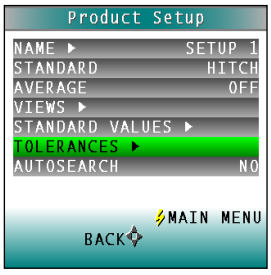
Then, change the highlighted digit of the selected color scale value to match the corresponding digit of the known values from the reference instrument using the up and down arrow buttons. When the desired digit is shown, press Next to move to the next digit. When all digits match the corresponding digit from the reference instrument's reading, press Done to return to the product setup configuration screen.

The offsets between the measured and entered values for the hitch standard are saved with the standard and applied to all samples read in that setup.

As a PQ Performance Qualification step, measure the physical hitch standard as a sample and verify that the read values closely match the reference values.

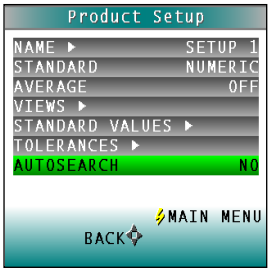
Tolerances ▸

When Tolerances is highlighted, press the right arrow button to move to the Tolerances configuration screen. Select the color scale and indices for the tolerances.



Change the highlighted digit of the selected color scale tolerance value using the up and down arrow buttons. When the desired digit is shown, press Next to move to the next digit. When all digits are as desired, press Done to return to the product setup configuration screen.

AutoSearch

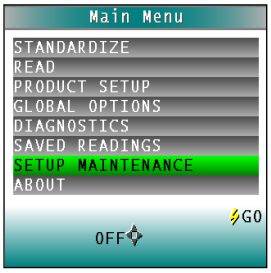


Select YES to include this product setup when using the automatic standard searchfeature, which pulls up the most appropriate product setup (based on the closest standard's color values) each time a sample is read. Only the setups where AutoSearch is enabled (YES) will be included in the automatic serach.

Select NO to exclude this product setup in automatic standard searching.

Press the left arrow button (Back) to accept the parameters just set and select another Product Setup to configure or the Go button (Main Menu) to accept the parameters just set and return to the Main Menu.

Setup Maintenance



Setup Maintenance is selected from the main menu by moving the cursor highlight to its position using the up and down arrow buttons and then pressing the Go button.

The Setup Maintenance menu appears.

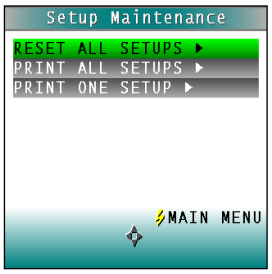
Select the desired command from the menu by moving the cursor highlight to its position using the up and down arrow

buttons and then pressing the right arrow button.

The available commands are described below.

Reset All Setups ▸

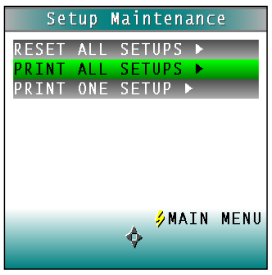
Reset All Setups first presents a confirmation message then, if Go is selected, returns all product setups to their default (factory) values.



Note: The default setups cannot be restored if the setups are locked in Global Options.

Print All Setups ▸

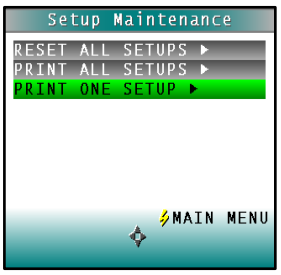
This command causes the product setup parameters to output through the USB port for all the product setups. If the USB cable is connected to a printer, the parameters will be printed. If the cable is connected to a computer or other device, it will be sent there.



Note: To output setup parameters to a computer, open a receiving device.

Print One Setup ▸

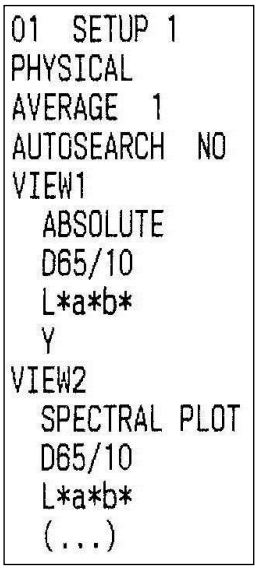
Print One Setup first gives a screen to select the product setup to print. Select the desired setup from the list by moving the cursor highlight to its position using



the up and down arrow buttons and then pressing the Go (Print) button. The product setup's parameters are then output through the USB port. If the USB cable is connected to a printer, the parameters will be printed. If the cable is connected to a computer or other device, it will be sent there.

Note: Open a receiving device in order to output setup parameters to a computer.

An example printout is shown.



Clone All Setups ▸

Clone All Setups appears in the Setup Maintenance menu only when two ColorFlex EZs are connected together via the standard ColorFlex EZ USB cable and a Standard-A to Mini-A adapter. When Clone All Setups is chosen on one of the ColorFlex EZs, the full set of 100 product setups are sent from the initiating instrument to the second connected instrument. This process takes several minutes.

Press Cancel to stop the setup cloning while it is in progress.

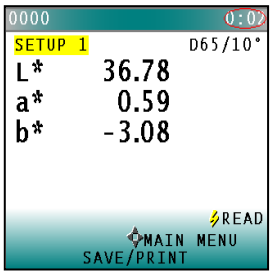
CHAPTER THREE

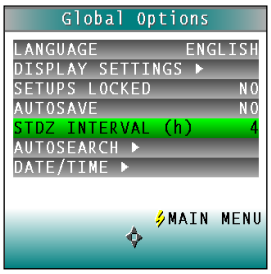
Standardization and Reading

This chapter describes the various steps performed in the course of normal instrument operations, such as standardizing, reading, storing and printing data.

Standardizing

Standardization sets the top and bottom-of-scale for the neutral axis. During standardization, the bottom-of-scale (zero) is set first. This is done by placing the Black Glass at the sample port. The top-of-scale is then set by reading the calibrated White Tile. Messages on the LCD screen prompt through the standardization process as described below. The time elapsed (in minutes) since the last standardization is shown in the upper right corner of the screen.





It is recommended that the ColorFlex EZ be standardized every four to eight hours. The instrument will automatically prompt for standardization after the Standardization Interval set in Global Options has elapsed, so it is a good idea to enter 4 to 8 hours as the Standardization Interval. Also standardize the ColorFlex EZ any time there is a significant change (greater than 5°F) in ambient temperature. For example, if the ColorFlex EZ is moved an air-conditioned office to an outdoor site that is 90°F, standardization should be repeated once the instrument has had a chance to stabilize under the new temperature. Also standardize the instrument any time there is a change in the optical path, such as changing from using the standard port to the sample cup port.

Also, it is important that the standards used in standardization be treated carefully. Tiles must be kept clean and in good condition. If there is any doubt about the standards being clean, clean them as described in the "Maintaining and Testing ColorFlex EZ" chapter.

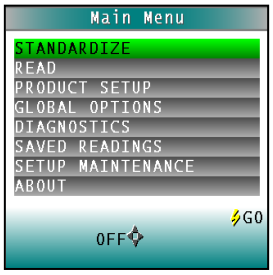
Standardization Process

Standardization of a ColorFlex EZ is performed as follows:

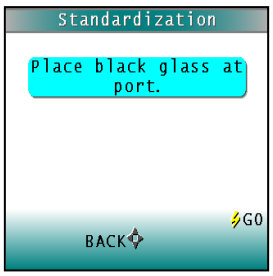
1. Remove the calibration tiles from the standards box.
2. Check that the tiles are clean and free of dust and scratches. If they are dirty (including marked with fingerprints),

clean them as described in "Maintaining and Testing ColorFlex EZ."

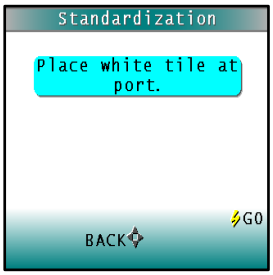
4. Select Standardize from the ColorFlex EZ's main menu by moving the cursor highlight to its position using the up and down arrow buttons and then pressing the Go button. The Standardization screen appears, prompting for the Black Glass.



5. Place the Black Glass on the measuring port with the shiny side of the glass against the port. **Check that the Black Glass is flat and in solid contact against the port and that the white dot is facing forward towards the operator.**

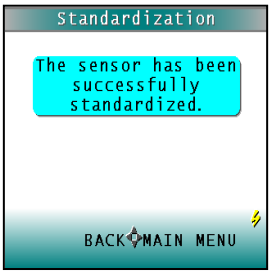


6. Press the Go buttonGo. The ColorFlex EZ reads the glass and sets the instrument zero or bottom-of-scale. When it is finished, the screen prompts for the calibrated White Tile.



7. Replace the Black Glass with the calibrated White Tile, which is contained in the standards box.

8. Press the button Go. The ColorFlex EZ reads the White Tile and sets the top of scale. When it is finished, the screen indicates that the instrument has been successfully standardized.

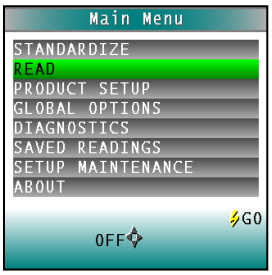


9. Press Main Menu (right arrow) to return to the main menu.

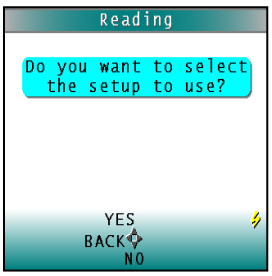
Reading Individual Samples

Complete the following steps to take individual readings using the ColorFlex EZ:

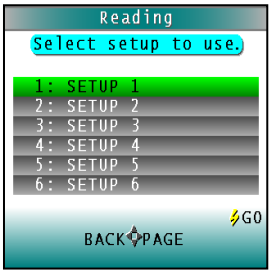
Note: These instructions apply when Average in the product setup is set to OFF.



1. Select Read from the ColorFlex EZ's main menu. Move the cursor highlight to its position using the up and down arrow buttons and then press the Go button.



2. The first Reading screen appears, for setup selection. To read the last product setup used, press No (down arrow) and skip to Step 4. To select the setup for use from the list of setups, press Yes (up arrow), and the Select setup to use screen appears.



3. Scroll through the list of setups using the up and down arrow buttons until the desired setup is highlighted. Then press the Go button Go to move to that setup.

4. Place the standard or sample at the sample port with the side to be measured toward the port. Make sure that the item is flat against the port and completely covers it.

5. Press the Go button to read. The standard or sample is read and its

6. values (as configured in the product setup) displayed on the screen.

   Note: If a bar code reader is installed, scan the bar code now, and the ID will appear beneath the color measurement.

7. Note that the all user options are shown on the keypad map at the bottom of the screen.

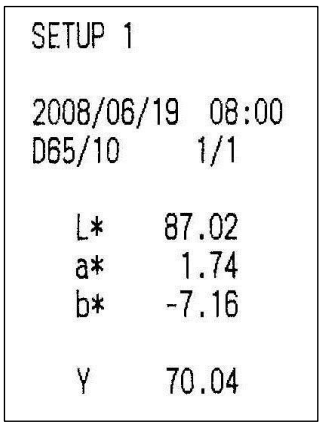
   Press Save/Print (down arrow) to both save the reading in the ColorFlex EZ's memory and print the reading if a USB printer is connected. The saved readings counter in the upper left corner of the screen will be incremented to reflect the newly saved reading.

   An example of a printout is shown.

   Press Read to take another reading in this product setup.

   Press Next (up arrow) if it is an option to move to the next data view for this product setup.

   Press Main Menu (right arrow) to return to the main menu.



Reading with Datalog

The ColorFlex EZ has the ability to manually or automatically save measurements to the Datalog on a USB

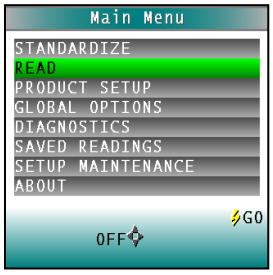
flash drive in CSV (.csv) or ASCII (.dtg) format. The precision is 3 decimal places for colorimetric data, 5 for chromaticity values and 4 for spectral data. Once saved to the USB, it can then be read directly into Excel or EZMQC for custom reporting.

Reading with Averaging

Complete the following steps to take and average multiple readings using the ColorFlex EZ:

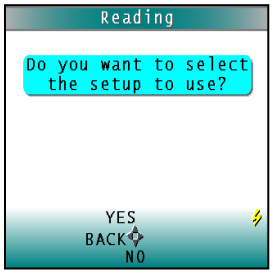
Note: These instructions apply when Average in the product setup is set to a value other than OFF.

1. Select Read from the ColorFlex EZ's main menu. Move the cursor highlight to its position using the up and down arrow buttons and then press the Go button.

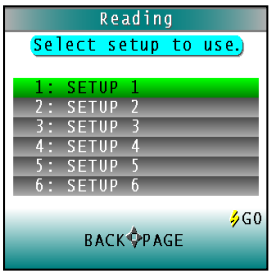


2. The first Reading screen appears, to select the setup to use. To read using the last product setup that was used, press

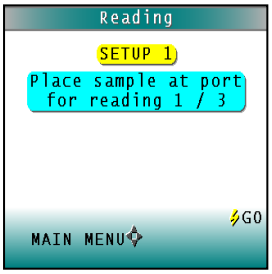
   No (down arrow) and skip to Step 4. To select the setup from a list of setups, press Yes (up arrow). The Select setup screen appears.



4. Scroll through the list of setups using the up and down arrow buttons until the setup is highlighted. Then press the center button Go to move to that setup.



5. The first reading screen appears, to place the standard for reading 1 of n (if the product setup uses a working standard) or sample for reading 1 of n.

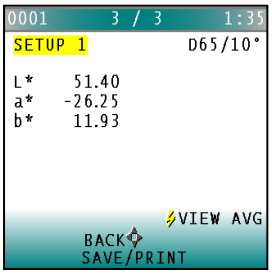


6. Place the standard or sample at the sample port with the side to be measured toward the port. Make sure the item is flat against the port and completely covers it.

7. Press the Go button to read. The standard or sample is read and its values (as configured in the product setup) displayed on the screen.

   Press Save/Print (down arrow) to both save the reading in the ColorFlex EZ's memory and print the reading if a USB printer is connected.

   Press Go to make the next reading in the averaging sequence. (Rotate or reposition the sample before doing so.)



8. After all readings in the averaging sequence have been made,.

   press Save/Print (down arrow) to both save the reading in the ColorFlex EZ's memory and print the reading (if a USB printer is connected).

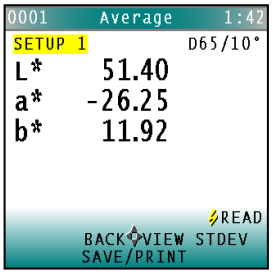
Press Next (up arrow) if it is shown to move to the next data view in the product setup.

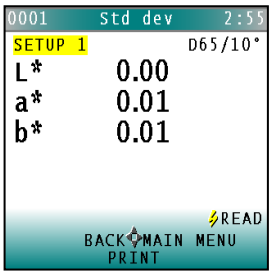
Press View Avg (right arrow) to show the average of all the measurements made in the averaging sequence.

Note: If a bar code reader is installed, scan the bar code now, and the ID will appear beneath the average color values.

Press Read (Go button) to take another reading in this product setup.

9. Once the average is displayed, press View StdDev (right arrow) to show the standard deviation of all the measurements made in the averaging sequence.

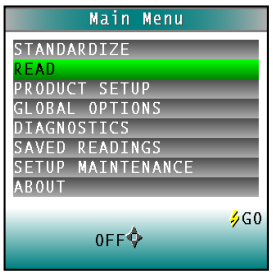


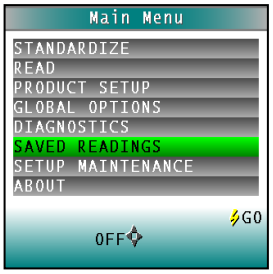


Working with Saved Readings

Readings stored in the ColorFlex EZ's memory during the read process may be viewed, printed, and deleted later, if desired.

To work with saved readings, select Saved Readings from the main menu by moving the cursor highlight to its position using the up and down arrow buttons and then pressing the center Go button. The Saved Readings menu appears.





Choose the desired function by scrolling using the up and down arrow buttons until it is highlighted and then pressing the right arrow button. The various functions perform as described below.

Delete All Readings ▸

Delete All Saved Readings displays confirmation message to proceed. When Go is pressed, all of the measurements stored in the ColorFlex EZ's memory are erased. When complete, a confirmation message is shown and the user is returned to the Saved Readings menu.

Print All Readings ▸

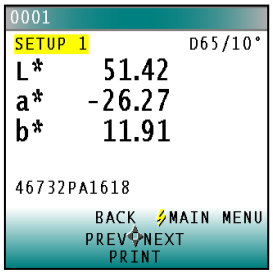
Print All Readings causes all the measurements stored in the ColorFlex EZ's memory to be output to the device (such as a computer) or printer connected to the ColorFlex EZ's USB port. When complete, return to the Saved Readings menu.

View Saved Readings ▸

View Saved Readings allows the user to view and scroll through the readings saved in the ColorFlex EZ's memory. The first reading stored in memory (which was assigned an ID of 0001 by default) will be shown first.

Press Print (down arrow) to output the saved reading currently shown to the device (such as a computer) or printer connected to the ColorFlex EZ's USB port.

Press Next (right arrow) to move forward to the next saved reading or Prev (left arrow) to move back to the previous saved reading.

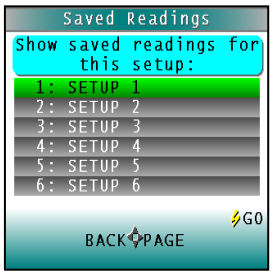


Press Back (up arrow) to return to the Saved Readings menu or Main Menu (center button) to return to the main menu.

Filter By Setup ▸

Filter By Setup views the readings by choosing the product setup. The Saved Readings screen is shown first.

Scroll through the setups using the up and down arrow buttons until the selected setup is highlighted, then press Go (center button). Scroll through the list of setups by advancing a page at a time using the Page (right arrow) button.



View, print, and move through the readings saved for this setup in the same way described above for "View Saved Readings."

CHAPTER FOUR

Sample Preparation and Presentation

The ColorFlex EZ spectrophotometer is a versatile color measurement instrument than can be used on products of virtually any size, in industries as diverse as paint and textiles. Because of its compact design, it can be used to measure objects that would be difficult to position at the sample port of a larger color instrument. However, careful attention to proper sample presentation and presentation is required for consistent and accurate color measurements.

It is important to select samples appropriately, use an established measurement method, and handle all samples in a consistent manner. The guidelines in this chapter will help while taking measurements.

Selecting Samples

Choose samples that are representative of the material used. If samples are non-representative of the batch or are spoiled, damaged, or irregular, then the result may be biased. When choosing a sample, select randomly and examine the sample to avoid biased results. If the sampling procedure is adequate, another sample selected from the same batch should result in comparable measured values.

Preparing Samples

Prepare samples in exactly the same manner each time they are measured. Follow standard industry methods if they exist, such as ASTM or TAPPI methods.

Sample Presentation

Present the samples to the instrument in a standard, repeatable manner. Results obtained depend on the condition of the samples and their presentation. If a method is established so that the same procedure is used each time specific samples or types of samples are measured, then there will be a valid basis for comparison of measured results. This also ensures repeatability of results when measuring the same sample. Make a checklist so that operators may simply check each step. The checklist will also help in the training of new operators.

There are variety of techniques that can be used in handling various forms of objects and materials so that the most valid and repeatable measurement of their appearance results. For example, when measuring the color of a sample, such as fabric, that is translucent, the sample should be folded into multiple layers to make it appear more opaque. Other materials, such as liquids or semi-solids, might be read through the glass of a sample cup, which presents a flat surface to the instrument.

When taking readings, make sure that the sample surface is flat against the ColorFlex EZ sample port. This may be difficult if the sample is curved or irregularly shaped. Look at the instrument from all angles to make sure the port makes as much contact as possible with the product. When measuring thin, soft materials (such as fabric or paper) place a hard, flat surface behind the product to ensure proper contact with the sample port and to ensure that it does not pillow into the sample port. Average several readings when measuring samples that are textured, patterned, or irregular in color.

Examples of ways to measure several types of samples are given below.

Directional Samples

Directionality can be minimized by averaging several measurements with rotation of the sample between readings. Examination of the standard deviation displayed with the averaging function can guide in selecting the appropriate number of readings to average.

Non-opaque Samples

Non-opaque samples must have consistent backings. A white uncalibrated tile is recommended. If the sample is such that it can be folded to give multiple layers, such as tissue or fabric, the number of layers for each sample should be noted.

Translucent Samples

Light trapped in a translucent sample can distort the color. The thickness of the sample presented should be chosen to maximize color difference between limit samples and the sample should be backed with multiple layers or a White Tileto eliminate the effects of ambient (room) light. Translucent liquids can be measured using in a sample cup, or a sample cup with the ring-and-disk set with the sample has low solids.

CHAPTER FIVE

Maintaining and Testing ColorFlex EZ

The ColorFlex EZ requires very little maintenance; keep the tiles, Black Glass clean, and take reasonable precautions to prevent entry of contaminants into the sample port.

This chapter describes the maintenance necessary to keep the instrument functioning properly and provides tests to assess performance.

Cleaning the ColorFlex EZ

Clean the outside surfaces of the ColorFlex EZ using a soft cloth. Do not spray liquids directly on the instrument.

Maintaining the Instrument Standards

Before standardizing, inspect the calibrated White Tile and Black Glass for dust and fingerprints. Do the same for the diagnostic Green Tile prior to running the Green Tile Test. Keep the calibration tiles in the carrying case when not being used. If a tile is lost or damaged, contact HunterLab as described in "When You Need Assistance" concerning replacement.

Clean the tiles and Black Glass using a soft nylon bristle brush and a solution of warm water and a laboratory grade detergent such as SPARKLEEN. Rinse the tiles in a stream of warm tap water. Blot them dry using a clean, non-optically brightened, lint-free paper towel.

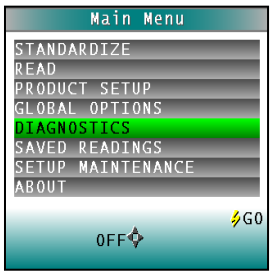
Note: SPARKLEEN is manufactured by Fisher Scientific Co., Pittsburgh, PA 15219 and may be ordered from them using catalog number 4-320-4. One tablespoon of SPARKLEEN should be added to every gallon of water.

Replacing the Lamp

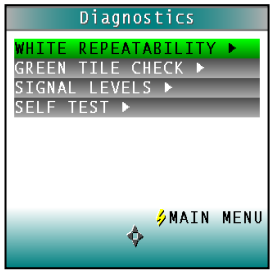
Lamp replacement requires a trained technician. Contact the HunterLab Field Service Department to arrange for lamp replacement. Please read "When You Need Assistance," page 8-7, prior to contacting HunterLab.

Diagnostics

The Diagnostics Tests can be run to verify instrument performance. Diagnostics is selected from the main menu by moving the cursor highlight to its position using the up and down arrow buttons and then pressing the center Go button. The Diagnostics menu appears.

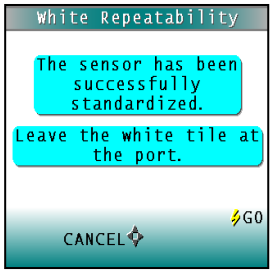


Choose the desired function by scrolling using the up and down arrow buttons until the desired test is highlighted and then pressing the right arrow button.

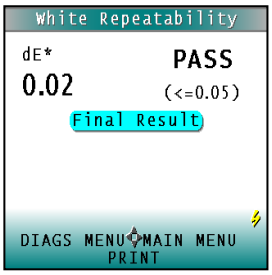


White Repeatability ▸

The White Tile Repeatability screens prompts through a normal standardization for the instrument. When standardization is complete, leave the calibrated White Tile in position at the sample port and press the Go button.



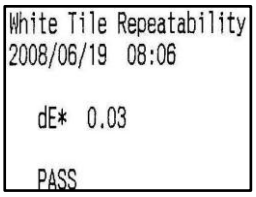
Twenty readings of the calibrated White Tile are made automatically and the results of each reading shown as it is made. This test may be cancelled at any time by pressing Cancel. When all readings are complete, the final result, as well as whether the instrument passes or fails the test, is shown.



To PASS, dE* must be less than or equal to 0.05.

Press Print to print the result (if a printer is connected to the instrument's USB

port). An example printout is shown.

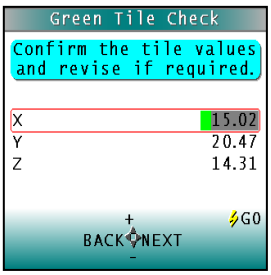


Press Diags Menu to return to the Diagnostics menu to run further tests

Press Main Menu to return to the main menu.

Green Tile Check ▸

The first Green Tile Check compares the values in the ColorFlex EZ's memory to the values read at factory on the back of the diagnostic Green Tile. If the values match, press the Go button to continue. If the values in the instrument's memory require revision, change the highlighted digit of the selected color scale value using the up and down arrow buttons. When the desired digit is shown, press Next to move to the next digit. When all digits are as desired, press Go to continue. Press Back to cancel the test.



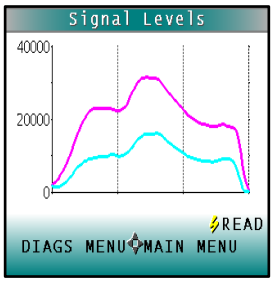
Standardize the instrument and when complete, place the diagnostic Green Tile at the sample port. Press the Go button. One reading of the Green Tile is made, and then the final result, as well as whether the instrument passes or fails the test, is shown. The specification is that dX, dY, and dZ must all be less than or equal to 0.30 for the instrument to PASS the test.

Press Print to print the result (if a printer is connected to the instrument's USB port).

Press Diags Menu to return to the Diagnostics menu. Press Main Menu to return to the main menu.

Signal Levels ▸

The Signal Levels diagnostic prompts to place a sample at the measurement port. Normally this will be the White Tile, but other instructions may be provided by HunterLab's Technical Support staff. Place the White Tile at the port and press Go.

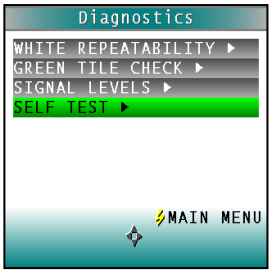


The sample and monitor channels are plotted on a graph for examination by HunterLab's Technical Support staff.

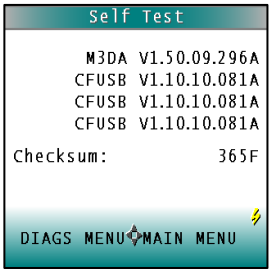
Press Read to read again. Press Diags Menu to return to the Diagnostics menu. Press Main Menu to return to the main menu.

Self Test ▸

The DIAGNOSTICS MENU contains a fourth function named SELF TEST. When this function is selected, communications tests between the ColorFlex EZ's subsystems are run. If successful, the versions of the firmware present would be displayed. Also shown is the value of the checksum of the instrument's calibration data as four hexadecimal digits.



The value of the checksum of the calibration data should remain constant unless the White Tile's assigned reflectance is updated or the instrument is serviced. A record of the checksum's value should be kept. If it changes for unexplained reasons then the instrument may not function correctly.



Press Diags Menu to return to the Diagnostics menu.

Press Main Menu to return to the main menu.

CHAPTER SIX

Specifications

The specifications and characteristics of the instrument are given in this chapter. For best performance, the instrument should be placed where there is ample work space with medium or subdued illumination and no drafts. The operating conditions (temperature and humidity ranges) are given in the Operating Conditions section below.

Operating Conditions

Do not leave ColorFlex EZ in an area where temperature or humidity extremes are possible.

Storage Temperature (3weeks)	-20°C to 65°C (-5°F to 150°F)
Operating Temperature	10°C to 40°C (50°F to 104°F)
Performance Temperature	21-28°C (70-82°F)
Noncondensing Humidity	10% to 90%
Standard Accessories	Calibrated Instrument White Tile, Black Glass, Green Diagnostic Tile, Universal AC adaptor, computer interface cable, USB flash drive, User's Guide, Certificate of Traceability

Physical Characteristics

Weight	4.5 kg (9.9 lb)
Dimensions (Height x width x length)	16cm x 13cm x 36cm (6.3-in x 5.1-in x 14.2-in)
Communications Interface	1- USB OTG to computer 2- USB A to Keyboard, printer, barcode scanner
Standards Conformance	CIE 15:2004, ISO 7724/1, ASTM E1164, DIN 5033, Teil 7 and JIS Z 8722 Condition C
Safety Compliance	UL, CSA, IEC, or equivalent
System Power	100-240 VAC/0.4A, 47-63 Hz

Conditions of Illumination and Viewing

Light Source	Pulsed xenon
Lamp Life	>1 million flashes
Geometry	45° Illumination/ 0° Viewing
Spectrophotometer	256-element diode array and high resolution concave holographic grating
Port Diameter/ View Diameter	31.8mm (1.25-in) illuminated/ 25.4mm (1-in) measured
Specular Component	Excluded

Instrument Performance

Spectral Data	Range: 400-700 nm Reporting Interval (nm): 10 nm
Bandwidth at Half-height	10 nm
Spectral Resolution	≤3 nm
Photometric Range	0-150% reflectance
Measurement Interval	3 seconds
Measurement Speed (at 23°C)	≤1.5 seconds
Inter-instrument Agreement	ΔE* ≤ 0.15 CIE L*a*b* (Avg) on BCRA II Tile Set; ΔE* ≤ 0.25 CIE L*a*b* (Max) on BCRA II Tile Set
Colorimetric Repeatability	ΔE* ≤ 0.05 CIE L*a*b* on white tile

Measurement

Data Views	Color Data, Color Difference Data, Tristimulus Color Plot, Spectral Data, Spectral Difference Plot, Spectral Plot, Spectral Difference Plot
Illuminants	A, C, D50, D65, D75, F2, F7, F11
Observers	2° and 10°
Color Scales	CIE L*a*b*, Hunter Lab, CIE L*C*h, CIE Yxy, CIE XYZ
Color Difference Scales	ΔL*a*b*, ΔLab, ΔL*C*H, ΔL*C*h, ΔYxy, ΔXYZ
Color Difference Indices	ΔE*, ΔE, ΔC*, ΔC and ΔEcmc

Indices and Metrics	E313 Whiteness & Tint, E313 Yellowness, D1925 Yellowness, Y Brightness, Z%, 457 nm Brightness, Opacity, Color Strength, Gray Change, Gray Stain, Metamerism Index, Shade Number, Tomato Color Scores*, Citrus Number*
Other	Tomato Color Scores*, Citrus Number*
Data Storage	250 spectral or tristimulus with Pass/Fail Tolerances as Working, Physical, Numeric and Hitch
Languages	Chinese, English, French, German, Italian, Japanese, Spanish

- Tomato Color Model Only or Citrus Color Model Only

Regulatory Notice

DECLARATION OF CONFORMITY according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hunter Associates Laboratory, Inc.

Manufacturer's Address: 11491 Sunset Hills Road
Reston, Virginia U.S.A. 20190

Declares that the Product:

Product Name: ColorFlex EZ

Model: **CLFX EZ 45/0 LAV.**

Conforms to the following Standards:

IEC 61326-1:2005 (CISPR 11:2003:A1:2004, EN 61000-4-2:1995, and EN 61000-4-3:2006 + A1:2008)

EN 61010-1:2001

Supplementary Information:

This product herewith complies with the requirements of the EMC Directive 2004/108/EC and Council Directive 98/34/EEC, and carries the CE mark accordingly.

(1) This product was tested using an IBM-compatible computer.

European Contact: *Local Hunter Associates Laboratory representative or*
Christian Jansen
Griesbraeustrasse 11
82418 Murnau
Germany
Telephone: +49 (0) 8841 9464
Fax: +49 (0) 8841 99472

CHAPTER SEVEN

Instrument Replacement, Repair, Problems, and Questions

The following HunterLab policies are described in this chapter:

- Warranty
- Shipping claims
- Returns/service
- Technical assistance.

Warranty

HunterLab warrants that all instruments it manufactures will be free from defects in material and workmanship under normal use and service. Our obligation under this warranty is limited to repairing or replacing any parts which our examination disclose to have been factory defective when returned to us by prepaid transportation. The time limit on this warranty is one year from date of shipment of new instruments and two months from the date of shipment of repaired instruments.

HunterLab warranty does not cover expendable items such as lamps, fuses, batteries, flash disks and CDs. The warranty is void if the user has made unauthorized repairs, performed improper installation, or has incorrectly used the instrument.

Shipping Claims

All materials are sold F.O.B. from Reston, Virginia (unless otherwise specified) and HunterLab responsibility ends upon delivery to the first carrier. All claims for loss or damage must be rendered by the consignee against the carrier within fifteen days of receipt of goods. A copy of this notice must also be forwarded to HunterLab within five days of its receipt.

Breakage or Damage

According to the contract terms and conditions of the carrier, the responsibility of the shipper ends at the time and place of shipment. The carrier then assumes full responsibility. Perform the following procedures in the case that the instrument arrives broken or damaged.

Freight or Express

1. Notify a local carrier.
2. Hold the damaged goods with their container and packaging for inspection by the examining agent. Do not return any goods to HunterLab prior to inspection by and authorization of the carrier.
3. File a claim against the carrier. Substantiate this claim with the examining agent's report. A certified copy of our invoice is available upon request. The original B/L is attached to our original invoice. If the shipment is prepaid, write for a receipted transportation bill.
4. Advise HunterLab regarding replacement.

Parcel Post Shipment

1. Notify HunterLab at once in writing, giving details of the loss or damage. This information is required for filing a claim.

2. Hold the damaged goods with their container and packaging for possible inspection by postal authorities.

3. Advise HunterLab regarding replacement.

United Parcel Service

1. Contact the local UPS office regarding damage and insurance claims. Each UPS office has a different method of handling these occurrences.

2. Retain the container and packaging.

3. Notify HunterLab at once for replacement.

Shortage

Perform the following procedure if the order appears to be missing items.

1. Check the packing list notations. The apparent shortage may be a backordered item and may be marked as an intentional short-ship.

2. Re-inspect the container and packing material, particularly to locate smaller items.

3. Ascertain that the item was not removed by unauthorized personnel prior to complete unpacking and checking.

4. Notify HunterLab immediately of the shortage in writing.

Incorrect Shipment

Perform the following procedure if material received does not correspond with the order.

1. Notify HunterLab immediately, referencing the order number and item.

2. Hold incorrect items until return shipping instructions are received.

Note: Unless the procedures described in this section are followed and HunterLab is notified within fifteen days, we cannot accept responsibility for damaged or incorrect items.

Returns / Repairs

A service request order (SRO) number is required before any items can be returned to HunterLab. Contact HunterLab's Order Processing Department to obtain an SRO for damaged or incorrect parts, or Technical Support to obtain an SRO to return and instrument for service.

Do not return any damaged or incorrect items until all shipping instructions are received.

HunterLab offers complete repair services for all instruments it manufactures. Call HunterLab for the nearest service facility location. If the equipment is not functioning properly, contact HunterLab Technical Support for maintenance or repair instructions. Many times, this on-the-spot diagnosis is all that is required.

If repair is required, the instrument may be returned to a HunterLab service facility. For schedule and terms for repairs, call HunterLab Technical Support. Please read the next section, "When You Need Assistance," prior to contacting HunterLab.

Customers are responsible for incoming and outgoing freight charges for instrument returned to HunterLab for all repairs, including warranty repairs.

Packing and Shipping Instruments for Repair

Please regard the following instructions when packing the instrument to return it to HunterLab for repair. **Proper packing is**

crucial. These instructions do not replace the recommended professional packaging for the instrument, but may assist in eliminating the need for a shipment claim due to faulty packaging. Purchasing freight insurance does not guarantee a successful damaged shipment claim if the carrier determines the instrument was not packaged properly.

- All instrument tiles, Black Glass, power supply, power cords, and cables for the instrument should be included in the shipment. **A repair estimate will be delayed if the instrument tiles are shipped separately later.**

- Cover the measurement port. **Does not use duct tape.** "Painter's tape" is preferred, as it will not leave residue on the instrument.

- ColorFlex EZ carrying cases are not intended as shipping containers. Place the instrument inside the carrying case and then place the carrying case into a new carton which includes, at a minimum, **6 inches of packing material** (preferably foam) around the instrument. Styrofoam peanuts should not be sued as packing material for instruments, as they can suspend items weighing only up to 5 pounds. Observe the information listed on the bottom of most cartons with regard to burst strength and gross weight limits. Single wall cardboard cartons should not be used. (A proper packing carton with packing material may be purchased from HunterLab, if desired.)

- Insure the shipment.

- Provide an itemized packing list of all contents of the shipment.

- Label the carton(s) as follows:

  HunterLab
  Attn: SRO #_____
  11491 Sunset Hills Road
  Reston, VA 20190 U.S.A

When You Need Assistance

When there is a problem with an instrument or software, or technical advice concerning a specific application is needed, contact HunterLab for assistance. In order to help, please have the following information available:

1. The type of sensor for which assistance is needed (ColorFlex EZ).
2. The serial number of the instrument (found on the bottom of the unit).
3. The type of processor or software being used, the sensor output (such as EasyMatch QC), the version of the software, the operating system, and the brand and type of computer, if applicable.
4. The specific nature of the problem, including the exact error message received or the number of units the sensor reads "off" from the standard tiles.
5. The steps performed prior to the start of the problem.
6. Steps already performed to reconcile the problem and/or results of any diagnostic tests.
7. The type of product being measured.
8. Environmental conditions under which the instrument is normally used (temperature, humidity, dust, fumes, etc.)
9. Whether the instrument has recently been moved or the computer reconfigured.
10. The name(s) of any HunterLab personnel with whom the problem was discussed.

The general number for HunterLab is (703) 471-6870. To place an order or for prices on instrument, software, or replacement parts, ask for the ORDER PROCESSING DEPARTMENT. For

measurement advice, for help in correcting instrument or software problems, to return instruments to HunterLab for service, or to ask questions about the servicing or recalibration of instruments, ask for TECHNICAL SUPPORT.

HunterLab may also be contacted through its web site, www.hunterlab.com, and our blog site, www.MeasureTrueColor.com

The mailing address for HunterLab headquarters is given below. Customers outside the United States should contact their HunterLab distributor for initial assistance.

Hunter Associates Laboratory, Inc.
11491 Sunset Hills Road
Reston, Virginia 20190 U.S.A

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