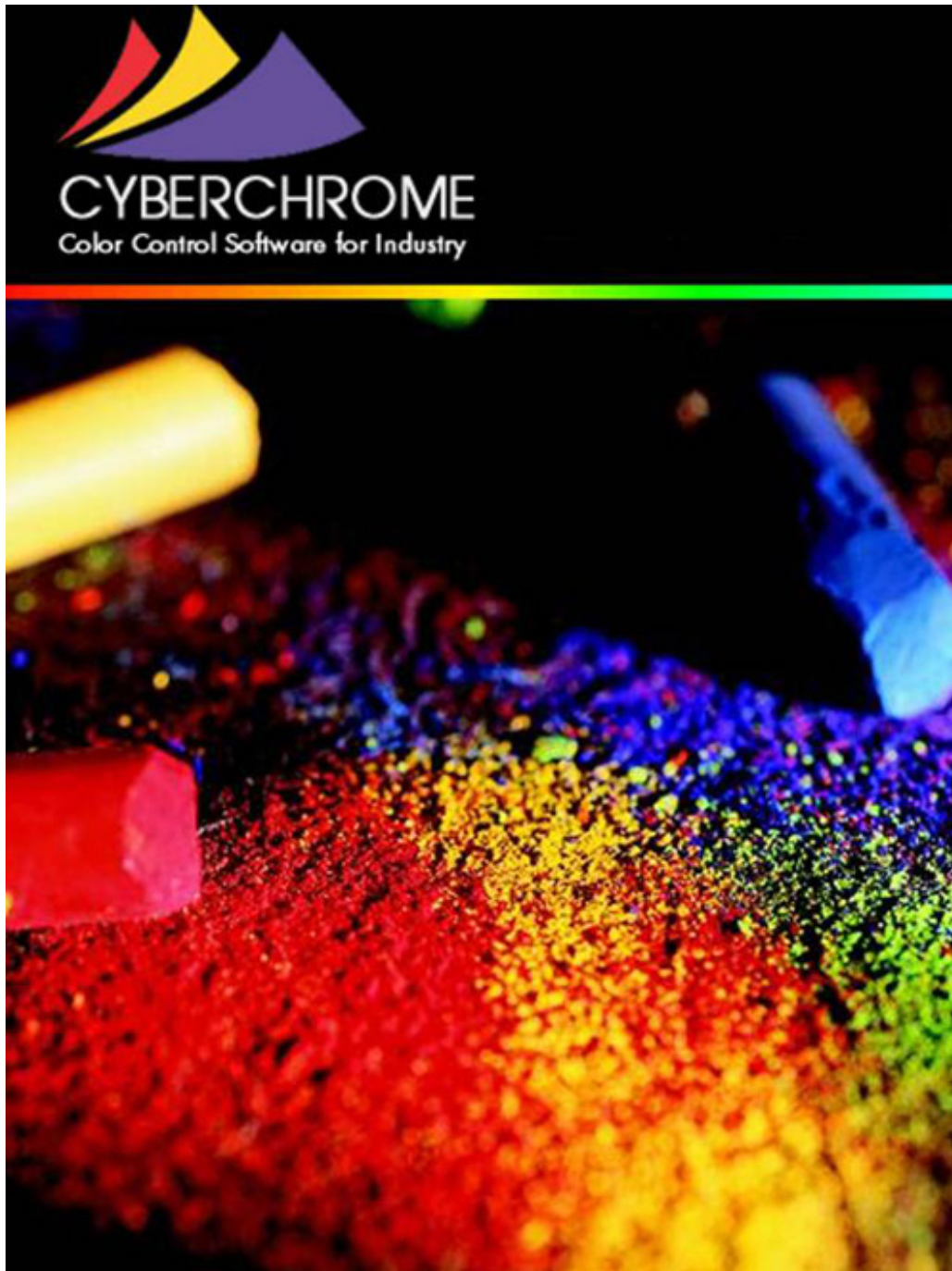# Welcome to OnColor Help

How to Install OnColor

Important Notes on the Hardlock Key: The hardlock key is very important and valuable. Without this key, you cannot access the OnColor software. If the key is defective or damaged, CyberChrome will replace it, but the original key must first be returned to us. No replacements will be issued for lost or stolen keys. It is your responsibility to keep track of this key. It may be moved to another computer at any time, but only the computer with the hardlock key on it will be able to access the software*.*

Do not plug this key into the PC until AFTER the software is installed!

**Installation Instructions for
OnColor QC and OnColor Match
in Windows NT, 2000, XP, Vista or Windows 7**

It is highly recommended that you close all other programs before installing any new software, including OnColor. If your computer is on a network, you must log on as a system administrator to gain the necessary access needed to install the software. If you or your supervisor is not authorized to do this, contact your Information Technology Department and have them install this software for you.

Note: *If you are currently running an older version of OnColor and are doing an update, we recommend that you first uninstall the existing version and then install the new version. To do this, use the Add/Remove Programs feature found in your Windows Control Panel. Highlight OnColor and then click on Remove to uninstall it. Be assured that none of your data files will be affected. Only program files are removed. Instrument and calibration data files specific to your instrument are also not affected.*

1. Do not plug the key into the PC until AFTER you have installed OnColor.
2. The OnColor setup program is configured to automatically run if the "auto-run" feature is turned on in Control Panel. Insert the OnColor CD into your CD-ROM drive.
3. If "auto-run" is not turned on, then select the RUN command from the Windows Start Menu.
4. In the Command Line field, type **<CD-ROM path>:setup**. Click OK or use the Browse button to locate the CD drive and then double click on **setup** to begin the installation process.
5. Follow the prompts in the Setup windows to enter your name and company; the destination location (the default location is: C:\ProgramFiles\CyberChrome\OnColor); and the folder for the OnColor data files.
6. Note that you can use the "Change" button to re-direct the path for the install. Click "Next" to continue. Review the settings and then click"Install".
7. The Hardlock device driver will be installed first. Click "next" to continue with this. After the hardlock is installed, click "Finish".
8. OnColor will automatically be installed next. Click "Finish" after the Installation Wizard Complete message is shown.
9. All program files will be copied and registered in Windows. After installation is complete, you should choose to restart your computer to have the settings take effect.
10. NOW, plug in the hardlock key and Windows will automatically find and install the USB driver for it.
11. A Shortcut Icon is placed on your desktop for easy access to the program.
12. To launch the OnColor software, double click on the shortcut on your desktop.
13. Refer to the OnColor Quick Start Guide for an introduction to the software and how to get your system up and running quickly.

Special Notes for Installing under Windows 7 and Vista

The OnColor Suite of color QC and color matching software is licensed through use of a hardlock key.
The USB hardlock key that is shipped with the software can be used on one computer at a time.
There are two ways to successfully install the Hardlock driver required for the USB key used by OnColor in Windows 7 and Vista:
OnColor setup will run HLDRV32.EXE (Included on the installation CD) which installs the Hardlock drivers.
Allowing Windows to install the Hardlock driver the first time the USB key is used.
If both driver setups take place, however, the Hardlock key will not work as the drivers conflict.
The preferred method is to follow our instructions and **do not insert the Hardlock USB key until after the setup of OnColor**.
The OnColor setup will run HLDRV32.EXE, which will prevent the Windows drivers from being installed when the USB key is inserted.
If for whatever reason, the Windows driver for Hardlock has been installed before the OnColor setup, you must uninstall the HLDRV32 Hardlock drivers after the OnColor setup.
To uninstall the Hardlock drivers, go to the Control Panel -- Programs and Features, which shows a list of programs that can be uninstalled.
You should see "Hardlock Device Drivers" in that list.
Uninstall that program.
Unplug the Hardlock key and then reboot the computer.
Plug in the Hardlock key and you will now be using the Windows supplied Hardlock driver.
If you know that the Vista Hardlock key driver has already been installed by Windows, you can hit the Cancel button during installation of the OnColor CD when the Hardlock setup dialog is displayed and then continue on with the OnColor installation.

How to connect your Sensor via a USB adapter

Many color instruments and spectrophotometers in use today come with a serial cable to connect and communicate with a computer. However, serial ports are a thing of the past and very few PC's come with a serial port as standard configuration these days. While you can always install a serial port, an easier way to connect to the PC is to use a Serial to USB adapter. This is a special cable that plugs into the serial port output of your spectrophotometer on one end and plugs into a USB port on the computer on the other. This circumvents the need for a serial port on the PC.

There are a few tricks to getting this to work however*. Resist the temptation to just plug the cable in and see if it works!!!* First, it is important that you read and follow the installation instructions that come with the USB adapter. Typically (but not always), the instructions will direct you install a driver for the adapter BEFORE plugging it into the computer. It's important that you follow the proper sequence, because once you get Windows confused on what is attached to this port, it can be difficult to undo it.

After installing the driver, go to the Windows Device Manager and go to Ports and note what COMM PORT the adapter was assigned to. (In Windows Xp Device Manager is found under Control Panel, then System, then Hardware tab, and then Device Manager button.) You will need to know this in OnColor when you tell it what Comm. Port to look for the spectro on. Then connect the spectrophotometer to the adapter and finally plug it into the PC.

For spectrophotometers that do not use a "straight through" cable, you will need to use the manufacturer's cable out of the spectro and then attach the USB adapter to the 9-pin end of that cable. (Examples of spectros like this would include the Konica Minolta CM-3600d, CM-2600/2500d and CM-3700d.)

Finally, you can open OnColor and go to Communications, choose the comm. Port assigned to this adapter and then test the settings. You should be good to go.

Don't move the adapter around to different USB ports, as the driver typically only configures it for that one USB port. If you move it to another USB port, it may be assigned to a different comm. Port number.

Not all USB adapters are created equal. Some are not compatible with Windows Vista. Others don't handle this type of data communication well. We recommend the Belkin serial to USB adapter (http://belkin.com/support/product/?lid=en&pid=F5U257&scid=1) since many OnColor users report no problems using this model.

OnColor QC - Quick Start Instructions

A complete OnColor User's manual is included on your installation CD. It was copied to your hard drive during installation of the software. Look for the Adobe PDF document called "OnColor Manual v5x.pdf".

OnColor QC Overview and Quick Start:

1. Follow the instructions to install the OnColor software that came with your software package. You need to attach the Hardlock key to either the USB port or the parallel port on your computer, depending on which configuration your software was shipped with. Start the OnColor software by double-clicking on the icon on your desktop that looks like this:

2. You will see a splash screen of the OnColor logo followed by the default User Screen. The default User Screen will look similar to this for spectrophotometers:
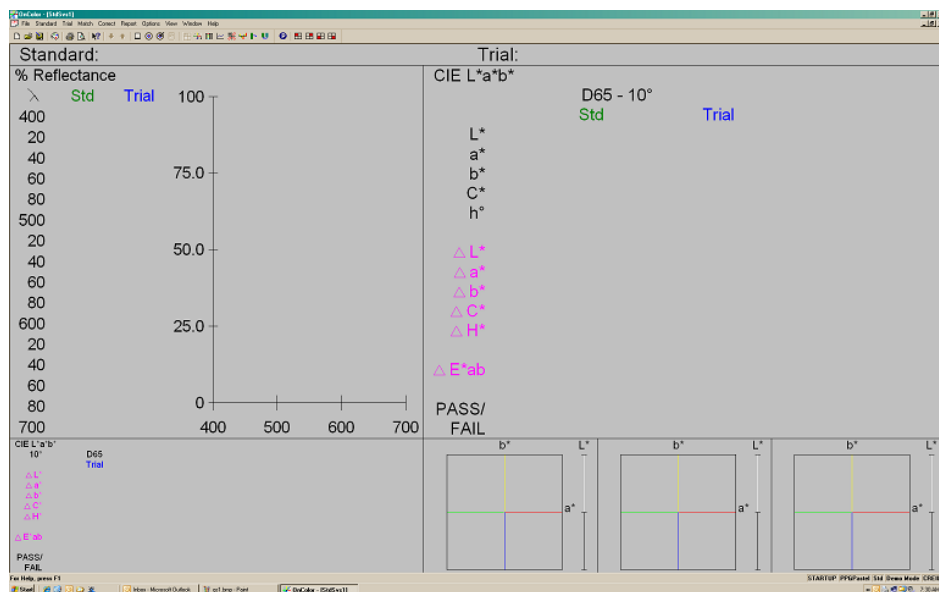
3. For colorimeters such as the CR-400 or CR-300 series, the default screen only shows two of these quadrants.

4. Before you can begin taking measurements with your color instrument, you must connect the instrument

to a serial port on the computer and establish communications. See the section below on "Establishing Communications with your Color Instrument".

5. Calibrate your instrument according to the section below entitled "Instrument Calibration". Your instrument manual will give you detailed instructions on how and when to perform correct calibration. To start the calibration procedure in OnColor, simply type "C" or click on the Calibrate icon on the tool bar. If you need to change the set-up of the instrument, go to Options → Instrument Settings. See the section below for more detail.

6. You are now ready to begin taking measurements. You must always start by declaring a Standard. To measure a Standard, type "S" on the keyboard or click on the Measure Standard icon on the tool bar. Enter a name for this color and then position the sample at the measuring port of the instrument. Press "Enter" or click on the OK button to initiate the reading.

7. You will see the addition of the measurement data to the User Screen.

8. To compare another sample to this Standard, you will designate it as a Trial. To measure a Trial, type "T" on the keyboard or click on the Measure Trial icon on the tool bar. Enter a name for this sample and then position it at the measuring port of the instrument. Press "Enter" or click on the OK button to initiate the reading.

9. You will see the addition of the measurement data to the User Screen and will note that the data for the Trial is compared to the Standard and color difference is calculated.

10. You can continue measuring other samples as Trials against this Standard. OnColor will handle an unlimited number of trials to one Standard. Use the ↓ and ↑ arrow keys on the keyboard to scroll through the different Trials.

11. You can save this data to a file by clicking on File → Save. The data is then saved to a save-set file. See the section below on Save-Set files for more description.

12. To enter a new Standard, click on File → New to open a new document. Follow steps 6 - 11 above to measure a new set of samples.

About Report Properties

Depending on the level of OnColor license that you have obtained, up to six different report screens are available to display your color data. You can change from one report to another by clicking on any of the following icons on the tool bar.
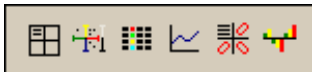
The look and layout of each Report screen can be changed or customized to your preferences. The design of each screen is saved into a template called a Report Property. This template or .PRP file does not change or affect your data. It only changes how and where it is displayed on the various Report screens. The Save-set or WSV file contains the actual data.

You can create and store as many templates or PRP files as you can imagine, but the most important one is the one called STARTUP.PRP. This template is the one that is applied every time OnColor is started. It is the default property file. You can make changes to the lay-out or template and save them by going to Report → Save Properties As and then saving your new design as STARTUP.PRP. Or, you can give it a different name and apply this template by clicking on Report → Recall Properties and then selecting the name of the PRP file that you gave it.
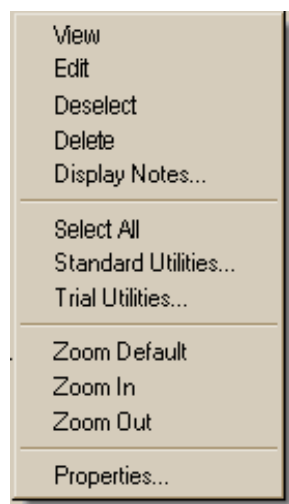
One item that you will want to change immediately in all Property files is your company name and address. This is changed by clicking on File → Page Setup. Enter the new information for your company name, address, and comment and then make the change permanent by saving your STARTUP.PRP file again.

As a general rule, you can change any item or "setting" on the report screen by double-clicking directly on the object that you want to change. For example, to change the Color Space or Illuminant or Observer, double click on the item that you want to change. This will bring up a Properties dialog box where you can make your new selection. To change the lay-out of the screen, double-click on a blank area of the screen and the appropriate dialog box will appear where you can change the lay-out of that report screen. This applies not only to the User Screen, but also to all other Report Screens. Double-clicking on the name of the Standard or Trial will bring up an Edit dialog where you can change the name or other data associated with this measurement.
On the tool bar, you can also click on this icon to change the Report Properties:

OnColor Navigation Aids

Once you have calibrated your instrument and measured a few samples into a Save-Set, it's easy to navigate through OnColor. Several Navigation Aids are available to streamline the use of OnColor.

Use the ↓ and ↑ arrow keys on the keyboard or on the toolbar to scroll through the different Trials.
Right click on any screen to bring up a shortcut menu for the most common options. On the QC Report screens, this includes these options:
On the Color Plot or Spectral Plot report screens you can use the Zoom features to zoom in or out on any portion of the graph.
Display the name of any Standard or Trial by gliding the mouse over that point.
Double click on any data point to bring up the Edit dialog box where you can change it.
Double click on any graph to bring up the change Properties dialog box where you can configure the type of data that you want to display.
All of these options are also available via the Menu options.

Use the Keyboard Shortcuts described below to get single keystroke access to the most commonly used
commands.

Keyboard Shortcuts:

OnColor allows the user to create and modify existing keyboard short cuts.   These short cuts can be modified or
viewed by selecting

View → Keyboard Shortcuts. Select a Menu option from the alphabetical list and then click on Create Shortcut.
Type the shortcut key that you wish to assign and then click OK.

OnColor comes pre-configured with a few basic shortcut keys. You can add to these or modify them to suit your
application:

C = Calibrate	S = Standard Measure	T= Trial Measure
D = Database of Standards	F1 - Help	F2 = Standard Save
F3 = Trial Save	F4 = Standard Recall	F5 = Trial Recall
F6 = Search		

You can set-up your own short-cut keys to further customize OnColor for your application and to streamline your
procedures.

Establishing Communications with your Color Instrument

1. Make sure your Spectrophotometer or Chroma Meter is turned on and attached to the serial port and then
   launch the OnColor program.
2. Go to Options and select Communications. The following text box will appear.
3. Select your Instrument type from the Instrument list. Click on Test settings.
4. A text box will appear telling you if you have successfully communicated with your instrument.

Communication Parameters

Instrument: BYK spectro-guide 45/0

Port: COM3	OK
Baud Rate: 9600	Cancel
Data Bits: 8	Help
Parity: None	
Stop Bits: 1	
Flow: ☐ DTR/DSR	Test Settings
☐ RTS/CTS	Instrument Default
☐ XON/XOFF	

Hints and Reminders :

OnColor recognizes Com1-4. Make sure your instrument is on the correct Com port.

If you can't establish communication and you feel that all the parameters are correct try toggling the power on the Spectrophotometer and hit test settings again.

An in depth discussion and troubleshooting guide for establishing Communication can be found in OnColor help. This topic is found by selecting the help drop down menu, index, and finally select the topic "establishing communication with a spectrophotometer."

Demo mode is the default mode when no instrument is connected to the software. Always insure that the proper instrument communication is established. The instrument type currently active is displayed in the bottom right corner of the OnColor program.

Instrument Calibration:

Quick Steps:

Type the letter "C" and the instrument settings text box will appear.

Make sure the default settings are selecting the calibration parameters you want.

Simply type the letter "C" again and the software will ask you to perform a zero or black calibration.

If your instrument is equipped with a black trap position the trap over the instrument port and hit ok.

The software will then ask you to perform a white calibration. Position your white tile over the instrument port and hit ok.

The software will give a successful calibration message.

Hints and Reminders:

The instrument settings allows a user to change the area of view, Specular component, and # of flashes per measurement.

For a detailed description of the Instrument settings options look under the help Index and selecting the following

Instrument Settings:

Quick Steps:

1. Go to Options → Instrument Settings.
2. A dialog box similar to the one at the right will allow you to change the set-up conditions for your instrument. Not all options are available for all instruments.
3. Select the conditions for measurement and then click OK or click on Calibrate to proceed with the calibration procedure.

```
Instrument Settings                                          [x]

 Status   Edit

   Calibrate...          Demo Mode                 Load...
                   Current Status:  CREILL
                   New Status:      CREILL         Save...

                                                   Transfer

 -Flashes-----------  -Calibration Mode--------  -Specular Component--
   Per Measurement:     (•) Reflectance (%R)        ( ) Included (SCI)

                        ( ) 100 % Line (%R)         (•) Excluded (SCE)
      [1] [▲▼]
                        ( ) Transmittance (%T)      ( ) Both (SCI, SCE)

 -UV Energy---------  -Area View Lens----------  -Area View Mask-----
   (•) Included (100%)   ( ) Extra Large (XLAV)     ( ) Extra Large

   ( ) Excluded (0%)     (•) Large (LAV)            (•) Large

                         ( ) Medium (MAV)           ( ) Medium
   ( ) Partial
                         ( ) Small (SAV)            ( ) Small

      % [    ] [▲▼]      ( ) Very Small (VSAV)      ( ) Very Small

                         ( ) Ultra Small (UVSAV)    ( ) Ultra Small

                                                    ( ) Petri Dish


         [ OK ]      [ Cancel ]     [ Apply ]     [ Help ]
```

Hints and Reminders:

1. An Instrument status code appears in the lower right corner of the screen. It is composed of three boxes; in the left and right boxes you will find a 6-letter code. The code in the left box refers to the instrument conditions under which the current standard was measured. The code in the right box refers to the current conditions of the instrument. In the center box the instrument model appears. If the instrument is set to Demo Mode, then the computer is NOT communicating with an instrument and you need to go to Options → Communications to establish communications with your instrument.

Instrument Status Codes

Position	Letter	Meaning
1	B	100% Line Calibration
	C	Ceramic Calibration
	H	Hitch Calibration
	K	Keyboard Input
	L	Low Illumination Calibration
	X	Not Calibrated
2	R	% Reflectance
	T	% Transmission
	P	Profiled Data
3	I	Specular Component Included (Gloss Included or SCI)
	E	Specular Component Excluded (Gloss Excluded or SCE)
	B	Both SCI and SCE
4	A	Extra Filter
	E	UV Component Excluded
	F	UV Component Excluded w/420nm Cutoff
	G	UV Component Excluded w/400nm Cutoff
	I	UV Component Included
	P	Partial UV
	Q	Partial UV w/420nm Cutoff
	R	Partial UV w/400nm Cutoff
	J	No UV w/460 nm Cutoff
5	X	Extra Large Aperture lens setting (XLAV)
	L	Large Aperture lens setting (LAV)
	M	Medium Aperture lens setting (MAV)
	S	Small Aperture lens setting (SAV)
	V	Very Small Aperture lens setting (VSAV)
	U	Ultra Small Aperture lens setting (VSAV)
6	X	Extra Large Area of View mask (XLAV)
	L	Large Area of View mask (LAV)
	M	Medium Area of View mask (MAV)
	S	Small Area of View mask (SAV)
	V	Very Small Area of View mask (VSAV)
	U	Ultra Small Aperture lens setting (USAV)
	P	Petri Dish Accessory (CM-3500d only)

Hints and Reminders:

When recalling a standard always check the instrument status box to the left of your instrument type; this displays the instrument status originally used to measure the standard.
Always compare a standard to a trial with the same instrument status.

Tool bar icon descriptions:

The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in OnColor and Colorant Analysis.

File Standard Trial Match Correct Report Options View Window Help
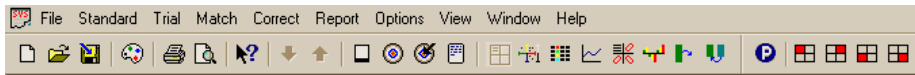
Icon descriptions: (listed left to right)

Open a new data file.
Open an existing data file.
Save the active data file.
Opens print dialog box.
Print preview the active data file.
Context sensitive help.
Show the next trial.
Show the previous trial.
Calibrate.
Measure Standard.
Measure Trial.
Show the notes for the current standard.
User Report screen.*
Color Plot Report.
Data Table Report *
Spectral Plot Report. &
Tolerance Plot Report *
Statistics Report *
Change the report properties.

* These features are not available with the Lite version of OnColorQC.
& These features are not available with the Colorimeter version of OnColorQC.

Hints and Reminders:
Drag the mouse on top of an icon and a label will be displayed with a brief description of the icon.
Further descriptions of the toolbar options can be displayed in help. Select the index option and type in the word
    toolbar and display the help file regarding the toolbar.

Report Screens:

OnColoQC offers the user six different "Report Screens" or views selectable from the toolbar. These reports offer a wide variety of display options and can be customized by selecting the property icon and defining conditions in the text box that is displayed. The six screen views are:
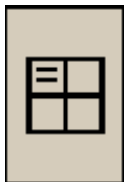
User Screen :   The user-defined report screen is the default screen that appears when the program is accessed. It divides the screen into four quadrants, and each of the quadrants can be customized using the properties icon.
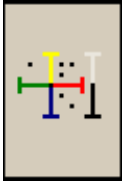
Color Plot : This screen displays a plot of the active datafile in a color space. The user has the option to change color space equations, scale, trial markers, etc.
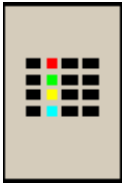
Data Table: _This screen displays a spreadsheet-like table of the colorimetric and color difference data. Color patches, assessments, indices, and job tags can be included.
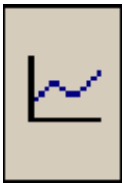
Spectral Plot: This screen view displays the active datafile's standard and trial reflectance data. As with all the screen views the user can manipulate the screen by selecting the properties button on the toolbar.

Tolerance plot : This screen view displays a graphical representation of the numerical values which define a range of color variation between samples which is considered acceptable.

Statistics plot: This screen is a histogram of the active datafile with multiple graphs displaying colormetric values such; delta L, delta A, and delta B.

Hints and Reminders:
All of the screen views are selectable from the toolbar.
The user can customize the active screen view by selecting the property button on the tool bar.
A detailed description of the customizable options available for each screen view can be found in the help index.

OnColor Help:

OnColor contains a online help file that is extremely extensive and covers a wide range of topics and information. The help file can also be found as a word document in the \OnColor\Documentation folder on your hard drive or on the OnColor CD. The online help can be accessed from the help drop menu.   Additional documentation is also found in the \OnColor\Documentation folder.

Hints and Reminders :
For directions on using the help select the option using help found under the help drop menu.
OnColor help offers detailed step by step outlines of almost every function in the OnColor program.

Using the OnColor Database of Standards

A very powerful feature of OnColor is the Database of Standards. This option is used to store reflectance data and tolerances for standards and formulas.   You will have the ability to: Search for closest match, Recall Standard, Recall Trial, as well as to "filter" your searches or recalls for a particular "system". The Database of Standards is stored as a Microsoft Access MDB file. This file type is ODBC compatible and can be read using MS Access. This file structure is very useful for networked applications and for viewing data in real time. The most difficult task in OnColor is creating this database. Following exactly the steps below will get you through this process quickly. Using the database for storing, recalling, and searching is easy from there.

To Create a new Database of Standards:
1. Select **File** , then **Database of Standard** or type the shortcut key "D". When selected it may take several seconds to load the current file. The first screen is the Transfer Tab. This lists the current database loaded, the records stored in the database, the current SaveSet and the standard and trial(s) in the Save Set. The Search Tab is used set the parameters for the search routine.
2. Select the **<Open>** button. This puts you in the Select Data Source window. Stay in the File Data Source tab. Select what directory you wish to store the new file. Go into "Look in" and bring up the directory name. Click on the **New** button.
3. The next window is Create New Data Source. The Microsoft Access driver (*.mdb) should be highlighted, click on **<Next>.**
4. The next window is still Create New Data Source. This is where you **type in the name** of the link (*.dsn) you want designated. Click on **<Next>.**
5. The next window tells you that you just created the filename (which is your *.dsn file). Click on **<Finish>.**

Now we will begin to build the database file (*.mdb).

6. The next box to pop up is the ODBC Microsoft Access Setup. In the Database section, click on **<Create>.**

7. This command puts you in the New Database window. Make sure you are in the right directory. Under Database Name, **type in the name** of your database (*.mdb), and click on **<OK>.**

8. The next dialogue box should say the Database C:\CyberChrome Color Systems\Wmatch*.mdb was successfully created. You will click on **<OK>.**

9. Click **<OK>** again to exit out of ODBC Microsoft Access Setup.

10. In Select Data Source window you will see the *.dsn file in the main box. Click on the newly **created *.dsn file** . The name will appear in the DSN Name box. Select **<OK>** again.

11. In the next window you have the option to select what additional data you want to store in the database. Click on **Tolerances** to save the pass/fail tolerance criteria for each standard; click on **Formula Data** to save formulas (colorants and amounts) for each standard; or click on **Delta Data** to save color difference data, assessments, indices and pass/fail rating. Any combination of these three can be selected. The option must be selected at this time and cannot be added later. The more options selected, the larger the database will be. The Formula Data option is available only on matching packages. Click **<OK>** to continue.

12. The database will load. This may take a few seconds. After the database has been loaded, you will see the file you created listed under Current Database. When you **click on <OK** >, the database window will close but the database remains the active one and is noted on the Status Bar in OnColor.

13. You can now transfer reflectance data to the database from any of the active save-sets by clicking on the standard or trial and then clicking on the left arrows.

14. After making color matches and you wish to store the formula into the database, Select Match on the menu bar, then click on Save Formula. The current formula will be stored in the new database (*.mdb) you just made. Note: any formula saved will always be stored in the last or current database in Database of Standards.

To Open an existing Database of Standards:

1. **Select File and Database of Standards** . When selected it may take several seconds to load into the option. The first screen is the **Transfer Tab** . This lists the current database loaded, the records stored in the database, the current Save Set and the standard and trial(s) in the Save Set. The **Search Tab** is used set the parameters for the search routine.

2. Select the <**Open** > button. This puts you in the Select Data Source window. Stay in the File Data Source tab. Select which directory where the (*.dsn) file is located. Go into "Look in" and bring up the directory name. Click one time on the desired *.dsn file. The name will appear in the DSN Name box. Select the <**OK** > button to load the database. This may take a few seconds.

3. After the database has been loaded, you will see the file you created listed under Current Database. When you click on <**OK** >, the database will close. You are ready to store reflectance data or the match formulas in the current *.mdb file.

4. The name of the current Database of Standards in shown in the Status Bar in the lower right portion of the screen (next to the name of the current Property file).

To store and recall data into the Database of Standards:

1. Go to **File** , then **Database of Standards** , or use the hot key "**D** ".

2. On the right side of the Transfer window are listed the standard and trials in the current save-set (WSV file). Use the left and right pointing arrows to copy records from one file to the other. The procedure works both ways.

3. You can also recall something from the Database using the menu commands **Standard → Recall** or **Trial → Recall** .

4. Similarly, you can save a sample to the Database using the menu commands **Standard → Save** or **Trial →**

Save .

To Search the Database of Standards:
1. Open a new save-set and measure the target color to be searched for as a Standard.
2. Click on **Trial → Search** . The program searches the database for the "n" closest shades that are within a certain DE as specified in the **Search Tab** of the Database of Standards. For example, the program returns the 5 closest shades that are less than 10DE from the Standard. They are reported as Trials in order from lowest DE to highest DE. The criteria for the Search are set in the **Database of Standards → Search Tab.** If "**Database Filtering** " is checked to **ON** , then the list of records in the database will be filtered accordingly. In order to use filtering, you must either have the Alternate Name field and/or System fields populated. The System field is generally set-up to indicate the product line, but it could also be used to enter the customer or any other criteria that is useful to search on.
3. Alternately, you can go to **File** , then **Database of Standards** , or use the hot key "**D"** .
4. Click on the **Search** button. The program searches the database for the "n" closest matches to the Standard in the current save-set, same as indicated above.

To Use Database Filtering:
1. The Database can be "filtered" according to the Alternate Name, System, or date and time. The date and time of measurement is always tagged with each reading. The Alternate Name and System are fields that must be input at measurement time or else edited later.
2. "Systems" are entered by going **to File → List Management** and then selecting **the List of Systems Tab** . You can Add, Edit, or Delete system names here. Same for Jog Labels, although you can't use job labels to filter the database.
3. If you have populated at least some of the records in the Database of Standards with Alternate Names or Systems, then you can turn on "filtering" on either the Transfer tab or the Filter tab in the Database of Standards window. You can also turn on or off filtering when you do **Standard → Recall** or **Trial → Recall** .
4. When "Filtering" is turned on, then only those records that meet the filter criteria will be listed or searched.

To Recall a Standard with a Stored Formula:
1. If you have the Matching version of OnColor, then formulas can also be stored with each Standard in the Database of Standards. A formula is stored in the database by going to **Match → Save Formula** after doing a match. The current formula displayed on the screen is saved. This can come from a combinatorial match, a single match, manual match, or the New Formula after a batch correction.
2. To recall a Standard with a Stored Formula, first you must be certain that the proper colorant file (.CLR) is the current active file. The easy way to do this is to recall a PRP file that references this CLR file. Then go to **Standard → Recall** and choose the desired standard from the list. If a formula exists for this standard and the correct colorant file is active, then the formula is recalled along with the Standard color data. If the correct colorant file is not open on the active save-set, then the Standard color data is recalled without a formula.

Saving the Trial Delta Data to the Database of Standards
1. If the option to save Trial Delta Data was selected when the current database of standards was created, then an additional table exists in the MS Access MDB file where color difference data, assessments, pass/fail, and indices are stored. See step 11 above in Creating a New Database of Standards. This data is stored for as an output table only. This data cannot be recalled with OnColor because it is dependent on what standard was active at the time the trial data was saved.
2. The purpose of this additional table is to provide for real time report generation using the ODBC capability of the Access database. Anyone on a network can view this Access MDB file in real time to query the database. They do not need to have an OnColor license to do this. Management and production reports

can be generated from this file on a real time or as needed basis.

3. To save the trial color difference data to the Access Database of Standards, click on **Trial → Save** or use the **Database of Standards Transfer window** to move a group of trials to the database. When using the **Trial → Save** option, the current trial is copied to the current database along with its color difference data for three illuminants, job ID's, assessments, pass/fail, and indices. The name of the current Standard is also stored with this record.

4. The Trial data can be recalled into either the Standard or Trial position. This will recall the %R data, but it will not recall the stored delta data since this is calculated based on the active standard. The Trial Delta data can only be read using MS Access.

Menu Options:

The following sections give a brief overview of all of the other Menu options available in OnColorQC. For a detailed description of how to use these features, go to the complete OnColor Manual found on your installation CD or your hard drive. The file name is:
OnColor Manual V5x.doc

The <u>File</u> Menu offers the following commands:

New	Opens a New *.WSV saveset file or *.CLR database file
Open	Opens an Existing *.WSV saveset file or *.CLR database file
Close	Closes the Active *.WSV saveset file
Save	Saves the active *.WSV data file using its current name and path
Save as	Saves the active *.WSV data file to a specific file name and path
Workspace	Pop-up menu with Workspace Options
Database of	Section where the formulas are stored
Copy to	Copies all records in the current WSV file to the current Database of Standards
List Management	Create and edit the lists for Systems and Job ID's
Security	Password protected files for managers and workers
Spreadsheet.	Export the current data to a spreadsheet format
Send Mail	Sends the active file using E-Mail
Print	Prints a report of the current data
Print Preview	Displays the report of the data on the screen, as it would appear printed
Page Setup	Sets the margins and font for the printout
Print Setup	Selects a printer and printer connection
Print Label	Selects a label template and prints a label on a Dymo Label printer
Exit	Exits OnColor
Recent Files	-1, -2, -3, -4 Opens the most recent WSV files listed

The <u>Standard</u> Menu offers the following commands:

Measure	Measures the standard with the instrument
Average	Averages a number of scans to comprise one standard measurement.
Keyboard	Input of standard values via the keyboard.
Edit	Edits the standard name, % reflectance and colorimetric data.
Null	Enters a null standard
Save	Saves the current Standard to the current Database of Standards
Recall	Recalls a Standard from the current database.
Most Popular	Polls all trials to determine which standard they are closest to in a multi-standards file
Utilities	Options to copy, delete, find, select/deselect, and sort the standard data
Download	Downloads the current standard into the portable instrument
Upload	Uploads target and/or trials from the portable instrument.
Switch	Exchange standard with current trial position.
Average	Trials Average all trials to replace current standard.
Auto Naming	Toggles auto naming of the trials on/off
Position	Enable/disable use of sample previewing mirror with CM-3500 before measurement.
Multi Standards	Mode allows for multiple standards to be managed in a save-set (WSL file)
Multiple Standards	Selects the standard to be used for display purposes
Hitch Mode	
Hitch Management	
Naming Options	Naming options for standard name.

The <u>Trial</u> menu offers the following commands:

Measure	Measure a trial with the instrument.
Average	Average a number of scans to comprise one trial measurement.
Keyboard	Input of trial values via the keyboard.
Edit	Edit the trial name, % reflectance and colorimetric data.
Measure from File	
Measure Loop	
Save	
Recall	Recalls a trial from the current database
Search.	Search for closest match to standard from database of standards.
Utilities	Options to copy, delete, find, select/deselect, and sort the trial data
Auto Naming	Toggles auto naming of the trials on/off
Insert Mode	Inserts the next trial in this position.
Position	Enable/disable the use of the sample previewing mirror with the CM-3500 before measurement.
Auto-Select Standard	Search for closest standard within all opened save sets.
Auto_Save	Automatically saves a measured trial to an existing file.
Naming Options	Naming options for trial name.

The <u>Report</u> menu offers the following commands:

User Defined	Displays the user defined screen.
Color Plot	Displays the color plot screen.
Data Table	Displays the data table screen
Spectral Plot	Displays the spectral plot screen.
Tolerance Plots	Displays the tolerance plot screen.
Statistical Charts	Displays the statistical charts screen.
Formulation	
Batch Correction	
Print QC Label	
Print Formula Label	
Print Correction Label	
Properties	Change the properties (screen layout) for the active report.
Save Properties As	Save all report properties (screen layouts) and current options for later recall.
Recall Properties	Recalls a PRP or property files and sets all report properties (screen layouts) according to this template

The <u>Options</u> menu offers the following commands:

Macro	Macros are used to perform a series of operations in one keystroke.
Averaging	Pre-select a fixed number of measurements to average or set the minimum and maximum number to average, or set a fixed time between measurements.
Tolerances	Select to view or edit box tolerance, elliptical tolerance, or for PASS/FAIL assessment.
555 Block Sizes	Select to do shade sorting.
Observer / Illuminants	Select illuminants and observer.
Color Space	Select the color space shown on output.
Indices	Select which indices are displayed.
Adjusted Strength	
Laminate Offset	
Opacity / Reflectivity	Performs opacity/reflectivity measurement.
Haze / diffuse Transmittance	Performs haze calibration and haze measurement.
Measure Background	Changes the white and black background when using Haze or Opacity options.
Gloss Correction	Applies a gloss correction to each measurement that is taken
Calibration	Calibrates the instrument
Instrument Settings	Selects the SCI/SCE; aperture and mask; UV energy settings, etc.
Calibration Interval	Select to enter in the time interval for instrument calibration.
Remote Measurement	Waits for the Measure Button to be triggered on a portable instrument rather than via the PC
Communications	Change or test instrument communication
Profile Settings	

The <u>View</u> Menu provides the following options:

Toolbar	Show or hide the toolbar.
Status Bar	Show or hide the status bar.
Keyboard Shortcuts	Create shortcut keys that accesses menu commands.
Default Directories	Displays the file type and directory path as selected.
Logo File	
Select Font	Select the display font.
Select Colors	Select display colors.
Calibrate Color Patches	Select to calibrate the color patches on screen.
Go to Colorant Analysis	Jump to the Colorant Analysis screen
Previous Standard	Scroll to display values for previous Standard in a multi-standards file
Next Standard	Scroll to display the data for the Next Standard in a multi-standards file
Previous Trial	Scroll to display values for previous trial.
Next Trial	Scroll forward to display values for next trial.
Display Notes	Displays the notes associated with the Standard and Trials.
Zoom	Uses the zoom feature to zoom in, zoom out, or return to the default position on graphs

The <u>Window</u> menu offers the following commands:

New Window	Creates a new window that views the same document. Use this command to display more than one report screen at a time.
Cascade	Arranges windows in an overlapped fashion.
Tile	Arranges windows in non-overlapped tiles.
Arrange Icons	Arranges icons of closed windows.
Recents	Selects the window to become active in the foreground.

The <u>Help</u> menu offers the following commands:

Contents	Table of Contents for Help topics
Index	Offers you an index to topics on which you can get help.
Search	Searches on keywords
About	Displays the version number of this application.
CyberChrome On the Web	Provides a link to the CyberChrome web site for sales, support, and other services options

OnColor Match - Quick Start Instructions

A complete OnColor User's manual is included on your installation CD. It was copied to your hard drive during installation of the software. Look for the MS Word document called "OnColor Manual v5x.doc". The latest feature additions are described in the document called "Release Notes.doc".

This manual is a supplement to the OnColor QC Quick Start Guide and covers the additional features of Color-Matching and Batch Correction. Please read the QC Guide before beginning here.

OnColor Match Overview

When launching OnColor Match Gold, you will see three additional icons on your toolbar for the formulation options. The Menu bar and Tool bar will look similar to this:
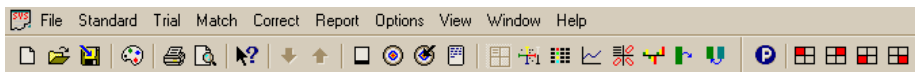
The additional icons are for the following Report Screens:

Colorant Characterization Report
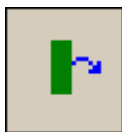
Match Report
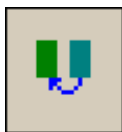
Batch Correction Report

_____
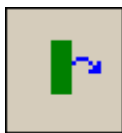
Color-Matching

1. Before doing a computer color-match you must have a colorant file (CLR) loaded. The CLR file contains the data on your colorants, pigments, or dyes as characterized in your product. If you do not have a colorant file, then you must either load one or obtain one from a master source (such as your supplier, your R&D or technical department, etc.)
2. After you have your colorant file loaded and/or stored on your computer, you should set up a Report Property file (.PRP) that calls up this colorant file and selects the other matching parameters. Go to the Match Report   or configure the User screen to have the Match Report in one of the quadrants. Several matching .PRP files are included with OnColor. Pick the one closest to your application (such as COATINGS.PRP, PLASTICS.PRP, TEXTILES.PRP, etc) and use it as a template to customize it for your colorant file and your application parameters.
3. To configure the Matching parameters, double-click in the Match Report to bring up the Formulation Properties dialog box. The Style tab controls the type of information displayed on the screen. The Select tab allows you to pre-select a colorant file (CLR) and the colorants you want to use for matching; and the Numeric tab allows you to enter the Batch Size, units of weight or volume, math type, number of colorants in the match, and the DE limits for the matches. Enter your desired application parameters to customize it for your needs.
4. After selecting all of these matching parameters, save these settings as a Report Property file (PRP). To do this, click on Report → Save Properties As, and then select a path and filename. If you save this as your STARTUP.PRP file, then these will be the default settings whenever you launch the program.

3 Easy Steps to Do a Color Match

1. Recall the Report Property file that contains the matching parameters that you want to use if it is not already active.
2. Type "S" to measure the color to be matched into the Standard position or recall it from a file.
3. Type "M" to do a combinatorial match.
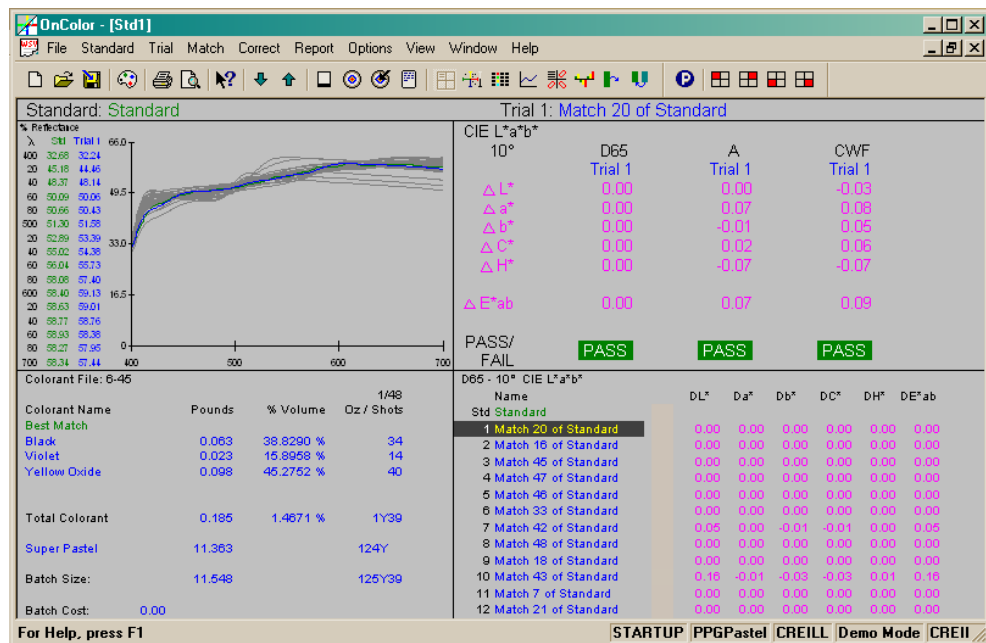
All possible matches that meet the match criteria are sorted by a weighted DE and displayed. The Best Match is shown as Trial #1. The second best match is shown as Trial #2, etc. Use the ↑ and ↓ arrow keys to scroll through the possible matches.

TIP: Right click in the Match quadrant to display a shortcut menu where you can: Sort the matches by cost; Sort them by DE; Save the Formula to the Database of Standards; or change the Match Report Properties.

Select the match that best meets your criteria of metamerism, cost, and pigment selection. Save the formula to the Database of Standards (Match → Save Formula or right click in the Match quadrant) for easy recall at a later time in case you need to do a color correction to this match. A typical user screen showing the results of a match prediction is shown here.
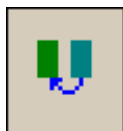
Batch Correction

OnColor contains powerful color correction routines that help you correct the color of a laboratory hit or production batch. Just as with the Matching options, it is advisable to set up a Report Property file specifically for doing batch correction. This PRP file would pre-select the colorant file, batch type, and numerical match parameters for the correction, allowing you to recall all of these setting with a single mouse click. Go to the Batch Correction Report or configure the User screen to have the Batch Correction Report in one of the quadrants.

4 Quick Steps to Do a Batch Correction

1. Recall the Batch Correction Report Property file (PRP) that you created.
2. Recall the Standard from the Database of Standards (Standard → Recall, then select it from the list). This will also recall the colorants and the formula if you stored it. If you did not store the standard, measure it now.
3. Measure the batch to be corrected as a Trial by typing "T" on the keyboard.
4. If you recalled the formula along with the Standard from the database, then type "B" to perform the batch correction. If you did not store the first hit in the database, then go to Correct → Input Batch Amounts and enter the amounts for each colorant.
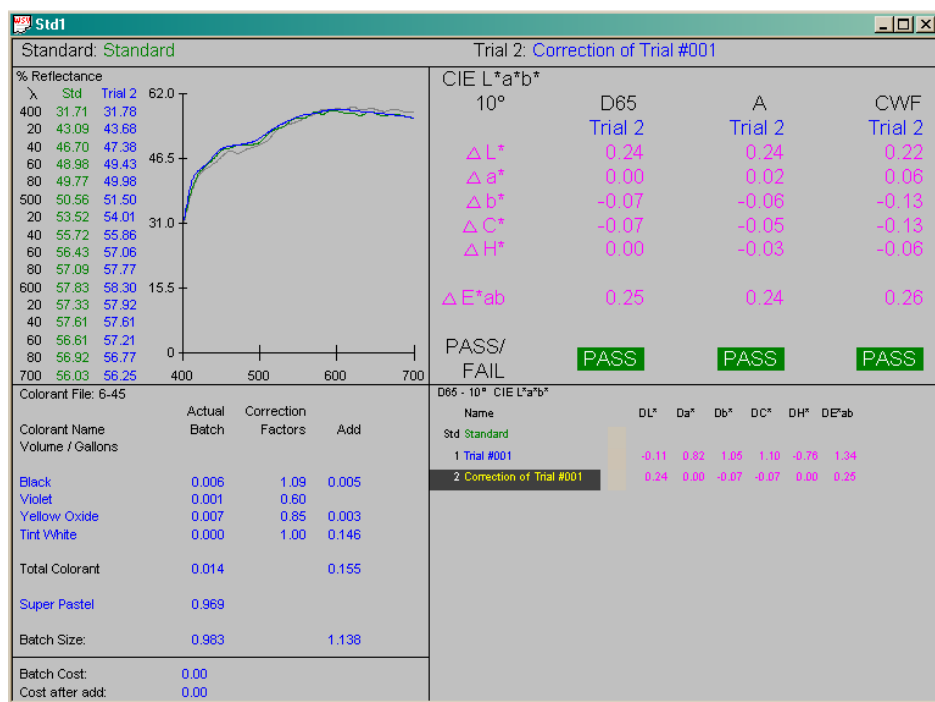
The "Add" to be made to the batch is shown in the Batch Correction Report along with the starting formula and the final formula after the add is made. Depending on the parameters chosen, correction factors and the % change to each colorant are displayed. Changes to the output to this screen made on the Style tab of the Batch Correction Report dialog box. You can easily change these properties by double-clicking in the Batch Correction quadrant and going to the Style tab.

The "New Formula" (the way to make the corrected color from scratch or reformulation of this color) is displayed in the Match Report. A typical User Screen showing the Batch Correction Report and the New Formula is shown here.

Other Batch Correction Options
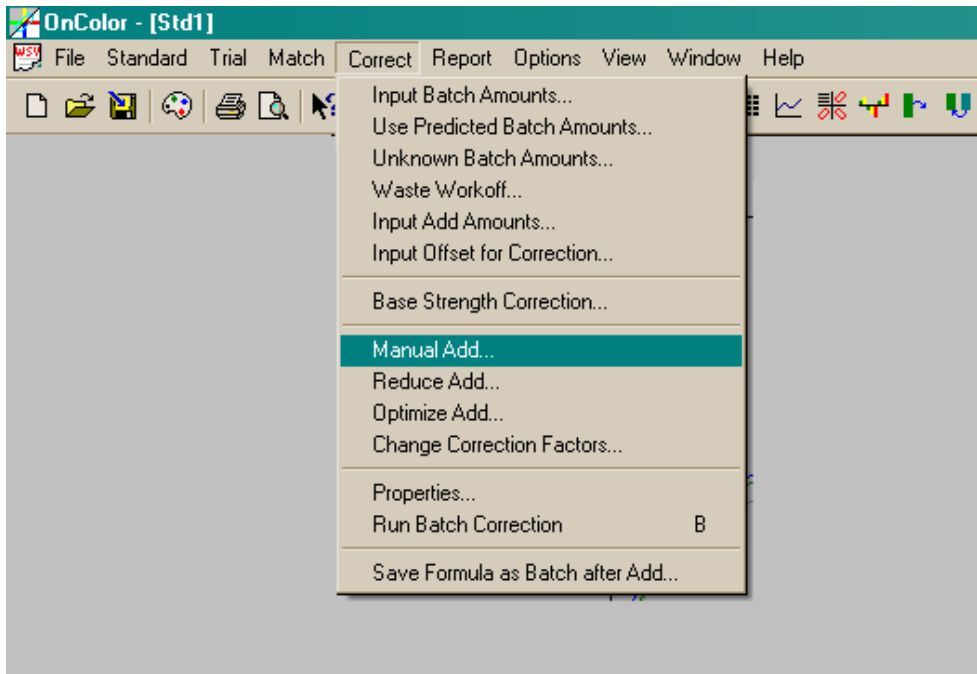
TIP: Right click in the Batch Correction quadrant to get this short-cut menu of options for manipulating the add and calculating alternative corrections.

Under the Batch Correction Menu you will find additional post-processing options to:

1. Save the Formula after the add - This will store the Standard color along with the batch formula after the add to the Database of Standards. If you need to do another correction, recalling this information will load the correct colorants and current amounts in the batch into the correction routine.

2. Manual Add - allows the operator to zero out the automatic computer add and then enter his idea on amounts to be added to correct the batch. The color difference data is displayed for the new proposed correction. One or more colorants can be added at the same time.

    a. If you want to do a Manual Add, click on Correct → Manual Add or use the right click in the correction quadrant to access the shortcut menu.

    b. Use the Zero Add button to set all of the add amounts to 0.0.

    c. Enter the amounts that you want to use and click on APPLY to see the change in the DE. Click OK when you are satisfied with your add.

3. Reduce Add - asks the correction routine to find a minimum add to get to an offset DE. The operator selects a DE greater than zero and the software will attempt to add the minimum amount of colorant to get to this DE. The automatic correction routine always attempts to adjust the batch to zero DE.

4. Optimize Add - provides an option to see if the batch can be corrected to an acceptable DE by adding the "optimal" amount of one colorant. The operator zeros out the automatic computer add and then selects a colorant that he thinks will correct the batch. The computer then predicts the optimal add of that colorant along with the resulting DE. The operator can use this feature in succession with more than one colorant.

    a. If you want to Optimize the Add, click on Correct → Optimize Add or right click in the Correction

quadrant and select Optimize Add.
   b. Click on "Zero Adds" button and note that all adds were set to zero and the DE returns to the original numbers (or very close).
   c. Click into the Add Amount column for the colorant that you want to Optimize, then click RUN. See the effects on the DE on the screen.
   d. If you want to Optimize another colorant, click into the add amount column for that colorant and hit Run again or you can Zero the Adds and start over again.
5. Change Correction Factors - allows the operator to change the correction factors that are applied to the add. This alternate correction factors can come from known strength information or from other successful adds.
6. How to Add a Colorant to the Batch for Manual Add: Follow these steps to add a fourth colorant to the batch for the purpose of making a manual add.
   1. Do a Batch Correction with 3 colorants
   2. Get your answer displayed on the screen, then double click in the Correct quadrant to bring up your Batch Correction Properties.
   3. Go to the Manual tab and then select the Manual Add option.
   4. Change the # of colorants to 4.
   5. Select the 4th colorant using the drop down list. This will be in the next to last slot. Remember that the White must be in the last slot.
   6. Your add amounts in the boxes should equal the add amounts that are on the screen.
   7. If you want to zero out the existing add, do it now.
   8. Then, enter the desired add amount of the 4th colorant and hit Apply to see the effect on the DE.

Loading a Colorant Database

Detailed steps for characterizing a colorant database are given according to application type in the full OnColor manual. Recommendations for the proper samples to prepare can also be found here. The scope of this topic is too lengthy for this Quick Start Guide. Please consult the full manual for these instructions or contact your OnColor applications expert to help you.

Default Directories for Data Files in OnColor

New Path for OnColor Data Files - *Starting with Version 5.4.1 of OnColor*, the default path for where data files are stored was changed to conform to Windows OS recommendations and standards. New security features in Windows Vista require this change so that no data or temporary files get written into the \Program Files folder. New installations will use the new default directories while upgrades from a previous version will maintain the current paths for the data files. Go to ViewàDefault Directories to view the current settings.

New Installations - With a new installation of OnColor V5.4.1 or higher, these will be the default directories for data files:

The default folders for "Temp files / Security.dat / Accel key / calibration data files (not CM-3600/3300/2600)":

Vista & Windows 7:   \Users\<user>\AppData\Local\CyberChrome\OnColor

Win2000 & XP: \Documents and Settings\<user>\Local Settings\Application Data\CyberChrome\OnColor

NOTE: putting the calibration files here is new. These would be WHITES*.DAT for the DataColor SpectraFlash instruments (all those that read the white cal data from WHITESI.DAT and WHITESE.DAT). For Konica Minolta instruments CM-3600/3300/2600/2500, the calibration files must remain under the .EXE folder under \Program Files
NOTE: For Vista the folder "\Users\<user>\AppData" may be hidden. To unhide it, go to Control Panel, double click Folder Options, select the View tab, click on "Show Hidden files and folders", click OK.

The default folders for Color Data (all WSV, PRP, MDB, CLR, etc) :

Vista & Windows 7:   \Users\<user>\Documents\CyberChrome\OnColor

Win2000 & XP: \Documents and Settings\<user>\My Documents\CyberChrome\OnColor

NOTE: the folders \Demo Files, \Documentation, and \Dymo Labels are now installed here.

Upgrades of existing installations -   For compatibility, upgrade installs will use the current default folders set in ViewàDefault Directories, as well as the exe folder as before. NOTE: Uninstalling an old version will NOT remove the default directory setting. This is stored in the Windows registry. Thus, the only way to make an upgrade conform to the new default folders is to change them in ViewàDirectories.

Customers running Vista or Windows 7 should never write data to the Program Files sub-folders.

Navigation

Use the ↓ and ↑ arrow keys on the keyboard or on the toolbar to scroll through the different Trials.

Right click on any screen to bring up a shortcut menu for the most common options. On the QC Report screens, this includes these options:

On the Color Plot or Spectral Plot report screens you can use the Zoom features to zoom in or out on any portion of the graph.

Display the name of any Standard or Trial by gliding the mouse over that point.

Double click on any data point to bring up the Edit dialog box where you can change it.

Double click on any graph to bring up the change Properties dialog box where you can configure the type of data that you want to display.

All of these options are also available via the Menu options.

Double Click here to invoke the Properties Dialog Box
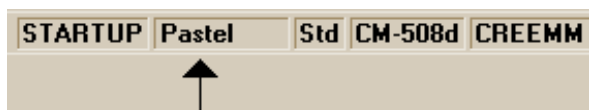
Double Click here to invoke the Database of Standards Dialog Box
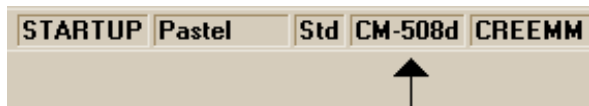
Double Click here to invoke the Communications Parameters Dialog Box

STARTUP | Pastel | Std | CM-508d | CREEMM

Double Click here to invoke the [Instrument Settings Dialog box](#)

Notes on OnColor Hardlock Network Key Installation

The Hardlock network key can be physically installed on any workstation on your network.   It does not need to be a server computer.   The HL-Server service must be installed on the workstation that has the Hardlock network key. HL-Server service only needs to be installed on the workstation that has the Hardlock network key. HL-Driver will be installed on any workstation that has OnColor installed, as installing HL-Driver is part of the OnColor install. OnColor does not need to be installed on the Hardlock server, though it can if the HL-Server computer will also function as a workstation to run OnColor.

HL-Server Installation:
The HLSW32 program can be downloaded from Aladdin's web site. The address of the download is: <http://www.aladdin.com/support/hardlock/downloads.asp>. The file to download is: hlsw32_inst.zip. This is a ZIP file which contains the executable file HLSW32.exe. Run the HLSW32.exe program to install the HL-Server service on your computer. You must have administrator privileges to install this service.   Once this service is running, you should be able to logon to OnColor from any computer connected to your network as long as a license to do so is available.

HL-Server Administration:
A very useful monitor can also be downloaded from the Aladdin site. The download address is the same as above, but the file to download is aksmon.zip. This is a ZIP file which contains the executable aksmon32.exe. Run this program to install the AKS monitor program. Run the AKS Monitor program to view how many users are logged on to the system and how many licenses are available at any time.

Inactivity Timeout:
The default timeout is set to 15 minutes at installation. That means that if OnColor is not used (mouse clicked or any key pressed) at a given workstation for 15 minutes, the key will "time-out" for this location and access will be lost. Each time the mouse is clicked or any key is pressed, the time-out is reset to the default value. If it times out, to regain access, the user needs to re-launch the program. To change this default timeout, use the following procedures:

NOTE: For any of the following, you must have the network privilege to change things. Usually this requires logging on as the network administrator. Please use care in editing registers.

> Under the Start Button, select "Run…". Enter REGEDT32 to edit the registry.
> Find the following registry entry:
> > \HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\HLServer
> Select the Timeout key. That will bring up a DWORD Editor, choose Radix: Decimal and enter the number of minutes of inactivity you wish to wait before releasing the license. For maximum timeout, enter 9999 as the data for this key. Exit the registry editor. The value will show up as 0x270F (the hexadecimal equivalent of 9999) on the screen.
> This will set the timeout for the Hardlock to 9999 minutes (166.65 hours or 6.94375 days). This is the maximum value accepted for the timeout by the HLSERVER program.
> Close the registry editor and restart the service or reboot the computer for the HL-Server to use this new timeout value.

Technical Support:
Aladdin has good documentation on their site if you have specific problems installing HL-Server and AKS Monitor. If you think your problem is related to the OnColor software, please contact your service representative.

New command (File menu)

Use this command to create a new Save Set file. This command opens a new, empty data window.

If you have the colorant analysis option, you can also create a new Colorant file using this command. In that case, you will be presented with a New dialog box from which you can select the type of file you want to open -- Save Set or Colorant Analysis file.

You can open an existing data file with the Open command.

Shortcuts

Toolbar:
Keys: CTRL+N

Open command (File menu)

You can open an existing file with this command.   When you execute this command, the Open dialog box is displayed so you can select the file you wish to open.

Shortcuts

Toolbar:
Keys: CTRL+O

Close command (File menu)

Use this command to close all windows belonging to the active file. If the file has been changed, you will be asked if you want to save changes. If you don't save changes, you will lose all changes made since the last time the file was saved. Before closing an untitled document, the Save As dialog box is displayed so that you can name the data file.

You can also close a document by using the Close icon on the document's window, as shown below:

Save command (File menu)

Use this command to save the active file to its current name and directory. When you save a document for the first time, the <u>Save As dialog box</u> is displayed so you can name your document. If you want to change the name and directory of an existing document before you save it, choose the <u>Save As command</u>.

Shortcuts
        Keys: CTRL+S

Save As command (File menu)

Use this command to save and name the active file. The Save As dialog box is displayed so you can name or rename your file.

To save a file with its existing name and directory, use the Save command.

Shortcuts

Toolbar:

Open command (Workspace menu)

Use this command to open a Workspace. On executing this command the user will get the [Open Workspace Dialog Box](#)

Close command (Workspace menu)

Use this command to close the active Workspace.

Save command (Workspace menu)

Use this command to save the active workspace to its current name and directory. When you save a workspace for the first time, the Save As dialog box is displayed so you can name your workspace. If you want to change the name and directory of an existing workspace before you save it, choose the Save As command.

Save As command (Workspace menu)

Use this command to save and name the active workspace. The Save Workspace dialog box is displayed so you can name or rename your file.

To save a file with its existing name and directory, use the Save command.

Recent Workspace command (Workspace menu)

Use the numbers and filenames listed at the bottom of the Workspace menu to open the last 10 files you closed. Choose the number that corresponds with the file you want to open. If you select the Workspaces... command the Open Workspace dialog will be presented.

Database of Standards (File menu)

Stores all reflectance and colorimetric data in a database. Tolerances, color difference formulation and illuminants can also be stored.

In the Transfer Tab, click [MANAGE]

In the User DSN Tab, click [ADD]

In the "Create New Data Source" dialog, select "Microsoft Access Driver (*.mdb)" and click [FINISH]

In the "ODBC Microsoft Access Setup" dialog, enter a Data Source Name. This is an identifier for the Database, not the actual name of the file that is going to be created. After entering a Data Source Name, click [CREATE]

In the "New Database" dialog, select a Path and a filename to be associated with the above selected Data Source Name. Click [OK] and the .mdb file will be created.

After the notice for "Successful Creation", click [OK]

Exit the "ODBC Microsoft Access Setup" dialog by clicking [OK]

Exit "User DSN" tab by clicking [OK]

In the "Database of Standards" dialog box, click [OPEN]

Select "Machine Data Source" tab

Select the Data Source Name that was just created, click [OK]

In the "Create Database" dialog, checkmark Tolerance Data and Formula Data, click [OK]

There should be a message "Connecting to ….."

Database of Standards ✕

Transfer | Search | Filter | Delta Table |

Current Database

RAL_ALK

[Open...] [Manage...]

[   ]

186 Records

RAL 1000
RAL 1001
RAL 1002
RAL 1003
RAL 1004
RAL 1005
RAL 1006
RAL 1007
RAL 1011
RAL 1012
RAL 1013
RAL 1013
RAL 1014
RAL 1015

[Delete] [Edit Name]

☐ Verify deletes   ☐ Use Filter

Current Save Set

Std1

Std1

Standard

[>>>]

RAL 1000

[<<<]

Trials

[>>>]

RAL 1002
RAL 1003
RAL 1004

[<<<]

[Delete]

[Edit Name]

[>>>Search]   ☐ View by name order

[OK] [Cancel] [Apply] [Help]

Change Database

Displays the SELECT DATA SOURCE DIALOG.
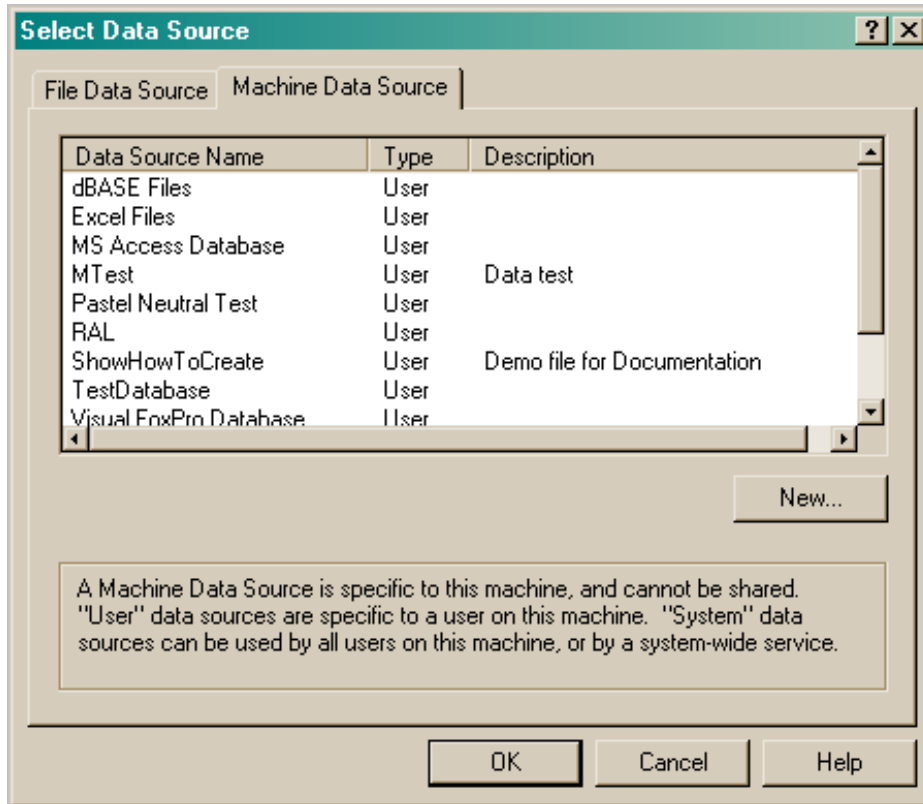
Select the Machine Data Source tab and highlight the desired DSN, then click 'OK'

Copy to Database (File menu)

This will copy the current Standard all of the Trials to the currently selected Database of Standards

See also: [Database of Standards](#)

List Management (File menu)

Displays the List Management Dialog.

The user can Create/Edit and Delete System Names and Job ID's that will be used in tagging STANDARDS & TRIALS
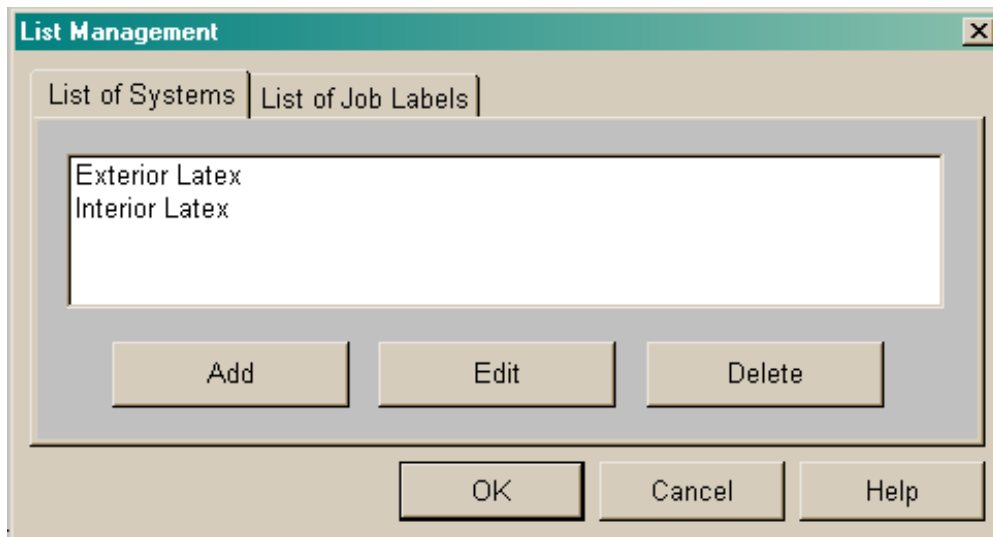
Security (File menu)

Choose this option to control the Level of Access for Manager and Worker status. Open the Security dialog by selecting the File-Security menu option.

Enter a password for both Administrator and Manager: Select the manager radio button. The password under the manager button is not selectable, because we already have access to the manager level (i.e.: have entered the correct password). The Change password edit boxes are selectable. Change the manager password "manager", by entering "manager" in both the New password and Verify New password edit boxes. Apply the changes -- you should get a "Password successfully changed" message box. Still the password for both the manager and administrator are not selectable, because we have access to both of those levels already.

Next, select the Administrator radio button. Change the password to "admin" using the Change password edit boxes. Hit Apply and get the "Password successfully changed" message box. Select the Worker radio button for both Current Level and Startup Level. Exit the dialog by hitting OK.

Now go back into the Security dialog. You should not be able to select the Manager or Administrator radio buttons without first entering the proper passwords. If you enter the Administrator password, you automatically get access to the manager level and can change the manager or administrator passwords. If you enter the Manager password only, you can change the password for the Manager, but not Administrator.

Log in as Administrator -- enter the admin password and select the "Edit Level" property dialog tab. Customize the options available to the Manager -- Set the Security Level radio button to Manager. There should be no commands in the Commands Available list box. If there are commands there, hit the "Add All" button to get all commands into the Commands Accessible list box. Let's not allow the manager to do Correction or Matching by deleting all the Correct: and Match: commands. Also delete the Report:Batch Correction and Report:Formulation Commands. You should have 8 Commands in the Commands Available list box (2 Correct: - 4 Match: - 2 Report: commands).

Now change over to the Worker radio button. Again the Commands available box should be empty (if not hit the Add All button). You'll notice that in the Commands accessible list box, the Worker does not have access to any Correct or match commands. The only commands available to the Worker are commands that are accessible to the Manager. Let's assume you have a low-level worker. We want the Worker to only be able to recall a standard, measure trials and save data. Hit the Delete All button to make the Commands Accessible list box empty. Now add the File: Save As, Standard:Recall and Trial:Measure Commands. There should just be 3 Commands in the Commands Accessible list box for the worker. Go back to the Change Level property dialog tab and select Worker as both the Startup Level and Current level. Exit the Security dialog by pressing OK.

You should see some dramatic changes to the menus and tool bar. The Worker has access to only those 3 commands we allowed, in addition to Help commands and Security. Open the Security dialog again and enter the Manager password. Select the Current level to be Manager and hit Apply. You see the Correction and Matching menu options disappear as well as the tool buttons.

Change Level Tab:
NOTE:
Administrator Level can edit Manager and Worker status.
Manager Level can edit Worker status only.
Worker Level not able to edit any status.

Select the Current Level and add a password (if required).
Select a Startup Level.
Click **Apply** to make the changes and remain in the dialog box or click **OK** to exit.

Edit Level Tab:
Pick and choose what commands will be accessible for the appropriate Security Level.
Click **Apply** to make the changes and remain in the dialog box or click **OK** to exit.

Spreadsheet command (File menu)

Use this command to export the current data to a spreadsheet. This command first presents a Export to Spreadsheet dialog box, where you select the type of printout you'd like to produce. After selecting a report you are presented with the Save As dialog box so you can name the file where the data will be exported.

Send Mail command (File menu)

Prerequisite: Your computer must be set up for network mail.

Note: This application only supports MS Exchange (Windows 95, 98, NT, XP, Vista and Windows 7 users)

The current data will be captured and written to a file.

The filename will be selected using the Save Copy as Dialog

After the file is selected, program control will invoke the current mail program.

The selected filename will appear as an attachment.

Screen Image (Send Mail menu)

The current screen image will be captured and written to a file.

The filename will be selected using the File to Save Dialog

After the file is selected, program control will invoke the current mail program.

The selected filename will appear as an attachment.

Spreadsheet (Send Mail menu)

The current data will be captured and written to a file.

First, the data to be saved must be selected using the Export to Spreadsheet Dialog

Then, filename will be selected using the File to Write Spreadsheet Dialog

After the file is selected, program control will invoke the current mail program.

The selected filename will appear as an attachment.

Other Files (Send Mail menu)

The filename to send will be selected using the File to Send via eMail Dialog

After the file is selected, program control will invoke the current mail program.

The selected filename will appear as an attachment.

Print command (File menu)

Use this command to print a document.   After executing this command the user will be presented with the Select Printer Report dialog box. Using this dialog the user can select which report is to be printed. After selecting a report, this command presents a Print dialog box, where you may specify the range of pages to be printed, the number of copies, the destination printer, and other printer setup options.

Shortcuts

Toolbar:
Keys: CTRL+P

Print Preview command (File menu)

Use this command to display the active document as it would appear when printed. After executing this command the user will be presented with the Select Printer Report dialog box. After you choose a report, the main window will be replaced with a print preview window in which one or two pages will be displayed in their printed format. The print preview toolbar offers you options to view either one or two pages at a time; move back and forth through the document; zoom in and out of pages; and initiate a print job.

Page Setup command (File menu)
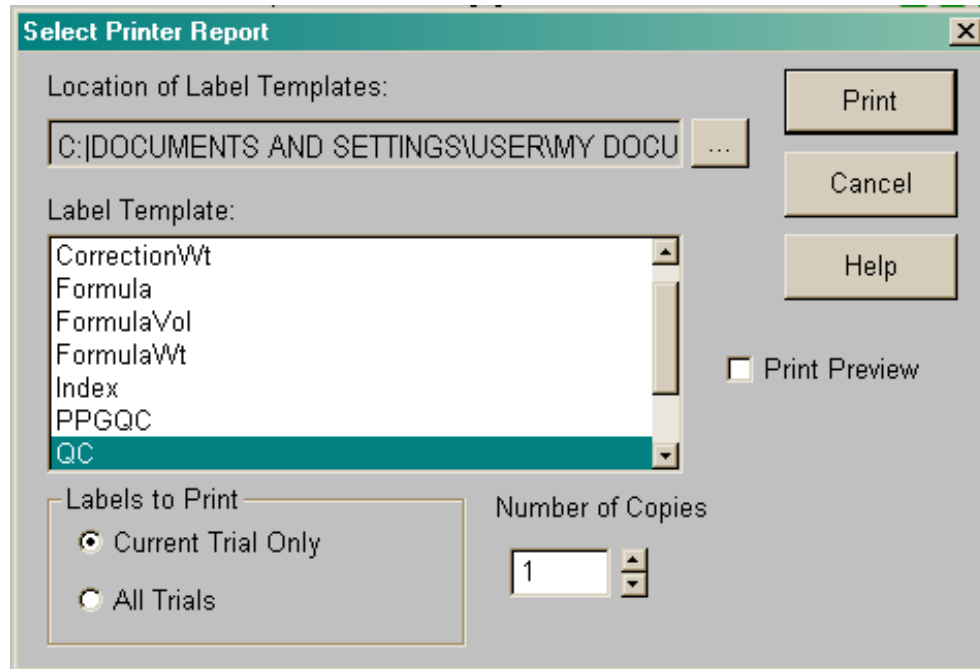
Use this command to select company name, address, margins and the font to be used for printouts. This command presents a [Page Setup dialog box](#), where you specify these parameters.

Print Setup command (File menu)

Use this command to select a printer and a printer connection. This command presents a [Print Setup dialog box](#), where you specify the printer and its connection.

Print Labels (File menu)

Prints data to the selected DYMO label format.

Recents (File Menu)

Contains a list of the last files that were opened. To select a Recent File, Double Click the name

Exit command (File menu)

Use this command to end your session. You can also use the Close command on the application Control menu. You will be prompted to save data files with unsaved changes.

Shortcuts

Mouse: Double-click the application's Control menu button.
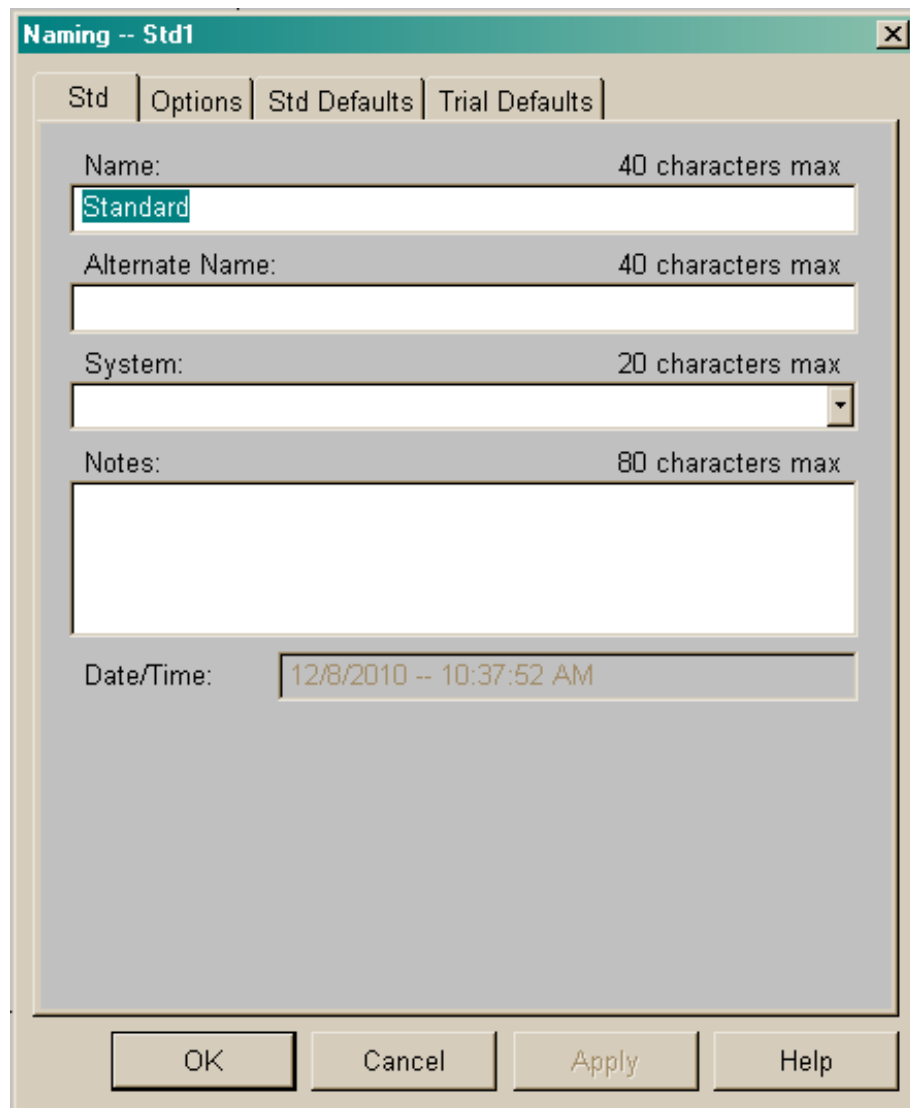
Keys: ALT+F4

Measure command (Standard menu)

Initiates a measurement from the connected Sensor.

If AutoNaming is NOT enabled, the Measure Dialog will appear.

Average command (Standard menu)

Use this command to measure a standard by averaging several measurements with the color sensor. After executing this command the user will be presented with the Enter Standard Name dialog box.

The software pauses between each reading to position the sample and display the results via the Average Measurement dialog box. Click on OK to continue averaging and click on Done when you have taken the desired number of scans.
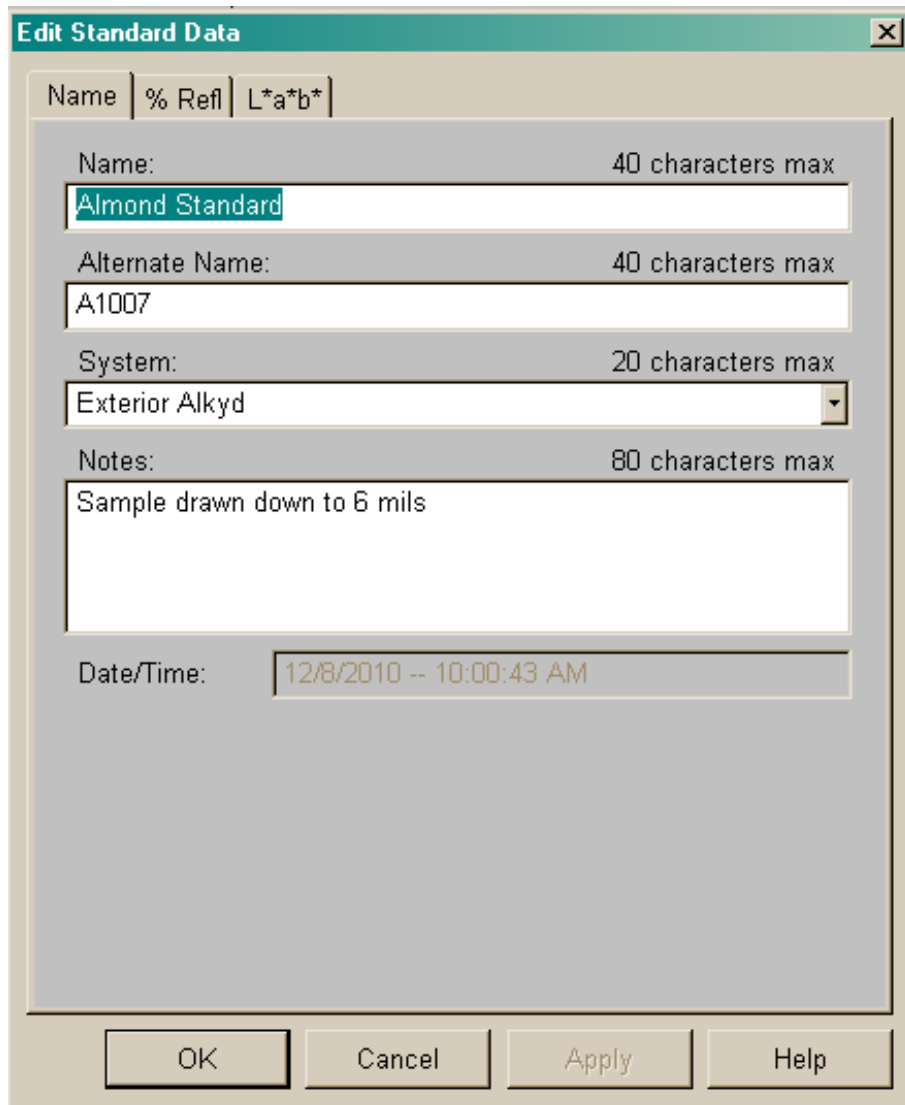
Keyboard command (Standard menu)

Use this command to enter a standard's name and colorimetric or reflectance values via the keyboard. After executing this command the user will be presented with the Enter Standard Name dialog box.

After the name is entered, the user is presented the Enter Standard dialog box, which has three tabs: Names, % Refl and Colorimetric.

Edit command (Standard menu)

Use this command to edit a standard's name and colorimetric or reflectance values via the keyboard. After executing this command, the user is presented the Edit Standard dialog box, which has three tabs: Names, % Refl and Colorimetric.

Edit Standard Data

| Name | % Refl | L*a*b* |
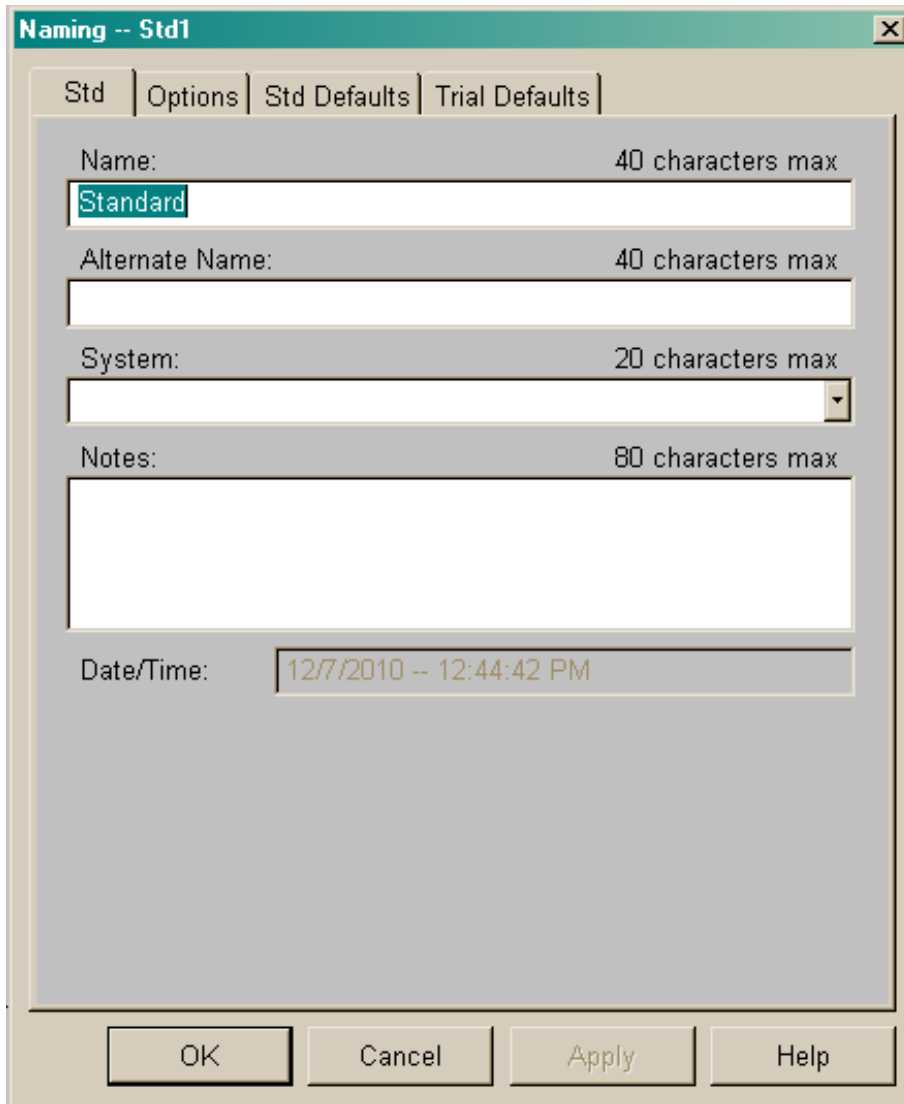
Name: 40 characters max

Almond Standard

Alternate Name: 40 characters max

A1007

System: 20 characters max

Exterior Alkyd

Notes: 80 characters max

Sample drawn down to 6 mils

Date/Time: 12/8/2010 -- 10:00:43 AM

| OK | Cancel | Apply | Help |

Null(0) command (Standard menu)

Use this command to enter a standard without a measurement or entering spectral/colorimetric datar.

The Standard name will default to 'Standard' if AutoNaming is checkmarked. Otherwise, the Naming Dialog will appear.

Naming -- Std1

| Std | Options | Std Defaults | Trial Defaults |

Name: 40 characters max
Standard

Alternate Name: 40 characters max

System: 20 characters max

Notes: 80 characters max

Date/Time: 12/7/2010 -- 12:44:42 PM

OK   Cancel   Apply   Help

Save (Standard menu)

Saves the Standard to the Currently open 'Database of Standards' file

Recall command (Standard menu)

Connects to the Database of Standards in order to return a list of all the Standard Records stored in the database.

Most Popular command (Standard Menu)

Use this command to view a list of standards stored in this file and a tabulation of the number of trials associated with each standard. The standard with the highest number of trials will appear first and is the "most popular".

This option is grayed out when a .WSV file with a single standard is the current file. A .WSL file must be displayed for this option to be active.

Information on Standards	×
Most Popular	

Hits	Name
11	Standard #1
6	Standard #2
5	Standard #3

[OK] [Cancel] [Help]
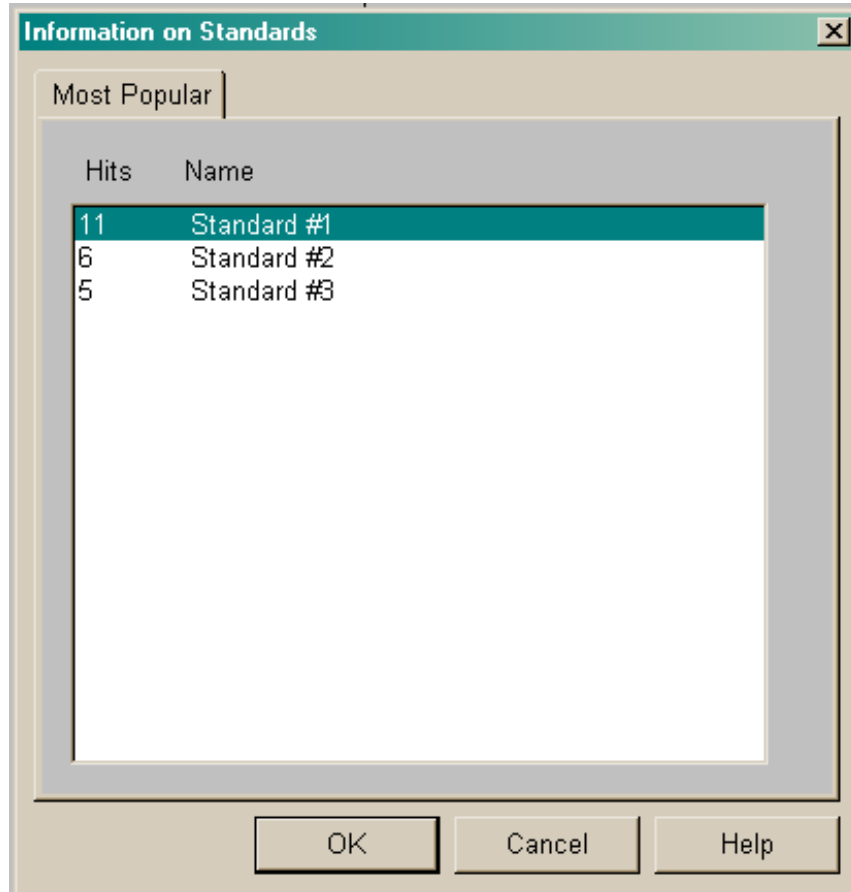
Utilities (Standard menu)

Utilities for Copying, Deleting or Finding Standard Data
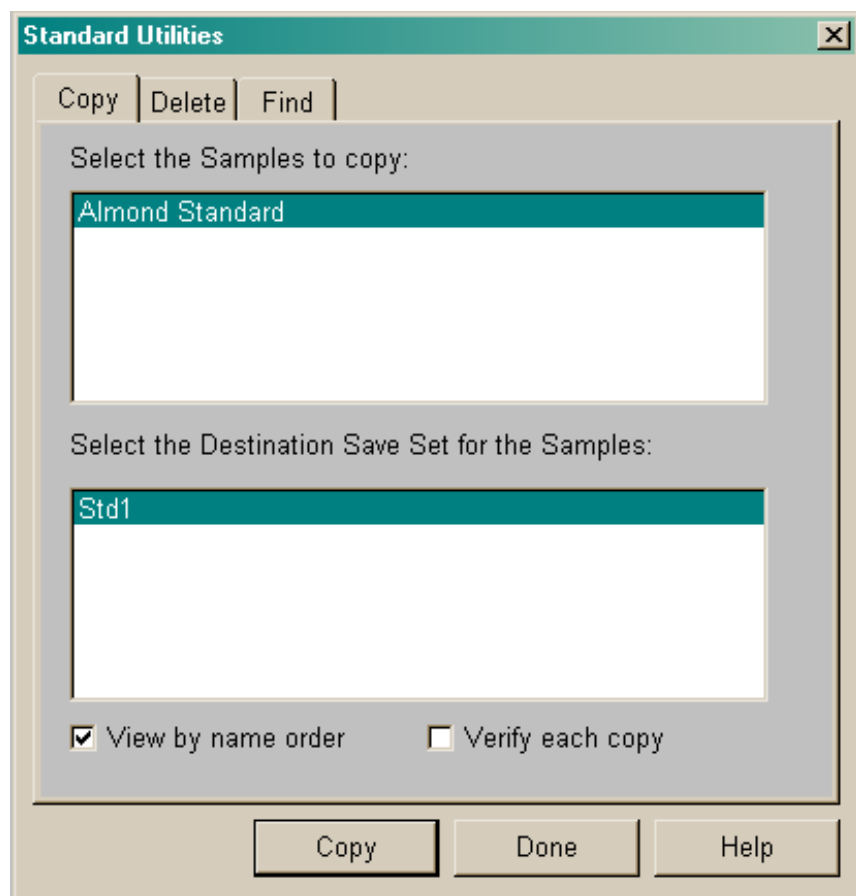
Download command (Standard menu)

Use this command to get data from the program into the instrument. After executing this command the user is presented with the **_Download Target to Sensor_** dialog box.

The dialog box displays the names of the current standard that is available to download to the sensor. The user can select the parameters to load. The Targets can be Overwritten or Appended To in the Sensor.

Upload command (Standard menu)

Use this command to get data from the instrument into the program. After executing this command the user is presented with the ***Select Data to Load from Instrument*** dialog box.
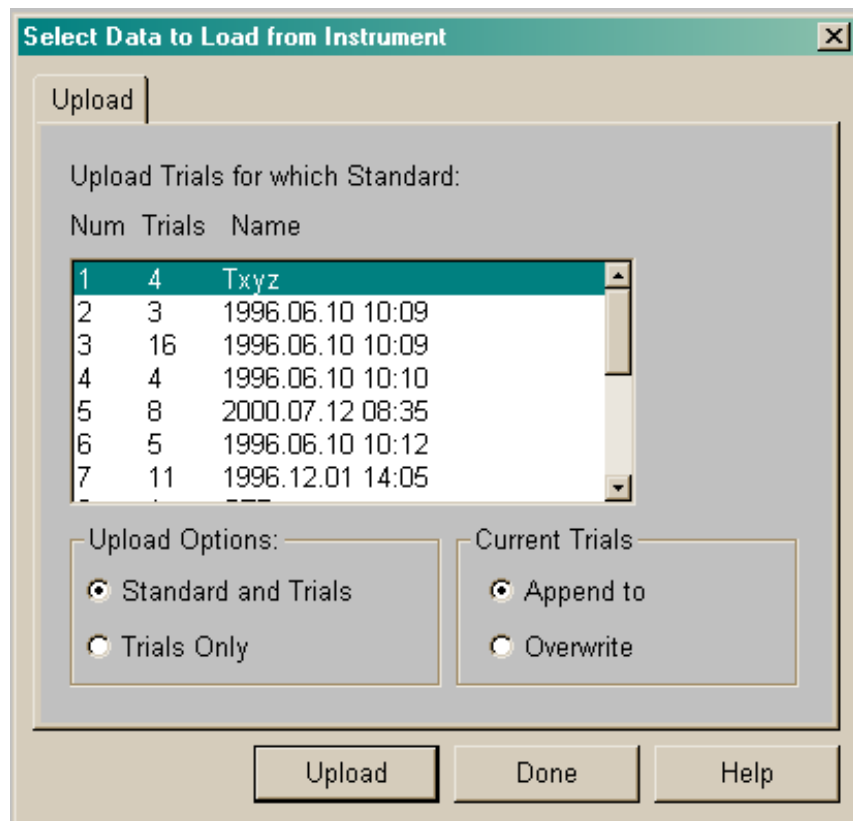
The dialog box displays the names of the standards and associated trials that are currently resident in the sensor. The user can select to load either Standard and Trial sets or just Trials. The Trial data can be appended to the existing open document or can be selected to overwrite all Trial data in the document.

The user must select the appropriate Standard Name in the dialog box, and then select the UPLOAD button.

Switch command (Standard menu)

Use this command to switch the current trial with the standard.

Average Trials command (Standard menu)

Use this command to generate a new standard based on the average of all trials.

Auto Naming (Standard menu)

If this option is checked, the Name of the Standard will be automatically entered using the information provided in the Naming Option / Std Defaults tab

Position command (Standard menu)

Use this command to issue a positioning prompt before measuring a standard.

Multiple Standards Mode (Standard menu)

This command is used to activate the Multiple Standards feature in On¥Color. It works with On¥Color Long File formats (.WSL) to allow multiple standards in a documentt. A .WSV file can be converted into a .WSL file by turning on this option and then storing the file as a .WSL file.

A .WSL file handles multiple standards and tolerances along with an unlimited number of trials. Trials are associated with any of the standards. A .WSV file handles only one standard and its tolerances per file.

To scroll through the different standards use ALT á or ALT â on the keyboard or go to the View menu and select Previous Standard or Next Standard.

When working with a Multiple Standards (.WSL) file, you can turn on the display of all of the tolerances on the same Color Plot display. To do this, go to Options à Tolerances à Pass/Fail Assessment. You can also get here from the Color Plot report by double clicking on the plot and then clicking on the Edit Elliptical Tolerance or Edit Box Tolerances. On the Pass/Fail Assessment tab, check the box for "Display Tolerances for All Standards". The Color Plot and the Tolerance Plot will then display multiple ellipses. Then under the "Centered Standard" select either Current Standard or choose one of the listed standards in the drop down menu as the fixed reference point.   To show only one ellipse or box at a time, uncheck the box for "Display Tolerances for All Standards".

Examples of applications where this may be useful are in automotive applications where a number of parts made of different materials must match.   The file may contain a paint standard, a vinyl plastic standard, a fabric standard, and a screen printed standard, all with different trials associated with the appropriate standard. Another example is an apparel color standard, where a knit shirt consists of an interlock body, a knit collar, a different texture arm band, and a matching embroidery color logo. Another example would be where a fabric is dyed and then different finishes are applied at various stages to achieve the final product.

Multiple Standards (Standard menu)

Diplays the Multiple Standards Selection Dialog.
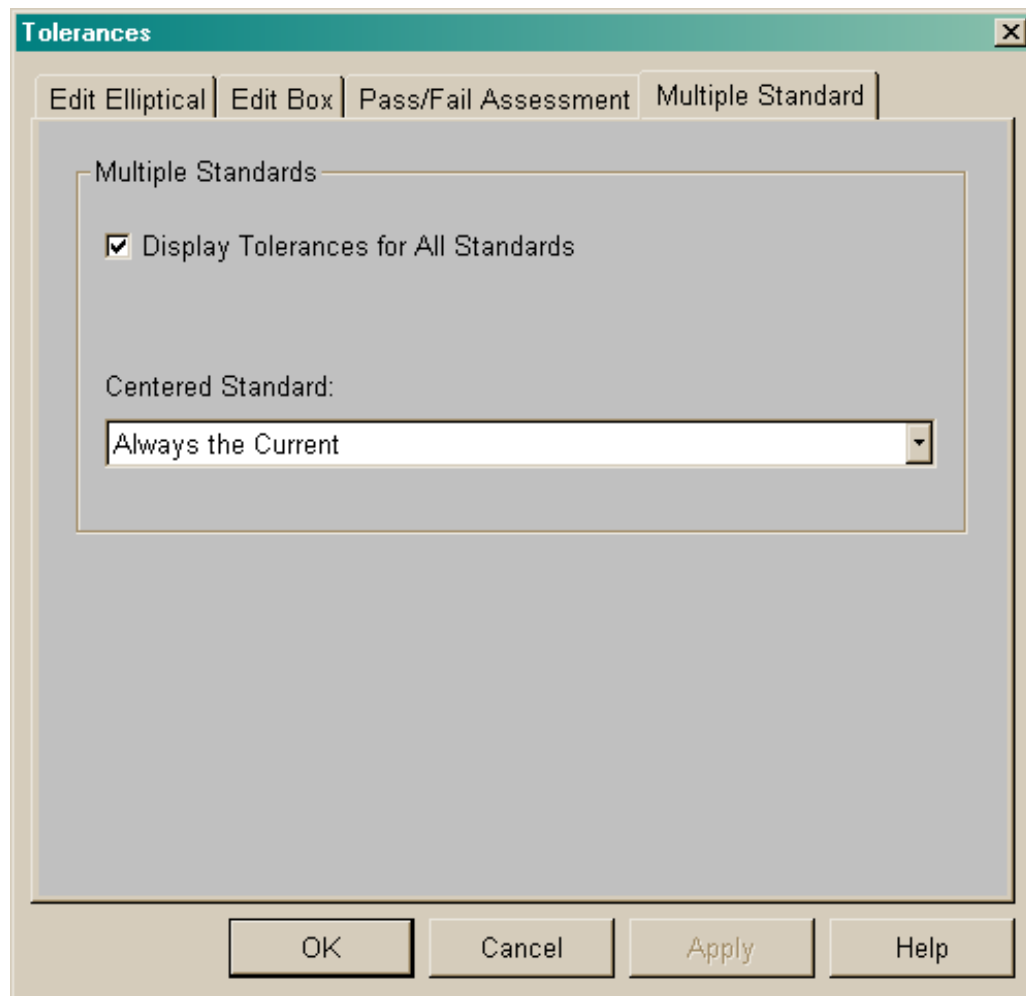
Hitch Mode (Standard menu)

Enables / Disables the Hitch Method for measurements. This can only be enabled if a file was selected using the Hitch Management command

Hitch Management (Standard menu)

Allows the user to enter a Hitch Standard, either by measuring or keyboarding in the Spectral Data or the L,a,b data

Naming Options command (Standard menu)

Use this command to set the naming options for the standard. After executing this command, the user is presented the Name Options dialog box.

See also: Auto Naming Standard and Auto Naming Trial

Measure command (Trial menu)

Use this command to measure a trial with the instrument. A single reading is taken. A standard must be entered before using this command.

Shortcuts

Keys: T

Average command (Trial menu)

Use this command to measure a trial by averaging several measurements with the instrument. The software pauses between each reading to position the sample. Click on OK to continue averaging and click on Done when you have taken the desired number of measurements.

Keyboard command (Trial menu)

Use this command to enter a trial's name and colorimetric or reflectance values via the keyboard. After executing this command, the user is presented the Enter Trial dialog box, which has three tabs: Names, % Refl and Colorimetric.

Edit command (Trial menu)

Use this command to edit a trial's name and colorimetric or reflectance values via the keyboard. After executing this command, the user is presented the Edit Trial dialog box, which has three tabs: Names, % Refl and Colorimetric.


Use this command to edit a trial's values or name. After executing this command, the user is presented the Edit Reflectance Data dialog box. A tab in this dialog box allows the user to access the Edit Colorimetric Data dialog box in order to edit colorimetric values.

Measure From File (Trial menu)

The user is prompted to select an existing file that contains the names of the TRIALS to be measured (in sequence)

Measure Loop (Trial menu)

This invokes a Macro to continue making TRIAL measurements until stopped by the user
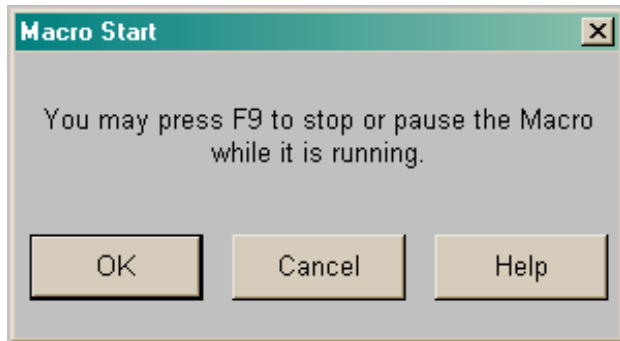
Save (Trial menu)

Saves the current TRIAL in the active Database of Standards

Recall command (Trial menu)

Connects to the Database of Standards in order to return a list of all the Trial Records stored in the database.

Search command (Trial menu)

Returns the number of matches specified in the Database of Standards.
Refer to the Search Tab in the [Database of Standards dialog of box.](#)

Utilities (Trial menu)

Utilities for Copying, Deleting or Finding Trial Data
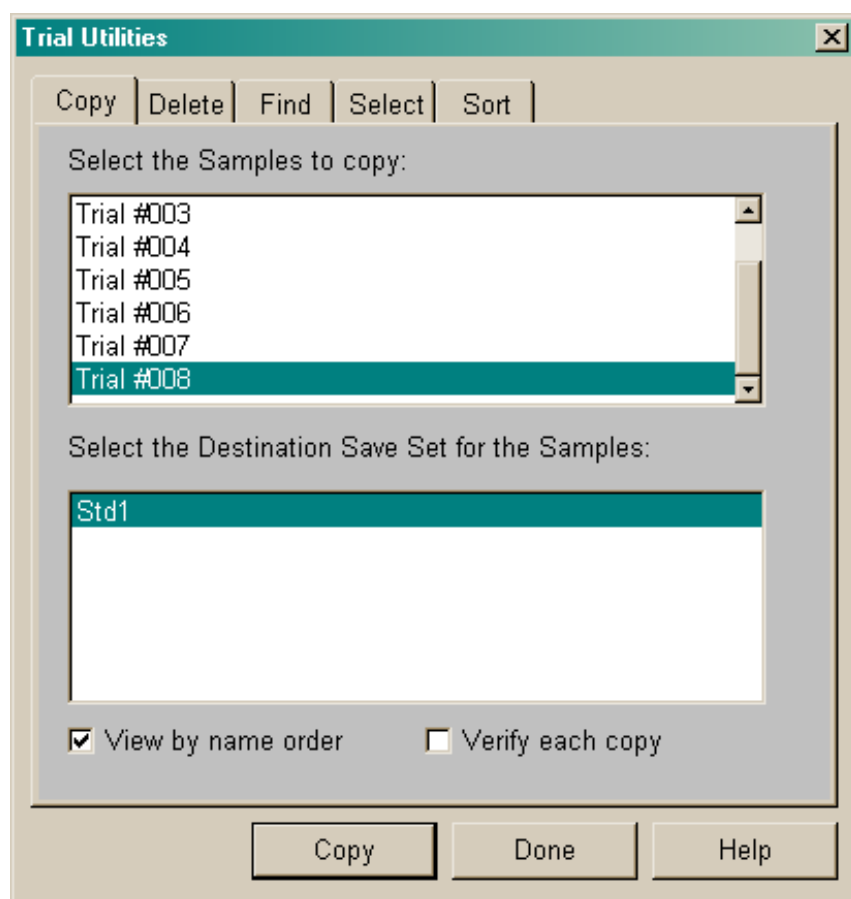
Average Last N Trials   (Trial menu)

The data for the STANDARD is replaced by the average of all the TRIALS

Auto Naming (Trial menu)

If this option is checked, the Name of the Trial will be automatically entered using the information provided in the Naming Option / Trl Defaults tab

Position command (Trial menu)

Use this command to issue a positioning prompt before measuring a trial.

If the user selects this option, before each measurement there is a prompt asking the user to position the sample in front of the color sensor viewport or position the instrument over the sample. If the instrument in use has a shutter, this option is necessary to open the shutter to allow inserting the sample.

The message box prompt is as follows: "Position sample and/or instrument."

Insert Mode command (Trial menu)

Use this command to insert trials after the current trial.

Auto Select Standard (Trial menu)

Autoselect (Trial Menu) - If enabled AND if Multiple Standards is enabled on the Standard Menu, will select the closest standard to the measured trial. This standard will then be the current standard.

Auto-Save command (Trial menu)

Trial Measurements will automatically be saved if this is enabled. The user will be prompted for a Save Set name when invoking this option

Naming Options command (Trial menu)

Use this command to set the naming options for the trial. After executing this command, the user is presented the Naming Options dialog box.

Automatic (Match menu)

Manual (Match menu)

Select (Match menu)

Numeric (Match menu)

OPL (Match menu)

Formulation Properties

Automatic | Manual | Select | Numeric | OPL

Optimum Pigment Loading Method

- ● Adjust Film Thickness by Delta E
- ○ Adjust Film Thickness by Contrast Ratio
- ○ Adjust Loading by Delta E
- ○ Adjust Loading by Contrast Ratio

Thickness Range

Minimum   0.100

Delta E   0.15

Maximum   15.000

☐ Enable Optimum pigment loading

OK   Cancel   Apply   Help

Properties command (Match menu)

View the Formulation Properties Dialog

Use this command to change formulation properties. On executing this command the user will be presented a tabbed dialog box that has five tabs. These tabs are:
Automatic
Manual
Select
Numeric
OPL

Additionally, selecting Properties for the formulation report will produce an extra tab for changing the report format. This tab is:
Style

Shortcuts

Toolbar: Only when formulation report is active.

Run Match command (Match menu)

Use this command to run a color formulation based on the current properties.

Shortcuts
Keys: M

Also see the help available in [How To Match a Standard](#).

Sort by Cost (Match menu)

Matches are sorted in the order of Cost.

Sort by DE (Match menu)

Matches are sorted in the order of lowest Delta E.

Go to Best Match command (Match menu)

Use this command to make the best match be the current trial.

Save Formula command (Match menu)

Use this command to save the current formula.
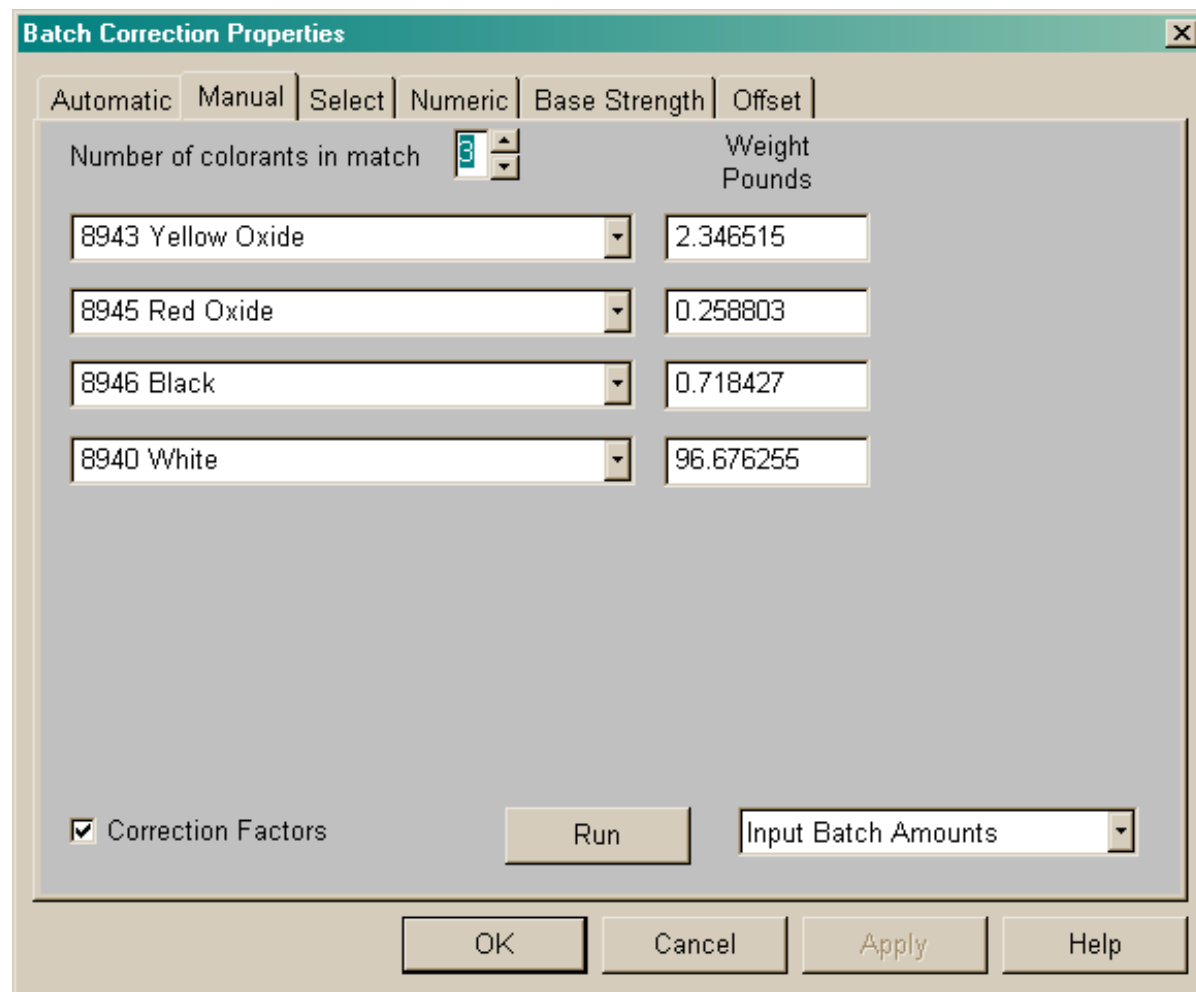
Dispense (Match menu)

The current formula is written to a text file for the selected network Dispenser.

Contact Tech Support for information on the current Dispensers that are supported with this format.

Input Batch Amounts (Correct menu)

Input Batch Amounts

See also - Alternate Correction Mode

Use Predicted Batch Amounts (Correct menu)

Use Predicted Batch Amounts

See also - Alternate Correction Mode

Unknown Batch Amounts (Correct menu)

Unknown Batch Amounts

See also - Alternate Correction Mode

Waste Workoff (Correct menu)

Waste Workoff

See also - Alternate Correction Mode

Input Add Amounts (Correct menu)

Input Add Amounts
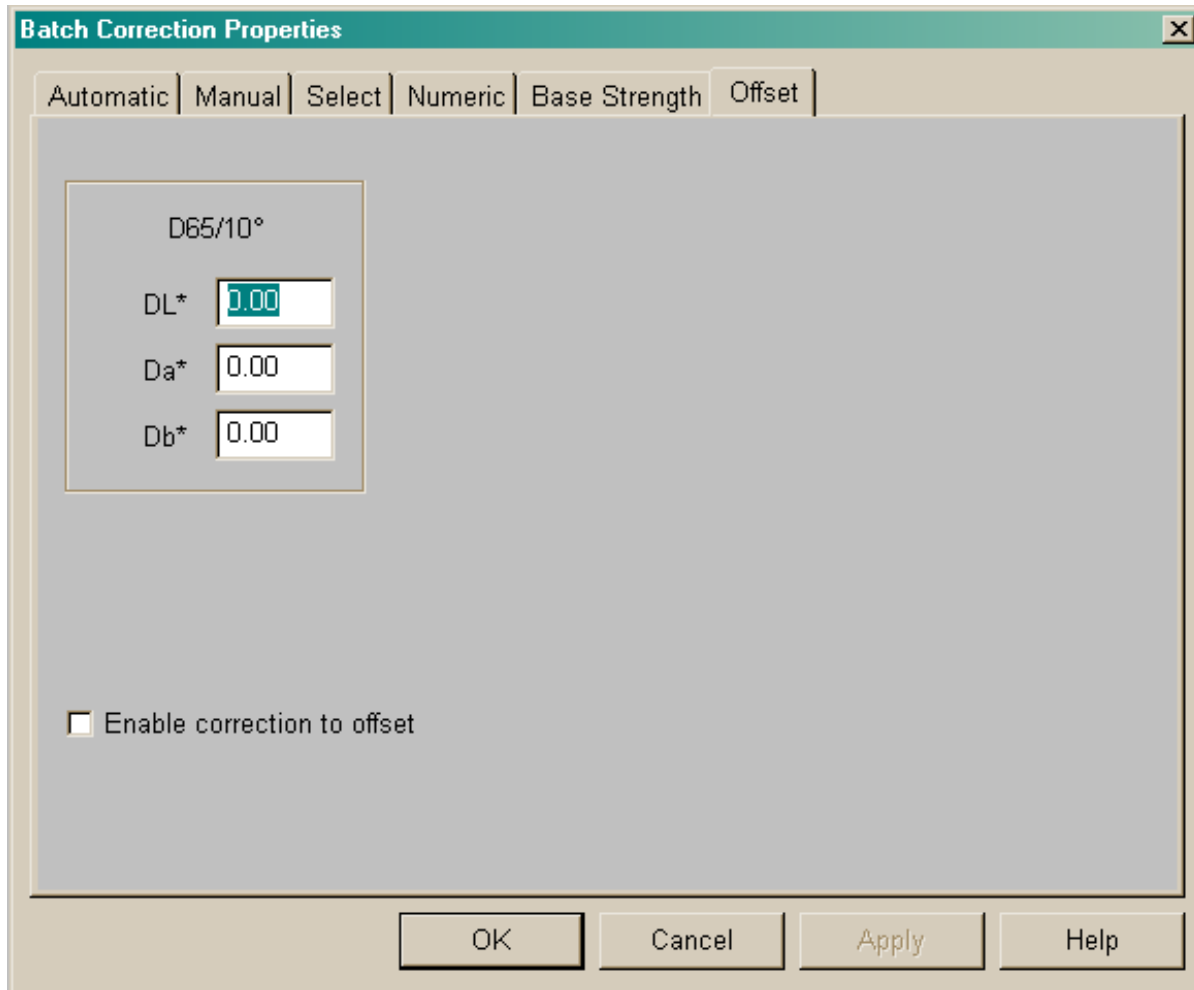
See also - <u>Alternate Correction Mode</u>

Input Offset for Correction (Correct menu)

Input Offset for Correction

See also - Alternate Correction Mode

Base Strength Correction (Correct menu)

Base Strength Correction

See also - <u>Alternate Correction Mode</u>

Manual Add (Correct menu)

Manual Add

See also - How to Scale the Add
See also - Alternate Correction Mode

Reduce Add (Correct menu)

Reduce Add

See also - Alternate Correction Mode

Optimize Add (Correct Menu)

Optimize Add
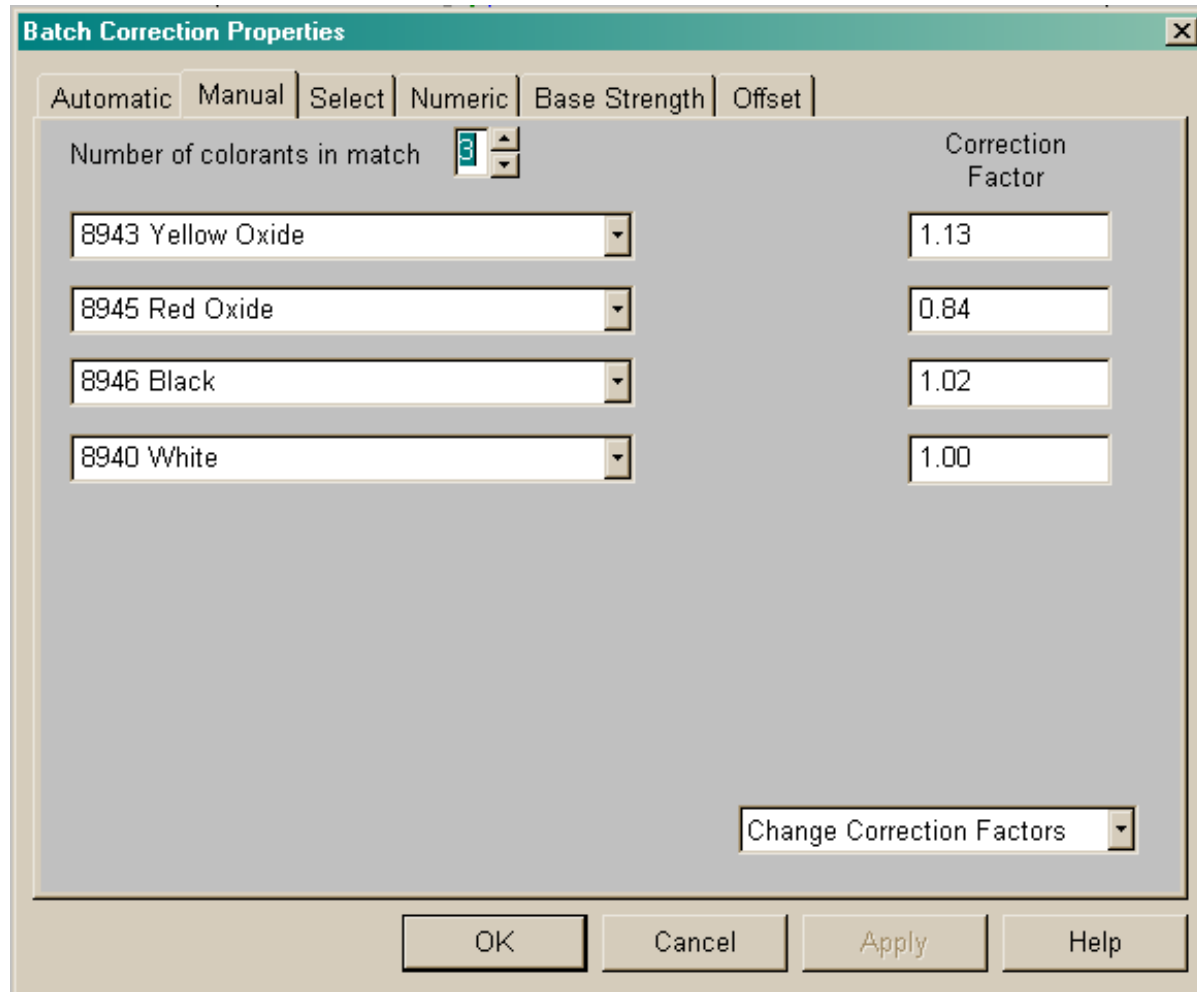
See also - Alternate Correction Mode

Change Correction Factors (Correct menu)

Change Correction factors

See also - Alternate Correction Mode

Properties (Correct menu)

Properties

Run Batch Correction (Correct menu)

Run Batch Correction

See also - [Alternate Correction Mode](#)

Save Formula as Batch after Add (Correct menu)

Save Formula as Batch after Add

See also - [Alternate Correction Mode](#)

User Defined command (Report menu)

Use this command to view the user defined report. Use the [User Defined Screen Properties dialog box](#) to design the look of this report.

Shortcut

Toolbar:

When the user defined report is active, the following buttons appear at the end of the toolbar:

Click To

 [Change NW Quadrant Properties command](#).

 [Change NE Quadrant Properties command](#).

 [Change SW Quadrant Properties command](#).

 [Change SE Quadrant Properties command](#).

Color Plot command (Report menu)

Use this command to view the color plot report. Use the Color Plot Properties dialog box to design the look of this report.

Shortcut

Toolbar:

When the color plot report is active, the following buttons appear at the end of the toolbar:

Click To

 Single Illuminant command -- View the single illuminant color plot.

 Three Illuminants command -- View the 3 illuminant color plot.

 Show Grid command -- Enable/disable the grid on the color plot.

Data Table command (Report Menu)

Use this command to view the Data Table report. Use the   Data Table Properties dialog box to design the look of this report.

To Select Numeric and Indices, Select Properties and then Indices

Shortcuts

Toolbar:

Click   **To**

   Enable / Disable the Grid

   To capture the data on the Windows Clipboard

Spectral Plot command (Report menu)

Use this command to view the spectral plot report. Use the Spectral Plot Properties dialog box to design the look of this report.

Shortcut

Toolbar:

When the spectral plot report is active, the following buttons appear at the end of the toolbar:

Click To

 Single Curve Trial command.

 Multiple Trial Curve command.

 Show K/S Values command.
or
 Show Absorbance Values command.

 Show Grid command.

Tolerance Plots command (Report menu)

Use this command to view the tolerance plots report. Use the Tolerance Plots Properties dialog box to design the look of this report.

Shortcuts

Toolbar:

When the tolerance plots report is active, the following buttons appear at the end of the toolbar:

Click To

 1 Illuminant/3 Dimensions command.

 3 Illuminant/3 Dimensions command.

 Edit Ellipses command.

 Edit Boxes command.

Statistical Charts command (Report menu)

Use this command to view the statistical charts report. Use the [Statistical Charts Properties dialog box](#) to design the look of this report.

Shortcuts

Toolbar:

When the statistical chart report is active, the following buttons appear at the end of the toolbar:

Click To

 [Show Line Charts command](#).

 [Show Bar Charts command](#).

 [Show Histograms command](#).

Formulation command (Report menu)

Use this command to view the Formulation report. Use the [Formulation Properties dialog box](#) to design the look of this report.

Shortcuts

Toolbar:

Batch Correction command (Report menu)

Use this command to view the Batch Correction report. Use the [Batch Correction Properties dialog box](#) to design the look of this report.

Shortcuts

Toolbar:

Print QC Label (Report menu) QC Label

Use this command to print QC data to the predetermined DYMO formatted label.

Print Formula Label (Report menu)

Use this command to print the formula result to the predetermined DYMO formatted label.

Print Correction Label (Report menu)

Use this command to print the Correction data to the predetermined DYMO formatted label.

Properties command (Report menu)

Use this command to change the screen appearance of the active report. The dialog box you will get is dependent on the current active report. It can be any one of the following:

User Defined Screen Properties dialog box
Color Plot Properties dialog box
Data Table Properties dialog box
Spectral Plot Properties dialog box
Tolerance Plots Properties dialog box
Statistical Charts Properties dialog box
Formulation Properties dialog box
Batch Correction Properties dialog box

Shortcut

Toolbar:

Save Properties As command (Report menu)

Use this command to save all report properties (screen layouts) under a specified filename. These properties may later be recalled using the Recall Properties command to change the layout of the screens.

Recall Properties Command (Report menu)
Use this command to recall report properties which were saved earlier using the Save Properties As command. This comman will recall a previously stored screen configuration.

Create/Edit (Macro dialog)

Use this dialog to Create or Edit a Macro

Load (Macro dialog menu)

Use this dialog to Load a predefined Macro

Run (Macro menu)

Use this command to RUN a Macro that has previously been loaded using the Load Macro Dialog

Averaging (Options menu)

This command is used to pre-select a fixed number of measurements, set the minimum and maximum number of measurements to average, or set a fixed time between measurements for averaging. Selects the [Measurement Averaging Options dialog box](#) .

Tolerances command (Options menu)

This option is used to select the Tolerances Dialog Box. This box has tabs for Edit Elliptical, Edit Box , Pass/Fail Assesments and Multiple Standards

Use Edit Elliptical to view or change the elliptical tolerances. After selecting this tab the user will be presented with the Edit Elliptical Tolerances dialog box. This option is also used to access the "best fit" algorithm for generating elliptical tolerances based on the current data set of trials.

Use Edit Box to change the tolerance values for the current standard. After selecting this tab the user will be presented with the Edit Box Tolerances dialog box. This dialog allows the user to change tolerances by entering new values or incrementally increasing or decreasing the values using the spinners

Use Pass/Fail to view or change which tolerances are used for Pass/Fail assessment. After selecting this tab the user will be presented with the Pass/Fail Assessment dialog box. Warning level is also set in this dialog box.

555 Block Size

Use this command to change the L*a*b* block size. After executing this command, the user will be presented with the [Edit 555 Block Sizes dialog box](#).

Observer/Illuminants command (Options menu)

Use this command to change the 3 illuminants or observer used in all reports. After executing this command the user will be presented with the Select Illuminants/Observer dialog box. This dialog allows the user to select one of 11 illuminants for each of 3 displayed illuminants or to change the color observer to 2 or 10 degrees.

Color Space command (Options menu)

Use this command to change the color space used to calculate colorimetric values. After executing this command the user will be presented with the Select Color Space dialog box. This dialog allows the user to select one of 12 different color spaces.

Indices command (Options menu)

Use this command to change the color indices displayed with colorimetric values on the color plot. After executing this command the user will be presented with the Select Indices dialog. This dialog allows the user to select from several different indices.

Adjusted Strength (Options menu)

Allows the user to select one of the available Strength calculations.

Laminate Offset (Options menu)

This option is used for computing color difference offsets in the manufacturing process of paper-laminated products. Please consult your CyberChrome applications specialist before using this option.

Opacity/Reflectivity command (Options menu)

Use this command to change the file to an opacity/reflectivity file.

Haze/Diffuse Trans. command (Options menu)

Use this command to calibrate the instrument for haze calculations.

Measure Background command (Options menu)

By selecting this, the user will be prompted (at measurement time) to present the sample background to the instrument. DSepending on the mode, the user may be prompted for WHITE background, BLACK background or BOTH

Gloss Correction command (Options menu)

Use this comman to make a mathematical correction to the spectral data of the measured sample, based on the degree of specular reflectance.

Calibrate command (Options menu)

Use this command to calibrate the instrument. After executing this command, the user will be presented with the Calibration dialog box, which has two tabs: Instrument Settings and Edit. After setting up the instrument, the Calibrate button will perform the instrument calibration.

Instrument Setting (Options menu)

Prerequisite: Establish Communications with the Instrument

Use this option to change the instrument settings, load calibration data, edit UV adjustment options, or setup Conditions and Tasks for certain instruments which support this feature.
Depending on instrument that is communicating with the software, different tabs will be available. For most benchtop spectrophotometers, only the Status and Edit tabs are used.

View the Instrument Setting Dialog

Calibration Interval command (Options menu)

This option is used to automatically set a designated time interval to calibrate your instrument. See [Calibration Interval Dialog Box](#) .

Remote Measurement command (Options menu)

Use this command to have the instrument initiate the measurement.

This feature is NOT available on all instruments.

Communications command (Options menu)
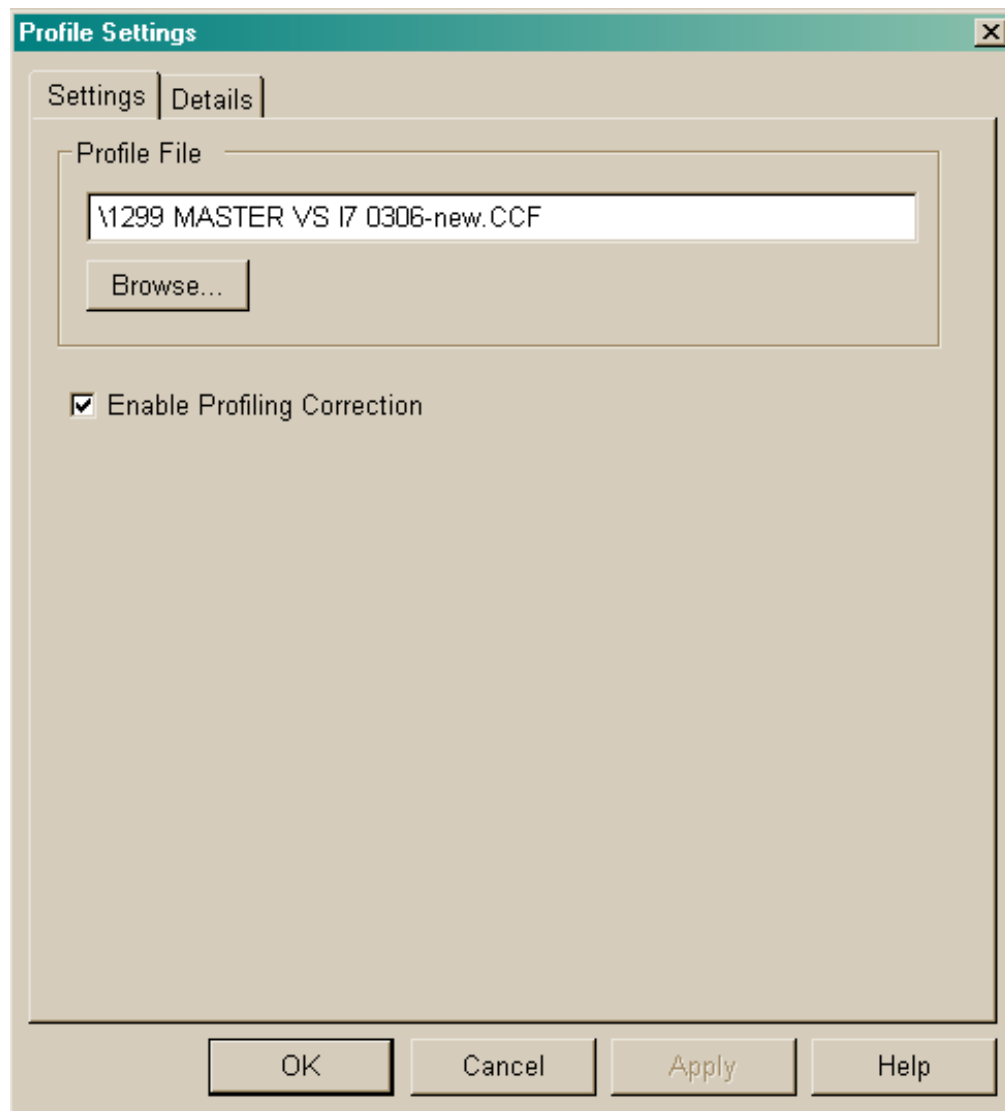
Use this command to change the instrument communication parameters. After executing this command, the user will be presented with the Setup Communications dialog box. This dialog allows the user to change the port, baud rate, data bits, parity, stop bits, data flow and instrument type.

If an error occurs anytime during instrument communication, the user will be presented with the Communication Error dialog box, which will explain the cause of the error.

For help in establishing communications with the instrument, refer to How To Establish Communications with the Instrument.

Profile Settings (Options menu)

Instrument Profiling - Selecting the .CCF file and Enabled/Disabling

Instrument Profiles - Details of the selected .CCF file

Profile Settings

Settings | **Details**

Master Instrument

Type:	MacBeth 7000
Serial Number:	37109621299
Last Profile Date	3/30/2010 -- 9:29:13 PM
Company:	CyberChrome, Inc.
Operator:	EB/TL
Status:	CREILL

Profiled Instrument

Type:	Gretag color i7
Serial Number:	47000470306
Last Profile Date	3/31/2010 -- 4:08:27 PM
Company:	CyberChrome, Inc.
Operator:	TL/EB
Status:	CREIXX

[OK] [Cancel] [Apply] [Help]

Toolbar command (View menu)

Use this command to display or hide the Toolbar, which includes buttons for some of the most common commands, such as selecting the display mode. A check mark appears next to the menu item when the Toolbar is displayed.

See Toolbar for help on using the toolbar.

Status Bar command (View menu)

Use this command to display or hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch state. The instrument status, standard status, and instrument type are reported in the right corner. A check mark appears next to the menu item when the Status Bar is displayed.

See Status Bar for help on using the status bar.

Keyboard Shortcuts (View menu)

Use this command to change the keyboard shortcuts. This command is not available for Windows 3.1x. After executing this command the user will be presented with the Shortcut Keys dialog box. Using this dialog the user can assign which keys execute which menu commands. The shortcut keys selected appear next to the menu item.

After selecting a command that you want to create a shortcut to and pressing the Create Shortcut button, the user is presented with the Assign Shortcut dialog box where the key to be used is selected.

Default Directories (View menu)

Highlight the file type and then enter or select the desired path.
Check the box next to "Put All Color Data Files in the Same Directory" to force the first seven files to the same directory. Change one, they all change. If this box is not checked, you can store different file types in different directories.

The default directory is only used for the first open of a file type in a session. If you open a file from another directory, the next time you open a file it will return to that directory.

Logo File (View menu)

Allows the user to change the Logo that appears with the Program

The following Dialog will appear - Logo File

Select Font (View menu)

Use this command to change the screen font. After executing this command the user will be presented with the Select Font dialog box. Using this dialog the user can change the characteristics of font used. Note: because the font is automatically scaled, the font size selection is ignored.

Select Colors (View menu)

Use this command to change the screen colors. After executing this command the user will be presented with the Select Colors dialog box. Using this dialog the user can change the color of the screen graphics.

Calibrate Color Patches (View menu)

This option is used to custom calibrate color patches on screen. See [Calibrate Color Patches Dialog Box](#) .

Jump to Colorant View

Use this command to jump to the colorant view.

Shortcuts

Toolbar:

Previous Standard (View menu)

Use this command to view the previous Standard.

Shortcuts

Toolbar:
Keys: Alt + DOWN arrow

Previous Trial command (View menu)

Use this command to view the previous trial.

Shortcuts

    Toolbar:
    Keys: DOWN arrow

Next Standard (View menu)

Use this command to view the next Standard.

Shortcuts

Toolbar:
Keys: Alt + UP arrow

Next Trial command (View menu)

Use this command to view the next trial.

Shortcuts

Toolbar:
Keys: UP arrow

Display Notes (View menu)

Displays the notes that are associated with the STANDARD and the current TRIAL

DIALOG

Zoom Default (View menu)

Causes all currently viewed graphic screens to return to normal viewing magnification

Zoom In (View menu)

Causes all currently viewed graphic screens to Zoom In 1 level

Zoom Out (View menu)

Causes all currently viewed graphic screens to Zoom Out 1 level

New Window command (Window menu)

Use this command to open a new window with the same contents as the active window. You can open multiple report windows to display different reports of the same standard at the same time. If you change the contents in one window, all other windows containing the same standard reflect those changes. When you open a new window, it becomes the active window and is displayed on top of all other open windows.

Arrange Icons command (Window menu)

Use this command to arrange the icons for minimized windows at the bottom of the main window. If there is an open document window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this document window.

Cascade command (Window menu)

Use this command to arrange multiple opened windows in an overlapped fashion.

Tile command (Window menu)

Use this command to arrange multiple opened windows in a non-overlapped fashion.

Contents (Help menu)

Use this command do display the Contents folders of the Help file.
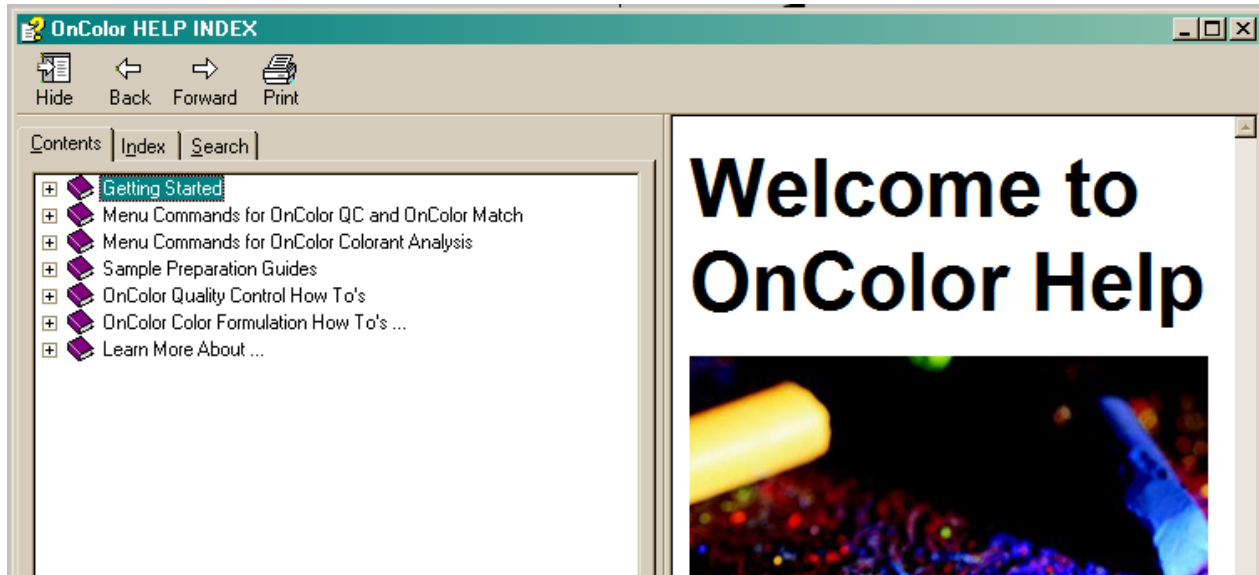
Index command (Help menu)

Use this command to display the opening screen of Help.

Once you open Help, you can click the Contents button whenever you want to return to the opening screen.
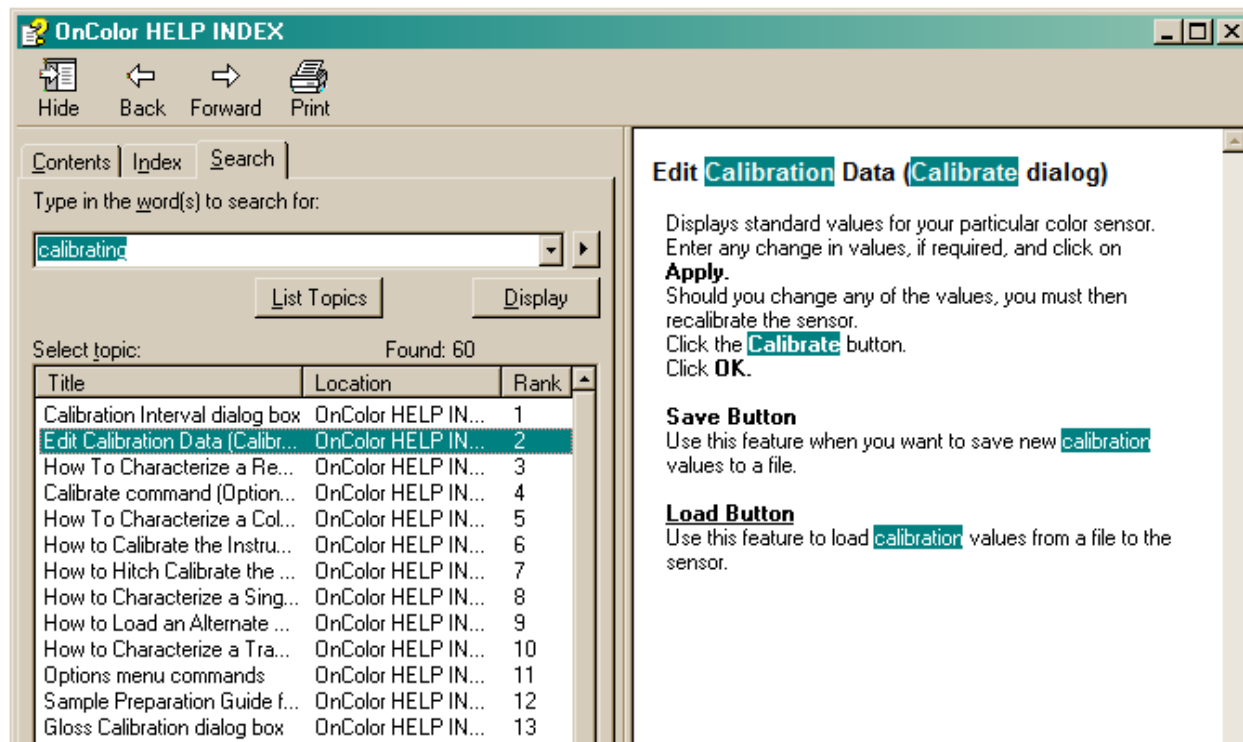
Shortcut
Keys: F1
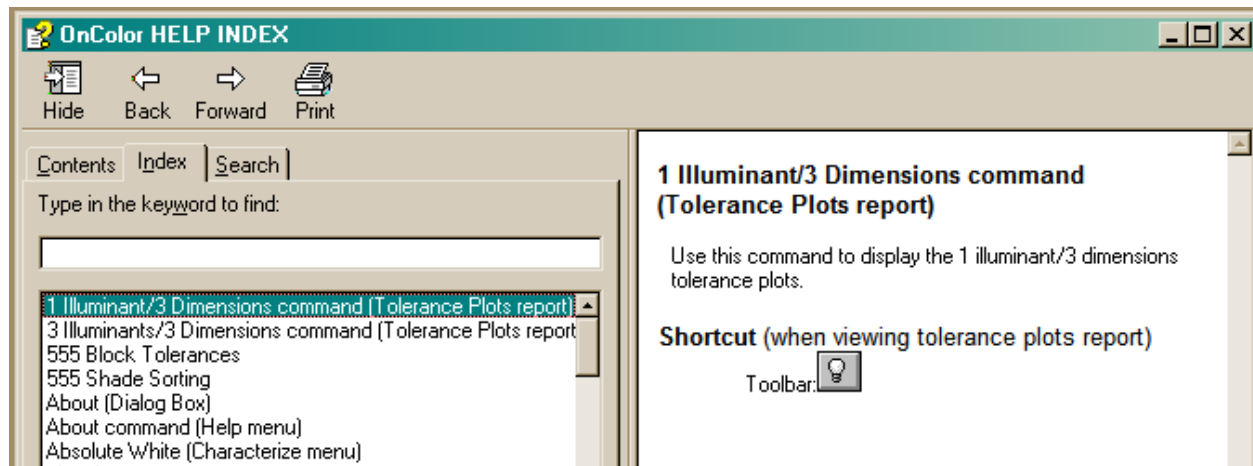
Search Topics (Help menu)

Use this command for Search for KEYWORD that is entered

About command (Help menu)

Use this command to display the copyright notice and version number of your copy of the Application.
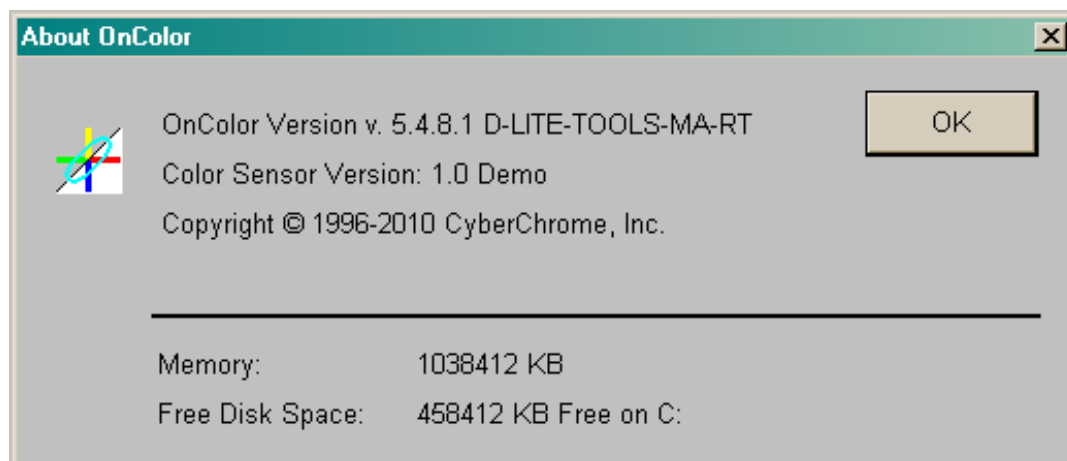
CyberChrome on Web

If there is an Internet connection, the Cyberchrome Website will be displayed in the default browser.

Delete command (Edit menu)

Allows either an entire colorant or a level of that colorant to be deleted.

Displays the [Delete dialog](#)

Zero command (Edit menu)

Converts all K/S data to 0.

Description command

Displays the [Decription Dialog](#)

Use this dialog to modify:

Name
ID
Cost
VOC
Colorant Strength
Density
OPL Strength
Hue Angle
Paste Factor

Heading Command

Display the [Heading dialog](#)

Use this dialog to modify:

K1
K2
Math Model
Calibration Weight/Volume settings

S Data Edit

Displays the [S Data dialog](#)

Use this dialog to edit the S data of the colorant

Rules command

Displays the RULES dialog

Colorant exclusions can be set here.

Properties command (Edit menu)

Use this command to change colorant properties. On executing this command the user will be presented a tabbed dialog box that has five tabs. These tabs are:

Description
Heading
K
S
Rules

K/S vs Wavelength command (Analysis menu)

The K/S data is plotted against the Wavelength. All levels of the colorant are displayed. This is the default analysis mode.

K vs. Wavelength command (Analysis menu)

The K data at each level of calibration is plotted against the Wavelength. This analysis is sometimes useful in identifying poor concentration levels. In this case, the curve of the poor sample will be significantly different than all other levels, not only in magnitude, but also in shape.

S vs. Wavelength command (Analysis menu)

The S data at each level of calibration is plotted against the Wavelength. This analysis is sometimes useful in identifying poor concentration levels. In this case, the curve of the poor sample will be significantly different than all other levels, not only in magnitude, but also in shape.

K/S vs. Concentration command (Analysis menu)

For multi-level calibrations only, the K/S data is plotted against the Concentration. The analysis is done at the wavelength of maximum absorption.

Normalized K/S vs. Concentration command (Analysis menu)

For multi-level calibrations only, the K/S data divided by the concentration, is plotted against the Concentration. The colorant is acting in a linear function of concentration where the curve is generally horizontal. The analysis is done at the wavelength of maximum absorption.

K vs. Concentration command (Analysis menu)

For multi-level calibrations only, the K data is plotted against the Concentration. The analysis is done at the wavelength of maximum absorption. This analysis is sometimes useful in identifying poor concentration levels. In this case, the curve of the poor sample will be significantly different than all other levels, not only in magnitude, but also in shape.

S vs. Concentration command (Analysis menu)

For multi-level calibrations only, the S data is plotted against the Concentration. The analysis is done at the wavelength of maximum absorption. This analysis is sometimes useful in identifying poor concentration levels. In this case, the curve of the poor sample will be significantly different than all other levels, not only in magnitude, but also in shape.

Properties command (Analysis menu)

Use this command to change the screen appearance of the analysis report. When selected the user will get the Colorant Analysis Properties dialog box.

Shortcut

Toolbar:

Save Properties As command (Analysis menu)

Use this command to save all report properties (screen layouts) under a specified filename. These properties may later be recalled using the Recall Properties command to change the layout of the screens.

Recall Properties command (Analysis menu)

Use this command to recall report properties which were saved earlier using the Save Properties As command. This command will recall a previously stored screen configuration.

New command (Characterize menu)

Creates a new colorant file. For two constant applications (Coatings and Plastics) the first colorant must be the primary white and the second colorant must be primary black. For Textiles, the first entry must be the substrate that was used for the calibration samples.

On executing this command the user will be presented with one tabbed dialog box called Characterization Select dialog box.

Append command (Characterize menu)

Adds colorants to an existing colorant file by appending at the end of the list. This is useful when adding new colorants or changing Letdown types for a 2 constant application. The colorant analysis file must be open and active before selecting this feature.

On executing this command the user will be presented with one tabbed dialog box called Characterization Select dialog box.

Replace command (Characterize menu)

Replaces an existing colorant. Useful for recalibrating an existing colorant. The colorant analysis file must be open and active before selecting this feature, and the colorant to be replaced should be current.

On executing this command the user will be presented with one tabbed dialog box called Characterization Select dialog box.

Insert command (Characterize menu)

Inserts a colorant between 2 existing colorants. Useful for adding a colorant when the colorant order is important. The colorant analysis file must be open and active before selecting this feature, and the colorant to be inserted will insert AFTER the current selected colorant.

On executing this command the user will be presented with one tabbed dialog box called Characterization Select dialog box.

Rework command (Characterize menu)

On executing this command the user will be presented with one tabbed dialog box called [Characterization Select dialog box](#).

Absolute White (Characterize menu)

Before using the OPL feature of the software, the Absolute White must be calibrated.
This is down by preparing a dreadown of the Masstone white ofver a White and Black Lenata Chart.
The Opacity should be between 80% and 90%.
The Dry Film Thickness will also be required.

To Calibrate and Absolute White a Saveset must first be generated with the following 3 samples:

Sequence	Name	Description
Standard:	BACKING	This is a measurement of the WHITE background of the Lenata Chart
Trial #1:	100% White	This is the measurement of the Masstone White over the WHITE background
Trial #2:	1.0 mil	The NAME is the actual Dry Film Thickness of the Drawdown
		The DATA is that of the Masstone White over the BLACK background

Jump to QC View

Use this command to jump to the QC view.

Shortcuts

Toolbar:

Previous Colorant/Resin command (View menu)

Use this command to view the previous Colorant/resin.

Shortcuts

Toolbar:
Keys: DOWN arrow

Go Back 10 Colorants/Resins command (View menu)

Use this command to view the colorants/resins 10 back from present Colorant/resin.

Shortcuts

Toolbar:
Keys: Ctrl+DOWN arrow

Next Colorant/Resin command (View menu)

Use this command to view the next Colorant/resin.

Shortcuts

Toolbar:
Keys: UP arrow

Go Forward 10 Colorants/Resins command (View menu)

Use this command to view the colorants/resins 10 forward from present Colorant/resin.

Shortcuts

Toolbar:
Keys: Ctrl+UP arrow

Previous Level command (View menu)

Use this command to return to the previous % concentration level within the colorant file.

Shortcuts

Toolbar:
Keys: LEFT

Next Level command (View menu)

Use this command to go to the next % colorant concentration level.

Shortcuts

Toolbar:
Keys: RIGHT

Colorant Mode command (View menu)

If this command is preceded by a check mark, it is the current mode.

Shortcuts

Toolbar:

General Guidelines for Colorant Database Preparation

The colorant database is the most important element in a successful color formulation system. The quality and accuracy of the matches and batch corrections obtained from any system are directly dependent on the quality and accuracy of the colorant database. Steps should be taken to ensure that the laboratory procedures used for preparing the colorant database samples correlate very well with production procedures. This means that if the same formulation is prepared in the laboratory and production, the same color will result.

To help you calculate the most accurate database, OnColor Match provides you with multi-white letdown capability for both single and two constant Kubelka-Munk applications. The multi-level capability allows you to characterize a colorant at the concentration range over which it will be used. If you make a lot of off-whites and pastel colors, you will certainly want to add a calibration level at a very low concentration. For optimum matches on dark and high chroma colors, concentrations levels are added at the near masstone range. The OnColor Match software automatically selects the appropriate concentration levels based on the depth of the sample. While we typically recommend between 4 and 8 levels be prepared depending on the application, an unlimited number of concentration levels may be stored for each colorant.

Other OnColor Match features used to provide you with the optimum database include a recommendation for the Saunderson coefficient (K1 and K2), diagnostics on the sample measurements, and error analysis on the database. These features combined with the state-of-the-art spectrophotometer, provide you with the best possible matches and corrections.

SAMPLE PREPARATION:

The samples you need to prepare depend entirely on the type of color application. For simplification, we've grouped the applications into 10 main. Please select the Sample Preparation Guide that most closely represents your application from the list below. If you are unsure what samples to prepare, it is always best to contact us. We really don't want to see you prepare the wrong samples or unnecessary samples

Sample Preparation Guide for Coatings - Dispersions
Sample Preparation Guide for Coatings - Inter-Mix Systems
Sample Preparation Guide for Powder Coatings
Sample Preparation Guide for Coatings - Trade Sales Paint
Sample Preparation Guide for Plastics
Sample Preparation Guide for Transparent Plastics or Films
Sample Preparation Guide for Screen Inks
Sample Preparation Guide for Transparent Inks
Sample Preparation Guide for General Single Constant
Sample Preparation Guide for Textiles
Sample Preparation Guide for Wood Stains

GENERAL GUIDELINES:

Please follow as closely as possible these general guidelines for preparing your colorant database.

The accuracy of the match predictions generated by the system is highly dependent on the following three factors:

1. The accuracy and repeatability with which you measure your samples; please average several measurements for the data you will be storing.
2. Choosing the correct calibration techniques for your colorants and your applications.
3. The accuracy with which you prepare your database. Please clean your equipment to avoid cross contamination and check the calibration of your balance. Don't try to weigh to more accuracy than your balance provides; instead make the sample size larger.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample reproducibility. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

Missing image: bm61.wmf The colorants, dispersions, inks, dyes must be representative of the shade and strength of a standardized lot of material. A sufficient quantity of all the colorants and base materials should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial period.

Missing image: bm62.wmf Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member. Also take a formulation being run in production and duplicate it using the laboratory equipment. Compare these samples for an indication of the operator and process agreement.

Missing image: bm63.wmf When applicable, the % colorant loading and thickness of the database samples should be chosen to achieve opacity if possible. However, do not exceed the normal colorant loadings which you normally use since the proper dispersion may not be attained. For plastics samples which are not opaque, prepare several plaques, so that multiple layers may be stacked together. For coatings and opaque ink applications, the translucent samples should be drawn down over a white and black substrate, such as a Leneta Chart. For non-opaque textiles and transparent inks, prepare enough sample so that multiple layers may be stacked together to achieve opacity.

Missing image: bm64.wmf The drying and processing conditions may also affect the final color of these primaries. Please ensure that the samples are not dried under conditions that cause yellowing or surfacing of unfixed dye or undispersed pigment. Do a "rub up" test on all coatings samples to check for pigment floating or flocculation.

Missing image: bm65.wmf For each colorant, resin, substrate, and clear include the cost, strength, dispersion factor, density or specific gravity, colorant name and code number. This data will be entered into the database.

Sample Preparation Guide for Plastics

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your resins and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

EACH SAMPLE DESCRIBED BELOW SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD BE PREPARED AT THEIR NORMAL COLORANT LOADING. FOR TRANSLUCENT SAMPLES, SEVERAL PLAQUES MAY BE STACKED TOGETHER TO ACHIEVE OPACITY. IF THIS DOES NOT YIELD AN OPAQUE SAMPLE, THEN THE REFLECTIVITY CALUCLATION WILL BE USED TO MEASURE THE SAMPLES OVER WHITE AND BLACK TO CALCULATE THE OPAQUE REFLECTANCE.

The calibrating resin system should be the most transparent resin available. Additional resins with fillers and additives such as flame retardants can be calibrated as alternate resins and entered into the database. It is important that the calibrating resin be as transparent as possible. Colorant loadings should approximate the loadings used in real world samples. It is not necessary to use the same colorant loading for all samples.

White & Black Samples -

> 1. White Masstone - is made from a clear resin mixed with White colorant at a normal colorant loading for a white.
> 2. Black Masstone - is a mixture of the most commonly used Black colorant in a clear resin. It contains only clear resin and black. This sample should be made at a normal colorant loading for a black.
> 3. Grays - Prepare 5 grays using the calibrating white and black at the ratios given below. Each sample should be prepared at a colorant normal consistent with what would be used in production. The colorant loading may vary as the white decreases and the gray gets darker.

For Each Inorganic Colorant - A minimum of three white letdowns and one black letdown are requested; Four samples total. For higher accuracy on dark and high chroma colors, five white letdowns are recommended and as many as 10 letdowns are useful. While the OnColor software has no upper limit on the number of letdowns that can be characterized, more than 10 typically offers no additional benefit.

> 1. 2% colorant; 98% TiO2 prepared at a normal colorant loading for this color.
> 2. 10% colorant; 90% TiO2 prepared at a normal colorant loading for this color.
> 3. 25% colorant; 75% TiO2 prepared at a normal colorant loading for this color.
> 4. 50% colorant; 50% TiO2 prepared at a normal colorant loading for this color.
> 5. 75% colorant; 25% TiO2 prepared at a normal colorant loading for this color.
> 6. 98% colorant; 2% black prepared at a normal colorant loading for this color.

For Each Organic Colorant - Five or more white letdowns and one black letdown are recommended.

> 1. 0.5% colorant; 99.5% TiO2 prepared at a normal colorant loading for this color.
> 2. 5% colorant; 95% TiO2 prepared at a normal colorant loading for this color.
> 3. 25% colorant; 75% TiO2 prepared at a normal colorant loading for this color.
> 4. 50% colorant; 50% TiO2 prepared at a normal colorant loading for this color.
> 5. 75% colorant; 25% TiO2 prepared at a normal colorant loading for this color.
> 6. 98% colorant; 2% black prepared at a normal colorant loading for this color.

For Alternate Resins - Additional resins may be entered into the same database as alternate resins. The primary resin is typically the clearest resin available. The alternate resins generally have more color and scattering. To characterize these alternate resin/filler systems, two samples are required--Either a masstone of the resin (if it can be prepared to near hiding) and a black letdown, OR a white letdown (if the resin cannot be applied to hiding) and one black letdown. The concentration for the black letdown should be

such that the sample is not a true black, but rather is a medium gray.

Known Mixtures - In order to make back predictions and verify the database, a series of Known Mixtures are made using the same raw materials and laboratory procedures and done at the same time. Each known should contain exactly 3 colorants plus white. The 3 colorants should be distinctly different hues, e.g. do not use two reds in the same mixture. Two chromatics plus black in a white base work well for this purpose. Choose a normal colorant loading for these samples. Each pigment should be used at least twice in these known mixtures.

EACH SAMPLE DESCRIBED ABOVE SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD BE PREPARED AT A COLORANT CONSISTEN WITH WHAT WOULD BE USED IN PRODUCTION.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Textiles

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your dyes and substrates at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given class of dyes must be prepared on the same substrate, on the same equipment, using the same preparation procedure (chemicals, temperature, etc.). They should be prepared as a finished product and include the finishing steps.

All percent concentrations are calculated on the percent of dye on total weight of the fiber or substrate. This is referred to as % Concentration.

A typical computer database contains several concentration levels of each dye. Usually between 5 and 10 levels are stored for each colorant (pigment, dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required.

SAMPLES REQUIRED--Prepare and label the following samples:

SUBSTRATE- A blank sample of the primary substrate must be processed using all chemicals and the same procedure used for the primaries. This sample will be used to characterize the substrate color in the database. Some processes may cause a color change of the substrate. This will affect the accuracy when measuring the low concentration levels if not accounted for. For this reason, the extrusion and molding conditions under which this resin sample is made should closely resemble the conditions under which all samples are routinely prepared.

COLORANT PRIMARIES - For each dye (pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the substrate or batch.

0.01%	0.75%
0.05%	1.00%
0.10%	1.50%
0.25%	2.00%
0.50%	3.00%

These are recommendations based on commonly used dyes. Certain dyes may be used in a different range of concentrations. If this is the case, then these concentrations should be changed to reflect the normal range over which this dye is used to match colors. For example, if a Navy dye is used up to 4% and never down in the low concentration range, then adjust the levels to include 4% and delete the levels at the low concentrations.

KNOWN MIXTURES - In order to evaluate the accuracy and performance of the database, several known mixtures should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for

more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Some suggested formulas:

Black Blue Red Yellow Green
Known #1   0.5% 0.5% 0.5%
Known #2 .25%   1.0% 1.0%
Known #3 .10%   1.0% 1.0%
Known #4 .50% 2.0%   .25%
Known #5 .10% .25%   .5%
Known #6 .75%   2.0%   .10%

Add more formulas to cover the normal gamut of colors that you routinely make.

<u>GENERAL GUIDELINES</u>
The accuracy of the match predictions generated by the system is highly dependent on three factors:
> § the accuracy and repeatability with which you measure your samples;
> § choosing the correct calibration techniques for your colorants and your application;
> § the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the dyes, substrates and chemicals should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Textiles - Exhaust Dyeing

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your dyes and substrates at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given class of dyes must be prepared on the same substrate, on the same equipment, using the same preparation procedure (chemicals, temperature, etc.). They should be prepared as a finished product and include the finishing steps.

All percent concentrations are calculated on the percent of dye on total weight of the fiber or substrate. This is referred to as % Concentration.

A typical computer database contains several concentration levels of each dye. Usually between 5 and 10 levels are stored for each colorant (pigment, dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required.

SAMPLES REQUIRED--Prepare and label the following samples:

SUBSTRATE- A blank sample of the primary substrate must be processed using all chemicals and the same procedure used for the primaries. This sample will be used to characterize the substrate color in the database. Some processes may cause a color change of the substrate. This will affect the accuracy when measuring the low concentration levels if not accounted for. For this reason, the extrusion and molding conditions under which this resin sample is made should closely resemble the conditions under which all samples are routinely prepared.

COLORANT PRIMARIES - For each dye (pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the substrate or batch.

0.01%	0.75%
0.05%	1.00%
0.10%	1.50%
0.25%	2.00%
0.50%	3.00%

These are recommendations based on commonly used dyes. Certain dyes may be used in a different range of concentrations. If this is the case, then these concentrations should be changed to reflect the normal range over which this dye is used to match colors. For example, if a Navy dye is used up to 4% and never down in the low concentration range, then adjust the levels to include 4% and delete the levels at the low concentrations.

<u>KNOWN MIXTURES</u> - In order to evaluate the accuracy and performance of the database, several known mixtures should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Some suggested formulas:

Black Blue Red Yellow Green
Known #1   0.5% 0.5% 0.5%
Known #2 .25%   1.0% 1.0%
Known #3 .10%   1.0% 1.0%
Known #4 .50% 2.0%   .25%
Known #5 .10% .25%   .5%
Known #6 .75%   2.0%   .10%

Add more formulas to cover the normal gamut of colors that you routinely make.

<u>GENERAL GUIDELINES</u>
The accuracy of the match predictions generated by the system is highly dependent on three factors:
- the accuracy and repeatability with which you measure your samples;
- choosing the correct calibration techniques for your colorants and your application;
- the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the dyes, substrates and chemicals should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Cement - Single Constant

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given set of colorants must be prepared in the same base and drawn down on a rigid substrate, on the same equipment, using the same preparation procedure (viscosity, film thickness, mixing techniques, etc.). They should be prepared as a finished product by including all of the usual fillers, additives, etc.

All percent concentrations are calculated on the percent of colorant based on total weight of the batch. This is referred to as % Concentration.

A typical computer database contains several concentration levels of each colorant. Usually between 5 and 10 levels are stored for each colorant (dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required.

<u>**SAMPLES REQUIRED**</u>--Prepare and label the following samples:

<u>**Cement Base on Substrate**</u> - A blank sample of the cement base (without any colorant) must be applied on the chosen substrate using the same procedure used for the primaries. This sample will be used to characterize the base or cement color in the database. Some processes may cause a color change of the substrate. This will affect the accuracy when measuring the low concentration levels if not accounted for. For this reason, the processing conditions under which this base sample is made should closely resemble the conditions under which all samples are routinely prepared.

<u>**COLORANT PRIMARIES**</u> - For each colorant (pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the sample or batch. These concentrations are based on dispersions. If you are not using pre-dispersed colorants, then adjust these concentrations accordingly or contact CyberChrome Color Systems for our recommendations. The levels need to be evenly spaced out between the lowest concentration and the maximum concentration used for each colorant. Please note that the maximum loading may be different for some colorants.

0.10%	2.00%	10.00%
0.50%	4.00%	
1.00%	6.00%	

<u>**KNOWN MIXTURES**</u> - In order to evaluate the accuracy and performance of the database, several known mixtures

should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Add more formulas to cover the normal gamut of colors that you routinely make.

GENERAL GUIDELINES
The accuracy of the match predictions generated by the system is highly dependent on three factors:
> § the accuracy and repeatability with which you measure your samples;
> § choosing the correct calibration techniques for your colorants and your application;
> § the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The inks, pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the pigments, colorants, substrate and base should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

Sample Preparation Guide for Coatings (Colorant Dispersions Systems)

OnColor Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

White & Black Samples -
   1. White Masstone - is made from either a white tinting base or a clear base mixed with White colorant and drawn down to complete hiding.
   2. Black Masstone - is a mixture of the most commonly used Black colorant in a clear base. It contains only clear base and black.
   3. Mixtures of black with white should be made at the concentrations given below to make various shades of gray.

For Each Dispersion or Colorant - Five white letdowns and one black letdown are recommended. Six samples total.
   1. 1.0% colorant; 99.0% white base (or if using a white dispersion rather than a pre-formulated base, use 1.0% colored dispersion to 99.0% white dispersion mixed in a clear base).
   2. 5% colorant; 95% white base (or if using a white dispersion rather than a pre-formulated base, use 5% colored dispersion to 95% white dispersion mixed in a clear base).
   3. 10% colorant; 90% white base (or if using a white dispersion rather than a pre-formulated base, use 10% colored dispersion to 90% white dispersion in a clear base).
   4. 40% colorant; 60% white base (or if using a white dispersion rather than a pre-formulated base, use 40% colored dispersion to 60% white dispersion in a clear base).
   5. 80% colorant; 20% white base (or if using a white dispersion rather than a pre-formulated base, use 80% colored dispersion to 20% white dispersion in a clear base).
   6. 98% colorant; 2% black dispersion in a clear base. This sample MUST be prepared in a clear base, not a white base

Known Mixtures - In order to make back predictions and verify the database, a series of Known Mixtures are made using the same raw materials and laboratory procedures and done at the same time. Each known should contain exactly 3 colorants plus white. The 3 colorants should be distinctly different hues, e.g. do not use two reds in the same mixture. Two chromatics plus black in a white base work well for this purpose. Choose a normal colorant loading for these samples.

EACH SAMPLE DESCRIBED ABOVE SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD BE PREPARED AT THEIR NORMAL COLORANT LOADING AND DRAWN DOWN TO OPACITY, WHEREVER PRACTICAL OVER A WHITE AND BLACK CARD.

OPL Samples - If you wish to use the OPL (or Optimized Pigment Loading) calculation to calculate the loading calculated for a certain opacity, then you need to prepare the following additional samples:

1. Characterization Samples - All that is needed is one (1) sample of white at incomplete hiding. However, we recommend preparing three (3) different samples of white at incomplete hide either varying the film thickness or loading. From the 3 samples, we will select the best one to use for the database. (The way we determine the best sample is by making "OPL Knowns" to test the back predictions.) Aim for an Opacity between 80% - 99%.

2. OPL Knowns - To validate and tune the OPL settings, several Knowns are required where the film thickness, loading, and opacity are known. These samples should have opacities between 90 - 99% in order to be useful. Approximately 12 Knowns are recommended. They can be any combinations of colorants, but they should contain varying amounts of white and range from an off-white to a very dark color.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Coatings (Inter-mix)

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize *your* colorants, in *your* process, using *your* raw materials. The OnColor™ Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor™ Help file and manual.

<u>**White & Black Samples -**</u>
     1. White Masstone - is made from white base and drawn down to complete hiding.
     2. Black Masstone - is made from the black tinting base and drawn down to complete hiding.
     3. Gray #1 -80% Black; 20% White
     4. Gray #2 - 40% Black; 60 % White
     5. Gray #3 - 10% Black; 90 % White
     6. Gray #4 - 2% Black; 98 % White
     7. Gray #5 - 0.5% Black; 99.5 % White

These are the calibrating white and black samples. The same calibrating white and black must be used for the letdowns in the following samples. It is recommended that you keep in reserve a supply of this calibrating white and black so that you have the same lot of paint if and when you need to add more colorants to the database. The calibrating white and black are "sacred" in the database and cannot be changed. All colorant samples are relative to these two primaries. Choose them with care.

<u>**For Each Colored Base**</u> - The following colored bases are assumed to be equivalent to finished product and require no additional ingredients to make a finished paint. Five white letdowns and one black letdown are recommended. Six samples total.
     1. 80% colored base; 20% white base
     2. 40% colored base; 60% white base
     3. 10% colored base; 90% white base
     4.   2% colored base; 98% white base
     5. 0.5% colored base; 99.5% white base
     6. 95% colored base; 5% black base

<u>**Dispersions**</u> - If colorant dispersions are used in conjunction with the inter-mix system, samples for the dispersions should be prepared according to the guidelines given in the Sample Prep Guide for Dispersions.

<u>**Known Mixtures**</u> - In order to make back predictions and verify the database, a series of Known Mixtures are made using the same raw materials and laboratory procedures and done at the same time. Each known should contain exactly 3 colorants plus white. The 3 colorants should be distinctly different hues, e.g. do not use two reds in the same mixture. Two chromatics plus black in a white base work well for this purpose. Choose a normal colorant loading for these samples. If you are not sure what to prepare for these Knowns, please contact CyberChrome or your applications engineer for help.

EACH SAMPLE DESCRIBED ABOVE SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD

BE PREPARED AT THEIR NORMAL COLORANT LOADING AND DRAWN DOWN TO OPACITY, WHEREVER PRACTICAL OVER A WHITE AND BLACK CARD.

The accuracy of the match predictions generated by the system is highly dependent on the accuracy with which these samples are prepared. Please assign this responsibility to an experienced technician!

If you have any questions about how to prepare these samples, please contact CyberChrome or your applications engineer to get them answered.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation guide for Architectural Coatings

(Multiple Base systems)

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize *your* colorants, in *your* process, using *your* raw materials to give you the best possible matching accuracy. By following these recommendations, you will achieve the best possible database with the lowest number of samples. The OnColor™ Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor™ Help file and manual.

For a typical 3 or 4 base system consisting of a Pastel, Midtone, Deeptone, and Clear base the following samples are recommended. It is helpful to know the can fill rules to calculate the optimum concentrations to use. The can fill rules include the pre-fill (or short fill) amount, the minimum fill amount (if any), and the maximum fill amount for a can. Usually these are given for the gallon can size. All concentrations for this application are based on Volume (not weight), although the proper amounts can be weighed out. The input into OnColor is always in terms of volume. Output can be in weight, volume, or both.

The examples below are given in terms of a gallon formula. The sample size can be reduced to a pint or half-pint as long as the accuracy and precision of your preparation is not sacrificed.

For the White bases (all bases except the clear):

White & Black Samples -
> **1. White Masstone** - is made from white base and drawn down to complete hiding.
> **2. Black Masstone** - is made with the black tint *in clear base* and drawn down to complete hiding.
> **3. Gray #**1 -0.5% Black; 99.5% White Base
> **4. Gray #2** - 1.0% Black; 99.0 % White Base
> **5. Gray #3** - 1.50% Black; 98.50 % White Base

For Each Colorant -
> 1. Prepare a White letdown of the colorant close to the maximum level of colorant allowed in this base. For example, let's suppose that you are allowed to put up to 4 oz of color in a pre-filled gallon of Pastel base. The 4 oz/132oz total is approximately 3% by volume. Make the white letdown in this base at 3 oz in a pre-filled gallon. Only one white letdown per colorant per base is required. This is paired with a black letdown of the colorant prepared in the Clear base to calculate the data for this colorant in this base. More white letdowns can be entered, but are not required.
> 2. For the Midtone and Deeptone bases, adjust the volume % of colorant according to the Prefill level of the base. For example, if the Midtone base is prefilled to 124 oz/gallon and you are allowed to overfill to 132 oz/gal, that leaves room for up to 8 oz of colorant in this base or approximately 6% of colorant. We recommend that you use slightly less than the full amount, so choose 4% which rounds off to approximately 5 oz of colorant per gallon. It is important that you know exactly what you put in the can, but it is not important that it be an even number.
> 3. The black letdown of the colorant that is made in the Clear base is used multiple times. Refer to the instructions under the Clear base on how to prepare this sample.

For the Clear Base:

All samples are prepared at the same volume. The %Concentrations are calculated based on the typical amount of colorant allowed in a clear base. For example, if the Clear base is prefilled to 116 oz and a maximum of 128 oz/gallon is allowed, then use a total of 12 oz of colorant mixed with a prefilled gallon of clear base in each of the samples given below. The percentages are calculated based only on this total of 12 oz of colorant, not the total amount including the clear base. If your Prefill is different, then adjust the colorant amounts accordingly.

White & Black Samples -
> **1. White Masstone** - is made from the tinting white mixed into the clear base and drawn down to complete hiding. (This is made with 12 oz of tint white in a prefilled gallon of clear base)
> **2. Black Masstone** - is made from the black dispersion mixed into the clear base and drawn down to complete hiding. (This

example would use 12 oz of Black in a prefilled gallon of clear base)
> **3. Gray #**1 -80% Black; 20% White (This is 80% of the 12 oz or 9.6 oz black with 2.4 oz tint white)
> **4. Gray #2** - 40% Black; 60 % White (This is 40% of the 12 oz or 4.8 oz black with 7.2 oz tint white)
> **5. Gray #3** - 10% Black; 90 % White (This is 10% of the 12 oz or 1.2 oz black with 10.8 oz tint white)
> **6. Gray #4** - 2% Black; 98 % White (This is 2.0% of the 12 oz or 0.24 oz black with 11.76 oz tint white)
> **7. Gray #**5 - 0.5% Black; 99.5 % White (This is 0.5% of the 12 oz or 0.06 oz black with 11.94 oz tint white)

These are the calibrating white and black samples. The same calibrating white and black must be used for the letdowns in the following samples. It is recommended that you keep in reserve a supply of this calibrating white and black so that you have the same lot of paint if and when you need to add more colorants to the database. The calibrating white and black are "sacred" in the database and cannot be changed. All colorant samples are relative to these two primaries. Choose them with care.

For Each Colorant -
In the Clear Base, we recommend that you prepare 5 white letdowns and one black letdown. We will use the example given above for the Clear Base that is prefilled to 116 oz and a maximum of 128 oz/gallon is allowed, then use a total of 12 oz of colorant mixed into a prefilled gallon of clear base in each of the samples given below. The percentages are calculated based only on this total of 12 oz of colorant, not the total amount including the clear base.
> **1. Letdown #**1 -80% Colorant; 20% White (This is 80% of the 12 oz or 9.6 oz colorant with 2.4 oz tint white)
> **2. Letdown #2** - 40% Colorant; 60 % White (This is 40% of the 12 oz or 4.8 oz colorant with 7.2 oz tint white)
> **3. Letdown #3** - 10% Colorant; 90 % White (This is 10% of the 12 oz or 1.2 oz colorant with 10.8 oz tint white)
> **4. Letdown #4** - 2% Colorant; 98 % White (This is 2.0% of the 12 oz or 0.24 oz colorant with 11.76 oz tint white)
> **5. Letdown #5** - 0.5% colorant; 99.5 % White (This is 0.5% of the 12 oz or 0.06 oz colorant with 11.94 oz tint white)
> **6. Letdown #6** - Colorant Letdown with Black - 98% Colorant; 2% Black (Use 11.76 oz of colorant with 0.24 oz of Black) This letdown will also be used repeatedly with the colorant letdowns in the white bases.

Draw down all of these samples to hiding if possible over a white and black contrast chart (such as a Leneta card or a BYKO chart). Use a 6 mil draw down bar if needed, but do not make more than 2 coats. If the sample is still not opaque, then we will use the reflectivity calculation to calculate the color at opacity.

These are the calibrating white and black samples. The same calibrating white and black must be used for the letdowns in the following samples. It is recommended that you keep in reserve a supply of this calibrating white and black so that you have the same lot of paint if and when you need to add more colorants to the database. The calibrating white and black are "sacred" in the database and cannot be changed. All colorant samples are relative to these two primaries. Choose them with care.

Known Mixtures - In order to make back predictions and verify the database, a series of Known Mixtures are made using the same raw materials and laboratory procedures and done at the same time. Each known should contain exactly 3 colorants in a white base or with the tint white in the clear base. The 3 colorants should be distinctly different hues, e.g. do not use two reds in the same mixture. Two chromatics plus black in a white base work well for this purpose. Choose legal can fill amounts for these samples; in other words don't put more or less total colorant in these samples than would be allowed You will need approximately 12 knowns for each base. Each colorant should appear at least twice in each base. If you are not sure what to prepare for these Knowns, please contact CyberChrome or your applications engineer for help.

A typical data base for a 4 base system using 12 colorants would require a total of approximately 120 calibration samples plus 48 Known Mixtures.

The accuracy of the match predictions generated by the system is highly dependent on the accuracy with which these samples are prepared. Please assign this responsibility to an experienced technician!

If you have any questions about how to prepare these samples, please contact CyberChrome or your applications engineer to get them answered. The guidelines given above are generic. Many products or applications can deviate from this. Your CyberChrome applications engineer will be happy to prepare a spreadsheet of actual samples to prepare for your specific products. Please don't hesitate to contact us.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Powder Coatings

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

EACH SAMPLE DESCRIBED BELOW SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD BE PREPARED AT THEIR NORMAL COLORANT LOADING AND APPLIED TO OPACITY, WHEREVER PRACTICAL OVER A WHITE AND BLACK PANEL.

White & Black Samples -

1. White Masstone - is made from a clear resin mixed with White colorant and applied to complete hiding and made at a normal colorant loading for a white.
2. Black Masstone - is a mixture of the most commonly used Black colorant in a clear resin. It contains only clear resin and black. This sample should be made at a normal colorant loading for a black.
3. Grays - Prepare 5 grays using the calibrating white and black at the ratios given below. Each sample should be prepared at a colorant normal consistent with what would be used in production. The colorant loading may vary as the white decreases and the gray gets darker.

For Each Inorganic Colorant - A minimum of three white letdowns and one black letdown are requested; Four samples total. For higher accuracy on dark and high chroma colors, five white letdowns are recommended and as many as 10 letdowns are useful. While the OnColor software has no upper limit on the number of letdowns that can be characterized, more than 10 is typically of no additional benefit.

1. 2% colorant; 98% TiO2 prepared at a normal colorant loading for this color.
2. 10% colorant; 90% TiO2 prepared at a normal colorant loading for this color.
3. 25% colorant; 75% TiO2 prepared at a normal colorant loading for this color.
4. 50% colorant; 50% TiO2 prepared at a normal colorant loading for this color.
5. 75% colorant; 25% TiO2 prepared at a normal colorant loading for this color.
6. 98% colorant; 2% black prepared at a normal colorant loading for this color.

For Each Organic Colorant - Five or more white letdowns and one black letdown are recommended.

1. 1% colorant; 99% TiO2 prepared at a normal colorant loading for this color.
2. 5% colorant; 95% TiO2 prepared at a normal colorant loading for this color.
3. 25% colorant; 75% TiO2 prepared at a normal colorant loading for this color.
4. 50% colorant; 50% TiO2 prepared at a normal colorant loading for this color.
5. 75% colorant; 25% TiO2 prepared at a normal colorant loading for this color.
6. 98% colorant; 2% black prepared at a normal colorant loading for this color.

For Alternate Resins - Additional resins may be entered into the same database as alternate resins. The primary resin is typically the clearest resin available. The alternate resins generally have more color and scattering. To characterize these alternate resin/filler systems, two samples are required--Either a masstone of the resin (if it can be prepared to near hiding) and a black letdown, OR a white letdown (if the resin cannot be applied to hiding) and one black letdown. The concentration for the black letdown should be such that the sample is not a true black, but rather is a medium gray.

Known Mixtures - In order to make back predictions and verify the database, a series of Known Mixtures are made using the same raw materials and laboratory procedures and done at the same time. Each known should contain exactly 3 colorants plus white. The 3 colorants should be distinctly different hues, e.g. do not use two reds in the same mixture. Two chromatics plus black in a white base work well for this purpose. Choose a normal colorant loading for these samples.

EACH SAMPLE DESCRIBED ABOVE SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD BE PREPARED

AT THEIR NORMAL COLORANT LOADING AND APPLIED TO OPACITY, WHEREVER PRACTICAL OVER A WHITE AND BLACK CHART

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Screen Inks

Match Gold and Silver software require an ink database to calculate matches and corrections. This ink database is made up of a special set of samples, called ink calibration samples. These samples are made using your bases and inks at specially designated concentrations. These samples are used to characterize your inks, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this ink file. In addition, a few known mixtures are prepared to verify and tune the ink file. The following is a summary of the samples required to characterize a ink file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

White & Black Samples -
> 1. White Masstone - is made from either a white tinting base or a clear base mixed with White ink and printed at complete hiding.
> 2. Black Masstone - is a mixture of the most commonly used Black ink in a clear base. It contains only clear base and black ink.
> 3. Grays - Prepare 5 grays using the calibrating white and black at the ratios given below.

For Each Ink - Five white letdowns and one black letdown are recommended. Six samples total.

> 1. 1% ink; 99% white base (or if using a white ink rather than a pre-formulated base, use 1% colored ink to 99% white ink in a clear base at a normal loading for your application).
> 2. 5% ink; 95% white base (or if using a white ink rather than a pre-formulated base, use 5% colored ink to 95% white ink in a clear base at a normal loading for your application).
> 3. 10% ink; 90% white base (or if using a white ink rather than a pre-formulated base, use 10% colored ink to 90% white ink in a clear base).
> 4. 25% ink; 75% white base (or if using a white ink rather than a pre-formulated base, use 25% colored ink to 75% white ink in a clear base at a normal loading for your application).
> 5. 75% ink; 25% white base (or if using a white ink rather than a pre-formulated base, use 75% colored ink to 25% white ink in a clear base).
> 6. 98% ink; 2% black ink in a clear base. This sample MUST be prepared in a clear base, not a white base

Known Mixtures - In order to make back predictions and verify the database, a series of Known Mixtures are made using the same raw materials and laboratory procedures and done at the same time. Each known should contain exactly 3 inks plus white. The 3 inks should be distinctly different hues, e.g. do not use two reds in the same mixture. Two chromatics plus black in a white base work well for this purpose. Choose a normal ink loading for these samples.

EACH SAMPLE DESCRIBED ABOVE SHOULD BE MADE AS A FINISHED PRODUCT. ALL SAMPLES SHOULD BE PREPARED AT THEIR NORMAL INK LOADING AND PRINTED TO OPACITY, WHEREVER PRACTICAL OVER A WHITE AND BLACK CARD.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Single Constant

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given class of colorants must be prepared in the same resin or base material, on the same equipment, using the same preparation procedure (dwell time, temperature, etc.). They should be prepared as a finished product by including all of the usual fillers, additives, etc.

All percent concentrations are calculated on the percent of dye or pigment based on total weight of the batch. This is referred to as % Concentration.

A typical computer database contains several concentration levels of each dye. Usually between 5 and 10 levels are stored for each colorant (pigment, dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required.

SAMPLES REQUIRED--Prepare and label the following samples:

RESIN or Foam Base - A blank sample of the primary resin or base (without any colorant) must be processed using all additives and the same procedure used for the primaries. This sample will be used to characterize the substrate color in the database. Some processes may cause a color change of the base. This will affect the accuracy when measuring the low concentration levels if not accounted for. For this reason, the processing conditions under which this base sample is made should closely resemble the conditions under which all samples are routinely prepared.

COLORANT PRIMARIES - For each colorant (pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the sample or batch.

> 0.10%
> 0.25%
> 0.50%
> 0.75%
> 1.00%
> 1.50%
> 2.00%
> 3.00%

KNOWN MIXTURES - In order to evaluate the accuracy and performance of the database, several known mixtures should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Some suggested formulas:

Black Blue Red Yellow Green
Known #1   0.5% 0.5% 0.5%
Known #2 .25%   1.0% 1.0%
Known #3 .10%   1.0% 1.0%
Known #4 .50% 2.0%   .25%
Known #5 .10% .25%   .5%
Known #6 .75%   2.0%   .10%

Add more formulas to cover the normal gamut of colors that you routinely make.

GENERAL GUIDELINES
The accuracy of the match predictions generated by the system is highly dependent on three factors:
§ the accuracy and repeatability with which you measure your samples;
§ choosing the correct calibration techniques for your colorants and your application;
§ the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the colorants, resins and base should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Transparent Inks (Pre-Mixed Ink Dispersions Systems)

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given class of inks or colorants must be prepared in the same clear and printed on the same base material, on the same equipment, using the same preparation procedure (viscosity, film thickness, printing technique etc.). They should be prepared as a finished product by including all of the usual solvents, additives, etc.

All percent concentrations are calculated on the percent of ink or colorant based on total weight of the batch. This is referred to as % Concentration.

A typical computer database contains several concentration levels of each ink. Usually between 5 and 10 levels are stored for each colorant (ink, dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required.

SAMPLES REQUIRED--Prepare and label the following samples:

Clear Base on Substrate - A blank sample of the clear base or varnish (without any colorant) must be printed on the chosen substrate using all solvents and additives and the same procedure used for the primaries. This sample will be used to characterize the substrate color in the database. Some processes may cause a color change of the substrate. This will affect the accuracy when measuring the low concentration levels if not accounted for. For this reason, the processing conditions under which this base sample is made should closely resemble the conditions under which all samples are routinely prepared.

COLORANT PRIMARIES - For each ink (pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the sample or batch. These concentrations are based on press-ready inks. If you are not using press-ready inks and need to add always add clear, then adjust these concentrations accordingly or contact CyberChrome Color Systems for our recommendations.

0.10%	20%
0.50%	40%
1.00%	60%
5.00%	80%
10.00%	100%

KNOWN MIXTURES - In order to evaluate the accuracy and performance of the database, several known mixtures should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Some suggested formulas:

```
           Black Blue Red  Yellow Green Clear
Known #1   50%  5%   5%          40%
Known #2   .25%      25%   5%         74.75%
Known #3   1.0%  30%  10%         59%
Known #4   .50% 2.0%  .50%        97%
Known #5   1.0% 20%        50%    29%
Known #6   2.0%  20%  10%         68%
```

Add more formulas to cover the normal gamut of colors that you routinely make.

GENERAL GUIDELINES
The accuracy of the match predictions generated by the system is highly dependent on three factors:
§ the accuracy and repeatability with which you measure your samples;
§ choosing the correct calibration techniques for your colorants and your application;
§ the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The inks, pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the inks, colorants, substrate and base should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Trade Sales Paint

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

Each sample should be prepared on a substrate that will allow you to check for opacity (i.e. Leneta or Morest chart or Q-panel with spray monitor). It is important to try to achieve opacity for these database samples. If necessary, increase the film thickness within your normal limits to increase the hiding of the coatings. Several layers may be applied (with proper drying time in-between). For drawdowns, use the "cross-coating" technique (rotating the sample a quarter turn between each coat) for up to four layers. As seen below, a single white drawdown pass lacks opacity (or has poor hiding power). The cross-coating technique would be necessary to properly hide the Leneta Chart.

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It is always a good idea to keep a laboratory notebook to record the exact composition of each sample, as preparation of the following samples will be required.

SUMMARY OF REQUIRED SAMPLES
1. For each colorant: **3** white letdowns in the midtone or medium base and **1** black letdown in the clear or neutral base.
2. Black masstone is in clear base.
3. Base masstones and black letdowns for each base.
4. Known mixtures in each base.
5. White colorant masstone and black letdowns in clear base.

Additional information for building a Trade Sales Database:
Base information for Trade Sales paint database
Can Fill data

Contact your CyberChrome Color Systems applications engineer to provide the base information and can fill data for your product line. He will use this information to develop a customized spreadsheet for the exact samples that you need to prepare. Call us at 845-687-2673 if you do not know who your contact is.

General Guidelines to follow when preparing samples:

A. The colorants, resins, additives, and solvents must be representative of the shade and strength of a STANDARDIZED lot of the material. A sufficient quantity of each of these materials should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials for later use. This ensures that there are no errors due to changes in the lot of materials during the database preparation.

B. The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures that have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

C. Batch size significantly influences the results from the database. In some of the calibrating samples and knowns, we are requesting very small amounts of colorants (<1.0%). You must prepare a quantity sufficient to ensure that you can accurately weigh a quantity this small using your existing scales or balances. For example, don't try to weigh .05 grams of black colorant when your balance is accurate only to 1.0 grams!! Note: rounding off to the second decimal place (0.00) is sufficient for weighting purposes.

D. For each colorant and base include the data on the cost, density, colorant name, pre-fill can volumes, min/max fill information and code number.

E. **<u>KNOWN MIXTURES</u>** - In order to evaluate the accuracy and performance of the database, several test or 'known' mixtures should be prepared and supplied with the database. These knowns should contain only the colorants, which are being calibrated. A colorant should appear in at least three different knowns. The more known mixtures available, the finer the database can be tuned.

Each known should contain exactly 3 colorants plus white (4 colorants total). The three colorants chosen should be distinctly different. Do not include two different reds or yellows, for example, in a single known. The objective of this exercise is not to 'trick' the computer; rather it is to test the accuracy of the database under the most controlled conditions. Choose a normal colorant loading for these samples.
   When adding colorants to the database at a later time, always prepare a few knowns using the new colorant.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for using Colored Bases in Trade Sales

To load a colored base into an OnColor Trade Sales file, you can either use the Masstone/ White Letdown/Black Letdown Method or the White Letdown /Black Letdown Method. The samples you need to prepare are:

1. <u>Masstone</u> of the colored base at opacity (if possible - but that's the whole point of a colored base, isn't it?)
2. <u>White letdown</u> - Make a sample of 50 parts colored base: 50 parts Midtone or Deep Base. The goal is to get a letdown of the colored base that has a % R minimum around 20%. We know this is not a "legal" sample, but it's required here.
3. <u>Black letdown</u> - Make a sample that is 97% colored base and 3% Black. The goal here is to get a %R maximum around 20% (for reds, yellows, and oranges). Adjust the amount of Black if needed to get to approximately this level. Blues, greens, and purples are generally below this level before adding any black.
4. <u>Knowns </u>- are always recommended. Make a few letdowns with just the base plus a few different levels of the tint white. Then make a few other colors that would represent real world colors you might match in this base. This is the one time where you can add just one or two colorants.

To load the base into the colorant file:
1. Make a copy of either the Midtone.CLR or Deeptone.CLR, depending which one you used for the white letdown and name it according to the name of the colored base.
2. You will be replacing the resin in the Resin section in this file.
3. Measure the samples into a WSV file in OnColor. For the MT/ Whit/ Blk method use:
Std = 100% Colored Base
Trial 1 = 50% (or whatever % you used) Colored Base
Trial 2 = 97% Colored Base w/ black

For the White/Black letdown method use:
Std = 50% (or whatever % you used) Colored Base
Trial 1 = 97% Colored Base w/ black

4. With the WSV file open from step 3, go to the Colorant View. Change to the Resin Mode.
5. Click on CharacterizeàReplace. Choose the Letdown Type according to whether you have Masstone/ White/Black or just White/Black. Click on Apply and say Yes to the question about replacing this resin. Then Cancel out of this dialog box.
6. Be sure to Edit the fields for the Prefill, min fill, max fill, and density. For colored bases, the min fill must equal the Prefill amount.
7. Finally go to FileàSave As and save the CLR under a new name for the colored base.
8. Make a PRP file for this base by editing the one you should already have for the Mid or Deep base.
9. You are now ready to match some colors. Hopefully you also made some Knowns in this base so that you can tune the KX and validate it. The KX White typically needs some tuning on a colored base, so it's good to check it with some knowns.

EACH SAMPLE DESCRIBED ABOVE SHOULD BE MADE AS A FINISHED PRODUCT.
ALL SAMPLES SHOULD BE PREPARED AT THEIR NORMAL COLORANT LOADING AND APPLIED TO OPACITY, WHEREVER PRACTICAL OVER A WHITE AND BLACK CHART

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Transparent Film or Plastics

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given class of colorants must be prepared in the same resin, on the same equipment, using the same preparation procedure (film thickness, drawdown or spray out, solvent system, viscosity, etc.). They should be prepared as a finished product by including all of the usual fillers, additives, etc.

All percent concentrations are calculated on the percent of dye or pigment based on total weight of the batch. This is referred to as *% Concentration.*

A typical computer database contains several concentration levels of each colorant. Usually between 5 and 10 levels are stored for each colorant (dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required.

<u>SAMPLES REQUIRED</u>--Prepare and label the following samples:

<u>RESIN or Base</u> - A blank sample of the primary resin (stain or base vehicle without any colorant) must be processed using all additives and the same procedure used for the primaries. This sample will be used to characterize the substrate and vehicle combination in the database. Some processes may cause a color change of the resin. This will affect the accuracy when measuring the low concentration levels if not accounted for.

<u>COLORANT PRIMARIES</u> - For each colorant (dye, pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the sample or batch.

0.10%	1.00%
0.25%	1.50%
0.50%	2.00%
0.75%	3.00%

<u>KNOWN MIXTURES</u> - In order to evaluate the accuracy and performance of the database, several known mixtures should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Some suggested formulas:

Black Blue Red Yellow Green
Known #1   0.5% 0.5% 0.5%

Known #2 .25%   1.0% 1.0%
Known #3 .10%   1.0% 1.0%
Known #4 .50% 2.0%   .25%
Known #5 .10% .25%   .5%
Known #6 .75%   2.0%   .10%

Add more formulas to cover the normal gamut of colors that you routinely make.

GENERAL GUIDELINES
The accuracy of the match predictions generated by the system is highly dependent on three factors:

§ the accuracy and repeatability with which you measure your samples;
§ choosing the correct calibration techniques for your colorants and your application;
§ the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the colorants, resins and base should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

See Also: **General Guidelines for Colorant Database Preparation**

Sample Preparation Guide for Wood Stains

Match Gold and Silver software require a colorant database to calculate matches and corrections. This colorant database is made up of a special set of samples, called colorant calibration samples. These samples are made using your bases and colorants at specially designated concentrations. These samples are used to characterize your colorants, in your process, using your raw materials. The OnColor Match Gold package is needed to establish and manage this colorant file. In addition, a few known mixtures are prepared to verify and tune the colorant file. The following is a summary of the samples required to characterize a colorant file. Detailed step-by-step instructions are given in the OnColor Help file and manual.

All primary samples for a given class of colorants must be prepared in the same resin, on the same equipment, using the same preparation procedure (film thickness, drawdown or spray out, solvent system, viscosity, etc.). They should be prepared as a finished product by including all of the usual fillers, additives, etc.

All percent concentrations are calculated on the percent of dye or pigment based on total weight of the batch. This is referred to as *% Concentration*.

A typical computer database contains several concentration levels of each colorant. Usually between 5 and 10 levels are stored for each colorant (pigment, dye or dispersion). These different concentration levels are needed to characterize the behavior of each colorant across the range in which it is used. If the colorant behaves in a linear fashion, only a few levels are needed. If the effective strength and/or the shade of the colorant changes with increasing concentration, then more levels are needed to characterize this behavior. While the OnColor software is capable of working with an unlimited number of levels, usually 10 levels are more than sufficient to characterize a colorant.

It is always a good idea to keep a laboratory notebook or log where you record the exact composition and procedure used to make each primary as the following samples will be required. The major issue with getting accurate matches on wood stains is being able to duplicate the same sample all the time. The substrate over which the stain is applied also cannot vary at all for the database samples. It must be the same for the entire database! Later, additional substrates can be characterized and entered into the database, but it is crucial to the accuracy that all samples are prepared using the same substrate and the same methodology.

<u>SAMPLES REQUIRED</u>--Prepare and label the following samples:

<u>RESIN or Base</u> - A blank sample of the primary resin (stain without any colorant) must be processed using all additives and the same procedure used for the primaries. This sample will be used to characterize the substrate and resin combination in the database. Some processes may cause a color change of the resin. This will affect the accuracy when measuring the low concentration levels if not accounted for.

<u>COLORANT PRIMARIES</u> - For each colorant (dye, pigment or dispersion), prepare and label the following samples. These percentages are given based on the total weight of the sample or batch.

0.10%	1.00%
0.25%	1.50%
0.50%	2.00%
0.75%	3.00%

<u>KNOWN MIXTURES</u> - In order to evaluate the accuracy and performance of the database, several known mixtures should be prepared and supplied with the database. These "knowns" should contain only the colorants which are being calibrated. Approximately 10 to 12 knowns should be prepared containing 3 colorants each. Two additional samples should be prepared to demonstrate the batch correction features of OnColor. These should be made by varying the formulas of two of the known mixtures slightly, so that a small color difference is seen.

There is nothing "magic" about these knowns--just be sure to use all of the colorants at least once. If you prepared primaries for more than these four (4) colorants, include each colorant in at least two (2) knowns. When adding additional colorants to the file, always use at least two knowns for each colorant to verify the database.

Some suggested formulas:

	Black	Blue	Red	Yellow	Green
Known #1		0.5%	0.5%	0.5%	

Known #2 .25%   1.0% 1.0%
Known #3 .10%   1.0% 1.0%
Known #4 .50% 2.0%   .25%
Known #5 .10% .25%   .5%
Known #6 .75%   2.0%   .10%

Add more formulas to cover the normal gamut of colors that you routinely make.

GENERAL GUIDELINES
The accuracy of the match predictions generated by the system is highly dependent on three factors:
> § the accuracy and repeatability with which you measure your samples;
> § choosing the correct calibration techniques for your colorants and your application;
> § the accuracy with which you prepare your database.

Since you control the last factor, we hope you'll strive for the best possible accuracy and sample repeatability. We recommend that the job of preparing database samples be given to the most skilled laboratory assistant. Sufficient time should be scheduled for the assigned individual to complete the task properly.

The pigments, colorants, or dispersions must be representative of the shade and strength of a STANDARDIZED lot of material. A sufficient quantity of all the colorants, resins and base should be set aside to make all the calibration samples and known mixtures. If you plan on expanding the database, be sure that you reserve enough of these raw materials. This ensures that there are no errors due to changes in the lot of materials during this trial.

Select one or two of the known mixtures and have them prepared in duplicate, preferably by another staff member.

The database samples should be prepared in a manner that is consistent with the production process. Always use laboratory procedures which have proven to show good correlation to the production process. If possible and practical, prepare the samples on production processing equipment.

See Also: **General Guidelines for Colorant Database Preparation**

Definition of Instrument Status Word

Position	Letter	Meaning
1	B C H K L X	100% Line Calibration Ceramic Calibration Hitch Calibration Keyboard Input Low Illumination Calibration Not Calibrated
2	R T P	% Reflectance % Transmission Profiled Data
3	I E B	Specular Component Included (Gloss Included or SCI) Specular Component Excluded (Gloss Excluded or SCE) Both SCI and SCE
4	A E F G I P Q R J	Extra Filter UV Component Excluded UV Component Excluded w/420nm Cutoff UV Component Excluded w/400nm Cutoff UV Component Included Partial UV Partial UV w/420nm Cutoff Partial UV w/400nm Cutoff No UV w/460 nm Cutoff
5	X L M S V U	Extra Large Aperture lens setting (XLAV) Large Aperture lens setting (LAV) Medium Aperture lens setting (MAV) Small Aperture lens setting (SAV) Very Small Aperture lens setting (VSAV) Ultra Small Aperture lens setting (VSAV)
6	X L M S V U P	Extra Large Area of View mask (XLAV) Large Area of View mask (LAV) Medium Area of View mask (MAV) Small Area of View mask (SAV) Very Small Area of View mask (VSAV) Ultra Small Aperture lens setting (USAV) Petri Dish Accessory (CM-3500d only)

EXAMPLE: If the Status Word is **CRIELL**

The Instrument
        - was calibrated using a **Ceramic** White Tile

- is in **Reflectance** Mode
- the Specular Component is **Included** in the measurement
- the UV Component has been **Excluded** from the measurement
- the Area of View is set to **Large**
- the Mask at the measuring port is **Large**

How to Calibrate the Instrument

Prerequisite: [Establish communications with the instrument](#)

Select **Options** on the Menu Bar (shortcut: O)
Select **Calibration** (Shortcut: C)
Click **Status** Tab
Enter appropriate information for specific sensor
Click **Calibrate**
Note: Depending on the sensor, you will be prompted to perform a specific measurement
Either click **OK** or **Skip** to next prompt
Once the sensor has been calibrated, Click **OK** to return to the User Screen

How to Change Colorimetric Parameters

Illuminants and Observer
1. Select **Options**
2. Click on **Illum/Observer**
3. Make a selection from Primary, Secondary and Tertiary categories
4. Choose 2* or 10* Observer
5. Click **OK**

Color Space
1. Select **Options**
2. Click on **Color Space**
3. Make selections from the Color Space dialog box
4. Click **OK**

How to Change From 3 Iluminants to 1 Illuminant

Click on **Options**
Select **Observer/Illuminants**
Set Primary, Secondary, and Tertiary to the same illuminant by clicking the down arrows and selecting the appropriate illuminant from the list.

How to Change Report Properties

Select **Options**

Choose one of the following Screens:

        [User Defined](#) (Split into quadrants displaying all of the following)
        [Color Plot](#)
        [Spectral Plot](#)
        [Tolerance Plots](#)
        [Statistical Charts](#)

How to Change Screen Colors

Select **View**
1. Click on Select Colors
2. Select the item you want to change
3. Choose a color
4. Repeat Steps 3 & 4 to change more than one item
5. Click **OK**

How to Establish Communications With the Instrument

Prerequisite: Connect the RS-232 sensor cable to the serial port on your computer.

Select **Options**
Select **Communications**
Select the correct instrument from the **Instrument** drop down list.
Click on **Test Settings.** This will establish and verify communications with the instrument.
Click **OK** if test was successful.
If the test was not successful, check that the correct instrument was selected. Also, check the sensor cable connections to the instrument and computer. Cycle power to the sensor, if necessary.

How to Hitch Calibrate the Instrument

Calibrate the instrument as usual with the black tile/trap and the white tile. See How to Calibrate the Instrument

Click on the Standard pull-down menu at the top of the OnColor QC screen.

Click on Hitch, the Edit Standard Data screen will be displayed.

Select the Hitch Standard tab.

Click on Measure, the Measure the Hitch Standard window will appear.

Place the hitch standard at the measurement port and click OK.

After the measurement is complete the Edit Standard Data screen will be displayed.

Enter either the L*a*b* data or the % reflectance data by clicking on the respective tabs at the top of the Edit Standard Data screen.

If you want to enter the data for just one illuminant see: How to Change From 3 Illuminants to 1 Illuminant When finished entering the L*a*b* data or the % reflectance data and hitting the "apply" button, click the Hitch Standard tab.

Check the Enable Hitch Standard box.

If you wish to save your Hitch Standard, click the Save as button.

Verify that Hitch Calibration is working by selecting the Standard menu and confirm that there is a check in front of Hitch. Next take a measurement of the hitch standard and verify that the values are the same as the values you entered.

How to Measure a Standard

Prerequisite: [Calibrate](#) the sensor

Select **Standard** on the Menu Bar (Shortcut: S)
Choose **Measure**
If **Naming Option** is selected, you will be prompted to name the Standard.
To change this option, Select **Options**
If required, enter the Standard Name, click **OK**
Standard Data will appear in the User Window

How to Measure a Trial

Prerequisite: <u>Standard</u> must have been entered

Select **Trial** on the Menu Bar (Shortcut: T)
Choose **Measure**
If **Naming Option** is selected, you will be prompted to name the Trial
To change this option, Select **Options**
If required, enter the Trial Name, click **OK**
Trial Data will appear in the User Window

How to Prepare Save-Sets

A save-set is a file (*.WSV) containing spectral data and unlimited number of trials for a standard along with the Color Space formula, Color Tolerances, 3 Illuminants and Standard Observer.

Once you have taken Standard and Trial measurements, save the information to file by selecting **File** -> **Save** from the Menu Bar. Type in the file name and click **Save**. All the above information is saved together in a file referred to as a Save-set.

Following are Sample Preparation Guides for Save-Sets:

Industrial Coatings
Plastics
Textiles
Trade Sales
Transparent Filters

How to Set Pass/Fail Criteria (Tolerances)

Select **Options** (Shortcut: O)
Select **Tolerances**
Choose one of the following:

> [Edit Elliptical](#)
> [Edit BoxEdit Box](#)
> [Pass/Fail Assessment](#)

How to Design a Label using the DYMO Software

Several Dymo label templates are copied into the \OnColor\Dymo\ folder at installation. These are templates that can be used to print various outputs of the colorimetric data, both absolute and difference, color indices, job ID's, sample names, and color match formulas in either weight or volume units. You can use these templates "as is", you can modify them to suit your needs, or you can design your own label formats (LWL file) using the Dymo Designer software that comes with the printer. To design your own labels, please refer to the instructions given below.

If any of the following token names are defined as variable fields using the Dymo editor, the fields will be filled with the appropriate value from OnColor when the label is printed. See the examples provided to see how this works.

The program will only match the first characters of each string. If there are more characters, the program will assume the last character is the number of digits to be displayed. In other words STD_ABS_L_4 will show 4 decimal places for the Std L*, while STD_ABS_2 will show 2 decimals. If there is no decimal shown, the program uses the setting from the Crosshair Report to set the number of decimal. Similarly the program uses the settings from the match Reportr to set decimals, units and other variables used to print matching data.

Fields in the Dymo editor can be either fixed or variable, to see the current state, go to Designer Mode and double click on the field, if the "Function as Variable Text Object" is checked, the program will fill in the value at runtime. If not checked, the text is fixed and always shown. If a field is checked as variable, but the program does not find a matching token, an error message will be produced and the label will not be printed.

After you have worked with the Label editor for a while, you will see that it is really quite easy to design your own custom label, but it does take some practice.

Standard Tokens

STD_NAME	STD_SYSTEM	STD_ALT	ILL_OBS	

STD_ABS_L	STD_ABS_A	STD_ABS_B	STD_ABS_C	STD_ABS_H

STD_JOB_01	STD_JOB_02	STD_JOB_03	STD_JOB_04	STD_JOB_05
STD_JOB_06	STD_JOB_07	STD_JOB_08	STD_JOB_09	STD_JOB_10
STD_JOB_11	STD_JOB_12	STD_JOB_13	STD_JOB_14	STD_JOB_15
STD_JOB_16	STD_JOB_17	STD_JOB_18	STD_JOB_19	STD_JOB_20

STD_IDX_01	STD_IDX_02	STD_IDX_03	STD_IDX_04	STD_IDX_05
STD_IDX_06	STD_IDX_07	STD_IDX_08	STD_IDX_09	STD_IDX_10
STD_IDX_11	STD_IDX_12	STD_IDX_13	STD_IDX_14	STD_IDX_15
STD_IDX_16	STD_IDX_17	STD_IDX_18	STD_IDX_19	STD_IDX_20

Trial Tokens

TRL_NAME	TRL_SYSTEM	TRL_ALT		

TRL_ABS_L	TRL_ABS_A	TRL_ABS_B	TRL_ABS_C	TRL_ABS_H

TRL_JOB_01	TRL_JOB_02	TRL_JOB_03	TRL_JOB_04	TRL_JOB_05
TRL_JOB_06	TRL_JOB_07	TRL_JOB_08	TRL_JOB_09	TRL_JOB_10
TRL_JOB_11	TRL_JOB_12	TRL_JOB_13	TRL_JOB_14	TRL_JOB_15
TRL_JOB_16	TRL_JOB_17	TRL_JOB_18	TRL_JOB_19	TRL_JOB_20

TRL_IDX_01	TRL_IDX_02	TRL_IDX_03	TRL_IDX_04	TRL_IDX_05
TRL_IDX_06	TRL_IDX_07	TRL_IDX_08	TRL_IDX_09	TRL_IDX_10

```
TRL_IDX_11   TRL_IDX_12   TRL_IDX_13   TRL_IDX_14   TRL_IDX_15
TRL_IDX_16   TRL_IDX_17   TRL_IDX_18   TRL_IDX_19   TRL_IDX_20

TRL_DEL_L    TRL_DEL_A    TRL_DEL_B    TRL_DEL_L2   TRL_DEL_C
TRL_DEL_H    TRL_DEL_E
```

Colorant Name Tokens

```
CLR_NAM_01   CLR_NAM_02   CLR_NAM_03   CLR_NAM_04   CLR_NAM_05
CLR_NAM_06   CLR_NAM_07   CLR_NAM_08   CLR_NAM_09   CLR_NAM_10
```

Colorant Weight Percents

```
PER_WGT_01   PER_WGT_02   PER_WGT_03   PER_WGT_04   PER_WGT_05
PER_WGT_06   PER_WGT_07   PER_WGT_08   PER_WGT_09   PER_WGT_10
```

Colorant Weight Amounts

```
AMT_WGT_01   AMT_WGT_02   AMT_WGT_03   AMT_WGT_04   AMT_WGT_05
AMT_WGT_06   AMT_WGT_07   AMT_WGT_08   AMT_WGT_09   AMT_WGT_10

DRY_WGT_01   DRY_WGT_02   DRY_WGT_03   DRY_WGT_04   DRY_WGT_05
DRY_WGT_06   DRY_WGT_07   DRY_WGT_08   DRY_WGT_09   DRY_WGT_10
```

Colorant Volume Percents

```
PER_VOL_01   PER_VOL_02   PER_VOL_03   PER_VOL_04   PER_VOL_05
PER_VOL_06   PER_VOL_07   PER_VOL_08   PER_VOL_09   PER_VOL_10
```

Colorant Volume Amounts

```
AMT_VOL_01   AMT_VOL_02   AMT_VOL_03   AMT_VOL_04   AMT_VOL_05
AMT_VOL_06   AMT_VOL_07   AMT_VOL_08   AMT_VOL_09   AMT_VOL_10
```

Coloant Weight & Volume Amounts

```
WGT_VOL_01   WGT_VOL_02   WGT_VOL_03   WGT_VOL_04   WGT_VOL_05
WGT_VOL_06   WGT_VOL_07   WGT_VOL_08   WGT_VOL_09   WGT_VOL_10
```

Batch Cost & VOC's

```
BAT_COST     BAT_VOC      BAT_WGTVOL_VOC
```

Notes on Printing Labels with the Dymo LabelWriter

OnColor contains a feature found under File→Print Labels to send the output of the QC or Match sections to a Dymo LabelWriter. This option is fast and convenient for printing labels for samples, drawdowns, sprayed panels, swatches, or other colored parts and specimens. The label can also conveniently be used to summarize the data resulting from a test and logged into a laboratory notebook. Duplicate labels can be printed to label the sample as well as a report.

Several Dymo label templates are copied into the \OnColor\Dymo\ folder at installation. These are templates that can be used to print various outputs of the colorimetric data, both absolute and difference, color indices, job ID's, sample names, and color match formulas in either weight or volume units. You can use these templates "as is", you can modify them to suit your needs, or you can design your own label formats (LWL file) using the Dymo Designer software that comes with the printer. To design your own labels, please refer to the instructions given in ***Designing a Label using OnColor Data Fields***.

The option to Print Labels only appears when a Dymo LabelWriter is installed and detected by OnColor. Follow the Dymo instructions to install the printer driver and Dymo software. Test the LabelWriter using the Dymo Label software. You can print labels using the templates (LWL files) found in the \OnColor\Dymo\ folder. The default label size is 2.31 x 4.00 inches or the Large Shipping Label (no. 30256). You can design smaller labels using the Dymo software by referring to the instructions for Designing a Label using OnColor Data Fields.

    1. To print a label, go to File->Print Label. The following dialog box is displayed:
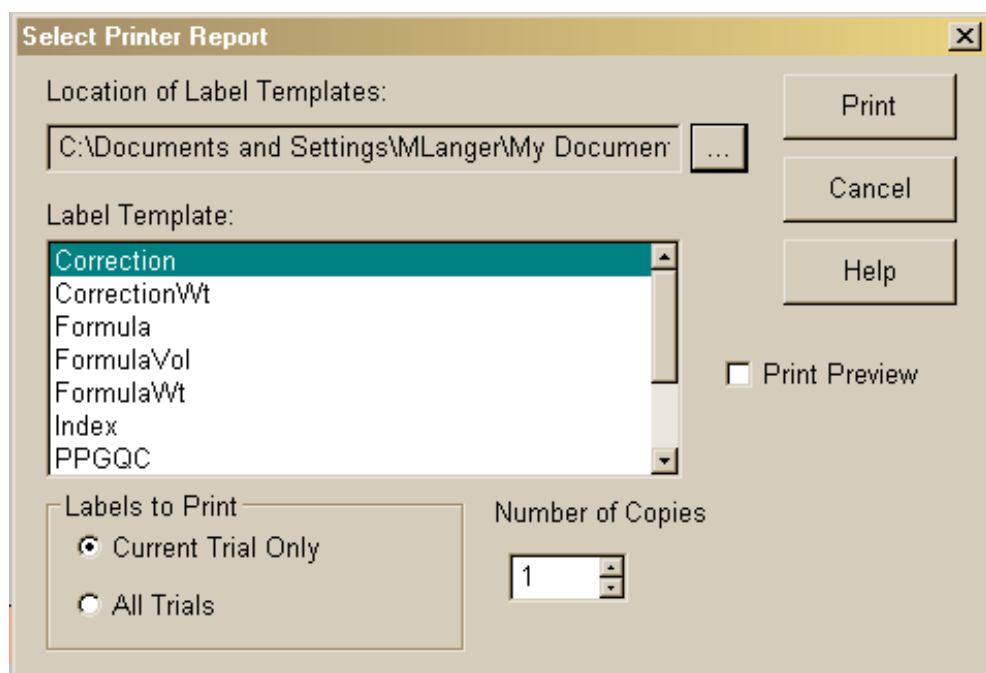
Click on the area circled in red to browse and select the folder that contains your LWL files. The default choice is the \OnColor\Dymo folder, but you can use whatever folder you like.

    2. A list of the current label templates is displayed. Formula, FormulaVol and FormulaWT are the output of a color match or new formula after correction. Index, QC, STD, StdAll, and TrlAll are outputs from the QC portion of the program.
    3. By clicking in Print Preview box, you can view the label before it's printed and then later decide whether you want to print it or not.
    4. Under the Labels to Print section, choose to print the Current Trial Only or All Trials by clicking on the appropriate button.
    5. Choose either 1 or multiple copies of the same label.
    6. Finally, click on Print to preview and/or print the label.
    7. We suggest that you experiment by viewing all of the pre-designed labels. You can edit and change the label format by using the Dymo Label software in the Designer mode.
    8. Right Click shortcuts to quickly print a label are available from the Color Plot Formulation Report screens. If you right click in the Color Plot report and select Print Label, the QC label will be printed. If you right click in the Formulation Report and select Print

Label, the Formula label will be printed. The default templates for these options are CYBQC.LWL and CYBFORMULA.LWL. Using the Dymo Designer program you can modify these labels to suit your needs.

Importing Data into OnColor

1. The data must be in a very specific format. Therefore, please use the Excel spreadsheet named "OnColor Import Test.XLS" as a template for cutting and pasting your data.
2. This spreadsheet contains some sample data on Sheet 1. You can replace this data with your own data and add more.
3. You must have %Reflectance or %Transmittance data from 360nm to 750nm. If you don't have data for some of the wavelengths, you can fill in 0.0, but there MUST be a value there. You cannot import colorimetric data such as XYZ or L*a*b*. It must be spectral data.
4. Sheet 2 (Instrument Codes) of this spreadsheet contains a list of Senor ID's (Instrument Codes) that you will need to fill in Column F of Sheet 1 (Import Test).
5. Sheet 3 (Status Codes) of this spreadsheet contains a list of the Status Codes for the data that you will need to fill in Column G of Sheet 1 (Import Test).
6. After you have filled in the data you would like to import on Sheet 1, you will need to save it as a Tab Delimited Text File (*.TXT). You can assign it any name that is logical to you and save it anywhere you like. Just remember what you called it and where you saved it.
7. To import the data into OnColor, use the feature File -> Open and then use the drop down list at "Files of Type" to select "Tab Delimited (*.TXT)". Then Browse to the correct folder to select the file you saved in step 6.
8. It is possible to use other programs to create the Tab Delimited format, but unless it is in the exact same format as given in the sample spreadsheet, the data will not import correctly. After importing the data into OnColor, save it as a WSV file. One TXT file will yield one WSV file.

How to Use the Trial ? Measure Loop

The menu item "Measure Loop" was specifically designed for use with portable instruments that have a trigger or measure button. This command makes the measurement of numerous trials more convenient by automatically naming them and using the measure button to trigger the instrument. This means less keystrokes or mouse clicks on the PC for the operator. It can also be used with benchtop instruments when a large number of samples need to be measured in a row. For portable instruments with a trigger, the Measure Loop automatically turns on the Remote Measure Feature and Auto-Naming. For benchtop instruments, there is no Remote Measure capability and Auto-Naming must be turned on before entering the option. This allows users to name the sample and measure with fewer keystrokes.   To use this feature:

1. To setup the auto-naming parameter, go to **Trial ? Naming Options ? Trial Defaults tab**. Enter the desired name to be used for each trial between the single quotes, such as 'Batch 12345 #'. The trailing use of *nnn* will add a consecutive number to each trial.

   2. Click on **Trial ? Measure Loop**. A message is displayed to use the **F9** key to stop this macro.
   3. For portable instruments, the software is waiting for the operator to position the sample and press the trigger or Measure Button to initiate the measurement. For benchtop instruments, the software is waiting for the naming of the sample and then for the operator to position the sample and press the **Enter key or click on OK** to initiate the reading.
   4. Step 3 is repeated infinitely or until the **F9 key** is pressed to stop the loop.

How To Change Between a Save Set File and a Colorant File

If a Save Set file and a Colorant file have been loaded, use the Ctrl+Tab keys to toggle between views.

How To Characterize a Colorant

Prerequisite: Save-sets must be prepared that contain the reflectance of the calibration panels.

Click here for more information on Save Sets.

Select **File / Open.**
From the **Open** dialogue box select the (.wsv) file that contains the measurements of the primary calibration samples (Save Set).
The screen will refresh with the new data from the (.wsv) file.
Select **File** / **New**.
From the New dialogue box select **Colorant View Mode**, or click on the Colorant View button on the Colorant toolbar.
Select **Characterize / New**.

The **Characterize** dialogue box will appear with the **Select** tab active.
Choose whether your samples were prepared by Percent Volume or Percent Weight as well as the units for each.
Note: The Gravimetric (Weight) and Volumetric units selected will be the default units for density and cost.

CAUTION: Density values are used to convert match results from the input calibration type (either Gravimetric or Volumetric) tot he other. Incorrect units or density values will result in incorrect conversions between gravimetric and volumetric results.

Select the appropriate **Math Model** and **Letdown** Type.
Choose an **Input document** from the drop down menu that you want to use for this characterization session.

After all parameters have been chosen, click on the **Characterize** button.

The **Surface Correction Factors** dialogue box appears. To begin the characterization process, click **OK.**
The screen will refresh and display the last colorant on the list that was calibrated.

Note: The Characterization dialog is still active. This allows for continued calibrations using other Input documents. This is useful if you need to change Letdown types in a colorant file. This is done by appending colorants to the existing file.

When you have finished, click **Done** and you will return to the User Screen.

OnColor Match - How to Characterize a Trade Sales Database

The following steps list how to load and characterize a database that contains multiple white bases and a tinting white. These steps assume that the operator is familiar with measuring samples in OnColor and storing them into save-set files (WSV). The output of this procedure is a colorant file (CLR file) that contains the K and S data for all colorants and the base. You will have one CLR file for each base in the product line.

1. Measure the samples into a save-set files as described below.
2. The samples must be measured in a very specific order and must be named according to the conventions described below.
3. The samples are always measured from **the highest concentration to the lowest concentration with the black letdown always coming last**. If you have a masstone (MT), it is always placed in the Standard slot. If not, then the highest concentration white letdown (WLD) is measured into the Standard slot.
4. Measure the remaining WLD's in as consecutive Trials going from highest concentration to lowest concentration in white. **The % concentration always refers to the pigment being characterized.**
5. Samples are always named starting with the % concentration of the colorant, followed by the % sign and then the name of the colorant. This name is what will appear in the colorant file.
6. **For the calibrating white and black colorants**, measure the samples in the following order:
   - Standard = 100% White Base (eg. Pastel Base)
   - Trial 1 = 100 % Black (made in Clear Base)
   - Trial 2 = 1.5% Black (made in Pastel Base)
   - Trial 3 = 1.0% Black   "
   - Trial 4 = 0.5% Black   "

   You will have one save-set like this for each base. The Black MT is the same sample used in all of these save-sets. The concentrations on the Black letdowns will be different for each base.
7. **For all other the colorants**, measure the samples into a save-set in the following order and name them accordingly (with the % concentration as the first part of the name):
   - Standard = 1% Colorant A (white letdown in Pastel)
   - Trial 1 = 98% Colorant A (black letdown in clear base)
   - (The colorant concentrations will change for each base, but the Black letdown will be exactly the same sample in each file.) Alternately, you can measure all of the samples into one save-set (excluding the calibrating white and black) in the following order:
   - Standard = 1% Colorant A (white letdown in Pastel)
   - Trial 1 = 98% Colorant A (black letdown in clear base)
   - Trial 2 = 1% Colorant C (white letdown in Pastel)
   - Trial 3 = 98% Colorant C (black letdown in clear base)
   - Trial 4 = 1% Colorant D (white letdown in Pastel)
   - Trial 5 = 98% Colorant D (black letdown in clear base)
   - …………Continue for all colorants

8. Create a folder for each base and store the save-sets (WSV files) in the appropriate folder. Organizing your data into folders makes it easier to manage the project.
9. For the Tinting White (sometimes called KX White) colorant, measure the following samples into a save-set:
   - Standard = 100% Tinting White (made in Clear Base)
   - Trial 1 = 98% Tinting White/2% Black (made in Clear Base)

   (This save-set will be used for **each** white base.)
10. Each base will get loaded into the Resin section of the program. To load a base in the Resin section of the colorant file, measure the following samples into a save-set.   You have already measured some of these samples, but the samples will be named differently here.
    - Standard = 100% Pastel Base
    - Trial 1 = 99% Pastel Base/1% Black (made in Pastel Base; take note of the way this sample is named. The concentration refers to the concentration of the base and not the black.)
    - (For the other white bases such as Midtone or Deep, always choose the middle black level and name the concentration accordingly.)
11. **For each base** you should have the following save-sets prepared:
    - Calibrating White and Black (from step 6)
    - One save-set for each colorant **or** all of the colorant letdowns in one save-set (from step 7)
    - Save-set for the KX or Tinting White (from step 9)

12. Be sure to save each individual save-set in its proper folder. Before proceeding to the colorant characterization step, open ALL of the save-sets for one base that you are ready to characterize. Scan each save-set and find the lowest %R in the file. Be sure to look at all wavelengths (every 10nm). Hint: You will probably find the lowest %R on either the Black MT, the Phthalo Green or Phthalo Blue black letdowns. Make a note of this value for later in the characterization process. Since this lowest %R comes from one of the black letdowns, it will be the same for all of the bases.

13. Go to the Colorant View Report screen by clicking on the color palette icon on the toolbar.

Click here to Jump to
Colorant View

14. To load the calibrating white and black, click on Characterize, then New. You will only use the New option for loading the white and black. After this, you will use the Append, Replace, or Insert options to add the colorants to the white and black in the file. ***You only use the New option the first time through!***

15. On the Select Tab, choose either % by weight or % by volume (depending on how your concentrations were calculated); output units; letdown type; math model according to your application; and finally the input document. Click on the save-set name that contains the measurement data on your calibrating white and black (from step 6 above), then click on Apply.

16. Next you will enter the K1 and K2 values for the Saunderson correction for this file. For K1, use the default value of k1+0.04 or a value calculated from:

K1 = (lowest %R - 0.20%) / 100

For K2, use the default of 0.400.

Click on OK, then click on Cancel to see the K and S data for the white and black. Use the up and down arrow keys to scroll between them.

17. To add the colorants to this file, click on Characterize -> Append. Select the letdown type of White/Black (or choose according to the letdown types you want to enter), then under "Input Document", click on the save-sets created in step 7 above (this contains the letdowns of the colorants).

18. Click on Apply and the K and S data is calculated for these colorants and appended to the file. Note that the next save-set is automatically highlighted and you only need to click Apply in turn for each save-set that you want to Append. .

19. Next change the Letdown Type to Masstone/Black and then as the Input Document, select the save-set containing the Tinting White colorant as created in step 8 above. The K and S data is appended. The S values for the Tinting White should be greater than 1.00 and should reflect the approximate strength difference between the base and the White colorant. Click Cancel. The Tinting White colorant must be the last colorant loaded into the Colorant section of the file.

20. Use the up and down arrow keys to scroll through the colorants. Use the left and right arrow keys to scroll through the different levels for each colorant.

21. To load the white base into the Resin section of the program, click on the color palette icon. This is a toggle between the Colorant Mode and Resin Mode. See the graphic below.

22. Next change the Letdown Type to Masstone/Black and then as the Input Document, select the save-set containing the white base and black letdown as created in step 9 above.   The S values for the base should be very close to 1.0.

23. Go to File ? Save to save this file.

24. You will also need to input the Pre-fill, Min-fill, and Max-fill as percentages. To do this go to the Resin mode and double click on the screen where the fill levels are displayed. The % fill levels are defined as:
    Pre-fill - the amount of base filled in a can at the time of manufacturing
    Min-fill - the minimum fill level of a base; normally for the white bases the pre-fill and min-fill levels are the same; sometimes the Deep base will have a different Min-fill for opacity reasons; for the Clear Base, the Min-fill must equal the Max-fill level
    Max-fill - defines the maximum amount of paint allowed in the can; this can be greater than 100% of the nominal can size; for example, in a gallon, sometimes the maximum fill level is 129 oz allowing for an extra ounce of colorant in a gallon can.
    All of these values must be entered as % based on a nominal can size

25. Use the Edità Heading option (or just double-click on the name or cost information of a colorant) to edit the name, cost, density, VOC, etc. for each colorant.

26. After making any edits or changes to the file, be sure to re-save it by going to File ? Save.

27. Use the Analysis option to view the different plots and reports to analyze the data.

28. Finally, don't forget to save your file by clicking on the floppy disk icon or going to File? Save (or Save As). You need to assign a name to this file which is stored as a CLR file. Name it according to the product line or base or resin system.

29. For the Clear base only, you will not prepare a letdown of the base by itself (due to its lack of opacity) and you will need to add an entry to the resin section. To add a Clear resin to this file, first you must switch to the Resin mode by clicking on the Color Palette icon. (See picture below). This icon toggles between the Colorant Mode and the Resin mode. The current status is always shown in the status bar in the lower right corner.

30. When you are in the Resin Mode, then click on Edit ? Zero to add an optically clear resin to this colorant file. Edit the Heading data for this clear base with the can fill information and density. Don't forget to save the file again with the changes that you made.

31. To get back to the regular or QC part of OnColor, click on the color plot icon:

Jump to QC Mode   Resin or Colorant Mode

How to Characterize a 2-Constant Database

The following steps list how to load and characterize a database. These steps assume that the operator is familiar with measuring samples in OnColor™ and storing them into save-set files (WSV).

1. For each colorant, measure the samples into a save-set file. Use a separate save-set for each colorant. It makes it easier to edit, maintain, and replace samples if needed.
2. The samples must be measured in a very specific order and must be named according to the conventions described below.
3. The samples are always measured from the highest concentration to the lowest concentration with the black letdown always coming last. If you have a masstone (MT) that is always placed in the Standard slot. If not, then the highest concentration white letdown (WLD) is measured into the Standard slot.
4. Measure the remaining WLD's in as consecutive Trials going from highest concentration to lowest concentration in white. *The % concentration always refers to the pigment being characterized.*
5. Samples are always named starting with the % concentration of the colorant, followed by the % sign and then the name of the colorant. This name is what will appear in the colorant file.
6. For the calibrating white and black colorants, measure the samples in the following order:

> Standard = 100% White
> Trial 1 = 100 % Black
> Trial 2 = 75% Black
> Trial 3 = 50% Black
> Trial 4 = 25% Black
> Trial 5 = 5% Black
> Trial 6 = 1% Black

7. For each colorant, measure the samples in the following order and name them accordingly (with the % concentration as the first part of the name):

> Standard = 75% Color
> Trial 1 = 50% Color
> Trial 2 = 25% Color
> Trial 3 = 5% Color
> Trial 4 = 1% Color
> Trial 5 = 98% Color BLD (black letdown)

8. Be sure to save each individual save-set. Before proceeding to the colorant characterization step, open ALL of the save-sets that you are ready to characterize. Scan each save-set and find the lowest %R in the file. Be sure to look at all wavelengths (every 10nm). Hint: You will probably find the lowest %R on the Black MT, the Phthalo Green or Phthalo Blue black letdowns. Make a note of this value for later in the characterization process.
9. Go to the Colorant View Report screen by clicking on the color palette icon on the toolbar.

10. To load the calibrating white and black, click on Characterize, then New. You will only use the New option for loading the white and black. After this, you will use the Append, Replace, or Insert options to add the colorants to the white and black in the file. *You only use the New option the first time through!*
11. On the Select Tab, choose either % by weight or % by volume (depending on how your concentrations were calculated); output units; letdown type; math model according to your application; and finally the input document. Click on the save-set name that contains the measurement data on your calibrating white and black, then click on Apply.

Characterization

Select | Prediction

Samples prepared by
- ○ Percent Weight
- ● Percent Volume

Units
- Pounds
- Gallons

Method

Math Model
- Coatings   2 Constant

Letdown Type
- Masstone/White/Black

Input document
- 200WB.SVS
- 200WB.SVS
- Std1

Apply   Cancel   Help

12. Next you will enter the K1 and K2 values for the Saunderson correction for this file. For K1, use the default value of k1+0.04 or a value calculated from:

K1 = (lowest %R - 0.20%) / 100

For K2, use the default of 0.400.

Click on OK, then click on Cancel to see the K and S data for the white and black. Use the up and down arrow keys to scroll between them.

13. To add the colorants to this file, click on Characterize→Append. Select the letdown type of White/Black (or choose according to the letdown types you want to enter), then under "Input Document", click on the save-set that you want to append to this file.

14. Click on Apply and the K and S data is calculated for this colorant and appended to the file. Note that the next save-set is automatically highlighted and you only need to click Apply in turn for each save-set that you want to Append. After you have added all of the colorants to the Colorant File, click Cancel.

15. Use the up and down arrow keys to scroll through the colorants. Use the left and right arrow keys to scroll through the different levels for each colorant.

16. Use the Edit→ Heading option (or just double-click on the name or cost information of a colorant) to edit the name, cost, density, VOC, etc. for each colorant.

17. Use the Analysis option to view the different plots and reports to analyze the data.

18. Finally, don't forget to save your file by clicking on the floppy disk icon or going to File→Save (or Save As). You need to assign a name to this file which is stored as a CLR file. Name it according to the product line or base or resin system.

19. To add a Clear resin to this file, first you must switch to the Resin mode by clicking on the Color Palette icon. (See picture below). This icon toggles between the Colorant Mode and the Resin mode. The current status is always shown in the status bar in the lower right corner.

20. When you are in the Resin Mode and then click on Edit→ Zero to add an optically clear resin to this colorant file. More than one resin can be added to a file. You can also characterize the K and S data of a resin if it has significant scattering properties. Edit the Heading data for this entry and don't forget to save the file again with the changes that you made.

21. To get back to the regular or QC part of OnColor™, click on the color plot icon:

OnColor™ Match - How to Characterize a Single-Constant Database in Transmission

The following steps list how to load and characterize a database. These steps assume that the operator is familiar with measuring samples in OnColor™ and storing them into save-set files (WSV).

1. For each colorant, measure the samples into a save-set file. Use a separate save-set for each colorant. It makes it easier to edit, maintain, and replace samples if needed.
2. The samples must be measured in a very specific order and must be named according to the conventions described below.
3. The samples are always measured from the highest concentration to the lowest concentration
4. Measure the highest concentration as the Standard and the remaining letdowns in as consecutive Trials going from highest concentration to lowest concentration in white. ***The % concentration always refers to the dye or colorant being characterized.***
5. Samples are always named starting with the % concentration of the colorant, followed by the % sign and then the name of the colorant. This name is what will appear in the colorant file.
6. For the first entry into the colorant file, you need a save-set with the base material or clear solvent as the Standard. This will be the calibrating Clear for the whole file. Measure the samples in the following order:

> Standard = 100% Clear
> Trial 1 = 1.00 % Black
> Trial 2 = .75% Black
> Trial 3 = .50% Black
> Trial 4 = .25% Black
> Trial 5 = .05% Black
> Trial 6 = .01% Black

7. For each colorant, measure the samples in the following order and name them accordingly (with the % concentration as the first part of the name):

> Standard = 1.00% Color
> Trial 1 = .50% Color
> Trial 2 = .25% Color
> Trial 3 = .05% Color
> Trial 4 = .01% Color
> Trial 5 = etc.

8. Be sure to save each individual save-set. Before proceeding to the colorant characterization step, open ALL of the save-sets that you are ready to characterize.
9. Go to the Colorant View Report screen by clicking on the color palette icon on the toolbar.

Click here to Jump to
Colorant View

10. To load the calibrating clear and black (or first colored dye), click on Characterize, then New. You will only use the New option for loading the calibrating clear and first colorant. After this, you will use the Append, Replace, or Insert options to add the colorants to the file. ***You only use the New option the first time through!***
11. On the Select Tab, choose either % by weight or % by volume (depending on how your concentrations were calculated); output units; letdown type; math model must be set to Filter (Beer's Law); and finally the input document. Click on the save-set name that contains the measurement data on your calibrating clear and first dye, then click on Apply.

Characterization

Select | Prediction

Samples prepared by
- ○ Percent Weight
- ● Percent Volume

Units
- Grams ▼
- Liters ▼

Method

Math Model
- Filter ▼

Letdown Type
- Colorant ▼

Input document

Std1

[Apply]   [Cancel]   [Help]

Next you will enter the K1 and K2 values for the Saunderson correction for this file. For this math type, K1 = K2 = 0.00.

Click on OK, then click on Cancel to see the K and S data for the calibrating clear and first colorant. Use the up and down arrow keys to scroll between them.

12. To add more colorants to this file, click on Characterize -> Append. Select the letdown type of colorant, then under "Input Document", click on the save-set that you want to append to this file.
13. Click on Apply and the absorbance data is calculated for this colorant and appended to the file. Note that the next save-set is automatically highlighted and you only need to click Apply in turn for each save-set that you want to Append. After you have added all of the colorants to the Colorant File, click Cancel.
14. Use the up and down arrow keys to scroll through the colorants. Use the left and right arrow keys to scroll through the different levels for each colorant.
15. Use the Edit -> Heading option (or just double-click on the name or cost information of a colorant) to edit the name, cost, density, VOC, etc. for each colorant.
16. Use the Analysis option to view the different plots and reports to analyze the data. The plot of K/S vs. wavelength and the plot of K vs. concentration are particularly useful in analyzing and troubleshooting the database. All levels of a dye are plotted on the K/S vs. wavelength plot and they should all be essentially of the same curve shape and nearly parallel.

Surface K1: 0.000   **Weight/Volume:** Grams/Milliliters
Surface K2: 0.000   **Built as %:**   Weight
Name: Blue 4G-T
ID: 4
Level: 1 of 3
Conc: 0.065 %

K vs. wavelength

λ	log(1/T)
400	2.1634
20	1.1756
40	0.6305
60	0.3550
80	0.2672
500	0.2906
20	0.5528
40	1.2827
60	2.8275
80	5.0392
600	6.9362
20	9.1335
40	9.1340
60	8.4411
80	7.7475
700	7.7474

% Strength:	100.00
Density:	1.00
OPL % Strength:	100.00
Hue Angle:	231
% Paste:	100.00
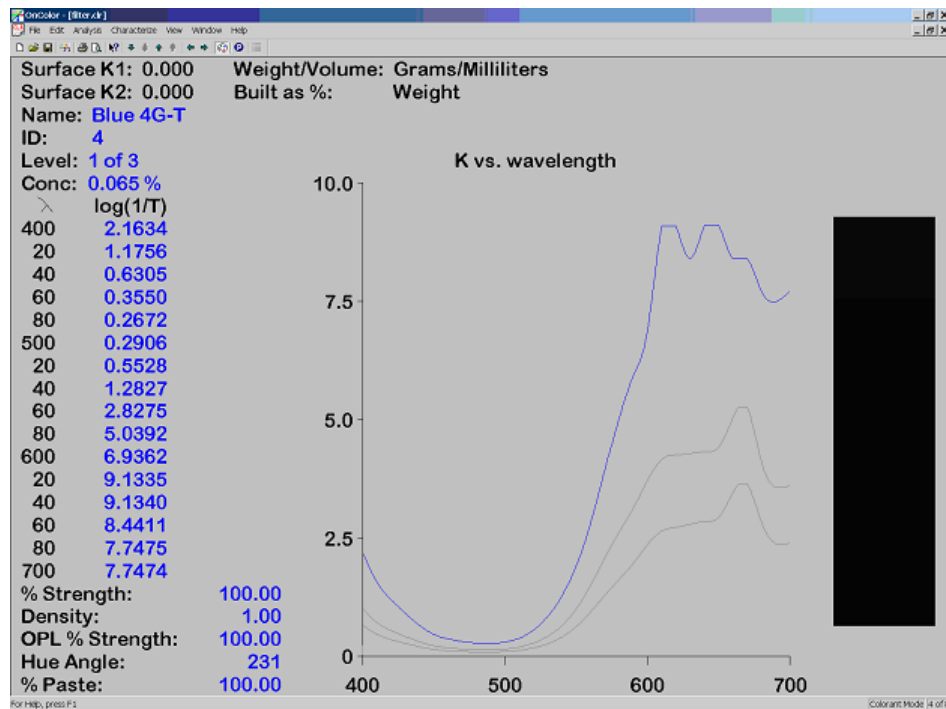
17. The plot of K vs. concentration shows the "build" properties of this dye. This "build" should show a nice, smooth and regular pattern. Ideally, this line would be a perfectly straight line. Any departures from this may point our errors in sample preparation or in measurement.
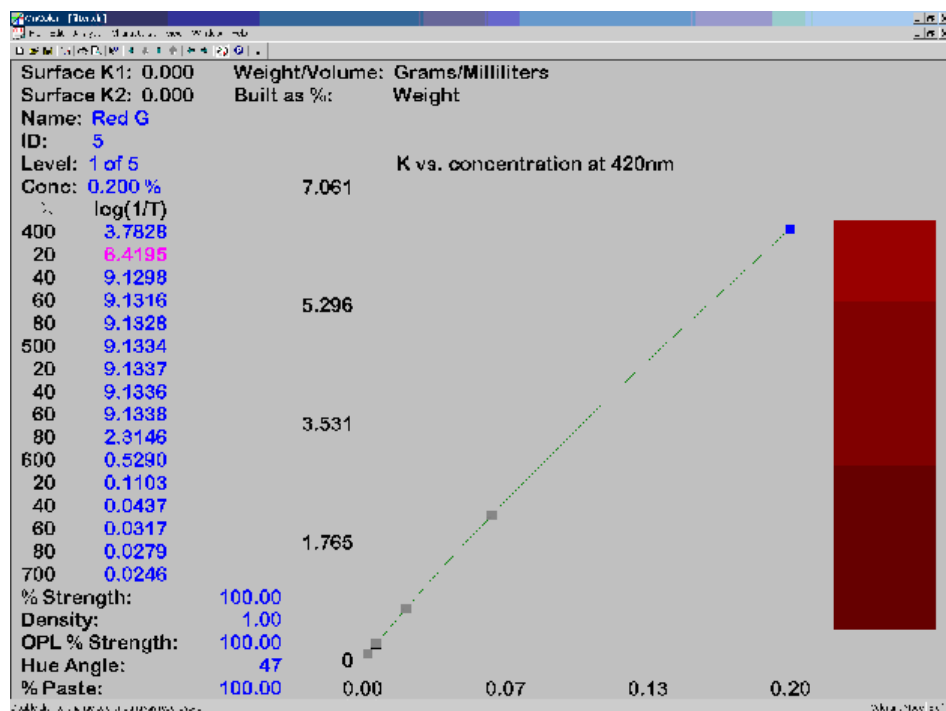
Surface K1: 0.000   **Weight/Volume:** Grams/Milliliters
Surface K2: 0.000   **Built as %:**   Weight
Name: Red G
ID: 5
Level: 1 of 5
Conc: 0.200 %

K vs. concentration at 420nm

λ	log(1/T)
400	3.7828
20	6.4195
40	9.1298
60	9.1316
80	9.1328
500	9.1334
20	9.1337
40	9.1336
60	9.1338
80	2.3146
600	0.5290
20	0.1103
40	0.0437
60	0.0317
80	0.0279
700	0.0246

% Strength:	100.00
Density:	1.00
OPL % Strength:	100.00
Hue Angle:	47
% Paste:	100.00

18. Finally, don't forget to save your file by clicking on the floppy disk icon or going to File -> Save (or Save As). You need to assign a name to this file which is stored as a CLR file. Name it according to the product line or base or resin system.
19. To add another Clear solvent or base material to this file, first you must switch the letdown type to Substrate.   The new clear or substrate must be in a save-set and must be labeled as 100% (something). The important thing is for the concentration to be

100%. This signals the software that this is another Clear.

20. To get back to the regular or QC part of OnColor™, click on the color plot icon:

Jump to QC Mode   Resin or Colorant Mode

How to Create an OPL Save Set

OPL samples are used to predict the colorant loading to get to complete opacity or hide. The first colorant that is prepared in this process is white (TiO2). All that is needed is one (**1**) sample of white at incomplete hiding. However, we recommend preparing three (**3**) different samples of white at incomplete hide *either* varying the **film thickness** or **loading**. From the 3 samples, we will select the best one to use for the database. (The way we determine the best sample is by making "OPL Knowns" to test the back predictions.) Aim for an Opacity between **80% - 99%**. (You can run the Opacity/Reflectivity option to determine the percentage.) It is recommended to have a range of opacity levels in order to select the one which yields the best loading predictions.

For coatings and opaque inks, you will need a Leneta chart for the drawdowns. The white background of the Leneta chart is measured in the Standard position. Trial #1 is the ##% loading for the colorant over the white Leneta chart. (Be sure to include the "%" sign after the loading amount.) Trial #2 is the thickness of the sample over the black Leneta chart. This can be denoted by mils, inches, microns, etc.

For Example:

Standard:	**White Background**
Trial #1:	**2% White over White Background**
Trial #2:	**1.0 mil White Film over Black Background**

Save and Name the Savesets.

Do this procedure 3 times varying the degrees of translucency as mentioned above. You will have 3 savesets for this white pigment.

Use these save-sets as the Input Documents under the Absolute white option under the Characterize menu to calculate the absolute white data.

See the appropriate sample preparation guide for the Known letdowns:
Sample Preparation guide for Plastics
Sample Preparation guide for Coatings
Sample Preparation guide for Opaque Inks.

Also see: Color Formulations OPL Dialog Box
Characterization Select Dialog Box
Absolute White command.

OnColor™ Match - How to Load an Alternate White

The following steps list how to load an Alternate White into a database. An Alternate White is another white pigment, but is not the calibrating white pigment. These steps assume that the operator is familiar with measuring samples in OnColor™ and storing them into save-set files (WSV).

1. For each Alternate White, prepare a Masstone of the white pigment (preferably at opacity). Use the phr or loading that you intend to use in practical applications for this pigment. Label this sample as 100% Alternate White. You also need a black letdown made with the calibrating black. As a starting point, use a ratio of 98% white to 2% calibrating black (prepared at the same phr as used for the masstone). The ideal black letdown will have a reflectance at 550nm between 20 and 40%R. If your sample is higher or lower in reflectance, then you should prepare another black letdown at another concentration.
2. Measure the samples into a save-set file. Use a separate save-set for each colorant. It makes it easier to edit, maintain, and replace samples if needed.
3. The samples must be measured in a very specific order and must be named according to the conventions described below.
   > Standard = 100% Alternate White
   > Trial 1 = 98% Alternate White; 2% Black (enter the appropriate % concentrations according to how you prepared this sample)

4. Go to the Colorant View Report screen by clicking on the color palette icon on the toolbar.
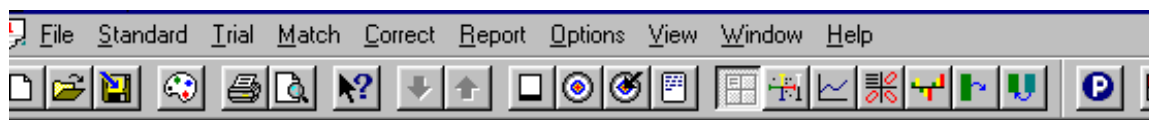
Click here to Jump to
Colorant View

5. If it is not already active, open the colorant file that you want to add this Alternate White.
6. To add an Alternate White to this file, click on Characterize→Append. Select the letdown type of Masstone/, then under "Input Document", click on the save-set that you prepared above.
7. Click on Apply and the K and S data is calculated for this new white is appended to the file. The "S" data should roughly reflect the relative difference in scattering strength as compared to the calibrating white. For example, if the S values for this Alternate White are approximately 0.5, then this white is approximately half the strength of the calibrating white.
8. Use the Edit→ Heading option (or just double-click on the name or cost information of a colorant) to edit the name, cost, density, VOC, etc. for each colorant.
9. Finally, don't forget to save your file by clicking on the floppy disk icon or going to File→Save (or Save As).
10. To use this Alternate White in matches and corrections, go to the Select Tab in the Formulation Properties and select this alternate white as the "White" for the match.

How to Use the Waste Work-off Feature in OnColor

Overview - A feature was added under Batch Correction for waste-work-off. The Waste is measured as a trial and the addition to correct to a new standard is displayed. The New Formula shows the starting formula to use this waste to make a specified amount of final product. This feature is available for all applications that use 100% colorant loading. The current Waste Work-off feature under Match is unaffected. This feature under Match utilizes the waste when entered into the colorant file as a colorant. These are two different approaches to using waste work-off.

1. You'll find the option under the Correct Menu. This way you can assign a keyboard shortcut to it (like "W" for Waste). To assign a keyboard shortcut, go to View -> Keyboard Shortcuts, then highlight 'Correct: Waste Work-off'. Click on the "Create Shortcut" button, then type the keystroke that you want to assign and click OK.
2. Recall a Property file the uses the colorant file and screen layout and parameters that you want to use.
3. Start by measuring your target color (the color you want for the final product) as a Standard. Alternately, you can recall the Standard from the Database of Standards.
4. Measure the waste as the Trial. Name the waste something logical so that when you print the results you'll know what you used.
5. Then click on Correct -> Waste or type the keyboard shortcut that you assigned in step 1.
6. Go to the Select tab to select the colorants that you want to have considered. (OnColor will do a combinatorial match to select the least metameric pigment combination if you choose more than 3 colorants).
7. Then go to the Manual tab and hit the Run button.
8. The Batch Correction report will show the "add" that you would make to a batch, while the New Formula re-scales the output to the requested batch size. The New Formula gives you the starting formula to make 'nnn' gallons (or 'nnn' pounds, depending on your output settings) of paint using as much of the waste as it can and still get to a near-zero DE.
9. If you want to accept a DE >0 then you can use the Manual Add or Optimize options of Batch Correction to try and reduce the add. Just right click in the Correction Report and choose the option that you want to use. The New Formula will always be adjusted to follow whatever 'add' you make in the Correction report.

Just remember that you CANNOT SAVE this formula. Obviously, you have to use some intelligence to pick which color waste and what color you are trying to correct it to. Trying to turn a dark blue into a pale yellow isn't going to work!

How to Load an Alternate Resin

[Two Constant Opaque Database](#)

You need the following samples:
> Resin Masstone (if it's opaque use Reflectivity to measure it)
> Resin + small amount of black, probably about 0.1 % to 0.25%. You want a sample that is opaque or close to being opaque without obscuring the underlying scattering of the resin. Remember, you will name this sample 99.9% Resin (if you used 0.1% Black). The concentration always refers to the colorant being characterized.

> 1. Measure these samples into a save-set where the Resin Masstone is the Standard and is labeled 100% 'nnnnn' Resin. Measure the resin + black sample as Trial 1. Save this file.
> 2. Go to the Colorant Characterization screen. Open the CLR file that you want to append this to (if it's not already opened).
> 3. Go to the Resin Mode.
> 4. Click on Characterize -> Append.
> 5. Under Letdown Type, click on Masstone/Black.
> 6. Highlight the input save-set, then Apply and finally Cancel to exit the dialog box.
> 7. Edit the name, density, or cost if needed.
> 8. Don't forget to save this CLR file with the changes.

[One Constant Transparent Database](#)

You need only one sample-the Resin masstone that you want to add as the alternate resin.
> 1. Measure this sample into a save-set where the Resin Masstone is the Standard and is labeled 100% 'nnnnn' Resin. Save this file.
> 2. Go to the Colorant Characterization screen. Open the CLR file that you want to append this to (if it's not already opened).
> 3. Go to the Colorant Mode (not the Resin Mode as above for two constant).
> 4. Click on Characterize -> Append.
> 5. Under Letdown Type, click on Substrate.
> 6. Highlight the input save-set, then Apply and finally Cancel to exit the dialog box.
> 7. Edit the name, density, or cost if needed.
> 8. Don't forget to save this CLR file with the changes.

Notes on Using Continuous Dye Math

Please pay attention to the following points when using Continuous Dye Math. In order to do this application correctly, the colorant file (CLR) must be loaded using Continuous Dye math and the math type in the Formulation Properties must also be set to Continuous Dye math.

1. When loading the primaries for the colorant file, choose the Continuous Dye math model.
2. Set the units for the file to grams/liter. Other units may be used, but this is the most common.
3. The file should be set-up as a Volume % file. If a primary is made at 120g/l, then this would be input as 12% on the sample; if made at 100g/l = 10%; 50g/l would be 5%; 10g/l would be noted as 1%; and 1 g/l would be 0.1%.
4. When using grams/liter, the densities of all the colorants, the substrate, and the clear (liquor) must all be set to 1000.0 (not 1.0 as this is grams/liter and NOT grams/milliliter).
5. After the colorant file is loaded, you will need to establish the Formulation Properties and save them in a PRP file. On the Numeric tab, be sure to choose Continuous Dye math. Also on this tab, select the Batch Type as Volume and then choose the units as Liters. This way you will input the batch size as the number of liters.
6. On the Style tab, you can choose to display the weight/volume as well as the grams and or milliliters for your output.

How To Characterize a Resin

From the **File** menu, select **Open.**

From the **Open** Dialogue box, select the (.wsv) file that contains the measurements of the primary calibration samples for the resin.

The screen should refresh with the new data from the (.wsv) file.

Select the **Colorant Mode** icon from the toolbar.

[icon]   From the **File** menu, select **Open.**

From the **Open** dialogue box, select ***.clr** as the file type .

Select the colorant file to which you will be adding this calibrated resin

The screen will now refresh with the K & S data from the colorant file.

Click on the Palette icon in the toolbar to switch to Resin Mode (see SPECIAL CASE below)

From the **Characterize** menu, select **Append.**

The Characterize dialogue box will appear with the Select tab active.

The **Math Model** Coatings (2 constant) should be selected.

The **Letdown type** of WhiteTint / WhiteTint should be selected.

The Input document must be selected. There will be a drop down menu that contains a list of all open documents. Select the input document that you want to use for this characterization session.

After all parameters have been chosen, select the **Characterize** button.

SPECIAL CASE: Creating a Clear Resin without samples
If the Resin to be characterized is the same resin that all the colorant samples were prepared with, it is NOT necessary to prepare letdown samples of the resin. The scattering and absorption coefficients of the resin have already been compensated for in the colorants. Therefore, the relative K and S data for this resin would be 0.0 at all wavelengths. You can shortcut the characterization procedure by zeroing an existing base.

Sample Preparation for a Resin

The sample preparation for a resin is similar to a colorant. There are generally 3 cases:

The resin is basically Clear. (i.e. A Neutral Base or a Clear plastic resin) That is, when prepared at nominal batch thickness, the sample appears transparent or milky(translucent) This resin would best be calibrated using either WhiteTint / WhiteTint method or if it is very translucent, use a WhiteTint / BlackTint method.

The resin is almost opaque and basically White. (i.e. A White Base in coatings or a plastic resin that contains significant scattering material) This resin would best be calibrated using Masstone / BlackTint method

The resin is opaque and chromatic. (i.e. Accent Bases in coatings or a pre-dispersed plastic resin). This resin would best be calibrated using either Masstone / WhiteTint / BlackTint method or WhiteTint / BlackTint method.

The above sample should be measured following the same procedure as if they were a colorant. The data should be saved in a .WSV file after being measured.

How To Correct a Batch

Before a Batch can be corrected, the following must have been established.

1) A Colorant File must have been generated (See How to Characterize a Colorant)
2) A Standard must be active (See How to Measure a Standard)
3) Match Properties must be set up (See How to Set up Match Parameters)
4) The Standard should be matched to create the Batch (See How to Match a Standard)
5) The Batch should be measured as a Trial (See How to Measure a Trial)
6) Correction Properties must be set up (See How to Set up Correction Parameters)

When all the above have been accomplished, a Correction can be initiated by either:

a) Select *Correct* / *Run* from the top line Menu
b) From the ***Correction Properties*** dialog ***Automatic*** or ***Manual*** tab, select the ***Run*** button.

How to Match a Standard

Before a Standard can be matched, the following must be established:

1. A Colorant File must have been generated. (See How to Characterize a Colorant)
2. A Standard must be active. (See How to Measure a Standard)
3. Match Properties must be set up. (See How to Set Up Match Parameters)

 When all the above have been accomplished, a Match can be initiated by either:

a. **Select Match / Run Match** from the **File** menu.
b. From the **Formulation Properties dialog box** , choose the **Automatic** or **Manual** tab, select the **Run** button.

Related Topics

How to Correct a Batch

Using Fixed Colorant Amounts

There are several circumstances when a color matcher might want to fix the amount or percentage of one of the colorants in the batch. It may be to hold cost down by fixing an amount of an expensive organic colorant; it might be to fix in a certain amount of an alternate or cheaper white such as HiTox, or a filler. This feature can even be used to work-off waste or materials to be recycled. (They must be characterized and loaded into the colorant file first).

This option is found under Match Properties-->Automatic tab. Activate this feature by checking the box at "Use Fixed Colorant Amount". The dialog shown will be displayed. If you want to fix a certain percentage, then check the box beside "input as percent of total batch". If this box is not checked then the weight or volume amount will be fixed.

Use the drop-down colorant list to select the colorant that you want to fix. This will be in addition to the Number of colorants in match currently selected in the lower right corner. Then enter either the % or amount desired in each formula.

Note: This option can only fix a dispersion amount or % and not a dry pigment amount or % unless the CLR file is characterized in dry pigment concentration.

How to Set Up Match Parameters

Select the Match (Formulation) report you will be using to display the results of the Match. You can either use the Formulation Report from the Report menu item, the Match Report (Formulation) icon or the Formulation report that may have been selected for the user screen.

There are 6 tabs associated with this dialog box:

Style   How the results will appear.   MANDATORY
Select   Wt Colorant File / Colorants to use.   MANDATORY
Numeric Math model, Batch Size, Loading and limits   MANDATORY
OPL   Optimum Pigment Loading   OPTIONAL
Manual   Set up for Manual Match   OPTIONAL
Automatic Set up for Automatic Match [DEFAULT]   OPTIONAL

To save the properties for the next session, select *Save Properties As* from the *Report* menu

How to Add a Colorant to a Batch for Manual Add

1. Do a Batch Correction with 3 colorants
2. Get your answer displayed on the screen, then double click in the Correct quadrant to bring up your Batch Correction Properties.
3. Go to the Manual tab.
4. Change the # of colorants to 4.
5. Select the 4th colorant using the drop down list. This will be in the next to last slot. Remember that the White must be in the last slot.
6. Your add amounts in the boxes should equal the add amounts that are on the screen.
7. Enter the desired add amount of the 4th colorant and hit Apply to see the effect on the DE.

Batch Correction - Alternate Correction Mode

Occasionally after you do an automatic Batch Correction, you will see the phrase "Alternate Correction Mode" appear in the Correction quadrant. Why do I see this sometimes and not others, and what does this mean?

In the process of performing an automatic correction, OnColor does a color match to the Standard and another match to the Trial (or batch in this case) in order to obtain information on the amounts of each colorant in the batch. In order to get a good correction with valid answers, OnColor must be able to do a color match to the Standard and another to the Trial to a very low (near zero) DE. If OnColor cannot match both the Standard and the Trial with the selected colorants, then it cannot proceed to do a correction and get a legitimate answer. Think of it this way. If we're trying to correct a yellow shade and we give the software three blues as the colorants to use, there is no way that you can expect to get a meaningful answer. This yellow simply cannot be corrected with the given blue colorants. Now this is an extreme example, but it points out the reason why the software needs to be able to predict matches to the Standard and Trial before it can do the correction.

Alternate Correction Mode is a red flag. Whenever you see this mode, you should stop and examine why the OnColor software is not seeing what you told it about the Standard or the Batch. It is basically saying that based on the colorant database you have given it, something doesn't agree with what you are telling it is in the Batch; or else it can't make a good match to the Standard with the colorants you've selected.

If OnColor can predict a good match to both Standard and Trial, then the Automatic Correction can continue and the amount of colorant to be added to fix the batch can be calculated. If on the other hand, either the Standard or the Trial cannot be matched with the given colorants, then OnColor uses a modified algorithm to adjust the curves and compute a correction. This algorithm "kicks in" when either the Standard or Trial cannot be matched within 0.15 DE. In most cases the Alternate Correction Mode calculates a valid correction and the important thing is that if it is not able to obtain a DE = 0.0, the operator can use the Manual Add or Optimize Add routines to adjust the batch as close as possible. Most of the time this yields a workable correction and a way to correct the batch.

Why wouldn't the OnColor software be able to match either the Standard or Trial with the given colorants? Some obvious reasons are that an error was made-either on input into the software, or an operator made an error and the colorants he thinks are in the batch, are not. A more common cause is that the colorant database is out of date or is not accurate enough. Bases or raw materials may have changed and no longer are the same shade as what they were when they were entered in the database. This is fairly common as most companies do not update their database on a regular basis because of the work involved.   They frequently try to use a database that "is close enough" to the product they are working with, but frequently this causes problems in the area of bright and high chroma colors. This is where you will see the Alternate Correction Mode most frequently.

So whenever the operator sees the "Alternate Correction Mode" in a Batch Correction, he should examine the reasons why the software cannot match the Standard or Trial with the given colorants. He should also scrutinize the add that is presented as the automatic add and he should use Manual Add and Optimize Add to examine alternate ways to correct the batch manually.

Colorimetry

Colorimetry is a measurement science which describes a color as the average (non-color blind) individual experiences it. A colorimetric notation includes three numbers, or coordinates, which are used to locate a color in a specific model of color space, and serves as its address or description. It is a description of a color as the average, or Standard Observer, experiences it.

Colorimetric data is derived from the spectral curve of the colored object, factored by the energy output of the light under which the colored sample is viewed, and by the sensitivity of the human eye to color. The resulting data consists of three numbers referred to as Tristimulus values (X,Y,Z). Therefore, these numbers are specific for the illuminant and observer for which they were calculated. Tristimulus values for an object under daylight will be very different than those under artificial light.

Tristimulus values are the starting point for the calculation of all color space notations. The program accepts tristimulus values as one form of colorimetric input (when FMC2 color space is selected). However, you may have available L*a*b* coordinates generated from the CIEL*A*B* model of color space, Y,x,y coordinates from the CIE Chromaticity Diagram, or other notations.

Since tristimulus values are specific to the Illuminant and Observer conditions, the values for the same sample, regardless of the notation used, will change if either the Illuminant or the Observer condition has changed. **Take the time to CONFIRM THAT THE ILLUMINANT/OBSERVER CONDITIONS UNDER WHICH THE COLOR NOTATIONS ARE GENERATED AGREE WITH THE CONDITIONS YOU HAVE SELECTED!!!!**

Spectrophotometry

Spectrophotometry is a measurement science which produces an independent, analytical description of a colored object. Spectrophotometric curves are relative measurements. They represent the amount of light reflected or transmitted by the colored sample at each wavelength in the visible spectrum, in comparison to the amount of energy reflected by an ideal white at the same wavelength. The typical range of measurement is the visible spectrum from 400 to 700 nanometers.

This measurement is a unique description of the colored sample, and it never changes. However, it does not translate directly to color as the eye see it. Colorimetric weighting functions for the human observer and the illuminant must be applied first to calculate color coordinates as the eye sees it. See also Colorimetry.

A curve measured on a spectrophotometer is called a spectral curve. It is a graph of the relative reflectance or transmittance values, which are plotted on the ordinate (or y-axis), versus wavelength, which in plotted on the abscissa (or x-axis). A perfect white diffuser reflects 100% of the light at each wavelength, while a perfect black reflects 0% of the light at each wavelength. Spectral curves contain a great deal of analytical information about the colorants used to make the sample, as well as contamination or processing conditions. A thorough understanding of spectra curves can be an invaluable tool in diagnosing color problems.

Standard Observer

The Standard Observer is a numerical definition of the color sensitivity of the human eye. It consists of a table of numbers for each of three primaries, red, green, and blue at wavelength intervals from 400 to 700 nm. These three primaries are referred to as the color-matching functions, x-bar, y-bar, and z-bar. x-bar has a high sensitivity in the red wavelength region; y-bar has a high sensitivity in the green wavelength region; and z-bar has high sensitivity in the blue wavelength region.   The colors that we see are the result of different x-bar, y-bar, and z-bar proportions (stimuli) in the light received from an object.

There are two descriptions used in colorimetric calculations, the Two-Degree Observer and the Ten Degree Observer.   The CIE originally defined the standard observer in 1931 using a 2° field of view, hence the name 2° Standard Observer. In 1964, the CIE defined an additional standard observer, this time based upon a 10° field of view. This is referred to as the 10° Supplementary Standard Observer.

The difference in these descriptions correspond to a difference in the size of the sample being viewed, and the distance between the object and the observer.   The Two Degree Observer represents a sample with a diameter of 1.7cm viewed from a distance of 50cm, and the Ten Degree Observer represents a sample with a diameter of 8.8cm viewed from a distance of 50cm.

THIS DESCRIPTION HAS NOTHING TO DO WITH THE INSTRUMENT GEOMETRY EMPLOYED BY THE COLOR MEASURING DEVICE YOU ARE USING. See Learn About Instrument Geometry.

Illuminants

Illuminants are numerical descriptions of the amount of energy emitted by a light across the visible spectrum. They are distinguished from light 'sources' in that the numerical description used may not exactly correspond to an actual light source available for use in the physical world. Sometimes there may be a physical light source which corresponds to an Illuminant, but this is not always the case.

Illuminants are described by their 'color temperature'. The color temperature refers to the color a carbon element, referred to as a 'black body', emits when it is heated. The color emitted by a black body is correlated to its temperature. Color temperature is expressed in degrees Kelvin.

For example, Illuminant A has a color temperature of approximately 2800K. The color of this Illuminant corresponds to the color of a black body when it is heated to 2800K. In the case of Illuminant A, this corresponds to a reddish cast. Illuminant A has a corresponding 'source', commonly referred to as incandescent, or 'tungsten' light. Daylight, on the other hand, is a very bluish source since it contains a higher proportion of energy in the blue part of the spectrum than the yellow and red regions. D65, the CIE standard daylight Illuminant, has a color temperature of approximately 6500°K. Colors viewed under these two types of illumination will appear very different.

The primary Illuminant is the most important Illuminant to be considered when evaluating color differences between samples. It is customary, however, to compare samples under more than one illuminant to evaluate metamerism. The secondary and tertiary illuminants you select should correspond to those alternate lights under which the samples are evaluated visually.

The following choices are available for illuminants in OnColor QC. The corresponding Illuminants on the CM-500 and CM-2002 are given in brackets.

A		Tungsten; incandescent; artificial illumination at 2856°K;
C		North Sky Daylight; average daylight excluding UV radiation at 6774°K;
CWF	[F2]	Cool White Fluorescent
D50		Average Daylight include UV radiation at 5000°K
D55		Average Daylight include UV radiation at 5500°K
D65		Average daylight including UV radiation at 6500°K
D75		Average Daylight include UV radiation at 7500°K
F6		Cool White Fluorescent 4150°K
F7		Broad Band Daylight Fluorescent lamp at 6500°K
F8		Daylight white Fluorescent lamp at 5000°K
F10		Three band daylight white Fluorescent lamp at 5000°K
H23		Horizon 2300°K
T84	[F11]	TL84 Three band daylight white fluorescent at 4000°K
U30	[F12]	Ultralume fluorescent (three band warm white Fluorescent lamp) 3000°K
U50		Ultralume fluorescent (three band warm white Fluorescent lamp) 5000°K

Color Space

A 'Color Space' is actually a three-dimensional model in which colored samples are located. Once samples are located in a particular color space model, the 'color difference' or distance between two samples, is calculated. This color difference is an expression of the distance between the samples positioned in the color space model.

More than one model of color space exists. Those most commonly used are the CIE Chromaticity Diagram, and the CIEL*a*b* model of color space Regardless of the color space model chosen, the calculations used to locate the samples in the model originate from the CIE tristimulus values (X, Y, Z) which describe the colors.

What distinguishes color space models and color difference calculations from one another is the way in which each mathematically manipulates the tristimulus values to locate the samples in the model.

The L*a*b* color space (also referred to as CIELAB) is one of the most widely used color spaces. In this model, the L* indicates the lightness dimension and the a* and b* coordinates define the chromaticity plane. The higher the L* value, the lighter the color. A perfect white would have an L* = 100.0, while a perfect black would have an L* = 0.0. The +a* is the red direction; -a* is the green direction; +b* is the yellow direction, and -b* is the blue direction. This is called an opponent color system. Hunter Lab color space resembles this model.

The L*C*h* color space uses the same color space model, but uses cylindrical coordinates instead of rectangular coordinates. In this system L* still indicates the lightness dimension and is the same L* as the L* in L*a*b* color space. C* is the chroma, and h is the hue angle. The value of chroma C*=0.0 is at the center and increases as the brightness of the color increases, moving away from the center. Hue angle h is defined as starting at the +a* axis and is expressed in degrees; 0° would be red; 90° would be yellow; 180° would be green, and 270° would be blue. This color notation corresponds well to the way we usually describe the three attributes of color: lightness, chroma, and hue and is therefore easy to visualize differences in color described in these notations.

CMC is a method used to specify color tolerances in an elliptical system. It is based on the CIEL*a*b* color space and used the L*C*h notation to describe color differences. CMC color tolerances are widely accepted as agreeing best with visual observations, and are therefore recommended for establishing color tolerances.

CIE 94 is a recent addition to the color difference equations recommended by the CIE for color comparisons. CIE 94 DE uses "parametric factors" similar to the weighting factors applied in CMC math. The parametric factors are multipliers used to vary the weighting of the L*, C*, and H* axes of color space. These parametric factors may be used to adjust for the viewing environment, material characteristics (gloss or texture), presentation factors, and psychological factors. Obviously, the choice of these factors is not to be made by the novice. Until such time as certain parametric factors are recommended for specific applications, it is advisable to use only the 1:1:1 weighting factors.

FMC2 is an older color difference formula, based on an opponent color system, which still in use by some industries.

Color Difference

Color Difference calculations are derived from color space models, and represent the distance between colored samples located in a particular color space. These distances are based on tristimulus values, and calculated along several different axes; most commonly the red-green, yellow-blue, and lightness-darkness axes. These axes carry different notations, specific to the color difference calculation chosen.

The composite difference between samples is expressed using a notation of 'DE'. Unlike the individual axes defined above, the notation identifying composite color difference, DE, is common to all color difference calculations. Because of this common notation, it is VERY IMPORTANT to clearly identify WHICH color difference calculation you are using to communicate color differences. The DE calculation is also dependent on the Illuminant and Observer combination chosen, and will change if either or both of these conditions change.

Color differences are specific to a particular color difference equation chosen. The magnitude of the color differences calculated between two samples do not remain the same across color difference calculations. For example a DE of 1.0 between two samples, calculated using CIEL*a*b*, may become a DE of .95 when the Hunter Lab color difference equation is applied to the same set of samples.

It is also the case that when the same color space model and color difference calculation is used color difference calculations **do not remain linear** throughout color space. This is because the sensitivity of the eye to color is not linear. For example, in L*a*b* color space, a visual inspection of two reds having a DE of 1.0 CIEL*a*b*, will not produce the same visual experience as two greens having a DE of 1.0 CIEL*a*b*. Because of this lack of uniformity regarding visual experience, it is often necessary to derive acceptability tolerances on a case-by-case basis.

The CMC color difference equations attempt to eliminate this non-linearity by using a system of ellipses to describe acceptability tolerances. The acceptability ellipses were bases on thousands of visual observations of pass-fail situations. CMC is therefore the only color difference equation where a single number DE can be applied across the board to all colors. CMC also contains a method to weight the lightness component differently from the chromaticity component. This is called the l:c ratio. Usually an l:c ratio of either 1:1 or 2:1 is used for most applications. The commercial factor sets the size of the overall color tolerance and establishes the limits for pass-fail.

The CIE 94 color difference equations also use ellipses to describe acceptability tolerances. Similar to CMC, the CIE 94 equations incorporate weighting factors on the three axes of the color difference ellipse. Since the use of CIE 94 is so new, there are as yet no agreed upon weighting factors for specific conditions or applications. If you choose to use these parametric weighting factors, they should be noted whenever these color difference numbers are reported or communicated.

Tolerances

Tolerances define an acceptability range within which your colored products must fall. They always include a specification for DE, and often include specifications for other axes defined by the color difference calculation you are using. For example, using the CIEL*a*b* color difference calculation, you may establish acceptability tolerances for DE, DL*, Da*, and Db*.

When a sample satisfies **ALL** of the tolerances you have defined, the Pass/Fail analysis will render an evaluation of 'Pass'. When a standard does not satisfy **ANY SINGLE** tolerance you have defined, the Pass/Fail analysis will render an evaluation of 'Fail'.

There are two types of tolerances used in color specification. These are Box Tolerances, and Elliptical Tolerances. Box tolerances are defined by the user, and include positive and negative differences. They are not necessarily 'symmetrical' with respect to a standard. It is not uncommon to see, for example, a tolerance on the a* axis of +.75, -.50. However, these tolerances always result in a box or rectangle defining the area of acceptability around the standard.

Elliptical tolerances in contrast, create ellipses rather than boxes around a standard. In OnColor QC, box tolerances are used for CIEL*a*b*, L*C*h, Hunter Lab, and FMC2 DE. Elliptical tolerances are used with the CMC DE and CIE 94. CMC math automatically generates the tolerance ellipsoid in three dimensions based on the position of the standard in color space. These ellipses automatically change size and shape as the standard changes through color space. These tolerance ellipsoids were based on thousands of visual observations of color difference pairs. The user has control over the weighting of the lightness difference relative to the chromaticity difference. This is changed by specifying an l:c ratio. Usually the l:c ratio is set between 1.0:1.0 and 2.0:1.0. A ratio of 2:1 indicates that twice as much lightness difference will be tolerated as chromaticity difference. The user establishes the overall size of the color tolerance with the commercial factor. A CF=1.0 means all samples with a DE less than 1.0 will PASS and all samples greater that 1.0 will FAIL.

CIE 94 math also automatically generates the tolerance ellipsoid in three dimensions based on the position of the standard in color space. They will change size and shape as the standard moves through color space. With CIE 94 the user has the option to apply a separate weighting factor to each of the three major axes of L*C*H*. These weighting factors are called parametric factors and should be applied with great caution. Unless specific weighting factors are given in a specification or standard procedure, it is best not to deviate from the defaults of 1:1:1. Whenever using CIE 94, always report the parametric factors along with the DE.

The most accurate way to establish tolerances is to have a wide range of samples that have been visually evaluated (PASS/FAIL). Instrumental measurements are then plotted and an acceptability ellipse based on CMC math is produced that encompasses only the acceptable samples. The size of the ellipse is adjusted by changing the commercial factor. This same technique can be used with box tolerances, but it will not be as accurate.

L*C*H* box tolerances
When box tolerances are set in terms of L*C*H*, the resulting box is keystone-shaped or fan-shaped in the C*H* plane due to the characteristics of the L*C*h color notation. The angle of arc covered by the tolerance box is the h angle determined from the input H* value; this h Equivalent is shown for reference directly below the input H* value and cannot be edited. For a given value of H*, the arc angle h will increase as C* decreases. If the target is very close to the white point (C*=0), a circle or a donut may be created because the equivalent arc angle h will be -180, +180. A circle will be created if the C* tolerance value in the minus direction is equal to or greater than the C* of the target; a donut will be created if the C* tolerance value in the minus direction is less than the C* of the target. The rectangles in the L*H* and L*C* planes are projections of the keystone shape onto those planes; it is therefore possible that they will be off-center depending on the shape and placement of the keystone in the C*H* plane.

See also:
How To Change Tolerances
Edit Box Tolerance dialog box
Edit Elliptical Tolerance dialog box
Pass/Fail Criteria dialog box

Visible Spectrum

Light is one form of energy present in the electro-magnetic spectrum. Light travels in the form of a wave; and is expressed in terms of its wavelength. A wavelength represents the distance light travels in one cycle, and is measured in nanometers. A nanometer is equal to one-billionth of a meter.

The visible spectrum represents the wavelengths of light the human eye is capable of detecting. This band includes wavelengths of 400-700nm. Wavelengths less than 400nm fall into the category of ultra-violet light, and wavelengths greater than 700 nm are considered infra-red. The human eye has very little sensitivity to wavelengths below 400 or above 700nm.

Within the visible spectrum, bands of wavelengths are generally associated with families of colors. The shortest wavelengths, approximately 400-460nm are perceived as blue, approximately 460-540nm are experienced as green, approximately 540-580nm as yellow, approximately 580-620nm as orange, and 620-700nm as red.

Instrument Geometry

Instrument geometry refers to the way in which the color measuring device both illuminates and views the sample under examination. Different designs are available for both spectrophotometers and colorimeters:

Diffuse/8° : In this configuration, the sample is diffusely illuminated by light from multiple directions at an almost constant luminance. Only the light reflected at 8° from the perpendicular to the sample is accepted for measurement. This geometry has the ability to either include the specular component or gloss (SCI) or exclude it (SCE). SCI measurements include all of the light reflected form the sample -- both diffuse and gloss. SCE measurements include only the diffuse reflectance from the sample. The CM-508d, CM-2002, and CM-3700 provide both SCE and SCI measurements. The CM-503i and CM-525i measure only SCI.

45°/0°: The sample is illuminated at an angle of 45° to the surface. In the CM-503c and CM-508c, circumferential illumination at 45° is used. Only the light reflected perpendicular to the sample is accepted for measurement.

45°/0° and SCE measurements are often said to agree better with visual color evaluation -- especially when there are differences in gloss or texture involved. SCI measurements on the other hand, are typically more repeatable because they are less sensitive to smudges, scratches, and surface imperfections. Both types of measurements have their place in color control.

Metamerism

Metamerism is a term used to describe a pair of colors which are a conditional match; that is, they match under one set of viewing conditions but not another. The viewing conditions include the light source, observer, and geometry of the illuminating/viewing arrangement.

If a pair of samples is metameric, than a change in one of these conditions can result in a mis-match. A metameric pair of samples has the same tristimulus values for one set of viewing conditions, but has different spectral curves. The tristimulus values for another illuminant may be very different. Only samples which have identical spectral curves will be an unconditional, or non-metameric match. That means that the samples will have identical tristimulus values under all illuminants, and all viewing conditions.

Metamerism exists in varying amounts, depending on the similarity or dis-similarity of the spectral curves. A metamerism index is frequently used to quantify this amount, most often being used to gauge the effect of changing the Illuminant used for viewing the pair.

Haze

The cloudy or turbid appearance of an otherwise transparent sample caused by light scattering from within the sample or from its surfaces. In the calculation of % haze, it is defined as the % of total transmitted light which, in passing through the sample, deviates from the incident beam through forward scatter by more than 2.5 degrees on average. Illuminant C or A should be selected to conform with ASTM D1003 - Standard Test Method for Haze and Luminous Transmittance of Plastics.

% Haze = [(T4 / T2) - (T3 / T1)] X 100

where: T1 = white background with no specimen
  T2 = white background with the specimen in the transmission compartment
  T3 = black background with no specimen
  T4 = black background with the specimen in the transmission compartment
also,

% Haze = Td / Tt X 100
where: **Td** = diffuse luminous transmittance
  Tt = total luminous transmittance

Td (diffuse luminous transmittance) is calculated as **[T4 - T3(T2 / T1)] / T1**
Tt = (total luminous transmittance) is calculated as **T2 / T1**

555 Shade Sorting

For instructions on using the 555 Shade Sorting Option, read the Help section on How to…Do 555 Shade Sorting.

The 555 Shade Sorter is used to "group" or "sort" the color of various batches of colored textiles, so that when cut and sewn together, all pieces laid side by side will match. The 555 Shade Sorter consists of a spectrophotometer, which is used to measure the color of the textile, and the 555 Shade Sorting option in the software which provides a "sort" number or means to group like-colored lots or bolts of fabric.

The 555 Shade Sorting method uses a three-dimensional cubic system. The center of the cube represents the color standard and is assigned a value of 555. The three digits in 555 refer to the L*, a*, and b* coordinates of color space , respectively. The cube is divided into smaller cubes, called sort blocks, which define the boundaries for a group of similar shades.

For instance, a sort number of 555 represents a fabric equal in color to the standard. The first digit in 555 refers to the lightness, or L*, dimension of color space. The second digit refers to the a*, or red-green dimension of color space, while the third digit designates the final dimension, which is the b*, or yellow-blue dimension of color space. A 455 number is darker that the color standard but equal in chromaticity or equal in red-green and yellow-blue. A number of 645 would represent a fabric that is lighter, greener and yellower than the standard. The greater the difference between the numbers and 555, the larger the color difference from the standard. But all colors within one sort group will visually match.

The figure below is a diagram of the 555 shade sort blocks in a a* versus b* plane. This two-dimensional diagram represents only the second and third digits of the 555 number. The third dimension would represent the light-dark direction. Note the 555 block, which includes the color standard, in the center of the diagram. The third dimension of lightness, or L*, is perpendicular to this plane. This example shows each axis subdivided into five sort blocks. This numbering system extends from 111 to 999 for a total of nine sort blocks along each axis. Any samples that fall outside of these boxes are assigned + or - values, depending on whether they exceed the tolerance in the + or - direction. For example, a +55 would be assigned to a lot that exceeds the lightness direction but is equal to standard in the a* and b* directions.

537	547	557	567	577
536	546	556	566	576
535	545	555**std**	565	575
534	544	554	564	574
533	543	553	563	573

Also see Learn about Color Space.

List of File Extensions

There are data files and set-up files which are created in the software as you use it. These files are stored in different formats. In order to recognize these files, we have assigned extensions to them so you can identify the different files. The following is a list of extensions that are available in OnColor Match and OnColor QC.

OnColor QC and OnColor Match

*.WSV Save-set of reflectance data which stores one standard, the tolerance and trials. % haze and % opacity used this format.
*.PRP File to be read to report Properties.
*.TXT Excel compatible file.
*.PRN Lotus compatible file.
*.SVS Used in the OnColor QC and OnColor Match for DOS software as the Save-set file. This file can be imported into the OnColor QC and OnColor Match for Windows.
*.WSF Used in the WinShades software program. This file can be imported into the OnColor QC and OnColor Match for Windows.
*.MCR Associated with Macro files.
*.WWS Associated with Workspace files.

OnColor Match

*.CLR Colorant File which stores all the characterized colorants and resins. Used in color formulation and batch correction.
*.GRP Colorant group file associated with a *.CLR file.
*.PRC File to associate Properties file in Colorant Analysis.
*.MDB File to associate with Database of Standards.
*.DSN File to Link with Database of Standards.
*.ABS File to associate the OPL characterization. Linked to the *.CLR file

Pigments

Pigments are small particles which are used for coloring. Pigments are divided into two categories: organic and inorganic. Both groups have different coloring characteristics due to their chemical composition. Pigments need to be dispersed in a resin matrix to impart color to the substrate. Dry pigment varies in particle mass. Pigment particles have an affinity for one another; they stick together during the course of manufacturing resulting in aggregates and agglomerates. The object is to disperse the aggregates and agglomerates to an acceptable level and achieve a desirable color characterization, strength, and optical characteristic, such as, opacity, translucency or transparency.

Primary Particles   Aggregate   Agglomerate
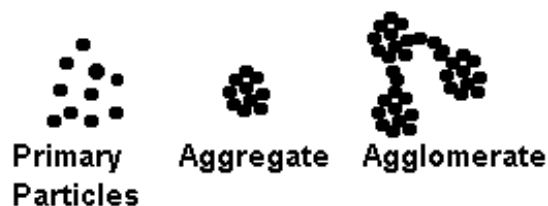
Organic pigments are considered very strong colorants. They are intense and have high chroma colors. Organic pigments, such as, phthalocyanine blue and green, quinacridone red, and diarylide yellow have very small particle size and have large surface areas. When dispersed at low loadings in clear resins the index of refraction is similar to the resin making the sample transparent. Organic pigments usually need an inorganic pigment, such as titanium dioxide or an extender to provide hiding or opacity. Carbon black is the exception to organic pigments, it alone has excellent hiding properties.

Inorganic pigments range in color intensities and chroma. They can be very intense as cadmium to very dull as red iron oxide. Inorganics are considered weaker in color strength than organics, therefore, higher pigment loading is necessary to color the same part. Inorganic pigments have large particle size and small surface areas. They are typically used at full strength (Due to environmental regulatory concerns, many companies are discontinuing the use of cadmium and lead chromate pigments.)

Pigment Particle size

Carbon
Black
TiO2
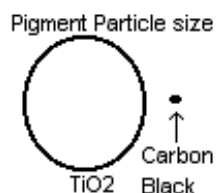
Coloring with pigments is not a precise science. Determining the right amount of pigment loading can be frustrating because every pigment varies in particle size, structure, surface area, etc. We typically group pigment types into broad categories (such as, organic and inorganic) and use practical means and history to use the pigment. The colorant manufacturers and/or colorant suppliers are good sources to find out what the optimum pigment level should be used for your application. This information will at least be a good start to develop the inherent color. As with any colorant, using the correct processing equipment is necessary to achieve a good dispersion and fully develop the pigment. See learn about pigment dispersion.

Organic pigments are typically harder to disperse than inorganic pigments. The type of equipment, additives, and other processing parameters may vary between formulas using these pigments. Using the correct pigment loading is critical particularly with organic pigments. Inorganic pigments tend to be more forgiving when they are overloaded.

Pigment overloading is typically found in an opaque applications. When a pigment is overloaded, the inherent color is compromised. More pigment is not necessarily better or makes a sample more intense in color. It can actually have the reverse effect. The base color may lighten and the chroma may shift. This is due to an increase in the internal scattering within the sample. Bronzing is a common condition in some pigments, where the sample has too much pigment. In addition, the surface characteristic may change due to the pigment particles at the sample surface causing the sample to have a lower gloss level.

When a pigment is under-loaded, not only is the color lighter or weaker but the optical characteristics are effected. When an inorganic pigment or organic pigment with hiding properties are under-loaded, the opacifying properties are now reduced so the sample becomes translucent. When a sample is translucent, any backing material may show through and contribute to the

reflectance color. For example, a diarylide yellow AAOT pigment is dispersed in a plastic film to hide blue objects. This pigment was under-loaded and caused the blue objects to show through the film. It is viewed through the film as yellow with a blue contribution. When measured instrumentally, the color difference will show a significant color change versus the opaque yellow film.

Due to the nature of pigment manufacturing, all pigments have lot-to-lot color variation. In order to maintain standard quality lots or batches, users must qualify the inherent color characteristics with standard material. Basic quality control measurements allows the user to set-up tolerance for color control. See learn about tolerances.

Dyes

Dyes are small organic particles that are soluble in water or some other solvent system. Their solubility only allows it to be used in selected resins. Dyes are extremely strong colorants and have the highest chromatic colors. Only small amounts are needed to color a substrate. Dyes do not scatter light, they absorb and transmit light energy. When dyes, such as, perinone and anthraquinone, are incorporated in a clear resin system, they produce brilliant transparent colors. When used with opaque substrates, they are excellent tinters to shade the color. Dyes have lot-to-lot color variation due to the nature of dye manufacturing. Color standards must be established to maintain acceptable color, and strength limits. Also see learn about Tolerances.

See [learn about pigments](#)

Pigment Dispersion

The act of dispersion requires force and shear to break apart agglomerates and reduce aggregates to primary particles and stay apart. Historically, organic pigments are harder to disperse than inorganic pigments. This is primarily due to the particle size. Organic pigments are very small in particle size conversely, inorganic pigments are very large in particle size. The smaller the particles, the more energy and work is needed to disperse them to an acceptable color and optical characteristic.

Three things must occur for good dispersion: initial wetting (pigment/resin matrix), size reduction breaking down of pigment aggregates), and intimate wetting (displacement of air with vehicle). Initial wetting requires that the pigment and resin be well mixed and have sufficient affinity for each other to avoid separation. Dispersing agents can aid in the affinity between pigment and resin thereby improving the dispersion quality or reduce the time needed to obtain initial wetting. Size reduction is achieved by particle to particle attrition or shear transmitted through fluid dispersion process.   Mechanical energy must be available in order to break the aggregates. Intimate wetting is the process where air is displaced with resin. This is to promote a strong enough bond between pigment and resin to withstand forces applied to the system in later processing.

Paints, inks, and some plastics systems may experience pigment flocculation. The two most common flocculation phenomena are: floating and flooding. They occur particularly when a formulation lacks a dispersing additive. Both floating and flooding cause the final product to be weaker or lighter and less intense in color. These conditions occur more often with phthalocyanine blue, molybdate orange and carbon black. These dispersion problems can be responsible for: surface imperfections, weaker color development, specking, streaking, and lower gloss. Some practical means to measure the degree of dispersion is measuring: color, strength, gloss, opacity or haze.

See learn about pigments.

Specialty Colorants

Specialty colorants are colorants used for a different visual effect. Some popular colorants are pearlescents, fluorescent, and metallics. Their color characterization is unique and best displayed in transparent resins. Their effectiveness relies on excellent dispersion into the resin system.

<u>Pearlescent</u> pigments have a deep luster of pearl. Coated mica is a popular pearlescent pigment. When incorporated in a resin, light is reflected from many parallel surfaces to produce the unique depth effect. Different colors can be viewed using additional reflective surfaces causing interference and iridescence colors. These pigments range in particle size to give different color behaviors. The small particle sizes give more covering power whereas, the larger gives more highlights.

<u>Fluorescent</u> pigments have very high reflectivity. Energy is absorbed in the Ultraviolet region and re-emitted in the visible spectrum. This energy is strongest in the red region where the reflectances go beyond 100% reflectance. This effect produces brilliant yellows, oranges and reds. Blue and green fluorescent pigments are actually conventional organic pigments with an optical brightener.

<u>Metallic</u> pigments are flakes which produce a sparkle effect. Metallics range in specular effects depending upon the particle size and shape (i.e., rectangle, square, and hexagonal). As the particle size increases, the sparkle effect or glitter increases. Small particle sizes allows for increased hiding and metallic sheen. Various combinations of flake sizes and shapes can produce specular effects depending upon the angle of observation. Some of the more popular metallic pigments are aluminum foil and gold bronzes.

Most specialty colorants have color contribution at the specular angle (or gloss angle), it is recommended a sphere based spectrophotometer be used to measure these colorants. The instrument should also be configured SCI. Also see learn about Instrument Geometry.

Kubelka-Munk Theory

Paul Kubelka and Franz Munk were two German physicists who developed mathematical equations which describe complex color mixing for completely opaque samples. They described the relationship of colorant behavior in terms of absorption (K) and scattering (S) in a reflectance mode. Their premise is that colorants absorb as well as scatter light. In addition, there must be enough scattering for light inside the sample to be completely diffused and, there is no change in refractive index at the sample's surface. The Kubelka-Munk equations are the basis for all color matching calculations in opaque systems. The percent reflectance of the colorant must be known to calculate the K/S. The K/S can be calculated at any wavelength. The equations are as follows:

- Kubelka-Munk Equation for Opaque Samples

$$K/S = \frac{(1-R)^2}{2R}$$

Where: R is percent Reflectance in decimal form.

e.g.   The K/S of a colorant at **20%** reflectance is:

$$K/S = \frac{(1-0.2)^2}{2(0.2)} = 1.6$$

- Kubelka-Munk Equation for Multiple Colorants

$$(K/S)mixture = \frac{Kmixture}{Smixture} = \frac{c1K1 + c2K2 + c3K3 + ...}{c1S1 + c2S2 + c3S3 + ...}$$

where: c1, c2, c3 are colorant concentrations.
This equation shows how the ratio K/S for a mixture of colorants depends on the concentration.

A significant amount of preparation is required to establish a color matching system. This requires the colorant characterization to be precise in order to calculate and fulfill Kubelka-Munk equations. In color formulation, there are applications which use the full Kubelka-Munk equation such as, paints, plastic, and opaque inks. There are other applications which modify the Kubelka-Munk equation so it enables us to properly characterize them such as, transparent inks, textiles and ceramics. Transparent plastics uses Beers Law method as it is characterized through transmission.

To help better define the application we often use: single constant and two constant Kubelka-Munk applications.
Coating and opaque Inks   = 2 constant
Plastics   = 2 constant
Transparent inks / Pad Printed textiles = 1 constant
Textile/Ceramics   = 1 constant
Transparent Plastics   = Beers Law

The "constant" refers to absorption and/or scattering. Two constant uses both absorption and scattering. Single constant uses either absorption or scattering. Different math equations must be used depending upon the optical characteristics of the application.

The function K/S is proportional to the concentration of the colorant. The Kubelka-Munk equations are used to relate the coloring power of colorants. This is applied to basic quality control features known as strength equations. Some of these strength equations are Chromatic Strength, Apparent Strength (or area under the curve), and Pseudo Tri-stimulus Strength.

Saunderson

Saunderson modified the Kubelka-Munk equations to include the effects of reflection losses accompanying a change in refractive index at the sample surface for color matching databases. This is a correction for the total surface reflectance, which includes the specular component with the measured reflectance as denoted by **Rm**. Sometimes this is referred to as the Saunderson Correction or Saunderson Coefficients.

Using the measured **R** values in this formula, we can calculate the corrected internal reflectance **Rc¢**.

$$Rc = \frac{Rm¢ - k1}{1 - k1 - k2(1 - Rm¢)}$$

where: **Rc** is used in Kubelka-Munk equations.

To calculate the measured reflectance from the correction internal reflectance use the following form of this equation

$$Rm¢ = \frac{k1 + (1 - k1)(1 - k2)\, Rc}{1 - k2(Rc)}$$

where:
k1 value describes the external first surface reflectance. This characteristic is most often referred to as the specular reflectance or gloss of a sample. This coefficient is directly dependent on the gloss, texture and other appearance characteristics of the sample. The reflected light energy indicated by k1 is the same color as the light source.

k2 value describes the internal first surface reflectance as diffuse light strikes the interface between the sample and the outside world, and is returned back into the sample. This coefficient is directly related to the degree of colorant dispersion, wetting characteristics of the vehicle system, agglomerates, particle size, and the general chemistry and physics of the system. The higher the k2 value the more light that is reflected back into the sample and the higher that amount of absorption of the light by the colorant, therefore, the higher the unit color yield.
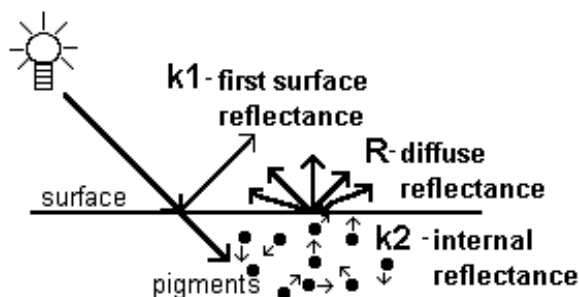
For single constant applications, the k1 and k2 is set to 0.00. For 2 constant applications, k2 is usually set at **0.40**. k1 is determined by the lowest reflectance in the database set. Usually it is a phthalo blue masstone or phthalo blue black tint. Locate the lowest reflectance on the spectral curve or spectral data and subtract 0.2% and then divide that number by 100% to determine k1.
For example:
The phthalo blue black tint has the lowest reflectance is 4.1% at 640nm.
(4.1% - .2%)/100% = .039 = k1

The following recommendations are made for k1 and k2:

Application	k1	k2
Coatings	lowest %R - 0.2%	0.40
Plastics	lowest %R - 0.2%	0.40
Trans. Inks	0.0	0.00
Textiles	0.0	0.00

Color Formulation

Computer color formulation provides: time savings in preparing "hits" to color match a target color, reduction of the number of colorants in the match and inventory, and fast batch corrections to production runs. All of this translates to *cost savings*. Before you can enjoy the benefits of a working color formulation system, you first must have the *commitment* to prepare an accurate database which is representable of your processing capability. With dedicated personnel preparing the colorant standards your chances of a successful system is good.

The OnColor Match color formulation option provides the capability of matching the color of a standard or target to the existing colorants in a colorant file. There are two types of methods to match a color: Automatic and Manual mode. The Automatic color match option provides you with the capability to do combinatorial matching. This is an invaluable tool which allows you to evaluate all of the matches which meet your criteria for quality and cost considerations. The Manual color match option allows the operator to enter the concentrations or amounts to be used in the match and have the software calculate the reflectance curve and color difference data between the standard and match.

The OnColor Match color formulation system is a program used for color matching many different applications, such as, plastics, coatings, inks, textiles, etc. This program is designed to characterize non-specialty colorants, i.e., pigments and dyes for characterizing the databases. The math used to build the databases is based on Kubelka-Munk theory.

The two constant Kubelka-Munk is used for applications where the colorants (usually pigments) contribute scattering and opacity to the color. Coatings and Plastics are typically two constant applications. Single constant Kubelka-Munk is used for transparent colorants (usually dyes and transparent inks) on an opaque substrate. Textiles and transparent printing inks are typically single constant applications. Filter applications uses Beer's Law which is only for transparent applications and through transmission measurement.

When formulating a color match you must remember that color is 3 dimensional and the most controllable formula is one that contains 3 colorants plus white or the substrate. One colorant is needed to control each of the dimensions of color space. A formula containing 3 yellows will be difficult to control in production both visually and by computer since it takes a large change in one of a the colorants to effect a small color change. There may be many possible ways to correct this color. The best color formulation is one which contains black (or a de-chromatizing colorant) and 2 chromatics located in color space on either side of the target color. Of course, this is not always possible in the real world. However, the advantage of computer color formulation is that the computer can evaluate dozens or hundreds of candidate matches while the visual matcher usually works with only one or two colorant combinations. Frequently, it is worth sacrificing a little in terms of cost and or metamerism to obtain a more workable formula in production.

Also see how to Make a Color Match.

Batch Correction

Due to the nature of colorants, all production batches vary to some degree in color to an established standard. It is the color difference or set tolerance acceptability that will determine if the batch meets the customer expectation. When the batch falls outside of the "shipping limits", the batch needs to be corrected. Simply throwing the batch away and starting from scratch can be expensive, and time consuming. However, *fixing* the batch is a practical solution to repairing it back to standard quality.

Batch correction is a useful tool in order to save time, energy and costs. The features allow the operator to enter in what is known about the batch. If there is a question about what the batch composition is, OnColor Match can simply calculate the missing colorant and or amount information. But before a computer batch correction can be performed, a colorant database must be available. A successful batch correction depends solely upon the preparation accuracy of the colorant database.

The batch correction routine computes the add of colorants and white needed to bring an off-shade batch to standard quality. The resulting answer may be presented in two different ways. The first or routine way is to display the answer in terms of amounts which need to be added to the existing batch to bring it on shade. The second way is to display the answer in terms of how to prepare the corrected formula starting "from scratch". The second way would be the case in the laboratory situation where the operator is formulating this color for the first time and is taking different "hits" to arrive at the match. The correction may also be displayed in terms of "% change" needed in each of the colorants to bring the batch " on shade". In all types of correction, the output is the ADD which needs to be made to the batch to correct the color.

Several types of correction methods are available to meet a variety of needs for adjusting off-shade batches. The types are designated according to whether the colorants in the batch are known and whether the exact amounts of the colorants in the batch are known. The software may use the correction factor (CF) to describe the strength of the colorants. There are two types of methods to make a correction: Automatic and Manual. The Automatic correction uses a combinatorial match where the operator enters a palette of colorants and lets the computer calculate the best colorant combination to correct this batch. After the best match is selected, the software corrects the batch with these colorants using unknown amounts. This method may be used for waste work-off. The Manual correction has 5 correction methods to choose from:

- **Input Batch Amounts**
- **Use Predicted Batch Amounts**
- **Manual Add**
- **Reduction of Add**
- **Change Correction Factors**

The Manual option is used to manually input the amounts of each colorant when they did not come from an original prediction to the standard. The correction can also be conducted by changing the offset of the color differences for a larger delta E or changing the correction factor for altering the colorant strength. Manual colorant "adds" can challenge an operators skill in correcting the batch by adding colorant to any or all of the colorants in the formula.   These features allow the operator to explore other possibilities of correcting the batch. (See Batch Correction Manual Dialog Box for additional explanation.)

Also see, how to Correct a Batch and learn about Color Formulation.

Analyzing the Colorant Database

An important part of setting up an accurate colorant database is analyzing the data for errors and inconsistencies. Many of the techniques and insights needed to successfully trouble shoot the database are on time and experience with your particular products. For example, a certain "quirk" in a spectral curve may mean an error for one database, but may be perfectly logical and acceptable in another. The following advise is offered in analyzing your database. While this is by no means an all encompassing list of things which can go wrong or things to look for, it provides you with a few of the fundamental techniques useful in analyzing your data.

As you are analyzing the data, you will want to print most of the data for your **Colorant Database Notebook.** As you built your colorant database, you recalled your colorants from Save-set (*.WSV) files. These Save-sets can be recalled for printing spectral data and curves. The following information should be printed for each colorant and inserted into our notebook:

- Reflectance Data
- Reflectance Curve
- K/S Curve
- Colorant Characterization Input screen which shows the DE's for the back predictions
- Colorant Data which shows the K/S or K and S data along with physical parameters.
- The **exact formulation** (including colorant loading) and procedure and equipment used to prepare each sample.

For Both Single and Two Constant Applications

- Examine the reflectance curves of all the database samples to see if any of them exceed the reflectance of the white substrate or white base. The OnColor Match software automatically flags those letdowns which exceed the white. Theoretically, it is impossible for a letdown or primary to reflect more light than the base material (unless it is fluorescent). If this occurs, it is usually due to a measurement or opacity problem. If many samples exceed the reflectance of the white, than most likely the white is in error and should be remade. If only a few samples exceed the white, than it is probably a problem with the measurement or opacity of these samples only. Bright yellows are notorious for exhibiting this. For textile samples, be sure to fold the primary sample to opacity. If this is not possible, then back it with the white substrate used in the database. For yellow pigments, the problem is more likely to be opacity, where the sample is not hiding the substrate at this film thickness. You can either make a thicker sample, increase the colorant loading, or use the reflectivity calculation to calculate the opaque reflectance.

- One of the features performed by OnColor Match during colorant characterization is to estimate the error in the database by back-predicting to the colorant primaries or letdowns. The newly established database is used to predict a formula to match the colorant primaries or letdowns. Since the letdowns represent a known formulation, the color differences between the predicted match and the known match is calculated and reported. A low or near zero color difference on back-prediction indicates that the database is performing as expected. Any color difference larger than 0.5 DE are highlighted and should be investigated. Color differences less than 0.5 units are within the normally expected error for the database. Color differences between 0.5 - 1.0 are suspicious and should be examined closer. Values for DE for DE greater than 1.0 need to be resolved; and values greater than 5.0 indicate that a gross error has taken place.

If you find unacceptable DE's on many or all of the black letdowns, then the black colorant data is probably in error. If this occurs on only a few samples, then weighting or lack of opacity may be the culprit. High errors on both the white and black letdowns may signify that the masstone is at fault. Check its opacity and also check for flocculation and bronzing. The sample may be overloaded with colorant. If you find several errors, don't be discouraged. The perfect database is very elusive and is seldom achieved on the first go-around.

For Single Constant Applications

- Analyze the colorant analysis display screen. Ideally all of the levels for a colorant will display the same shape. The K/S curves should be roughly parallel to one another. Some flattening of the curves may take place at the highest concentration levels, due to saturation of the dye sites. However, the curves should not cross. Also look for any suspicious dips and spikes which may be indicative of contamination.

- Inspect all of the K/S data for each level for negative K/S values using the printout of colorant data. This will occur when the primary

measures higher in reflectance than the substrate. If you cannot get rid of this problem with a re-measurement of the sample, then the negative K/S values should be edited to 0.0. If multiple levels are present then it is also possible to delete that particular level which does not follow the norm.

- For yellows, reds, and oranges, the K values at all wavelengths should decrease as concentration decreases. Look for crossovers at the longer wavelengths. This generally indicates a measurement, contamination or opacity problem.

- For each level of a colorant, plot the K/S at the wavelength of maximum absorption vs. the % concentration of the sample. Kubelka-Munk theory holds that there is a direct relationship between the concentration of the sample and the K/S value. That is, if you double the concentration, you double the K/S value. Your resulting plot will most likely not show a perfect linear relationship, but should show a smooth progression of levels without any spikes or dips in the curve. The curve will also most likely begin to level off at the higher concentration levels, where the dye is reaching its maximum build. This shows you where it is no longer cost effective to continue increasing the concentration of this dye.

- To plot the Normalized K/S vs. concentration, first calculate the Normalized K/S for each level of a colorant.

For Two Constant Applications

- Examine the reflectance curves of the letdowns for each colorant checking to be sure that the K1 value you have chosen for the database is lower than any other reflectance data on the letdowns. If it in not, try re-measuring the culprit letdowns paying special attention to the exact positions on the sample you are measuring. If this problem happens on a phthalo blue or phthalo green (or other organic pigments) masstone or black letdown then bronzing may be the problem. You can try remaking the sample at a lower % colorant loading, however you may have to use multiple layers to obtain opacity. If the problem remains, then the only solution is to re-establish the database with a new K1 which is lower than the lowest sample measurement.

- If you have used the multi-white letdown capability and have more than one level of K and S data stored, then check to see that the K and S data at each level is roughly the same. The data will typically show small changes from level to level. It will most likely NOT be the same at each level, or else it would not be necessary to store more than one level. However, the data should be in the same order of magnitude and should show trends or patterns as the concentration increases. Within each level the S data should show a relatively smooth progression with no abrupt jumps.

- Examine the K and S data at each wavelength; there should be no negative numbers.

- Examine both K/S and reflectance curves of yellows, oranges, and reds for phthalo blue contamination at 660 - 700nm. This will show up as a pronounced dip in the curve at these wavelengths.

Using Debug Mode in OnColor

1. Launch OnColor.
2. Go to Options -> Communications
3. Double RIGHT click in the Communications dialog box.
4. Another dialog will appear like this:
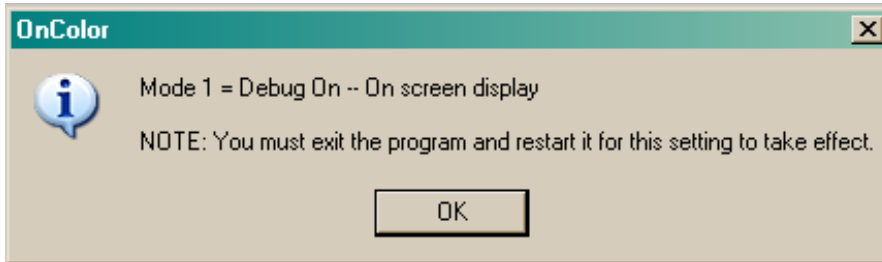
5. Click OK to exit this box. Close the program and re-launch it. You will now be in Debug Mode = 1, where you get pop-up windows. Debug Mode = 2 writes the messages to a TXT file (CYBDEBUG.TXT created in the folder of the .exe file), and Debug Mode = 0 is the Silent mode. You want to get back to the Silent Mode.
6. Repeat steps 2 - 5 until the Color Sensor = = 0 is shown. This is the normal or "silent" mode.

HyperTerminal Instructions

1. Go to Windows Start -> Accessories -> Communications -> HyperTerminal.
2. Choose a name for this session (eg, ColorGuide, or DF200) and then pick an icon for it from the displayed ones.
3. On the next window, change the Connect Using -> Comm1
4. Then on the next screen, set the proper BAUD rate, etc for whatever instrument you are connecting.
5. Once in the program go to File -> Properties -> Settings Tab. Then click on the ASCII setup and check off the following:
   a. Send line ends with line feeds
   b. Echo typed characters locally
   c. Append line feeds to incoming line ends
6. Go to File -> Save and save these settings for this connection so that you can call them up again later if needed.
7. Now the real fun begins. Type a "legal" command for this instrument. It might be "cal" or "C" for calibrate; "MES" or "M" for measure, etc. This is where you need to know the protocol for the instrument, but some of the manuals contain this or you may be able to get it from BYK for the ColorGuide or DCI for the DataFlash.
8. See what happens and how far you get and if you can establish communications this way.

Recommended Procedure for Short Term Repeatability of a Spectrophotometer

1. The white calibration tile is traditionally used to check the instrument for short term repeatability. For purposes of this test, short term repeatability is defined as the drift over a period of one hour. Readings are taken on the spectrophotometer at one minute intervals using a macro called "Short Term" that comes with the software. This macro can be modified to change the time interval to one minute between measurements and to continue for 60 readings thereby totally one hour of testing.

2. The spectrophotometer should be calibrated properly for the SCI mode in LAV (large area view), UV included and the number of flashes set for three for a single measurement. The software should be configured for the CIELAB (L*a*b*) color scale for the 10 Degree Standard Observer / Illuminant D65 and the CIELAB Delta E*.

3. The white calibration tile should be centered at the reflectance port.

4. To load the macro, click on Options → Macro→ Load and then select the Short Term.MCR file.

5. To run the Short Term macro, click on Options → Macro→ Run.

6. Follow the prompts given in the macro and name the standard. Be sure to turn on the Auto-Naming check box on the Trial Defaults tab. After the macro is started and after the first trial is measured, you can leave the instrument and software unattended. It will automatically take a reading every minute and log the data.

7. If you let the macro run to completion, it will finish on the Statistics Report screen where you can view a trend chart of the repeatability of the instrument and look at the mean, standard deviation, and variance.

Recommended Procedure for Long Term Repeatabilityof a Spectrophotometer

1. BCRA Series II tiles should first be checked for cleanliness and if necessary cleaned. **No "Windex" or cleaners with optical brightners. We recommend "Sparkleen" sold by Fisher Scientific or a product such as "Kimwipes" to clean the tile surface.** The tile set should always be stored in an area where the temperature and humidity are stable!

2. The test room environment must be stable for temperature and humidity. **(Note: A change in temperature will cause a variation in the BCRA tile readings. The tiles should always be measured at the same temperature. If there is a change in temperature (+/- 2 degrees F or +/- 1 degree C) from the first test, there are published correction values that can be applied to the tile readings. Temperature and humidity should be recorded at the time each test is performed. This can be conveniently logged into the "notes" field of the Minolta software for each measurement, along with the operator performing the test. If tiles are moved to another room, or location, the tiles should be conditioned for 24 hours in the same room the instrument is tested)**.

3. The spectrophotometer should be calibrated properly for the SCI mode in LAV (large area view), UV included and the number of flashes set for three for a single measurement. The software should be configured for the CIELAB (L*a*b*) color scale for the 10 Degree Standard Observer / Illuminant D65 and the CIELAB Delta E*.

4. The first tile should be centered at the reflectance port and measured.

5. The reading should be saved in a file as the reading for that individual tile on that individual instrument. Repeat this measurement procedure for this tile, so that you have a Standard (Target) and one Trial (Sample) reading. Save this data in a "save-set" (.wsv) file.

6. Each of the remaining tiles should be measured in the same manner and saved in a separate file. After completing all the tile readings, you will have twelve separate "save-sets", one for each tile.

7. The next working day, recall each save-set file and add another measurement for each tile as Trial #2 following steps 1-5. Re-save each file with the same name.

8. Repeat this procedure for a total of five days. You will have a Standard and five trial readings.

9. After you have collected data on five successive days, use the software to develop the average reading for these five measurements. You will find this option on the Menu Bar under Standard/Average Trials. This option takes all of the trial readings, averages them, and places the average in the Standard position. Your Standard will now be an average of the readings taken over five days on this tile. Developing the Standard reading using this technique yields a more representative measurement of the instrument performance and averages out minor differences in the temperature and humidity of the environment. The resulting averaged values for the Standard will become your **"working reference values"**.

10. On a regular basis (twice a month, the beginning and the middle, for the first 3 months and once a month thereafter), each tile should be measured using steps 1 - 4 above. Recall the save-set file for the tile to be measured and then add another Trial to the save-set. 11. Always remember to re-save the file after you add another reading. Use the Statistics report screen to view a Trend chart of the data along with statistics. An average Delta E* can then be calculated using the Delta E* values for each of the twelve tiles. This **average Delta E*** value for the twelve tiles, compared to their "working reference values", **should not exceed 0.50**. Please note that the limit is based on the average Delta E* for the twelve BCRA Tiles and individual tiles may exceed this limit. If this average Delta E* exceeds 0.5 the tiles should be cleaned, the instrument recalibrated and the tiles re-read.

Reminder: Changes in ambient temperature will result in HIGHER Delta E* values! If the average Delta E* still exceeds 0.5 the Instruments Service Department should be contacted.

Recommended Procedure for Inter-Instrument Agreement a Spectrophotometer

1. The **"working reference values"** for the <u>designated</u> **"master"** instrument, once determined (**see *Recommended Procedure for Long Term Repeatability for a Spectrophotometer***), may be used to compare other instruments for inter-instrument agreement (reproducibility).

2. The "working values" are stored as Standards in twelve "save-set" files (one for each BCRA Series II tile) within the software of the master instrument. These files may be shared with the other instruments by copying the files into the software of each instrument.

3. Each Minolta Spectrophotometer can recall the twelve data files containing the "working reference values" for the twelve BCRA tiles, previously measured on the master instrument.

4. BCRA Series II tiles should first be checked for cleanliness and if necessary cleaned. **No "Windex" or cleaners with optical brightners. We recommend "Sparkleen" sold by Fisher Scientific or a product such as "Kimwipes" to clean the tile surface.** 5. The tile set should always be stored in an area where the temperature and humidity are stable!

5. The test room environment must be stable for temperature and humidity. **(<u>Note</u>: A change in temperature will cause a variation in the BCRA tile readings.   The tiles should always be measured at the same temperature. If there is a change in temperature (+/- 2 degrees F or +/- 1 degree C) from the first test, there are published correction values that can be applied to the tile readings. Temperature and humidity should be recorded at the time each test is performed. This can be conveniently logged into the "notes" field of the software for each measurement, along with the operator performing the test. If tiles are moved to another room, or location, the tiles should be conditioned for 24 hours in the same room the instrument is tested)**.

6. The spectrophotometer should be calibrated properly for the SCI mode in LAV (large area view), UV included and the number of flashes set for three for a single measurement. The software should be configured for the CIELAB (L*a*b*) color scale for the 10 Degree Standard Observer / Illuminant D65 and the CIELAB Delta E*.

7.Beginning with the first BCRA tile, the "save-set" for that tile should be opened for comparison to the saved standard reading ("working reference value).

8.The first tile should be centered at the reflectance port and measured as a **Trial**.

9.The trial reading should be saved and you may include the date in naming this trial.

10.The remaining eleven tiles should be measured in the same manner and the trial reading saved.

11. After completing all the tile readings the twelve "save-sets" will each contain a Standard ("working reference value") and a Trial and the Delta E* color difference.

12. An **<u>average Delta E*</u>** for the twelve tile set can then be calculated using the Delta E* values for each of the twelve tiles. The average Delta E* value for the twelve tiles **<u>should not exceed 0.50</u>**. Please note that the limit is based on the average Delta E* for the twelve BCRA Tiles and individual tiles may exceed this limit. If this average Delta E* exceeds 0.5 the tiles should be cleaned, the instrument recalibrated and the tiles re-read. **<u>Reminder</u>: Changes in ambient temperature will result in HIGHER Delta E* values!** If the average Delta E* still exceeds 0.5 the Minolta Service Department should be contacted.

13. This test procedure may be repeated on a regular basis to check the population of the instruments.

How to use the Multi-Angle Features of the CM-512m3

On the CM-512m3, set the baud rate to 9600 and the REMOTE mode to YES. To establish communications between the instrument and the software, go to Options Menu of OnColor QC or OnColor Match and then choose Communications. Select the CM512m3 as the instrument type. Choose the comm port which you are connected to on the computer and set the baud rate =9600, data bits = 8, parity = none, and stop bits = 1.   Then click the Test Settings button to establish communications.

Calibrate the instrument using the Calibration Option on the Options Menu. Perform the zero and white calibration according to the instructions given on the screen and following the guidelines given in the CM-512m3 manual. The calibration data for the white calibration tile must be stored in the memory of the CM512m3 before performing calibration.

The User Screen of the software can be configured in several different ways. The default configuration shows the spectral and colorimetric data for one angle (45°) on all screens. Use the left and right arrow keys ($\leftarrow$ and $\rightarrow$) to scroll through the data for the 75° and 25° angles on any screen. The angle that is displayed is shown directly under the standard and trial names. The up and down arrow keys (and $\downarrow$) are still used to scroll consequently through the trials.

On any screen the angle that is displayed can be fixed in the properties screen. On the Style Tab, you will note an "Angle" field. (On the Statistics Report, this field is located on each Chart Tab.) When this field is set to "Current", you can scroll through the angles by pressing the left and right arrow keys ($\leftarrow$ and $\rightarrow$). When the "Angle" field is set to 25°, 45°, or 75°, the display is fixed to show only the data for that angle. This feature can be used to fix the User Screen display so that colorimetric data is shown in each of 3 quadrants-using one quadrant for each angle. The fourth quadrant can be used for any other desired display.

An additional type of display can be accessed on the Statistic Report. On the Statistics Report Properties , go to any Chart and under the Display Mode select Multi-Angle Plot. Then choose the Variable to Plot, such as L* or DE*. The resulting chart will show a plot of this color parameter vs. angle-or how this parameter changes with respect to angle. This is invaluable for tracking how a color changes with angle, or comparing how two samples change at different rates with respect to angle.

You can setup several screen configurations and save them as different Report Properties files. When storing data in a save-set (.WSV) file or the Database of Standards (.MDB) file, the reflectance data for all 3 angles is stored.
In the Database of Standards, you can set the Search criteria so that each of the angles is weighted differently. Go to the Search tab, and under "Measurement Angle Weights", enter the desired weighting factors for the DE for each angle. For example, the 45° angle may be weighted more heavily than the 25° and the 75° because this angle visually has tighter tolerances than the other two angles, therefore the sample is expected to be a better match at this angle. These weighting factors are used to compute an overall index of difference between a trial and the standard for which it is being searched.

Use the "Show Angle Mismatch Warning Message" when searching a database where all or some of the samples were measured on a different multi-angle spectrophotometer which has different geometries or different angles than the CM-512m3.

Using the BYK Lico LCS II with OnColor

1. Install the OnColor software from the CD. Connect the serial cable from the LCS II to your PC and turn ON the instrument.
2. The LCS II must be set to Remote mode to communicate with the PC. To do this, use the LCD display and the control buttons on the instrument. Start at the Main Menu and select CONFIG -> SYSTEM ->INTERFACES -> PC REMOTE. The check box for PC REMOTE must be filled in. Then return to the main menu by pressing ESC -> ESC -> ESC -> DATA -> CURVE. The instrument must be in the measure mode to communicate with the PC.
3. Once the LCS II is in remote mode, then it is ready to communicate with OnColor. Launch OnColor by double-clicking on the icon on your desktop.
4. Go to Options -> Communications and select the BYK Lico LCS II from the instrument list. Click on the "Test Settings" button to confirm the connection. The instrument should say REMOTE MODE when it is ready.
5. All measurements are now controlled by the PC. This instrument only takes reading in the transmission mode.   Fill a reference cell with the reference liquid for calibration. Follow the normal calibration procedure. When changing the type or path length of cell, the instrument will prompt you to re-calibrate it for this new cell type.
6. The Gardner color scale can be displayed in OnColor as an index. Go to the Color Plot Properties, select the Gardner Color Scale D1544-98, and be sure to turn on the display of the indices. Just be sure to set Illuminant C and the 2 degree observer to get accurate Gardner numbers. This index is only defined for Ill C/2 degree.

Using the X-Rite 8000 Series with OnColor

1. Install the OnColor software on your PC **without** connecting the X-Rite 8000 Series instrument. Before using the X-Rite 8000 Series for the first time, you will need to install the special USB drivers for the instrument and the camera. These drivers can be found on either the OnColor CD or the X-Rite Manuals and Utilities CD.
2. After installing OnColor, connect the USB cable for the X-Rite. Windows should automatically launch the "Found New Hardware Wizard" and ask questions about where to find the drivers. You will need to go through this Wizard two times-once for the instrument and once for the camera.
3. When the Wizard prompts for a drive location, direct it to look for the drivers on your CD-ROM drive and place the OnColor CD into the drive. If need be, point to the XRite folder on the CD. Click on the XRUSB.INF file to install the driver for the spectrophotometer. Follow the screen prompts to complete the installation.
4. The Wizard will launch a second time to install the drivers for the Camera. When the Wizard prompts for a drive location, direct it to look for the drivers on your CD-ROM drive and place the OnColor CD into the drive. If need be, point to the XRite folder on the CD. Click on the OV511p.INF file to install the driver for the camera. Follow the screen prompts to complete the installation.
5. Software and driver installation is now complete. Launch OnColor by double-clicking on the icon on your desktop.
6. To communicate with the X-Rite 8000 Series (models 8200 & 8400) in OnColor, go to Optionsà Communications and select the X-Rite 8000 Series from the instrument list. Click on the "Test Settings" button to confirm the connection. There are no special settings or modes on the spectro that need to be setup.
7. This instrument will measure both SCI and SCE conditions. If you want to take advantage of this feature, go to Options -> Instrument Settings and select the toggle for both SCI and SCE in the Instrument Settings dialog box. Any file created under this mode is a 2-status file. You can toggle between the two statuses by using the left and right arrow keys. If you only want to see one status, go to ViewàMeasurement Status Sequence and check only the status that you want to see.
8. The "Position" option (under the Standard or Trial menus) is used to activate the camera as the sample previewing device. Go to Standard -> Position (and/or TrialàPosition) to toggle this feature on. When this feature is activated, then a pop-up window displays the sample image after you enter the name for the Standard or Trial. Click OK from this image to take the reading or cancel to abort this reading. For sample averaging modes, the sample image is shown after you click the OK button on the averaging dialog box.
9. CAUTION! Do not unplug the USB cable while in the OnColor software. This may cause the camera software to crash! We recommend that you always exit the OnColor software and use the Windows "Eject Hardware" icon to safely disconnect the instrument and keep it happy.

How to use the X-Rite VS450 with OnColor

Follow these steps to connect the VS 450 to OnColor:

1. Do not connect the USB cable from the VS450 to the PC until directed to do so in step 3. You MUST install the driver first.
2. Locate the disc from X-Rite that contains the USB driver. Install the USB driver following the instructions in the X-Rite manual and the prompts on the screen.
3. After successful installation of the driver, plug the VS450 USB cable into the instrument and then into the PC. The power should also be plugged in. Windows should automatically recognize the instrument and find the driver to install.
4. The "Found New Hardware Wizard" will open. Follow the prompts and first select "Not this time (for searching on the internet to find the driver" and then choose "Automatically Find the Driver". Follow the prompts on the screen and click "Finish" when completed.
5. Open OnColor. Go to Options→ Communications and select the X-Rite VS450 at the instrument drop-down list. There is no COMM PORT to select since it uses a USB driver.
6. Click on "Test Settings" and then OK. You should get a message "Test was successful".
7. Go to Options→Instrument Settings to select the Area of View (either Small or Large are available on this instrument). Click OK.
8. The calibration plate is mounted on the back side of the sample rail. (See the X-Rite instruction manual for pictures and details.) Slide it into place and then calibrate the VS450 by going to Options→Calibrate [or type the shortcut key "C"]. Follow the prompts to calibrate and click OK when finished.
9. You are now ready to take measurements.