

# **SpectraShop™ 5**

## **Operation Guide**

*Version 5.0.8*

22 April 2016

# Collection Window

The collection is the heart of SpectraShop. A collection is equivalent to a folder which contains the specimen information, including the spectral data.

Multiple collections may be open simultaneously.

Specimens may be copied or dragged to the tool windows for various analyses.

Measurements are automatically sent to the active collection.

**Important Note:** Remember that some collections of colors may be subject to copyright restrictions, so please check your legal rights and restrictions before publishing or distributing your collections to others.

The screenshot shows the SpectraShop interface with several callout boxes pointing to specific features:

- Tool Selectors:** A vertical toolbar on the left containing icons for: Edit specimen information, Measure specimens, Measure chart, Define a chart, Graph 2D, Lighting Tool, Calculate Tool, Difference Tool, Search Tool, and Light Source Tool.
- Simulated Color Patch:** A large orange square in the center of the main window.
- Specimen List:** A list on the left side of the main window showing specimen IDs (e.g., 11630, 11328, 11105, 11140, 11136, 11086, 11120, 11350, 11310, 10075, 12300, 12443, 12473, 12215, 12246, 12197, 11400, 11302, 12199, 13531, 10324, 10219, 10080, 10075, 10070, 10075, 10049, 10059, 10045, 17778, 13690, 13711, 13613, 12648, 10371, 10115, 10233, 12160, 10091, 17855, 13695, 13618, 13591, 13637, 13655) and a count of 586 specimens.
- Spectrum Graph:** A line graph showing Reflection (%) on the y-axis (0.0 to 100.0) versus wavelength on the x-axis (400 to 700). The curve shows a sharp increase starting around 500nm, reaching a plateau of approximately 60% reflection above 600nm.
- Information Display:** A metadata panel for specimen 11400, showing: Identifier 2, Identifier 3, Material: Paint, Manufacturer: U. S. Government, Model: Federal Standard 595B, Production Date: 1989-12, Serial Number: 7690-01-162-2210, Originator, Creation Date: 1999-12-10, Surface: Gloss, and Comments.
- Information Selectors:** Three buttons labeled S, M, and C, used to toggle between Specimen information, Measurement information, and Colorimetric values.
- a\*b\* Graph:** A colorimetric graph showing a single data point on a color space plot.
- Collection Inspector:** A settings panel in the top right corner for configuring the spectral graph, colorimetric calculations, and specimen list.
- Add Specimen Manually:** A button at the bottom left that opens the specimen manual entry window.

# Collection Window, Instant Difference Feature

To activate the Instant Difference Feature select **two specimens** in the specimen list. The differences between the two specimens are instantly calculated and the numeric differences are displayed in the Colorimetry area, indicated by a  $\Delta$  symbol preceding each value.

Colorimetric differences are displayed in the lower-right information area.

The screenshot shows the 'Federal Standard Colors' application window. On the left is a specimen list with IDs 11630 to 13655. Two specimens, 12473 and 11400, are highlighted. The main area displays two color patches (12473 and 11400) and a spectral comparison graph showing reflectance (%) vs wavelength (nm) for both. Below the graph is a colorimetry data table with differences indicated by  $\Delta$ . A 'Color Differences' box highlights the  $\Delta E_{ab}$ ,  $\Delta E_{2000}$ ,  $\Delta E_{94}$ , and  $\Delta E_{CMC}$  values. An 'Append Button' is located at the bottom right of the colorimetry area.

| Parameter             | Value   |
|-----------------------|---|
| $\Delta\Sigma$        | 38.25   |
| CIE XYZ               | $\Delta X$ : -11.52, $\Delta Y$ : -10.72, $\Delta Z$ : 0.14       |
|                       | $\Delta x$ : 0.01968, $\Delta y$ : -0.04491                       |
| CIELAB 1976           | $\Delta L^*$ : -11.75, $\Delta a^*$ : 9.16, $\Delta b^*$ : -21.16 |
|                       | $\Delta C^*$ : -9.28, $\Delta h$ : 21.10                          |
| CIELUV 1976           | $\Delta L^*$ : -11.75, $\Delta u^*$ : 6.08, $\Delta v^*$ : -19.93 |
|                       | $\Delta C^*$ : -1.16, $\Delta h$ : -9.85, $\Delta s$ : 0.50       |
| CIECAM02              | $\Delta J$ : -11.84, $\Delta C$ : 1.83, $\Delta h$ : -17.09       |
|                       | $\Delta a_c$ : 16.36, $\Delta b_c$ : -16.00                       |
| CIE 1976 UCS          | $\Delta u'$ : 0.04618, $\Delta v'$ : -0.01573                     |
| Indices               | $\Delta SNI$ : 18.63  |
| $\Delta Status V$     | 0.192   |
| $\Delta Status ISO 1$ | -0.053  |
| $\Delta Status ISO 2$ | -0.048  |
| Status                | A   |

Color Differences:

|                   |       |                  |       |
|-------------------|-------|------------------|-------|
| $\Delta E_{ab}$   | 25.88 | $\Delta E_{94}$  | 15.41 |
| $\Delta E_{2000}$ | 16.65 | $\Delta E_{CMC}$ | 18.74 |
| RMSE              | 0.138 | NRMSE            | 0.00  |

## Collection Window, Instant Average Feature

To activate the Instant Average Feature **select three or more specimens** in the specimen list. The average of the specimens is instantly calculated and the numeric averages are displayed in the Colorimetry area, indicated by a  $\mu$  symbol preceding each value.

The colorimetric differences are displayed in the lower-right information area.

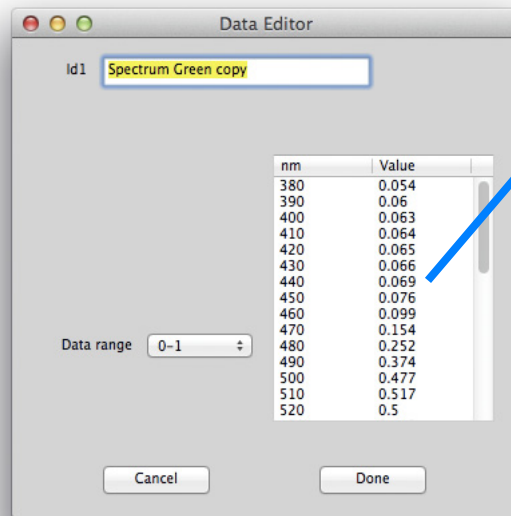
The screenshot displays the 'Federal Standard Colors' software interface. On the left, a 'Collection Note' window shows a list of 586 specimens with their IDs and corresponding color swatches. Three specimens (12300, 12473, and 11400) are highlighted in yellow. The main window features a 'Colorimetric Averages' section with a blue border, displaying various colorimetric values for the selected specimens. To the right, a 'Color Difference' plot shows three data points on a color difference scale. A legend at the top of the plot identifies the curves for specimens 12300, 12473, and 11400. A callout box points to the legend with the text 'Click on a curve to identify the specimen and value'. Another callout box points to the data points on the plot with the text 'Click on a spot to identify the specimen'. At the bottom right, an 'Append average to list' button is highlighted with a callout box that says 'Append Button' and 'Appends the average of the two spectra to the specimen list'. The 'Colorimetric Averages' section contains the following data:

| Specimen                            | $\mu$ val         | $\mu\Sigma$      |
|-------------------------------------|-------------------|------------------|
| $\mu$ m: 730                        | 0.7488            | 113.96           |
| <b>CIE XYZ</b>                      |                   |                  |
| $\mu$ X: 34.30                      | $\mu$ Y: 23.86    | $\mu$ Z: 2.90    |
| $\mu$ x: 0.56400                    | $\mu$ y: 0.38587  |                  |
| <b>CIELAB 1976</b>                  |                   |                  |
| $\mu$ L*: 55.44                     | $\mu$ a*: 47.03   | $\mu$ b*: 63.64  |
| $\mu$ C*: 80.44                     | $\mu$ h: 52.83    |                  |
| <b>CIELUV 1976</b>                  |                   |                  |
| $\mu$ u*: 106.46                    | $\mu$ v*: 47.72   |                  |
| $\mu$ C*: 117.59                    | $\mu$ s: 24.39    | $\mu$ s: 2.15    |
| <b>CIECAM02</b>                     |                   |                  |
| $\mu$ J: 48.26                      | $\mu$ C: 76.00    | $\mu$ h: 48.10   |
| $\mu$ ac: 49.81                     | $\mu$ bc: 55.14   |                  |
| <b>CIE 1976 UCS</b>                 |                   |                  |
| $\mu$ u': 0.34877                   | $\mu$ v': 0.53348 |                  |
| <b><math>\mu</math>Status V</b>     |                   |                  |
| $\mu$ S: 0.512                      |                   |                  |
| <b><math>\mu</math>Status ISO 1</b> |                   |                  |
| $\mu$ S: 1.576                      |                   |                  |
| <b><math>\mu</math>Status ISO 2</b> |                   |                  |
| $\mu$ S: 1.589                      |                   |                  |
| <b>Status A</b>                     |                   |                  |
| $\mu$ R/C: 0.171                    | $\mu$ G/M: 1.061  | $\mu$ B/Y: 1.616 |

## Collection Window, Data Editor, Existing Specimen

To open the Data Editor to modify the data for an existing specimen, **double-click one of the specimens in the list.**

Click on a value then enter the new value. Use tab, return, line feed or arrow keys to advance to the next data value.



## Collection Window, Data Editor, New Specimen

To open the Data Editor to create a new specimen, click on the “+” button below the specimen list.

**Step 1. Name the specimen**

**Step 2. Specify the specimen's type**

**Step 3. Define the wavelength information**

**Step 4. Click Enter to automatically generate the wavelengths and default values.**

The screenshot shows the 'Data Editor' window with the following fields and controls:

- Id1:** A text field containing 'Untitled'.
- Type:** A dropdown menu.
- Wavelength Information:** A group of fields including 'Start' (380), 'End' (780), 'Inc' (10), and 'Default Value' (0.0), all enclosed in a blue box.
- Data range:** A dropdown menu set to '0-1'.
- Enter:** A button to generate data.
- Cancel:** A button to close the window.
- Done:** A button to finish editing.

| nm | Value |
|----|-------|
|----|-------|

**Step 5. Enter the response at each wavelength.**

Click on a value then enter the new data. Use tab, return, line feed or arrow keys to advance to the next data value.

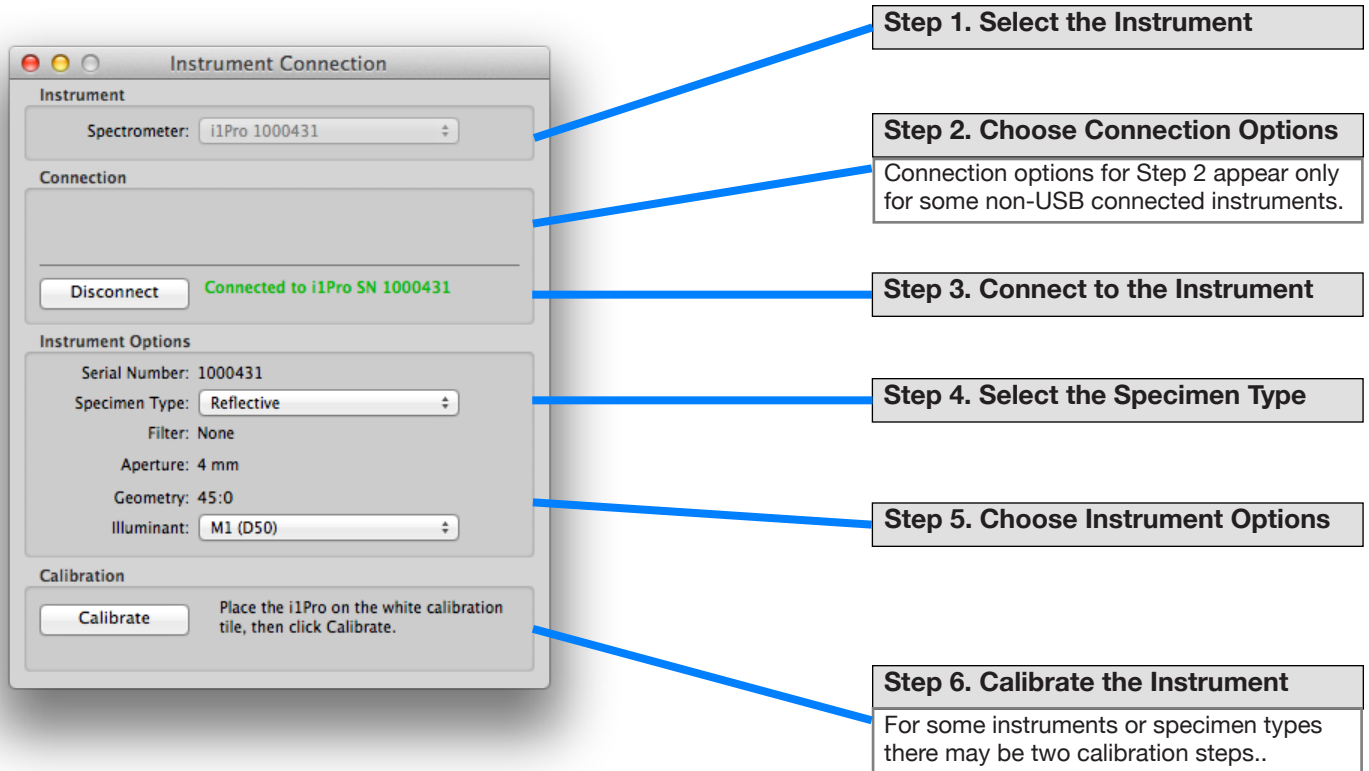
## Measuring Specimens Part 1, Connecting to the Instrument

All measuring begins with the Instrument Connection window.

Follow the steps to prepare the instrument.

*Note 1: Connection options for Step 2 appear only for some non-USB connected instruments.*

All measurements are sent automatically to the active collection.



The screenshot shows the 'Instrument Connection' window with the following sections and steps:

- Step 1. Select the Instrument:** Points to the 'Spectrometer' dropdown menu showing 'i1Pro 1000431'.
- Step 2. Choose Connection Options:** Points to the 'Connection' section, which is currently empty.
- Step 3. Connect to the Instrument:** Points to the 'Disconnect' button and the status text 'Connected to i1Pro SN 1000431'.
- Step 4. Select the Specimen Type:** Points to the 'Specimen Type' dropdown menu showing 'Reflective'.
- Step 5. Choose Instrument Options:** Points to the 'Instrument Options' section, which includes 'Filter: None', 'Aperture: 4 mm', 'Geometry: 45:0', and 'Illuminant: M1 (D50)'.
- Step 6. Calibrate the Instrument:** Points to the 'Calibrate' button and the instruction 'Place the i1Pro on the white calibration tile, then click Calibrate.'

## Measuring Specimens Part 2, Emissive-light or Flash Measurements

For emissive-light measurements, most devices require an ambient filter or a cosine-corrector be added to the instrument.

When emissive-flash is selected in the Instrument window, to make a flash measurement, click Start, then depress the i1Pro's measure button, then trigger the flash, then release the i1Pro's button.

The screenshot shows the 'Measure Light Specimens' window with the following sections and callouts:

- Step 1. Auto Naming (optional):** Points to the 'Preceding:', 'Separator:', 'Value:', 'Inc:', and 'Digits:' fields. The 'Preceding' field contains 'Untitled', 'Separator' is '-', 'Value' is '0', 'Inc' is '1', and 'Digits' is '1'. An example 'Untitled-0' is shown below.
- Step 2. Fill in specimen information (optional):** Points to the 'Specimen Information' section, which includes fields for Identifier 1 (Untitled-0), Identifier 2, Identifier 3, Material (Fluorescent lamp), Manufacturer (General Electric), Model (F40-12), Serial Number, Production Date (2014), Originator (Robin Myers Imaging), Date, and Comments (Shop fixture lamp).
- Step 3. Set measurement options (optional):** Points to the 'Measurement' section, which includes 'Measurements/specimen: 1', 'Measuring 1 of 1', a checked 'Audio tone' checkbox, and a 'Notes' field.
- Step 4. Select auto routing (optional):** Points to the 'Specimen Routing' section, which includes a checked 'Current collection' checkbox, an unchecked 'Lighting - Test light sources' checkbox, and an unchecked 'Difference - Test' dropdown menu.
- Step 5. Start measuring (required):** Points to the 'Start' and 'Measure' buttons at the bottom of the window.

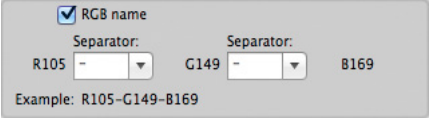


# Measuring Specimens Part 3, Emissive-monitor Measurements

Allows for measuring manually selected monitor colors.

### Step 1. Auto Naming (optional)

Shown is the pattern auto naming method, below is the optional RGB auto naming method.

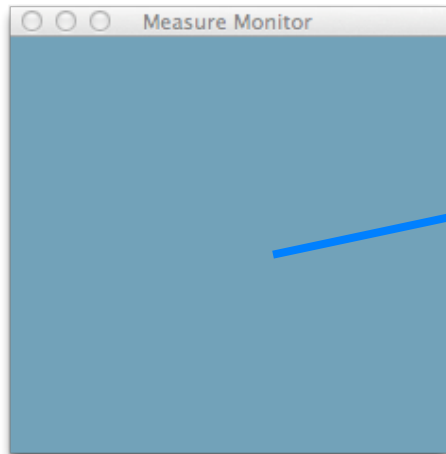


### Step 2. Fill in specimen information (optional)

### Step 3. Set measurement options (optional)

### Step 4. Set the RGB values for the patch to be measured (required)

### Step 5. Start measuring (required)



**Test Patch**  
Position and resize the Test Patch window to match your requirements. Then place the instrument on the monitor to measure this patch.

## Measuring Specimens Part 4, Reflective Measurements

The screenshot shows the 'Measure Reflective Specimens' window with the following fields and callouts:

- Step 1. Auto Naming (optional):** Points to the 'Prefix' field containing 'Untitled', the 'Separator' dropdown set to '-', the 'Value' field set to '0', the 'Inc' field set to '1', and the 'Digits' spinner set to '1'. Below these is the 'Example: Untitled-0'.
- Step 2. Fill in specimen information (optional):** Points to the 'Identifier 1' field containing 'Untitled-0'.
- Step 3. Set measurement options (optional):** Points to the 'Backings' dropdown set to 'white' and the checked 'Audio tone' checkbox.
- Step 4. Select auto routing (optional):** Points to the 'Difference' dropdown set to 'Test'.
- Step 5. Start measuring (required):** Points to the 'Start' and 'Measure' buttons at the bottom.

Step 1. Auto Naming (optional)

Step 2. Fill in specimen information (optional)

Step 3. Set measurement options (optional)

Step 4. Select auto routing (optional)

Step 5. Start measuring (required)

## Measuring Specimens Part 5, Transmissive Measurements

The screenshot shows a software window titled "Measure Transmissive Specimens" with the following sections and fields:

- Auto Id:** A checked checkbox.
- Preceding:** A text field containing "Untitled".
- Separator:** A dropdown menu showing a hyphen (-).
- Value:** A text field containing "0".
- Inc:** A text field containing "1".
- Digits:** A spinner control set to "1".
- Example:** A text field containing "Untitled-0".
- Specimen Information:** A group of fields including Identifier 1 (containing "2A"), Identifier 2, Identifier 3, Material (Gelatin filter), Manufacturer (Kodak), Model (Wratten), Serial Number, Production Date (1998), Originator (Edward Teach), Date, and Comments.
- Measurement:** A section with "Measurements/specimen:" set to "1", "Measuring 1 of 1", a checked "Audio tone" checkbox, and a "Notes:" text field.
- Specimen Routing:** A section with a checked "Current collection" checkbox and a "Difference -" dropdown menu set to "Test".
- Buttons:** "Start" and "Measure" buttons at the bottom.

Five blue callout boxes with black text are connected to the interface by blue lines:

- Step 1. Auto Naming (optional)** points to the Preceding, Separator, Value, Inc, and Digits fields.
- Step 2. Fill in specimen information (optional)** points to the Specimen Information fields.
- Step 3. Set measurement options (optional)** points to the Audio tone checkbox and Notes field.
- Step 4. Select auto routing (optional)** points to the Specimen Routing section.
- Step 5. Start measuring (required)** points to the Start and Measure buttons.

Step 1. Auto Naming (optional)

Step 2. Fill in specimen information (optional)

Step 3. Set measurement options (optional)

Step 4. Select auto routing (optional)

Step 5. Start measuring (required)

## Measuring Charts Part 1, Emissive-monitor Charts

Measure Monitor Chart

Chart

Open RGB8+W17

Number of Patches: 25

Monitor Information

Manufacturer: Apple

Model: 13" Trinitron

Serial Number:

Production Date: 1988

Originator: Ed Teach

Date:

Comments:

Measurement

Measurements/specimen: 1 Measuring 1 of 1

Audio tone

Time between patches (secs.): 1

Notes:

Start

Step 1. Open chart definition file (required)

Step 2. Fill in specimen information (optional)

Step 3. Set measurement options (optional)

Step 4. Start measuring (required)

### Progress Indicator

Provides relative indication of how many patches have been measured and the amount remaining.



### Test Patch

Position and resize the Test Patch window to match your requirements. Then place the instrument on the monitor to measure this patch.

## Measuring Charts Part 2, Reflective Charts

Measure reflective charts previously defined using the Chart Editor.

The operator is prompted with the name of the patch to measure and its position in the chart diagram is shown with a blue outline.

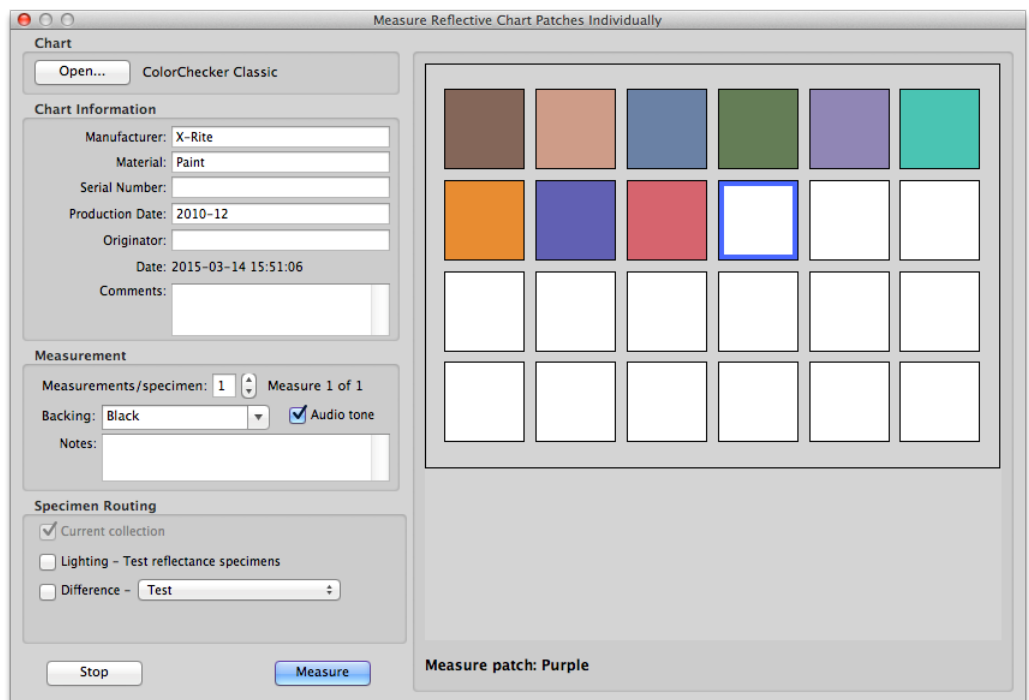
**Step 1. Open chart definition file (required)**

**Step 2. Fill in specimen information (optional)**

**Step 3. Set measurement options (optional)**

**Step 4. Select auto routing (optional)**

**Step 5. Start measuring (required)**



## Measuring Charts Part 3, Transmissive Charts

Measure transmissive charts previously defined using the Chart Editor.

The operator is prompted with the name of the patch to measure and its position in the chart diagram is shown with a blue outline.

**Step 1. Open chart definition file (required)**

**Step 2. Fill in specimen information (optional)**

**Step 3. Set measurement options (optional)**

**Step 4. Select auto routing (optional)**

**Step 5. Start measuring (required)**

Measure Transmissive Chart

Chart

Open... Agfa IT7-1 Agfachrome

Chart Information

Manufacturer: Agfa

Material: Agfachrome RS100 Plus

Serial Number: B30227xx

Production Date: 1993-03

Originator: Ed Teach

Date:

Comments:

Measurement

Measurements/specimen: 1 Measuring 1 of 1

Audio tone

Notes:

Specimen Routing

Current collection

Difference - Test

Start Measure

Measure patch: 1A

# Creating and Editing Emissive-monitor Charts

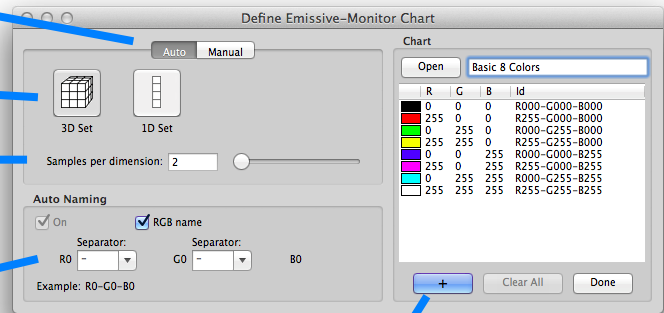
**Step 1. Select patch generation, Auto or Manual**

**Step 2. Choose 3D or 1D patch value sampling**

**Step 3. Choose number of samples per dimension**

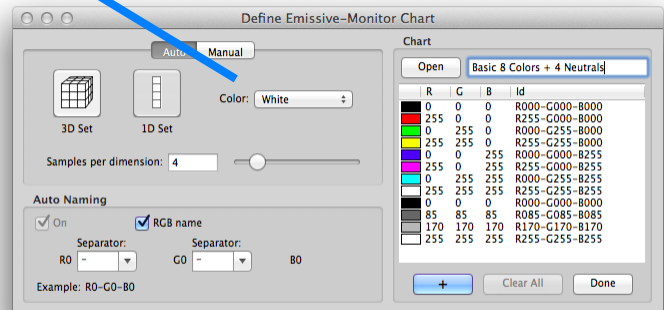
**Step 4. Select the type of auto naming**

The auto naming can be with a pattern (default) or using the RGB values for names.



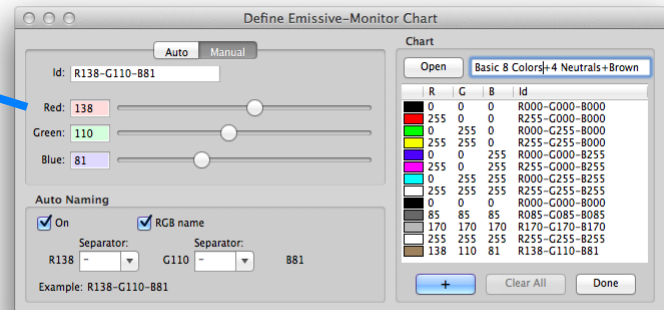
**Step 5. Click this button to append patches to the list.**

For 1D patch generation, choose the color for the patches.



## Manual Patch Generation

Set the color for each patch with the sliders or type in the exact RGB values.



# Creating and Editing Reflective Charts

SpectraShop charts have the ability to define almost any physical chart layout.

Corner instructions serve to identify the corners for automatic measuring devices and also for software that converts chart images to numeric color values.

**Step 1. Enter chart title**

**Step 2. Fill in chart and common patch information (optional)**

**Step 3. Provide instructions for manual identification of the chart corners. (required)**

**Step 4. Select auto layout direction, rows first then columns, or columns first then rows (required)**

**Step 5. Enter the patch data (required)**

**Chart Information**

Open

Manufacturer:

Material:

Surface:

Chart size: H:  V:  in

**Corner Descriptions**

UL:

LL:

UR:

LR:

Rectangular  Arbitrary

Rows first then columns  Columns first then rows

Number: H:  V:

Spacing: H:  V:

Size: W:  H:

Patch 1, UL: X:  Y:

Prefix:  Separator:  Value:  Digits:

Example: Untitled-0

**Patches**

| Id            | Surface | Left  | Top | Width | Height |
|---------------|---------|-------|-----|-------|--------|
| Dark skin     | matte   | 0.388 | 0.5 | 1.6   | 1.6    |
| Light skin    | matte   | 2.188 | 0.5 | 1.6   | 1.6    |
| Blue sky      | matte   | 3.988 | 0.5 | 1.6   | 1.6    |
| Foliage       | matte   | 5.788 | 0.5 | 1.6   | 1.6    |
| Blue flower   | matte   | 7.588 | 0.5 | 1.6   | 1.6    |
| Bluish green  | matte   | 9.388 | 0.5 | 1.6   | 1.6    |
| Orange        | matte   | 0.388 | 2.3 | 1.6   | 1.6    |
| Purplish blue | matte   | 2.188 | 2.3 | 1.6   | 1.6    |
| Moderate red  | matte   | 3.988 | 2.3 | 1.6   | 1.6    |
| Purple        | matte   | 5.788 | 2.3 | 1.6   | 1.6    |
| Yellow green  | matte   | 7.588 | 2.3 | 1.6   | 1.6    |
| Orange yellow | matte   | 9.388 | 2.3 | 1.6   | 1.6    |

**Step 6. Click to add the current patch layout to the chart**

## Patch List

Click on an id or surface to edit each after they have been added to the chart.



# Creating and Editing Transmissive Charts

SpectraShop charts have the ability to define almost any physical chart layout.

Corner instructions serve to identify the corners for automatic measuring devices and also for software that converts chart images to numeric color values.

**Step 1. Enter chart title**

**Step 2. Fill in chart and common patch information (optional)**

**Step 3. Provide instructions for manual identification of the chart corners. (required)**

**Step 4. Select auto layout direction, rows first then columns, or columns first then rows (required)**

**Step 5. Enter the patch data (required)**

**Chart Information**

Open: Agfa IT8.7/1-1993

Manufacturer: Agfa

Material: Agfachrome RS100 Plus

Chart size: H: 10.8 V: 7.15 cm

**Corner Descriptions**

UL: Mark the upper-left corner fiducial mark near patch 1A.

LL: Mark the lower-left corner of grayscale patch 0 (white).

UR: Mark the upper-right corner fiducial mark near patch 22A.

LR: Mark the lower-right corner of grayscale patch 23 (black).

Rectangular Arbitrary

Number: H: 22 V: 12

Spacing: H: 0 V: 0

Size: W: 0.45 H: 0.45

Patch 1, UL: X: 0.45 Y: 0.45

Prefix: Separator: Value: Digits: Untitled ~ 0 1

Example: Untitled-0

**Patches**

| Id  | Left | Top  | Width | Height |
|-----|------|------|-------|--------|
| 1A  | 0.45 | 0.45 | 0.45  | 0.45   |
| 2A  | 0.9  | 0.45 | 0.45  | 0.45   |
| 3A  | 1.35 | 0.45 | 0.45  | 0.45   |
| 4A  | 1.8  | 0.45 | 0.45  | 0.45   |
| 5A  | 2.25 | 0.45 | 0.45  | 0.45   |
| 6A  | 2.7  | 0.45 | 0.45  | 0.45   |
| 7A  | 3.15 | 0.45 | 0.45  | 0.45   |
| 8A  | 3.6  | 0.45 | 0.45  | 0.45   |
| 9A  | 4.05 | 0.45 | 0.45  | 0.45   |
| 10A | 4.5  | 0.45 | 0.45  | 0.45   |
| 11A | 4.95 | 0.45 | 0.45  | 0.45   |
| 12A | 5.4  | 0.45 | 0.45  | 0.45   |

+ Clear Done

**Step 6. Click to add the current patch layout to the chart**

**Patch List**

Click on an id or surface to edit each after they have been added to the chart.

# Graph 2D Tool

Create graphs of colorimetric properties.

Begin by pasting, or drag and dropping, a group of specimens from any collection into the Group list.

**Groups**

Paste or drop specimens here to create a display group.

Each paste or drop will create one group.


Groups cannot be added to later.


Click on a group's name to edit it.


**Group Specimens**

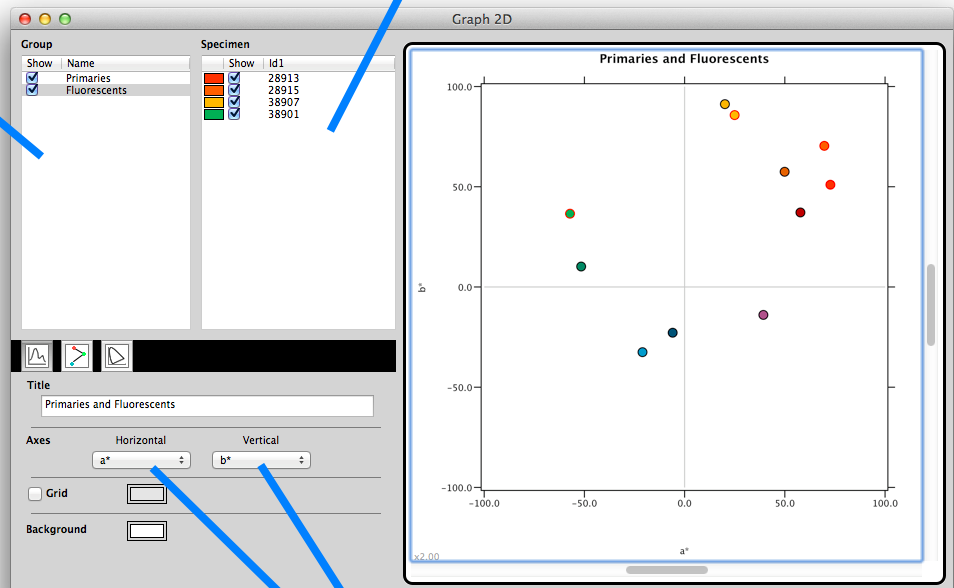
Check or uncheck the boxes to display or hide the groups or individual specimens.

**Graph Parameter Selectors**

 Graph properties

 Group properties

 Display the spectral locus, if appropriate.



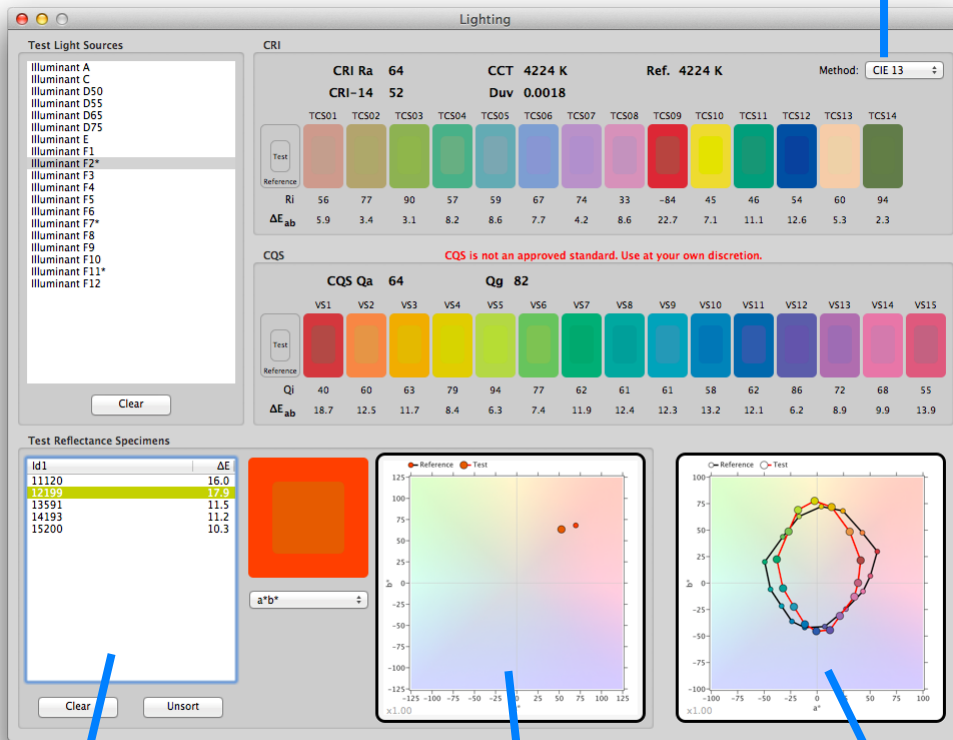
Select which colorimetric values to use for the axes.

# Lighting Tool

Paste, or drag and drop, emissive-light specimens into the Test Light Sources list to calculate CRI and CQS.

## CRI Calculation Method

CIE 13: Reference spectrum is based on the CCT of the test specimen; a Planckian radiator below 5000 K, or a D illuminant above 5000 K.  
 ISO 3664: Reference spectrum is always D50.



## Custom CQS Test Patches

Put reflective specimens here to calculate their color differences under the currently selected test illuminant compared to the D65 illuminant used as the CQS reference.

## CQS Gamut Graph

Graph of test and reference reflective specimen's a\*b\* coordinates.

## CQS Gamut Graph

## Calculate Tool

Paste, or drag and drop, specimens into each list, then select to operation to be performed on the list, or between adjacent lists.

Each list will appear once the previous operation is selected.

The calculations are performed from left to right with the final results placed into the currently active collection.

Calculations are performed on a single list for the *average*, *normalize* and *scale by* operations, between two lists for the *add*, *subtract*, *multiply*, *divide*, and *average by rows* operations.

**Step 1. Enter Specimens in List 1 (required)**

**Step 3. Enter Specimens in List 2, 3 or 4 (optional)**

The screenshot shows the 'Calculate' tool interface with three lists and their operations. List 1 contains specimen numbers: 11120, 12199, 13591, 14193, 15200. Operation 1 is set to 'Multiply'. List 2 contains illuminant codes: Illuminant D5, Illuminant D55, Illuminant D65, Illuminant D75. Operation 2 is set to 'Multiply'. List 3 contains specimen numbers: 09, 25, 32, 38, 40, 47A. Operation 3 is currently empty. There are 'Clear' buttons for each list and a 'Calculate' button at the bottom right.

**Step 2. Select Operation for List 1 (required)**

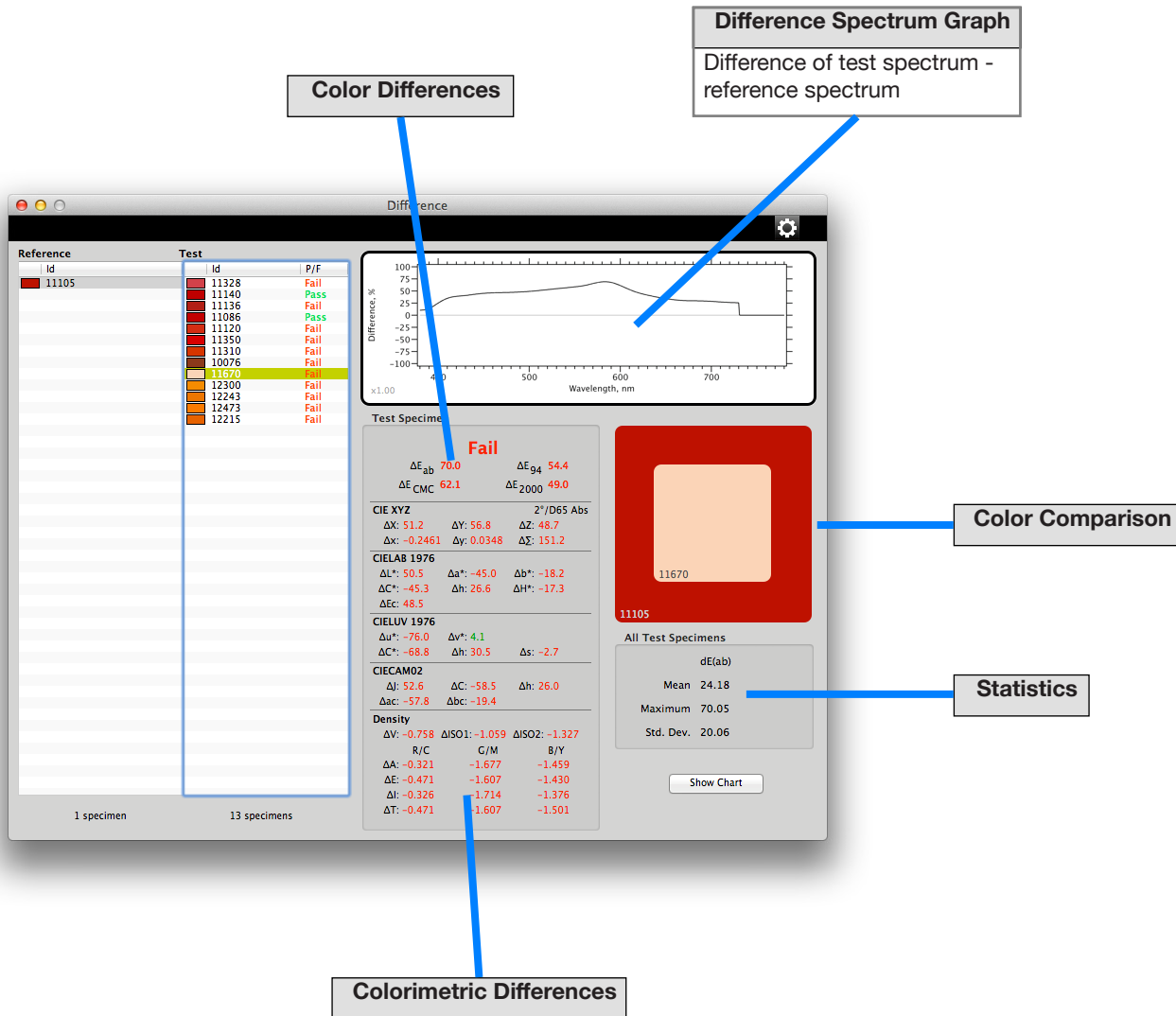
**Step 4. Click Calculate (required)**

After all the desired lists have specimens entered and the appropriate calculations selected, the calculated results will be appended to the specimen list in the currently active collection.

# Difference Tool, Compare Many to a One

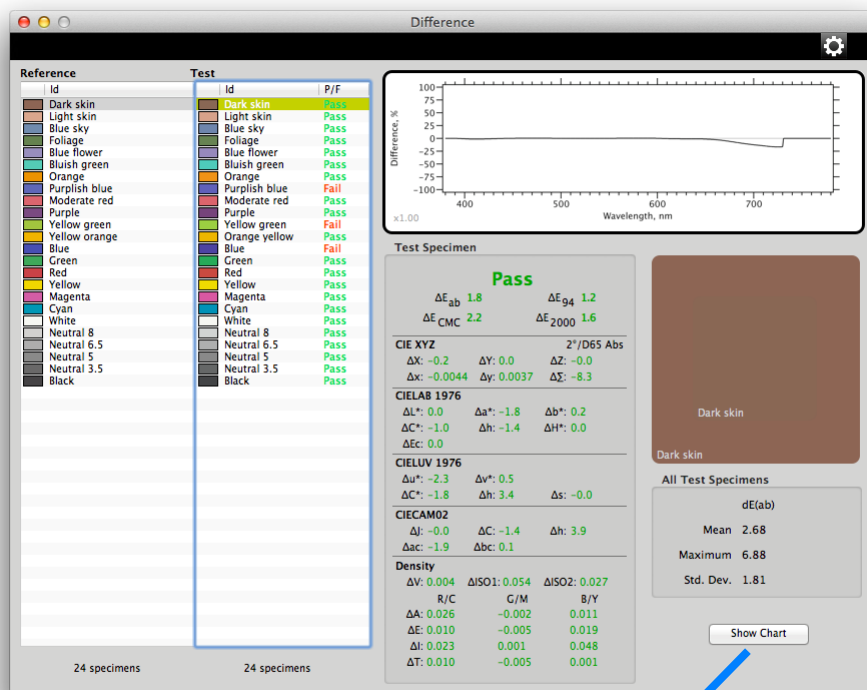
When a single specimen is used for the reference, each test specimen is compared against the reference.

This method is useful for quality testing. Routing measurements directly to the test list allows for monitoring quality as a test proceeds.



## Difference Tool, Compare One List to Another

With more than one reference specimen, each test specimen is compared against the reference in the same row. This is called a paired comparison. This type of test is useful for comparing one set of specimens against another, such as one test chart against a set of reference values.



Show Differences in a Chart

# Chart Difference Tool

When the Show Chart button is clicked in the Difference Tool window, the Chart Difference Tool window appears. Select a chart definition file prepared with the Chart Editor to specify the chart's layout.

Once the chart has been specified it will be drawn in a color-coded format. Each patches name and its difference from the reference value are displayed. The color of each patch corresponds to a difference range specified by the Difference Zones controls.

**Step 1. Select a chart definition file (required)**



**Step 2. Set each zone's difference range (optional)**

# Search Tool

This tool will search through any, or all, of the currently opened collections for specimens whose spectra match those in the *For matches to* list.

Select each test specimen and result specimen to compare their spectra graphically and their colors.

This tool can allow for searching through measurements of color collections for matches to your test specimens.

**Important Note:** Remember that some collections of colors may be subject to copyright restrictions, so please check your legal rights and restrictions before publishing or distributing your collections or matches to others.

Set Search Parameters

The screenshot shows the 'Search' application window. On the left, there is a 'Search within:' section with a list of collections including 'Sintra' and 'Federal Standard Colors'. Below this is a 'Clear' button. In the center, there is a 'For matches to:' section with a list of color names and their corresponding color swatches. Below this is another 'Clear' button. On the right, there is a 'Results:' section with a table of search results. The table has columns for 'Id1', 'Collection', and 'RMSD'. The results are as follows:

| Id1   | Collection              | RMSD  |
|-------|-------------------------|-------|
| 31136 | Federal Standard Colors | 0.02  |
| 11105 | Federal Standard Colors | 0.02  |
| 11140 | Federal Standard Colors | 0.027 |
| 21105 | Federal Standard Colors | 0.03  |
| 11086 | Federal Standard Colors | 0.034 |
| 11136 | Federal Standard Colors | 0.049 |

At the top of the window, there is a 'Set Search Parameters' button. Below the 'Search within:' and 'For matches to:' sections, there is a 'Search' button. The main area of the window is divided into three sections: a color swatch on the left labeled '11105 Dark Red', a spectral graph in the middle showing 'Reflectance, %' vs wavelength (400-700 nm) for 'Dark Red' and '11105', and the 'Results:' table on the right.

Step 3. Click on each test specimen

Any matches found are listed in the Results list as each test specimen is selected.

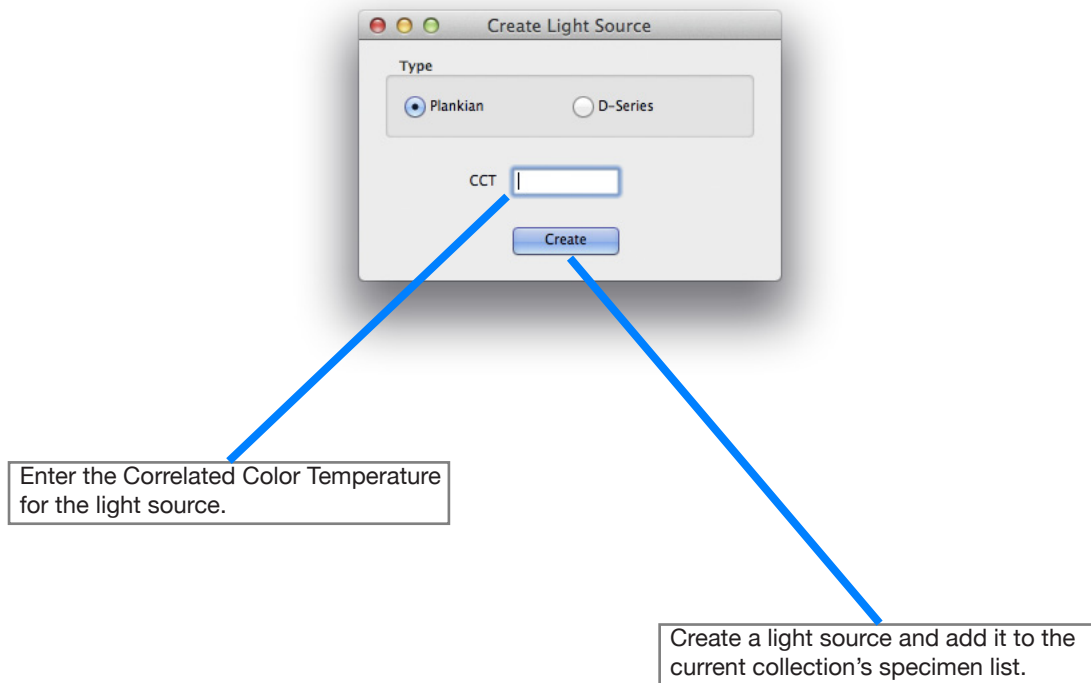
Step 1. Place test specimens here

Step 2. Click to perform the search



## Light Source Tool

This tool will create a Plankian or D-series light source specimen and enter it into the current collection.



### Import File Formats Supported

CGATS 17

ColorMunki

MeasureTool

Radiation Instruments

Solar Laser SDH

StellarNet

X-Rite's CGATS 17

SpectraShop

### Export File Formats Generated

CGATS 17

X-Rite's CGATS

Data Only

InCamera Lighting File

MeasureTool

SpectraShop