User's Manual for
ColorFlex® EZ Tomato

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A60-1014-592, Version 2.1
For CFEZ firmware version 1.11 and above

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Safety Notes

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

Note: General safety instruction that should always be observed 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.

Contents

CHAPTER ONE

Introduction to the ColorFlex EZ Tomato System

The ColorFlex EZ Tomato spectrophotometer is a versatile color measurement instrument that can be used to measure the color of fresh and processed tomato products. Color is an indication of the quality and freshness of the product. The ColorFlex EZ Tomato instrument provides tomato score values, colorimetric and spectral data. This instrument can also be used to measure the reflectance color of other products.

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.

ColorFlex EZ Tomato is available with a 25.4 mm (1 in) viewing area and 45°/0° geometry. The special port plate is designed specifically for holding in place a 64 mm (2.5 in) glass sample cup with tomato products such as paste/puree, sauce, catsup and juice.

Accessories

The following accessories are included with the ColorFlex EZ Tomato:

- Calibration tiles - A NIST traceable white calibrated tile is placed at the sample port during standardization to set the top of scale. The Black Glass is placed at the sample port during standardization to set the bottom of scale, and the Green Check Tile is used to assess long-term instrument performance during the Diagnostic 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.

- HunterLab Tomato Tile with assigned color values. This tile is used to hitch the instrument and improve inter-instrument agreement of processed tomato products.

- USB cable for connecting the ColorFlex EZ Tomato to a computer.


Figure 1. USB Cable

- Standard 31.8 mm (1.25 in) open port insert used for the instrument diagnostic test and measurement of flat, solid samples.

- Sample cup port plate used to hold the 64 mm (2.5 in) glass sample cup at the measurement port.

- Two 64 mm (2.5 in) glass sample cups used to hold processed tomato products a the sample port.

- Sample cup opaque cover used to cover the filled sample cup at the sample port to eliminate the effects of ambient light.

- Standards care card - gives instructions on how to clean the standards.

- USB Flash Drive for data transfer

- AC adapter, 12 W/9V.

- ColorFlex EZ Tomato User's Manual on CD.

Installation

Before operating the ColorFlex EZ Tomato, 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 Tomato 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 Tomato.

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 Tomato.

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 Tomato. 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 Tomato.

7. Turn the ColorFlex EZ Tomato on by pressing the **GO** (lightning bolt⚡) button on the button pad.

CHAPTER TWO

The Basics of ColorFlex EZ Tomato Operation

Commands are given to the ColorFlex EZ Tomato 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 Tomato, the sample 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 into the detector by the sample is evaluated. The calculated measurement is then shown in the display.

Up to 2000 readings and 250 product setups may be stored in the ColorFlex EZ Tomato'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. 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.
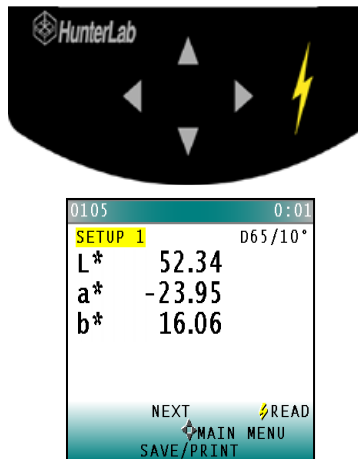
Figure 2. Main Menu Key Pad

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 Tomato's memory, and the number of hours and minutes since the instrument was last standardized.

Menus and Prompts

All ColorFlex EZ Tomato 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.

Figure 3. Main Menu

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

About Your 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.
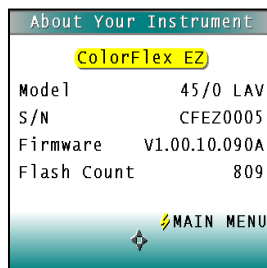

Figure 4. About Your Instrument

Taking a Simple Measurement

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

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 display 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.
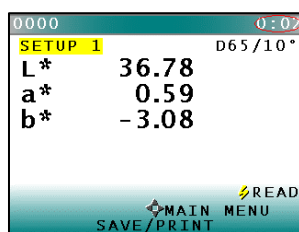
Figure 5. Time Since Last Standardization

It is recommended that the ColorFlex EZ Tomato 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 Tomato any time there is a significant change (greater than 5°F) in ambient temperature. For example, if the ColorFlex EZ Tomato 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.
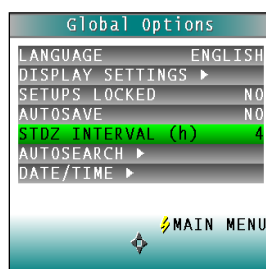

Figure 6. Set Standardization Interval

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 TOMATO** chapter.

Standardization Process

Standardization of a ColorFlex EZ Tomato is performed as follows:

1. Remove the calibration tiles from the standards box. 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 TOMATO**.
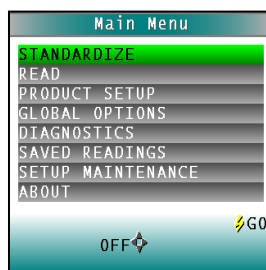

Figure 7. Standardize

2. The 64 mm (2.5 in) glass sample cup is needed to measure tomato products. Prior to standardizing, install the sample cup port plate.

3. Select **STANDARDIZE** from the ColorFlex EZ Tomato'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.
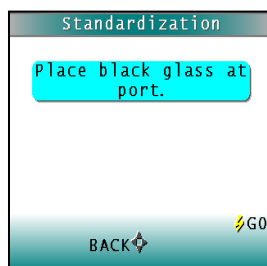

Figure 8. Place Black Glass at Port

4. 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.

5. Press the **GO** button. The ColorFlex EZ Tomato reads the glass and sets the instrument bottom-of-scale. When it is finished, the screen prompts for the calibrated White Tile.

Figure 9. White Tile Reading

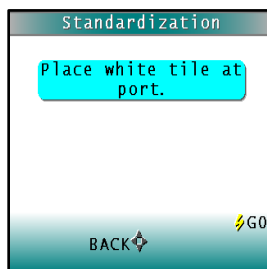6. Replace the **Black Glass** with the calibrated **White Tile** from the standards box.
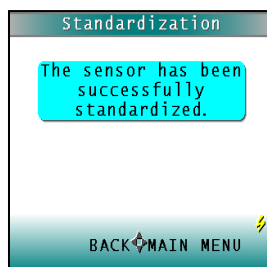

Figure 10. Confirmation of Standarization

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

8. Press **MAIN MENU** (right arrow) to return to the main menu.

9. Periodically (i.e. once per week), perform the **White Tile** check and **Green Tile** check to ensure that the instrument is operating properly. The calibrated tomato red tile should also be read to confirm that the instrument hitch is valid.

Reading Individual Samples

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

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

1. From the *MAIN MENU*, press the *DOWN ARROW* key until the product setup screen is reached. Press *GO* to select a setup.

Figure 11. Main Menu > Product Setup

2. Press the *UP* or *DOWN ARROW* to select the **TOMATO SCORE SETUP**. Press *GO* to continue.

Figure 12. Select Setup

3. Select *READ* from the ColorFlex EZ Tomato's *MAIN MENU*. Move the cursor to highlight its position using the *UP* and *DOWN ARROW* buttons and then press the *GO* button.

Figure 13. Main Menu > Read

4. When beginning measurements of tomato products, it is recommended to read the hitched tomato Red tile as a Performance Qualification check. If the instrument is still hitched correctly, it should read the assigned Hunter Lab C/2 values closely. If

not, reset the hitch to the Tomato Red tile as described under **USING A HITCH TO THE TOMATO RED TILE**.

5. To measure a sample, pour or spoon the sample into a 64 mm (2.5 in) glass sample cup until the cup is almost full.

6. Place the sample cup in the recessed area of the sample cup port plate

7. Cover the sample cup with the sample cup opaque cover.
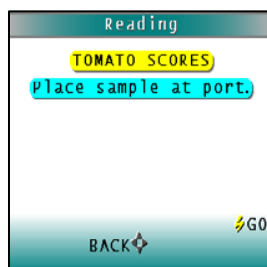
8. Measure the sample by pressing the *GO* key.

Figure 14. Place sample at port
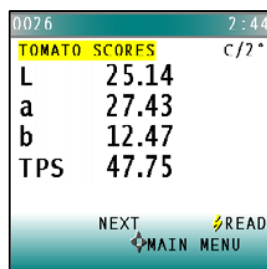
9. The result is displayed.

Figure 15. Tomato Score

10. To view the next Tomato Score, press the *UP ARROW*.
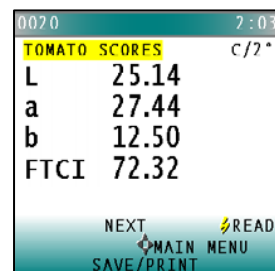
Figure 16. Next Tomato Score

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

11. User options are shown on the keypad map at the bottom of the screen. Press *SAVE/PRINT* (down arrow) to both save the reading (if AutoSave is not enabled) in the ColorFlex EZ Tomato's memory and print the reading if a USB printer is connected.

12. The saved readings counter in the upper left corner of the screen will be incremented to reflect the newly saved reading.

13. Remove the sample cup from the sample port and place the next sample at the port.

14. Press **READ** to take another reading using this product setup.

15. Press **UP** to move to the next data view for this product setup.

16. Press **RIGHT ARROW** to return to the main menu.

Using a Hitch to the Tomato Red Tile

The purpose of the Tomato Red Tile is to improve inter-instrument agreement in Tomato Score values at multiple sites, or between a buyer and seller of processed tomato products. The hitch standard is particularly important for the ColorFlex Tomato because in the first setup ("Tomato Scores") hitches the instrument to the assigned values of the Tomato Red tile.

At the factory, the values for the Tomato Red tile (C/2°) have been entered along with the product views. If it is necessary to re-set the hitch, here is the procedure.

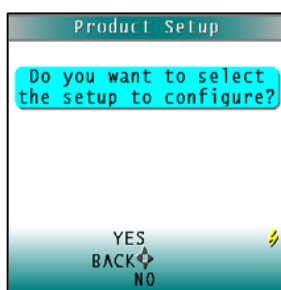1. From the **MAIN MENU**, choose **PRODUCT SETUP**.

Figure 17. Yes to Select Setup

2. Select the **TOMATO SCORES SETUP** by highlighting the selection and pressing **GO**.

Figure 18. Select Tomato Scores

3. Make sure that the **STANDARD TYPE** is set to **HITCH**; the **AVERAGE** is set to **OFF**, then select the **VIEWS**.
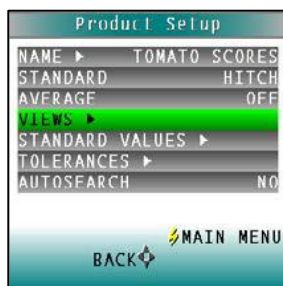

Figure 19. Product Setup

4. For each Tomato Score, the **VIEW** is set to Absolute, the Observer to C/2°, and the scale to Hunter L,a,b.

5. Return to the Product Setup screen and select **STANDARD VALUES**. The Standard Values screen appears.

6. **READ** the Tomato Tile and the Hunter L,a,b values read on the ColorFlex EZ are displayed with the first digit highlighted.

7. Modify each digit of the Hunter L,a,b C/2 values until it matches those of the values on the back of the tile.
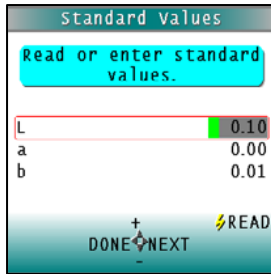
Figure 20. Enter Hitch Values

8. Press **DONE** to return to the **PRODUCT SETUP SCREEN**.

Setting Tolerances for Tomato Products

1. To enter Tolerances, select **TOLERANCES** from the **PRODUCT SETUP SCREEN**.

Figure 21. Select Tolerances

2. Enter the tolerance values for each parameter using the plus or minus key. Press **NEXT** to go to the next digit or next tolerance and **DONE** when all values have been entered.

Figure 22. Enter Tolerance Values

1. Choose **READ** and select the setup.

2. Select **YES** and select the **TOMATO SCORES**.

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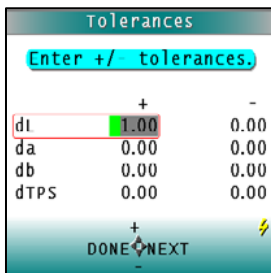3. Follow the prompts to *READ* the samples. Any measurements made in this setup will be adjusted to match the reference instrument. Place the sample at the port in the sample cup. Press the *GO* button to Read as before.

Defining Standard, Sample and Tolerances

Product Standard

A product 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 Tomato or a set of color values that is entered into the ColorFlex EZ Tomato's memory.

Sample

A sample is an object that will be measured with the ColorFlex EZ Tomato 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 Tomato 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.

CHAPTER THREE

Configuring Setups

Before using the ColorFlex EZ Tomato 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 Tomato 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 (if applicable), and the acceptable tolerances applied to the standard values (if applicable). Each product setup is saved in the ColorFlex EZ Tomato memory with a setup number and name.

The instrument options and product setups are retained in the ColorFlex EZ Tomato'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.

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.
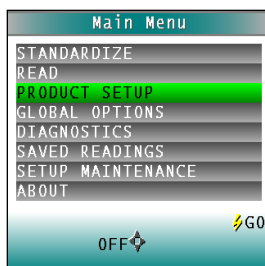

Figure 23. Product Setup

Tomato Scores Setup

The Tomato Scores are stored in the ColorFlex EZ's memory when configured at the factory.

Figure 24. Product Setups for Tomato Scores

There are two main setups and multiple views under each setup. The two Main Setups are: **TOMATO SCORES** and **LYCOPENE**.
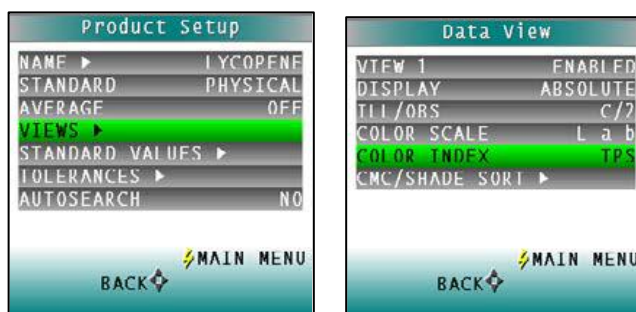
The Views shows the different product types.

Figure 25. Product Setup Views

Table 1. Tomato Scores

Tomato Scores Product Views			
Views	Std	Ill/ Obs	Color Scale/Index
Tomato Paste	Hitch	C/2°	Hunter Lab, TP
Tomato Sauce	Hitch	C/2°	Hunter Lab, TSS
Tomato Catsup	Hitch	C/2°	Hunter Lab, TC
Tomato Juice	Hitch	C/2°	Hunter Lab, TJS
a/b	Hitch	C/2°	Hunter Lab, a/b
Fresh Tomato Color Index (FTCI)	Hitch	C/2°	Hunter Lab, FTCI

Custom Setups

For other applications, the setups may be modified. Up to 250 product setups may be stored in the ColorFlex EZ Tomato memory. 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 desired 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 this same manner.

When all parameters are set, 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.
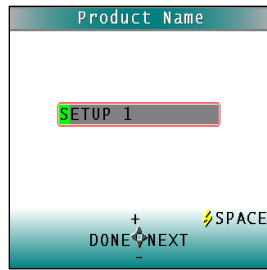

Figure 26. Name the Setup

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. Press the *RIGHT ARROW* button to move through the list of available standard types.

Choose **WORKING** when a number of different samples are measured against a standard 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 this product setup is opened.
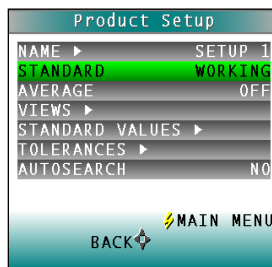

Figure 27. Working Standard

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.
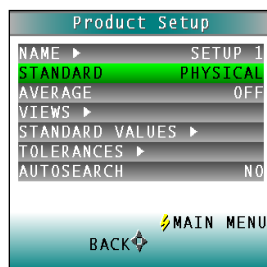

Figure 28. Physical Standard

Choose **NUMERIC** when a 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.
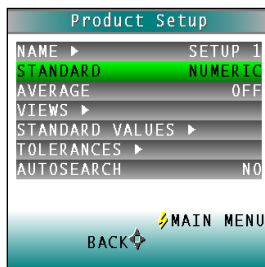

Figure 29. Numeric Standard

Choose **HITCH** for agreement between two or more instruments and is helpful when companies are manufacturing the same product in different plants and need the colors to match. A standard is measured on a reference instrument and the color values noted. This Hitch standard is then placed on a second instrument such as the ColorFlex EZ Tomato. This Hitch Standard is then read on the ColorFlex EZ Tomato and the target values from the reference instrument entered manually. The ColorFlex EZ Tomato then mathematically adjusts to match the reference instrument. The modified standard is stored in the product setup for as long as desired.
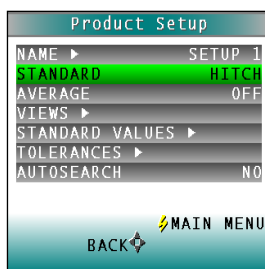

Figure 30. Hitch Standard

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.
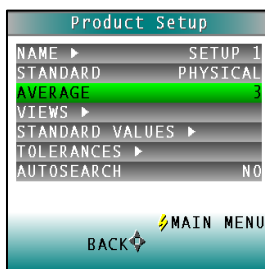

Figure 31. Average

Views ▶

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

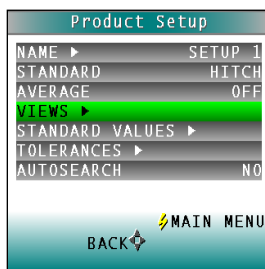Press the **RIGHT ARROW** button to obtain the **VIEWS** screen.

Figure 32. Views

Up to eight different views may be displayed for the ColorFlex EZ Tomato. 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.
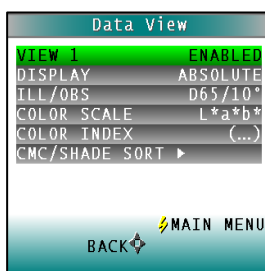

Figure 33. Data Views

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 to the **DISPLAY** parameter, then scroll through the choices using the right arrow button.

The display choices are as follows:

ABSOLUTE
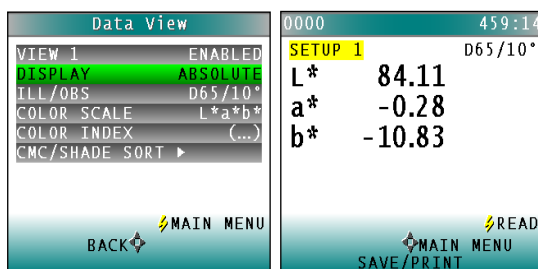Absolute displays the color scale values (such as L*, a*, and b*) for the most recent standard or sample read.

Figure 34. Display as Absolute

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DIFFERENCE

Difference allows 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.

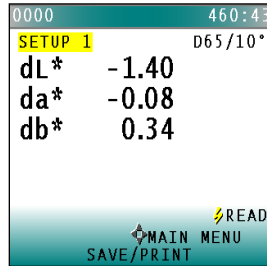*Figure 35. Difference Values*

SPECTRAL DATA

Spectral Data displays the raw reflectance values for each wavelength read by the instrument for the most recent standard or sample.

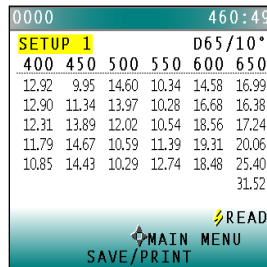

Figure 36. Spectral Data

SPECTRAL DIFFERENCE

Spectral Difference displays the raw reflectance difference between the standard and the most recent sample for each wavelength.
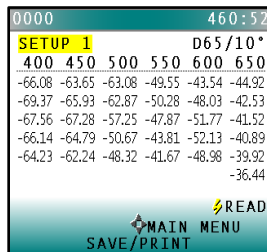

Figure 37. Spectral Difference

SPECTRAL PLOT

Spectral Plot graphs the raw reflectance values for each wavelength for the most recent standard or sample.
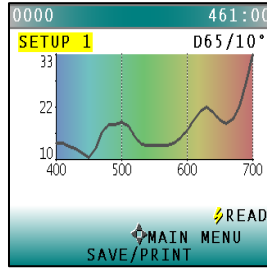
Figure 38. Spectral Plot

DIFF PLOT

Spectral Difference plots the raw reflectance difference between the standard and the most recent sample at each wavelength.

Figure 39. Plot of Spectral Difference

COLOR PLOT

Color Plot displays the sample's location in color space relative to the centered standard.

Figure 40. Color Plot

ILL/OBS

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.

Figure 41. Ill/Obs

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.
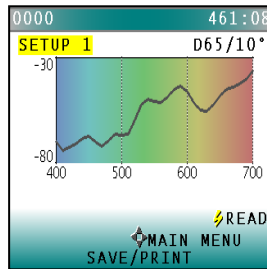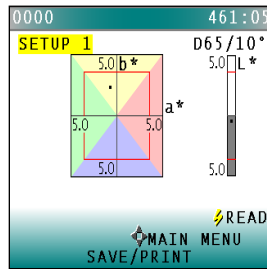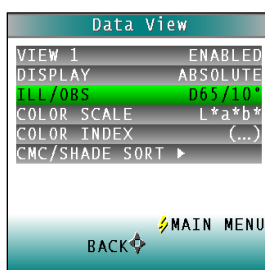
COLOR INDEX

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. Some indices may not display until both a standard and a sample are read.
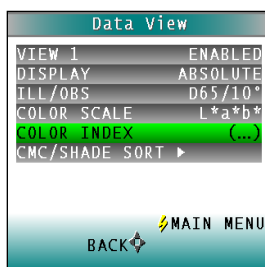
Figure 42. Color Index

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.
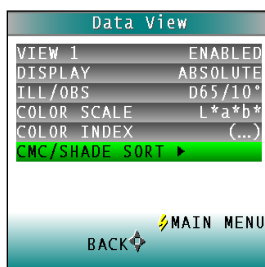
Figure 43. CMC Shade Sort

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.
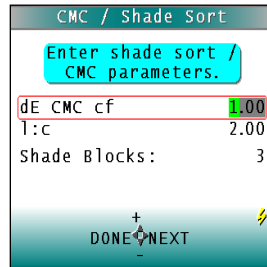
Figure 44. CMC Parameters

Table 1. Summary of Measurement Values on ColorFlex EZ Tomato

Illuminant/Observer	Scales	Differences	Indices
A/2, A/10	CIE Lab	dL*a*b*	Y
C/2, C/10	CIE LCh	dL*C*h	YI D1925
D50/2, D50/10	Hunter Lab	dLab	YI E313 (YIE)
D55/2, D55/10	XYZ[1]	dXYZ	WI E313 (WIE)
D65/2, D65/10	Yxy[1]	dYxy	Tint
D75/2, D75/10			Z%
F02/2, F02/10			457 Brightness (457B)
F07/2, F07/10			Metamerism Index (MI)
F11/2, F11/10			SMA or Strength at Max. Absorption
			SW or Strength Weighted
			Opacity (OP)
			GSC or Grey Scale Color
			GSS or Grey Scale Stain
			dE*
			dEc
			dE
			dC*
			dC
			Shade Sort Number (SSN)

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.

Figure 45. Standard Values

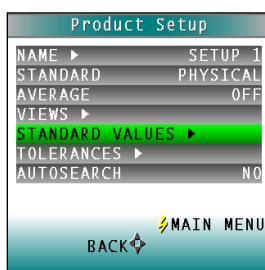For a **PHYSICAL** standard, place the standard at the sample port and press the **GO** button (Read) to read the standard and place its measurement values (in the selected color scale) in the product setup. Then press the **LEFT ARROW** button (Done) to return to the product setup configuration screen.

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 set as desired, press **DONE** to return to the product setup configuration screen.
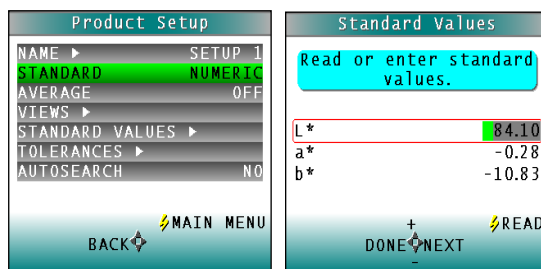
Figure 46. Enter a Numeric Standard

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.
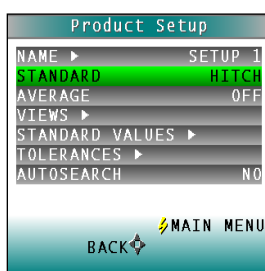
Figure 47. Hitch Standard

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.
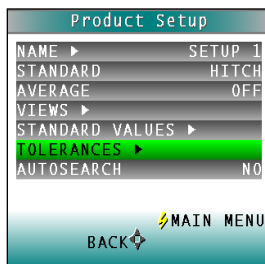
Figure 48. Tolerances

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 set 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 search feature. This matches a product setup (based on the closest standard's color values) to a sample reading. Only the setups where AutoSearch is enabled (YES) will be included in the automatic search.

Figure 49. AutoSearch

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

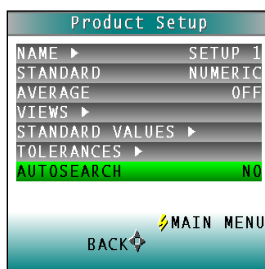Setup Maintenance is selected from the main menu by moving the cursor highlight to its position using the *UP* and *DOWN ARROW* buttons and then pressing the *GO* button.

Figure 50. Setup Maintenance

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.
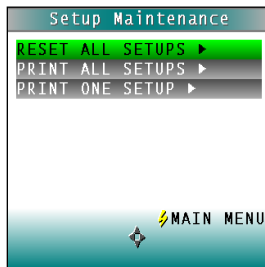
Figure 51. Reset Setups

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

Print All Setups ▶

This command outputs the product setup parameters to 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.

Figure 52. Print All Setups

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.

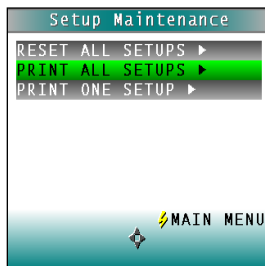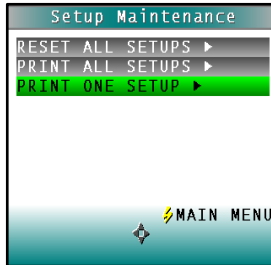*Figure 53. Print One Setup*

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

An example printout is shown.

Figure 54. Printout

Clone All Setups ▶

CLONE ALL SETUPS appears in the Setup Maintenance menu only when two ColorFlex EZ Tomato instruments are connected together via the standard ColorFlex EZ Tomato USB cable and a Standard-A to Mini-A adapter. When *CLONE ALL SETUPS* is chosen on one of the ColorFlex EZ Tomato units, 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 FOUR

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.

Figure 55. Global Options

The Global Options screen appears. Configure each parameter by moving the cursor highlight to its position using the **UP** and **DOWN 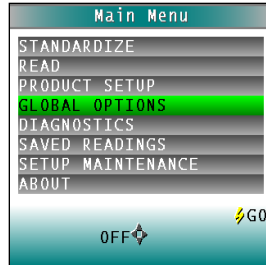ARROW** buttons. When the desired parameter is highlighted, press the **LEFT** or **RIGHT ARROW** button to scroll through the available choices for the parameter. When the appropriate choice is displayed, stop scrolling. Move onto configure more options in the same manner.

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 Tomato 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.

Figure 56. Display Settings

In this submenu, the following parameters can be set:

Screen angle

Rotate the text on the ColorFlex EZ Tomato 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.
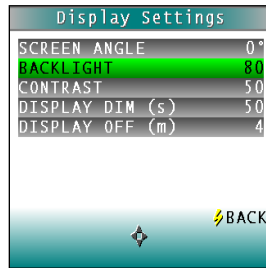
Figure 57. Backlight

Contrast:

Press the **RIGHT ARROW** button to increase the display contrast or the **LEFT ARROW** button to decrease the contrast. Values between 0 and 100 may be selected in increments of 5.
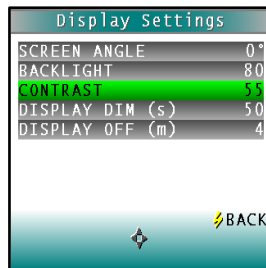
Figure 58. Contrast

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.
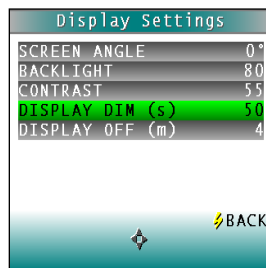
Figure 59. Display Dim

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 Tomato's display 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.

The ColorFlex EZ Tomato will turn off entirely (display 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**.
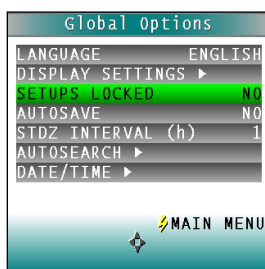
Figure 60. Setups Locked

AutoSave

Choose **YES** to save each measurement automatically to the instrument's Datalog. Choose **NO** to save the measurements manually, only on demand.   Each press of the **RIGHT ARROW** button toggles between **YES** and **NO**.

Figure 61. AutoSave

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.
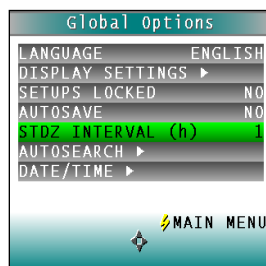

Figure 62. Standardization Interval

AutoSearch ▶

One of the features of the ColorFlex EZ Tomato 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, the following parameters may be set:

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.

Figure 63. Color Difference

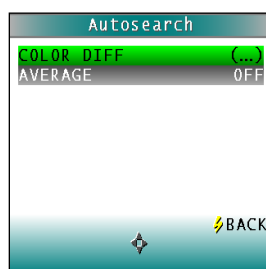Each press of the **RIGHT ARROW** button changes the color difference index to the next one available.

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**.
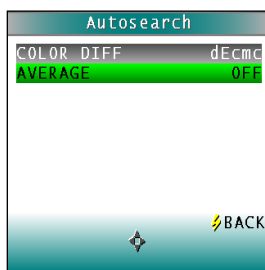
Figure 64. Average

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. Set the current date and time. Refer to the button pad map at the bottom of the screen for selection options.
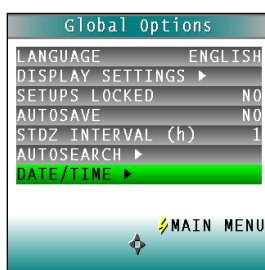
Figure 65. Set Date/Time

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.

Figure 66. Date & Time Screen

CHAPTER FIVE

Reading, Storing and Printing Data

Reading with Datalog

The ColorFlex EZ Tomato can manually or automatically save measurements to the Datalog on a USB flash drive in CSV (.csv) or ASCII (.dtg)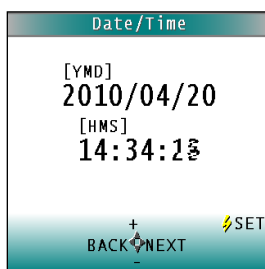 format. The precision is 3 decimal places for colorimetric data, 5 for chromaticity values and 4 for spectral data. Once saved to the USB, it can then be transferred to a computer and read directly into Excel or EZMQC for custom reporting.

Reading with Averaging

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

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 Tomato's main menu. Move the cursor highlight to its position using the **UP** and **DOWN ARROW** buttons and then press the **GO** button.
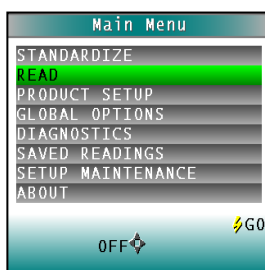

Figure 67. Select Read

2. The first Reading screen appears; 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.
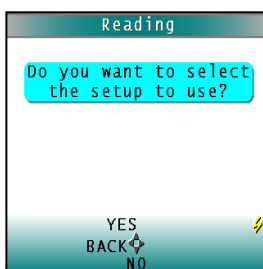

Figure 68. Choose to Select the Setup

3. 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.
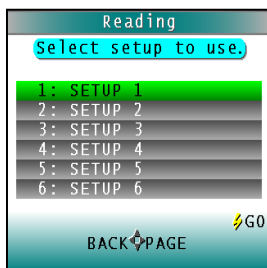
Figure 69. Select Setup

4. 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.
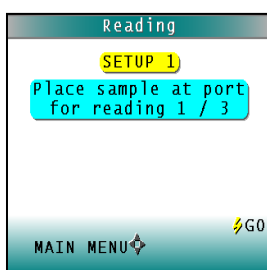
Figure 70. Place Sample at Port

5. 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.

6. 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.

7. Press *SAVE/PRINT* (down arrow) to both save the reading in the ColorFlex EZ Tomato's memory and print the reading if a USB printer is connected.
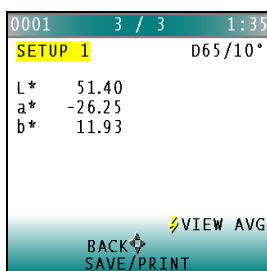
Figure 71. Reading with Averaging

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

9. After all readings in the averaging sequence have been made press *SAVE/PRINT* (down arrow) to both save the reading in the ColorFlex EZ Tomato's memory and print the reading (if a USB printer is connected).

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

11. Press **VIEW AVG** (**GO**) 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.

12. Press **READ** (Go button) to take another reading in this product setup.

13. 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 Tomato's memory during the read process may be viewed, printed, and deleted later, if desired.
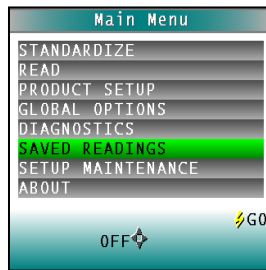
Figure 72. Select Saved Readings

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, the measurements stored in the ColorFlex EZ Tomato's memory are erased. When complete, a confirmation message is shown and the user is returned to the **SAVED READINGS** menu.
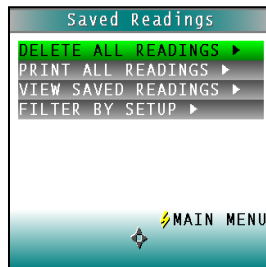
Figure 73. Delete All Readings

Print All Readings ▶

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

Figure 74. Print All Readings

View Saved Readings ▶

View Saved Readings allows the user to view and scroll through the readings saved in the ColorFlex EZ Tomato's memory. The first reading stored in memory (which was assigned an ID of 0001 by default) will be shown first.
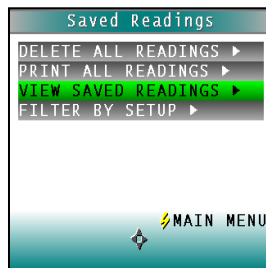
Figure 75. View Saved Readings

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 Tomato's USB port.
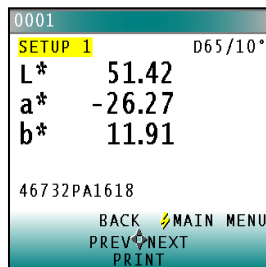
Figure 76. Print Saved Reading

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.
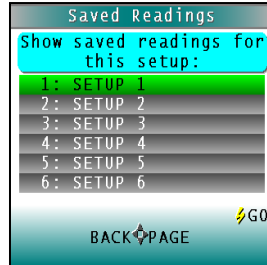
Figure 77. Saved Readings

View, print, and move through the readings saved for this setup in the same way described above for **VIEW SAVED READINGS**.

CHAPTER SIX

Sample Preparation and Presentation

The ColorFlex EZ Tomato spectrophotometer is a versatile color measurement instrument that can be used on products of virtually any size and in diverse industries. With 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 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 Tomato 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 Tile to 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.

> *Note: Please visit www.hunterlab.com and support.hunterlab.com for more details.*

CHAPTER SEVEN

Maintaining and Testing ColorFlex EZ Tomato

The ColorFlex EZ Tomato requires very little maintenance This chapter describes the maintenance necessary to keep the instrument functioning properly and provides tests to assess performance.

Cleaning the ColorFlex EZ Tomato

Clean the outside surfaces of the ColorFlex EZ Tomato 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 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** 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.
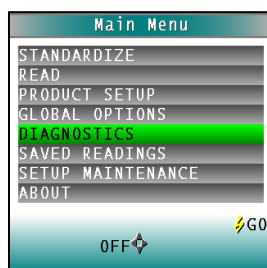

Figure 78. Diagnostics Menu

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.

> *Note: When running all Diagnostic Tests the standard port plate must be installed. This is the one-inch opening (approximately) without any glass or plastic covering*.

White Repeatability ▶

The purpose of this diagnostic is to verify short term repeatability performance of the instrument. The White Tile Repeatability prompts through a normal standardization of the instrument. When standardization is complete, the calibrated White Tile is left in position at the sample port and the *GO* button is pressed.
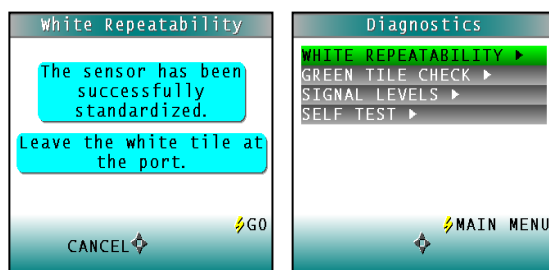

Figure 79. White Repeatability

Twenty readings of the calibrated White Tile are made automatically, and the results of each reading is shown. This test may be cancelled at any time by pressing *CANCEL.* When all readings are complete, the result and a rating of pass or fail is shown.

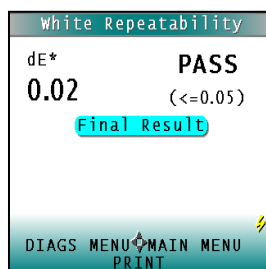To PASS, dE* must be less than or equal to 0.05.

Figure 80. White Repeatability Test Results

Press *PRINT* to print the result (if a printer is connected to the instrument's USB port). An example printout is shown.
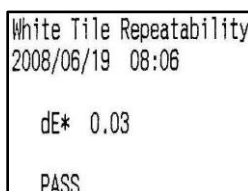

Figure 81. Printout of Repeatability Test

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 screen allows you to compare the values in the ColorFlex EZ Tomato'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.
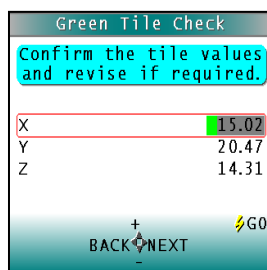

Figure 82. Green Tile Values

Standardize the instrument as prompted 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 the result with a pass/fail rating is shown. To pass, dX, dY, and dZ must all be less than or equal to 0.30

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 Service 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 Service Support staff.

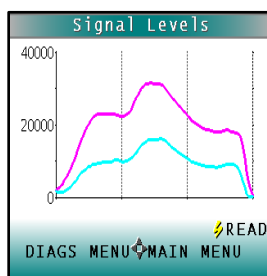*Figure 83. Signal Levels*

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 Tomato'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.
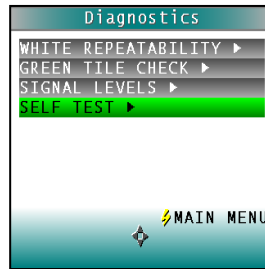

Figure 84. Self-Test

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.
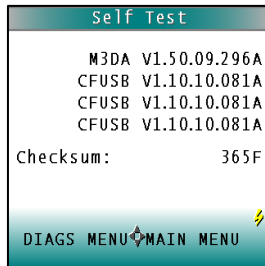

Figure 85. Self-Test Results

Press **DIAGS MENU** to return to the **DIAGNOSTICS MENU**. Press **MAIN MENU** to return to the **MAIN MENU**.

CHAPTER EIGHT

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 workspace 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 Tomato in an area where temperature or humidity extremes are possible.

Storage Temperature	-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, HunterLab tomato tile, Universal AC adaptor, Computer interface cable, USB flash drive, ColorFlex EZ Tomato User's Guide, Certificate of traceability

Physical Characteristics

Weight	4.5 kg (9.9 lb)
Dimensions (Height x width x length)	16 cm x 13 cm x 36 cm (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	31.8 mm (1.25 in) illuminated/ 25.4 mm (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
Photometric Range	0-150% reflectance
Measurement Speed (at 23°C)	≤1.0 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
Tomato Scores	TPS – Tomato Paste TSS – Tomato Sauce TCS – Tomato Catsup TJS – Tomato Juice Tomato a/b Ratio Lycopene Index

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*,
Data Storage	250 spectral or tristimulus with Pass/Fail Tolerances as Working, Physical, Numeric and Hitch
Languages	Chinese, English, French, German, Italian, Japanese, Spanish

Regulatory Notice

HunterLab
ISO 9001 Certified

Declaration of Conformity

EU Directive: 2014/30/EU (EMC)

Standards to which Conformity is Declared: EN 61326-1:2012
                                                  EN 61010-1:2010

Manufacturer: Hunter Associates Laboratory, Inc.
                         11491 Sunset Hills Rd, Reston, VA, USA

European Representative: Christian Jansen
Representative's Address: Christian Jansen, Griesbraeustrasse 11, 82418 Murnau, Germany

Type of Equipment: **Spectrophotometer**

Model No.:   ColorFlexEZ

*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: August 31, 2016   Full Name   Tim Barrett

                                     Position   Systems Engineer

Options and Sample Devices

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

- Carrying case (D02-1010-619),

- External serial printer (A12-1014-259),

- Keyboard (A13-1014-294)

- Barcode Scanner (A13-1014-254)

- EasyMatch QC Software with Tomato Option (EZMQC-CFLX)

- 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

The external thermal printer (A13-1014-259) connects to the ColorFlex EZ Tomato'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 Tomato. More information on the external printer is provided in its separate Printer Manual.

Figure 86. Thermal Printer

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

Keyboard

The optional flexible keyboard (A13-1014-294) connects to the ColorFlex EZ Tomato'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 Tomato button pad. The Enter key on the keyboard emulates the center **Go** button on the ColorFlex EZ Tomato's button pad. Numbers and letters may be typed on the keyboard as usual.

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

Figure 87. Optional Keyboard

Bar Code Scanner

The optional bar code scanner (A13-1014-254) connects to the ColorFlex EZ Tomato'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 Tomato once connected.

Figure 88. Barcode Reader

USB Flash Drive for Data Transfer

Supplied as standard this USB Flash Drive (A10-1013-423) provides a way to transfer data from the CFEZ Datalog to a USB flash drive for viewing in Microsoft Excel. This can also be used to save product setups and transfer the setups to another CFEZ.

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
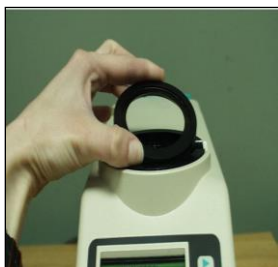
the instrument. Any change in port size must be followed by standardization on both the Black Glass and the calibrated White Tile.

Glass Port Insert

This option provides a snap-in port plate (D02-6624-05) 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

This port insert contains a 420-nm filter (D02-1010-618) to prevent UV illumination 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.

To install, 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.

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.
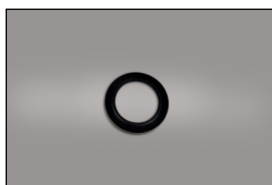

Figure 91. Sample Cup Port Plate

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.

Figure 92. Glass Sample 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.

Figure 93. Sample Cup Cover

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.

Figure 94. Ring and Disk

EasyMatch QC Software

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

CHAPTER NINE

When You Need Assistance

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

For the Americas, Support@hunterlab.com

For Asia, AsiaSupport@hunterlab.com

For Europe, EuropeSupport@hunterlab.com

For India, Middle East and Africa, IMEASupport@hunterlab.com

For all other regions, Support@hunterlab.com

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

For personalized assistance, go to support.hunterlab.com and locate the **Create A Ticket** button on the menu. A subsequent form gathers information on your request for response from our Customer Experience Teams around the globe.

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