
Datacolor

MATCH^{PIGMENT}

User's Guide



Datacolor MATCH^{PIGMENT} User's Guide
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Introduction

Program Overview

Datacolor MATCH^{PIGMENT} is a state-of-the art software package developed by Datacolor for manufacturers of colored products—paints, plastics, printed materials, and cosmetics, among others—to evaluate, match and correct the color of their products. It can be used at every step in the manufacturing process, from initial formulation to outgoing finished product.

The program consists of a suite of program modules, each tailored to a specific function included in the package.

-  **Formula Central.** Formula Central is the workhorse of the package. You will use it for all routine color matching activities in the lab and production.
-  **System Administration.** System Administration controls all default system selections, and offers the option to customize user profiles to the needs and requirements of the individual user.
-  **Navigator.** Provides features for managing data storage and retrieval.
-  **Ingredient Maintenance.** Ingredient Maintenance provides access to information about the physical properties of the raw materials, and administrative information such as cost, lot name, etc.
-  **Set Maintenance.** Set Maintenance is used to create and edit the optical data of the raw materials.

- 
Schedule Maintenance. Schedule Maintenance is included in the Advanced Queuing options. It enables you to create and edit *Schedules*, which allows you to incorporate several job templates into a single queue.
- 
Queue Maintenance. Queue Maintenance is included in the Advanced Queuing options. The program is dedicated to building and editing queues, and provides all functions required to support a queue.

You will find that this package uses many of the same devices used by other Windows-based programs. It uses toolbars, shortcut keys and drop-down menus as tools to navigate through the program modules. If you have used other Windows-based products, you will learn how to operate this package very quickly. For those users with no previous Windows experience, the tutorials provide explicit instructions for mastering the basic tasks.

System Requirements

Component	Minimum (see note 1)	Recommended Minimum	Notes
Processor	Pentium 4 1.4 GHz	Pentium 4 2.5 GHz	1
Memory	512 MB	2 GB	1
Free Hard Drive Capacity	20 GB	120 GB	1
Video Resolution	800x600 16-bit	1024 x 768 True Color	2
Video Memory	4 MB	128 MB	2
CD/DVD Drive	CD Reader	CD Writer	3
Diskette Drive	1.44 MB	1.44 MB	4
Available Ports	(1) RS-232 Serial (1) USB	(1) RS-232 Serial (3) USB	5
Printer Port	Parallel or USB	Parallel or USB	5
Operating System	Windows® 2000 SP 4 Internet Explorer 5.01	Windows® XP Pro, SP 2	6

NOTES

- Minimum system configurations may limit performance, data capacity and operation of some features. Faster processor, more memory and faster hard drives will significantly enhance performance.
- Accurate on-screen color display requires monitor calibration and true-color video mode.
- Datacolor MATCH^{PIGMENT}™ is supplied on three standard 12 cm, 650MB capacity compact discs. Recommend a CD or DVD writer is recommended for data backup and file transfer from stand-alone systems.
- Some instrument calibration media are high-density (1.44MB) 3.5" diskettes.

- Datalog spectrophotometers use either an RS-232 Serial or USB connectors.

Datalog Spyder2™ requires a universal serial bus (USB) connection.

Printer port requirements depend on the specific printer selected.
- Microsoft Windows® Vista® support requires specific installation and configuration for Sybase 9. Contact Datalog support for instructions or latest details.

Documentation

A printed user's guide is provided with each system. It is a comprehensive reference that documents each program option, and provides an applications context for using the color technology tools that are available. An electronic copy of this manual is also provided on the program CD in a PDF format (Datalog MATCH^{PIGMENT} User Guide.PDF). The manual has also been modified for use as an on-line help with the program.

User's Guide Organization

- **Getting Started.** Includes instructions to configure and calibrate the instrument, and includes tutorials that provide step-by-step instructions for performing basic matching and correction activities. When the program is installed, demonstration data is also provided so you can run every program module. The data provided includes samples and colorant sets. Several colorant sets are provided, and each simulates a colorant set type that can be used. Target and trial samples are also provided in Formula Central. You do not have to measure a sample to run the formulation or correction tutorials.
- **Program Features.** Explains some of the features that characterize Datalog MATCH^{PIGMENT} program structure and operation.
- **Formula Central.** Provides explanations of the most commonly used program features included in the Formula Central module. This section focuses on the basic matching and correction features, and provides a basic explanation of the program options used to execute these fundamental tasks.
- **Formula Central Menus.** Includes detailed documentation of every field that displays in the Formula Central window. Includes details regarding each menu option and input/output field included in this program module.
- **Colorants and Databases.** Provides an overview of the features used for Ingredient Maintenance and Colorant Set Maintenance.
- **Ingredient Maintenance.** Provides detailed documentation of each menu option, and every input/output option included in this program module.
- **Set Maintenance.** Provides detailed documentation of each menu option, and every input/output option included in this program module.

- **Queue Maintenance.** Provides detailed documentation of each menu option used to create and edit queues. *See also Applications Technology, Advanced Queuing Options for a comprehensive discussion of the program modules that support the advanced queuing options.*
- **Schedule Maintenance.** Provides detailed documentation of the program option used to create and edit schedules used by queues. *See also Applications Technology, Advanced Queuing Options for a comprehensive discussion of the program modules that support the advanced queuing options.*
- **Queue Viewer.** Provides detailed documentation of the program options used to view queue results. *See also Applications Technology, Advanced Queuing Options for a comprehensive discussion of the program modules that support the advanced queuing options.*
- **Admin.** Provides documentation related to system defaults used across the suite of programs. This includes selecting and editing system defaults, and the creation of custom user profiles. It includes details regarding each menu option and input/output field included in this program module.
- **Navigator.** Provides an explanation of the structure of the data management functions available. Includes details regarding each menu option and input/output field included in this program module.
- **Data Import/Export Wizards.** Users of legacy Datacolor formulation and correction programs must convert existing data into a format recognized by Datacolor MATCH^{PIGMENT}. Wizards have been provided to perform the data conversions, and this section provides a brief explanation of these wizards.
- **Data Exchange.** Data Exchange is the program module used to transfer sample and formula data between Lab Paintmaker and Datacolor MATCH^{PIGMENT}. It is an essential program for laboratories using Datacolor MATCH^{PIGMENT} to provide data for use by Datacolor point-of-sale (POS) products.
- **Applications Technology.** Contains detailed discussions of the concept and operation of the various tools offered in Datacolor MATCH^{PIGMENT}, framed in the context of industrial color processing issues. Much of this information is considered “advanced topics”, and is intended to help you to maximize the performance of the system.
- **Glossary of Terms.** Terms commonly used in color science and industrial processing applications used extensively throughout this guide, are defined in this section.

Online Help

The contents of the Datacolor MATCH^{PIGMENT} user’s guide are also provided as online help. The online help is accessed from the help icon, and from the Help menu.

Required Data

New users must prepare physical samples of the colorants.

Data is provided with the program to allow you to practice running all of the program modules included in the package, while you are preparing your samples. This data includes:

- Sample data representing Targets and Trials
- Colorant sets that contain optical data describing the behavior of the raw materials
- Ingredient data that includes information about the physical properties of the raw materials.

Current Datacolor users can continue using existing data sets. However, they must be formatted for use with this program. *Contact your Applications Specialist for assistance in the data conversion.*

NOTE

The demonstration data is provided solely for the purpose of learning to run the program modules. This data has no relationship to the materials you use. To produce results that you can apply to your products and processes, you must use data generated from physical samples prepared using your equipment and raw materials.

Sample Colorant Sets

- **Transparent.** The settings in this colorant set activate matching and correction options typically used for transparent products. There is also a job template called, "Transparent" that loads the correct settings to run a transparent match in Formula Central
- **Translucent.** The settings in this colorant set activate matching and correction options typically used for translucent products. There is also a job template called, "Translucent" that loads the correct settings to run a translucent match in Formula Central.
- **Opaque.** The settings in this colorant set activate matching and correction options typically used for opaque products. There is also a job template called, "Opaque" that loads the correct settings to run a translucent match in Formula Central.

Sample Preparation Guides

Following the purchase of the system, you will receive literature including a guide for preparing samples to be brought to the User's Course. These instructions are specific to your industry. We have included an electronic version of these guides for your reference.

NOTE

To view the contents of each guide, you must have Adobe Acrobat Reader installed. The corresponding *.PDF files can be found on the program CD included with your system.

- Sample Preparation Guide for **Ink and Printing**.
- Sample Preparation Guide for **Paint and Coatings**.
- Sample Preparation Guide for **Plastics**.

Contact Us

An Applications Specialist is assigned to every new user. This individual possesses expertise in specific industry applications, and will provide training on the program modules and expertise used to troubleshoot your database, matching, and correction predictions.

If you have any questions or problems regarding product installation or licensing, please contact our service department by telephone or email:

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Getting Started

Overview

This section provides step-by-step instructions to perform the following operations:

- Opening Datacolor MATCH^{PIGMENT} program modules
- Instrument setup
- Instrument calibration
- Color difference evaluation
- Formulation
- Automatic Correction

Opening Program Modules

Datacolor MATCH^{PIGMENT} consists of the following program modules:

- Data Navigator
- Formula Central
- Set Maintenance
- Ingredient Maintenance
- System Administration
- Datacolor TOOLS. This is a companion product that offers options frequently used in color QC. *See also Datacolor TOOLS User's Guide for information on the operation of this program.*

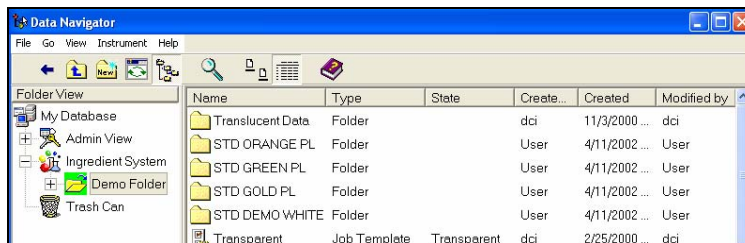
When you install the software, an icon displays on the Windows desktop. To launch the software:

1. On the Windows desktop, double-click the icon.

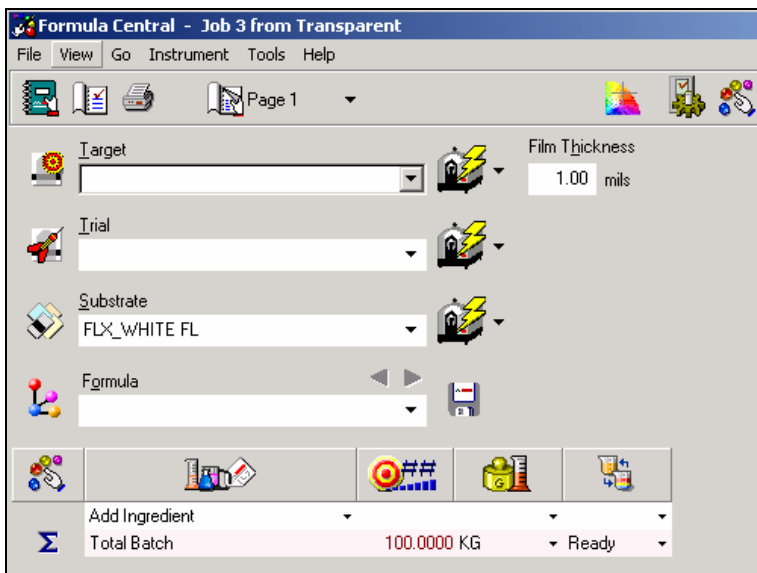


The Login dialog box displays.

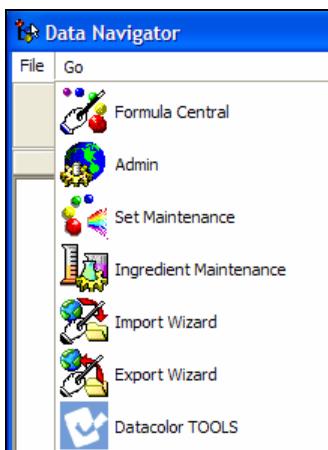
2. In the *User Name* field, enter your user name. The default is **USER**.
3. In the *Password* field, enter your password. The default is **CC3**.
4. Click the **Login** button. The program automatically loads two program modules: Navigator and Formula Central. During this process, the Navigator window is displayed:



A splash screen is displayed, followed by the Formula Central window:



The Navigator Go Menu provides access to remaining program modules including the Datacolor TOOLS program:



NOTES

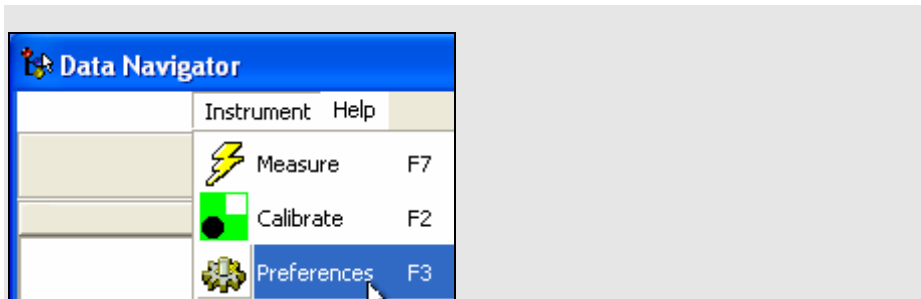
- The Navigator module is always open when the program is running. It provides access to the remaining program modules. You cannot "exit" the Navigator module; you can "exit and Log off", which closes all program modules. *See also Navigator, Menus, File Menu for details on these options.*
- The default configuration for the program is that the Formula Central window is displayed upon startup. However, this selection can be changed to another program option, through System Administration. *See System Administration, All Users, User Settings for instructions to change the user defaults.*

Instrument Setup and Calibration

When the program is installed, the instrument is configured for demonstration mode. You must edit the instrument setup to connect to the instrument you are using, and install the calibration data. After the program is properly configured, you must calibrate the instrument.

NOTE

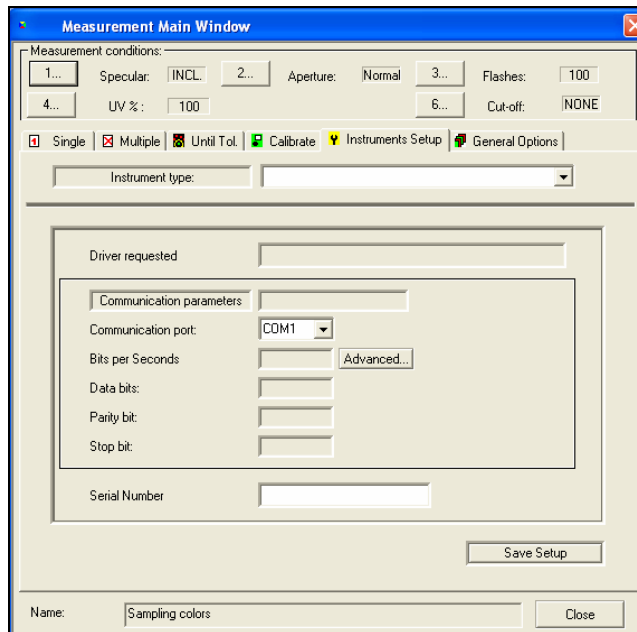
The options to configure and calibrate the instrument are located on the Instrument menu. The Instrument menu can be accessed from either the Navigator or Formula Central program modules:



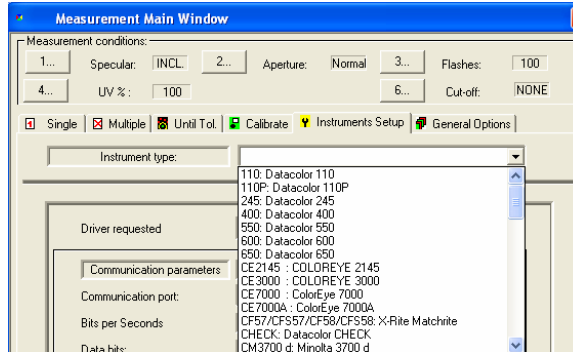
Instrument Setup

After the program is installed, you must configure the software to recognize the particular instrument you are using. Below are the instructions:

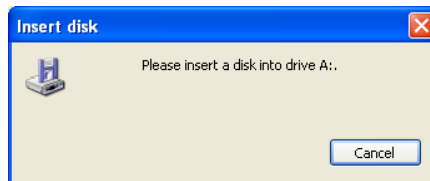
1. Select **Instrument Menu, Preferences**. The window below is displayed.



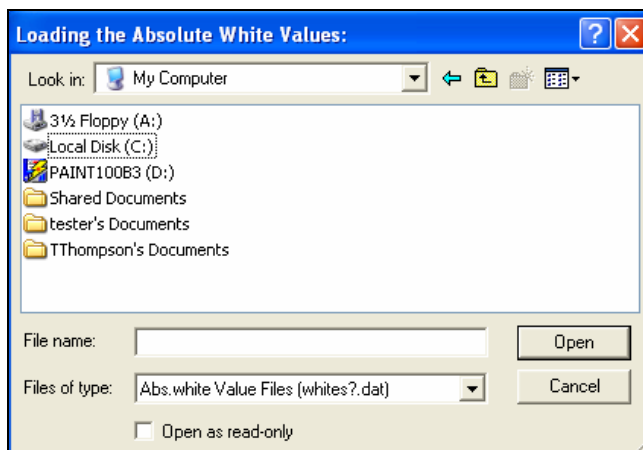
- **Instrument Type.** Click on the down arrow to view the instrument choices and click on the instrument you are using:



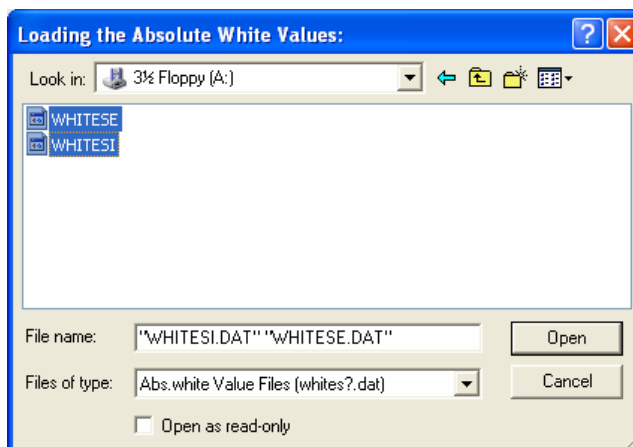
- **Communication Port.** Select the communication port for the instrument. The default is **Com 1**. The communication parameters should not be changed, unless there is a problem with the instrument communicating with the software. A change can be made with the assistance of Datacolor personnel.
 - **Bits per Second.** Select the correct baud rate for the instrument is displayed. The Bits per Seconds field should not be changed unless there is a problem with the instrument communicating with the software. A change can be made with the assistance of Datacolor personnel.
 - **Serial Number.** Enter the serial number of the instrument. (For Datacolor instruments, this is usually found on a label on the back of the unit.)
2. When you have made all of the necessary changes, click the **Save Setup** button to make the changes permanent. The program will prompt you for the calibration data.



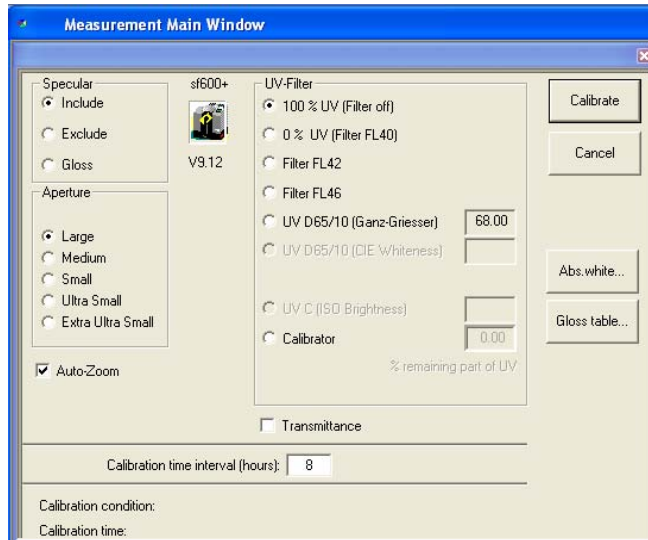
3. Place the calibration disk in the appropriate drive (diskette or CD drive). The program defaults to the diskette drive A. If it does not find this drive, it will prompt you for the disk location:



4. Browse to the correct drive, highlight it and click **Open**. Two files will be displayed:



5. Select both files and click **Open**. The calibration data will be copied to the system. When the data is copied, the window below will be displayed:



6. You can calibrate this instrument directly from this option, or you can calibrate at a later time.
 - Click **Calibrate** to calibrate the instrument. You will need the black trap, white tile and green tile from the instrument tile box to complete the calibration. *See also Instrument Calibration Tutorial for instructions to complete the calibration.*
 - Click **Cancel** to close this window.

Instrument Calibration

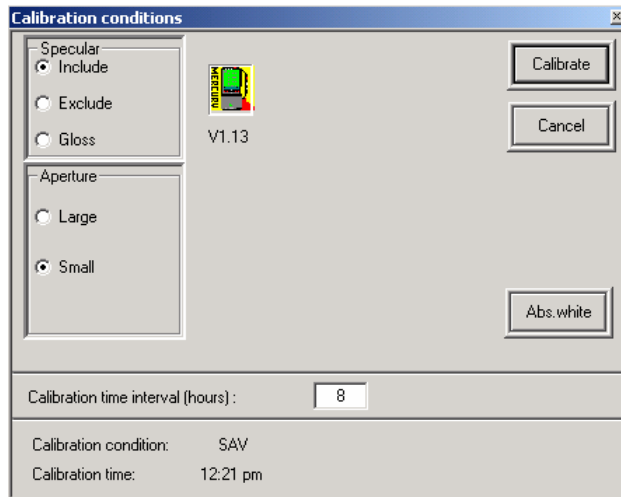
Instrument calibration is a function that you perform on a daily basis. This routine compensates for any changes to the instrument over time that can affect the accuracy of the measurement.

NOTE

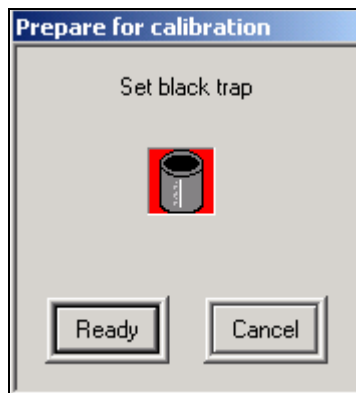
You must calibrate the instrument separately for each condition you use. This includes changes to aperture size, and reflectance/transmittance modes.

To start the calibration routine, do the following:

1. From the Formula Central menu bar, select **Instrument Menu, Calibrate**. The Calibration conditions dialog box displays.
2. Select the instrument calibration conditions, and click the **Calibrate** button.



The following dialog box displays:

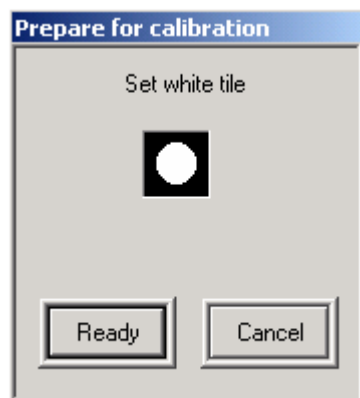


3. Place the black trap over the measurement port, and click the **Ready** button.

NOTE

If the instrument does not have a black standard or black trap, clear the instrument port and start the black trap measurement.

4. When the measurement of the black trap is completed, the following dialog box displays:

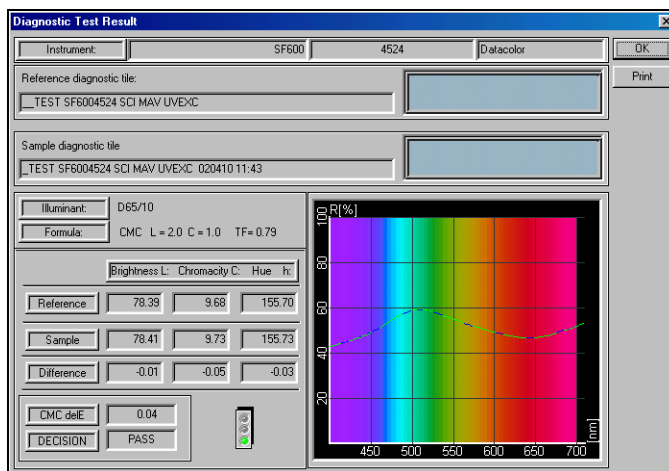


Place the white calibration tile over the measurement port, and click the **Ready** button.

5. When the second measurement is completed, you are prompted you for a green tile measurement:



- A green tile is included in the tile box. Place the green tile at the instrument and click on **Ready**. When the green tile measurement is completed, a window containing the test results displays:



- If the Decision is Pass, click **OK** to close the Diagnostic Test Result window.

Tutorials

Overview

This section provides step-by-step instructions for running basic program options including:

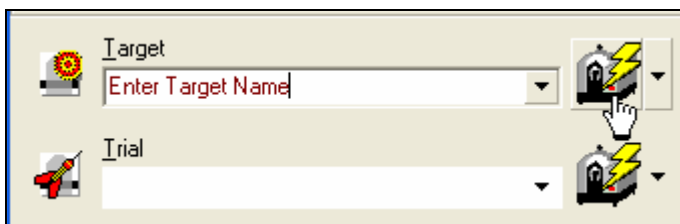
- Color Difference Evaluation
- Formulation
- Correction

Sample Measurement

Depending on the program option you want to run, you must begin by measuring a Target and/or Trial sample. To perform these measurements, do the following:

- Open Formula Central and calibrate the instrument.
- Enter a name in the *Target* field.
- Place the target sample at the instrument port.

4. Click on the **Target Measurement** icon on the Formula Central screen.



The instrument will flash.

NOTE

If you are running a color difference evaluation or a correction, you must also measure a trial. The procedure above is repeated, but for the trial measurement you use the *Trial* sample field, and click on the **Trial Measurement** icon.



See also *Formula Central, Sample Measurement* in this guide for a complete discussion of all measurement methods available in Datacolor MATCH^{PIGMENT}.

Color Difference Tutorial

Color coordinates and color differences are displayed in the Formula Central Evaluation Window for the active target, trial and formula prediction.

1. Measure a target **and** trial sample.
2. To display the evaluation window, go to the Formula Central toolbar, and click the **Evaluation Window** icon.

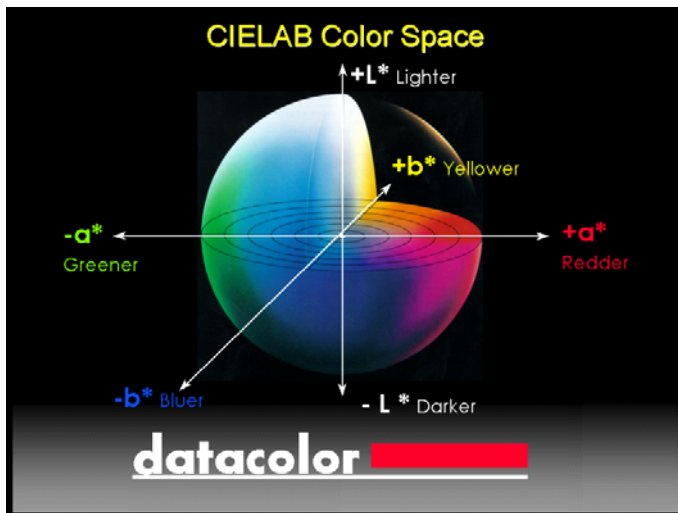


CIELAB		L*	a*	b*	C*	h	CF
Target		55.25	-6.94	-14.16	15.77	243.89	
Trial As Is		55.28	-6.99	-14.64	16.23	244.47	0.06
Substrate		94.90	-0.47	5.50	5.52	94.87	
	DE*	DL*	Da*	Db*	DC*	DH*	MI
D65/10	0.48	0.03	-0.05	-0.48	0.46	0.16	1.92
A/10	0.96	-0.02	0.43	-0.86	0.49	0.83	
F11/10	2.06	-0.70	1.33	-1.40	0.71	1.80	

Below is an explanation of the color difference output in this example. The color difference equation used in this example is CIELAB.

CIELAB Color Space

Below is an illustration of the CIELAB color space model:



The CIELAB color difference equation calculates coordinates to locate the samples in this color space model. The coordinates are for the L*, a* and b* axes. Color differences are calculated from these coordinates, and represent the distance between the target and trial along each axis.

CIELAB Color Difference Output

Column Label	Translation of Number	Words Often Used to Describe the Difference
DE*	Overall distance between the samples. This is always a positive number	Delta E Total distance between samples regardless of the direction.
DL*	Difference in Lightness (+L) = Trial is lighter than Target (-L) = Trial is darker than Target	Lightness, lighter, darker
Da*	Red-Green Difference (+a) = Trial is redder than Target (-a) = Trial is greener than Target	Red-Green axis, redder, or less green, greener, or less red
Db*	Yellow-Blue difference (+b) = Trial is yellower than Target (-b) = Trial is bluer than Target	Yellow-Blue axis, more yellow/less blue, bluer/less yellow
DC*	Difference in Chroma (+C) = Trial is more chromatic than Target (-C) = Trial is less chromatic than Target	Chroma, brighter, cleaner, more intense, duller, dirtier, less intense
DH*	Difference in Hue Locates the trial with respect to the target on a hue circle.  NOTE: In the color space model shown above, the hue circle corresponds to the outside circumference of the solid. +H: Trial is moving in a counter-clockwise direction from the Target. -H: Trial is moving in a clockwise direction from the Target.	Hue The trial may be redder, greener, yellower or bluer than the target. To interpret hue differences, you must know where the target lies in color space. Regardless of the direction, the overall size of the hue difference indicates the quality of the match. As hue differences increase, the color difference becomes less acceptable.

Interpreting the Color Difference Evaluation

Using this table, you can interpret the numerical differences reported in the window:

CIELAB		L*	a*	b*	C*	h	CF
Target		55.25	-6.94	-14.16	15.77	243.89	
Trial As Is		55.28	-6.99	-14.64	16.23	244.47	0.06
Substrate		94.90	-0.47	5.50	5.52	94.87	
Trial As Is	DE*	DL*	Da*	Db*	DC*	DH*	MI
D65/10	0.48	0.03	-0.05	-0.48	0.46	0.16	1.92
A/10	0.96	-0.02	0.43	-0.86	0.49	0.83	
F11/10	2.06	-0.70	1.33	-1.40	0.71	1.80	

- Trial is 0.03 units *lighter* than Target.
- Trial is 0.05 units *greener* than Target.
- Trial is 0.48 units *bluer* than Target.
- Trial has 0.46 units *more chroma* than Target.
- Trial has a *hue difference* of 0.16 units from Target. In this example, the Trial is .16 units bluer than the Target.
- The *overall color difference* is 0.48.

There are two additional pieces of information to note on the Formula Central window:

- **Color Difference Equation.** The differences in this example are based on CIEL*a*b* calculations. When you change the color difference equation, the color difference values will change. To change the color difference equation, do the following:
 1. In the *Equation* field, click the drop-down list arrow.

CIELAB
CIELAB
CIE L*a*b*
CIE L* C* h
CMC(l:c)
CIELAB 94
HunterLab
FMCII

- Click on a different equation. In the example below, CIELAB 94 is selected:

CIELAB 94		L*	C*	h	CF
Target		55.25	15.77	243.89	
Trial As Is		55.28	16.23	244.47	0.06
Substrate		94.90	5.52	94.07	
Trial As Is	DE*94	DL*/SL	DC*/SC	DH*/SH	MI
D65/10	0.30	0.03	0.27	0.13	1.92
A/10	0.68	-0.02	0.26	0.63	
F11/10	1.62	-0.70	0.39	1.41	

Notice that the DE value is markedly different from the CIELAB example.

- Illuminant/Observer Selections.** The Illuminant/Observer combinations are identified in the window. The Illuminant/Observer selections for this color difference evaluation are:
 - D65/10
 - A/10
 - F11/10

When you change the Illuminant/Observer combination, the color difference values may change significantly.

Formulation Tutorial

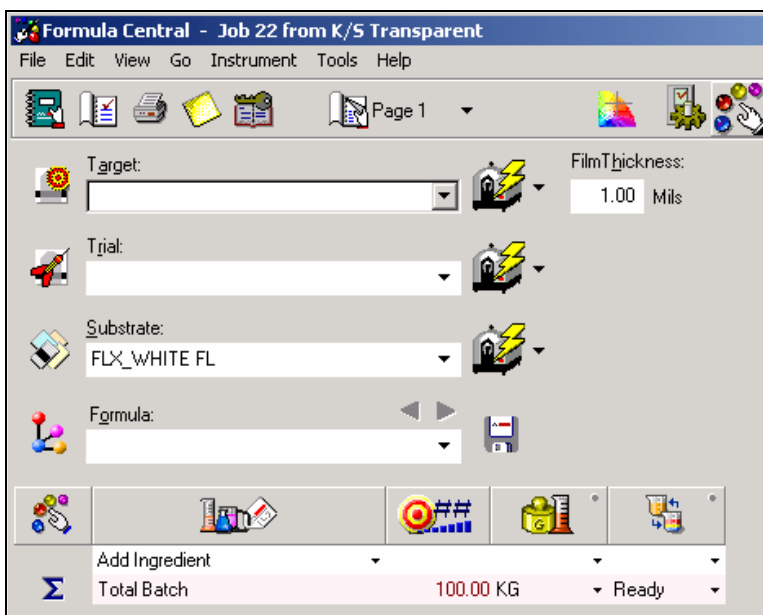
Formulation work is done in the Formula Central program module.



What is the minimum input required to run a match?

You must provide the target sample, and select the ingredients to be used.

Below is the Formula Central window:



1. **Name the Target Sample.** To specify the name for this sample, click in the *Target* field, and enter the **target name**.



2. **Measure the Target Sample.** To start the measurement, place the target at the instrument port, and click the **target measurement icon**.



NOTE FOR PORTABLE INSTRUMENT USERS

If using a handheld instrument, position the sample so that it completely covers the opening on the probe or port.

- From the Formula Central toolbar, click the **AutoFormulate** button.



The program will begin calculating formulas. When finished, the best match is displayed in the Formula Grid at the bottom of the page.

	2	Flex Red	7.5246 KG	▼ Ready ▼	
	3	Flex Green	17.5545 KG	▼ Ready ▼	
	4	Flex Blue	9.0887 KG	▼ Ready ▼	
	7	Flex Clear	65.8321 KG	▼ Ready ▼	
Σ		Total Batch	100.0000 KG	▼ Ready ▼	

This is an example of the Auto Formulate option. There are 3 additional formulation tools.

- To run Search, click the **Search** button.



- To run Search & Correct, click the **Search & Correct** button.



- To run a combinatorial match, click the **Combinatorial Match** button.



See also *Formula Central, Matching and Correcting Colors* for a complete discussion of all formulation options.

- The program automatically stores all of the formulas found as matches as part of the job. Make a note of the job name displayed in the top left border of the Formula Central window.



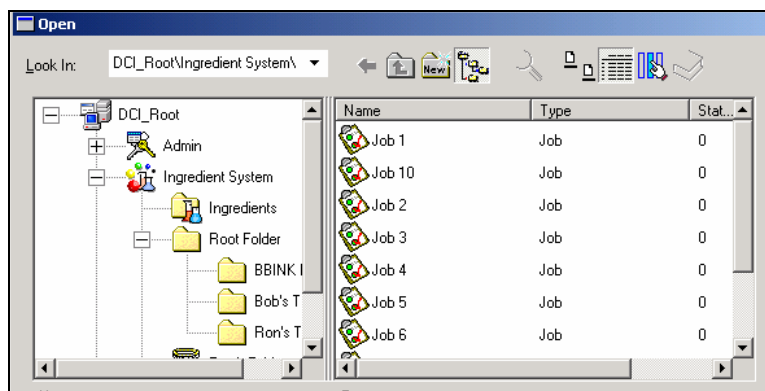
To run a correction, you must recall this job by its name.

Automatic Correction Tutorial

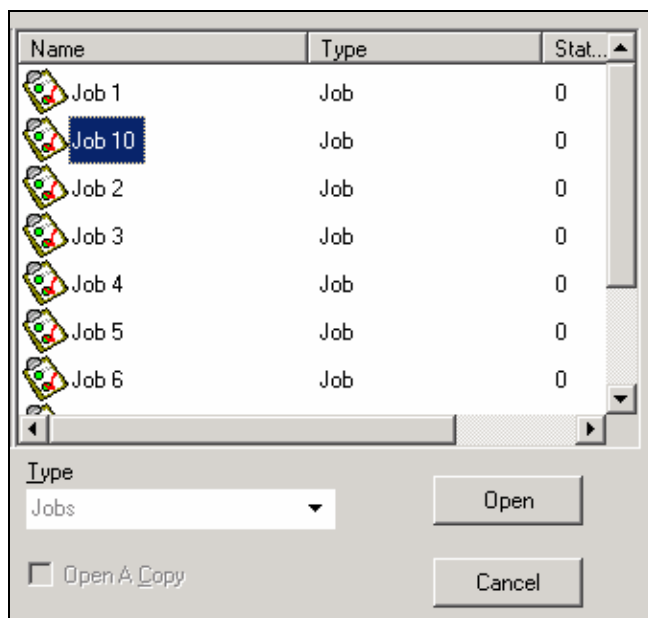
1. Recall the job containing the target and formula you are using, by moving to the toolbar, and clicking the **Open** icon.



The Open dialog box displays.



2. Locate the job to be recalled, click to highlight it, and click the **Open** button.



The Formula Central window refreshes and the information for the selected job is displayed.

The screenshot shows the Formula Central window with the following settings:

- Target:** Blue Panel #24
- Film Thickness:** 1.00 mils
- Trial:** (Empty field)
- Substrate:** FLX_WHITE FL
- Formula:** Prediction 1

Below the settings is a table with icons for each row:

	2	Flex Red	7.5246 KG	Ready
	3	Flex Green	17.5545 KG	Ready
	4	Flex Blue	9.0887 KG	Ready
	7	Flex Clear	65.8321 KG	Ready
		Total Batch	100.0000 KG	Ready

3. **Name the trial sample.** To specify the name for this sample, click in the *Trial* field, and enter the **trial name**.

The close-up shows the **Trial:** label and a text input field with the placeholder text "enter Trial name here".

4. **Measure trial sample.** Place the trial at the instrument port. To start the measurement, click the **Target Measurement** icon.



NOTE FOR PORTABLE INSTRUMENT USERS

If using a handheld instrument, position the sample so that it completely covers the opening on the probe or port.

The ingredient amounts stored for the initial formula are displayed in the **Trial Formula Amounts** column.



					
Flex Red	7.5246				KG
Flex Green	17.5545				KG
Flex Blue	9.0887				KG
Flex Clear	65.8321				KG
Add Ingredient					
Total Batch	100.0000	100.0000			KG

5. **Run a correction.** Move to the toolbar, and click the **Reformulate** icon.



The correction displays in the Formula Grid:

					
2 Flex Red	7.5246	7.7084	0.1838	KG	Ready
3 Flex Green	17.5545	18.0226	0.4681	KG	Ready
4 Flex Blue	9.0887	8.7528	-0.3359	KG	Ready
7 Flex Clear	65.8321	65.5162	-0.3159	KG	Ready
Total Batch	100.0000	100.0000	0.0000	KG	Ready

6. Interpret the formula results using the following legend:

-  **Trial Formula Amounts.** Contains the formula for the current trial.
-  **Output Amounts.** Contains the new correction. Because *Reformulate* was selected, the batch size is equal to the batch size for the current trial.
-  **Add/Change Amounts.** For each ingredient, this column contains the differences between the amount used in the original formula and the amount used in the correction.

Overriding Correction Defaults

The procedure above uses all of the default settings for formulation. These defaults include:

- Batch Size
- Ingredient Selection
- Reformulate. You may want to use a different correction tool.

Changing Batch Size. You can instruct the program to calculate a correction for a different batch size. Below is a correction calculated for the original batch size of 100.00 units.

						
	2	Flex Red	7.5246	7.7084	0.1838	KG
	3	Flex Green	17.5545	18.0226	0.4681	KG
	4	Flex Blue	9.0887	8.7528	-0.3359	KG
	7	Flex Clear	65.8321	65.5162	-0.3159	KG
		Total Batch	100.0000	100.0000	0.0000	KG

To change the batch size:

1. **Before** running the correction, enter the new batch size In the *Output Formula Amounts* column.



						
		Flex Red	7.5246			KG
		Flex Green	17.5545			KG
		Flex Blue	9.0887			KG
		Flex Clear	65.8321			KG
		Add Ingredient				KG
		Total Batch	100.0000	125.0000		KG

2. Run the correction.

						
	2	Flex Red	7.5246	9.6354	2.1108	KG
	3	Flex Green	17.5545	22.5281	4.9736	KG
	4	Flex Blue	9.0887	10.9410	1.8523	KG
	7	Flex Clear	65.8321	81.8955	16.0633	KG
		Total Batch	100.0000	125.0000	25.0000	KG

Changing Ingredient Selection. In some cases, you may need to use an ingredient in the correction that was not included in the original formula.

1. Move to the *Add Ingredient* row in the formula grid, and click the drop-down arrow to view a list of all available ingredients:

Add Ingredient		▼
1	Flex Yellow	▲
5	Flex Red	
4	Flex Green	
2	Flex Blue	▼

2. Highlight the ingredient to be added. The grid refreshes, and the new ingredient is shown. In this example, *Flex Yellow* has been added:

	Flex Yellow	0.0000			KG	Ready
	Flex Red	7.7084			KG	Ready
	Flex Green	18.0226			KG	Ready
	Flex Blue	8.7528			KG	Ready
	Flex Clear	65.5162			KG	Ready
	Add Ingredient					
	Total Batch	100.0000	100.0000		KG	Ready

3. Repeat the above process for additional ingredients.
4. Run the correction.

	1 Flex Yellow	0.0000	0.0000	0.0000	KG	▼
	2 Flex Red	7.7083	7.8942	0.1859	KG	▼
	3 Flex Green	18.0225	18.4975	0.4750	KG	▼
	4 Flex Blue	8.7528	8.4273	-0.3255	KG	▼
	7 Flex Clear	65.5164	65.1810	-0.3354	KG	▼
	Total Batch	100.0000	100.0000	0.0000	KG	▼

Changing Correction Tools

Automatic correction options include "reformulate" or "add to". The procedure above uses the **Reformulate** tool. To use a different correction tool, simply click on the icon:

- 
Reformulate. This option produces a new formula that is the same size as the original formula.
- 
Add To. Instead of reformulate, you can use the 'Add To' tool. The option adds material to the existing batch, and produces the smallest possible add to the original formula prediction.

Program Features

Wizards

Several instruction wizards are available throughout the suite of programs to lead you through the process of entering data.

- The **Measurement Wizard** guides you step-by-step through the process of gathering measurement data for a sample.
- In Set Maintenance, the **Colorant Set Wizard** and **New Colorant Wizard** are provided to help simplify the process of creating colorant sets, and entering information for individual colorants, resins, and substrates.
- In Set Maintenance there is also a **New Mixtures Wizard** to guide you through the process of adding additional samples to an existing colorant record.
- Finally, there is an Import **Export Wizard** to step you through the process of importing data into and out of your current database. This wizard is used to convert data from Datacolor legacy programs for use with Datacolor MATCH^{PIGMENT}, and to allow different locations to share sample, formula and ingredient information used in the program.

Grids

Formula Grid

Grids are used to display information throughout the program. The most recognizable grid is the Formula Grid, displayed in the lower section of the Formula Central screen.

	Flex Red	▼	5.19		KG	▼ Ready	▼
	Flex Green	▼	27.51		KG	▼ Ready	▼
	Flex Violet	▼	8.43		KG	▼ Ready	▼
	Flex Clear	▼	58.87		KG	▼ Ready	▼
	Add Ingredient	▼				▼	▼
Σ	Total Batch		100.00		KG	▼ Ready	▼

This grid is flexible, allowing you to make changes quickly without leaving the screen. These changes include:

- Changing the ingredients used in the formula.
- Changing the batch size.
- Rescaling the formula.
- Displaying/Hiding information fields.

Additional Grids in MATCH^{PIGMENT}

Similar grids are displayed in Colorant Set Maintenance and Ingredient Maintenance.

Colorant Set Maintenance

	Flex Yellow	1	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	
	Flex Red	2	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	
	Flex Green	3	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	

Ingredient Maintenance

Components				Lot History			
▶ Flex Black Dry	20.00 KG	▼	20.0000	20.0795	1.0000	KG/L	1.0000
Resin B	40.00 KG	▼	40.0000	39.7614	1.0100	KG/L	8.3980
Solvent B	40.00 KG	▼	40.0000	40.1590	1.0000	KG/L	1.0000
* Totals	100.0000	KG	▼	100%	100%	1.0040	KG/L 392.59

For details on using grids, refer to documentation for the appropriate program module.

Jobs and Templates

What is a Job?

Jobs contain all of the data and instructions the program needs to complete the task. This includes specific information regarding software options to be activated, match parameters, formula grid and screen configuration. It also collects all job data, including spectral data for the samples, and all match and correction predictions that were generated for the job.

What are Job Preferences?

When the program approaches a formulation or correction problem, it needs to know how you define a 'match.' This includes knowing the objective or goal of the work, specific tolerances for the color, appearance and physical properties of the formula, rules for sorting and displaying the formulas, etc. The program refers to these selections as *Job Preferences*, and references a *Job Template* for these selections.

When are the Job Preferences created?

They are initially created from the job template. However, you can change, add, and/or remove the selections for any job or job template that you use.

How do you change the Job Preferences?

Access is available through the *Tools Menu*, *Job Preferences* option. When you access Job Preferences, a window will open containing 5 Tabs. *See also Tools Menu, Job Preferences for details on editing the job preferences.*

What is a Job Template?

A job template is a software module that is used to create a job, and contains the structure and setup data for the job. It is similar to an MS Word template, and serves the same purpose. A job template supplies all of the default job preferences and data required to create a new job.

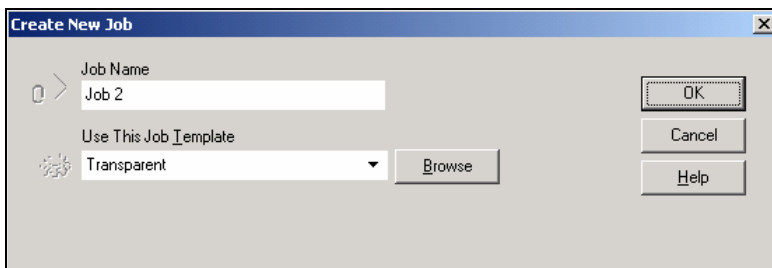
Specifically, the job template includes default settings for:

- Colorant set
- Ingredient selection
- Limits on number of ingredients to be used
- Illuminant/Observer selections
- Formula sort requirements
- Color space and acceptability tolerances
- Formula constraints
- Industry specific settings
- Advanced match parameters

Multiple job templates can be created and customized to a variety of situations such as:

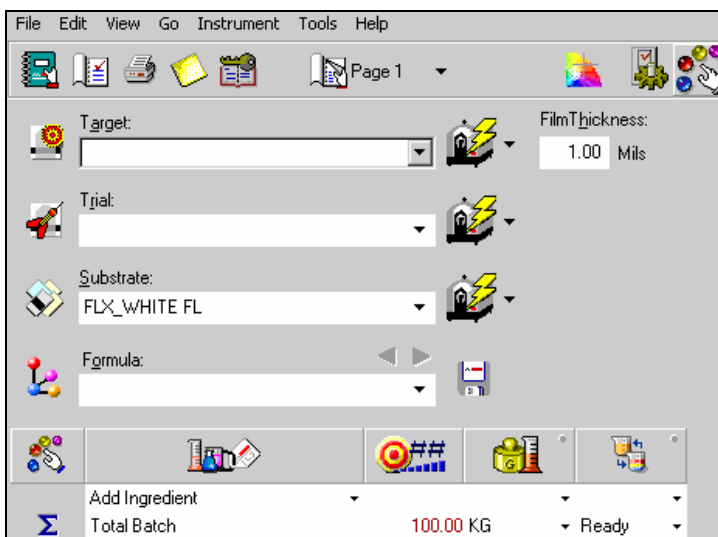
- The requirements of a particular customer
- The requirements of a particular user
- The requirements of a particular product

Any job template you create can be recalled, and its settings used to create a new job



Jobs in Formula Central

Whenever you start Formula Central, a new job is automatically created and assigned a name. Each user has a default job template that is used automatically to create new jobs. *See also System Admin, All Users to view or edit the user default settings.*



You can start a new job by doing one of the following:

- Changing the target (retains the current job settings).
- Selecting **File, New, Job** from the menu bar.
- Click the **New Job icon** on the toolbar.



Rather than using the default job name, you can assign a custom name to the job by storing the active job under a different name (File, Save As, Job). You can also assign a unique job name when you create the job using the New Job function.

Can I make changes to a job?

Yes, you have the ability to change the job settings at any time. For example, if the color difference calculation you most frequently use is not the default color equation for the template, you can change this selection at run time directly from Formula Central.

NOTES AND TIPS ABOUT JOBS

- Changing the target sample, forces the creation of a new job. The target can be changed before a match is run (i.e., when grid state is *Formulation Input*).
- When the grid state is *Correction Input*, the trial can be changed.
- If the trial is changed when the grid state is *Correction Output*, changing the trial creates a new page.
- See also *Formula Central*, *Formula Grid*, *Job States* for a detailed discussion of job states.

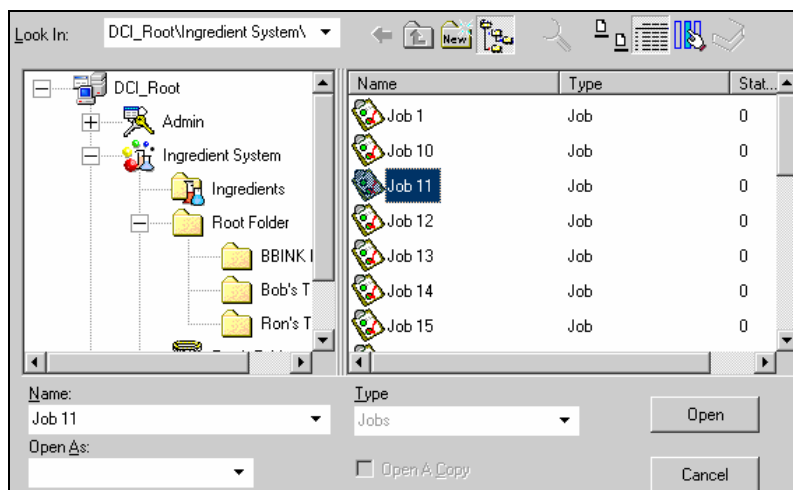
Reviewing Job Information

Jobs that have not been deleted can be reviewed at any time. To access a job for review:

1. Open the job. If the job is not currently displayed, do one of the following:
 - Move to the menu bar, and select **File, Open, Job**.
 - Move to the toolbar, and click the **Open Job icon**.



The Navigator window displays.



2. Select the job to be opened. The Formula Central window refreshes and the last page of the job displays.
3. Use the **Job Page icon** on the toolbar to scroll through the individual pages in the job.



Storing Jobs

You never have to perform a Save function to record the job information. The program does this automatically throughout the process. The information saved includes:

- Sample and substrate names
- Spectral data for the samples and substrate (if used)
- Ingredients used
- Screen and formula grid configuration
- All match and correction predictions

If you have run multiple corrections for a single job, every input and output sequence you have run will be saved with the job. This information is stored in the job page(s).

Job Templates

The selections in the default job template are those most commonly used. While the settings may fundamentally satisfy your requirements, you will probably want to customize some of the job settings.

Can I make changes to a job template?

Yes, you have the ability to change the information in the job template. For example, if the color difference calculation you most frequently use is not the default color equation for the template, you can change this selection at run time directly from Formula Central.

Are the changes temporary or permanent?

Changes made to job settings are applied only to the active job. When the same job template is used for a new job, the original job settings will be restored. If you want the changes to be applied to all future jobs created using the same job template, you must select *File, Save As, Job Template* to save the changes for use with future jobs.

Can I have more than one template?

Yes. If you find that at run time you are always changing the same fields, you can eliminate this annoyance by creating another template. For example, if you frequently use either CIEL*a*b* or CMC as the color difference equation, you can create a second template. One template will have CIEL*a*b* selected, and the other will have CMC selected as the color difference equation. The program does not limit the number of templates you create. You may want to create templates that are customized to the specific needs of a customer, a user, a piece of equipment, a product line, etc.

Storing Job Templates

You can store a job as a template any time. The job settings you want to store permanently must be selected for the active job. Two methods are available to store job templates.

Job Preferences Option. When you access the job preferences options, you save the changes you have made as a new template. There is an option at the bottom of the Job Preferences window that provides this capability:

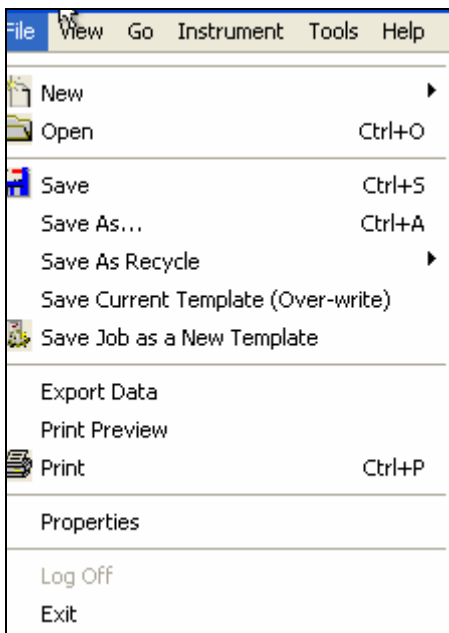


- Enter a name for the template in the Job Template field, and click **OK**. The current selections will be stored as a job template.

NOTE

If target or trial data are currently entered for the job, that data will be included in the job template. You should store a job template *after* you have customized the program selections, and *before* any job-specific data, such as target data, had been entered into the job.

File Menu. The File Menu in Formula Central includes two options to store job templates:



- **Save Current Template.** This option saves the current selections for future use. It overwrites the current job template. The name will remain the same, but the selections will be updated to reflect any changes you have made. *This option is only available when the formula grid is in an "input" state.*
- **Save Job as a New Template.** This option saves all of the current selections as a new job template. You will assign a new name to this template.

Editing Job Templates

In addition to the target and trial data, match parameters, and formula grid settings, the job template stores defaults for ingredient selection. All of these settings can be accessed from the Tools Menu options, and from buttons on the toolbar. *See also Tools Menu, Job Preferences for details on the settings that are stored with the job template.*

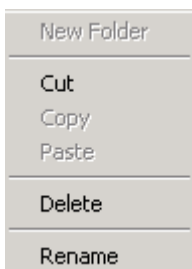
Deleting Job Templates

Job templates are deleted through the Navigator module.

1. Maximize the Navigator window.

Folder View	Name	Type	Created by
My Database	Job 6	Job	User
Ingredient System	Opaque	Job Template	dci
Demo Folder	Translucent - CR Mat...	Job Template	dci
	Translucent - Fixed %...	Job Template	User
	Transparent	Job Template	dci
	150	Sample	User

2. Click to highlight the job template to be deleted. When it is highlighted, right-click the mouse. A menu displays:



3. Click **Delete**.

WARNING!

The program does not display a confirmation message before deleting the job template. When you select delete, the job template is immediately deleted.

Keywords

A keyword is a term that describes additional properties of an ingredient that are not found in the ingredient record. There are two types of keywords: true/false, and numeric. True/false keywords are descriptive terms such as "lead-free." Numeric keywords expand the keyword information through the use of a number. For example, complex processing properties such as heat resistance, light fastness, etc. are usually defined with number that identifies a limit, such as a temperature limit.

Keywords are created and assigned to ingredients in Ingredient Maintenance. Once keywords are created, you can create a keyword query in Formula Central. The query is used to retrieve formulas from the database. When you create a keyword query, you are asking the program to retrieve formulas containing ingredients that have a specific keyword (for example "lead-free").

Keyword queries are created in Formula Central, during Ingredient Selection (Tools Menu, Browse Ingredients, Ingredient Keywords) or click the **Browse Ingredients** button on the toolbar.



See also...

- ***Ingredient Maintenance, Keywords*** for information on creating and assigning keywords to ingredients.
- ***Formula Central Menu, Tools Menu, Select Ingredients*** for instructions to create a keyword query.

Advanced Queuing Options

A basic queuing feature exists in Formula Central that allows you to store jobs for matching at a future time. This allows you to perform color matching tasks at your convenience. In addition to this basic queuing feature, Datacolor MATCH^{PIGMENT} includes a suite of program modules dedicated to running queues. These Advanced Queuing options were developed for users required to produce a high volume of color matches. This program suite includes three program modules designed to facilitate matching speed and accuracy in high-volume color matching applications, such as color card manufacturers, trade sales paint manufacturers, etc. They include:

- **Queue Maintenance.** Used to create and run the queue. *See also Queue Maintenance for details regarding the operation of this module.*
- **Schedule Maintenance.** This tool enables you to run the jobs in a queue through multiple job templates. This is a powerful tool to help you optimize the formula results for colorimetric and non-colorimetric properties. It can be thought of as a super-queue option. *See also Schedule Maintenance for details regarding the operation of this module.*
- **Queue Viewer.** Used to organize and view the queue results. Includes options for filtering and sorting queue results, marking formula candidates for further evaluation, and accepting a final formula. *See also Queue Viewer for details regarding the operation of this module.*

Using these program modules you can build multiple queues, each of which can work with multiple job templates, run the queues and review the results at your convenience.

See also Applications Technology, Advanced Queuing Options for comprehensive discussion of this suite of program modules.

NOTES

Formula Central

Overview

Formula Central combines the functionality of a formulation, correction, and formula retrieval program into one program. All of the routine color matching activities—instrument calibration, sample measurement, matching and correction, sample and formula evaluation, re-scaling formulas and formula storage—are done from the Formula Central screen. The features include:

- Measuring samples
- Ingredient selection
- Formula generation
- Lab/production corrections
- Formula scaling
- Ingredient substitution

In contrast to previous color matching software, Formula Central does not force you to follow a specific order of events to complete your task. Instead you start by placing your samples into Formula Central, and then use the available program tools (color evaluation, ingredient selection, formulation, correction) to work with the samples. Program options are activated based on the input the program receives from the user. For example, when you measure a batch, the batch correction features will become available for use. If a batch is not provided, the correction features are not activated.

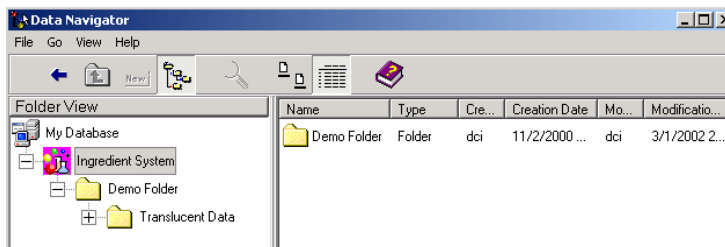
Formula Central records all of the work you do for a particular color, or 'job' in a job file. This includes the standard and batch measurements, original ingredient selection, all match and correction predictions, etc. If you have a question about any aspect of the job, you can recall the job and review the entire procedure.

? How Do You Get to Formula Central?

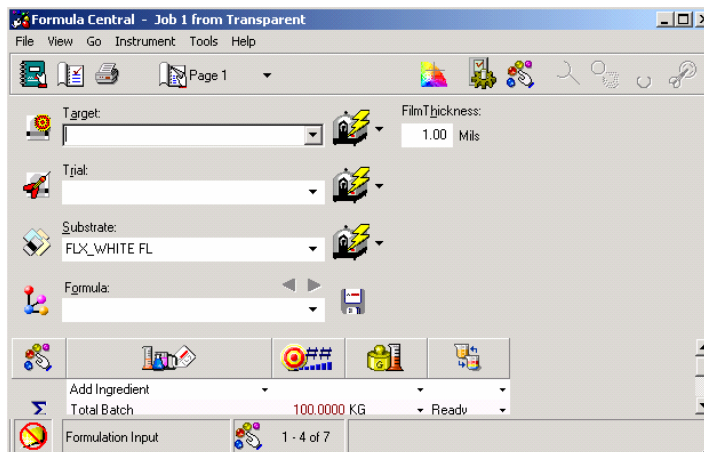
- On the Windows desktop, double-click the icon.



The Navigator window displays...



...followed by the Formula Central window.



For details about the fields in this window, see the Formula Central Tutorial.

Sample Measurement

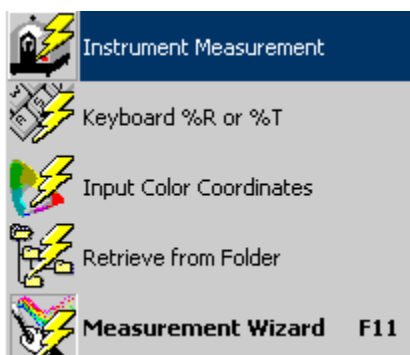
The program requests that a default measurement method be assigned independently to the target, trial and substrate. This allows you to set one default measurement type for the target, and a different one for the trial and the substrate.

Next to the sample name is an icon that indicates the default measurement method for the sample:



There are several measurement methods available, and the method you use most frequently should be set as the default measurement method. *See also Measurement Method Option.*

1. Click on the drop-down arrow shown next to the Measurement Method icon to view the choices.



2. To change the default measurement method, click on one of the methods shown in the list. The icon changes to match the method selected.



NOTES AND TIPS ABOUT DEFAULT SAMPLE MEASUREMENT

- The choices available for measurement methods are the same for both target and trial measurements.
- When measuring a substrate, some of the measurement methods (i.e., input colorimetric data, etc.) are not available.

Measurement Method Options

There are several sample measurement method options offered:



Instrument Measurement



Keyboard



Keyboard Color Coordinates



Retrieve from Folder



Measurement Wizard. When this option is selected as the default measurement method, a wizard opens to guide you through the measurement process.

NOTE

The instructions provided in this section are based on the use of the Measurement Wizard. If you have selected one of the measurement methods as your default, the procedure is similar to the wizard procedure.

Instrument Measurement Procedure

The instrument should be calibrated properly before sample measurements are made. See Tutorials, Instrument Calibration for instructions.



When this icon is displayed for the measurement method, the sample is measured using the instrument. You must enter the sample name before making the measurement. The sample must be securely positioned at the port BEFORE the measurement is initiated.

1. Enter the sample name in Formula Central.
2. Position the sample at the instrument port. Click the **Measure** button in the window.



3. When the measurement is completed, click the **Finish** button at the bottom of the window.

Keyboard Spectral Values Procedure



When this icon is displayed for the measurement method, spectral data for the sample are entered from the keyboard. Depending on the application, you will enter reflectance data (%R) or transmittance data (%T). The program can work with a data interval as small as 1nm. Below are a summary of the data intervals typically provided by Datacolor instruments:

360 – 700 nm	10nm	35 data points
360 – 700 nm	20nm	18 data points
400 – 700 nm	10nm	31 data points
400 – 700 nm	20nm	16 data points.

1. Enter the sample name in Formula Central, and click on the **Keyboard** icon.
2. The following window displays:

Enter spectrum from keyboard

Sample Name: keyboard spectral data Single Measurement >>

Icons: Spectrophotometer, Keyboard, Multi-colored bar, Keyboard with lightning bolt

Enter Spectral Data for Sample

	λ	%R
Start 1	400	25.0
Next: 2		

End λ Checksum 25 Add Sample

Back Finish Cancel

3. Under the λ column, input the first wavelength to be input, and press **Enter** to advance to the next field. In the example above, the starting wavelength is 400nm.
4. In the *End* field at the bottom of the window, enter the number of spectral points to be input. Typically this is either “16” or “31”.
5. In the λ field at the bottom of the window, enter the last wavelength to be input. Typically this is “700”. Press **Enter**.
6. Under the **%R** column, all of the wavelengths to be entered display.
7. Enter the spectral value in the **%R** column for each wavelength. When the last wavelength value is entered, the **Add Sample** button will become active.
8. Click **Add Sample**.
9. Click **Finish**. The *Enter Spectrum from Keyboard* window will close

Input Colorimetric Coordinates



When this icon displays for the measurement method, colorimetric coordinates for the sample, such as XYZ, Lab, etc. are entered from the keyboard. Formula Central can run a match or correction from this data.

If you are working with a substrate, the substrate data provided must be spectral data. You must enter the sample name before selecting this measurement method.

1. Enter the sample name in Formula Central, and click on the Measurement Wizard. Click on the *Input Color Coordinates* tab. The screen below displays:

Enter Coordinates for Sample on the primary Substrate

Color Coordinates
CIE L*a*b*

Illuminant/Observer
D65/10

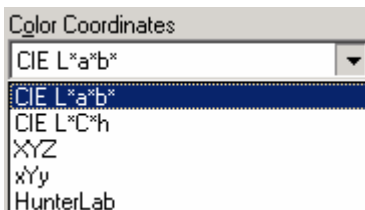
L* = 0.00

a* = 0.00

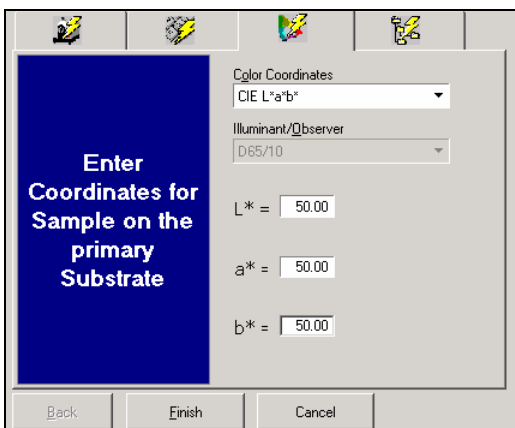
b* = 0.00

Back Finish Cancel

2. Select **Color Coordinates**. Click on the down arrow to view/change the color coordinates choices. Select the coordinates to be used.



3. The screen will refresh and the appropriate color coordinate fields display:



4. Enter the coordinates, and click **Finish**.

Retrieve Measurement from Folder



The option retrieves data for a sample previously stored in a folder.

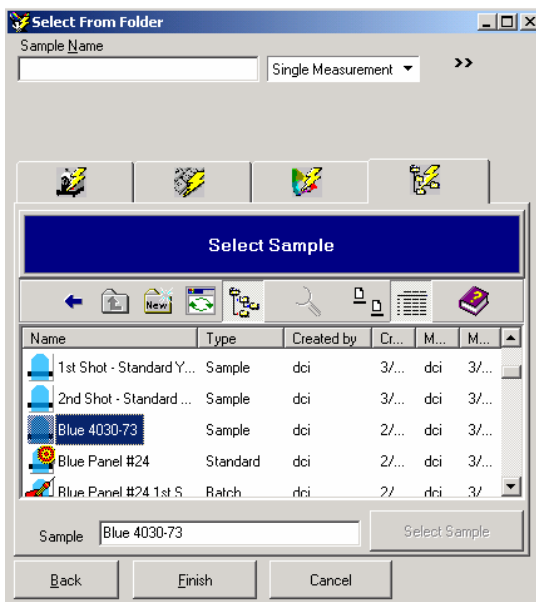
NOTES and TIPS about Retrieving Samples from Folders

- When this measurement method is selected, the program will open either the "user's home folder" (*System Admin, User Profiles, Details*) or the folder most recently opened.
- The Target and Trial labels are assigned by Datacolor TOOLS, not by Datacolor MATCH^{PIGMENT}. Datacolor TOOLS requires that the relationship between standards and batches on the desktop be maintained. *See also Datacolor TOOLS User's Guide for details.*
- The Filter, Sorting and Find options included in Data Navigator are also available for retrieving data using this option. *See also Data Navigator, for detailed instructions to use these options.*

To retrieve measurements from a folder, do the following:

1. Enter the sample name in Formula Central, and click on the **Retrieve Measurement button**.

The dialog box below displays:



2. Click on the name of the folder containing the sample data to be retrieved. A list of samples displays in the right pane. The icons next to the samples indicate the type of sample:



The sample is labeled a *Target*.



The sample is labeled a *Trial*.



The sample type is not specified. It may be a target, trial or substrate.

3. Point and click on the sample to be retrieved. The **Select Sample** button will become active. Click on it.
4. Click **Finish**. The window will disappear, and the sample selected displays in the sample field.

Matching/Correcting Colors

Ingredient Selection

When you match or correct a color, you must select the ingredients that you want the job to consider using in the formula. This is referred to as *Ingredient Selection*. There are two methods for selecting ingredients:

- **Select Ingredients by Name.** When this method is used, the user works from the Name Tab, and selects individual ingredients to be used. *See also Select Ingredients by Name for details regarding this procedure, and the fields that appear on the Name tab.*
- **Select Ingredients by Keyword.** When this method is used, the user works from the Ingredient Keywords tab, and constructs a keyword query to be used by the job. *See also Select Ingredients by Keyword for details regarding this procedure and for all fields that appear on the Ingredient Keyword tab.*

"Must Use Ingredient" and Keyword Queries

- Ingredients can be marked as 'must use'. This option is selectively enabled and disabled for each individual ingredient, and is accessed from this window.
- When a keyword query is created, there is an option to include the ingredients marked "must use".
- When this feature is enabled, all of the ingredients marked "must use" are always included in the ingredient selection when a query is run.
- When this feature is disabled, the ingredients marked "must use" are included in the ingredient selection only if they have the correct keyword attached.

See also Tools Menu, Select Ingredients, Must Use Ingredient for an explanation of this feature.

To access the Select Ingredient window, do the following:

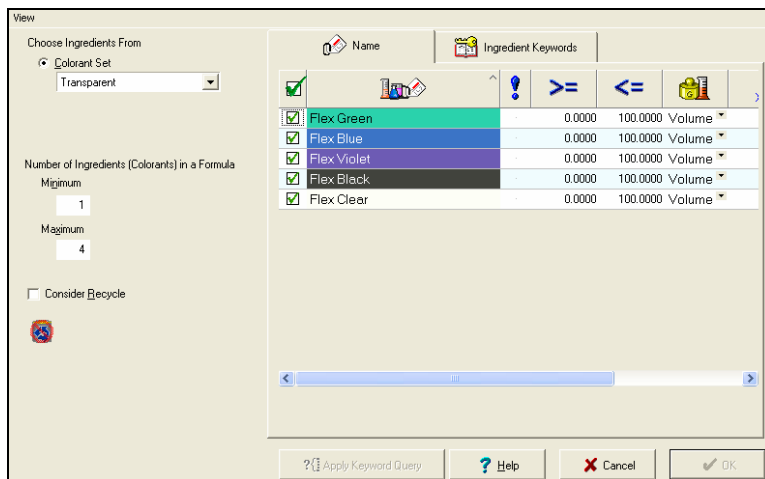
1. From the menu bar, select **Tools, Select Ingredient**.

-or-

From the toolbar, click the **Ingredient Selection** icon.



The Select Ingredients window displays.



For details on the icons, tabs, and fields in this window, see [Formula Central Menus, Tools Menu, Select Ingredients](#).

Matching Features

Formula Central includes several tools to help you efficiently match colors. These tools were designed to simulate procedures commonly used in commercial color matching settings. The following matching features are available:

- Auto Formulate
- Combinatorial Matching
- Search
- Search & Correct
- Search & Adjust

These tools can be accessed from the Tools Menu or from buttons on the Formula Central toolbar.



NOTES AND TIPS ABOUT FORMULATION

- The first time you create a job from a job template, all of the ingredients in the colorant set are automatically selected.
- The only action required to execute a formulation is a target measurement. Once you have measured a target, you can select a formulation tool.

- For all of the formulation options, the program uses selections in your Job Preferences. These selections include tolerances, the number of formulas to display, and the Illuminant/Observer combination, among many others.
- When you receive your program, default values are preset in the job preferences so that you can begin matching immediately. You can adjust these values so that the formulas you receive satisfy your requirements exactly.
- When the current job state is "formulation input," you can enter additional information into the Formula Grid to be considered during the match calculations. For example, you can fix the amount of an individual colorant to be used, specify the colorant loading, etc.

Auto Formulate



This feature combines three color matching tools into a single option. It is designed to closely simulate the approach used by an experienced color matcher when matching a new color.



What does an experienced color matcher do?

Whether matching visually or instrumentally, skilled color-matchers typically maintain a library of formulas. When a new color needs to be matched, the colorist will first search the library to see if any existing formulas match the new color. These formulas are considered the most reliable, since there is no guesswork about the color produced by the formula. In addition, any processing problems have been identified. It is the most efficient approach to use when formulating a new color.

If no existing formulas match the color, the colorist then looks for an existing formula that is a close match to the new target color. The goal is to achieve the color match with minor modifications to an existing formula. The colorist will try to limit the formula changes to the ingredient amounts, preserving the ingredient combination used in the original formula. By doing this, the modified formula still offers processing advantages, since the ingredient combination has a processing history. This approach produces a highly reliable formula.

If no acceptable formulas can be generated from the existing color library, a veteran color-matcher will then create a new formula, "from scratch", to match the target. While an acceptable color match is also achieved, there is no processing information for the formula. This makes the formula somewhat less reliable than those coming from an established formula library.

When you select the Auto Formulate option, the same 3-step procedure performed by the experienced colorist is performed by the program.

What happens during Auto Formulate?

When you select this option, the match process is performed as follows:

- The system will search through the formula records you have previously stored for acceptable matches. It sorts and displays stored formulas that satisfy your tolerances. (Search Only)
- If the program does not find the specified number of formulas during the *Search* step, it moves to *Search & Correct*. During this step, the program searches the library for a formula that can be used as a starting point for the new color. It then runs a correction on the stored formula to achieve a match to the target (Search & Correct).
- The final step in Auto Formulate is to run a combinatorial match. If the program does not find the specified number of formulas through the first two steps (*Search*, *Search & Correct*), it will then calculate new formulas using the ingredients you have selected.

How many formulas are provided?

This depends on the number of formulas requested. *See also Job Preferences, Results.*

When Auto Formulate is selected, does the program always complete all three steps?

No. Depending on selections in Job Preferences, Auto Formulate will either stop when it finds the specified number of formulas, or complete all three steps in the process, and then select the best matches found. *See also Job Preferences, Results Tab, Auto Formulate for details on this feature.*

What is an acceptable match?

Acceptability is based on the job tolerances. *See also Tools Menu, Job Tolerances, Tolerances Tab for details on tolerances.*

How are the formulas sorted and displayed?

The formulas found during each step in the Auto Formulate process are kept together. The program assigns a number (1 – 3) to each formula to identify which of the three sources (Search, Search & Correct, or Combinatorial Match) produced it. Within each formula source group, the formulas are then sorted from best to worst, according to the sort characteristics selected in the job preferences.

See also...

- *Tools Menu, Job Preferences for a general discussion of the job requirements set by the user.*
- *Applications Technology, Formula Sorting Options for a detailed discussion on the sorting feature.*

In a combinatorial match, the job considers every ingredient you have selected for the match. The ingredients are selected through **Tools Menu**, **Browse Ingredients**, or by clicking the **Browse Ingredients** icon on the toolbar.



Choose Ingredients From

☒ Colorant Set

Translucent

Number of Ingredients (Colorants) in a Formula

Minimum

3

Maximum

3

☐ Consider Recycle

☒ Name

☒ Ingredient Keywords

☒			
☐	YELLOW P162	-	0.0000
☒	YELLOW P159	-	0.0000
☐	RED XP441	-	0.0000
☒	RED P481	-	0.0000
☐	MAGENTA P412	-	0.0000
☐	GREEN P509	-	0.0000
☒	BLUE ST8298	-	0.0000
☐	BLACK	-	0.0000
☒	WHITE	-	0.0000
☐	CLEAR	-	0.0000

Based on the information in this window, you have specified the following requirements for the formula:

- You want every formula to have exactly three colorants.
- You have selected red, yellow, blue and white as your colorants.

Below are the possible 3-colorant combinations that contain the colorants you have selected.

Colorants Selected	Formula #1	Formula #2	Formula #3	Formula #4
Red	Red	Red	Red	--
Yellow	Yellow	Yellow	--	Yellow
Blue	Blue	--	Blue	Blue
White	--	White	White	White

If you selected combinatorial matching, and told the system that you want to see all formulas using 2 colorants, and using 3 colorants, it will consider every 2-colorant formula **and** every 3-colorant formula that it can make from the ingredients selected. The job will not stop until it has considered every possible formula you have asked it to consider.

If you have indicated that you can accept matches containing a minimum of 2 colorants and a maximum of 7 colorants, it will go through this calculation for 2-, 3-, 4-, 5-, 6- and 7-colorant combinations, using all of the ingredients you have selected. Depending on the number of ingredients you have selected for use, and the variety of color combinations, it is possible for the program to try hundreds of formulas to find a single match.

How many combinatorial formulas are saved?

In Job Preferences (*Tools Menu, Job Preferences, Results tab*), you tell the program the number of formulas to find. For example, if you asked for 10 formulas, the system will try to give you 10 formulas. As it works through every colorant combination, the system saves the first 10 formulas it finds. When it finds #11, it checks to see if #11 is a better match than any of the 10 formulas it is holding. If it is better, #11 will replace one of the 10 formulas it is currently holding. This process continues until every combinatorial formula is evaluated.

How does the system decide if the new formula is better or worse than the formulas in this group of 10?

It uses the selections you have made for the Optimizer Goal, and ranks the formulas from best to worst using the goal function.

Once the program has completed all of the combinations, it will sort the formulas again, based on the selections made in *Job Preferences, Results, Sort*. This is an additional sort called a recursive sort. For example, if you want to see the formulas sorted by cost, the job displays the formulas in order from best to worst, based on the formula cost.

All of the formulas displayed satisfy the job tolerances. The sort feature organizes the display of the formulas in an effort to make your final selection easier and faster.

NOTES AND TIPS FOR COMBINATORIAL MATCHING

- The program will store all of the formulas found, including the one you select for use. You have access to the alternate formulas while the job is in process.
- After you have selected one and run a correction, you can return to Page 1 of the job, select another formula candidate and begin the correction with a different formula. See *Tools, Job Preferences* for details on where the tolerances and sorting instructions can be found, and how they work.

Search



Rather than calculating a new formula to match a target, Search looks through folders containing formulas previously made, to find a stored formula that matches the current target. Search, however, will not calculate a correction to an existing formula to improve the match to the Target. It will simply locate all existing formulas that satisfy the match tolerances for the job.

This tool is similar to other types of matching features in that you must select the ingredients you want to use in the formula. The program references the ingredient selection, and will skip those formulas that contain ingredients not included in the selection. If any ingredient is flagged as "must use", only formulas containing the 'must use' ingredients will be considered.



Where are the formulas stored?

Both Search and Search & Correct sort and retrieve formulas to be used for new color matches. However, they do not search job records to retrieve formulas. They only look in formula records, so you must create separate formula records for any formulas you want to use. *See also Formula Central, Formula Storage & Retrieval for information on formula storage.*

SEARCH TIP: If you run Search Only, you can then run a correction on the formula(s) found. By performing the correction separately, you can view the 'as is' formula and color difference before any correction is made. This is done as follows:

1. Select **Tools Menu, Use Formula's Sample As a Trial**. This puts the predicted formula into the trial position.
2. Run a correction.



How many formulas are displayed?

In Job Preferences (**Job Preferences/Results**) you indicate the number of formulas to be displayed for the job. It will try to find the designated number of formulas through Search (only). However, depending on the number of stored formulas you have, it may not find the number you have specified. When this happens, it displays all of the formulas it found.

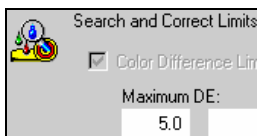
Search & Correct



Search & Correct is another matching tool provided in Formula Central. This option takes the search function a step further. It looks for an existing formula to serve as an acceptable starting point to match the target, and calculates a correction to the stored formula.

What is the difference between the Search & Correct Tolerance and the Job Tolerance?

For the Search phase, the formula acceptability is based on the tolerances you have created for the job (*Job Preferences, Search*). The tolerance set in the Search tab defines a starting point for accepting stored formulas as candidates for the current job. In the example below, the Search tolerance is 5.0.



When performing either Search, or Search & Correct, the program will not consider any stored formula with an 'as is' color difference greater than 5.0 units from the Target.

What is an acceptable match?

Acceptability is based on the Job Tolerances you have created for the job. (See also *Job Preferences, Tolerances tab*.) For Search & Correct, the program calculates a correction to the stored formula to satisfy the job tolerance.

How many formulas are saved?

In Job Preferences (*Job Preferences, Results tab*) you indicate the number of formulas to be displayed for the job. It will try to find the designated number of formulas through Search & Correct. However, depending on the number of stored formulas you have, it may not find the number you have specified. When this happens, it displays all of the formulas it found.

How does the system decide if the one formula is better or worse than another it is currently holding?

For both Search, and Search & Correct, the program bases its decisions on the selections in the Optimizer Goal.

Search & Adjust

The Search & Adjust option operates the same as Search & Correct, with one restriction: the correction it uses must maintain the colorant ratios used in the original formula. As a result, the correction is limited to an adjustment of the amount of clear used in the formula.

Which applications would use this option?

- **Translucent applications.** Often a variation in film thickness can produce a different color.
- **Color concentrate applications.** Typically formulas can only be adjusted by adding clear.

Queue Matching

The word queue is defined as "a line of waiting people or vehicles". In the program, a queue is a line of colors waiting to be matched. This feature allows you to set up color matches to be run at a later time. Multiple jobs can easily be set up and matched using the Queue Matching options. Many users find it convenient to create a queue, and start it before leaving for the day. When they return the next morning, the samples have been matched and the formulas are ready to be evaluated.

Any folder containing jobs may be used as a queue. When setting up a queue, all unmatched jobs are stored to a folder. You can also browse the database and select multiple samples as match Targets.

There are two steps in the process: *queue creation* and *queue matching*.

NOTES

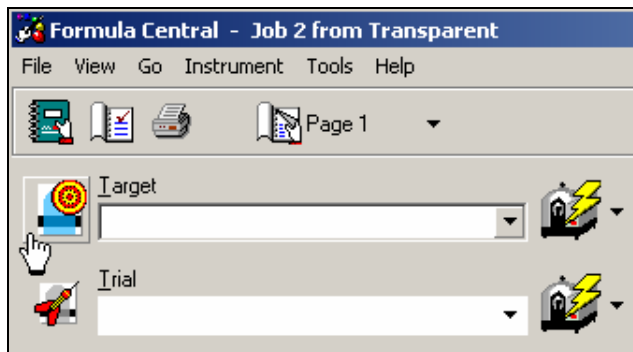
- You must measure all of the samples to be matched, and store them as a job in a folder. These measurements can be made from either Datacolor MATCH^{PIGMENT} or Datacolor TOOLS. The folder is either a default folder, or the home folder defined for the current user.
- If you measure the samples from the Tools desktop, you must store the standards into the database. Once the measurement is made, select the *Store Std* button. A dialog box displays prompting you for a folder name. When you retrieve the sample in Datacolor MATCH^{PIGMENT}, you will be opening the same folder.
- In Datacolor MATCH^{PIGMENT} you can store unmatched jobs in a folder.
- Formula Central also provides an option to browse and select multiple samples for a match target. Making multiple selections will cause the system to automatically create a number of jobs using the selected target samples and current job template. They are saved to the default job folder. Below are the procedure details.

Queue Creation

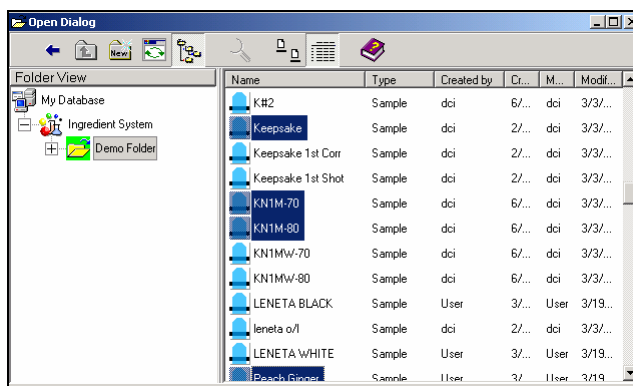
The procedure below covers selecting multiple samples as match targets in Formula Central.

1. To create a queue of jobs, click on the **Find Target** button.





The Open Dialog box displays:



2. Browse to a folder and select the targets that you want to match.
3. Click **Open** after you have made your selections. A job will be created in the default folder for each of the selected targets.

For example, to match 50 targets, simply select the targets and the program will automatically create 50 jobs. See also *Match Queue for instructions to start the match process*.

Match Queue

The *Match Queue* option is accessed from Formula Central, Tools Menu.

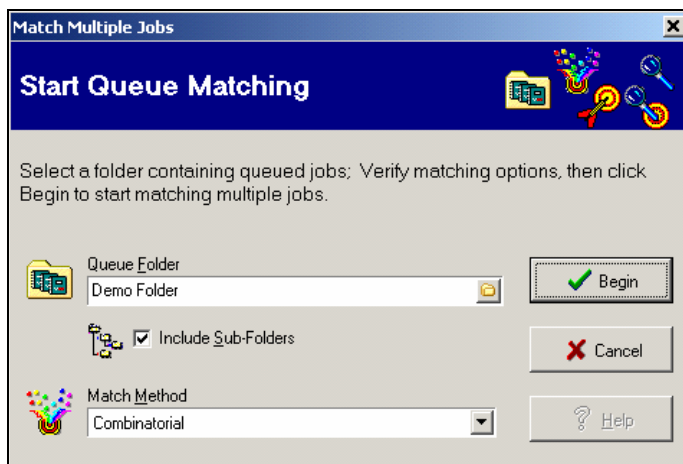


This option includes the ability to:

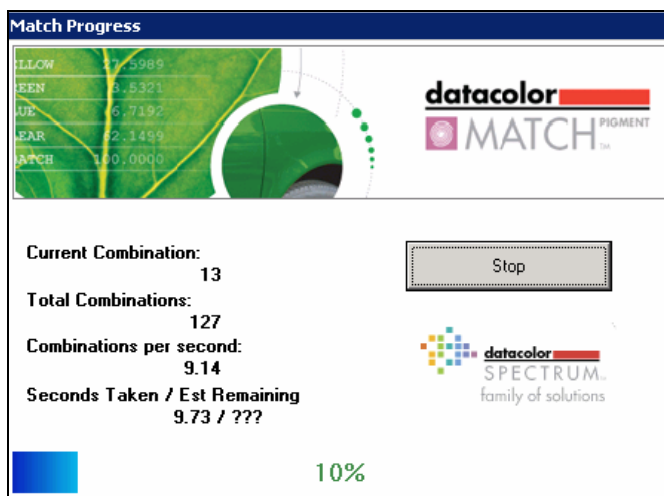
- Include sub-folders of the selected folder.
- Select a matching method (Search, Search & Correct, Auto Formulate).
- Cancel during matching without losing results already found.

To start queue matching, do the following:

1. From the Tools Menu, select **Match Queue**. The Match Multiple Jobs dialog box displays.



2. **Queue Folder.** Select the folder containing the unmatched jobs. You can include sub-folders by checking the control. All unmatched jobs in the current folder and in any sub-folders will be run through the queue.
3. **Match Method.** Select the formulation tool to be used for the matches. See *also Formulation Tools*.
4. Start the match process by clicking the **Begin** button. When this option is selected all unmatched jobs found will be matched in order, one after the other.
5. During the matching of the job queue, a status dialog displays showing the job name, the target name of the current job being matched and the number of jobs remaining.



6. The queue process can be stopped by clicking on the **Stop Queue** button. The job being processed will be completed before the process stops. The queue can be re-started by again selecting the "Match Queue" option.
7. After the process is complete, you can open the jobs to evaluate the formulas.

NOTE

Currently, the queuing option does not run in the background, or offline. Formula Central will be occupied with matching the queue and unavailable for any requests other than "Cancel."

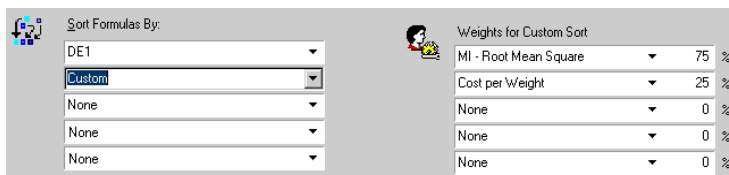
Advanced Queuing Options

In addition to this basic queuing feature, Datacolor MATCH^{PIGMENT} includes a suite of program modules dedicated to running queues. These Advanced Queuing options were developed for users required to produce a high volume of color matches. This program suite includes program modules designed to facilitate matching speed and accuracy in high-volume color matching applications, such as color card manufacturers, trade sales paint manufacturers etc. *See also Applications Technology for complete details about this function.*

Formula Sorting

Formula Central offers several sorting methods to rank and display the formula predictions.

- **Initial sorting.** When sort criteria are selected in the job preferences, they are used to sort the formula predictions. When no sort criteria are selected, the program sorts the formulas based on Optimizer Goal selections (*Tools Menu, Job Preferences, Advanced Tab*). The formula predictions are assigned a number that ranks them from best to worst based on the criteria used.
- **Recursive Sort.** This is offered as an option. The program takes the formulas from the optimizer goal function, and resorts them, based on the parameters selected for sorting (*Tools Menu, Job Preferences, Results tab*):



Sort Formulas By:	
DE1	
Custom	
None	
None	
None	

Weights for Custom Sort	
MI - Root Mean Square	75 %
Cost per Weight	25 %
None	0 %
None	0 %
None	0 %

- **Custom Sort.** Allows you to combine several sort parameters into one sort criterion. For example, you can make the following selections:

<u>Parameter</u>	<u>Weight</u>
DE 1	75%
Cost	25%

This custom sort includes multiple parameters, but is treated as a single sort criterion to be used in a recursive sort.

NOTE

The custom sort should be placed as the first or second sort criteria in order to have a significant impact on the formula sort.

Why do I need the formulas sorted?

Depending on the ingredient selection, formula constraints and job preferences you have defined, the program may find hundreds of formulas to satisfy your requirements. The sorting function instructs the program to show you the available formulas, from best to worst. When you set up the sort options, you can choose characteristic(s) about the formulas that are most important to you. You can sort the formulas from best to worst based on a variety of parameters, including a range colorimetric, appearance and physical properties. In addition, you can choose multiple properties on which to base the sort.

Why choose more than one sort characteristic?

If you have selected DE1 as the only sort criteria, you may have several formulas with a DE of 0.0 in the first Illuminant/Observer condition. You then need to select another characteristic of the formulas, in order to break the 'tie' between these formulas. We refer to this procedure as a 'recursive sort'. It requires that multiple sort criteria be defined.

What is a custom sort?

This is a refinement of the multiple sort option. When you choose Custom Sort, you can combine multiple sort parameters and assign a 'weight' to each sort characteristic you have selected. The resulting 'custom sort' is treated as a single, additional sort characteristic that can be applied during a recursive sort.

NOTE

A custom sort is most effective when assigned as the first or second sort parameter in a multiple sort.



What is a weight?

It is a rank assigned to the importance of each sort characteristic you select. In Custom Sort you can assign different ranks or priority levels to the sort characteristic you have selected. Sometimes, one sort characteristic may be more important than another. For example, metamerism may be more important than either DE1 or Cost, and would have a higher % assigned to it in the custom sort.

Sort Formulas By:		Weights for Custom Sort	
DE1	▼	MI - Root Mean Square	75 %
Custom	▼	Cost per Weight	25 %
None	▼	None	0 %
None	▼	None	0 %
None	▼	None	0 %

See also *Applications Technology, Formula Sorting* for a detailed discussion of the sorting feature.

Correction Features

The correction tools included in Formula Central are designed for use both in laboratory and production environments. They include the following:

- **Automatic Correction.** The correction is automatically calculated by the program. This feature includes both an *Add to* and a *Reformulate* option.
 - **Add To.** This option is often used in production environments. The program assumes you want to add material to a batch that already exists.
 - **Reformulate.** This feature is commonly used in laboratory settings that use small batch sizes. It is also used in both laboratory and production settings for materials that cannot be reprocessed.
- **Manual Add.** This option allows you to make adds, as you would working with actual raw materials. You can select an ingredient, input an add amount, and the program displays the results of this add, expressed in colorimetric terms (e.g., DE, etc.) This option includes an *Optimize* feature.

The job preferences can be customized to include additional information to make the correction recommendation useful. This includes physical properties including gloss data, contrast ratio, viscosity, film thickness, and container size limitations, among others.

Auto Correct

This option produces a corrected formula without any user intervention. The program will calculate an add or new formula using the current optimizer goal function (*Tools Menu, Job Preferences, Advanced Tab*).

The minimum input required by the user includes providing the trial measurement. The formula produced from Auto Correct can either be an *add to* or a *reformulation*.

NOTES FOR AUTO CORRECT

- During the job state, "correction input", the size of the add can be constrained by placing an amount in the "Total Add" field.
- During the job state "correction output," changing the total add amount will rescale the add.
- Enabling the *Bucket Size* option in Job Preferences (*Tools Menu, Job Preferences, Tolerances tab*) also constrains the add size.

Add To



(Auto Correct Add). This correction type assumes that you can add material to an existing batch. It is normally used to correct production batches.

If you do not specify a new batch size, the system will calculate the smallest positive add needed to match the Target. If you specify a new batch size, it will stop when it reaches that batch size, even if the tolerances and constraints (i.e., DE, film thickness, contrast ratio, etc.) are not achieved.

	2	Flex Red	5.1812	5.6558	0.4745	KG
	5	Flex Violet	8.4381	8.4381	0.0000	KG
	3	Flex Green	27.5439	28.5638	1.0200	KG
	7	Flex Clear	58.8368	60.6390	1.8022	KG
Σ		Total Batch	100.0000	103.2967	3.2967	KG

If you specify a new batch size, and the required add produces a batch size smaller than needed, the system will scale up the formula to make it exactly equal to the batch size entered. In the example below, the same correction is run, but with new batch size of 105.00.

	Flex Red	5.1812			KG	Ready
	Flex Green	27.5439			KG	Ready
	Flex Violet	8.4381			KG	Ready
	Flex Clear	58.8368			KG	Ready
	Add Ingredient					
Σ	Total Batch	100.0000	105.0000		KG	Ready

The result is an add that brings the batch to exactly 105.00 KG.

	2	Flex Red	5.1812	5.7490	0.5678	KG
	5	Flex Violet	8.4381	8.5773	0.1391	KG
	3	Flex Green	27.5439	29.0347	1.4909	KG
	7	Flex Clear	58.8368	61.6390	2.8022	KG
Σ		Total Batch	100.0000	105.0000	5.0000	KG

NOTES AND TIPS ABOUT ADD TO

- In reformulation output, you may notice that the system reduced the proportion of an ingredient used in the original formula. This is referred to as a 'negative add', since the system has 'removed' material that was previously there.
- In an 'Add To' case, you cannot physically remove materials that are in the formula. The only way to decrease the proportion of an ingredient is to add large quantities of the remaining ingredients. In this situation, 'Add to' can result in a very large adjustment.

Reformulate



This correction feature is often used in laboratory settings, where small batch sizes are used. It assumes that the next trial sample will not be made from existing batch material, and expects that a new batch will be made. Reformulate is also used when the material cannot be processed a second time, and additional trials must be made from scratch.

	2	Flex Red	5.1812	5.4752	0.2940 KG	▼
	5	Flex Violet	8.4381	8.1689	-0.2692 KG	▼
	3	Flex Green	27.5439	27.6520	0.1081 KG	▼
	7	Flex Clear	58.8368	58.7039	-0.1329 KG	▼
Σ		Total Batch	100.0000	100.0000	0.0000 KG	▼

Notice that both the **Trial Formula** and the **Output Formula Amount**



total 100.0 KG, although the output formula is significantly different from the Trial formula.

NOTES AND TIPS ABOUT REFORMULATE

- You can run *Reformulate* simply by selecting the **Formulate** button while in *Correction Input*. The new batch size will be the same as the original batch. This is the typical procedure.
- If you want to specify a new batch size, just put the new batch size into the *Total Batch Size* field in the *New Formula Amount* column while in *Correction input*.

			
	Flex Red	▼	7.5246
	Flex Green	▼	17.5545
	Flex Blue	▼	9.0887
	Flex Clear	▼	65.8321
	Add Ingredient	▼	
	Total Batch		100.0000 125.0000

- If you fix an amount in the *Output Amount* column for a single ingredient, the batch size will change.
- If you change the *ingredient selection* or add ingredients, the program will recalculate the correction

Manual Add



Instead of having the program calculate an adjustment, you may want to make the adjustment yourself. Manual Add allows you to adjust the amounts of existing ingredients. You can also introduce ingredients not included in the original formula. Manual Add is available for both *Add To* and *Reformulate* correction situations.



When should I use manual add?

- When there is some flexibility regarding the tolerances and ingredient restrictions the job is trying to satisfy. This includes color difference, loading, contrast ratio, individual ingredient selections, etc. You can experiment with ingredient amounts and discover how these changes affect the quality of the match to the target, with respect to one or several of those criteria.
- When the automatic correction does not significantly improve the match to the target. One solution to the situation may be to introduce new ingredients. You can experiment with different ingredient choices to try to improve the match to the target.
- When the automatic correction satisfies all of the tolerance and ingredient restrictions, but is too large to use. You can adjust ingredient amounts to determine if a smaller add will give you an acceptable match to the target.
- Training new color matchers. This program allows you to experiment with colorants and amounts to learn instantly how colorants behave. It gives the user experience in selecting ingredient combinations, and selecting the amounts to use in an adjustment. It can enhance the skills of both beginner and veteran color matchers.

What is the optimize feature?

Optimize offers a compromise between *AutoCorrect* and *Manual Add*. Using Optimize, **you select the ingredient(s)** for adjustment, and **the system calculates the amount** needed to optimize the existing match to the Target. Optimize allows you to select a specific property of the formula, such as the DE in a particular illuminant, curve fit, etc. to maximize.

Below is a list of all properties to which the optimize feature can be applied:

DE1	DL*
DE2	Da*
DE3	Db*
Curve Fit	DC*
Metamerism Index	DH*

To run the manual add option, you must first run an automatic correction.

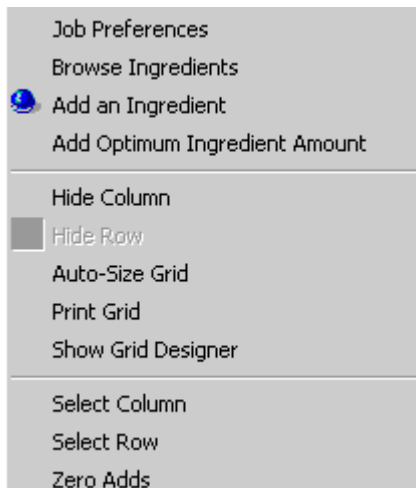
1. When the automatic correction is completed, click on the **Manual/Modify button**.



2. You must 'zero' the current adds. Position the cursor in the **Add/Change Amount** column and right click.



A menu displays:



If the *Zero Adds* option is not active, you have not first selected the **Manual Add/Modify** button on the toolbar. Click this button first and then return to this menu.

	3	Flex Green	▼	51.52	51.52	0.00	KG	▼	Ready	▼	1.00	
	5	Flex Violet	▼	23.28	23.28	0.00	KG	▼	Ready	▼	1.00	
	6	Flex Black	▼	5.81	5.81	0.00	KG	▼	Ready	▼	1.00	
	4	Flex Blue	▼	19.39	19.39	0.00	KG	▼	Ready	▼	1.00	
		Add Ingredient	▼					▼		▼		
		Total Batch		100.00	100.00	0.00	KG	▼	Ready	▼		

	3	Flex Green	▼	51.52	51.52	0.00 KG	▼	Ready	▼	1.00		
	5	Flex Violet	▼	23.28	23.28	0.00 KG	▼	Ready	▼	1.00		
	6	Flex Black	▼	5.81	5.81	1.00 KG	▼	Ready	▼	1.00		
	4	Flex Blue	▼	19.39	19.39	0.00 KG	▼	Ready	▼	1.00		
		Add Ingredient	▼						▼			
		Total Batch		100.00	100.00	0.00 KG	▼	Ready	▼			

 	3 5 6 4 6 Add Ingredient Total Batch	Flex Green Flex Violet Flex Black Flex Blue Add Ingredient Total Batch	51.52 23.28 5.81 19.39 100.00	51.52 23.28 5.81 19.39 100.00	0.00 KG 0.00 KG 1.00 KG 0.00 KG 0.00 KG	Ready Ready Ready Ready Ready	1.00 1.00 1.00 1.00 Ready		
Correction Output			4 - 4 of 7		Optimize Options (Right Click)				

Trial As Is	DE*	DL*	Da*	Db*	DC*	DH*	M
D65/10	20.67	19.97	0.43	5.32	-5.06	-1.70	6.0
A/10	22.00	20.70	-1.08	7.36	-6.00	-4.39	
F11/10	23.13	21.57	-4.50	7.03	-5.28	-6.46	
Trial Corrected							
D65/10	1.38	-0.58	0.27	1.22	-1.24	-0.19	2.7
A/10	1.38	-0.39	0.00	1.32	-1.21	-0.53	
F11/10	3.03	-0.15	-2.25	2.02	-1.46	-2.65	

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Optimize

"Optimize" is a feature that is offered in as part of the Manual Add option, and is a compromise between the automatic and manual correction. When Optimize is chosen, you select the ingredient(s) for adjustment, and the program calculates the amount of the ingredient to be added to improve or optimize the formula for that property. You can optimize all of the ingredient amounts in the formula, or you can select an individual ingredient to optimize.

The Optimize feature offers two approaches: **Optimize All Ingredients** and **Try to Improve**.

- **Optimize All Ingredients.** When selected, this approach makes adjustments to the formula ingredients, one-by-one. It adjusts each ingredient amount to improve the formula, based on the Optimizer Goal Function.

See also Tools Menu, Job Preferences, Advanced Tab for current optimizer selections.

See also Applications Technology, Optimizer Goal for a detailed discussion of this tool.

- **Try to Improve.** This approach tries to change the amounts of an individual ingredient to improve a specific colorimetric property such as DE1, curve fit, or the optimizer goal function.

NOTES AND TIPS ABOUT OPTIMIZE

- For the colorimetric properties such as DE1-5, DL, etc., the color difference calculation used is the one selected in *Job Preferences/Tolerance* tab.
- When you use *Optimize* along with *Reformulate*, the program will optimize the ingredient, and then re-scale to formula to the original batch size. In this situation the 'add' column displays a negative number, but the 'batch + add' will contain a positive add. The amount of the ingredient in the correction may be less than the amount in the original formula.
- When you use *Optimize* with *Add To*, the program knows that you cannot remove any of the ingredient amount, and the add column will always be positive.
- The *Optimize* option is not available unless you have first run an automatic correction. The job state must be "Correction Output" to run a manual add.

To **optimize** ingredients, do the following:

1. After running an Automatic Add, activate the Manual Add tool. To do this select **Tools Menu, Manual** or click the **Manual Add** button.



The *Optimize* field displays in the first column on the Formula Grid.

- To optimize an individual ingredient for the parameter selected, click on the Optimize icon for the ingredient. In the example below, black was optimized. The program immediately calculates and displays an add amount.

 						
	4	Flex Blue	▼	19.39	19.39	0.00 KG
	6	Flex Black	▼	5.81	31.97	26.16 KG
	5	Flex Violet	▼	23.28	23.28	0.00 KG
	3	Flex Green	▼	51.52	51.52	0.00 KG
		Add Ingredient	▼			
		Total Batch		100.00	126.16	26.16 KG

- In the Evaluation window, the color difference displayed for the "Trial Corrected" indicates the how the optimized add will affect the color difference.

CIELAB		L*	a*	b*	C*	h	CF
Target		90.41	-0.99	6.57	6.64	98.56	
Trial As Is		95.44	-0.72	7.02	7.05	95.84	0.64
Trial Corrected		90.54	-0.49	5.51	5.53	95.07	0.64
Trial As Is	DE*	DL*	Da*	Db*	DC*	DH*	MI
D65/10	5.06	5.03	0.27	0.45	0.41	-0.33	0.25
A/10	5.14	5.10	0.47	0.53	0.57	-0.42	
F11/10	5.14	5.11	0.29	0.51	0.49	-0.33	
Trial Corrected							
D65/10	1.18	0.13	0.50	-1.06	-1.11	-0.37	0.49
A/10	1.04	0.10	0.41	-0.96	-0.91	-0.51	

See also *Formula Central Menus*, *Tools Menu*, *Correction Options* for details on each parameter available in the *Try to Improve* option.

Performance Data

We often refer to the program's ability to "learn" about the behavior of your materials. In laboratory and production settings, the actual performance of the raw materials never exactly matches the expected performance. Performance Data refers to the knowledge that the program acquires about the ingredient behavior. This data is calculated by comparing the expected performance of the ingredients to the actual results of the formula prediction. Once calculated, this data can be applied to future formula predictions to improve the accuracy of the predictions.

The program offers two approaches for calculating and applying types of performance data: Performance Factors and spectral adjustments (SmartMatch). The information stored in the colorant set serves as a reference point for both approaches.

Performance Factors



The program has the ability to learn about the ingredients and the process, and to apply that knowledge when it calculates a correction. One way the system learns is through Performance Factors.

Performance factors are numbers that evaluate how the colorants are performing in the current batch. They are based on a comparison between the amount of the colorant you put into the formula, and the amount of colorant the system 'sees' in the formula. A PF is calculated for each ingredient individually. PF's reveal how each colorant is behaving with respect to its strength. The colorant can perform three ways:

- **Performance Factor = 1.0:** The colorant is performing exactly as expected.
- **Performance Factor > 1.0:** The colorant is performing stronger than expected.
- **Performance Factor < 1.0:** The colorant is performing weaker than expected.

When calculating matches and corrections, the system assumes the colorants have a PF of 1.0. This means that they are behaving exactly like the colorants used to generate the colorant data. The colorant amounts in a formula are very precise. You will notice that formulas often include colorant amounts in fractions of a unit. The system is saying that it needs precisely that amount to match the colorant.

When the PF of a colorant is not 1.0, some error is introduced into the formula. For example, if a colorant has a PF of .8 rather than 1.0, the particular colorant is behaving in a weak fashion. If the formula contains 10 units of this colorant, it is only getting the effect of 8.0 units. The result is that the formula predicted by the system will not achieve a match to the target. In order to achieve the target, the formula will need an additional 20% of this colorant.



How can Performance Factors reduce the number of adds made to a batch?

When you have instructed the system to apply PF's, the program automatically adjusts the amounts of each colorant in a correction based on their individual performance. Generally, when the PF is less than 1.0, the system will increase the amount of the colorant in the correction. When it is greater than 1.0, it decreases the amount of colorant.



Are Performance Factors the same as spectral adjustments?

No. Performance factors are similar to strength adjustments, and are used to adjust colorant concentrations used in the formula. Spectral adjustments (SmartMatch) modify the optical weights across the spectrum.

How do I control the use of Performance Factors?

Performance Factors are activated in Job Preferences (Tools Menu, Job Preferences, Advanced Tab).

Performance Data To Use

☒ None

☐ Automatic (recommended)

☐ Performance Factors only

☐ SmartMatch only

Where are Performance Factors displayed?

Performance Factors are displayed in the Formula Grid.

								
2	Flex Red	7.5246	8.0937	0.5691	Ready	0.9756		
3	Flex Green	17.5545	18.9236	1.3691	Ready	0.9732		
4	Flex Blue	9.0887	9.1905	0.1017	Ready	1.0380		
7	Flex Clear	65.8321	68.7922	2.9600	Ready	1.0000		
	Total Color	34.1679	36.2078	2.0400	Ready			
	Total Batch	100.0000	105.0000	5.0000	Ready			

NOTES AND TIPS ABOUT PERFORMANCE FACTORS

- Performance factors are only displayed for correction job states. If they are not currently displayed in the grid, you can activate them using either the Grid Designer, or from Job Preferences (*Tools Menu, Job Preferences, Advanced Tab*). See also *Formula Grid*.
- Performance factors are independently activated for each colorant in the formula. You have three choices regarding the use of Performance Factors: *Display Only*, *Display AND Apply*, *Do Not Display*.

If you choose *Display Only*, the information displayed will help you to learn about your batch, because you can see the behavior of the colorant over a series of adds. This will indicate whether the behavior of the colorant is consistent or inconsistent.

- See also *Applications Technology, Performance Factors* for additional information the use of performance factors.

Spectral Data Adjustments (SmartMatch)

The program has the ability to learn about the ingredients and the process, and to apply that knowledge when it calculates a correction. One type of adjustment involves changes to the spectral data for the colorants. This type of adjustment is referred to as "SmartMatch."

SmartMatch data originates from an evaluation of the measured curve of the trial, and the synthesized curve of the predicted formula. It compares, wavelength by wavelength, the differences between these two curves. The differences are calculated, and are used to adjust the next correction prediction. This adjustment anticipates the group behavior of the colorants during the next add.

Formula Grid

Formulas are displayed in the Formula Grid, located on the lower half of the Formula Central screen.

					
	2	Flex Red	7.5246 KG	▼ Ready ▼	
	3	Flex Green	17.5545 KG	▼ Ready ▼	
	4	Flex Blue	9.0887 KG	▼ Ready ▼	
	7	Flex Clear	65.8321 KG	▼ Ready ▼	
		Total Batch	100.0000 KG	▼ Ready ▼	

The Formula Grid is dynamic and allows you to manipulate the formula(s) displayed quickly and easily. This includes:

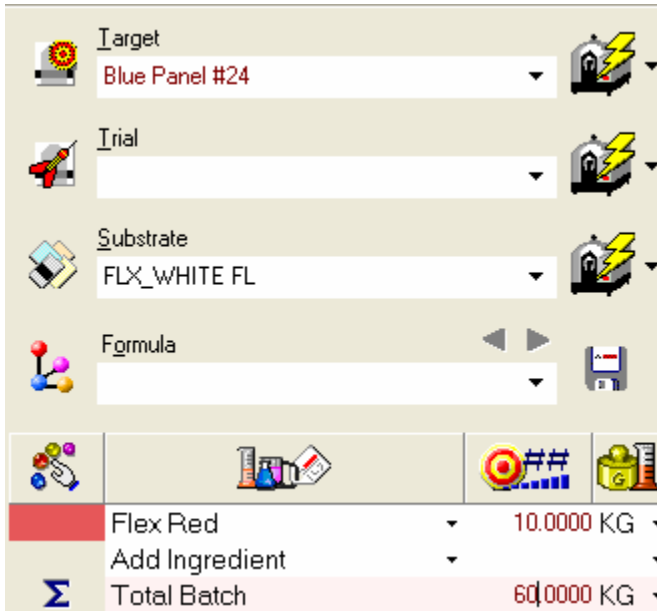
- Changing ingredient amounts and/or total batch size to recalculate and re-scale formulas.
- Changing the ingredient form to be used in the formula.
- Changing the ingredient mode to be used in the formula.
- Mixing both the form and the mode of ingredients used in a single formula.
- Displaying and/or hiding fields in the grid. You can customize the grid display to your needs.
- Re-sizing the grid based on the fields of information being displayed.
- Change the number of formulas displayed on a single screen.

All of these functions can be performed from inside the grid.

Formula Constraints

In both formulation and correction input, you can place restrictions on individual ingredient amounts for multiple ingredients, ingredient subtotals, and total batch size in a single formula. These are referred to as "formula constraints".

In the example below, the amount of red is fixed at 10 grams, and the total batch size is also fixed at 60 grams.



	<u>T</u> arget	
	Blue Panel #24	
	<u>T</u> rial	
	<u>S</u> ubstrate	
	FLX_WHITE FL	
	<u>F</u> ormula	
		
	Flex Red	10.0000 KG
	Add Ingredient	
	Total Batch	60.0000 KG

The program will fulfill all of the requirements you have input. It will then verify the job tolerances to determine if the resulting formula(s) satisfy the tolerances. If the formulas fail the job tolerances, the program will check the tolerances to see if the 'display best formula' option is enabled. If the option is enabled, it displays the best formula.

In the example below, notice how large the color differences are for the 'best' formula. When the "show best formula" option is not enabled, and the program fails to find a match that fulfills the formula constraints, the program will report "no matches found", and return to the formulation input screen. The constraints you entered will still be displayed.

When you are working in Formula Central, you can work in either an "input" state or an "output state". The handling and display of input to the formula grid is determined by the job state at the time the information is entered.



The status bar indicates whether the current job state is a *formulation* or *correction* activity, and the state of that activity, *input* or *output*. In the example above, the job state is *Formulation Input*. Before results are displayed, Formula Central is in an "input" state. Each time results are displayed (formulation, correction, search, etc.), the job is in an "output" state.

The display of fields in the grid is also based on the job state. For example, if you were running a formulation, fields specific to the 'Trial' sample would not be displayed. *See Grid Designer, Columns and Grid Designer, Rows for complete detail regarding the display of individual fields in the grid.*

Input States. Regardless of whether you are running Formulation or Correction Input, the operation of the feature is straightforward. You input information into fields in Formula Central including the formula grid, and the program uses that information to generate an output (either formulation or correction). *See also Formulation Input and Correction Input.*

Output States. In an output step, the program can handle user input one of two ways.

- to rescale a predicted formula
- to recalculate a formula, changing the proportion of ingredients used.

To handle these two possibilities, there are two conditions of an output state: **display** and **modify**. However, these two words never appear in the job state.

What is a Display state, and how does it handle user input?

The default output state is "display." Input to the grid rescales the formula displayed (i.e., rescales the formula or converts current formula amounts from weight to volume). Changing a formula mode or formula form preserves the original formula, and simply converts it to equivalent amounts. This is the default condition for output states.

When the grid is in display condition, the background color of the Manual icon on the toolbar is dark gray.





What is "Modify" state, and how does it handle user input?

When the grid is in "modify" condition, the *Optimize* field displays as the first column in the grid.

	2	Flex Red	5.19	7	KG	Ready
	3	Flex Green	27.51	27.51	KG	Ready
	5	Flex Violet	8.43	8.43	KG	Ready
	7	Flex Clear	58.87	58.87	KG	Ready
		Add Ingredient				
		Total Batch	100.00	100.00	KG	Ready

Formulation Output 3 - 4 of 7 Primary Formula Form

To enable this feature, either move to the menu bar and select **Tools, Manual** or click the **Manual** button on the toolbar.



The background color of the Manual Add button turns from dark to light gray. In a **modify** state, any changes to the grid are used to *recalculate* the formula. The proportions of each ingredient will change, based on the input.

NOTE

The Modify option can only be enabled during an "output" mode.

Formulation Input

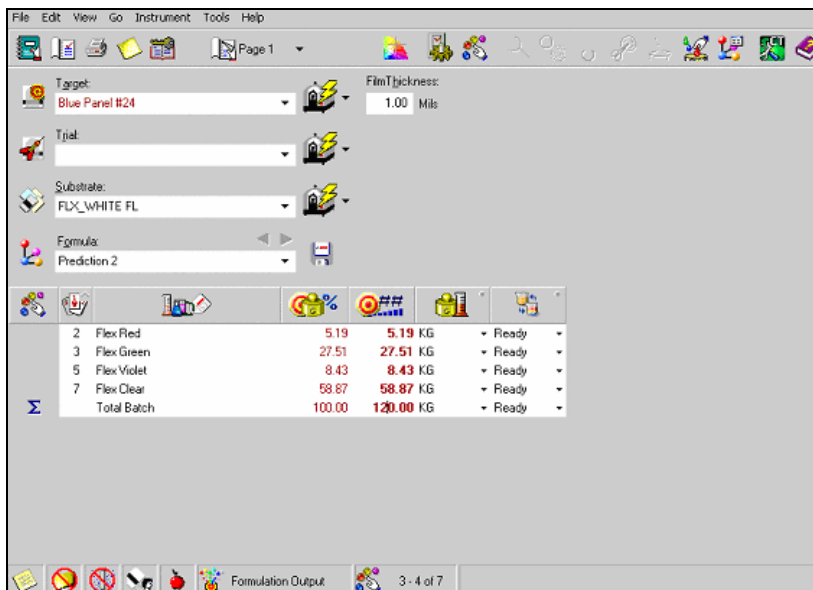
The *Formulation Input* job state allows users to input ingredients, ingredient subtotals, total batch size, and set other requirements for the formula. Below is an example of the grid during formulation input.

In this job state, you can input the following information into the grid:

- Select the formula mode and form.
- Edit minimum/maximum concentrations for individual ingredients.
- Flag ingredients as "must use".
- Enter ingredient amounts for ingredients flagged as 'must use.'
- Enter amounts for either ingredient subtotals, or a total batch size.

This information can be entered using the Select Ingredients button, or it can be input manually into the formula grid. *See also Select Ingredients.*

When the input is completed, select a formulation tool (i.e., Auto Formulate, etc.). The grid refreshes, a formula displays, and the job state changes from Formulation Input to Formulation Output.



TIP

During formulation input, the evaluation window displays color coordinates for the target (if available). No color differences appear, and any plots identify the target in red.

Formulation Output

The Formulation Output job state displays a formula, either calculated by the program or selected from a folder. In an output step, the program can handle user input to the formula grid in one of two ways:

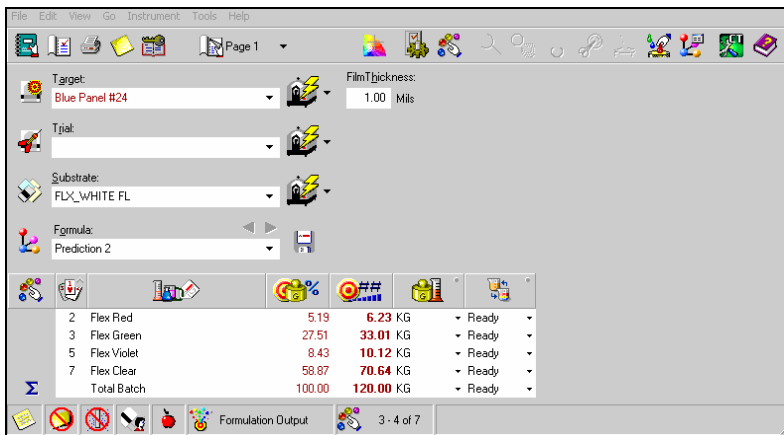
- Rescale a predicted formula.
- Recalculate a formula, changing the proportion of ingredients used.

To handle these two possibilities, there are two conditions of an output state: **display** and **modify**.

NOTE

These two words - display and modify - never appear in the output job state.

Example of a Formulation Output/Display. Below is an example of Formulation Output/Display Mode. We have changed the total batch size from 100 to 120 KG. Amounts entered into the grid for any of the ingredients will be used to rescale the current formula. The ingredient proportions will not be changed.



The formula has been rescaled, but the ingredient proportions (%) have remained the same.



TIP

The evaluation window can be configured to display color coordinates for the target and trial, color differences between the target and trial, and the trial and predicted formula. See also *Formula Central View Menu, Evaluation Window*.

Example of Formulation Output/Modify. In a *modify* condition, any changes to the grid are used to recalculate the formula. The proportions of each ingredient will change, based on the input.

To enable this feature when you are in an output state, either move to the menu bar and select **Tools, Manual**, or click the **Manual** button on the toolbar.



The background color of the Manual Add icon turns from dark to light gray.

When this option is selected, the grid refreshes, and the *Optimize* field displays in the first column of the grid.

	2	Flex Red	5.19	5.19 KG	▼	Ready ▼
	3	Flex Green	27.51	27.51 KG	▼	Ready ▼
	5	Flex Violet	8.43	8.43 KG	▼	Ready ▼
	7	Flex Clear	58.87	58.87 KG	▼	Ready ▼
		Total Batch	100.00	100.00 KG	▼	Ready ▼

Formulation Output 1 - 4 of 7

This indicates that you can enter amounts for any ingredient or ingredient subtotal in grid. The program will use the input to recalculate the ingredient proportions.

NOTE

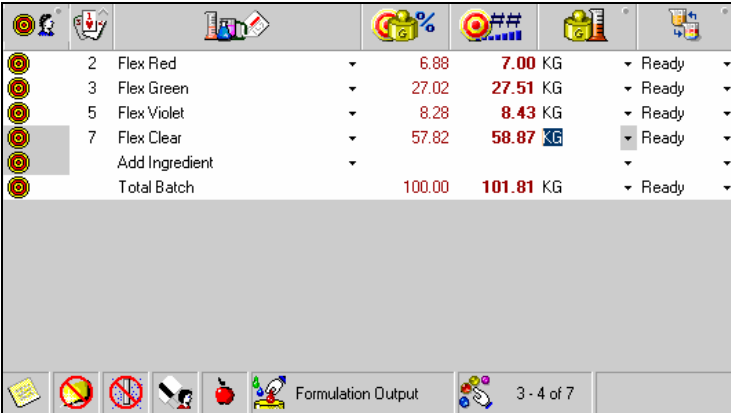
The information is entered into the *Output Formula Amounts* column.



	2	Flex Red	5.19	7	KG	▼ Ready ▼
	3	Flex Green	27.51	27.51	KG	▼ Ready ▼
	5	Flex Violet	8.43	8.43	KG	▼ Ready ▼
	7	Flex Clear	58.87	58.87	KG	▼ Ready ▼
		Add Ingredient				▼ Ready ▼
		Total Batch	100.00	100.00	KG	▼ Ready ▼

Formulation Output 3 - 4 of 7 Click or type Alt+a to

In the example above, the amount of Flex Red has changed from 5.19 to 7.0 KG. This was done by entering "7" in the *Output Formula Amount* column for the Flex Red. The formula was recalculated. Both the amount of Flex Red and % Flex Red has changed, as well as the batch size:

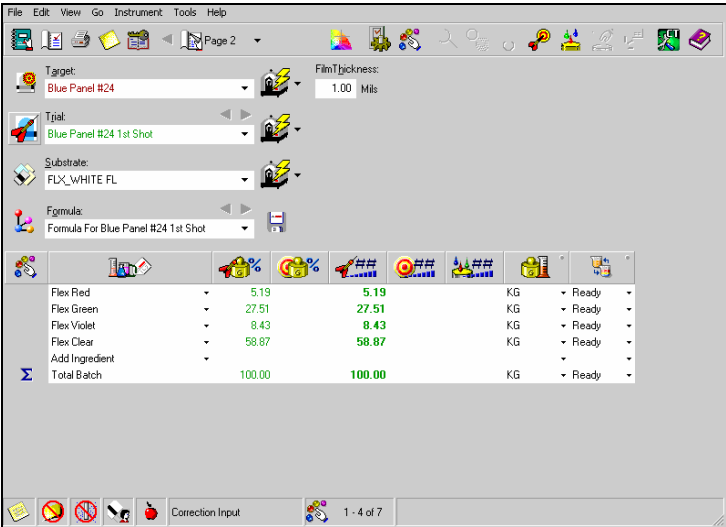


2	Flex Red	6.88	7.00 KG	Ready
3	Flex Green	27.02	27.51 KG	Ready
5	Flex Violet	8.28	8.43 KG	Ready
7	Flex Clear	57.82	58.87 KG	Ready
	Add Ingredient			
	Total Batch	100.00	101.81 KG	Ready

The impact of this change on the color difference is displayed in the evaluation window. See also *Formula Central View Menu, Evaluation Window*.

Correction Input

Once you enter a trial sample, the job state changes to *Correction Input*. If the *Modify* tool was used in the previous step, the grid returns to *display* condition, and any input to the grid is used to setup the correction.



Flex Red	5.19	5.19	KG	Ready
Flex Green	27.51	27.51	KG	Ready
Flex Violet	8.43	8.43	KG	Ready
Flex Clear	58.87	58.87	KG	Ready
Add Ingredient				
Total Batch	100.00	100.00	KG	Ready

- Changes to the ingredient amounts in the *Trial Formula Amount* column....



....should reflect the formula actually used to make the trial sample. There may be some discrepancies between the formula used to make the trial sample, and the formula stored for the trial.

- Changes to total batch size, or ingredient subtotals in this column are used to scale the current *Trial Amount* correction.
- Entries in the "output" column...



...are used as requirements for the upcoming formula. In the upcoming correction, the ingredient is restricted to the amount entered.

- The evaluation window displays the color coordinates and color differences between the target and the trial. In the example below, the amount of Flex Red in the trial (from the formula displayed earlier) is changed from 5.19 to 4.5:

Flex Red	-	4.50	KG	-	Ready	-
Flex Green	-	27.51	KG	-	Ready	-
Flex Violet	-	8.43	KG	-	Ready	-
Flex Clear	-	58.87	KG	-	Ready	-
Add Ingredient	-					
Σ Total Batch		99.31	KG	-	Ready	-

You can enter information into other fields the grid. When you are satisfied with the changes, you must select a correction tool (i.e., AutoCorrect).

In the example below, AutoCorrect is selected, and a "Reformulation" is calculated:

2	Flex Red	4.53	4.79	4.50	4.76	0.26	KG	-	Ready	-	1.08
3	Flex Green	27.70	27.82	27.51	27.63	0.12	KG	-	Ready	-	0.99
5	Flex Violet	8.49	8.22	8.43	8.16	-0.27	KG	-	Ready	-	1.03
7	Flex Clear	58.28	59.17	58.87	59.76	-0.11	KG	-	Ready	-	1.00
Σ	Total Batch	100.00	100.00	99.31	99.31	0.00	KG	-	Ready	-	

A new batch formula totaling 99.31 is displayed. However, the ingredient amounts have changed.

Correction Output

When a correction is displayed, the grid state changes from *correction input* to *correction output*, and defaults to "display" mode. The grid includes two different formulas: one "before" correction and one "after" correction.

If you enter amounts in any of the ingredient columns when the job state is "*Correction Output*" the formula will be rescaled but the ingredient proportions will not be changed.

In this example, we have changed the batch size from 99.31 to 150.

							
2	Flex Red	4.53	4.79	4.50	7.19	2.69	
3	Flex Green	27.70	27.82	27.51	41.73	14.22	
5	Flex Violet	8.49	8.22	8.43	12.33	3.90	
7	Flex Clear	59.28	59.17	58.87	88.75	29.88	
	Total Batch	100.00	100.00	99.31	150.00	50.69	

The formula has been rescaled to 150 as shown in this column:



However, the ingredient proportions have remained the same for the rescaled formula as shown in this column:



TIP

The evaluation window displays color coordinates of the target and trial, and color differences between the target and the formula currently displayed.

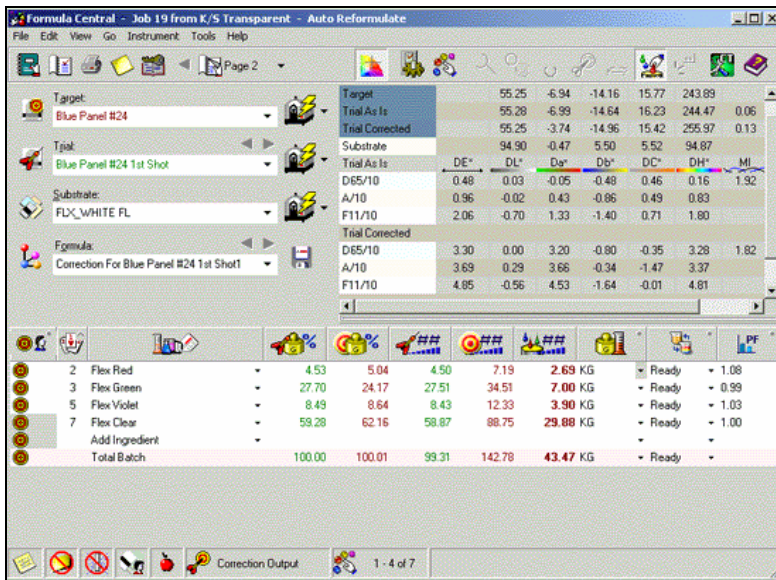
Manual Add

If you want to change the proportion of the ingredients used in the correction, you must activate the 'modify' mode of the grid. This is done by selecting the **Manual** tool.



You can now adjust the ingredient amounts manually by entering ingredient amounts into "output" column. Enter amounts of individual ingredient(s) to be added to the current trial.

In the example below, the recommended add is half of the original batch total. The amount of green added to the formula will be lowered manually to 7.00 KG:



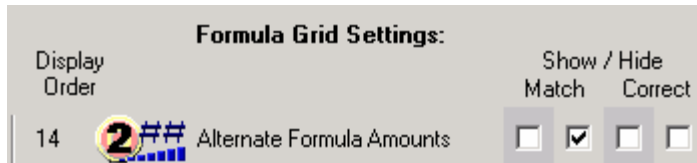
The colorimetric data for the target, trial and correction prediction are displayed in the evaluation window. The DE of the 'corrected formula' is 3.30 units, while the DE of the trial sample, "As Is" from the Target is 0.48. This add made the color match worse than the current trial.

Formula Grid Configuration

The job template you select provides the initial grid settings for Formula Grid. Any changes you make at run time are permanent changes to the job, not the job template. Two tools can be used to edit the grid settings:

- **Job Preferences Settings** (*Tools Menu, Job Preferences, Appearance Tab*). This is the method recommended, because it provides more flexibility in configuring the grid, and also because the changes are stored permanently.

When you edit the grid from the Job Preferences option, you are given the ability to enable/disable grid choices for all four job states. For example, if you enable the field *Alternate Formula Amounts* using this option, you can select the job states when it will be displayed:



You can enable/disable a particular field for any/all of the job states in which it displays.

- **Grid Designer (Tools Menu, Grid Tools).** Changes made using this option are only applied to the current job state. For example, when the job state is *Formulation Output* and you use the Grid Designer to add the field *Alternate Output Amount* to the grid display, the field will ***not*** appear when you move to *correction input*. This is because the change is only applied to the *Formulation Output* state.

In addition, this option only provides access to the configuration of the columns in the grid. To add or edit subtotals of ingredient types, you must edit the job preferences settings.

The grid designer is accessed from the Tools Menu (*Tools Menu, Grid Designer*). It can also be accessed from the Formula Grid, by right-clicking anywhere in the grid. A menu displays that contains the Grid Designer option.

- **Saving Changes to the Grid.** Changes made using either tool are applied only to the active job, and are automatically saved with the job. However, when the same job template is used for a new job, the original grid settings, stored with the job template, will be restored. To make the changes permanent for use with future jobs, select *File (menu), Save Job As New Template* to save the changes to a job template. See also *Jobs and Templates*.

See also *Formula Central Menus, Tools Menu, Job Preferences, Appearance Tab* for details on each row and column included in the Formula Grid.

NOTES & TIPS ABOUT FORMULA GRID CONFIGURATION

- The job template you are running sets up the initial configuration of the Formula Grid. Any changes you make at run time, whether you resize the grid or change its contents, are restricted to the particular job, and are saved with the job.
- If the job is saved as a template (*File, Save As, Job Template*), the current grid configuration will be stored with the job template, and will be available for use with other jobs. You can specify batch size, or any ingredient type subtotals for future use. To do this, input the required information into the grid before saving it as a job template.
- The number in the 'order' field on the tabs determines the location of the column field in the grid. Rows are numbered top-to-bottom, and columns are numbered left to right.
- There is also limited access to the grid configuration directly from the grid itself. Right-click anywhere in the grid to display the grid designer options.

NOTES & TIPS ABOUT FORMULA GRID COLUMNS

- The width of any column can be changed directly in the grid. This is done by positioning the cursor over either boundary and dragging the boundary to the left or right.
- Each job (and job template) contains separate row and column settings for the four possible job states. Because of this, the columns may appear to you to randomly 'appear' and 'disappear'. See also *Job States for a detailed discussion of this feature*.

NOTES & TIPS ABOUT FORMULA GRID ROWS

- The rows contain individual ingredients, and subtotals for various ingredient types
- The number of ingredients may vary, but there is a maximum of (7) seven rows that contain subtotals. They correspond to the six ingredient types used by the program, and one row for "Total Batch." These rows always appear below the individual ingredients
- You cannot hide individual ingredients
- You can hide or show individual sub-total rows, but you cannot change or add to these seven rows.
- If you have enabled concentrate scaling, three (3) additional subtotal rows displays: *Carrier Resin*, *User Resin* and *Total Concentrate*. This brings the total to (10) ten.

Formula Storage/Retrieval

Whenever you enter Formula Central, a "job" automatically opens. This job is an ongoing electronic record of all of the activity that occurs for a particular color match or correction, and all of the information is automatically stored in a permanent job record. After the job is completed, you may need to reference the final formula for use in a new color match. By recalling the job, you have access to the formula information. Since the job record contains much more than the final formula, sorting through it to find the final formula can become time-consuming.

To simplify this formula storage and retrieval task, Formula Central includes the option to save and retrieve formulas as a separate formula record. Unlike a job record that contains all of the activity for a job, a formula record narrows the information to the following:

- a single formula
- a measurement of a sample made from the formula

In Formula Central, formula records can later be retrieved manually by name. They are also accessed by the **Autoformulate**, **Search** and **Search & Correct** options.

Formula Storage/Search Options

If you plan to use the program options Search or Search & Correct, you must create separate formula records. These program options retrieve stored formulas to be used for new color matches. However, they do not search job records to retrieve formulas. They only look at formula records.

See also *Auto Formulate*, *Search* and *Search & Correct* for information on Search and Search & Correct features.

NOTES AND TIPS ABOUT FORMULA STORAGE

- Unlike job storage, formula storage is not an automatic function. You must select the *Save Formula* icon to store a formula. See also *Formula Storage Procedure* for step-by-step instructions.
- The formula to be stored must be displayed in Formula Central at the time you select the **Save Formula** icon.

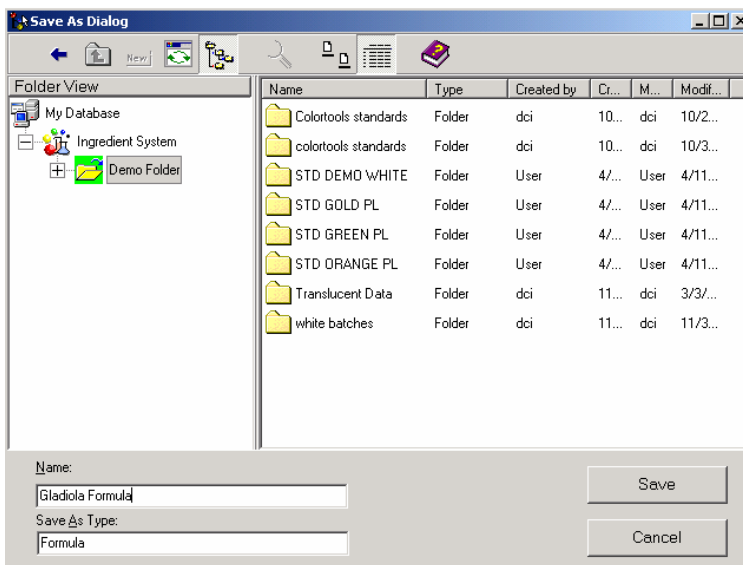


- To make the stored formula available for Search and Search & Correct, a sample must be in the *Trial* field.
- You can store formula information at any point in the matching and correction process.
- If the job state is Formulation Input (no trial entered) when you save the formula, only the target and the formula are stored. No trial data is stored. This formula can only be retrieved manually by name. It is **not** available to Search or Search & Correct.
- If the job state is either Correction Input or Correction Output, the information stored includes the formula and trial sample. This formula is available for Search and Search & Correct, and can also be retrieved manually by name.
- If the formula used to make the physical sample is not identical to the displayed formula, you should edit the displayed formula **before** you save it.
- If you have prepared the recommended correction and approved it visually, you must also measure the approved sample as the trial sample, to include it in the formula record.

Unlike job storage, formula storage is not an automatic function. You must select an option to store a formula. The typical procedure for storing a formula is as follows:

1. Recall the job used to generate the original formula prediction.
2. Verify that the job state is *Correction Input*.

3. Measure the actual sample made from the formula prediction as the Trial. *You must have a sample in the Trial field in order to later retrieve the formula for Search or Search & Correct options.*
4. Edit the formula in the formula grid to match the formula used in the physical sample.
5. Click on the *Save Formula* icon on the Formula Central window. The navigator window opens.



6. Enter a name for the formula, and select a folder where the formula record will be stored. When you have made this selection, the **Save** button will be become active.
7. Click **Save**.

When you use this procedure, the following information is stored in the formula record:

- Formula currently displayed in the formula grid.
- Spectral data for the sample.

This information can be recalled by name for use in Formula Central at any time. It is also available for the Search and Search & Correct options.

Storing Formulas Manually

You may have the need store a formula that was not generated from Formula Central. This can happen when someone matches a color visually, or if the formula came from an outside source. The formula has been approved for use, and you would like to make it available for use when running Search or Search & Correct.

1. Measure the sample made from the formula as the trial.
2. Select the ingredients contained in the sample.
3. Enter the ingredient amounts in the sample. Be sure to enter exact amounts, including decimal amounts.
4. Click on the **Save Formula** icon in Formula Central. The navigator window opens.
5. Select a folder to hold the formula record. When you have made this selection, the **Save** button becomes active.
6. Assign a name to the formula record.
7. Click **Save**.

NOTES

- To make this formula available for use in Formula Central, you must have a physical sample to accompany the formula.
- You must measure the physical sample as a trial in order to make the formula available to the Search and Search & Correct options.

Formula Retrieval

Stored formulas can be retrieved manually in Formula Central, based on the formula name. Formulas are also retrieved by the Search and Search & Correct program options, through the use of keywords that can include colorimetric properties such as color difference, opacity, etc. and physical properties such as opacity.

The information contained in a formula record includes:

- List of ingredients and amounts
- Sample data for the sample associated with the formula

Keywords and Formula Retrieval

Keywords are created and assigned to ingredients in *Ingredient Maintenance*. Once keywords are created, you can create a keyword query in Formula Central. The query is used to retrieve formulas from the database. When you create a keyword query, you are asking the program to retrieve formulas containing ingredients that have a specific keyword (for example "lead-free").

See also...

- ***Ingredient Maintenance, Keywords*** for information on creating and assigning keywords to ingredients.
- ***Formula Central Menu, Tools Menu, Select Ingredients*** for instructions to create a keyword query.

Formula Sample Handling Settings

When a formula is recalled through Search, the stored formula sample is displayed in the trial field, and the stored formula is displayed in the formula grid.

If you are viewing multiple formulas using the Reports option, formulas retrieved through the Search option are coded as "1" in the *Formula Type* field.

If you have *Show Best Formula* enabled in job preferences, and the Formula found from Search does not satisfy the job tolerance, it is coded "4".

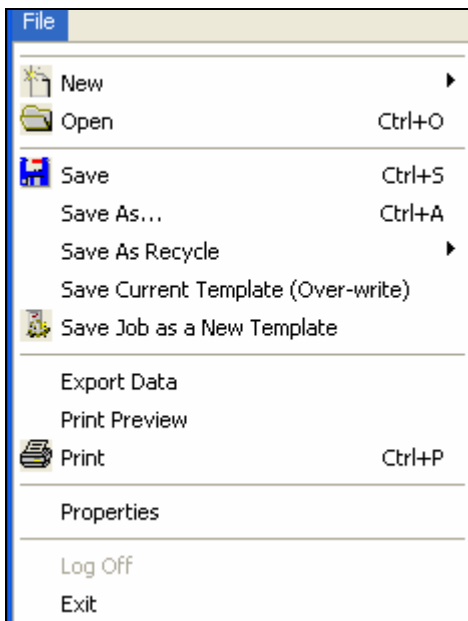
When the formula is retrieved manually by name, the program must know where to put the sample data. This selection is made in the System Administration program module. See also *Applications Technology, Formula Storage and Retrieval, Formula Sample Handling* for a detailed discussion of the sample handling feature and settings.

NOTES

Formula Central Menus

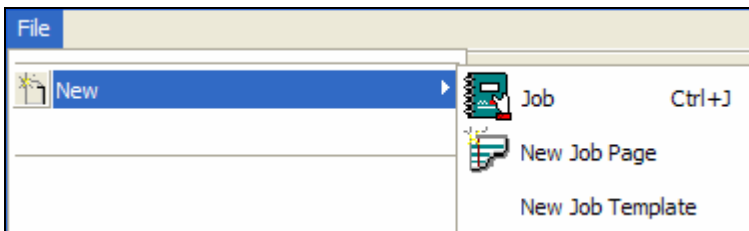
File Menu

The File Menu includes standard options for opening, closing, creating and editing files, printing file contents and closing the program. It also includes options for creating, saving and retrieving jobs and job templates used in Formula Central.



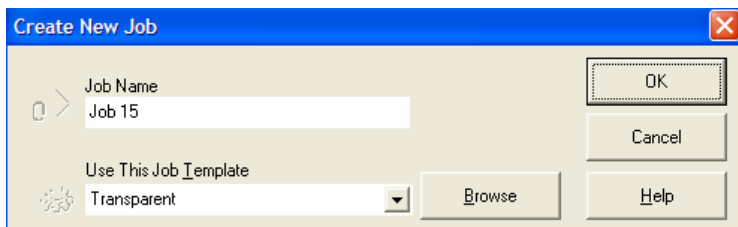
New

Provides options to create a new job, job page or job template:



New Job

- To create a new job, click **File Menu, New, Job**. The Create New Job dialog box displays.



The default name assigned to a job is a number. You can edit this name.

You must select a job template to be used for the job. The template provides default information used by the program to calculate formulas. *See also Program Features, Jobs and Templates for an explanation of jobs and templates.*

New Job Page

Starts a new job page using the current information. This moves Formula Central into an *Input* state, and allows you to add/change the job information to be used for the match/correction. If you are in a formulation state, you will start a new formulation page. If you are in a correction state, you will start a new correction page. *See also Program Features, Jobs and Templates for an explanation of job pages.*

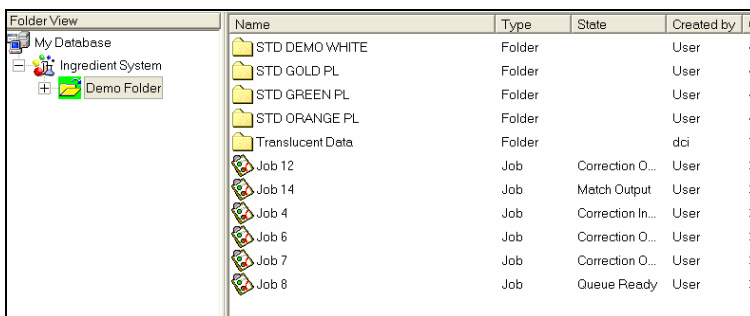
New Job Template

Stores the existing job information as a new job template. This includes all job preferences selected, and default settings created/edited in the Admin program module.

This operation can only be completed if you are in the job state *Formulation Input*.

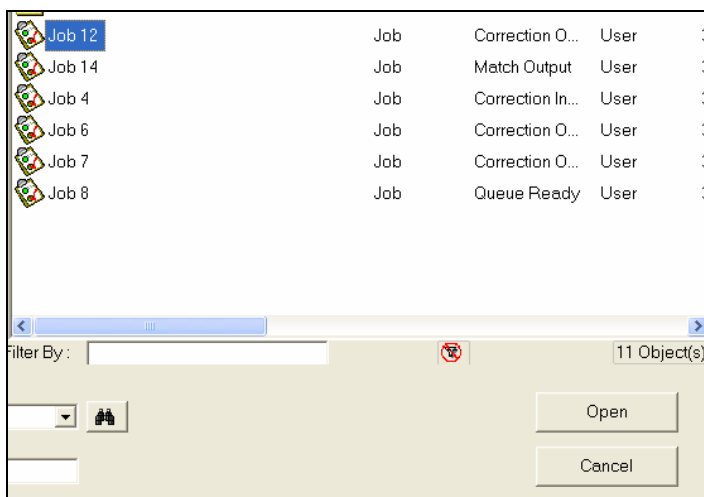
Open

Opens a job previously stored. When selected the window below is displayed:



Name	Type	State	Created by
STD DEMO WHITE	Folder		User
STD GOLD PL	Folder		User
STD GREEN PL	Folder		User
STD ORANGE PL	Folder		User
Translucent Data	Folder		dci
Job 12	Job	Correction O...	User
Job 14	Job	Match Output	User
Job 4	Job	Correction In...	User
Job 6	Job	Correction O...	User
Job 7	Job	Correction O...	User
Job 8	Job	Queue Ready	User

- Click to select a record, and then click **Open**.



The Formula Central screen refreshes and displays the information you have selected.

Save

Saves the job currently open. If you have disabled the *Autostore Jobs* option, you must use this option to store the job data. *See also Admin, All Users Tab for information to enable/disable the Autostore option.*

Save As

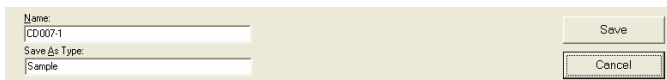
This option can be used to save the entire job, or specific data included in the job such as the target, trial, substrate, or formula prediction. When the Save As option is selected, the program default saves the job.

To save target, trial, substrate or formula data:

1. Click in the field to be saved. In the example below, the Target is selected:



2. Click **File Menu/Save As**. The Navigator window will open. The Save As Type field at the bottom of the window displays the name and data type to be saved:



3. Click on the **Save** button.

Save As Recycle

A recycle is a material that typically has been rejected as “off-color”, or is leftover from a production run. This option enables you to recycle, or “work off” this excess material into another production batch. *See also Applications Technology, Recycles for a complete discussion of the purpose and implementation of this option.*

Save Current Template (Overwrite)

Saves the current job information under the existing job template name. This option overwrites the information in the job template with the current selections.

This operation can only be completed if you are in the job state Formulation Input.

Save Job as New Template

Saves the job data as a new template. This operation can only be completed if you are starting a new job.

Export Data

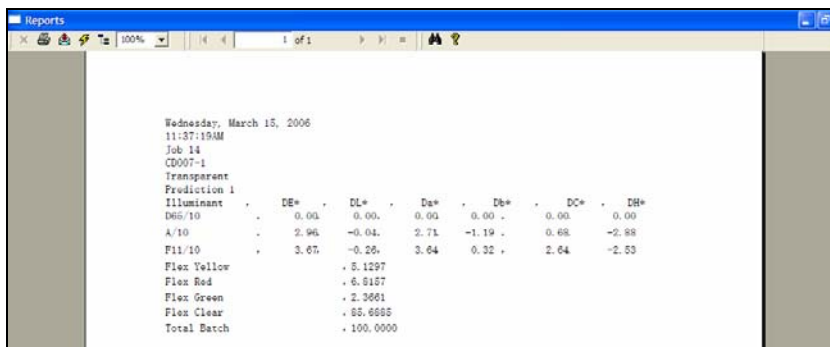
This option is used to export a limited amount of formulation or correction information to an ASCII file format, for use with third-party applications.

NOTE

The Export option can only be used in combination with Crystal Reports software. Please contact your Applications Specialist for support to use this feature.

- Click on **Export Data**. The program will export data based on the current job state in Formula Central.

Below is an example of the formulation data that can be exported:



	DE*	DL*	Ds*	Ds*	DC*	DH*
Wednesday, March 15, 2006						
11:37:19AM						
Job 14						
CD007-1						
Transparent						
Prediction 1						
Illuminant						
D65/10	0.00	0.00	0.00	0.00	0.00	0.00
A/10	2.96	-0.04	2.71	-1.19	0.68	-2.88
F11/10	3.67	-0.26	3.64	0.32	2.64	-2.53
Flex Yellow						
Flex Red						
Flex Green						
Flex Clear						
Total Batch						

Print Preview

The option displays the output that will be printed, when the Print option is selected.

Print

Prints the job data as a batch ticket. Select *Print Preview* to examine the printed output the will be generated.

Properties

Displays the job preferences selected for the current job. You can edit any of the selections from this option.

The Properties dialog box is shown with the 'Advanced' tab selected. The settings are as follows:

- Number of Formulas to Show:** 5
- Matching Options:**
 - Stop After: 10 Formula Found
 - ☒ Profiling
 - ☐ Quick Match (alternate point matching)
- Show Predictions in Spreadsheet:**
 - ☐ Always
 - ☒ Never
 - ☐ Auto (Multiples Only)
- AutoFormulate Method:**
 - ☒ Optimum
 - ☐ Multiple
- Always Display Evaluation Grid on Output:** ☒
- Sort Formulas By:** Five dropdown menus, all set to 'None'.
- Weights for Custom Sort:** Five dropdown menus, all set to 'None' with a weight of 0%.
- Job Template:** Transparent
- Buttons:** Help, Cancel, OK

See also *Formula Central Menus*, *Tools Menu*, *Job Preferences* for explanation of all of the job preference selections.

Log Off

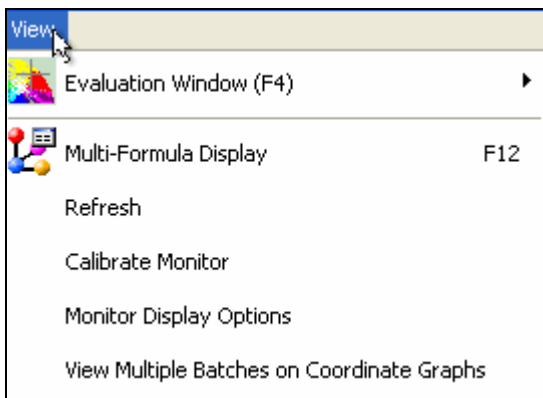
Not currently enabled.

Exit

Closes Formula Central. The Data Navigator will remain open.

View Menu

The View Menu includes options to configure the evaluation window display, and the display of multiple formulas on a spreadsheet.



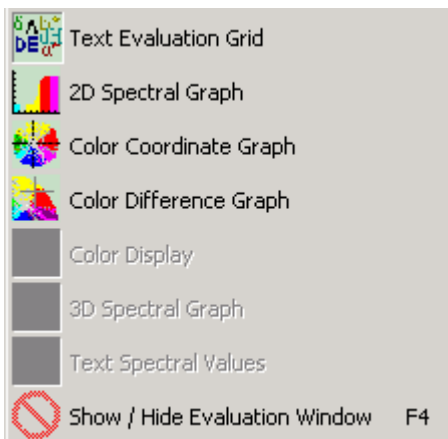
Evaluation Window Options

When the Evaluation Window (*View Menu, Evaluation Window*) or **Evaluation Window** button (see below) is activated, spectral and colorimetric data for the target, trial and predicted formula are displayed in the Formula Central window. When the *Evaluation Window* is enabled, the display can include either a text or graphic presentation of the colorimetric data.



CIELAB		L*	a*	b*	C*	h	CF
Target		74.59	32.27	13.50	34.98	22.71	
Trial As Is		74.80	32.98	13.67	35.70	22.52	0.12
Trial Corrected		74.88	32.46	13.42	35.12	22.46	0.12
Substrate		94.90	-0.47	5.50	5.52	94.87	
Trial As Is	DE*	DL*	Da*	Db*	DC*	DH*	MI
D65/10	0.76	0.21	0.71	0.17	0.72	-0.12	0.70
A/10	0.98	0.31	0.62	0.70	0.90	0.24	
F11/10	0.93	0.19	0.88	-0.23	0.70	-0.58	

The configuration of the evaluation window is accessed from *View Menu, Evaluation Options*. It provides options to display data either in text or graphic format. For the graphic options, it includes choices to graph either spectral or colorimetric data. When **View Menu, Evaluation Options** is selected, the menu below displays:



NOTES AND TIPS FOR THE EVALUATION WINDOW

- The text display includes data for a maximum of five (5) Illuminant/Observer conditions. The Illuminant/Observer condition is displayed on the Formula Central screen. You can change the Illuminant/Observer selections for the job from *Tools Menu, Job Preferences, Tolerances Tab*, or selecting the *Job Preferences* button on the toolbar.
- The selection of the color space displayed is controlled through Job Preferences.
- When the Evaluation Window is *disabled*, match parameters and keywords are displayed in the right half of the window.
- You can only display one evaluation tool at a time.
- Color space coordinates and color difference calculations are colorimetric functions, and they are calculated for a specific Illuminant/Observer combination. Color differences between samples change when either the Illuminant or the Observer is changed.
- Regardless of the type of plot selected, the target plot is red, and the trial plot is green.
- Strength, whiteness and yellowness indices, trend analysis, and other evaluation tools not included in the evaluation window of Formula Central can be found in the Color Tools (QC) program.
- Several of the options in this menu can be accessed from the toolbar at the bottom of the evaluation window. The evaluation window can also be configured using these buttons.

Text Display

When the Text Evaluation Grid is selected, screen below displays:

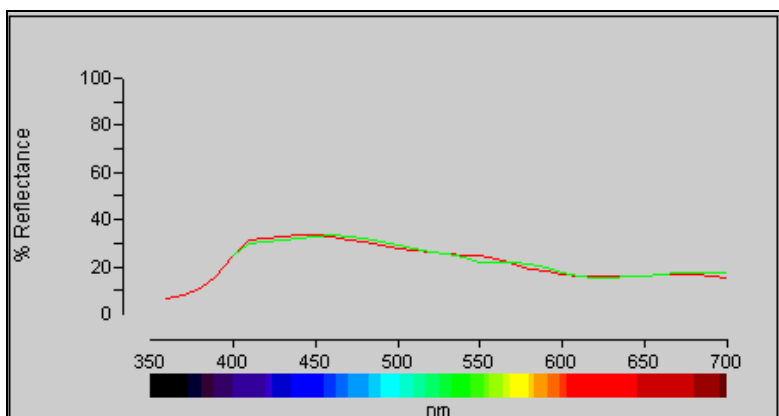
CIELAB		L*	a*	b*	C*	h	CR
Target		76.07	0.01	0.00	0.01	0.00	62.00
Formula		76.07	0.01	0.00	0.01	0.00	62.00
Substrate		94.09	-0.68	2.79	2.87	103.61	
Formula		94.09	-0.68	2.79	2.87	103.61	
	DE*	DL*	Da*	Db*	DC*	DH*	CDE
D65/10	0.00	0.00	0.00	0.00	0.00	0.00	15.05
A/10	0.26	0.00	0.25	-0.09	0.26	0.00	16.38
F11/10	0.14	-0.03	0.09	-0.10	0.13	0.00	15.78

It includes colorimetric data for the target, trial and predicted formula.

The Evaluation Window includes options for graphically displaying either spectral data or colorimetric data.

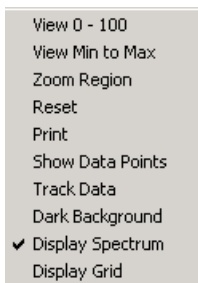
Spectral Graph

The 2D Spectral graph is a rectangular plot of the reflectance or transmittance values vs. wavelength.



Customizing the Spectral Plot

When you right-click in this plot the following menu displays:



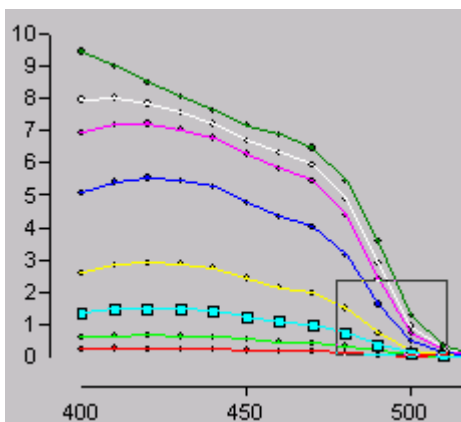
A check next to the scaling option indicates that it is enabled.

View 0 –100. The vertical (x-axis) axis is scaled to include values from 0 –100.

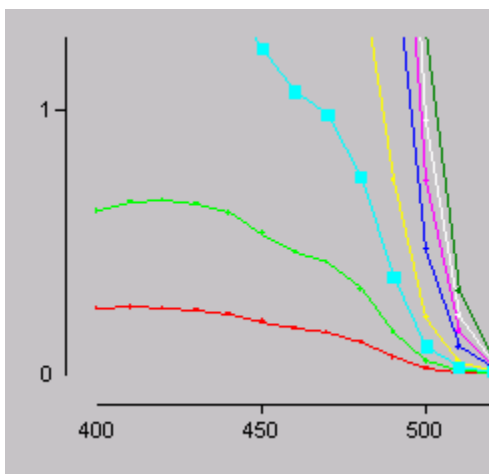
View Min to Max. The vertical (x-axis) is scaled to display 0 – max value. The max value is determined based on the samples included.

Zoom Region. User can magnify or ‘zoom’ a particular area of the plot along the vertical axis (x-axis). To magnify a particular region:

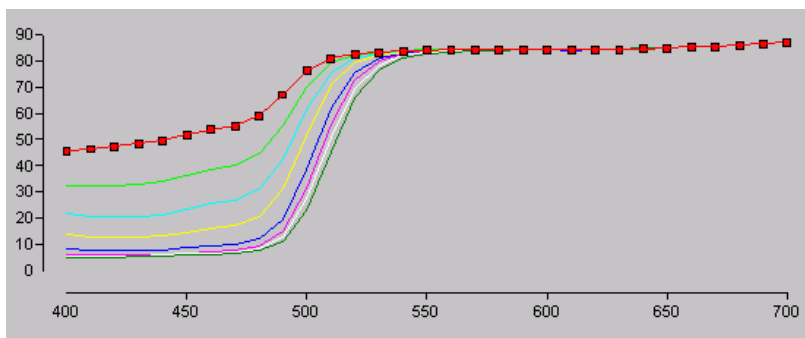
1. Select **Zoom Region** from the menu.
2. Using the mouse, place the cursor in the area to be zoomed.
3. Click the mouse key.
4. Move the mouse away from the insertion point. A rectangle is drawn around the area to be magnified.



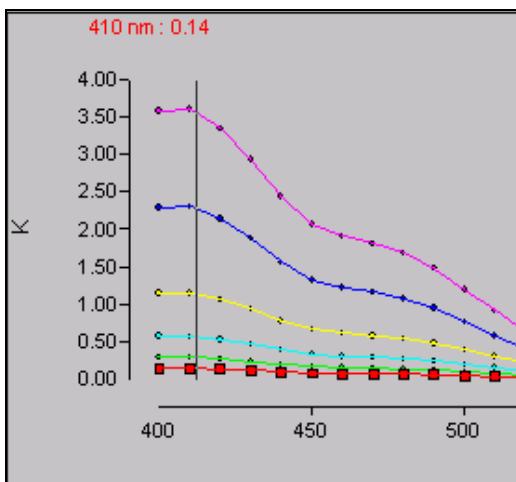
5. When the rectangle includes the entire area of interest, click the mouse key again. The plot will immediately refresh, and the area identified will be magnified.



- **Reset Graphics.** Rescales the plot scale to the default values. This is used to reset the plot after the *Zoom* option is used.
- **Print Graphics.** Prints the plot. It uses the default Windows settings for the printer.
- **Show Data Points.** The data points on all of the curves are displayed. When this feature is disabled, only the data points on the active curve are displayed.



Track Data. Activates the Data Tracker. When this function is enabled, a vertical black line displays in the plot. The mouse controls the movement of this line along the horizontal axis (x-axis).



This tool is referred to as the "Data Tracker". It is used to isolate behavior at a point of particular interest along the x-axis of the plot. When the graph includes multiple curves, the Data Tracker allows you to closely examine the behavior of every curve at the same point.

The upper left corner of the plot identifies the x,y coordinates for the point highlighted by the Data Tracker.

410 nm : 0.14

The graph above plots the level data for a particular colorant. It is a plot of K vs. wavelength. The point highlighted by the Data Tracker is 410nm (wavelength), and the K value for the active curve at 410 is 0.14.

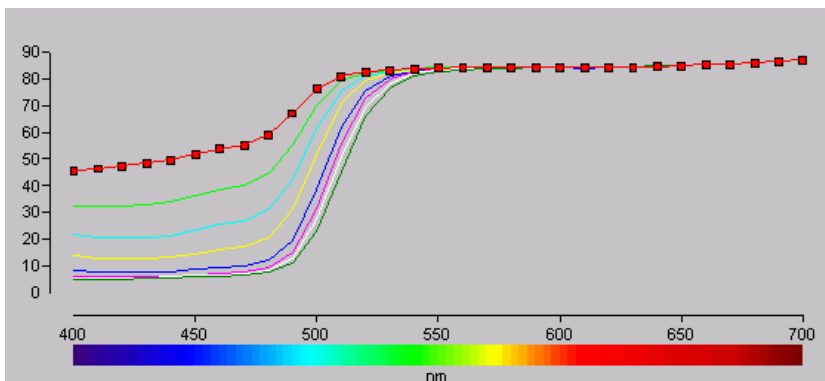
Depending on the type of plot selected, this plot may include wavelength data, concentration data, spectral data or optical data.

NOTE

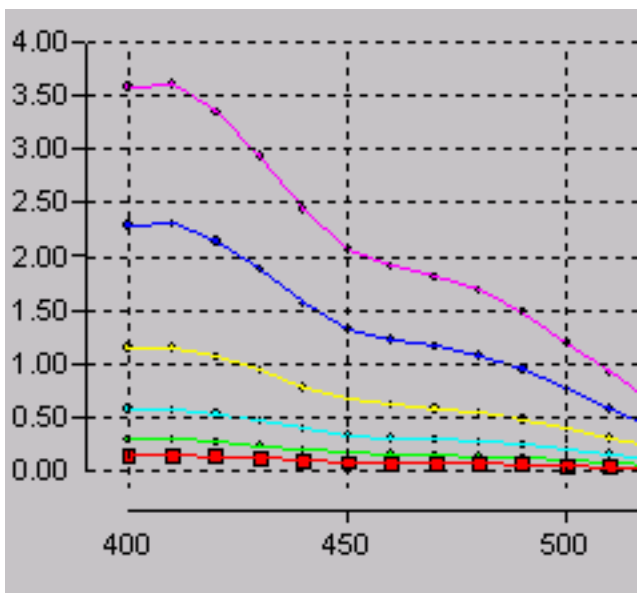
The curve for the lowest level in the record is always labeled as the standard. When you highlight a different level in the plot, both a standard and batch values are displayed. The standard remains the lowest level in the record, and the batch data represents the data for the second curve that has been highlighted.

Dark Background. The background color of the plot is changed from gray to black.

Display Spectrum. The visible spectrum is displayed under the horizontal axis (y-axis).



Display Grid. When enabled, grid lines are added to the plot.

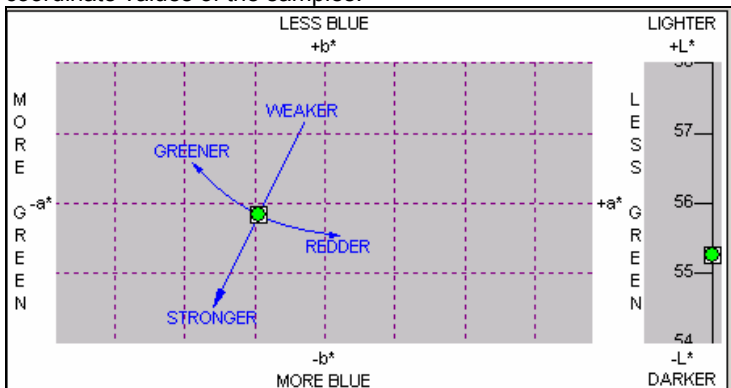


Colorimetric Plots

Colorimetric plots include both color coordinate (absolute) and color difference plots.

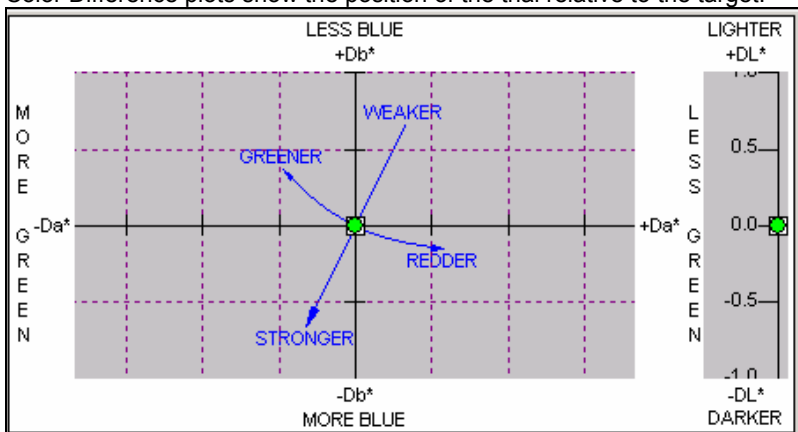
Color Coordinate Plot

Color coordinates locate the samples in a color space model, based on the absolute coordinate values of the samples.



Color Difference Plot

Color Difference plots show the position of the trial relative to the target.



The target is always located at the intersection of the a , b axis .

NOTES AND TIPS FOR COLORIMETRIC PLOTS

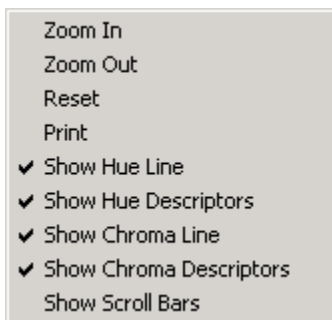
- Color space coordinates and color differences are colorimetric functions. They are calculated for a specific Illuminant/Observer combination, and change when either the Illuminant or the Observer is changed. The Illuminant/Observer selection is accessed through *Tools Menu*, *Job Preferences*, or by clicking the **Job Preferences** icon on the toolbar.



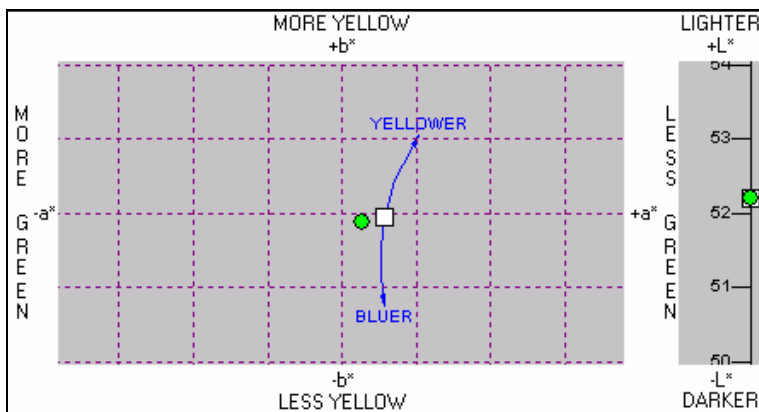
- Color Coordinate plots are absolute plots. The intersection of the x, y-axes is a neutral color.
- Color Difference plots are relative plots. The intersection of the x, y-axes is the target, and the trial sample(s) are plotted relative to the target.
- The axes on a both color coordinate and a color difference plot contain similar legends (i.e., L^* , a^* , b^* , etc.). When the letter "D", is not included in the axis label (i.e., Da^* , Db^* , DL^* , etc.), absolute coordinates are displayed, not relative differences.
- When the intersection of the axes falls in the center of the display, it is usually a color difference plot. When the intersection of the axes is not centered in the display, the plot is a coordinate plot.
- If the color space selected includes a hue axis, the "hue line" points to the origin.
- Each of the Lab color difference calculations offered (CIEL a^*b^* and Hunter Lab) displays Lab values for the same sample. When you are working with Lab values it is very important that you define which Lab equation you are using.
- You can plot all of the trials included in the job, or you can limit the number of trials included in the plot.

Customizing the Colorimetric Plots

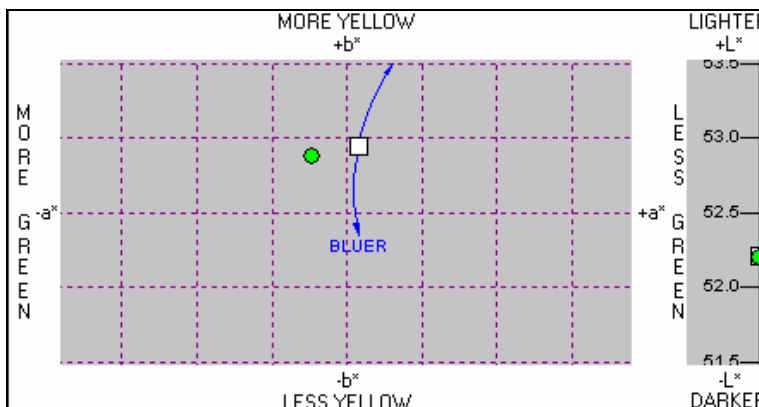
The options for scaling a plot are accessed by placing the cursor anywhere on the plot, and clicking the right mouse button. A menu containing scaling options relevant to the plot currently displayed displays. A check next to the scaling option indicates that it is enabled.



Zoom In. Magnifies the area selected. Each time you click on “Zoom In” the plot refreshes and magnifies a smaller area. Click on “Reset” to return to the default settings for the plot.



Default Plot Setting



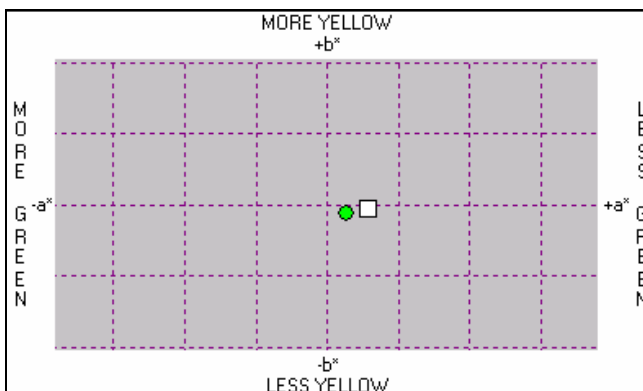
Zoom In

Zoom Out. Creates a wider view of the plot. Each time you click on “Zoom Out” the plot refreshes and includes a larger area. Click on “Reset” to return to the default settings for the plot.

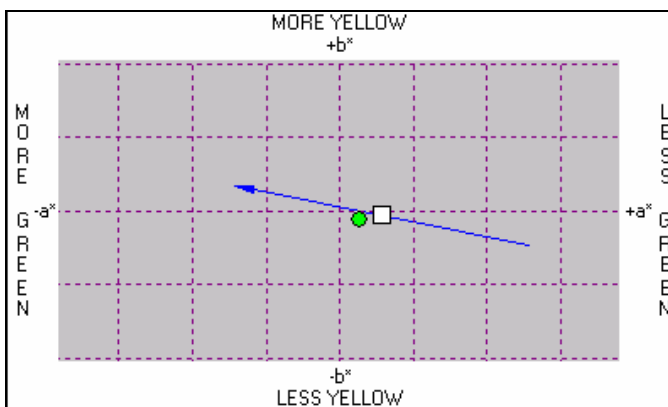
Reset. Rescales the plot using the default settings.

Print. Sends the plot to the printer.

Show Hue Line. Includes the hue line on the plot. This is a line segment that displays on the plot, and indicates the relationship between the target and trial along the hue axis. All points included on the line segment itself have the same hue.



No Hue Line



Hue Line

NOTE

You can enable the hue line, chroma line, hue descriptors and chroma descriptors on a single plot.

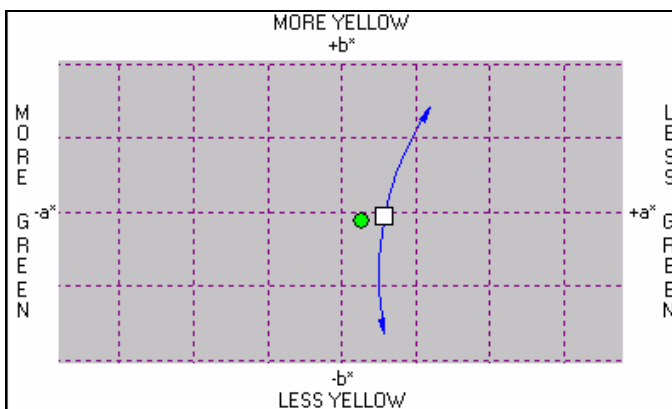
Show Hue Descriptors. The plot will include the display of text descriptors that interpret the differences between the target and trial along the hue axis. This text will include comments such as “redder”, “greener”, “yellower”, “bluer”, etc.

You can enable the hue line, chroma line, hue descriptors and chroma descriptors on a single plot.

Show Chroma Line. Plot will include an arc that passes through the target. All points on the arc represent samples having equal chroma.



No Chroma Line



Chroma Line

You can enable the hue line, chroma line, hue descriptors and chroma descriptors on a single plot.

Show Chroma Descriptors. Plot includes the display of text descriptors that interpret the differences between the target and trial along the chroma axis. This text will include comments such as “weaker”, “stronger”, etc.

You can enable the hue line, chroma line, hue descriptors and chroma descriptors on a single plot.

Show Scroll Bars. Displays scroll bars, providing a larger chunk of color space in which the samples displayed are located.

Evaluation Toolbar

When the cursor is positioned over the double line at the bottom of the evaluation window, a toolbar displays.



It contains icons that are shortcuts used to change the evaluation display types. In several cases, these correspond to options included on the View Menu/Evaluation Window.



Displays Color Difference Text



Displays 2D Spectral Graph



Displays Color Coordinate Graph



Displays Color Difference Graph

ROL/ROD. For some translucent applications, the sample data is based on two measurements. When the application requires two measurements, you must indicate which measurement data you want to display in the Evaluation Window:

- **ROL.** Displays the data from the measurement "over light" background. The color difference displayed is based on the sample presented over the "light" background.
- **ROD.** Displays the data from the measurement "over dark" background. The color difference displayed is based on the sample presented over the "dark" background.

Multi-Formula Display

When you run a match in Formula Central, the program routinely finds several formulas that satisfy your requirements. When the calculation is completed a single formula, determined to be the 'best' formula for the job, is displayed in the formula grid. However, you have the option to view all of the candidate formulas on the same screen. This is done selecting *View Menu, Multi-Formula Display*, or by clicking the **Spreadsheet Display** button on the toolbar.



Multi-Formula Spreadsheet

When this option is selected, the following window displays:

Target					
Blue Panel #24					
Evaluation / Sort	Prediction 1	Prediction 2	Prediction 3	Prediction 4	Prediction 5
Formula Type	3	3	3	3	3
Goal Function	0.80	0.81	1.01	1.20	1.32
None					
None					
None					
Flex Red	7.5246	5.1811			
Flex Green	17.5543	27.5440	21.2182	2.0895	
Flex Blue	9.0888			12.4114	13.3227
Flex Clear	65.8324	58.8366	66.4246	81.2459	82.0038
Flex Violet		8.4382	9.9728		
Flex Black			2.3843	4.2532	3.9674
Flex Yellow					0.7060

The formulas are sorted from best to worst, from left to right on the spreadsheet. The display includes information about the source of the formula, the sort criteria used, and the relative ranking of the formula within the current group selected.

- Evaluation/Sort.** The top five rows provide information about the source of each formula, and the criteria used to sort.
- Formula Type.** Identifies the source of the formula (e.g., Search, Search & Correct, Combinatorial) that generated the formula. See grid below for formula type codes.

NOTE
Formula Type is displayed only when Autoformulate is the formulate option used.

1	Formula source is <i>Search</i> . Formula satisfies job tolerances.
2	Formula source is <i>Search & Correct</i> . Formula satisfies job tolerances
3	Formula source is <i>combinatorial match</i> . Formula satisfies job tolerances
4	Formula source is <i>Search</i> . Formula does <i>not</i> satisfy job tolerances (<i>show best prediction</i> enabled in job preferences).
5	Formula source is <i>Search & Correct</i> . Formula does <i>not</i> satisfy job tolerances (<i>show best prediction</i> enabled in job preferences).
6	Formula source is <i>combinatorial match</i> . Formula does <i>not</i> satisfy job tolerances (<i>show best prediction</i> enabled in job preferences).

- Sort Criteria.** The four rows under Formula Type identify the sort criteria used to rank the formulas. In this example, the optimizer goal function is the only sort criterion used. The formulas displayed can be resorted by adding additional sort criteria from this screen.

- **Ingredients.** The rows below the sort criteria contain the ingredients used in the formulas. Click in the ingredient name field to move an individual ingredient to the top of the ingredient list.

Formula Name

The formulas are numbered from best to worst, based on the sort. The default formula name is “Prediction N” where “Prediction” is the default label assigned to the formula, and “N” is the formula number. The numbers are used to order the formulas from best to worst, with “1” indicating the best formula.

NOTES AND TIPS FOR MULTI-FORMULA DISPLAY

- The formula number assigned is not based on any sort criteria that are selected. The numbers are always based on how well the formula satisfies the optimizer goal function defined for the job.
- When no sort criteria are selected in job preferences, the default sort criterion used is the goal function. In this situation, the formula numbers are displayed in sequence from left to right across the spreadsheet.
- If you have enabled “*Always Show Best Prediction*”, the results may include formulas that do not satisfy the tolerances. This is based on the number of formulas requested, and the job tolerances. *See Tools Menu, Job Preferences, Tolerances Tab to view the job tolerances and “show best” options currently selected. See Tools Menu, Job Preferences, Results Tab to view/edit the number of formulas requested.*
- If you have **not** enabled “*Always Show Best Prediction*”, you may not receive the number of formulas you have requested. This is based on the number of formulas requested, and the job tolerances. *See Tools Menu, Job Preferences, Results Tab to view the number of formulas requested.*
- You can select and edit the sort criteria in Job Preferences, or from this screen. Any changes to the sort criteria made from this window are automatically updated in the job preferences for the job.
- Changes to the sort criteria are not permanently updated to the job template. To make the changes permanent, the job template must be re-saved.
- The formula number remains the same regardless of any resorting that is done. This enables you to keep track of how the formula ranking changes based on the sort criteria.
- The default formula label can be changed. *See System Administration, All Systems, View Details, User Defined Labels for instructions to edit the formula label.*
- Double-click in any formula column, to change the active formula in Formula Central. The multi-formula spreadsheet closes and the selected formula is displayed in the formula grid.

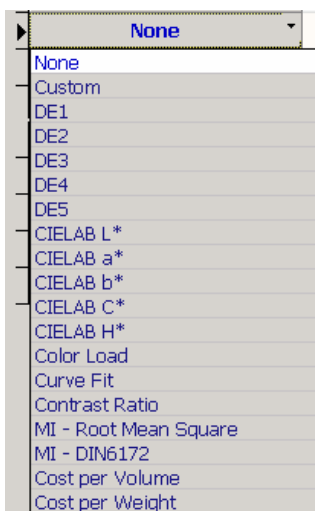
Editing Sort Criteria and Resorting Formulas

The formulas can be resorted based on various parameters.

 Target Blue Panel #24		Blue Panel #24: R = 104, G = 140, B = 161				
Evaluation / Sort		Prediction 1	Prediction 2	Prediction 3	Prediction 4	Prediction 5
►	Goal Function ▼	0.80	0.81	1.01	1.20	1.32
	None ▼					
	None ▼					
	None ▼					
	None ▼					
	Flex Red	7.5246	5.1811			
	Flex Green	17.5543	27.5440	21.2182	2.0895	
	Flex Blue	9.0888			12.4114	13.3227
	Flex Clear	65.8324	58.8366	66.4246	81.2459	82.0038
	Flex Violet		8.4382	9.9728		
	Flex Black			2.3843	4.2532	3.9674
	Flex Yellow					0.7060

To view these parameters:

1. Click the down arrow that displays in the *Evaluation/Sort* field in rows 1-5.
The following menu displays:



- Highlight a parameter to be used as a basis for resorting the formulas. The window will refresh, and the formulas will be re-ordered.

Target		Blue Panel #24: R = 104, G = 140, B = 161				
Blue Panel #24		Prediction 2	Prediction 1	Prediction 6	Prediction 7	Prediction 4
Evaluation / Sort						
Goal Function		0.81	0.80	1.56	1.79	1.20
CIELAB L*		0.00	0.00	0.00	0.00	0.00
None						
None						
None						
Flex Red		5.1811	7.5246		4.3771	
Flex Green		27.5440	17.5543	20.4328		2.0895
Flex Violet		8.4382		13.0167		
Flex Clear		58.8366	65.8324	63.1280	75.3899	81.2459
Flex Blue			9.0888		16.0311	12.4114
Flex Yellow				3.4225	4.2020	
Flex Black						4.2532

Refresh

Allows you to update or “refresh” the current display following any changes.

Calibrate Monitor

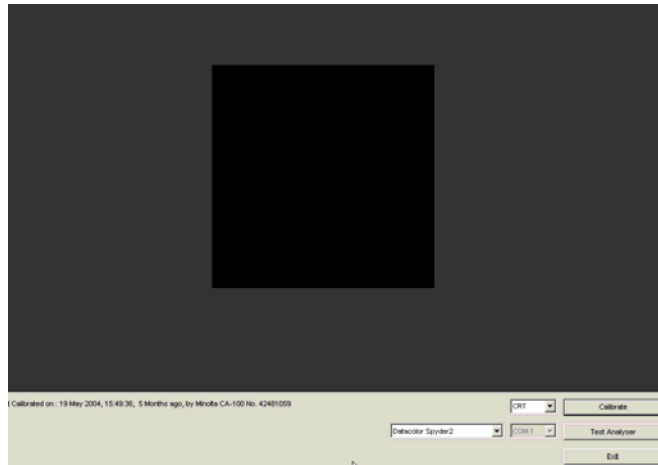
This option is used along with the Datacolor Spyder2 to adjust the color of the monitor. After calibrating the monitor, all color patches displayed on the screen should more closely approximate the color of the measured sample.

NOTES

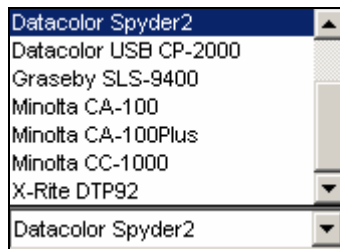
- See also *Datacolor Spyder2 User's Guide* to become familiar with the components and operation of the device.
- You will not need to install any additional software to enable this option.
- Connect the calibration device to the computer (either serial or USB port depending on the device you are using).
- Monitor calibration does not work with a terminal server application

To start the procedure:

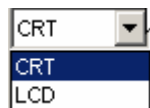
1. Select **View Menu, Calibrate Monitor**. The window below displays:



2. Verify that you have the correct device selected. Click on the down arrow to view the choices, and highlight the calibration device.



3. Verify that the correct monitor type is selected. Click on the down arrow to view the choices, and highlight the monitor type you are calibrating.



4. Click on **Calibrate**. The program will prompt you through the calibration.
5. When the calibration is completed, click **Exit**.

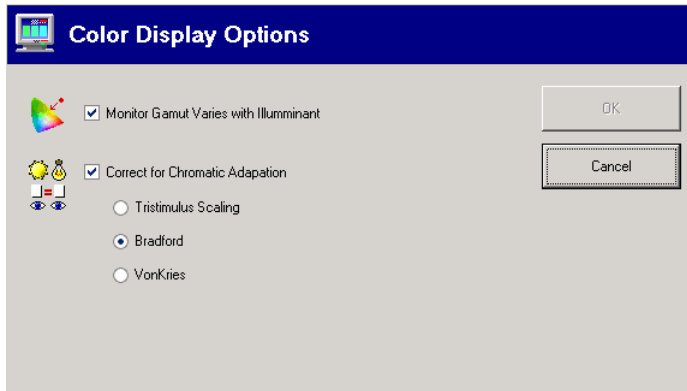
NOTE

For best results, perform the monitor calibration on a daily basis.

Test Analyzer. If you fail to communicate with the Spyder2, or the calibration is unsuccessful, use this option to test the communication between the computer and the calibration device.

Monitor Display Options

Color Display Options. This group of options controls the display of sample colors on the monitor. The selections also determine the method for finding the closest color (RGB value), when the sample color falls outside the color gamut of the monitor.



- **Monitor Gamut Varies with Illuminant.** When you change the Evaluation Illuminant/Observer selection, the RGB values for samples are calculated using the Illuminant/Observer currently selected. When this is not enabled, the RGB values for "out of gamut" colors are calculated using D65/10 Illuminant/Observer condition.
- **Correct for Chromatic Adaptation.** Enabling this option preserves the white balance of the color displayed, regardless of the Illuminant/Observer selected. When the option is not enabled and the Illuminant is changed from Ill D65 to Ill A, white samples often appear orange on the monitor. The remaining selections in this screen determine the factors used to balance the white point for the monitor.
 - **Tristimulus Scaling.** Uses the XYZ values of the sample to find the closest RGB value.
 - **Bradford.** Applies an additional factor to the transformation of the XYZ values to RGB values. Uses a different factor from the Von Kries equation.
 - **Von Kries.** Applies an additional factor to the transformation of the XYZ values to RGB values. Uses a different factor from the Bradford equation.

View Multiple Batches on Coordinate Graphs

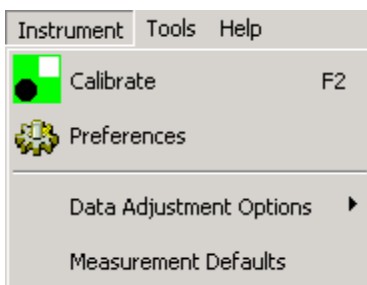
A coordinate graph is a color coordinate plot. If the job you are running has required multiple corrections, you may want to include each trial point on the graph, in order to analyze the behavior of the corrections.

- Click on this option to enable it. A check is added to the menu.
- Click on the option again, to remove the check and disable the option.

When this option is disabled, the color coordinate plot will include only the target and the current trial.

Instrument Menu

The Instrument Menu provides you access to instrument functions. These include instrument calibration, sample measurement, and the ability to change settings related to the instrument.



- **Calibrate.** This option opens the calibration procedure. You should calibrate the instrument every eight (8) hours for each measurement condition you use. For most instruments you will need the black trap and the white tile to complete this procedure.
- **Preferences.** This option controls the operating conditions of the spectrophotometer. Each instrument may have different features available. If an option is not available, the text for the option will be grayed out.
- **Data Adjustment Options.** *Not available for this version.*
- **Measurement Defaults.** Measurement defaults are created and edited from the Admin program module. This window provides access to defaults controlling the measurement. *See also Admin, All Users, View System Details, Measurements for information on the fields on this window.*

Calibrate

The Calibrate tab is used to select or edit the instrument conditions used measurement activities. It is also used to install the white tile calibration data used for instrument calibration. In the Calibration conditions dialog box, make your selections/entries according to the guidelines provided below.

NOTE

Depending on your instrument type, the features available on this screen may not be enabled.

The screenshot shows the 'Calibrate' dialog box with the following settings:

- Specular:** ☒ Include, ☐ Exclude, ☐ Gloss
- Aperture:** ☒ Large, ☐ Medium, ☐ Small, ☐ Ultra Small, ☐ Extra Ultra Small
- UV-Filter:** ☒ 100 % UV (Filter off), ☐ 0 % UV (Filter FL40), ☐ Filter FL42, ☐ Filter FL46, ☐ UV D65/10 (Ganz-Griesser) [68.0], ☐ UV D65/10 (CIE Whiteness) [52.1], ☐ UV C (ISO Brightness) [], ☐ Calibrator [90.0]
- Buttons:** Calibrate, Cancel, Abs.white..., Gloss table...
- Checkboxes:** ☒ Auto-Zoom, ☐ Transmittance
- Calibration time interval (hours):** 8
- Calibration condition:**
- Calibration time:**

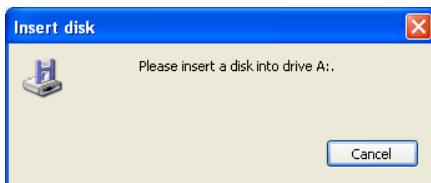
- Specular Port Selection.** This field determines the position of the specular port. It is either closed --Specular Included (SCI), or open-- Specular Excluded (SCE). This option is used to include or exclude the surface effects in the measurement. Specular Included will include the influence of the surface on the reflectance measurement, and Specular Excluded will exclude the surface effect from the measurement. Gloss makes two measurements of the sample; one specular included, and the other specular excluded.

- **Aperture Selection.** This refers to the aperture plate and lens position used. Your sample must completely cover the port size you select. Some instruments provide an automated lens selection. *Some instruments offer only one aperture size.*
- **UV Filter Selection.** This option identifies the UV filter position to be used for UV calibration and measurements. This option is not available for all instruments.
- **100% UV.** No UV radiation is excluded.
- **0% UV.** Wavelengths below 400nm are excluded.
- **Filter 42.** Wavelengths below 420nm are excluded.
- **Filter 46.** Wavelengths below 460nm are excluded.
- **Calibrator.** Used for CIE and Ganz-Griesser whiteness.
- **Auto-Zoom.** *Not applicable.*
- **Transmission.** Click on this check box to activate transmittance measurements.

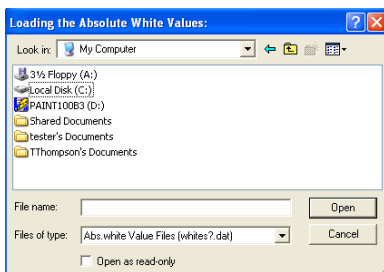
NOTE

Some instruments are not designed to make transmittance measurements.

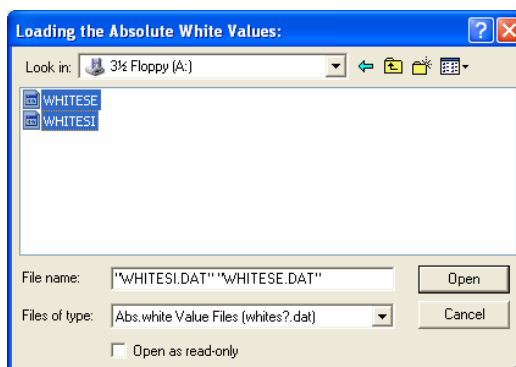
- **Abs. White.** Click on this button to install white tile calibration values specific to your instrument. This is typically done once, when the instrument is installed. If you have replaced the white calibration tile, you must install the tile data for the new tile. To install white tile data:
 1. Click on the **Abs. White** button. The program will prompt you for the calibration data.



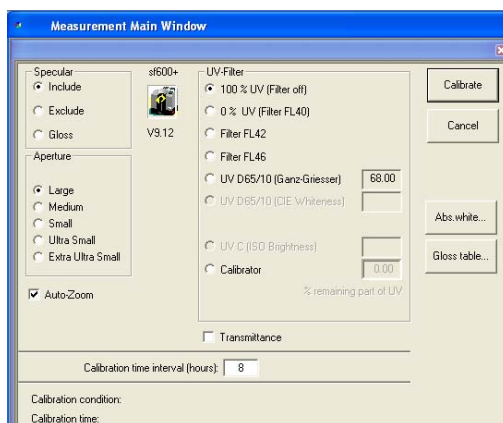
2. Place the calibration disk in the appropriate drive (diskette or CD drive). The program defaults to the diskette drive A. If it does not find this drive, it will prompt you for the disk location:



3. Browse to the correct drive, **highlight** it and click **Open**. Two files will be displayed:



4. Select both files and click **Open**. The calibration data will be copied to the system. When the data is copied, the window below will be displayed:



You can calibrate this instrument directly from this option, or you can calibrate at a later time.

- Click **Calibrate** to calibrate the instrument. You will need the black trap, white tile and green tile from the instrument tile box to complete the calibration. *See also Instrument Calibration Tutorial for instructions to complete the calibration.*
- Click **Cancel** to close this window.

- **Gloss Table.** This option provides access to the values used to adjust measurements for gloss values. Datacolor TOOLS offers a gloss compensation feature. Enabling the gloss option requires that additional tables be added to the system. This data is accessed from the calibration window (**Instrument Menu, Calibrate** or the **Calibrate** button on the button bar). It is typically only installed once.
1. Click on the **Gloss Table** button. The program will prompt you for a diskette containing the gloss information. It is included on the calibration diskette provided with the instrument. After the data is copied from the diskette, the window below displays:

	DeltaY	GLOSS
1. Point	0.440	10.100
2. Point	1.190	27.000
3. Point	1.690	50.300
4. Point	2.890	74.600
5. Point	3.290	79.500
6. Point	3.540	86.600
7. Point	4.710	91.300
8. Point	4.770	94.400

The *Aperture* and *Geometry* fields on this screen identify the conditions associated with the data displayed on the screen. Each aperture/gloss geometry combination uses a different set of factors to correct the measurement for gloss differences.

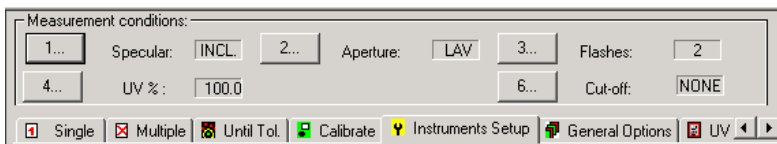
- **Aperture.** This corresponds to the aperture associated with the gloss data displayed.
- **Gloss Geometry.** This corresponds to the geometry associated with the gloss data displayed.

Calibration Time Interval (Hours)

This determines the interval applied for instrument calibration.

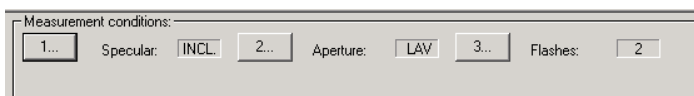
Preferences

The fields and tabs for this menu option control the operating conditions of the spectrophotometer:

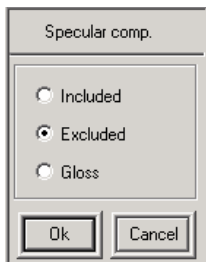


Each instrument may have different features available. To change any of the current conditions, do the following:

1. Click in the numbered button (1, 2 or 3) for the measurement condition.



A dialog box similar to the one below displays:



2. Make the required changes and click **OK**. The dialog box will close, and the Measurement Main Window will be displayed.
3. On the *Measurement Main* window, click **Save Setup** to save the changes. The new conditions will become the active conditions.

TIPS FOR CHANGING INSTRUMENT PREFERENCES

- When you make any changes to the instrument configuration, the changes may sometimes need to be made to both the software options, and to instrument switches. These situations may include:
 - Changing the measurement type from reflectance to transmittance. You must calibrate the instrument separately for each condition.
 - Changing the plate or 'mask' over the opening. This is required when you change the aperture size, and is done manually by replacing the aperture plate. Depending on the instrument you are using, you may have as many as 6 different viewing areas. Some instruments are

equipped with sensors that detect a change in the aperture plate, and communicate that information directly to the program. Others do not. Once you have successfully calibrated each aperture size needed, you can switch between the measurement types without recalibrating.

- Changing the lens used. If more than one viewing area is available, the instrument is equipped with multiple lenses. In some instrument models, the lens change is automated, and the change is communicated to the program. For other instruments, you must manually change the lens. Consult your instrument documentation to determine whether the lens change is made automatically or manually.

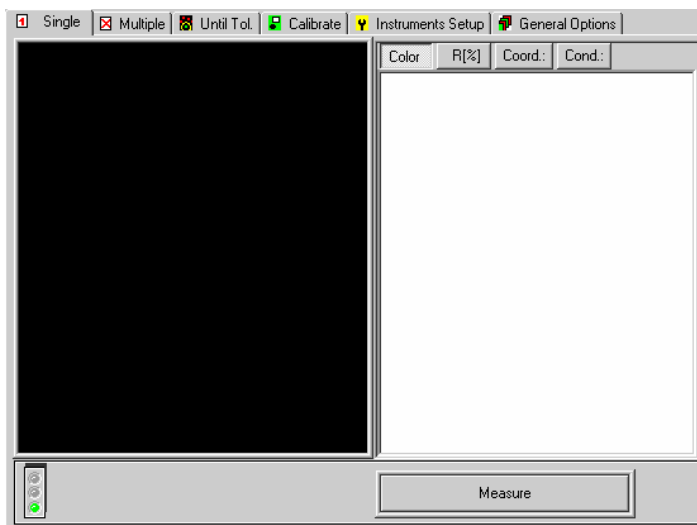
- You must calibrate the instrument separately for each condition.
- Before beginning the calibration, you should confirm that the aperture selection in *Instrument Preferences* matches the current aperture plate and lens configuration of the instrument.

Single Tab

The Single tab allows you to make a single measurement. There is no capability to enter a sample name, or store the data. It can be used to quickly check the measurement of a sample, without leaving the Instrument menu.

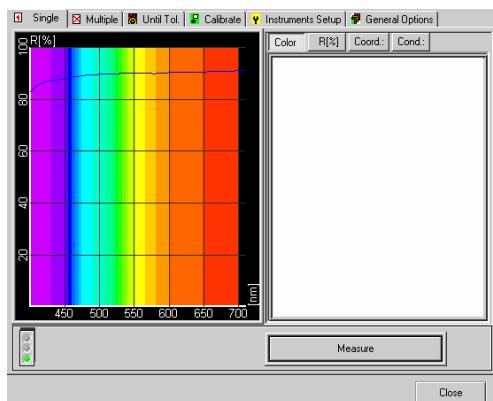
To start the measurement process, do the following:

1. Click on the **Single** tab.



2. Position the sample at the instrument port, and click **Measure**.

3. Choose the type of data to be displayed (*Color, R%, Coordinates, Condition*) by clicking the button.



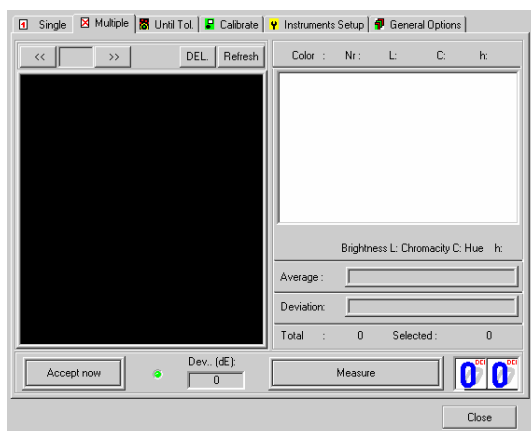
- **Color.** Displays a color patch and reflectance curve plot.
- **%R.** Displays reflectance values and reflectance curve plot.
- **Coord.** Displays the measured color coordinates for the sample.
- **Cond.** Displays instrument conditions for the sample measurement.

Multiple Tab

The Multiple tab allows you to average a series of measurements for a single sample. This measurement technique is commonly used to measure samples that do not have a uniform surface, such as textiles, textured paint, etc.

To start the measurement process, do the following

1. Click the **Multiple** tab.



2. Position the sample at the port. You may want to track the orientation of the sample by placing an arrow or some other marking on the back of the sample.
3. Click the **Measure** button.
4. For the next measurement, reposition the sample at the port, and click the **Measure** button again. After each measurement, the average of the scans is calculated. The deviation between each individual scan is calculated, based on L, C, h values, and is expressed as Delta E. There is also a counter displaying how many measurements have been taken.
5. To exclude an invalid measurement, highlight the invalid measurement, and click the **DEL** button.
6. To recalculate the average after a measurement is deleted, click the **Refresh** button. The *Average* and *Deviation* information is recalculated.
7. When the specified number of measurements has been completed, the **Measure** button will be labeled **Accept**. To accept and save the measurements taken, click **Accept**. This measurement stored will be the last calculated average.

TIP

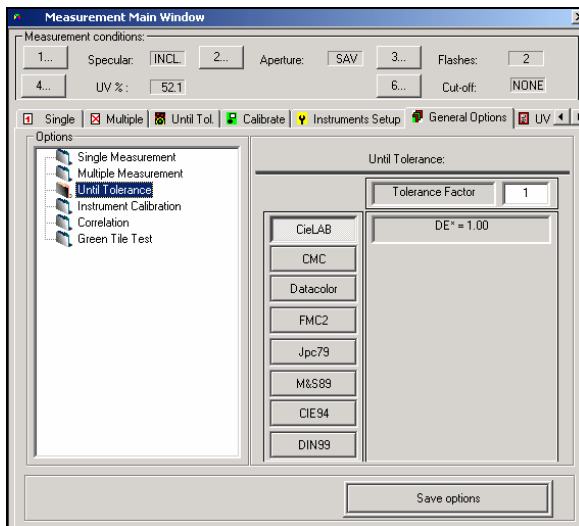
The number of measurements to be averaged is defined in the **General Options** tab, **Multiple Measurement**.

NOTES

- The measurements made in this option are not named.
- The measurements made in this option are not stored, and cannot be retrieved for use at a later time.
- The measurements made in this option do not appear on the desktop.

Until Tolerance Tab

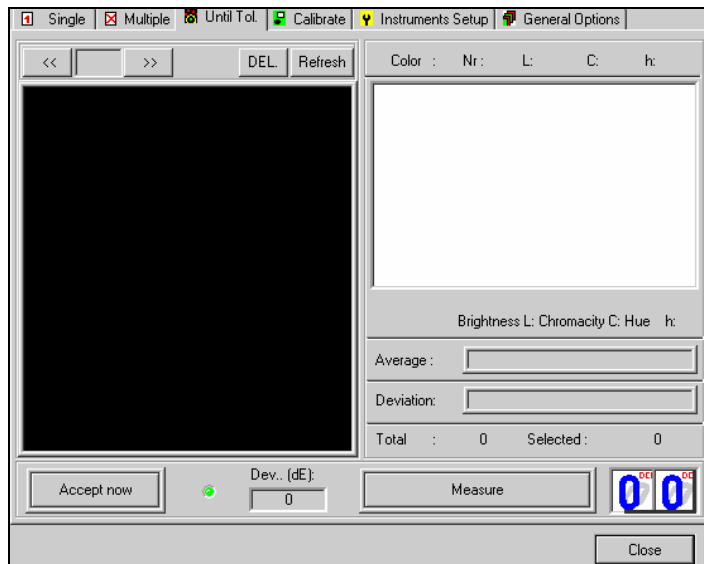
The Until Tol. Tab is used to determine the number of measurements required to accurately describe the sample when multiple measurements need to be averaged for a single sample. It can be used to establish a procedure for measuring samples that do not have a uniform surface.



A color difference tolerance is used to specify the amount of deviation that an individual measurement can introduce into the average measurement. When the deviation is less than the specified tolerance, the averaged measurement is an acceptable representation of the sample. The tolerances are defined by clicking the General Options tab. *See also General Options Tab.*

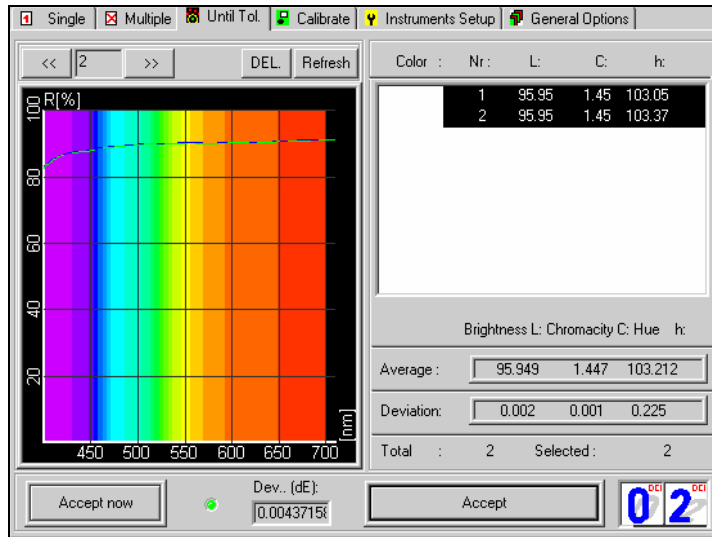
To start the measurement process, do the following:

1. Click the **Until Tol.** tab.



2. Position the sample at the port.

- Click the **Measure** button. It may be necessary after each measurement to reposition the sample. Repeat the sequence until the **Measure** button on the right is labeled **Accept**. The number of readings require to reach the tolerance is displayed on the lower right corner of the window.



Until Tolerance Window Buttons

- **VCR Buttons.** Allows you to browse through the scans made for the current sample.
- **DEL.** Allows you to delete an individual scan from the measurement. When you know that there is an error in an individual scan, you can delete it rather than repeating the entire procedure.
- **Refresh.** Resets the display.
- **Accept Now.** This allows you to accept the composite measurement regardless of whether the tolerance has been met.
- **Measure/Accept.** This button is used to start each individual scan. When the tolerance has been satisfied, the button label changes to **Accept**. Click on **Accept** to complete the procedure.

Calibrate Tab

See also *Instrument Menu, Calibrate.*

Instrument Setup Tab

This option provides access to the instrument setup. When selected, the window below displays:

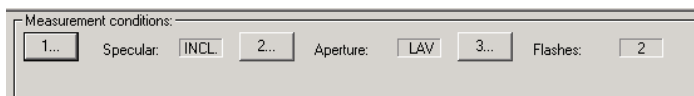
The screenshot shows the 'Instrument Setup' window. At the top, there are buttons for '1...', 'Specular: INCL.', '2...', 'Aperture: SAV', '3...', and 'Flashes: 2'. Below these are tabs for 'Single', 'Multiple', 'Until Tol.', 'Calibrate', 'Instruments Setup' (which is selected), and 'General Options'. The 'Instrument type' dropdown is set to 'MERCURY: DCI Mercury'. The 'Driver requested' field shows 'Unispef32.dll'. A 'Communication parameters' section contains a dropdown for 'Com2:19200.N, 8,1', a 'Communication port' dropdown set to 'Com2', and input fields for 'Bits per Seconds' (19200), 'Data bits' (8), 'Parity bit' (N), and 'Stop bit' (1). There is an 'Advanced...' button next to the 'Bits per Seconds' field. A 'Serial Number' field is empty. At the bottom right are 'Save Setup' and 'Close' buttons.

Current Measurement Conditions

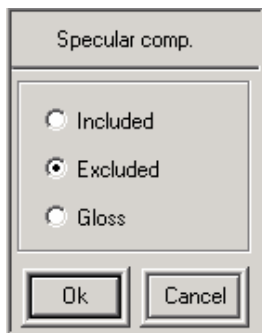
- **Specular.** This option controls the position of the specular port. You can make measurements either **Specular Component Included (SCI)** or **Specular Component Excluded (SCE)**. The selection depends on the particular application, and the sample being measured.
- **Aperture.** Identifies the aperture plate used for the measurement. For many instrument models there are multiple apertures available, offering openings of different sizes. This selection depends on the instrument used, and the size of the sample.
- **Flashes.** Number of times the lamp flashes for each measurement. Using multiple flashes enhances the illumination of the sample, and the number is typically increased when measuring dark samples. The default setting is 2.

To change any of the current conditions, do the following:

- Click in the numbered button (1, 2 or 3) for the measurement condition.



A dialog box similar to the one below displays:

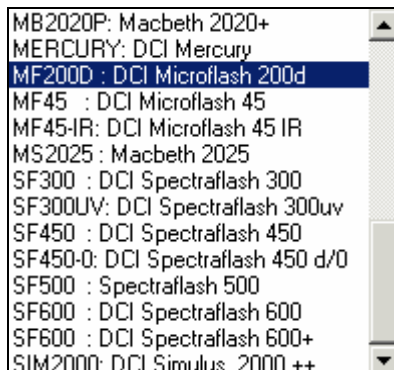


Other Instrument Settings

Instrument Type

Identifies the instrument you are using.

1. Click the drop-down list arrow to display the list of currently defined instruments.



2. Move the scroll bar on the right up/down to view the complete list.
3. When the correct instrument is displayed, click to highlight it.

Communications Settings

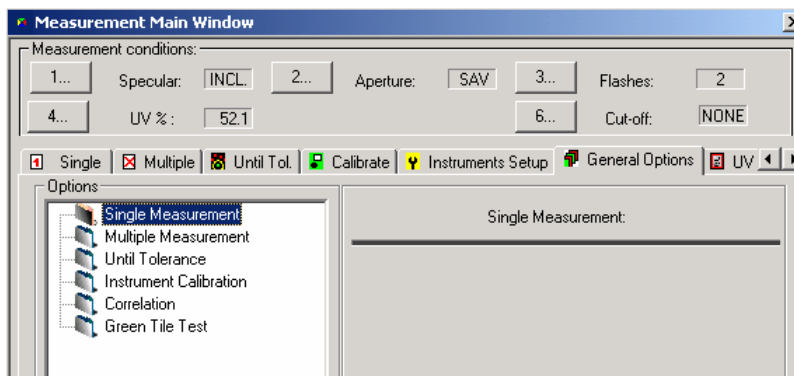
- **Communication Port.** Select communication port for the instrument. The default is **Com 1**. The communication parameters should not be changed, unless there is a problem with the instrument communicating with the software. This can be done with the assistance of Datacolor personnel.
- **Bits per Second.** Select the correct baud rate for the instrument is displayed. The *Bits per Second* field should not be changed unless there is a problem with the instrument communicating with the software. This should be done with the assistance of Datacolor personnel.
- **Serial Number.** Enter the serial number of the instrument. (For Datacolor instruments, this is usually found on a label on the back of the unit.)

Completing the Edit

When you have made all of the necessary changes, click the **Save Setup** button to make the changes permanent.

General Options Tab

The General Options tab defines the parameters used for single measurement, multiple measurement, until tolerance, and instrument calibration.

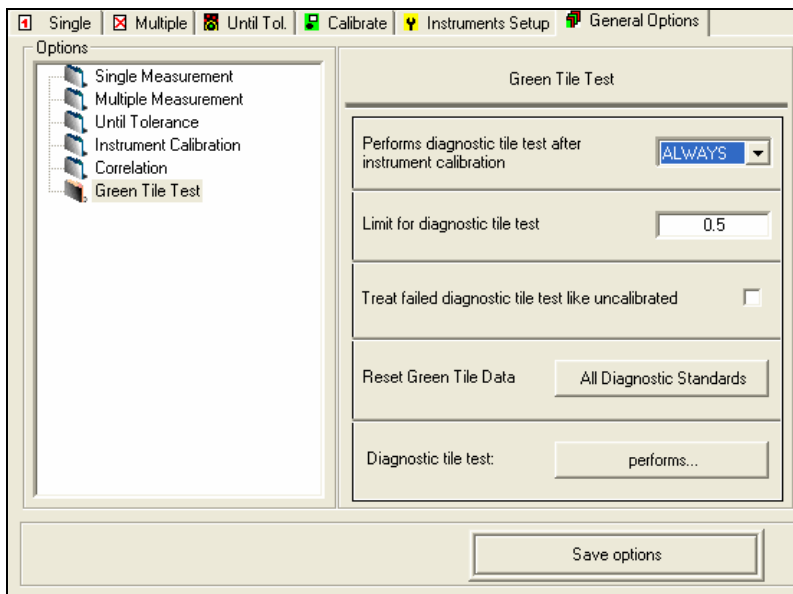


Instrument Correlation

This option enables the application of correlation factors to measurement data. This is only valid for systems that include the Datacolor MAESTRO^{PLUS} correlation feature.

Green Tile Test

A green diagnostic tile is included with most Datacolor instruments, and is used to perform a routine check on the instrument during calibration. This screen sets up the parameters for the diagnostic test.



Performs diagnostic (green tile) test after instrument calibration. Options include the following:

- **Never.** Following the normal calibration procedure, the program does not ask for the measurement of the diagnostic tile.
- **Always.** Following the normal calibration procedure, the program requires a measurement of a diagnostic tile.
- **Optional.** Following the normal calibration procedure, the user chooses whether or not to measure the diagnostic tile.

Limit for diagnostic tile test. This defines the acceptable color difference between the current measurement of the diagnostic tile and the stored measurement of the tile. It is expressed in CIEL*a*b* values.

Treat failed diagnostic tile test like uncalibrated. When the instrument fails the green tile diagnostic test, the condition of the instrument is set to uncalibrated, and you cannot continue generating measurement data. You must correct the problem causing the test failure. Place a check to enable, or remove check to disable.

Reset Green Tile Data/All Diagnostic Standards. WARNING: When selected, this option deletes the green tile measurement used for the green tile diagnostic test. No confirmation message is displayed.

Diagnostic Tile Test/Performs. This option runs the green tile test manually.

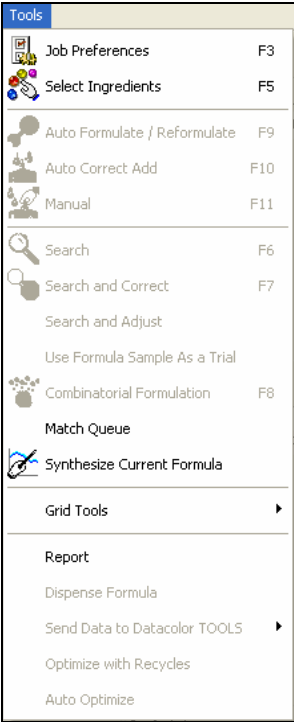
Save options. Saves the changes to green tile test setup.

Tools Menu

These menu selections provide access to various matching and correction tools available. These tools include:

- Defining the preferences for the job.
- Selecting ingredients for the job.
- Running a formulation or correction activity, including queue matching.
- Configuring the formula grid.

Below is the Tools Menu:



Some of the options serve dual functions, and the function performed depends on the current activity, and job state at the time the option is selected. For example, the *Manual* tool can operate as either the "manual add" or "modify formula" tool.

Job Preferences

Some fields included on the Formula Central screen, such as *Target* name and *Trial* name, are entered at run time, and are not normally preset. However, you can assign pre-selected or 'default' values to the majority of the information required by Formula Central to calculate formula predictions. Assigning default values in advance reduces the amount of operator input required at run time, which will speed the matching and correction processes, and limit input errors.

Job Preferences define the default information used by a job. This includes:

- Configuration of the display screen and printed output
- Selection of the color difference equation used for color evaluations and color tolerancing
- Selection of Illuminant/Observer selections
- Specification of acceptability tolerances
- Instructions for sorting and displaying the formula results

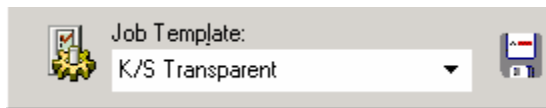
Default job templates are provided with the software. The job templates contain default job preferences that are applied to all jobs run using the template.

- **Job Identification.** Whenever the Job Preference window is open, a title bar displays at the *top* of the page that identifies the job currently running.



In this example, the job, Job 1 from K/S Transparent is currently running.

- **Job Template Identification.** Whenever the Formula Central window is open, a bar displays at the *bottom* of the page that identifies the job template originally used to create the current job.



See also *Program Features, Jobs and Templates*.

The Job Preferences are accessed from the Tools Menu (**Tools Menu, Job Preferences**) or by clicking on the **Job Preferences** icon on the Formula Central toolbar:



The dialog box is divided into five tabs:

- Results Tab
- Tolerances Tab
- Search Tab
- Appearance Tab
- Advanced Tab

WARNING!

Editing Advanced settings should only be done with the assistance of an Applications Specialist.

Default job preferences are originally stored with a job template and applied to all jobs run using the template. Any changes made to these fields are temporary, and are only applied to the active job. You can either save the changes as the original job template, or assign them to a new template name. You can create multiple job templates and tailor the defaults to the needs of a customer, a product, an operator, etc.

To make the changes to the job preferences permanent, you must go to **File, Save As Job Template**.

Results Tab

The Results Tab controls the display and sorting of predicted formulas in Formula Central. The selections made here control both screen displays and printed output, and can be edited for a job in-process.

Below is the Job Preferences, Results Tab window:

The screenshot shows the 'Results' tab in the Job Preferences window. The 'Number of Formulas to Show' is set to 10. Under 'Matching Options', 'Stop After' and 'Profiling' are checked. 'Show Predictions in Spreadsheet' is set to 'Always'. 'AutoFormulate Method' is set to 'Optimum'. 'Always Display Evaluation Grid on Output' is unchecked. There are five 'Sort Formulas By' dropdowns, all set to 'None'. There are five 'Weights for Custom Sort' dropdowns, all set to 'None', each with a percentage field set to 0%.

Number of Formulas to Show. When the program finds several formulas that satisfy all of the job requirements, it needs to know how many you would like to be displayed for examination.

The field will accept an entry between 1 and 250. However, the program will disregard any number greater than 25.

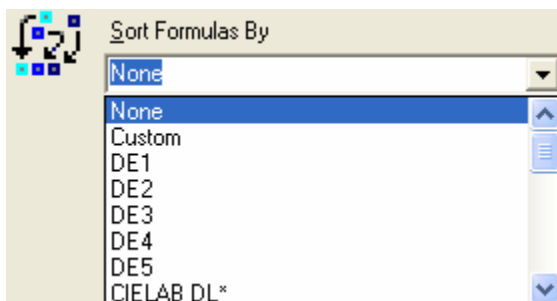
TIPS

We suggest you start with some number from 5 – 25. You will find through experience how many formulas you usually need to evaluate before making a selection, and you can change this selection as necessary.

Show Predictions in Spreadsheet. This selects the method for displaying the predicted formulas. You can either view them one-by-one, or you can scroll through a series of formulas displayed in a spreadsheet layout.

- **Always.** The spreadsheet view is always automatically displayed, even when only one formula is found.
- **Never.** The spreadsheet view is never automatically displayed. A detailed view of the best formula found will be displayed in Formula Central, and you can scroll through all of the formulas in the *Formula* field on the Formula Central screen using the left/right arrow.
- **Auto (if more than one).** Automatically displays the spreadsheet view in Formula Central when it finds more than one predicted formula that satisfies the job requirements. When only one formula is found, a detailed view of the formula is displayed.

- **Always Display Evaluation Grid on Output.** When a formulation or correction output screen is displayed, you have a choice regarding whether the Evaluation Grid is included. When this option is enabled, the Evaluation Grid always displays when Formula Central is in an output state. When it is not enabled, the program saves the configuration of the last job state. If the last job state was an output state, and the evaluation grid was not included, it will not be displayed automatically the next time you enter Formula Central. *See also Formula Central, Formula Grid, Job States for an explanation of job states.*
- **Sort Formulas By.** The program includes a sorting feature that automatically sorts from best to worst, all formula predictions found for a job. This sorting feature can consider a single formula characteristic such as “lowest cost”, or can include multiple formula characteristics, such as “curve fit to Target” and “cost”, when sorting the formula predictions.
- Enter the characteristic(s) to be used to sort the predicted formulas from best to worst.



You can choose up to five characteristics for sorting purposes. Multiple sort characteristics are considered when there is a tie between two formulas for a certain criteria, such as ‘color difference’. The program will use the next selection in the sort list as the tiebreaker.

See also Matching Features, Formula Sorting Options for a discussion of the sort features available. See also Applications Technology, Formula Sorting Options for a detailed discussion of these options.

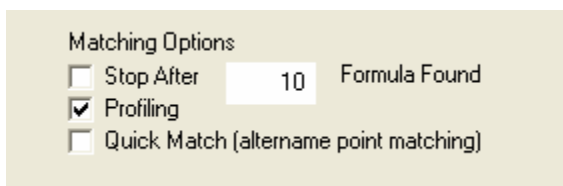
- **DE 1 – DE 5.** The predicted formulas are sorted from best to worst, based on the DE. The DE is specific to the Illuminant/Observer conditions, 1-5, defined in *Job Preferences, Tolerances Tab, Match Illuminant/Observers*.
- **CIELab DL.** Sorts predicted formulas from best to worst, based on the CIELab lightness difference (DL*) between the target and the predicted formula, for the primary Illuminant/Observer condition.
- **CIELab Da.** Sorts predicted formulas from best to worst, based on the CIELab a* (Da*) difference between the target and the predicted formula, for the primary Illuminant/Observer condition.

- **CIELab Db.** Sorts predicted formulas from best to worst, based on the CIELab b^* (Db^*) difference between the target and the formula, for the primary Illuminant/Observer condition.
- **CIELab DC.** Sorts predicted formulas from best to worst based on the chroma (DC^*) difference.
- **CIELab DH.** Sorts predicted formulas from best to worst based on the absolute value of the CIELab hue difference (DH^*) between the target and the predicted formula. The job does not consider the direction of the difference (+ or -). It only considers the absolute size of the hue difference.
- **Color Load.** *Not currently enabled.* Sorts predicted formulas from best to worst based on the color loading of the formulas.
- **Curve Fit.** Sorts the predicted formulas from best to worst, based on the curve fit between the formula and the target.
- **Contrast Ratio.** Sorts the predicted formulas from best to worst based on the difference between the contrast ratio of the target and the predicted formula. *Not valid for no-load, opaque file formulas.*
- **MI-Root Mean Square.** Sorts the predicted formulas from best to worst based on the metamerism index. This option uses the Root Mean Square method to calculate the metamerism index.
- **MI – DIN 6172.** Sorts the predicted formulas from best to worst based on the metamerism index. This option uses the DIN 6172 method to calculate the metamerism index.
- **Cost per Volume.** Sorts the predicted formulas from best to worst by cost, based on a volumetric formula.
- **Cost per Weight.** Sorts the predicted formulas from best to worst by cost, based on a weight formula.
- **Contrast DE 1-5.** Contrast DE is the color difference between the target and the predicted formula, measured over a dark (contrasting) background. This selection sorts the predicted formulas to minimize the Contrast DE under the specified Illuminant/Observer combination. *Not valid for no-load, opaque file formulas.*
- **Contrast Curve Fit.** Sorts the predicted formulas to maximize the curve fit between the target and the predicted formula, presented over a dark (contrasting) background.
- **Hiding Power—Transmission.** Sorts the formulas based on hiding power. *This is valid for diffuse transmittance applications only.*
- **Recycles.** Sorts the formulas based on the amount of recycle used.
- **Ingredient Priority.** Sorts the formulas based on the Ingredient Priority value calculated for each.
- **Ingredient Compatibility.** Sorts the formulas based on the Ingredient Compatibility value calculated for each.

- **Compatibility and Priority.** Sorts the formulas based on the ingredient priority (IP) and ingredient compatibility (IC) combined as a single value. It is the average of IP of the two.

See also Applications Technology Ingredient Priority and Ingredient Compatibility for a detailed discussion of these sorting features.

- **Matching Options.** Depending on the requirements of the match and the number of ingredients to be considered, the program may be required to calculate thousands of possible formulas. The Matching Options provide different approaches for speeding the calculation process, while continuing to provide matches that satisfy your formula requirements using your materials.



Matching Options

☐ Stop After 10 Formula Found

☒ Profiling

☐ Quick Match (altname point matching)

- **Stop after X Formula Found.** This option instructs the program to stop calculating combinatorial matches when a specific number of acceptable formulas are found. The program uses the traditional matching approach, in which it applies the optimizer goal to every single colorant combination it considers. The formulas are often run through multiple iterations before being disqualified. This approach can often lead to the calculation of thousands of formula possibilities that are ultimately discarded, and significantly lengthens the formula calculation time.

For example, if you have entered “10” for the number of formulas to find, the program will stop calculating formulas after it finds 10 formulas that satisfy all of the formula requirements. While there may be “better” formulas that are not considered, the 10 formulas offered will always satisfy all of the formula requirements. *This feature is applied when Profiling is **not** enabled. See Matching Options/Profiling below for an explanation of the Profiling feature. See also Applications Technology, Optimizer Goal for a detailed discussion of the Optimizer Goal.*

NOTE

If Profiling is not used, the program will optimize every possible combination, resulting in significantly longer calculation times. If you decide not to use *Profiling*, we strongly recommend that you use the *Stop After* option, unless you want to optimize every possible combination.

- **Profiling.** When *Profiling* is enabled, the program runs each colorant combination through an initial match and, using a proprietary calculation, makes a preliminary decision as to whether the combination can possibly yield an acceptable match. Once it has found 2000 potential candidate formulas during the initial calculation, those 2000 formulas are run through the optimizer to refine the formula and find the

best matches. This approach quickly eliminates colorant combinations that can never match the color, such as using three reds to match a blue, etc. and significantly reduces the formula calculation time. This is the default selection.

When *Profiling* is disabled, the number of combinations will be the actual number, based on the number of colorants selected and the number of colorants specified for the match.

NOTE

When *Profiling* is used in conjunction with the *Stop After* option, the matching may be very fast, but may not provide the best combination.

- **Quick Match** (alternate point matching). This option decreases the number of spectral points considered for matching calculations from 31 points (10nm data) to 16 points (20nm data). This option uses this same logic as the Profiling option, but the reduction to 16-point data further speeds the calculation process.
- **Weights for Custom Sort.** When you choose Custom Sort, you combine several parameters into a single sort criterion labeled Custom, and assign a weight to each sort characteristic included. This allows you to incorporate several formula characteristics into a single sort criterion. Each parameter selected is assigned a weight. The weights are expressed as percent (%), and the total of the weights you use must total 100%. Below is an example of a custom sort:

Metamerism	40%
DE1	30%
Cost	<u>30%</u>
Total	100%

The job accepts a maximum of five characteristics for a custom sort, and *you must assign a weight to each*. The weight enables the system to assign a priority to the sort criteria. There are no default values for the weights.

The custom sort criteria available are identical to those available for a single sort. See also *Applications Technology Formula Sorting Options for a detailed discussion of the sorting features available in Datacolor MATCH^{PIGMENT}*.

Tolerances Tab

All matches and corrections calculated in Formula Central must satisfy a series of tolerances. The Tolerances tab provides the options to create and edit the tolerances for a job or job template.

Below is the Job Preferences, Tolerances Tab window:

The screenshot shows the 'Tolerances' tab in the Job Preferences window. It includes a 'Default Color Equation' dropdown set to 'CIELAB 1976 All'. The 'Match Tolerance' section contains a table with values for Maximum DE1 (5.0), Maximum DE2 (10.0), Minimum CR (0.0), and Maximum Metamerism (10.0). There is a checkbox for 'Always show best prediction'. The 'Illuminant/Observer conditions for matching' section lists five conditions: 1. D65/10, 2. A/10, 3. F11/10, 4. (empty), and 5. (empty). The 'Film Thickness Limit' section shows a range from 0 to 0%. The 'Show Predictions at' section has radio buttons for 'Match Film Thickness' and 'Optimum Film Thickness'. The 'Opacity / Contrast Limits' section shows a range from 0.00 to 0.00 CR. The 'Correction Add Limits' section shows a value of 2.3 and radio buttons for 'None - Ignore Bucket Capacity' and 'Bucket Capacity'. The 'Instead of Excessive Additions' section has radio buttons for 'Reduce Correction Quality' and 'Remove Partial Batch'.

Default Color Equation. This selection defines the color equation used for the match tolerances, the optimizer goal and Sorting functions. It is also the default used for the color difference display in the *Evaluation Window* of Formula Central.

For the equation selected, the display in Formula Central will include:

- The color space coordinates for the primary Illuminant/Observer combination selected
- Color difference evaluations for every Illuminant/Observer combination selected
- If the color difference selection in the Evaluation Window is changed, it does not affect the color space applied to the tolerances, optimizer goal and sort functions.

Match Tolerance. Defines a series of acceptable tolerances between the target and a predicted match or correction. A tolerance can be assigned to DE under two different illuminants, Contrast Ratio, and Metamerism (a metamerism index value). You can implement tolerances for all of these properties

- **Always Show Best Prediction.** When the program cannot find a match to satisfy your requirements, it displays the best match it finds. Click to place a check in the box, to enable this option.

Illuminant/Observer Conditions for Matching. Enter the Illuminant/Observer combination(s) to be used when calculating color differences between the formula(s) and the target. You must select at least two combinations, and you can enter a

maximum of five. We recommend that you use a minimum of 2 Illuminant/Observer combinations.

Film Thickness Limit. This option identifies whether any variation in the film thickness specification is acceptable. When a value other than 0 is entered, the program has the option to adjust the film thickness to find the best match.

The limit is expressed as a range around the target film thickness, and requires a minimum and maximum value. The range of variation is expressed as a percentage (%) of the nominal thickness. One label is defined for film thickness units (e.g., mils), and is used throughout the entire system.

Show Predictions At

NOTE

This option is valid only when the film thickness limit is not zero (0).

Show Predictions at:

- ☒ Match Film Thickness
- ☐ Optimum Film Thickness

- **Match Film Thickness.** The color difference displayed for the match is based on the film thickness input at the time of the match. However, the program may display a message that there is an “optimal film thickness”. This indicates that the film thickness can be adjusted to improve the color difference of the match prediction.

NOTES

- When this option is enabled the color difference (DE) displayed is always based on the film thickness input at the time of the match.
- This option is useful when the film thickness of the product cannot actually be adjusted, but information regarding the required film thickness is critical to selecting the correct formula.
- **Optimum Film Thickness.** The color difference displayed is based on the formula prepared at the optimum film thickness. The input film thickness on the Formula Central window will match the optimum film thickness.

NOTE

This option is useful when the film thickness of the product can be adjusted. The optimum film thickness replaces the film thickness value input for the match, and the formula should be made at the new film thickness.

Opacity/Contrast Limits. Enter a minimum and maximum value to define the acceptable range for the contrast ratio. Contrast Ratio (CR) is typically used to define opaque or near opaque samples. A single value, from 1 – 100, is entered in this field.

Correction Add Limits. This feature places a limit on the size of the correction recommended for the job. When the batch size is not limited, the program may recommend a correction that exceeds the size of the container.

Enter a value that defines the maximum size by which an add can increase the batch size. The default value is 2.3. This means that the add cannot exceed the 2.3 times the batch size. If the current batch size is 100KG, the new batch size cannot exceed 230KG.

- **None-Ignore Bucket Capacity.** This selection does NOT limit the size of the recommended correction.
- **Bucket Capacity.** Enter a number that indicates the maximum batch size. You must also define the unit of measurement for the batch size (i.e., kg, gal, etc.).
- **Bucket Capacity Form.** Select the ingredient form associated with the bucket capacity.

Instead of Excess Additions. When the program cannot recommend a correction that fits into the container, this option provides an alternate strategy for resolving the batch size problem.

- **Reduce Correction Quality.** Calculates the best add possible that will fit into the container.
- **Remove Partial Batch.** Program is given the option to remove part of the batch from the container. The correction includes an amount that needs to be removed from the existing batch, and an add to be made after the material is removed. In some situations, the program may remove the entire batch.

Search Tab

When you choose any of the Search options, the job needs to know the requirements for performing the search. Those requirements are created and changed through this program option. There are three approaches to the search functions: **Search**, **Search & Correct** and **Search & Adjust**.

- **Search.** Any formula that satisfies all job requirements will be displayed for evaluation. However, no adjustments are made to the ingredient concentrations.
- **Search & Correct.** The job looks for an existing formula to serve as an acceptable starting point. When necessary, the program calculates a correction to the stored formula so that it satisfies the job tolerances. This correction can change the relative proportion of the colorant concentrations in the formula, as well as the colorant loading.
- **Search & Adjust.** The Search & Adjust option also looks for an existing formula to serve as an acceptable starting point, and when necessary calculates a correction. It is different from Search & Correct in that any changes to the formula amounts must maintain the colorant ratios used in the original formula. The adjustment is limited to the amount of clear used in the formula.

The advantage to working with an existing formula is that you know the ingredient combination works in production, and you are aware of any processing

problems it may have. Working with an existing formula usually reduces the number of adjustments you must make.

Below is the Job Preferences, Search Tab window:

Search

Use This Folder for Searches
Ingredient System

☒ Include Sub-Folders
☐ Include Job (In-Process) Formulas
☐ Include Recycle Formulas

Search and Correct Limits

☒ Use Correction Limit
Maximum DE
5.0

Show Search and Correct Results As
☒ Additions
☐ Re-Formulations

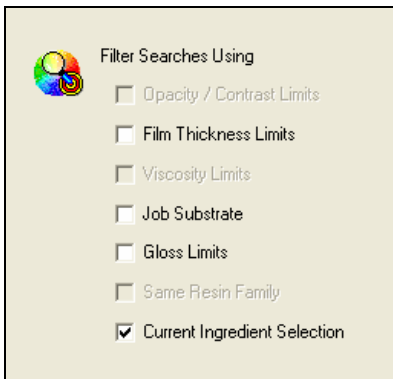
Filter Searches Using

☐ Opacity / Contrast Limits
☐ Film Thickness Limits
☐ Viscosity Limits
☐ Same Substrate Family
☐ Same Resin Family
☒ Current Ingredient Selection

Use This Folder for Searches. Formulas can be stored in many different folders in the system. You must identify the folders that are to be included in the Search. Click on the down arrow to view the folder choices. The program can only consider one folder at a time.

- **Include Sub Folders.** If there are subfolders under the selected folder, they will also be searched.
- **Include Job (In-Process) Formulas.** *Not available in this version.* In-process (job) formulas are included in the Search.
- **Include Recycle Formulas.** Includes formulas that use recycled materials.

Filter Searches Using. Formulas found during a search can be filtered based on non-colorimetric properties. The Search function can filter multiple properties of the formula, and you can select one or all of these properties.



Filter Searches Using

- ☐ Opacity / Contrast Limits
- ☐ Film Thickness Limits
- ☐ Viscosity Limits
- ☐ Job Substrate
- ☐ Gloss Limits
- ☐ Same Resin Family
- ☒ Current Ingredient Selection

NOTE

The availability of the filters depends on the colorant set selected and system admin settings.

Opacity/Contrast Limits. Formulas found must satisfy the opacity/contrast specification. Only available for translucent sets.

Film Thickness Limits. Formulas found must satisfy the film thickness specifications. Only valid for transparent and translucent formulas.

Viscosity Limits. *Not currently enabled.*

Job Substrate. Formulas found must use the job substrate selected for the match.

Gloss Limits. Formulas found satisfy the gloss specification. Only available when gloss option is enabled in System settings *See also System Admin, Industry Tab.*

Same Resin Family. *Not currently enabled.*

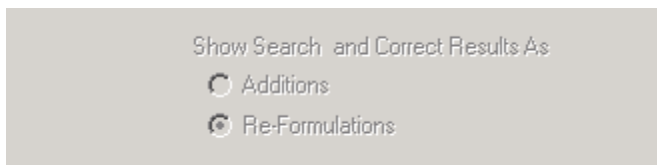
Current Ingredient Selection. When performing a search, the program will only consider formulas containing colorants that are included in the ingredient selection. If a colorant is flagged, as 'must use', only formulas containing that colorant(s) will be selected during the search.

Search and Correct Limits. For *Search & Correct* options, you can identify a color difference limit that serves as the starting point for the search. The program will ignore all stored formulas having a DE from the target that is greater than the number in this field.

- **Use Correction Limit.** When enabled the value specified in "Maximum DE" is used as the cut-off point for considering a formula to be used with the Search & Correct feature. Any formula with an "uncorrected" color difference greater than this value will not be considered for correction.

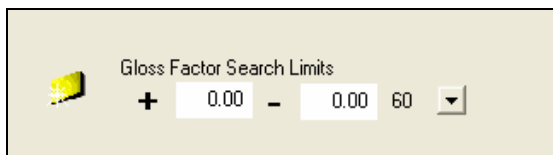
- **Maximum DE.** Defines the maximum uncorrected color difference between a stored formula and the current target. This is not an acceptability tolerance for the match. It is only used as a reference point for Search and Search & Correct options. The color difference equation used is CIELab. Enter a number between 0.5 and 100.

Show Search and Correct Results As. *Not currently enabled.* For corrections, you must identify if the recommended addition should be expressed as 'addition' to the existing formula, or a new formula (reformulate).



- **Additions.** *Not currently enabled.* This is used when you need to add new ingredients to existing material to achieve the match. When the formula contains recycled ingredients, this is the type of add that should be made.
- **Reformulations.** *Not currently enabled.* The corrected formula will be expressed as a new formula. When you select this option, you must specify a batch size in the formula grid.

Gloss Factor Search Limits. Specifies an acceptable gloss range for the formulas found. You must define a minimum and maximum value, and the gloss meter (gloss geometry) to be used.



Appearance Tab

The selections on the Appearance Tab control the information displayed in Formula Central for matches and corrections. This includes both the input fields and the grid display. The selections are applied to both screen displays and printed output. The selections on this page are limited to the display of information. To view the tolerances used for the job, select **Job Preferences, Tolerances**.

Below is the Job Preferences, Appearance tab window:

Match Parameters		Formula Grid Settings:			
Show / Hide	Default Value	Display Order	Columns	Show / Hide Match	Correct
				In	Out
☒ Substrate	FLX_WHITE FL	1	Ingredient Color / Selection	☒	☒
☒ Film Thickness	1.00 MILS	2	Locked Ingredient Amount	☐	☐
☐ Contrast (Ratio or DE)	= 0.00	3	Ingredient Rank	☐	☒
☐ Gloss Values	0.00 @ 20	4	Name	☒	☒
☐ Viscosity	21 sec 3Z	5	Trial Weight % Formula	☐	☐
☐ Yield Factor	100 %	6	Output Weight % Formula	☐	☐
☐ Consumption	0.285 G / Sq Ft	7	Trial Volume % Formula	☐	☐
☐ Company Name		8	Output Volume % Formula	☐	☐
☐ Custom1		9	Trial Formula Amounts	☐	☒
☐ Custom2		10	Output Formula Amounts	☒	☒
☐ Custom3		11	Add / Change Amounts	☐	☒

Match Parameters

Some fields included on the Formula Central screen, such as target name and trial name, cannot be changed or removed. However, you can enable/disable many of the fields displayed on the Formula Central window, and assign default settings for them. All of the fields displayed under *Match Parameters* can be customized to your needs.

NOTE

These selections include fields that typically have default values assigned to them. When enabled, this information is displayed in the Formula Central window.

Substrate. Activates the display of substrate information. The substrate name and a color display of the substrate are displayed. You may have more than one substrate choice available for color evaluation, matching and correction.

Film Thickness. Activates the display of film thickness values for the target and the trial. Only one value is displayed, and is applied to both the target and trial.

Contrast Ratio. Activates the display of contrast ratio or contrast DE for both the target and trial. The contrast ratio of a sample is directly affected by its film thickness. If the material is not applied at the proper film thickness, the displayed contrast ratio may not be achieved.

Viscosity. Activates the display of viscosity information for the target and the trial. A single value is displayed for both, and the program assumes that the trial sample will have the same viscosity as the target. Variations in viscosity can affect other

parameters such as gloss, color difference and film thickness values displayed in Formula Central. When preparing the job formula you must match the viscosity displayed with the formula.

NOTE

This is simply a label. Viscosity is not adjusted as part of a formula calculation.

Yield Factor. This field activates the display of the yield factor for the predicted formulas.

Consumption. *Not currently enabled.*

Company Name. This field activates the display of the company name. The program assumes that the same company name is assigned to the target and trial.

Custom Fields. This field activates the display of any custom fields you have attached to the formula.

Formula Grid Settings. This group of options controls the display of fields in the Formula Grid for the current job/job template. The first group of options consists of 30 fields, each of which is assigned to a specific column in the grid. *See also Grid Designer, Formula Grid Columns below for information on each field available.*

Moving the scroll bar from top to bottom displays a second group of grid settings labeled "Rows." These fields relate to ingredient subtotals and batch totals, and are assigned to the rows in the grid. *See also Formula Grid, Rows below for information on each field available.*

Show/Hide Match Correct. The four boxes correspond to the job state. A check activates the display of the field for the corresponding job state. *See also Formula Grid, Job States.*

Formula Grid Settings:						
Display Order		Columns	Show / Hide			
			Match		Correct	
			In	Out	In	Out
1		Ingredient Color / Selection	☒	☒	☒	☒
2		Locked Ingredient Amount	☐	☐	☐	☐
3		Ingredient Rank	☐	☒	☐	☒
4		Name	☒	☒	☒	☒
5		Trial Weight % Formula	☐	☐	☐	☐
6		Output Weight % Formula	☐	☐	☐	☐
7		Trial Volume % Formula	☐	☐	☐	☐
8		Output Volume % Formula	☐	☐	☐	☐
9		Trial Formula Amounts	☐	☐	☒	☒
10		Output Formula Amounts	☒	☒	☒	☒
11		Add / Change Amounts	☐	☐	☒	☒

Formula Grid, Columns

The configuration of the columns determines the level of detail provided regarding the predicted formulas. You can display the formula in multiple ingredient forms (e.g., dry colorant, intermediate or finished material), and multiple modes (e.g., weight or volume). You can display the prediction as percentages of the formula or actual amounts to be used. You can also evaluate the formula based on amounts contained in the target, the trial, or restrict it to the add amount.



Select Ingredient/Colorant. Clicking the column header or double-clicking a column cell opens the Ingredient Selection window. You can select ingredients by name or by keyword. *See also Tools Menu for a complete explanation of all ingredient selection options.*



Locked Ingredient Amount. When checked, ingredient amounts in the trial formula are considered “locked” and the amounts cannot be changed in the correction. This allows you to correct with a subset of the formula colorants or to force the program to use colorants not in the trial formula. This column is applicable only to corrections.



Ingredient Rank. Identifies the ingredient rank. This is a number representing preferred display order that is assigned through Ingredient Maintenance. If you want the ingredients presented in a particular order other than name, you must assign a rank.

- Rank is set in Ingredient Maintenance and may not be modified in Formula Central.
- You can display ingredients based on *Rank*, *Name* or by the *ingredient amount*. Clicking on the header cell will alternately sort the formula ingredients first by ascending, then by descending rank.



Name. Displays ingredient name. Ingredients may not be renamed in Formula Central. Clicking on the header cell will alternately sort the formula ingredients alphabetically by name first by ascending, then by descending order.



Trial Weight % Formula. Displays the trial formula expressed in weight percent. Clicking on the header will alternately sort the formula ingredients by weight percent in the trial formula, first by decreasing, then by increasing amounts. Applicable only to corrections.



Output Weight % Formula. Amount of ingredient, by weight, contained in the current formula prediction.

NOTES

- During formulation or correction input, you may fix this amount.
- During formulation or correction output, this column shows the target formula in weight percent.
- For corrections, this amount includes the original ingredient amount and the add amount.
- Clicking on the header will alternately sort the formula ingredients by weight percent, first by decreasing, then by increasing amounts.



Trial Formula Amounts. Contains a number that, along with a unit, expresses the actual ingredient amounts in the trial formula. Clicking on the header will alternately sort the formula ingredients by trial amount, first by decreasing, then by increasing amounts. Applicable only to correction.



Output Formula Amounts. Contains the ingredient amounts for the predicted formula. Applicable to all job states.

NOTES

- During formulation or correction input, you may fix an amount to display in this field.
- During formulation or correction output this column displays shows the ingredient amounts (and units) in the target formula.
- Clicking on the header will alternately sort the formula ingredients first by decreasing, then by increasing amounts.



Add/Change Amounts. Contains a number that, along with a unit, expresses the difference between the trial formula amount and the predicted formula amount. Applicable only to correction.

NOTES

- If the correction is a reformulation, some amounts may be negative.
- If the correction is an addition, all amounts will be positive.
- Clicking on the header will alternately sort the formula ingredients, first by decreasing, then by increasing add amounts.



Primary Formula Mode. Identifies the ingredient mode to be used for the *Trial*, *Output* and *Add Amount* columns. Mode refers to how you measure the ingredients that go into the formula. For example, if you weigh the amounts of each ingredient, the ingredient mode is *weight*. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the ingredient mode is *volume*. A single formula can contain different ingredient modes for each ingredient. For example, in a coatings application you may need the colorant amounts expressed in weight, and the white expressed in volume units.

The specific type of weight unit (i.e., kilograms, lbs, etc.) or volume unit (cups, liters, gallons, cc's, etc.) for the ingredient is defined in *Admin*, *System*, *View User Details*, *Material Handling*.

Multiple ingredient modes can be defined for a system. They are used to define the type of units displayed, and control the number of decimal places displayed for the ingredient amounts. At run time, the type of unit can be changed, but the number of decimal places displayed cannot be changed.

NOTES

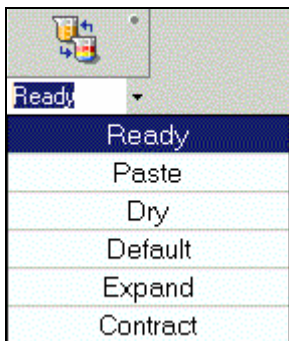
- Clicking on the header cell will open a menu allowing selection of a particular unit or formula mode.
- Clicking column cells will allow selection of a unit for that row (ingredient).
- This field is applicable to all job states.



Primary Formula Form. Identifies the form of the ingredients in the primary formula.

Ingredients may contain any number of components that may, themselves, have components. "Form" describes a level of expansion of a colorant into component ingredients. Three "special" forms are given user-defined labels.

Click on the header cell to open the menu below:



This menu offers the option for a specific form, to expand one level, contract one level, or default.

- **Ready.** The ingredient amounts are based on a finished form of the ingredient. Typical labels include Base, Ready-To-Use, Light.
- **Paste.** The ingredient amounts are based on an intermediate form of the ingredient. Typical labels include Heavy, Paste, Concentrate
- **Dry.** The ingredient amounts are based on a primary form of the ingredient. Typical labels include Dry, and Powder.
- **Default.** Sets the form of each ingredient to that indicated by the colorant set.
- **Expand.** Expands the formula. For example, “ready” amounts are converted to “paste” amounts, and additional ingredient components may appear in the formula.
- **Contract.** Contracts the formula expression. For example, “paste” amounts are converted to “ready” amounts. Some ingredient components may disappear from the formula.

NOTES

- Cells display the name of a form.
- This field is applicable to all job states. Clicking in individual cells allows the selection of specific forms for individual ingredients, or to expand/contract a single ingredient.
- A single formula can include multiple ingredient forms.
- For those ingredients in an intermediate form, the formula can be expanded to include the amounts of each intermediate colorant, as well as the name and amounts of resin, solvents and additives that need to be added to make a finished product.
- The default choices for the colorant form are defined in the colorant set.
- The customized labels for ingredient form are defined in Admin, Systems, View User Details, User Defined Labels.



Alternate Formula Amount. Contains the equivalent ingredient amounts contained in the predicted formula, converted to a different formula mode/formula form. The formula is as close to the primary amounts as possible using the selected alternate units and forms.

NOTES

- During formulation or correction input, you may fix an amount to be used in a formula.
- During formulation or correction output this column (along with a unit) shows the ingredient amounts in the result (Target) formula.
- Clicking on the header will alternately sort the formula ingredients, first by decreasing, then by increasing amounts.
- This field is applicable to all job states.



Alternate Add/Change Amounts. Displays an alternate expression of the current add amount. This is simply a conversion of the primary formula, and contains equivalents of the ingredient amounts displayed in the primary formula (correction). Applicable for all correction states.



Alternate Formula Mode. Identifies the ingredient mode to be used for the Trial, Output and Add Amount columns for the secondary formula.

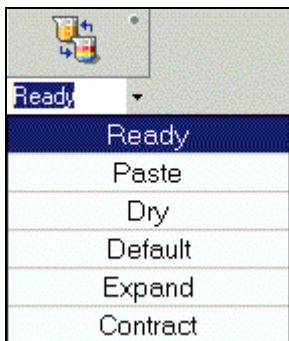
Mode refers to how you measure the ingredients that go into the formula. For example, if you weigh the amounts of each ingredient, the ingredient mode is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the ingredient mode is volume.

This field is applicable to all job states.



Alternate Formula Form. Identifies the form of the ingredients used in the secondary formula.

Ingredients may contain any number of components that may, themselves, have components. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given user-defined labels. Clicking the header cell opens the menu below:



This menu offers the option, for a specific (named) form, to expand one level, contract one level, or default.

- **Ready.** The ingredient amounts are based on a finished form of the ingredient. Typical labels include Base, Ready-To-Use, Light.
- **Paste.** The ingredient amounts are based on an intermediate form of the ingredient. Typical labels include Heavy, Paste, Concentrate
- **Dry.** The ingredient amounts are based on a primary form of the ingredient. Typical labels include Dry, and Powder.
- **Default.** Sets the form of each ingredient to that indicated by the colorant set.
- **Expand.** Expands the formula. For example, “ready” amounts are converted to “paste” amounts, and additional ingredient components may appear in the formula.
- **Contract.** Contracts the formula expression. For example, “paste” amounts are converted to “ready” amounts. Some ingredient components may disappear from the formula.

This field is applicable to all job states.



Performance Factors. Displays the performance data for each ingredient in the formula. This icon changes to indicate the type of performance data used, and if it has been used in the correction prediction. Applicable only to correction.

NOTES

- The ingredient categories that can have performance data are colorants and whites.
- When the column is gray, the PF's are displayed for informational purposes, but they are not applied to the corrected formula.

See also Correction Features, Performance Data.



Costs. Displays the cost of each ingredient amount. It is based on the formula in the *Output Amount*. Applicable to output job states. Clicking on the header will alternately sort the formulas by cost, first by increasing cost, then by decreasing cost.



Recycle Locations. Identifies the location of the recycles contained in the formula. It is a comment field, and can accept a maximum of 30 characters. See also *Applications Technology, Recycles* for a complete discussion of the *Recycle* feature.



Ingredient Types. An ingredient type, or category, is assigned to every material in your system. In a formula, each material has a specific function, and the function determines its ingredient type. A formula can contain 6 basic ingredient types:

- Colorant
- Clear
- Thinner
- Auxiliary
- Base

Assigning ingredient types to materials allows you to working with ingredients as a group. This may be useful for scaling formulas, and setting constraints on a formula, such as colorant loading.

NOTES

- Clicking on the header will alternately sort the formula ingredients by ingredient type, first by decreasing amounts, then by increasing amounts.
- This field is applicable to all job states.

See also *Ingredient Maintenance, Ingredient Types* for additional information.



Ingredient Lots. Displays the lot number of the ingredient to be used. Clicking on the header will sort the formula ingredients alphabetically by lots, first by ascending, then by descending lot number. This field is applicable to all job states.



Ingredient Strengths. If you include strength information in the colorant set, this field displays it. The strength information can be displayed in the grid, but it cannot be changed in Formula Central. Clicking on the header will alternately sort the formula ingredients by strength, first by decreasing strength, then by increasing strength. This field is applicable to all job states.



Ingredient Density. Displays the ingredient density (a number). A value will always appear in this column. If you have not provided a real density, the program will insert a default value of 1.0.

- Density information cannot be changed in Formula Central.
- Clicking on the header will alternately sort the formula ingredients by density, first by decreasing density, then by increasing densities.
- This field is applicable to all job states



Density Unit. Identifies the unit of expression; e.g., grams/liter, pounds/gallon, etc., associated with the density value.

- The density unit cannot be changed in Formula Central.
- This field is applicable to all job states.



Minimum Concentrations. Displays the minimum concentration to be used for the ingredient in the formula. You may need to limit the concentration of an ingredient due to the cost, chemistry or processing problems associated with the ingredient.

If limiting the minimum concentration for a particular ingredient is an unusual situation, you can make the change in the Formula Grid at run time. Minimum concentration limits can be also be defined in Colorant Set Maintenance. If there are concentration limits for a colorant that are always used, these values should be stored in the Colorant Set.

The following limits are placed on editing the minimum concentration limit from Formula Central:

- The minimum concentration limit can be decreased.
- Cannot set a minimum lower than the minimum for a colorant in the colorant set.
- Cannot set a minimum on non-colorant ingredients.
- Can set a minimum for a “subtotal” row” (Total Colorant, Total White, Total Resin, Total Base). Effectively sets a constraint on total of that ingredient type such as “colorant load”.
- Cannot set a minimum for ingredient types Thinner and Auxiliary.
- This field is applicable to input job states.

Clicking on the header will alternately sort the formula ingredients by minimum concentration, first in order of increasing concentration, then by decreasing concentration.



Maximum Concentrations. Displays the maximum concentration to be used for the ingredient in the formula. You may need to limit the concentration of an ingredient due to the cost, chemistry or processing problems associated with the ingredient. Applicable to input job states.

If limiting the maximum concentration for a particular ingredient is an unusual situation, you can make the change in the Formula Grid at run time. Maximum concentration limits can also be defined in Colorant Set Maintenance. If there are concentration limits for a colorant that are always used, these values should be stored in the colorant set.

The following limits are placed on editing the maximum concentration limit from Formula Central:

- The user cannot increase the maximum concentration range, unless you have 'rights' to edit colorant sets.
- Cannot set a maximum higher than the maximum for a colorant in the colorant set.
- Cannot set a maximum on non-colorant ingredients.
- Can set a maximum for a "subtotal" row" (Total Colorant, Total White, Total Resin, Total Base). Effectively sets a constraint on total of an ingredient type such as "colorant load".
- Cannot set a maximum for ingredient types "Thinner" and "Auxiliary".

Clicking on the header will alternately sort the formula ingredients by maximum concentration, first in increasing, then in decreasing order.



Min/Max Modes. Identifies the ingredient mode associated with the minimum/maximum concentration limits. Mode refers to how you measure the ingredients that go into the formula. For example, if you weigh the amounts of each ingredient, the ingredient mode is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the ingredient mode is volume. This field is applicable to all input job states.



Min/Max Forms. Identifies the ingredient form associated with the minimum/maximum concentrations.

Ingredients may contain any number of components that may, themselves, have components. "Form" describes a level of expansion of a colorant into component ingredients. Three "special" forms are given user-definable labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light.
- **Expanded One Level.** Typical labels include Heavy, Paste, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

This field is applicable to all job states.



Optimize Options. When you choose to optimize an ingredient, you want to maximize the contribution of the ingredient the overall formula. Optimize can be applied to both matching and correction situations.

- **Matching.** In matching operations, the program optimizes formula amounts to minimize differences between the target and predicted formula(s). The criteria used to evaluate these differences, and their relative importance is referred to as the “optimizer goal”. For example, if the criteria include DE1 and cost, the program adjusts the formula to enhance both the DE1 and the cost of the formula. When it fails to make an adjustment that improves *both* of the qualities specified, it stops.

A default optimizer goal is set for the program. This can be modified by the user. See also *Tools Menu, Job Preferences, Advanced Tab for the optimizer goal currently being used. See also Applications Technology, Optimizer Goal for a detailed discussion of the optimizer goal feature.*

- **Manual Correction.** In manual correction, users may also “optimize” individual colorant amounts in a formula using a single evaluation criterion. The program will automatically calculate the optimal amount of colorant required to minimize the difference between the target and predicted formula for a single parameter.

For example, you can select CIELAB DE as the parameter to be evaluated. You then can optimize the amount of red color for this parameter. The program will calculate the optimal amount of red needed to reduce CIELAB DE. You can then move to another colorant in the formula and optimize it using the same criterion.

NOTES

- Optimize is displayed only when *Manual Correction, Modify* is selected.
- Click on column cells to optimize an individual ingredient amount using the optimizer goal currently defined in *Job Preferences*.
- A default optimizer goal is set for the program. This can be modified by the user. See also *Tools Menu, Job Preferences, Advanced Tab for the optimizer goal currently being used. See also Applications Technology, Optimizer Goal for a detailed discussion of the optimizer goal feature.*

Formula Grid, Rows

The rows in the grid are used for formula scaling functions. The program provides the flexibility to provide formula subtotals based on the ingredient types assigned in the colorant set.

Formula Grid Settings:						
Display Order			Show / Hide			
			Match		Correct	
Rows			In	Out	In	Out
1		Total Color	☐	☐	☐	☐
2		Total Resin	☐	☐	☐	☐
3		Total White	☐	☐	☐	☐
4		Total Base	☐	☐	☐	☐
5		Total Thinner	☐	☐	☐	☐
6		Total Auxiliary	☐	☐	☐	☐
7		Carrier Resin	☐	☐	☐	☐
8		User Supplied Resin	☐	☐	☐	☐
9		Concentrate	☐	☐	☐	☐

- **Total Color.** Displays the total amount of color. It is expressed in the colorant form and mode you have identified.
- **Total Clear.** Displays the total amount of clear contained in the formula. It is expressed in the ingredient form and ingredient mode requested.
- **Total White.** Displays the total amount of white contained in the formula. It is expressed in the ingredient form and ingredient mode requested.
- **Total Base.** Displays the total amount of base contained in the formula. It is expressed in the ingredient form and ingredient mode requested.
- **Total Thinner.** Displays the total amount of thinner contained in the formula. It is expressed in the ingredient form and ingredient mode requested.
- **Total Auxiliary.** Displays the total amount of auxiliary contained in the formula. It is expressed in the ingredient form and ingredient mode requested.
- **Total Batch.** Displays the total formula amount contained in the formula. It is expressed in the ingredient form and ingredient mode requested.

There are an additional set of options that display when concentrate scaling is enabled. Below is an explanation of the scaling fields activated for concentrate

scaling. See also *Admin All Systems*, *System Details*, *Material Handling* for instructions to enable this option.

- **Total Carrier Resin.** Displays the total amount of carrier resin contained in the formula.
- **Total User-Supplied Resin.** Displays the total amount of user-supplied resin contained in the formula.
- **Total Concentrate.** Displays the total amount of concentrate contained in the formula.

Advanced Tab

The job needs numerous specifications defined to calculate and evaluate matches and corrections. The Advanced Tab provides access to the advanced settings for the job. Editing any of these fields may have a significant impact on the quality of the predicted formulas calculated for a job. Editing should only be done with the assistance of an Applications Specialist.

Below is the Job Preferences, Advanced Tab window:

The screenshot shows the 'Advanced' tab of the Job Preferences window. It is divided into several sections:

- Specular / Internal Values for Matching:**
 - ☒ Automatic (recommended)
 - ☐ Use Colorant Set Defaults
 - ☐ Use These Values:

	Specular %R	Internal %R
Target	0.00	0.00
Trial	0.00	0.00
- Performance Data:**
 - ☐ None
 - ☒ Automatic (recommended)
 - ☐ Performance Factors only
 - ☐ SmartMatch only
- Performance Data Type:**
 - ☒ Optimum Point
 - ☐ Local Area
- PF Limits:**

From to
- MTB Limit (DE / Percent of As-Is):**
- ☐ Legacy Combinatorial Correction
- Contrast Specifies:**
 - ☒ Color and Loading
 - ☐ Loading Only
- Gloss To Use For Correction:**
 - ☒ Product Gloss Only
 - ☐ Trial Gloss Only
 - ☐ Both (Trial Gloss for Trial ; Product Gloss for Prediction)
- Formula Synthesis Agreement Warning:**

When storing formulas, warn if synthesized vs. actual color difference exceed this limit.
- Combinatorial Scope / Profiling:**
 - ☒ Fixed (Normal)
 - ☐ Variable (Faster)
- Weights for Optimizer Goal:**

DE1	60	%
DE2	40	%
None	0	%
None	0	%
None	0	%

Specular/Internal Values for Matching

- **Automatic.** Instructs the job regarding the application of surface (Saunderson) correction values to measurements of the target, trial and substrate. These corrections are applied when calculating formula predictions. The program stores separate specular values for the target, trial and formula(s). The options below set the specular and internal reflectance values to be used when adjusting the measurements.

Automatic uses the specular value from the current colorant set as the upper limit(s) for the specular. It will adjust the specular for the Target, Trial or Substrate downward, as needed. The internal reflectance value used is the value stored with the set.

- **Use Colorant Set Defaults.** Uses the specular and internal reflectance values stored in the colorant set. When the program finds a reflectance value for the target that is lower than the default value, it adjusts the reflectance of the target by raising the reflectance values, where necessary, to the default specular value stored for the set, +0.1%.
- **Use These Values.** User inputs specular and internal reflectance values to be used. These values represent a lower limit. When it finds a reflectance value for the target that is lower than the default value, it adjusts the reflectance of the target by raising the reflectance values, where necessary, to the specular values defined here, +0.1%.

Performance Data to Use

Identifies the type of performance data to be used when adjusting correction predictions. Performance data are data gathered by the correction program, and helps the system to understand how the ingredients in the batch are actually performing. This information is based on physical samples, and is used to adjust the corrections calculated by the program.

Two types of performance data are used:

- Performance Factors
- SmartMatch Data

See also Correction Features, Performance Data.

- **None.** The job does not apply any performance data adjustments to correction predictions. The correction is based solely on the colorant data stored in the colorant set.
- **Automatic.** The program chooses the type of performance data, performance factors, SmartMatch or both, to apply to a correction. This decision is made formula-by-formula.
- **Performance Factors (only).** Performance factors are applied to adjust the colorant concentration(s) used in the colorant set. *See also Correction Features, Performance Factors.*
- **SmartMatch (only).** The optical weights calculated for the colorants are adjusted based on evaluation of a physical samples. *See also Correction Features, Performance Factors.*

Performance Data Type

Two options control the application of performance data when using the Search & Correct option. This selection is applied to the use of either performance factors or SmartMatch.

- **Optimum Point.** Performance data gathered solely from the current trial is applied to the correction prediction. For Search & Correction, the information is based on the candidate formula.
- **Local Area.** *Not available.*

PF Limits. This field places restrictions on the use of performance factors. When the performance factors calculated for any colorant fall outside the range defined in this field, the program sets the performance factor to the minimum and maximum limits entered here.

For example, if the minimum PF value is set to 0.5, and the performance factor calculated for a colorant is 0.2, the PF used for the colorant is set to 0.5. In the same way, if the maximum value is set to 1.2, and the calculated PF for a colorant is 2.0, the performance factor will be set to 1.2.

MTB Limit

Match-to-Batch (MTB DE/% of As Is). When the program calculates a correction, it calculates a formula to match the trial sample. It then runs a color difference calculation between the *measured curve* of the trial and the *synthesized* curve of the formula. This is referred to at the Match-To-Batch DE. This color difference is important because the results of the correction depend on the MTB DE being in an acceptable range. This option is used to define an acceptable value for the MTB DE.

Enter a DE value into the field. It is applied to two different calculations, and the larger of the two values is used. The approach assumes that, as the actual (“As Is”) color difference between the target and the trial becomes larger, the program assumes you can accept a larger MTB DE.

- **(MTB)DE.** The color difference between the measured curve of the trial and the synthesized curve of the formula must fall within the specified value.
- **% of “As Is”.** The value in the field is used as a factor and applied to the “As Is” color difference.

For example, if the MTB value is .2 and the “As Is” color difference is 25, the % of “As Is” is calculated as follows:

$$(.2) * (25) = 2.0.$$

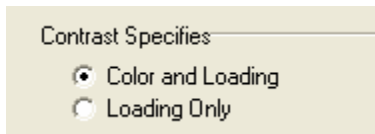
Below is a table containing examples of the calculation, using different values for the field As Is DE:

MTB Input Value	As Is DE	Calculation	Actual MTB Limit Used
.2	25	Greater of .2 OR $.2 * 25 = 2$	5
.2	10	Greater of .2 OR $.2 * 10 = 2$	2
.2	5	Greater of .2 OR $.2 * 5 = 1$	1
.2	1	Greater of .2 OR $.2 * 1 = .2$	.2
.2	.1	Greater of .2 OR $.2 * .1 = .02$	.2
.6	10	Greater of .6 OR $.6 * 10 = 6$	6

Legacy Combinatorial Correction

The combinatorial correction logic used by Datacolor MATCH^{PIGMENT} is different from that used by Datacolor legacy products (e.g., ChromaCalc DOS, and Datamatch PPI). This option allows you to select which logic the program is to use when calculating a combinatorial correction. Place a check in the box to apply the legacy program logic. Remove the check to apply the combinatorial correction logic implemented in Datacolor MATCH^{PIGMENT}. See also *Applications Technology, Legacy Combinatorial Correction for a comparison of the program logic used.*

Contrast Specifies. Identifies which color matching model, translucent or opaque, will be used. The selection defines how the contrast specification is used for the calculation of matches and corrections. Not valid for transparent sets. See also *Applications Technology, Color Matching with White for a complete discussion of this selection.*

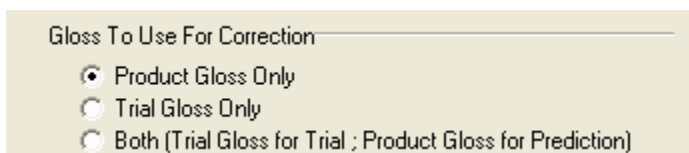


- **Color and Loading.** This selection uses the translucent matching model.
 - Matches are calculated using the substrate selection and film thickness entered in Formula Central.
 - The program reports the real color difference of the translucent match based on the background you have selected. The default is the job substrate, but for some applications you have the choice to view it over a light (ROL) or dark (ROD) background. See also *Formula Central Menus, View Menu, Evaluation Window Options, Evaluation Toolbar for instructions to change the background selection.*
 - If a contrast ratio is entered in Formula Central, the program can match the color and determine the correct pigment loading to achieve the specified contrast ratio.
- **Loading Only.** This selection uses the opaque matching model.

- The program assumes that the sample produced will be thick enough to produce an opaque match, and substrate and film thickness are not taken into account.
- The program will always report the opaque color difference, even if the sample is not opaque.
- User can enter a target contrast ratio. When *Loading Only* is selected, the program matches the target at opacity, and then tries to achieve the specified contrast ratio by diluting the opaque match with clear.

The default selection for this field is for *Color and Loading*.

Gloss to Use For Correction. When calculating a correction for a job that specifies the gloss, you must identify the gloss value to be used.



Gloss To Use For Correction

- ☒ Product Gloss Only
- ☐ Trial Gloss Only
- ☐ Both (Trial Gloss for Trial ; Product Gloss for Prediction)

If gloss compensation is activated, you can specify a gloss for every sample that is measured. This option provides details regarding the use of gloss information for correction predictions.

- **Product Gloss Only.** The gloss of the target is not adjusted. The assumption is that the gloss of the trial sample and future predictions will match the product gloss.
- **Trial Gloss Only.** The trial sample and any future predictions are assumed to have the gloss of the trial.
- **Both (Trial Gloss for Trial; Product Gloss for Prediction).** The gloss of the target is not adjusted. The gloss of the trial is adjusted to its measured (defined) gloss. Future predictions are assumed to match the product gloss.

Formula Synthesis Agreement Warning. The information stored for a formula may include the target measurement, a synthesized formula to match the trial, and the measurement of the actual trial sample. If the color difference between the synthesized formula and the trial sample is greater than the color difference defined here, the program displays a warning when the formula is stored.

Combinatorial Scope/Profiling. This option provides additional instructions for the program to use when Profiling is enabled. *See also Tools Menu, Job Preferences, Results Tab, Matching Options for an explanation of the Profiling feature.*

Fixed. In the *Profiling* sequence, the program initially finds 2000 candidate formulas. It then refines the formula calculations to find the best formulas available using your materials. This option instructs the program to evaluate each of the 2000 formulas initially found.

Variable. This option shortens the evaluation of the 2000 candidate formulas found during the Profiling sequence. Starting with the 2000 formulas initially found, the program puts aside the number of formulas requested that satisfy the match requirements (*Tools Menu, Job Preferences, Results Tab, Number of Formulas to Display*). As it continues evaluating the initial formulas, when the program finds 20 **consecutive** formulas that, upon additional calculations/adjustments, fail to satisfy the match requirements, the program stops looking. This speeds the matching time, but in some unusual circumstances may reject a formula(s) that is a better match than the formulas it submits.

Weights for Optimizer Goal. You can select up to five parameters for the Optimizer Goal to consider when evaluating a match, and assign a weight to each. The weight is expressed as a percent (if the total does not equal 100, the weights will be normalized to 100). *See also Applications Technology, Optimizer Goal for a complete discussion of this option.*

The default selections for the optimizer goal are: 60% DE 1 (Match Illuminant/Observer selection), 40% DE2.

NOTE

You must select a criterion for the first weighting condition. The default selection is DE1.

DE1. Optimizes predicted formulas based on the DE1 Illuminant/Observer conditions defined in Job Preferences (*Job Preferences, Tolerance Tab, Match Illuminant/Observers*). This parameter is always included in the optimizer goal definition.

DE 2-5. Optimizes predicted formulas based on DE2 – DE5 Illuminant/Observer conditions defined in Job Preferences (*Job Preferences, Tolerance Tab, Match Illuminant/Observers*).

DL*. Optimizes predicted formulas based on the CIELab (DL*) between the target and the formula, for the primary Illuminant/Observer condition.

Da*. Optimizes predicted formula based on the CIELab Da* difference between the target and the formula, for the primary Illuminant/Observer condition.

Db*. Optimizes predicted formulas based on the CIELab Db* difference between the target and the formula, for the primary Illuminant/Observer condition.

DC*. Optimizes predicted formulas based on the chroma (DC*) difference.

DH*. Optimizes predicted formulas based on the absolute value of the CIELab hue difference (DH*) between the target and the formula.

Color Load. Optimizes predicted formulas based on the color load of the formulas.

NOTE

If you choose to optimize on this feature, you should also include a colorimetric

property in the optimizer goal. If you don't, you may receive a formula that does not contain any colorant.

Curve Fit. Optimizes the predicted formulas based on the curve fit to the target.

Contrast Ratio. Optimizes the formula amounts to improve the agreement between the contrast ratio of the target and the predicted formula. *Not valid for no-load, opaque file formulas.*

MI-RMS (Root Mean Square). Optimizes the predicted formulas based on the metamerism index. This option uses the Root Mean Square method to calculate the value.

MI – DIN 6172. Optimizes the predicted formulas based on the metamerism index. This option uses the DIN 6172 method to calculate the metamerism index.

Cost per Volume. Optimizes the predicted formulas based on the cost of the formula expressed in volumetric units.

NOTE

If you choose to optimize on this feature, you should also include a colorimetric property in the optimizer goal. If you don't, you may receive a formula that minimizes cost without regard to any other formula properties.

Cost per Weight. Optimizes the predicted formulas based on the cost of the formula expressed in weight units.

NOTE

If you choose to optimize on this feature, you should also include a colorimetric property in the optimizer goal. If you don't, you may receive a formula that minimizes cost without regard to any other formula properties.

Contrast DE 1-5. Contrast DE is the color difference between the target and the predicted formula, measured over a dark (contrasting) background. Optimizes the predicted formulas to minimize the Contrast DE under the specified Illuminant/Observer combination. *Not valid for no-load, opaque file formulas.*

Contrast Curve Fit. Optimizes the predicted formulas to maximize the curve fit between the Target and the predicted formula presented over a dark (contrasting) background.

Hiding Power—Transmission. Maximizes the formula amounts to achieve the specified hiding power. *This is valid for diffuse transmittance applications only.*

Select Ingredients

When you match or correct a color, you must select the ingredients that you want the job to consider using in the formula. This is referred to as Ingredient Selection. There are two methods for selecting ingredients:

- **Select Ingredients by Name.** When this method is used, the user works from the Name Tab, and selects individual ingredients to be used. *See also Select Ingredients by Name for details regarding this procedure and the fields which appear on the Name tab.*
- **Select Ingredients by Keyword.** When this method is used, the user works from the Ingredient Keywords tab, and constructs a keyword query to be used by the job. *See also Select Ingredients by Keyword for details regarding this procedure, and for all fields that appear on the Ingredient Keyword tab.*

"Must Use Ingredient" and Keyword Queries

- Ingredients can be marked as 'must use'. This option is selectively enabled and disabled for each individual ingredient, and is accessed from this window.
- When a keyword query is created, there is an option to include the ingredients marked "must use".
- When this feature is enabled, all of the ingredients marked "must use" are **always** included in the ingredient selection when a query is run.
- When this feature is disabled, the ingredients marked "must use" may not be included in the ingredient.

NOTE

In order to create a keyword query, you must first create and assign keywords in Ingredient Maintenance. *See also Ingredient Maintenance, Keywords for details on this procedure.*

Opening the Select Ingredient Window

To access the Select Ingredient window, do the following:

1. From the menu bar, select **Tools, Select Ingredient**.

-or-

On the toolbar, click the **Ingredient Selection** button.



The Select Ingredients window displays.

Choose Ingredients From

Colorant Set
Transparent

Number of Ingredients (Colorants) in a Formula
Minimum
1
Maximum
4

☐ Consider Recycle



Ingredient Keywords

Name	Ingredient Keywords	0.0000	100.0000	Volume
☒ Flex Yellow		0.0000	100.0000	Volume
☒ Flex Red		0.0000	100.0000	Volume
☒ Flex Green		0.0000	100.0000	Volume
☒ Flex Blue		0.0000	100.0000	Volume
☒ Flex Violet		0.0000	100.0000	Volume
☒ Flex Black		0.0000	100.0000	Volume
☒ Flex Clear		0.0000	100.0000	Volume

Apply Keyword Query Help Cancel OK

2. **Name Tab.** Click on this tab to select ingredients "by name". See also *Select Ingredients by Name for step-by-step instructions*.
3. **Ingredient Keywords Tab.** Click on this tab to select ingredients "by keyword". See also *Select Ingredients by Keyword for step-by-step instructions*.

NOTE

The ingredient selection is stored as part of the job information. To use the same ingredient selection for a different job, store the job as a template after you have made the ingredient selection. The template can then be reused for other jobs.

Fields Common to Both Ingredient Selection Methods

The fields on the far left of the ingredient selection window (e.g., colorant set, number of ingredients, etc.) remain the same regardless of the selection method, and the colorant set type you use.

Choose Ingredients From

☒ Colorant Set

Transparent

Number of Ingredients (Colorants) in a Formula

Minimum

1

Maximum

4

☐ Consider Recycle



Choose Ingredients From

- **Colorant Set.** You must identify the set that contains the ingredients to be used. Click on the down arrow to view the sets available, and highlight the set to be used.

Number of Colorants in Formula. Instructs the job regarding the number of colorants a formula must contain. You must include a minimum and maximum number of colorants for use.

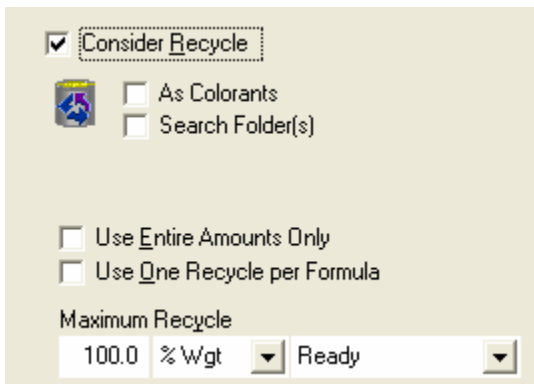
- **Minimum.** Enter the minimum number of colorants to be included in a formula. The program will accept 1 as a minimum, but we recommend that you use at least 2 colorants in a formula.
- **Maximum.** Enter a number from 1–7. The job will try every combination of ingredients possible based on the Minimum and Maximum values. For example:

Min = 2 and maximum = 5.

The program will try every two-colorant formula, three-colorant formula, four-colorant formula and five-colorant formula.

During a correction, the program references this information to decide if it can add colorants that were not part of the original formula. If the maximum number of colorants were not used in the original formula, the program may add new colorants to the correction. However, the number of colorants in the correction will never exceed the maximum number specified here.

Consider Recycle. This option enables the *Recycles* option. Click in the box to enable recycles. Additional fields are displayed, which are used to configure the recycles option.



- **As Colorants.** You can use recycles as colorants in a match or correction. When you check this, the recycles will appear in the colorant list. You can select or deselect just like a regular colorant.
- **Search Folder(s).** The program will search for a single recycle to use as a batch, in each match formula. The search is based on colorimetric data, and will find the closest recycle to the target color. If *As Colorants* is also checked, other recycles may be used as colorants in the same match.

NOTE

The Search DE limit for the recycle search is set at 25 DE.

- **Use Entire Amounts Only.** You can force the program to use a recycle *only* when the entire inventory amount can be used.
- **Use One Recycle per Formula.** You can also constrain the match to use only one recycle per formula.
- **Maximum Recycle.** This option sets the maximum amount of recycle that can be used in a formula. You must specify the amount, the recycle mode and recycle form to be used.

See also *Applications Technology, Recycles* for a complete discussion of the recycle feature, and all of the recycle program options that can be configured.

Select Ingredients by Name

Selecting ingredients "by name" allows the user to review all of the ingredients available, and choose the appropriate ingredients for the job. When this method is used, the user works from the Name Tab (*Tools Menu, Browse Ingredients, Name tab*) and selects individual ingredients to be used.

Must Use Ingredient. Ingredients can be marked as 'must use'. This requires that the ingredient is used *in every formula prediction*. The "must use" feature is selectively enabled and disabled for each individual ingredient, and is accessed from this window.

Name Tab Window

1. To access this window, do one of the following:
 - From the Menu bar, select **Tools, Browse Ingredients**.
 - On the Toolbar, click the **Browse Ingredients** button.



2. Click the **Name** tab to select ingredients by name. The window displays all of the colorants in the set.

Name		Ingredient Keywords			
☒		!	>=	<=	 x : y
☒	Flex Yellow	-	0	100	Volume
☒	Flex Red	-	0	100	Volume
☒	Flex Green	-	0	100	Volume
☒	Flex Blue	-	0	100	Volume
☒	Flex Violet	-	0	100	Volume
☒	Flex Black	-	0	100	Volume
☒	Flex Clear	-	0	100	Volume



Ingredient Selected. Click in the box to select an ingredient for use in a formula prediction. A check in this column indicates that the colorant can be considered as a candidate for use in formulas, although it may not be used.



Ingredient Name. This column identifies the ingredient.



Minimum Concentration. Displays the maximum concentration to be used for the ingredient in the formula. You may need to limit the concentration of an ingredient due to the cost, chemistry or processing problems associated with the ingredient. Minimum concentration limits can be also be defined in Colorant Set Maintenance. If there are concentration limits for a colorant that are always used, these values should be stored in the colorant set.

NOTE

Changes to the minimum concentration can be applied to input job states.



Maximum Concentration. Displays the maximum concentration to be used for the ingredient in the formula. You may need to limit the concentration of an ingredient due to the cost, chemistry or processing problems associated with the ingredient. Applicable to input job states.

If limiting the maximum concentration for a particular ingredient is an unusual situation, you can make the change from this window at run time. Maximum concentration limits can be also be defined in Colorant Set Maintenance. If there are concentration limits for a colorant that are always used, these values should be stored in the Colorant Set.

The following limits are placed on editing the maximum concentration limit from Formula Central:

- The user **cannot increase** the maximum concentration range, unless you have 'rights' to edit colorant sets.
- Cannot set a maximum higher than the maximum for the colorant in the colorant set.



Must Use. Click in the box to set an individual colorant as 'must use'. All colorants marked as 'must use' will be displayed in the formula grid prior to the initial formulation, and will be included in every formula prediction.

NOTES

- When running the Search options, the formulas selected will include all of the ingredients marked as *Must Use*.
- Ingredients marked as *Must Use* can be considered or ignored during a keyword query. *See also Must Use Ingredients and Keyword Queries for an explanation.*
- Additional parameters such as *min/max %*, *min/max form*, and *mode*, are often associated with *Must Use* ingredients. These are not included in the default formula grid settings and must be added to the grid display.



Min/Max Form. When you limit the concentration that can be used for an ingredient, you must define the ingredient form associated with the concentration limits.



Ingredient Proportions. If you are using the Pearl software and you want the program to maintain the pigment-to-clear ratio in the formula, enter the pigment to-clear ratio in this field.

NOTES

- When you select ingredients "by name" the program disregards all query information on the Ingredient Keyword tab. When you make a selection on the Name tab, you are telling the program that you are selecting ingredients "by name", not by keyword query.
- When you move from formulation to correction, the program automatically edits the selections in this tab to match the formula selected during the formulation step.

Select Ingredients by Keyword



The Keywords tab feature allows you to create keyword queries to be used by the job. Once keywords are created and assigned to ingredients, you can create a "keyword query" during ingredient selection. A query is a question or request. It is the device used to ask the program to include or exclude ingredients based on properties you have included in the query. By using keyword queries, you are further narrowing the ingredients available for use in a formula.

NOTE

Although keywords are applied to the ingredients, they are not part of the standard ingredient record.

Keywords Window

This tab is used to create keyword queries that will be used by the job to evaluate the ingredient selection, and any formulas retrieved by the database.

To access this window, do one of the following:

- From the Menu bar, select **Tools, Browse Ingredients**. ~OR~
- On the Toolbar, click the **Browse Ingredients** button.



When you click on the Keyword tab, the window below displays:

Name		Keyword		
Select: Ingredient: Properties and Values				
				
FDA Approved				
Heat Resistance		=		250
Lightfast		=		0.0

Two types of keyword queries are available in Formula Central, *True/False*, and *numeric* keyword queries. In the case of keywords that consist solely of a term, such as "FDA-approved", you can create a true /false "query". You can either ask the job to identify either those ingredients that are "FDA-approved", or are not "FDA-approved".

True/False Keywords Queries

Below is an example of a true/false query regarding the use of ingredients that are "FDA approved". To include only those ingredients that are specifically "FDA approved", the keyword query would be constructed as follows:

				
	FDA Approved			

This keyword query says: "include FDA Approved (ingredients)".

To exclude all ingredients that are specifically "FDA-Approved", the keyword query would be as follows:

				
	FDA Approved			

This keyword query says "exclude FDA Approved (ingredients)".

Numeric Keyword Queries

The job will include or exclude individual ingredients based on a numeric specification attached to the keyword. Below is an example of a keyword query regarding heat resistance:

	Heat Resistance			360

This keyword query says, "include (ingredients) with heat resistance greater than/equal to 360°". It is actually composed of two keyword values:

- A true/false value that is assigned to the term *heat resistance*.
- A value of “less than/equal to 360°” is assigned to the heat resistance.

TIPS

- If the heat resistance example above contained the instruction  , the keyword query would say: ***“exclude all ingredients that have the keyword ‘heat resistance’ assigned.”***
- It would not say: ***“exclude all ingredients with heat resistance less than 360°.”*** It will find all ingredients that do not have the term “heat resistance” assigned. Since heat resistance is absent, no value is assigned to it.

NOTES

- The query becomes part of the job. If you want to reuse the keyword query for other jobs, you should save the job template after you have created the keyword query.
- Creating a keyword and assigning it to an ingredient are two separate steps. If the keyword you want to use does not appear in the Select Ingredients window, you must create it, and it displays in the keyword list. However, if it has not been assigned to any ingredients, the keyword query will not be able to narrow the ingredient selection. Assigning keywords to ingredients is done in Ingredient Maintenance.
- See also *Ingredient Maintenance, Keywords* for details on creating and assigning ingredient keywords.

Include Must-Use Ingredients

At the bottom of the Ingredient Keywords tab is an option to “include Must-Use Ingredients” in the keyword search:

Name		Ingredient Keywords	
Select: Ingredient: Properties and Values			
			
☐	FDA Approved	=	250
☐	Heat Resistance	=	0.0
☐	Lightfast	=	0.0
☒ Include Must Use Ingredients			

When this feature is enabled, all of the ingredients marked "must use" are always included in the ingredient selection when a query is run. When this feature is disabled, the ingredients marked "must use" may not be included in the ingredient selection.

- Click to place a check in the box. This enables the option.
- Click again to remove the check and disable the option.

Correction Options

Correcting a color is accomplished through 4 different options, each using a different approach to your request. These include **Reformulate**, **Auto Correct Add**, **Manual Add** and **Combinatorial Correction**. The correction options can be accessed in one of the following ways:

- Via the menu bar by selecting the **Tools** option.
- Via the toolbar by clicking a **correction tool** button.
- Via the keyboard by using the **function key shortcuts**.

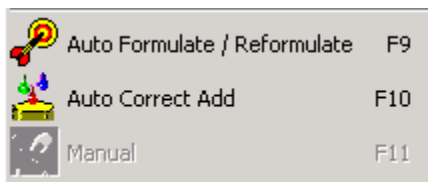
When running a correction, you are only required to provide a trial sample. You are **not** required to specify the ingredients in the formula or a batch size. In this situation, the program will also run a combinatorial match to the trial, using the ingredients selected.

NOTES

- If you do not provide a batch size, the program defaults to a batch size of 1 liter.

- Whenever multiple corrections are run for the same job, information in the formula grid and the evaluation window are updated to reflect the latest correction.

When the job state is *correction input*, the options below are enabled on the Tools Menu and Formula Central toolbar



Reformulate



This program option assumes that you will not use any material 'left over' from the current formula to prepare the next predicted formula, and retains the original batch size.

See also *Formula Central, Matching & Correcting Colors* for a detailed discussion of this option.

AutoCorrect Add



Calculates an addition to the existing formula.

See also *Program Features, Formula Central, Matching & Correcting Colors* for a detailed discussion of this option.

Manual



This correction allows the user to select an individual colorant to be added to the batch, and to specify the amount to be added. The program updates the formula in the formula grid, and the colorimetric results of the add will be displayed in the evaluation window. A "manual add" can only be run after an automatic add has been run.

NOTE

This feature is available in both formulation output and correction output. You must first do an automatic correction to enable the manual add option.

See also *Formula Central, Matching & Correcting Colors* for more information on the manual add option.

Combinatorial Correction

If the minimum/maximum number of ingredients allowed in the formula is greater than the number of ingredients in the trial formula, you can select additional ingredients to be used in the formula. In the correction, the program will automatically try multiple ingredient combinations that include the new ingredients. Typically, the program will find more than one formula to satisfy the job.

NOTE

Combinatorial Correction is not a user-selected feature, and does not appear as a menu option. It is a feature internal to the program that is part of the correction logic

Example 1:

- The minimum number of ingredients in a formula is 5.
- The maximum number of ingredients is 5.
- The batch contains 3 ingredients.
- You have provided additional ingredients during "Correction Input."

The system will try to find a batch formula containing five ingredients. If it finds multiple formulas, you can cycle through the formulas using the left-right arrows above the formula name.

Example 2:

- The min number of ingredients is 3.
- The max number of ingredients is 5.
- The batch contains 3 ingredients.
- Six additional colorants are selected during "Correction Input."

The program will try to make "corrections" using from 3 to 5 ingredients. It will include ingredients already in the batch, and add ingredients to reach a total of 5. This situation will generate multiple corrections.

See also Formula Central, Matching & Correcting Colors, Matching Features for a detailed discussion of this option.

Formulation Options

Matching a color is accomplished through a variety of options, each using a different approach to your request. For all formulation options, the program references *Job Preferences*, *Tolerances* for match tolerances, and *Job Preferences, Results* for instructions regarding the sorting and display of formulas.

When the job state is *formulation input*, the options shown below are enabled on both the Tools Menu and the Formula Central toolbar:

Tools	Help
	Job Preferences F3
	Select Ingredients F5
	Auto Formulate / Reformulate F9
	Auto Correct Add F10
	Manual F11
	Search F6
	Search and Correct F7
	Search and Adjust
	Use Formula Sample As a Trial
	Combinatorial Formulation F8
	Match Queue
	Synthesize Current Formula

Auto Formulate



Combines three color-matching techniques into a single procedure. This feature simulates the way an experienced color matcher approaches the problem of formulating a match to a new color standard.

Search



Rather than calculating a new formula to match a target, this tool looks through folders containing formulas previously made, to find a stored formula that matches the current target. Search, however, will not calculate a correction to an existing formula to improve the match to the Target. It will simply locate all existing formulas that satisfy the match tolerances for the job.

Search & Correct



This option takes the search function a step further. It looks for an existing formula to serve as an acceptable starting point to match the target, and calculates a correction to the stored formula.

Search & Adjust

This option is a variation of Search & Correct. When adjusting formulas to improve the quality of the match, the option requires that the program maintain the ratios of the colorants used in the original formula. Adjustments can only be made to the colorant loading (adjustments to amount of clear used) to improve the formula results.

Combinatorial Match



In a combinatorial match, the job considers every ingredient you have selected.

Match Queue

The word queue is defined as "a line of waiting people or vehicles". In Formula Central, a queue is a line of colors waiting to be matched. This feature allows you to set up color matches to be run at a later time. Multiple jobs can easily be set up and matched using the new Queue Matching options

See also *Formula Central, Matching & Correcting Colors* for a detailed discussion of each formulation option including queue matching.

Formula Synthesis

When this option is selected, the program calculates a theoretical spectral curve, based on ingredient amounts input to the formula grid. The synthesis results include:

- The synthesized formula in the output column
- The display of a color difference between the measured target and the synthesized formula, when a measured target is available.

NOTES

- The job state must be "Formulation Input" to accept ingredient amounts entered through the grid.
 - You must mark each ingredient as "Must Use".
 - You must enter each ingredient amount into the grid.
1. Open a new job and select the appropriate colorant set.
 2. Select the ingredients to be used, and mark them **Must Use**.

Name		Ingredient Keywords				
☒						x : y
☒	Flex Yellow	☒	0	100	Volume	
☒	Flex Red	☒	0	100	Volume	
☒	Flex Green	☒	0	100	Volume	
☒	Flex Blue	☒	0	100	Volume	
☐	Flex Violet	☐	0	100	Volume	
☐	Flex Black	☐	0	100	Volume	
☒	Flex Clear	☒	0	100	Volume	

3. Enter the ingredient amounts to be used:

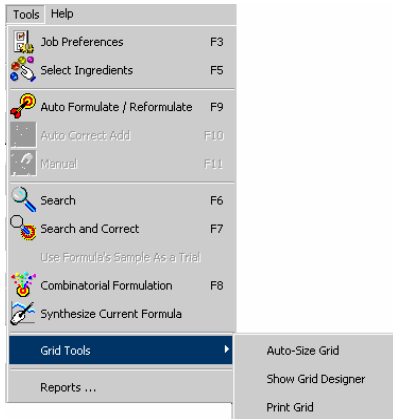
The screenshot shows the Formula Central interface. At the top, there are four dropdown menus: 'Target' (set to 'Synthesis Example'), 'Trial' (empty), 'Substrate' (set to 'FLX_WHITE FL'), and 'Formula' (empty). To the right of these is a 'Film Thickness' field set to '1.00 mils'. Below these is a table of ingredients with their amounts and status.

Ingredient	Amount	Status
Flex Yellow	1.0000 KG	Ready
Flex Red	4.0000 KG	Ready
Flex Green	3.0000 KG	Ready
Flex Blue	2.0000 KG	Ready
Flex Clear	KG	Ready
Add Ingredient		
Total Batch	100.0000 KG	Ready

4. Select **Tools Menu, Formula Synthesis**. The Navigator window opens, and prompts you for a name for the synthesized formula.
5. You can now retrieve the synthesized formula for examination in Formula Central or Datacolor TOOLS.

Grid Tools

Formulas are displayed in the Formula Grid in the lower half of the Formula Central screen. The submenu of Grid Tools options allows you to select the information to be displayed in the grid, and to control the grid layout.



This menu is also displayed when the cursor is placed anywhere in the formula grid, and you click the right mouse key.

- **Auto-Size Grid.** Distribute the rows and columns of the grid evenly across the screen. You will use this if you have added or removed any rows or columns from the Formula Grid.
- **Show Grid Designer.** This option is used to customize the grid display to the needs of the individual job, by showing, hiding or moving any of the fields. See also *Tools Menu, Job Preferences, Appearance Tab for a summary of the columns that can be added/removed using this option.*

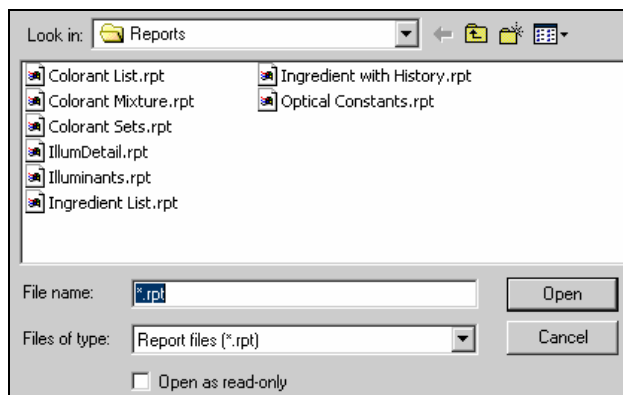
NOTES

- The Grid Designer only offers options to change the columns displayed. If you want to add the display of ingredient subtotals, you must edit the job preferences (*Tools Menu, Job Preferences, Appearance Tab*).
- Changes made using the Grid Designer option are only applied to the current job state. For example, when the job state is "Formulation Output" and you use the Grid Designer to add the field Alternate Output Amount to the grid display, the field will not appear when you move to Correction Input. This is because the change is only applied to the "Formulation Output" state.
- Changes made using the Grid Designer are only applied to the current job. If you want the changes to be applied to all future jobs created using the same job template, select *File, Save As Job Template*, to save the changes to a job template for use with future jobs.

Print Grid. *Not currently enabled.*

Reports

This option provides the ability to display and print ingredient, colorant and Illuminant/Observer data stored in the system. When you select this option, the following dialog box displays:



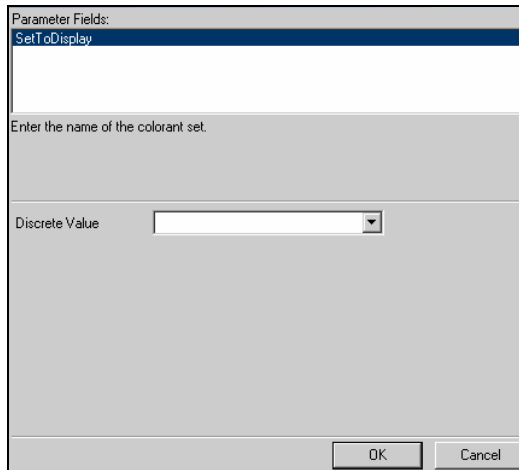
Click on the report you want to view. The screen will refresh and the report you have selected displays.

NOTES

- When you open one of the reports, a toolbar displays at the top of the window. It contains buttons that you may need to use to format the report.
- To see a list of batch tickets, you must browse the *Tickets* folder.

Report Summaries

- **Colorant List Report.** Summarizes the colorants stored in each colorant set. This includes: colorant set name, colorant name, colorant id, calibration status and current availability (active/disabled).
- **Colorant Mixture Report.** Provides detailed information regarding the mixtures stored for each colorant in the selected colorant set. This includes: colorant name, name of each mixture stored for the colorant, mixture formula and concentrations, current availability (active/disabled), and other physical and/or administrative data stored for each mixture.
- **Colorant Sets Report.** Summarizes the contents of each colorant set in the system. This includes: name, colorant ID number, optical model, mixture grouping type, curve smoothing method, instrument geometry, measurement type, file creation and modification information, and current availability (active/disabled).
- **Illuminant Detail Report.** Provides the stored values, at 10nm intervals, of every Illuminant/Observer combination stored in the system.
- **Illuminants Report.** Summarizes the Illuminant/Observer selections stored on the system.
- **Ingredient List Report.** Summarizes the ingredients stored in the system. This includes: ingredient name, ingredient id number, ingredient type, and information regarding the creation and modification of the data.
- **Ingredient with History Report.** Provides detailed information for the ingredients stored in the system. The detail includes lot id, density, cost strength, and current availability (active/inactive).
- **Optical Constants Report.** Provides detailed information regarding the optical constants stored for each colorant in the selected colorant set. This includes: colorant name, concentration, optical constants (reported at 10nm intervals across the visible spectrum), and other data stored in the colorant set record. When this report is selected the following dialog box displays.

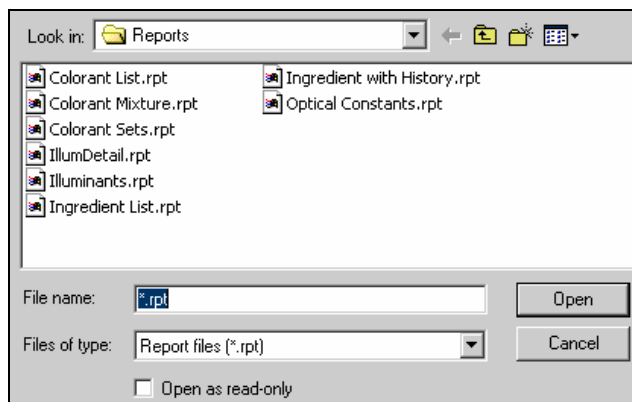


In the *Discrete Value* field, enter the name of the colorant set, and press **OK**. The optical constants data will be displayed.

Viewing Batch Tickets

This option also provides access to the batch tickets.

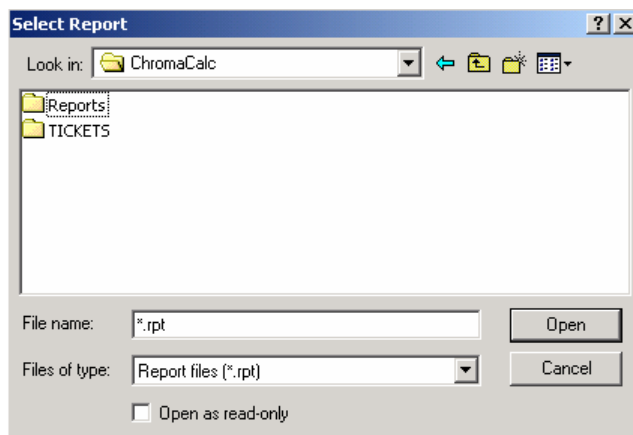
1. To access the batch tickets, select **Tools Menu, Reports**.



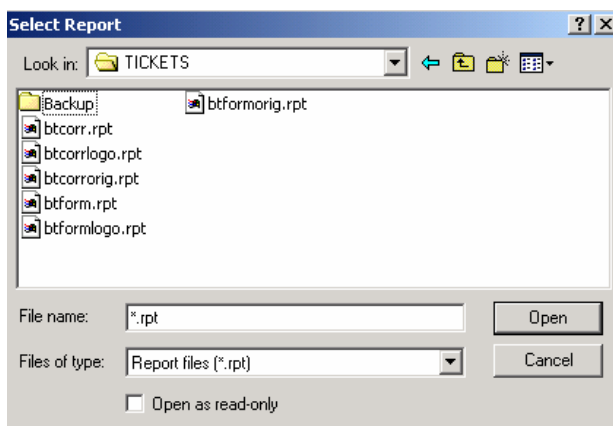
2. In the dialog box, click the **Backup** button.



A list of the folders in the database is displayed:



3. Click on **Tickets**. A list of batch tickets displays:



4. Click on one of the ***.rpt** files to highlight it.

- Click **Open**. The batch ticket displays:



Batch Ticket - Formulation

Job: Job 1434
 Target: 1st Shot - Standard Yellow YRB
 Formula: Prediction 1

Colorant Set: Transparent
 Film Thickness: 1.00 mils

Predicted Color Difference of Formula			CIELAB			
Illuminant	DE*	DL*	Da*	Db*	DC*	DH*
D65/10	0.00	0.00	0.00	0.00	0.00	0.00
A/10	0.02	0.00	0.01	-0.01	0.00	-0.02
F11/10	0.01	0.00	0.01	0.00	0.00	-0.01

Ingredient: Flex Yellow

Amount: 44.1387 KG

Form: Ready

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 Monday, October 11, 2004
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Other Tools Menu Options

The final 4 options on the TOOLS menu include:

Dispense Formula

Send Data to Datacolor TOOLS ▶

Optimize with Recycles

Auto Optimize

Dispense Formula

When an automated dispenser is connected to the system, you can dispense a match or correction directly from Formula Central.

NOTE

This option is not enabled unless the dispenser driver files have been installed on the system.

- Click on **Tools Menu, Dispense Formula**. The formula will be dispensed immediately, and a message displays indicating that the dispense was successful.

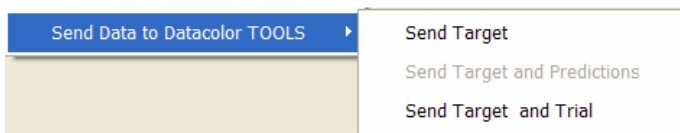
Send Data to Datacolor TOOLS

These options allow you to send active Targets and Trials to the Datacolor TOOLS desktop.

NOTE

These options are available regardless of whether Datacolor TOOLS is open at the time the option is selected. If the program is not open, it is launched as part of either of these functions.

1. Click on **Send Data to Datacolor TOOLS**. A submenu is displayed:



NOTE

If you send the same target multiple times, TOOLS will create multiple standards with the same name on the desktop.

2. **Send Target.** The program switches to Datacolor TOOLS, and the target is added to the TOOLS desktop as a *standard*. If Datacolor TOOLS is not running, it is launched, and remains open until you close it.
3. **Send Target and Predictions.** *Not enabled.*
4. **Send Target and Trial.** When selected, the active target and trial in Formula Central are sent to the TOOLS desktop. The target is placed in the *Standard* field and the trial is placed in the *Batch* field.

Optimize with Recycles

After the program has calculated a formula, you can re-run the match to determine if any available recycles can be substituted for the current ingredients in the formula.

NOTE

This option is enabled only when the *Recycles* option is enabled, and when the job state is either *formula output* or *correction output*.

Auto Optimize

The optimize feature is typically applied after a correction has been run. When this option is selected, the program skips the automatic correction, and immediately optimizes the colorants in the formula to calculate a correction. *See also Formula Central, Matching and Correcting Colors for a discussion of all correction options.*

NOTE

This option is not enabled until you have provided a target and a trial measurement.

NOTES

Ingredients, Colorants, & Databases

Database Overview

This program refers to all of the materials you use—colorants, resins, solvents and additives—as "ingredients". The program offers access to the ingredient information from Ingredient Maintenance and Colorant Set Maintenance. The use of these two programs is based on the type of ingredient data you need to access.



What is ingredient data?

Ingredient data is the physical and administrative data for a raw material. This includes the name, cost, viscosity, density, lot, supplier, component information, etc, and is created and edited through Ingredient Maintenance. You are only required to enter this information into the system once, because the information doesn't change. For example, you may have a resin that is used in several product lines. However, the cost of the resin remains the same regardless of the product that uses it. This ingredient information is stored in a central location under a single record. Regardless of the products that use it, the ingredient name, physical properties and administrative information remain the same.



What is the difference between an ingredient and a colorant?

Colorants are a specific type of ingredient that has optical data attached to them. Colorant Set Maintenance is the program option used to create and change the optical data for an ingredient. The optical data for the same material may change when it is mixed with different raw materials, or is subject to different processing techniques. For example, a red oxide pigment may be used in many different product lines, and its behavior may change significantly from one product to another. As a result, there are separate records in the database that contain optical data for the red oxide pigment.

Why is optical data unique?

Unlike physical and administrative information, the optical data for a colorant is based on the interaction of all of the ingredients used in a particular product line. Optical constants for an individual colorant can change significantly from one product to another. For example, the behavior of a red oxide pigment may be very different in an alkyd resin system than in a vinyl or a polyurethane system. If optical data is generated for the red oxide pigment in an alkyd system, and the same optical data is used to match a color in a polyurethane system, it will not produce an accurate formula for the polyurethane application. In this case, you need to generate two sets of optical data—one for the alkyd resin system and the other for the polyurethane system, so the program can generate accurate formulas for each product.

How is optical data calculated?

Optical data is calculated from the measurement of physical samples, based on detailed handling information for each sample, and the appearance properties of the samples.

Handling information includes the colorant concentration, ingredient form and ingredient mode, density, etc. Appearance information can include gloss, contrast ratio, nominal film thickness, etc. The measurement of the sample, the handling information and appearance data are input through Colorant Set Maintenance.

Ingredient Terminology

An ingredient "system" is a collection of materials that are physically compatible with one another. It can include multiple resins, solvents, additives and colorants, any of which can be combined to create a finished product. For example, you may use the same paste colors in both nitrocellulose and acrylic products. In this example, the same ingredient system is used to create both finished products, but each uses a separate colorant set.

NOTE

Only one ingredient system can be created in the current release of the program.

A formula contains several types of ingredients. Physical data and administrative data associated with each ingredient are stored into the database and used to calculate a formula.

Ingredient Types

A colorant is an ingredient that possesses physical data, administrative data, and optical data. This data is calculated and stored using Colorant Set Maintenance. Resins typically have optical constants of 0.0, but some translucent resins may influence the color of the sample, and generate real optical data. In this situation, optical data are calculated and stored for the resin. Depending on the ingredient you are using and the task you are performing, you will use either Ingredient Maintenance or Colorant Set Maintenance to enter or change ingredient information.

- **Ingredient Maintenance** provides access to the physical and administrative data for all ingredients. For solvents and additives and some resins, you will only use Ingredient Maintenance to edit ingredient data.
- **Colorant Set Maintenance** provides access to optical and appearance data regarding an ingredient. For colorants and some resins, you will use both Colorant Set Maintenance and Ingredient Maintenance to edit ingredient data.

Below is a summary of fields associated with ingredients. It indicates the ingredient type(s) with which the field is associated, and the program option needed to access it.

Ingredient Types					
Data Field	Color	Clear	Solvent	Additive	Maintenance Option
Density	Y	Y	Y	Y	Ingredient Maintenance
Cost	Y	Y	Y	Y	Ingredient Maintenance
Strength	Y	N	N	N	Ingredient Maintenance
Lot ID	Y	Y	Y	Y	Ingredient Maintenance
Supplier ID	Y	Y	Y	Y	Ingredient Maintenance
Notes	Y	Y	Y	Y	Colorant Set & Ingredient Maintenance
Keywords	Y	Y	Y	Y	Colorant Set & Ingredient Maintenance
Optical Data	Y	N	N	N	Colorant Set Maintenance
Gloss	Y	N	N	N	Colorant Set Maintenance

Ingredient Systems

The program refers to all of the materials you use as ingredients. Information about the physical properties of your raw materials (density, cost, name, etc.) and administrative information (lot number, supplier name, etc.) is entered into an ingredient record. Ingredient Maintenance is the program module used to enter this information for each of your raw materials.

What is an Ingredient System?

An ingredient system is a collection of ingredients that are physically compatible. An example would be a solvent-based paint system, such as a lacquer system. Ingredients may be used in more than one ingredient system, but within a single ingredient system, all of the ingredients must be compatible.

An ingredient system will frequently include multiple solvents, resins, additives and colorants, and several different products can be created from a single ingredient system. As a result several colorant sets may use the same ingredient system.



Mixing Ingredient Modes and Ingredient Forms

The program has the capability to convert ingredient amounts into the ingredient modes and forms that are used in production, and you can use multiple ingredient modes and forms in a single formula. The objective is to provide a formula for the finished product, that you do not have to alter manually in any way. When ingredient information is correctly entered, the matching and correction formulas will be able to express the ingredient amounts contained in a formula exactly the way you use them.

In the example below, the ingredient mode, kilograms, and the ingredient form "Ready" remains the same for all of the ingredients in the formula.

	2	Flex Red	10.3623	KG	Ready
	3	Flex Green	55.0879	KG	Ready
	5	Flex Violet	16.8763	KG	Ready
	7	Flex Clear	117.6736	KG	Ready
		Total Color	82.3264	KG	Ready
		Total Resin	117.6736	KG	Ready
		Total Thinner	0.0000	KG	Ready
		Total Batch	200.0000	KG	Ready

In production situations, you may work with volumetric units of one ingredient type, and weight units for another, and need to combine both ingredient modes in a single formula. The program gives you the flexibility to customize the formulas to your needs.

Below is another expression of the same formula. In this case, "Total Color" is expressed in volume units (L), while "Total Resin" and "Total Batch" amounts are expressed in weight units (KG).

	7	Flex Clear	117.6736	KG	Ready
	3	Flex Green	50.3086	L	Ready
	2	Flex Red	9.7758	L	Ready
	5	Flex Violet	15.9813	L	Ready
		Total Color	76.0656	L	Ready
		Total Resin	117.6736	KG	Ready
		Total Thinner	0.0000	KG	Ready
		Total Batch	200.0000	KG	Ready

Similarly, you may use multiple ingredient forms in a single formula:

	7	Flex Clear	117.6736 KG	▼ Ready	▼
	3	Flex Green Paste	19.2491 L	▼ Paste	▼
	2	Flex Red Paste	3.9388 L	▼ Paste	▼
	5	Flex Violet Paste	6.4298 L	▼ Paste	▼
	30	Solvent Blend	41.1632 KG	▼ +/-	▼
		Total Color	76.0656 L	▼ Ready	▼
		Total Resin	117.6736 KG	▼ Ready	▼
		Total Thinner	0.0000 KG	▼ Ready	▼
		Total Batch	200.0000 KG	▼ Ready	▼

This is an example of the same formula used in the two previous examples. In this case, the formula includes both "Paste" and "Ready" ingredient forms.

Expanding Ingredients into Components

Notice that the ingredient "Solvent Blend" has been added to the formula. In this case, the ingredient form for the colorants has changed from "Ready" (to use) to "Paste". Component information can be stored for ingredients such as pastes. When this information is provided, it is recalled when the ingredient form is changed, in order to provide an accurate formula. Since "Paste" is an intermediate form of the ingredient, additional solvent must be added to the batch to create a finished product.

How is ingredient information entered?

There is a separate program module, Ingredient Maintenance that provides access to store, edit and delete ingredient information. It is found on the *Go Menu* in the *Navigator* window.



NOTES

Ingredient Maintenance

Overview

This program module is used to store, edit and delete ingredient information. Ingredient information is limited to the physical properties of the raw material such as strength, viscosity, etc., and administrative information including cost, lot number, etc. Ingredients can be used with any colorant set included in the ingredient system. With the exception of ingredient density, the ingredient information is independent of the optical data generated for a particular colorant set.

The Ingredient Maintenance screen is divided into two sections.

- The top section contains default information for the ingredient identified in the ingredient name field.

	Ingredient Name Flex Blue Paste		Ingredient Lot ID RTM FBuP01			
	Ingredient Abbreviation 		Density 1.3354 KG / L			
	Ingredient Type 		Cost 6.70 \$ / L			
	Color 		Strength 100.0000 %			
	Display Rank 4					
	Priority 50					
 Components		 Lot History				
						
Flex Blue Conc	25.00 KG	25.0000	11.6292	2.2772	KG/L	3.6470
Resin A	25.00 KG	25.0000	25.5125	1.0380	KG/L	7.4370
Solvent A	25.00 KG	25.0000	26.4820	1.0000	KG/L	1.0000
Additive A	25.00 KG	25.0000	36.3763	0.7280	KG/L	6.6570
Add Ingredient						
Totals						
	100.0000	KG	100%	100%	1.0593	KG/L 472.76

These fields must be completed in order to store the ingredient record. *See also Storing and Editing Ingredients.*

The bottom of the screen is a grid that provides details regarding the ingredient. It displays either the Lot History information, or details about the components used in the ingredient currently displayed.

Components				Lot History			
	##		%	%			
Flex Blue Conc	25.00 KG	▼	25.0000	11.6292 2.2772	KG/L		3.6470
Resin A	25.00 KG	▼	25.0000	25.5125 1.0380	KG/L		7.4370
Solvent A	25.00 KG	▼	25.0000	26.4820 1.0000	KG/L		1.0000
Additive A	25.00 KG	▼	25.0000	36.3763 0.7280	KG/L		6.6570
Add Ingredient	▼						
Totals		100.0000 KG	▼	100%	100%	1.0593 KG/L	472.76

Ingredient Maintenance Grids

Several of the same information fields found in the top half of the screen, e.g., density, cost, strength, etc., also appear in the grids at the bottom of the screen. This is not duplicate information; it is additional detail regarding the specific raw material you are using. For example, the strength of an individual lot of an ingredient may be different from the standard specification for the material. The strength information displayed in the top half of the window is the default information for the ingredient. By entering the strength of each lot of the ingredient in the Lot History Grid, the program can make adjustments to any formula using this particular lot of the ingredient.

The Ingredient Maintenance grid includes two tabs:

Components Grid. This grid includes details about every component in an ingredient, and provides a record for making the ingredient. When an ingredient is an intermediate such as a paste ink or concentrate, it is composed of materials from several fundamental ingredient categories. In the example below, the Components Grid displays all of the ingredients used to create the paste.

Components				Lot History			
	##		%	%			
Flex Blue Conc	25.00 KG	▼	25.0000	11.6292 2.2772	KG/L		3.6470
Resin A	25.00 KG	▼	25.0000	25.5125 1.0380	KG/L		7.4370
Solvent A	25.00 KG	▼	25.0000	26.4820 1.0000	KG/L		1.0000
Additive A	25.00 KG	▼	25.0000	36.3763 0.7280	KG/L		6.6570
Add Ingredient	▼						
Totals		100.0000 KG	▼	100%	100%	1.0593 KG/L	472.76

Lot History Grid. This grid contains information regarding a specific lot of the ingredient.

Components					Lot History				
RTM FBuP01	☒	☒	100.00	1.3354	KG/L	6.70	L	11/23/1999	

The information includes density, cost, strength, date received, date activated, etc., and may vary from lot-to-lot. This grid contains all of the information relevant to a particular ingredient lot.

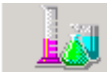
Storing/Editing Ingredients

Ingredient information is limited to physical properties such as viscosity, density, etc., and administrative information including cost, lot number, etc. Sample measurements are not required to store ingredient information.

Storing Ingredients

To **STORE** a new ingredient, you must complete all of the fields in the top half of the Ingredient Maintenance screen.

- To store a new ingredient, select **File Menu, New, Ingredient**, or click the **New Ingredient** button on the toolbar.



The screen refreshes and the *Ingredient Name* field is cleared. Other fields contain default information.

Ingredient Name New Blank Ingredient	Ingredient Lot ID RTM FBuP01
Ingredient Abbreviation 	Density 1.3354 KG / L
Ingredient Type 	Cost 6.70 \$ / L
Color 	Strength 100.0000 %
Display Rank 4	
Priority 50	

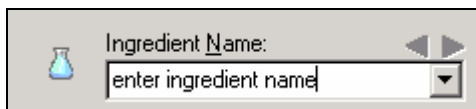
Components					Lot History				
Flex Blue Conc	25.00 KG	*	25.0000	11.6292	2.2772	KG/L	3.6470		
Resin A	25.00 KG	*	25.0000	25.5125	1.0300	KG/L	7.4370		
Solvent A	25.00 KG	*	25.0000	26.4820	1.0000	KG/L	1.0000		
Additive A	25.00 KG	*	25.0000	36.3763	0.7280	KG/L	6.6570		
Add Ingredient	*								
Totals	100.0000	KG	-	100%	100%	1.0593	KG/L	472.76	

NOTE

Optical data (K/S, K and S, Absorbance) for an ingredient is generated and displayed through colorant set maintenance.

Ingredient Name. A new ingredient is entered through the *Ingredient Name* field at the top of the window:

- Place the cursor in the field and click.
- Enter the new ingredient name from the keyboard.

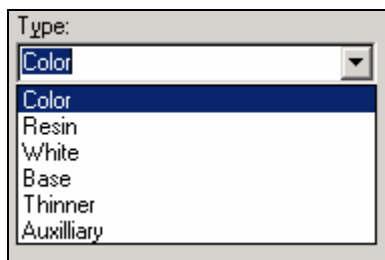


Ingredient Abbreviation. When working with the Data Transfer program module, you must assign an abbreviation to the name of the ingredient. This abbreviation is stored in the ingredient record, and referenced when converting formulas generated using Datacolor MATCH^{PIGMENT} for use with Paintmaker and Datacolor PAINT point-of-sale products. See also *Data Exchange* for details on this program module.

Ingredient Type. Each ingredient must be assigned an ingredient type. Assigning ingredient types to materials allows you to working with ingredients as a group. This may be useful for scaling formulas, and setting constraints on a formula, such as colorant loading.

Ingredient Type is selected from the *Ingredient Type* field at the top of the window:

1. Click the down arrow at the left side of the field. A list of ingredient types displays.



2. Point and click on the ingredient type to be assigned to the ingredient.

NOTE

There are only four basic ingredient types. However, the field selection includes multiple labels for the same ingredient type. The alternate selections are included because different industries often use different terms for the same ingredient types. For example, solvent is referred to as "thinner" in some applications.

Display Rank. Rank is a number representing a preferred display order. You can decide to display ingredients by Rank, Name or by the ingredient amount. If you want the ingredients presented in a particular order other than name, you must assign a rank.

- Enter a number in the *Ingredient Rank* field to identify the ingredient. The default value is one. If you do not intend to use this feature, assign '1' to the rank of each ingredient in the system.

Priority. You may have processing requirements that favor the use of one ingredient over another. On the other hand, you may have pigments that you want to avoid using. Assigning a Priority to an ingredient can be used to either increase or decrease the possibility that the formulas found will include a particular ingredient.

The program assigns a default ingredient priority value of 50 to every ingredient in the system.

- A value of 50 indicates that no changes were made to the ingredient priority values for the colorants in the formula.
- A value greater than 50 increases the possibility that a colorant will be used.
- A value less than 50 decreases the possibility that a colorant will be used.

When you assign Ingredient Priority values, you must include Ingredient Priority in the sorting options for the job template to enable this feature. *See also Applications Technology, Ingredient Priority and Ingredient Compatibility for a complete discussion of this feature.*

Ingredient Lot ID. The program works with individual ingredient lots. You can use a maximum of 30 characters to identify the ingredient lot.

1. Place the cursor in the *Ingredient Lot* field and click.
2. Enter the new ingredient name from the keyboard.

An activation date is also assigned to the ingredient lot. The default date is the current date. To assign a different date:

1. Click on the down arrow.
2. Select a different date to be used. Use the left/right arrows to move through the calendar.

Ingredient Density. A density must be assigned to each ingredient. This includes a numerical value, a weight unit and a volume unit. For example, if the density of the ingredient is expressed as specific gravity:

- the weight unit would be grams.
- the volume unit would be cubic centimeters (cc).
- the density entered in the field should be the measured density for the material, not the theoretical density.

NOTE

The density information in this field is related to the particular lot selected in the ingredient lot ID field.



To complete this field:

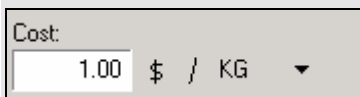
1. Enter the density value. If you do not work in volumetric units and do not need to convert amounts from weight to volume, enter "1" in this field.
2. In the field to the near right, click on the down arrow to view the weight units available, and highlight the unit to be used. If you entered "1" in the density column, you can accept the default unit.
3. In the field to the far right, click on the down arrow to view the volume units available, and highlight the unit to be used. If you entered "1" in the density column, you can accept the default unit.



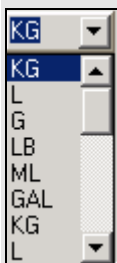
Ingredient Cost. A cost must be assigned to each ingredient. In addition to an amount, you must identify the cost basis unit. This is either a weight unit or a volume unit. For example, the ingredient cost may be \$10.00/gallon.

NOTE

The cost information in this field is related to the particular lot selected in the ingredient lot ID field.



Cost: 1.00 \$ / KG ▼



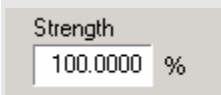
KG
KG
L
G
LB
ML
GAL
KG
L

If you entered a "1" in the *Cost* field, you can accept the default unit.

Ingredient Strength. The Strength field provides the ability to edit the relative tinting strength of the ingredient. The entry for this field is expressed as a percent. The default strength value, 100%, should be assigned to a new ingredient.

NOTE

The strength information in this field is related to the particular lot selected in the ingredient lot ID field.



Strength 100.0000 %

To enter a different value:

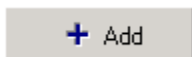
1. Place the cursor in the field and click the mouse.
2. Enter the new strength percentage.

This strength information that displays in the grids in the lower half of the window cannot be edited in the grid. The value displayed in this field is specific to the lot selected in the ingredient lot ID field.

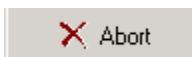
Completing the Record

You can also enter information regarding the new ingredient into both the component and lot history grids. When all of the information has been entered

1. To store the new ingredient information, click the **Add** button.



2. To exit the *New Ingredient* option without making any changes, click the **Abort** button.



Editing Ingredients

To edit an existing ingredient, do the following:

1. In the *Ingredient Name* field, click on the down arrow to display a list of stored ingredients.
2. Highlight the ingredient to be selected.

Ingredient Name Flex Blue Paste		Ingredient Lot ID RTM FBuP01	
Ingredient Abbreviation _____		Density 1.3354 KG / L	
Ingredient Type Color		Cost 6.70 \$ / L	
Display Rank 4		Strength 100.0000 %	
Priority 50			

Components			Lot History				
	##		%	%			
Flex Blue Conc.	25.00 KG	25.0000	11.6292	2.2772	KG/L	3.6470	
Resin A	25.00 KG	25.0000	25.5125	1.0380	KG/L	7.4370	
Solvent A	25.00 KG	25.0000	26.4820	1.0000	KG/L	1.0000	
Additive A	25.00 KG	25.0000	36.3763	0.7280	KG/L	6.6570	
Add Ingredient							
Totals	100.0000 KG	100%	100%	1.0593	KG/L	472.76	

The information for the ingredient you selected will be displayed. Edit the information as appropriate. Changes can be made any fields in the window, and to information in the *Components Grid* or the *Lot History Grid*.

To edit or delete an Ingredient Abbreviation, Priority or Compatibility value:

- Place the cursor in the appropriate field, and delete the existing entry;
- Leave the field blank to delete the current value; ~or~
- Enter a different value into the field.

NOTE

Changes made to the ingredient information are automatically updated. The program does not ask you to confirm any changes you make.

Adding Components to Ingredients

Below is the procedure used to enter the component information for a parent ingredient. See also *Ingredient Maintenance Grids for additional information on the Component and Lot History grids.*

1. In the *Ingredient Name* field, select the ingredient to be edited. The components currently stored for the ingredient are displayed in the *Components* grid:

 Components			
	##		%
Flex Black Dry	20.00	KG	19.0476
Resin B	40.00	KG	38.0952
Solvent B	40.00	KG	38.0952
Additive B	5.00	KG	4.7619
Add Ingredient			

2. Move to the *Add Ingredients* column, and click on the down arrow. From the list displayed, highlight the component to be added.

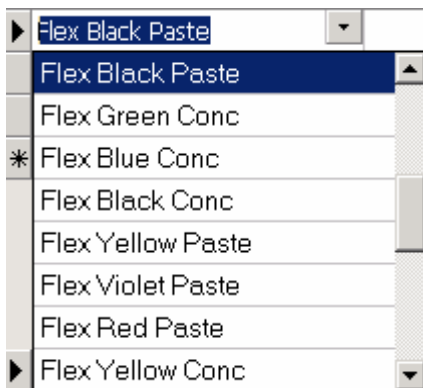

Flex Black Paste
Solvent Blend
Resin A

3. Enter the appropriate information into the *Amount* and *Unit* fields in the grid.

Repeat the procedure to add all of the components included in the ingredient. All changes are immediately updated.

Substituting Components

If you have discontinued a component ingredient, or if it is temporarily out-of-stock, you can replace the ingredient in your system. Below is the procedure used to substitute an ingredient component(s):



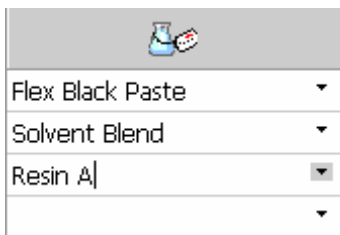
1. Move to the component to be replaced, and click on the drop-down list arrow. Highlight the component to be substituted. The grid will be updated immediately.
2. Make the appropriate changes to the information in the *Amount* and *Unit* fields in the grid. All changes are immediately updated.

Editing Component Data

Information contained in the fields highlighted in white can be edited from the grid. Information contained in the gray fields cannot be edited from the grid. For example, you can edit the *Amount* and *Unit* fields for any component list in the grid. However, if you want to edit the cost of a particular component in the grid, you must select the component in the Ingredient Name field in the top half of the window. You then edit the cost field in the top half of the window.

To edit a field directly from the grid:

1. Move to the field containing the information to be edited.
2. From the list displayed, highlight the component to be added.

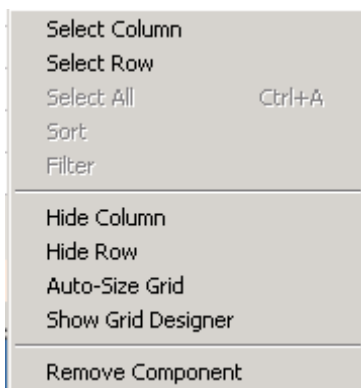


- Enter the appropriate information into the fields to be edited. All changes are immediately updated.

Deleting Ingredient Components

You can delete components from an ingredient at any time. To delete a component from an ingredient:

- Place the cursor in the *Ingredient Name* field in the grid.
- Click the right mouse key. A menu displays.



- From the menu, click **Remove Component**.

WARNING!

When you select *Remove Component*, the data is automatically deleted without any confirmation message.

Ingredient Maintenance Grids

The Ingredient Maintenance grid includes two tabs:

- Components Grid.** This grid includes details about every component in an ingredient, and provides a record for making the ingredient. When an ingredient is an intermediate such as a paste ink or concentrate, it is composed of materials from several fundamental ingredient categories. In the example below, the Components grid displays all of the ingredients used to create the paste.

Components				Lot History			
	##		%	%			
Flex Blue Conc	25.00 KG	▼	25.0000	11.6292	2.2772	KG/L	3.6470
Resin A	25.00 KG	▼	25.0000	25.5125	1.0380	KG/L	7.4370
Solvent A	25.00 KG	▼	25.0000	26.4820	1.0000	KG/L	1.0000
Additive A	25.00 KG	▼	25.0000	36.3763	0.7280	KG/L	6.6570
Add Ingredient							
Totals	100.0000	KG	100%	100%	1.0593	KG/L	472.76

- **Lot History Grid.** This grid contains information regarding a specific lot of the ingredient.

Components					Lot History				
RTM FBuP01	☒	☒	100.00	1.3354	KG/L	6.70	L	11/23/1999	

The information includes density, cost, strength, date received, date activated, etc., and may vary from lot-to-lot. This grid contains all of the information relevant to a particular ingredient lot.

Components Grid

This grid provides the ability to store, edit, delete and display detailed information regarding the components included in the ingredient. Many ingredients include a combination of ingredient types. For example, a paste contains colorant, solvent and resins. When an ingredient includes multiple components, you can include the details of each component in the ingredient record.

NOTES ABOUT THE COMPONENTS GRID

- When the ingredient being stored is a fundamental component (i.e., dry pigment, resin, solvent or additive), the Component grid will remain empty. You only need to complete the top half of the Ingredient Maintenance screen.
- An ingredient component must be stored to be added to the component grid. See *Storing and Editing Ingredients*.
- The columns displayed in this grid are fixed, and cannot be changed by the user.
- Information contained in the fields highlighted in white can be edited from the grid. Information contained in the gray fields cannot be edited from the grid.

For example, if you want to edit the cost of a particular component in the grid, you must select the component in the *Ingredient Name* field in the top half of the window. You then edit the cost field in the top half of the window.

To store ingredient components:

- Click on the **Components** tab to display the components of the ingredient selected in the *Ingredient Name* field at the top of the window.

Ingredient Name Flex Blue Paste		Ingredient Lot ID RTM FBuP01	
Ingredient Abbreviation 		Density 1.3354 KG / L	
Ingredient Type 		Cost 6.70 \$ / L	
Color 		Strength 100.0000 %	
Display Rank 4			
Priority 50			

Components			Lot History						
	##	Unit	%	%					
Flex Blue Conc.	25.00	KG	25.0000	11.6292	2.2772	KG/L	3.6470		
Resin A	25.00	KG	25.0000	25.5125	1.0380	KG/L	7.4370		
Solvent A	25.00	KG	25.0000	26.4820	1.0000	KG/L	1.0000		
Additive A	25.00	KG	25.0000	36.3763	0.7280	KG/L	6.6570		
Add Ingredient									
Totals			100.0000	KG	100%	100%	1.0593	KG/L	472.76



Select Ingredients. Click on the down arrow to display the ingredients currently stored, and highlight the ingredient to be included as a component of the ingredient.



Amount. Enter the amount of the component contained in the ingredient. The amount does not need to be converted to percent, simply enter the amount of the component material.



Unit. This field displays the units associated with the entry in the Amount field. The units can be weight or volume. Click on the down arrow to displayed the choices, and highlight the correct unit. The grid will be updated immediately.



Weight. This field displays the percent of the component contained in the ingredient, by weight. The operator does not enter this value. It is calculated by the program, based on the information in the *Amount* fields in the grid, and the density and density unit information stored for each ingredient component.



% Volume. This field displays the percent of the component contained in the ingredient, by volume. The operator does not enter this value. It is calculated by the program, based on the information in the *Amount* fields in the grid, and the density and density unit information stored for each ingredient component.



Density. Displays the density for the lot. To edit the density for an individual lot, you must provide a number, a weight unit, and a volume unit (i.e., 0.5 grams/cc).

Ingredient Lot ID: test lot id Date: 1/08/2002

Density: 8.3444 LB / GAL

1. Move to the top half of the window and select the lot as the **active lot**.
2. Move to the *Density* fields in the top half of the window.
3. Enter the **density** value in the density field.
4. Select the **weight unit** to be used.
5. Select the **volume unit** to be used.

See also Applications Technology, Ingredient Density for a detailed discussion on ingredient density and its effect on the calculation of accurate optical constants.

NOTE

These fields update immediately, and default to 1KG/L. For this reason, we recommend that you edit the weight and volume fields before entering the amount. If you do not, you will have to enter the amount a second time to make the expression correct.



Cost. This field displays the cost of the lot included in the ingredient.

Lot History Grid

This grid provides the ability to store, edit, delete and display detailed information regarding individual lots of the ingredient. Over time, many lots of the same ingredient are used in a single facility. Each time a new lot of ingredient is received, the user can update the ingredient record with information specific to the lot of ingredient received.

Components					Lot History				
RTM FBuP01	☒	☒	100.00	1.3354 KG/L	6.70 L		11/23/1999		



Lot ID. Identifies the lots stored for the ingredient. To add a new lot, enter the lot name in this field. You can use a maximum of 30 characters.



Lot Availability. The grid may include lots of material that are not currently available. A check in the box indicates the material is available. An empty box indicates the material is not available for use. This information is edited directly from the grid. Click in the field to change the current availability status.



Default Lot. This field identifies which lot is the default lot. At least one lot must be checked.



Lot Strength. Displays the relative strength each individual ingredient lot. This is a relative comparison, based on the strength of the standard lot of the material. This field is not edited directly from the grid. To edit the strength of an individual lot:

	Ingredient Lot ID:	Date:
	test lot id	1/08/2002
	RTM.FBkP01	
	test lot id	

- Move to the top half of the window and select the lot as the **active lot**.
- Move to the *Strength* field in the top half of the screen, and edit the value.



Lot Density. Identifies the actual density for the selected lot. Densities can vary slightly from one lot to another. Enter the density measured for the lot.



Density Unit. Identifies the weight/volume units attached to the density. See also *Applications Technology, Ingredient Density for a detailed discussion on ingredient density and its effect on the calculation of accurate optical constants.*



Cost. Displays the cost of the lot included in the ingredient. You must provide a cost, and a unit to be used as the cost basis. To edit the cost for an individual lot:

Cost:
1.00 \$ / KG

1. Move to the top half of the window and select the lot as the **active lot**.
2. Move to the Cost fields in the top half of the window.

3. Select the **cost basis unit** to be used.
4. Enter the **value** in the cost field.

NOTE

These fields update immediately, and default to 1.00 /KG. For this reason, we recommend that you edit the cost basis field before entering the amount. If you do not, you will have to enter the amount a second time to make the expression correct.



Cost Basis. In addition to an amount, you must identify the cost basis unit. This is either a weight or volume unit. For example, the lot cost may be \$10.00/gallon.



Start Date. Indicates the date the lot was originally available. This can be edited directly from the grid. To enter or edit:

1. Position the cursor in the grid.
2. Enter the **start date**. The year must be expressed using 4 digits.



End Date. Indicates the date the lot is no longer available. To enter or edit:

1. Position the cursor in the grid.
2. Enter the **end date**. The year must be expressed using 4 digits.

NOTES ABOUT THE LOT HISTORY GRID

- The operator provides information contained in the fields highlighted in white. Information contained in the gray fields is calculated from the information entered into the white fields.
- The columns that are displayed in this grid are fixed, and cannot be changed by the user.

Ingredient Keywords

The Ingredient Keywords feature allows you to assign 'terms' to ingredients to describe properties of the ingredient, not included in the ingredient record. Once keywords are created and assigned to ingredients, you can create keyword queries in Formula Central. A query is a question. When you create a keyword query, you are asking the program to inquire about the status of a specific property of the ingredient, (for example "lead-free") which is identified by the keyword.

NOTES

- Ingredient keywords can only be created and assigned through the Ingredient Maintenance program module.
- Keyword queries are created during ingredient selection in Formula Central

- Keyword queries are dynamic, and run at the time you start the match. If new colorants are added to a set and keywords are attached, the query will automatically pick up the new colorants based on their keywords.

See also *Program Features, Keywords* for a detailed discussion of this feature.

Create, Edit, or Delete Keywords

To CREATE, EDIT, or DELETE keyword information:

1. Click the **Keyword** icon found on the Ingredient Maintenance toolbar.



The Ingredient Keyword window displays:

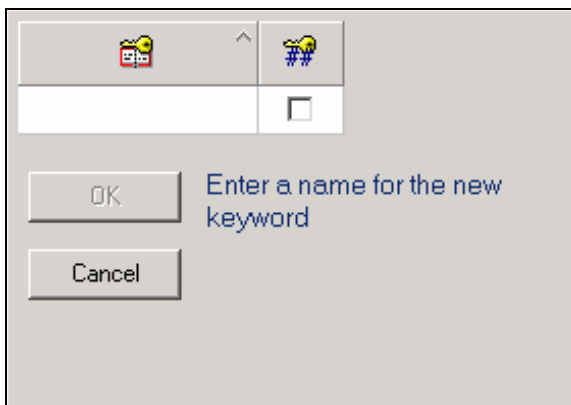
Assign:Ingredient: **Additive A**

☒		^^
☐	FDA Approved	
☐	Heat Resistance	250
☐	Lightfast	0.0

2. Place the cursor anywhere in the keyword grid, and click the right mouse button. The following menu displays:

New Keyword
Delete Keyword
Edit Keyword
Rename Keyword

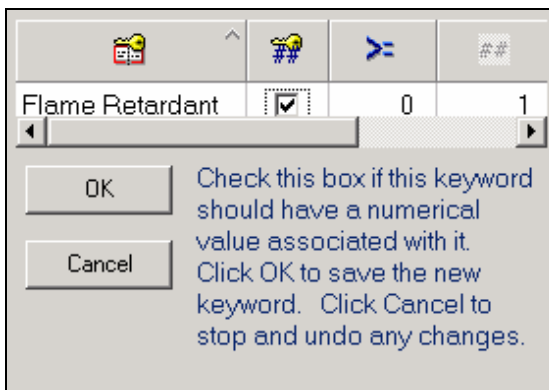
3. Select the **New Keyword** option. The Keyword Wizard displays:



4. Enter the new keyword. You can also attach values to the keyword, by placing a check in the *keyword value* column.



Keyword Values. Use the scroll bar below the keyword information to view additional fields related to numerical value information:



Keyword	Keyword Value	Lowest value allowed	Assume this value by default
Flame Retardant	☒	0	1

Keyword Value Fields



Lowest value allowed. The minimum value allowed for the keyword characteristic.

Assume this value by default. The default value to be used for the keyword characteristic.



Decimal places to show. Some values will be expressed as decimals. This field indicates that number of decimal places to be displayed for the

numerical values.



Highest value allowed. The maximum value allowed for the keyword characteristic.

5. Click **OK** when you have completed the keyword information. The window will refresh and the new keyword displays in the list.

Assigning Keywords to Ingredients

To assign keywords to ingredients:

1. Click the **Keyword icon** to create, edit, or delete keywords for an ingredient.



2. Each row contains one keyword per row. Place a check in the box to attach the keyword to the ingredient currently displayed.

Assign:Ingredient: **Additive A**

☒	 ^	##
☐	FDA Approved	
☐	Heat Resistance	250
☐	Lightfast	0.0

In the example below the keyword "*Flame Retardant*" has been assigned to the ingredient "*Flex Blue Conc.*"

Assign: Ingredient: **Flex Blue Conc**

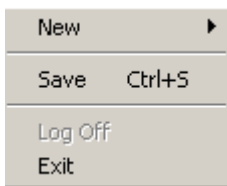
☒	 ^	##
☐	FDA Approved	
☒	Flame Retardant	1.0
☐	Heat Resistance	250
☐	Lightfast	0.0

3. Click the **Keyword** icon to close this dialog box.

Ingredient Maintenance Menus/Toolbar

This section covers the menus and toolbar options included in the Ingredient Maintenance program module.

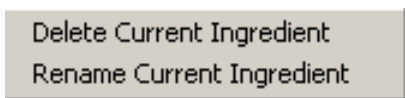
File Menu



- **New.** Updates the fields on the window to add either a new ingredient, or a new lot.
- **Save.** Saves any changes made to the ingredient information.
- **Exit.** Closes the Ingredient Maintenance program module.

Edit Menu

The options on this menu are limited to editing and renaming ingredients.



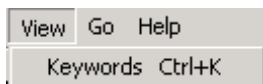
- **Delete Current Ingredient.** Use this option to delete an ingredient from the system.
- **Rename Current Ingredient.** Use this option to edit the name of an ingredient currently stored.

NOTES

- Editing ingredient information should not be done when other users are accessing the data.
- It is recommended that you close other program modules before editing ingredient data.
- Ingredient data cannot be deleted if it is stored in a colorant set, or included as part of a formula.

View Menu

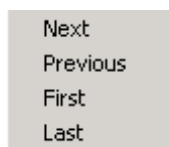
The View Menu is limited to an option to display the keywords for an ingredient.



For details on this feature, see also [Ingredient Maintenance](#), [Keywords](#), and [Formula Central Menus](#), [Ingredient Selection](#), [Keywords](#).

Go Menu

This menu provides options to page through all of the ingredients stored in the system. These options can also be accessed through the VCR buttons on the toolbar.

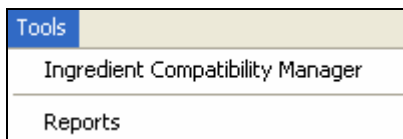


The Ingredient List is alphabetized. The menu options allow you to sort through the list for a particular ingredient.

- **Next.** Displays the next ingredient.
- **Previous.** Displays the previous ingredient.
- **First.** Displays the first ingredient in the ingredient list.
- **Last.** Displays the last ingredient in the ingredient list.

Tools Menu

The Tools menu provides access to the Ingredient Compatibility Manager and the Datacolor MATCH^{PIGMENT} reporting options:

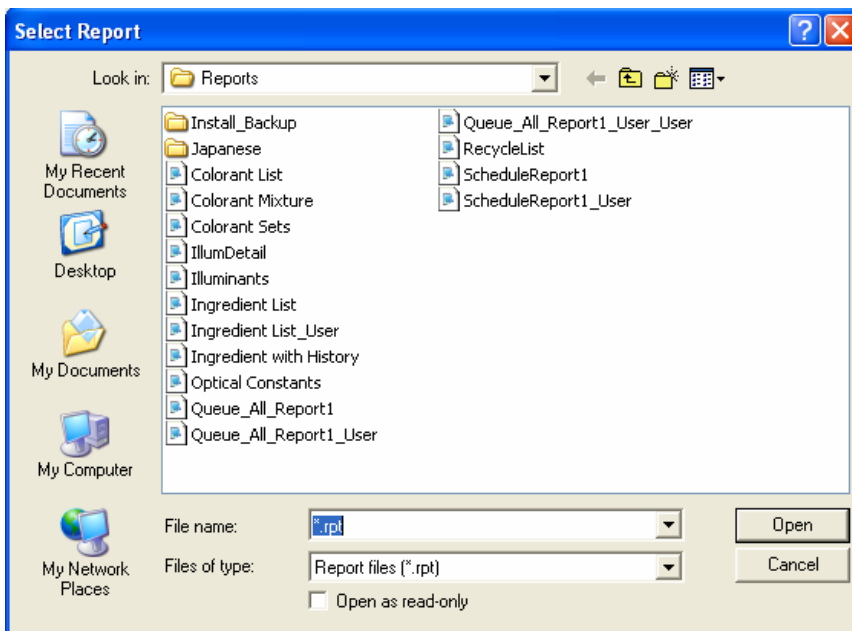


Ingredient Compatibility Manager

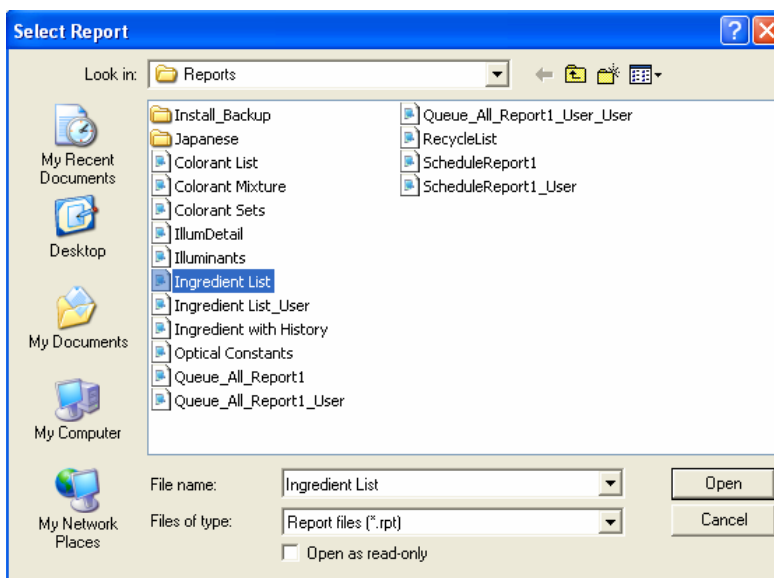
See also [Ingredient Maintenance](#), [Ingredient Compatibility Manager](#) for instructions on this option.

Reports

This option opens a window displaying all of the reports available across all program modules included in Datacolor MATCH^{PIGMENT}.



- Highlight a report and click **Open**:

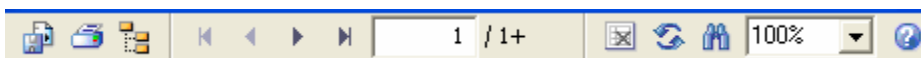


The report displays.

Ingredient List						
Tuesday, May 20, 2008 3:59:49PM						
ID	Display Order	Name	Type	Modification Date and User		Creation Date and User
1	1	cc clear d	Clear	2/14/05 9:57	User	2/14/05 9:57 User
2	1	cc white d	White	2/14/05 9:57	User	2/14/05 9:57 User
3	1	cc black d	Color	2/14/05 9:57	User	2/14/05 9:57 User
4	1	cc fastred d	Color	2/14/05 9:57	User	2/14/05 9:57 User
5	1	cc red oxide d	Color	2/14/05 9:57	User	2/14/05 9:57 User
6	1	cc fastyellow d	Color	2/14/05 9:57	User	2/14/05 9:57 User
7	1	cc yellow oxide d	Color	2/14/05 9:57	User	2/14/05 9:57 User

Reports Toolbar

At the top of the Report is a toolbar containing several icons.



Below is a summary of the toolbar functions:



Export Options. You can export the selected report in many different file formats. You must make the following selections:
File Format and *Folder Location*.



Print Options. You must make the following selections:
Number of pages to print
No. of copies to print
Collate/No Collate. You can choose to collate a multi-page report.



Toggle Group Tree. Changes the screen layout. When enabled, the report is displayed in a Windows Explorer-style layout. The headings/chapters in the report are displayed on the left. When disabled, the full screen display is dedicated to a single page in the report.



Go To options. Use these buttons to navigate forward and backward through the pages of the report.



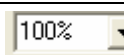
Stop Loading. Cancels the operation you have selected.



Refresh. Updates the display with any changes made.



Search Text. Search the report content to locate specific text strings.



Scaling. Offers an option to reduce/enlarge the image of the report.

Ingredient Maintenance Toolbar

The toolbar contains buttons that are shortcuts to Ingredient Maintenance functions. Clicking on the button opens the window associated with the button.



Buttons on the Toolbar



New Ingredient. Clears the current ingredient information, and resets the default values. Used to add new ingredients to the system.



New Lot. Adds a new entry to the lot history grid, and enters default values for the lot. The defaults can be edited.



Save Ingredient. Saves the current ingredient.



Ingredient Compatibility Manager. Opens the Ingredient Compatibility Manager. *See also Ingredient Priority/Compatibility for an explanation of this options.*



Keywords. Opens the Keyword Maintenance window. A list of existing ingredient keywords is displayed. You can assign one/several of these keywords to the current ingredient.



Trash can. Deletes the current ingredient.



VCR Buttons. Enable you to cycle through all of the ingredients in the system. These buttons include *Previous*, *Next*, *First* and *Last* functions.



Online Help. Opens the online help.

Ingredient Priority/Compatibility

In Formula Central you can configure a job template to sort and filter the formula display based on non-colorimetric properties assigned to individual ingredients. The properties, *priority* and *compatibility*, are assigned as values (0 – 100) to colorants in the formula.

- **Ingredient Priority.** Assigns a preference to *individual* ingredients.
- **Ingredient Compatibility Manager.** Assigns a preference to *combinations of ingredients*.

Ingredient Maintenance is used assign these values to the colorants. Once they are assigned, the system can consider Ingredient Priority or Ingredient Compatibility during the matching process.

These properties are especially useful when working with the Advanced Queuing options. The Queue Viewer can use these properties as the basis for filtering and sorting queue results. This speeds the evaluation of queue results, by enabling the system to prioritize non-colorimetric factors that may need to be considered during formula selection.

See also Formula Central, Tools Menu, Job Preferences, Results for instructions to activate ingredient priority or ingredient compatibility as sort tolerances in the job template.

See also Queue Maintenance, Edit Tolerances for instructions to assign tolerances to these formula properties, for use with the queuing options. These tolerances are applied when filtering and sorting queue results.

See also Queue Viewer, Filtering and Sorting Options for instructions to use Ingredient Priority and Ingredient Compatibility when filtering and sorting queue results.

Ingredient Priority

You may have processing requirements that favor the use of one ingredient over another. For example, inorganic pigments such as red oxide, yellow oxide, etc. may be the most reliable colorants to use with respect to your process. You can assign a high priority value to these individual ingredients. In contrast, you may carry some organic colorants in your inventory that are required for special colors, but are very difficult to process. To avoid including these pigments whenever possible, you can assign a very low priority value to each. By assigning different priorities to ingredients in the colorant set, you enable the system to consider these preferences when finding the *best* formula for a color.

Considerations

Keep in mind the following points when designing an ingredient priority scheme:

- A priority can be assigned to any type of colorant.
- The program assigns a default ingredient priority value of 50, to every ingredient in the system. A value of 50 indicates that no changes were made to the ingredient priority values for the colorants in the formula.
- All ingredients having a priority of 0 are eliminated before the matching begins.
- An average ingredient priority value is calculated and displayed for a formula, based on the priority value assigned to each ingredient, and the number of ingredients in the formula.

Assigning Ingredient Priority

Ingredient Priority is accessed from the Ingredient Maintenance window:

	1			100.00	7.6900	LB/GAL	0.00	KG	3/22/2006	
		☒	☒							

1. In Ingredient Name field, highlight the ingredient you want to edit.
2. In the *Ingredient Priority* field, enter a value from 0 - 100.

NOTES

The higher the value assigned, the higher the priority.

The program assigns a default value of 50 to every colorant in the set. If you do not change the default priority value for the ingredients, the ingredient priority value will be the same (50) for every formula displayed.

3. Repeat this procedure to edit the Priority value for ingredients as needed.
4. In Formula Central, add Ingredient Priority as the first sorting selection used by the template. *See also Formula Central, Tools Menu, Results for instructions to make this assignment.*

You can now use ingredient priority as the basis for determining formula acceptability when performing any matching or correction activity. You can also assign a tolerance to ingredient priority in Queue Maintenance. This assignment is used by the Queue Viewer to organize queue results by ingredient priority. *See also Queue Maintenance, Edit Tolerances for instructions to assign a sorting/filtering tolerance based on Ingredient Priority. See also Queue Viewer, Filter and Sorting Options for instructions to filter and sort queue results based on Ingredient Priority.*

Ingredient Compatibility Manager

The Ingredient Compatibility Manager is used to specify *combinations of ingredients*, and assign a compatibility value to the combination. The *Compatibility* value is considered during the matching process to determine the best formulas available.

Ingredient Compatibility is based on a principle similar to ingredient priority. There may be specific *combinations* of ingredients that perform better or worse than others, in the coloring process. For example, you may know that formulas containing red oxide and yellow oxide consistently perform better than those using a different selection of red and yellow colorants. On the other hand, you may want to avoid a specific combination of ingredients because they create processing problems when used in combination. In this situation, you can assign low compatibility values to the ingredient combinations you do not want to use.

Considerations

- Combinations can include all types of colorants.
- You can include a maximum of three colorants in a combination.
- All ingredient combinations having a compatibility value of 0 are eliminated before matching begins.
- The program assigns a default ingredient combination value of 50, to every ingredient in the system. A value of 50 indicates that no changes were made to the ingredient compatibility values for the colorants in the formula.

Assigning Ingredient Compatibility

To assign a compatibility value to a group of ingredients:

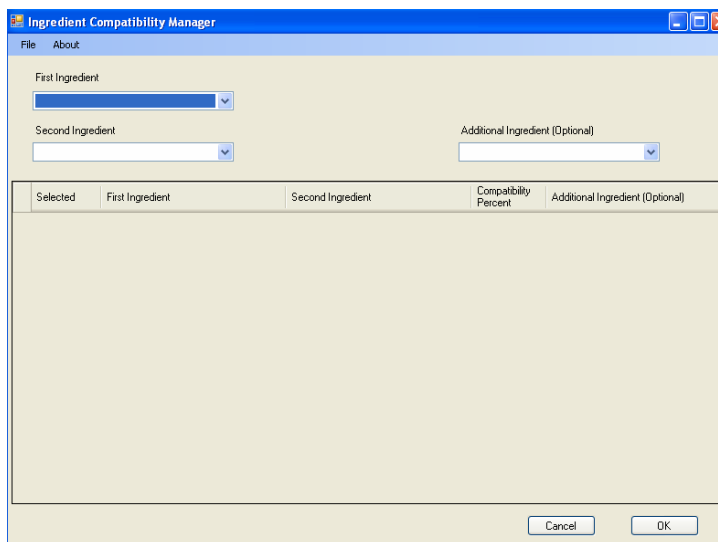
1. Launch Ingredient Maintenance.



2. Click on the **Ingredient Combination Manager** icon.

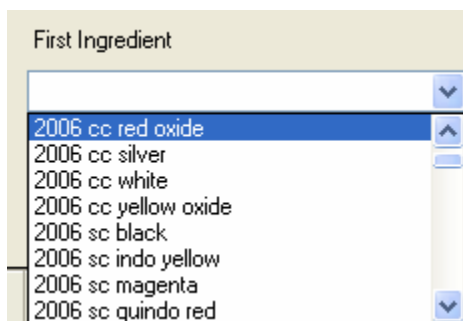


3. The Ingredient Compatibility Manager displays.

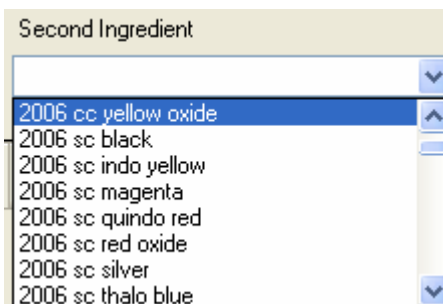


You must define at least 2 ingredients for each combination, and you can define a maximum of 3 ingredients for each combination.

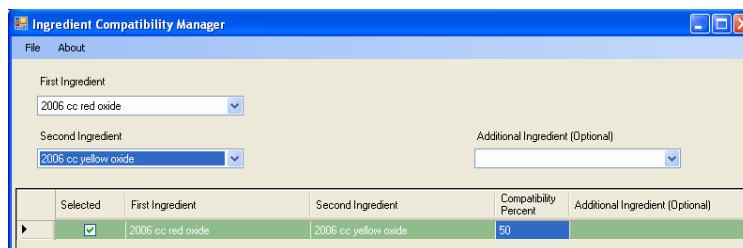
4. **First Ingredient.** Click on the down arrow to view all of the ingredients in the system. Highlight an ingredient to be included in the combination.



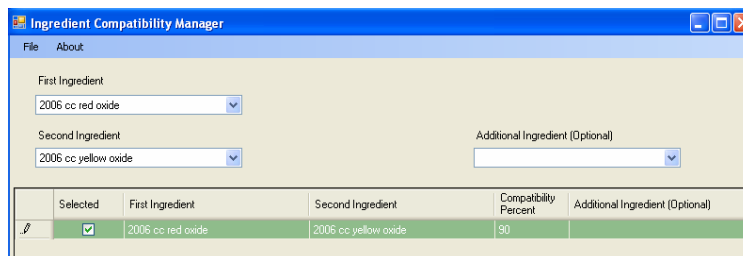
5. **Second Ingredient.** Click on the down arrow to view all of the ingredients in the system. Highlight a second ingredient to be included in the combination.



The window refreshes, and the two ingredient selections are displayed:



6. **Compatibility Percent.** This is the value assigned to the combination.
 - The default value is 50.
 - A low value reduces the probability that the combination will be included in the formula results.
 - A high value increases the probability that the combination will be included.
 - Assigning a value of 0 will eliminate the combination from consideration at match time.
7. **Additional Ingredient.** You can include another ingredient in this combination. In the *Additional Ingredient* field, click on the down arrow and select a third colorant.



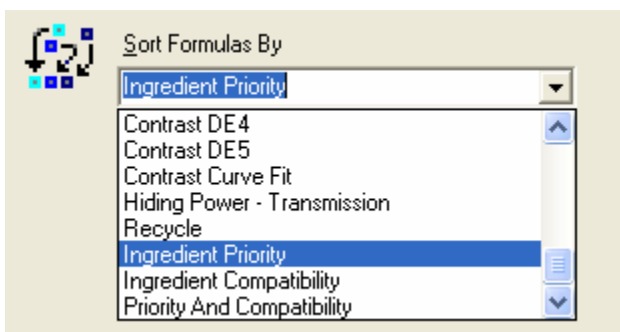
8. In Formula Central, add Ingredient Compatibility as the first sorting selection used by the template. See also *Formula Central, Tools Menu, Results for instructions to make this assignment.*

If you are working with the Advanced Queuing options, you can now use Ingredient Compatibility as the basis for filtering and sorting queue results. See also *Queue Maintenance, Edit Tolerances for instructions to assign a tolerance to Ingredient Compatibility.* See also *Queue Viewer, Filter and Sorting Options for instructions to filter and sort queue results based on Ingredient Compatibility values.*

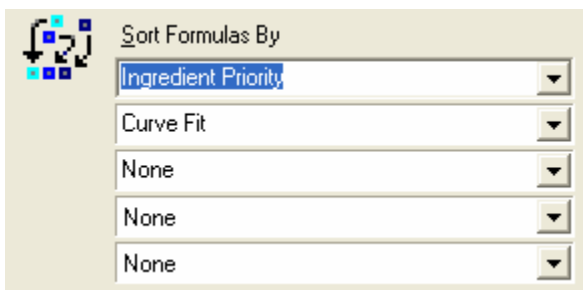
Enabling Ingredient Priority/Ingredient Compatibility

Once you have assigned ingredient priority and ingredient compatibility values in Ingredient Maintenance, you must active these options in the *job template* you are using for the queue.

The selection is made in the *Job Preferences, Results* page:



Ingredient Priority and/or Ingredient Compatibility must be selected as the sorting criteria:



See also *Formula Central, Tools Menu, Job Preferences, Results* for instructions to change the formula sorting selections.

NOTES

If you want to consider both ingredient priority and ingredient compatibility, select *Priority and Compatibility* as the first sort selection.

If these sort options are not enabled in the job template, the program will ignore the priority and compatibility assignments during formula calculation.

When you select *Priority* as the first sort criteria, all formulas that have a priority of 0 are eliminated before the matching begins.

When you select *Compatibility* as the first sort criteria, all formula combinations that have a compatibility of 0 are eliminated before the matching begins.

When *Priority* or *Compatibility* are not in the first sorting position, these values are only applied to a recursive sort. This means that *Ingredient Priority* or *Compatibility* will not be used to determine which formulas are kept and which are discarded, as it works through the matching process. See also *Applications Technology, Formula Sorting Options* for a detailed explanation of recursive sorting.

When *Priority* or *Compatibility* are in the first sorting position in the template, the option *Always Show Best Predictions* is disabled.

NOTES

Set Maintenance

Overview

This program module is used to calculate the optical data for your colorants, and is designed to work with many different industrial color matching applications. These applications vary from one in another in numerous ways. Consider the following:

- Some applications work with dyes while others work with pigments. In the case of fiber applications, both types of materials may be used in the plant.
- Some applications make transparent products, while others make opaque products. It is not uncommon in a plastics application to find transparent, translucent and opaque products made by the same manufacturer, sometimes using the same raw materials.
- Some products, such as printing inks, are formulated for application to a substrate. Others, such as paper and textiles, color the substrate as part of the process.

Each of these cases requires specific sample preparation techniques and sample calibration techniques to produce accurate optical data.

Set Maintenance is a single program used to create and edit optical data. It adapts to this wide variety of processes and products. The basic screen layout remains the same regardless of the application. However, upon close examination you may notice that individual program features vary from one colorant set to another. These features are specific to the type of colorant set, and the program selectively enables and disables features based on the type of database that is currently active.

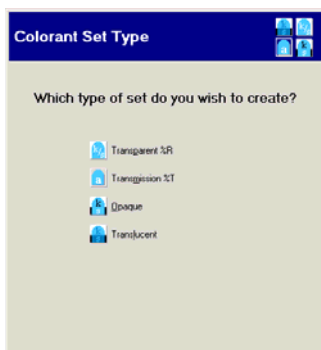
Set Maintenance Wizards

The program provides three wizards to guide you through the steps required to create a colorant set and enter data.

- The *Colorant Set Wizard* leads you through the procedure to create a new set.
- The *New Colorant Wizard* guides you through the procedure to add a new colorant to a colorant set.
- The *New Mixtures Wizard* leads you through the procedure to add more mixtures to an existing colorant record.

Colorant Set Types

When you create a new colorant set, you will be asked to select a colorant set type:



Each type of colorant set uses a specific method for sample preparation and sample presentation, and a specific optical model for calculating the optical data. The data fields that appear in the Colorant Set Maintenance window depend on the type of colorant set created or edited. Four different colorant set types, listed below, are available.

- Transparent (One Constant with Substrate)
- Transparent (One Constant without Substrate)
- Transmission
- Opaque
- Translucent

Transparent with Substrate

This colorant set type is used match **transparent or translucent coatings** applied to a substrate. The substrate can be partially seen through the colored layer.

- **Model.** This model uses simple subtractive color mixing. The model assumes that the absorption behavior (K) is contributed by the colorant and the scattering behavior (S) is contributed by the substrate. Although pigments do scatter light, the assumption made in this model is that it is insignificant when compared to the scattering behavior of the substrate. The optical constants for each colorant are calculated independently.
- **Advantages.** Provides accurate matches when using absorbent substrates
- **Disadvantages**
 - The colorant load must remain fixed.
 - Requires a larger number of samples than other approaches.

Sample Preparation Guidelines

- Single-colorant mixtures are applied to a substrate (i.e., fabric, paper, etc.) at several different concentrations
- Reflectance measurements are made.
- The substrate must be measurable
- A sample of the substrate coated with the clear vehicle must be measured.
- Film thickness must be closely controlled and measurable

Typical Applications

- Textile dyeing and printing
- Transparent printing
- Screen printing
- Specialty paint coatings

Transparent Transmission

This model is used to match transparent products such as transparent liquids.

Model. This model uses simple subtractive color mixing. The model assumes that there is no light scattering, and the color of a sample is derived exclusively from the light absorption properties of the colorants in the sample. Absorption values (A) are calculated for each colorant.

Advantages

N/A

Disadvantages

N/A

Sample Preparation Guidelines

- Single colorant mixtures are prepared at several concentration levels.
- Transmission measurements are used. The samples cannot be too dark, and cannot display significant light scattering behavior.
- You must include a sample of the clear (vehicle system) used in the samples. For liquid applications, a sample of the appropriate solvent is used. For transparent films, a sample of the finished film that does not contain any colorant is used.

Typical Applications

- Dyes in solution
- Transparent films

Translucent

This model is used to match translucent products, when colorant loading affects the color of the product. It is also used for opaque products to minimize colorant loading.

Model. This model uses the complex subtractive color mixing model. It assumes that the colorants can both absorb (K) and scatter (S) light, and calculates the absolute K and S values for each colorant.

Advantages

- Can calculate the colorant loading for each formula
- Can consider the influence of a colored substrate on a color match

Disadvantages

- Requires the use of a non-absorbent substrate

Sample Preparation Guidelines

- Typically a minimum of two samples are required for each colorant, although more are recommended
- Reflectance measurements are used
- All of the samples must be presented over a contrasting background (substrate)
- The substrate must be measurable
- Film thickness must be measurable

Typical Applications

- Ink matching
- Most printing applications
- Translucent plastics
- Coating applications that want to minimize colorant load
- Opaque plastics that want to minimize colorant load

Opaque

This model is used for opaque products that use variable amounts of white in a formula.

Model. This model uses the complex subtractive color mixing model. It assumes that the colorants can both absorb (K) and scatter (S) light, and a series of K and S values are calculated for each colorant. The K and S values of each colorant are calculated relative to the K and S values of the white. This white is designated as the 'Master White'.

Advantages

- Requires less primary samples than an 'absolute' colorant set.
- Film thickness does not have to be closely controlled.

Disadvantages

- Cannot be adapted for use with translucent samples.
- Cannot calculate variable pigment loading.

Sample Preparation Guidelines

- All of the samples must be opaque.
- Reflectance measurements are used.
- A minimum of two samples are required for each colorant (although more are recommended).

Typical Applications

- Industrial coatings
- Trade sales paint
- Opaque plastics
- Cosmetics

Colorant Set vs. Colorant Maintenance

Throughout the set maintenance documentation you will see references to both **colorant set** maintenance, and **colorant** maintenance. They are **not** the same feature. When reference is made to Colorant **Set** Maintenance, the program options are working with all of the colorants in the set. When a reference is made to **Colorant** Maintenance, the program options are working with data for a single colorant record.

For example, when Colorant Set Maintenance is opened, the following window displays:

Colorant Name	Count	Status	1	2	3	4	5	6	7	8	9	10
YELLOW P162	1	✓	6/6	5/5	100.00	100.00	Ready	0.00	100.00	Ready		
YELLOW P159	1	✓	5/5	4/4	100.00	100.00	Ready	0.00	100.00	Ready		
RED XP441	2	✓	5/5	4/4	100.00	100.00	Ready	0.00	100.00	Ready		
RED P481	2	✓	6/6	5/5	100.00	100.00	Ready	0.00	100.00	Ready		
MAGENTA P412	3	✓	3/3	2/2	100.00	100.00	Ready	0.00	100.00	Ready		
GREEN P509	4	✓	3/3	2/2	100.00	100.00	Ready	0.00	100.00	Ready		
BLUE ST8298	5	✓	8/8	7/7	100.00	100.00	Ready	0.00	100.00	Ready		

This window displays summary information regarding all of the colorant records in the colorant set. Currently, colorant "Yellow P162" is selected. When you select **Open Colorant** from the toolbar, a new window displays which contains all of the colorant data for Yellow P162.

Mixture	Weight	Form	Weight	Form	Weight	Form	Weight
1	0.01 KG	Form0	0.29 KG	Form0	KG	Form0	0.71
2	0.02 KG	Form0	0.28 KG	Form0	KG	Form0	0.71

Mixtures: 6, Enabled: 6 Levels: 6, Enabled: 6 dci Created: 10/9/2001 3:58:12 PM dci Edited: 10/18/2001 9:32:06 A

The fields in this window are similar, but not identical to the *Set Maintenance* window. For example, the detail in the colorant list is for each mixture for Yellow P162 stored in the colorant record. No other colorants are included. In addition, the *Minimum Concentration* and *Maximum Concentration* fields have moved from the grid to the *Handling* tab. These are just two examples of the subtle differences between the maintenance windows.

These two maintenance windows can be differentiated by the title of the dialog box:

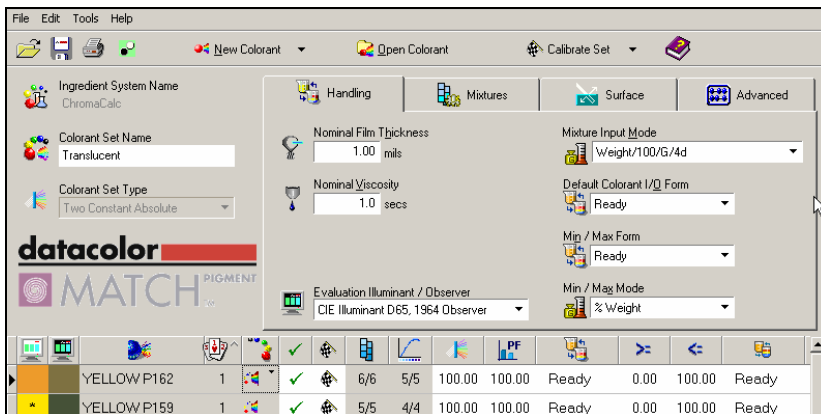
- The title of the Colorant Set Maintenance window includes the words **Colorant Set**. This indicates that information about the entire colorant set is displayed.
- The title of the Colorant Maintenance window includes the words **Colorant Maintenance**. All of the information displayed in this window is limited to an individual colorant in the set.

NOTE

In Colorant Set Maintenance, when you place the cursor anywhere in the grid, and double-click the mouse, the program will respond by opening the colorant maintenance window. The colorant record opened will correspond to the row in which the cursor was located when you double-clicked the mouse key.

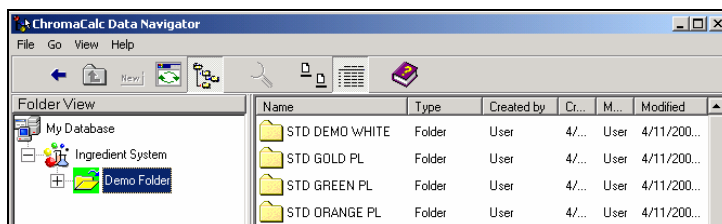
Colorant Set Maintenance

This is the program module used to create, edit or examine the optical data for your colorants. When you enter set maintenance, the default screen displays information regarding the default colorant set.

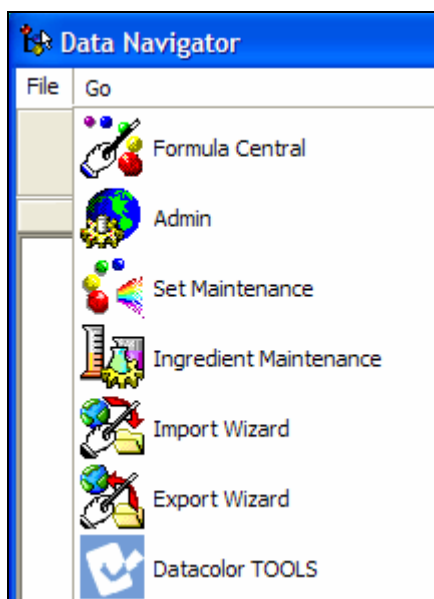


When you access Set Maintenance, the program needs to know the type of colorant set you will be using. This is true whether you are opening an existing colorant set or creating a new one. To open Colorant Set Maintenance:

1. Display the Navigator window.



- Click **Go** to see the program options.



- Click on **Set Maintenance**. The window below displays:

What do you want to do?

☐ Create a New Colorant Set
☒ Open an Existing Colorant Set
☐ Delete a Colorant Set

Select a Colorant set to OPEN from the list below, then click OK

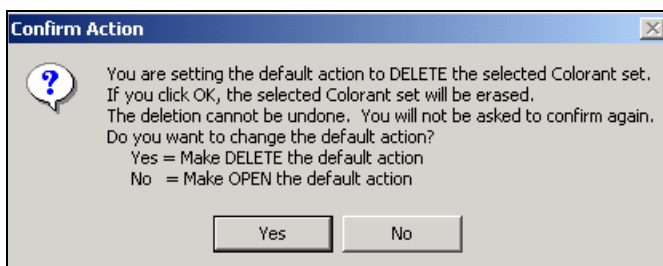
Colorant Set Name	Modified	Modified by	Created	Created by
Transparent	10/1/2004 8:31:52 AM	User	9/10/1999 11:52:00 AM	dci
Opaque	9/16/2003 9:50:17 AM	dci	9/21/1999 2:12:00 PM	dci
Translucent	9/16/2003 9:50:44 AM	dci	10/9/2001 3:58:08 PM	dci
Opaque_45	6/15/2004 12:11:25 PM	dci	6/15/2004 11:50:52 AM	User

OK Cancel

What do you want to do? Click in the box that indicates the action you want to take.

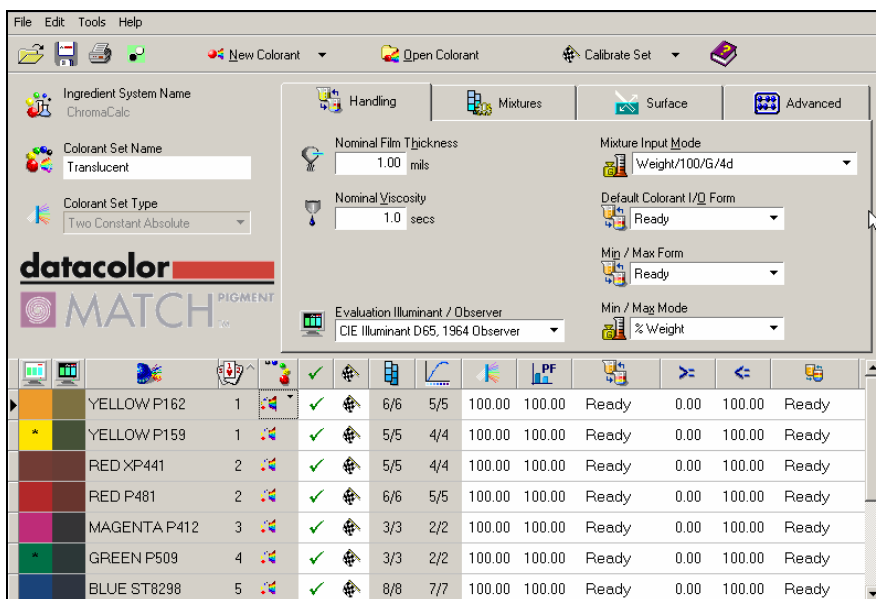
- Create a New Colorant Set.** When you select this option, you simply click OK to open the New Colorant Set Wizard.

- **Open an Existing Colorant Set.** When you select this option, you must also select the set to be opened. All of the available sets are listed in the grid at the bottom. Using your mouse, move the pointer on the far right to the colorant set you want to open, and then press **OK**. The colorant set maintenance window will open. This is the default selection.
- **Delete a Colorant Set.** Using your mouse, move the pointer on the far left of the grid to the colorant set you want to delete. Then check the *Delete* box. The following dialog box displays to confirm you selection:

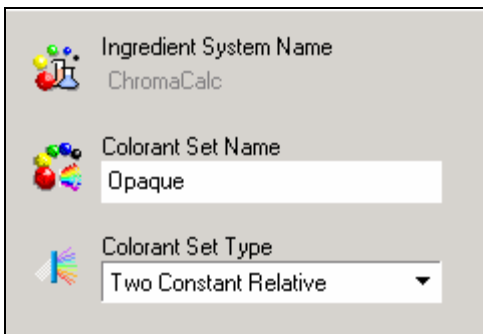


Colorant Set Maintenance Window

The organization of the Set Maintenance screen remains the same for all colorant set types.



On the left are three fields that are always displayed when you are working in colorant set maintenance:



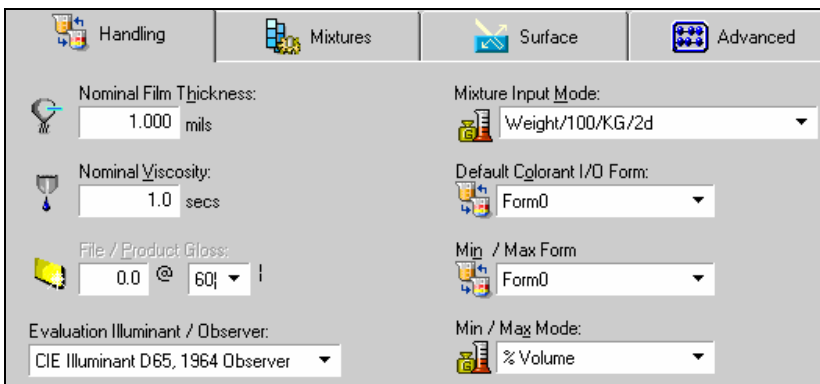
Ingredient System Name
ChromaCalc

Colorant Set Name
Opaque

Colorant Set Type
Two Constant Relative ▼

- 
Ingredient System Name. This field identifies the master ingredient system. The ingredient system includes all of the raw materials that you use, the program options that are enabled, and default software settings.
- 
Colorant Set Name. This field identifies the active colorant set. Click on the (down arrow) to view all of the colorant sets included in the ingredient system.
- 
Colorant Set Type. Identifies the optical model used to generate the data. *See also About Colorant Set Types.*

Tabs in the Colorant Set Maintenance Window. The area of the screen shown below contains tabs that access specific pages in the colorant set record.



Handling Mixtures Surface Advanced

Nominal Film Thickness:
1.000 mils

Nominal Viscosity:
1.0 secs

File / Product Gloss:
0.0 @ 60°

Evaluation Illuminant / Observer:
CIE Illuminant D65, 1964 Observer ▼

Mixture Input Mode:
Weight/100/KG/2d ▼

Default Colorant I/O Form:
Form0 ▼

Min / Max Form:
Form0 ▼

Min / Max Mode:
% Volume ▼

These pages contain all of the default information for the colorant set selected. Moving from left to right along the tabs, the information becomes more specific. To display the information on a particular page, click on the tab at the top.

NOTE

Some of the fields on the tabs may change, based on the type of colorant set that is active.

Handling Tab

Colorant sets are created to simulate a specific production process. Although you may use the same colors in two different products, separate colorant sets are created for each product because the processing is significantly different. The 'handling' information for a colorant set provides specific information about the process you are trying to simulate with the colorant set.

Handling information is non-colorimetric information that includes:

- Identification of the mode and form of the color used in the primary samples. These become the default output mode and form for formulas in Formula Central.
- Gloss and film thickness data.

This information is required to produce a formula that fits your process.

NOTE

Selections made during software installation control the display of the fields described below. Some of the fields mentioned below may not appear on your screen.

Handling	Mixtures	Surface	Advanced
 Nominal Film Thickness 1.00 mils	Mixture Input Mode  Weight/100/KG/2d		
 Nominal Viscosity 1.0 secs	Default Colorant I/O Form  Ready		
	Min / Max Form  Ready		
 Evaluation Illuminant / Observer CIE Illuminant D65, 1964 Observer	Min / Max Mode  % Volume		



Nominal Film Thickness. Displays the film thickness at which the optical constants are calculated. If film thickness was not enabled for the system, this field will not appear.



Nominal Viscosity. Displays the viscosity specified for the colorant set. If viscosity was not enabled for the system, this field will not appear. *This is a label for informational purposes.*



Evaluation Illuminant Observer. Displays the Illuminant/Observer combination used to generate the color patches displayed, and for other colorimetric evaluations displayed in the Colorant Set Maintenance program module. The default is set in Admin, System Settings.



Mixture Input Mode. This field identifies the formula mode used to create the mixture samples. Typically the mode is expressed as weight, volume, or density (weight/volume unit). The mode specified here becomes the default output mode and form used in Formula Central.

NOTE

These fields are user-defined. *See also Admin, Edit Formula Units for details on creating and editing the units used for formula mode.*



Default Colorant I/O Method. Identifies the default colorant form to be used for matching and correction. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given user-definable labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

NOTES

- The *New Set* wizard prompts the user for the default colorant form and default colorant mode for the colorant set.
- The *New Colorant* wizard prompts the user for the default colorant form and colorant mode for the colorant record.



Min/Max Form. Specifies the ingredient form associated with the minimum/maximum concentration limits. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given labels that can be customized. The default forms include:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.

- **Completely expanded into components.** Typical labels include Dry, and Powder.



Min/Max Mode. Specifies the ingredient mode associated with the minimum/maximum concentration limits. Mode refers to how you measure the ingredients that go into the formula. For example, if you weigh the amounts of each ingredient, the ingredient mode is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the ingredient mode is volume.

Mixtures Tab

The **Mixtures** tab contains information about the primary samples. This information is specific to the colorant set type. Transparent colorant sets can include information about the vehicle (clear), colors and substrate (when used) used in the mixtures.

When the *Mixtures* window displays, the defaults for the entire colorant set are displayed. They are based on selections made when the colorant set is created. The defaults can be changed at any time.

The screenshot shows the 'Mixtures' tab in a software interface. The tab is selected, and the following options are visible:

- Default Calibrating Resin:** CLEAR (dropdown menu)
- Default Calibrating White:** WHITE (dropdown menu)
- Default Calibrating Black:** BLACK (dropdown menu)
- Default Calibrating Substrate:** CARD (dropdown menu)
- Default Measurement Method:**
 - ☒ Over Light and Dark (ROL/ROD)
 - ☐ Reflectance and Transmission (R/T)
 - ☐ Over Light and Black Trap or Open Port (RO)
 - ☐ Opaque and Over Dark (ROO/ROD)
- ☐ Correct for Non-Optical Contact
- ☐ Prompt For Substrate Every Sample

NOTE

The fields that appear on this screen are dependent upon the type of colorant set you are using. If a field does not appear on your screen, it is not relevant to the colorant set you have selected.



Default Calibrating Resin. Identifies the resin used in the mixtures. The default selection is the resin identified for the colorant set. Click on the down arrow to view all of the resins available for use with the set.

NOTES

- When the colorant set type is translucent, you must identify a calibrating resin for the mixtures.
- When the colorant set type is “opaque,” identifying the calibrating resin is optional.
- The calibrating resin must remain the same for every mixture in the colorant record. If the resin you are using is not included in the choices, you can add it to the ingredient system.
- If the resin you are using is not included in the choices, use the **New Colorant Wizard** icon to enter a new resin into the system.



Default Calibrating White. This field identifies the white used in the mixture. The default selection is the white selected as the default for the colorant set. Click on the down arrow to view the white colorants available for use, and select the white used in the mixtures. If the white you are using is not included in the choices, use the **New Colorant Wizard** icon to enter a new white into the system.

NOTES

- The samples prepared for a translucent set can include a mixture of each color with white.
- The calibrating white used for a translucent set can either be a master white or an alternate white.
- The samples prepared for an opaque set usually include a mixture of each color with white.
- The calibrating white used for an opaque set must be designated as the “master” white.



Default Calibrating Black. This field identifies the black used in the mixtures. The default selection is the black selected as the default for the colorant set. Click on the down arrow to view the black colorants available for use, and select the black used in the mixtures. If the black you are using is not included in the choices, you can add it to the ingredient system.

NOTES

- The samples prepared for a translucent colorant set can include a mixture of each color with black.
- The samples prepared for an opaque colorant set usually include a mixture of each color with black.



Default Calibrating Substrate. Identifies the substrate used for the mixtures. The default selection is the substrate identified for the colorant set. Click on the down arrow to display the substrates available for use, and select the substrate used for the mixtures.

- If the substrate you are using does not appear in this field, you can add it. To add a new substrate:
- Enter the substrate name in the substrate field.
- Place the substrate at the instrument port, and click the **Measure** icon.



When the measurement is completed, the new substrate will become the default selection for this field.

NOTES

- If your colorant type is translucent, you must identify a calibrating substrate for in the mixtures.
- If your colorant set type is opaque, the substrate is not identified.
- You are not required to use the same substrate for every mixture stored in the colorant record.

Default Measurement Method. Identifies the sample type you are measuring. This selection depends on your application. Consult your Applications Specialist to determine which measurement method you should use.

Default Measurement Method
☒ Single Measurement
☐ Over Light and Dark (ROL/ROD)
☐ Reflectance and Transmission (R/T)
☐ Over Light and Black Trap or Open Port (ROL/RO)
☐ Opaque and Over Dark (ROO/ROD)

- **Single.** The sample is measured once. This is used when measuring opaque samples, or when measuring translucent or transparent samples presented over a constant background.

For some translucent applications you are required to make two measurements of each mixture sample. One measures the color over a light background (“over light”), and the second measures the color over a dark or contrasting background (“over dark”). *See also Applications Technology, Sample Types for a discussion of this requirement.* There are several different measurement methods available to complete the measurements required for translucent applications.

- **Over Light and Dark (ROL/ROD).** This method uses two reflectance measurements. Each mixture is presented over both a light and the dark background.
- **Reflectance and Transmission (R/T).** Some translucent applications (primarily translucent plastics) make use of both reflectance and transmittance measurements of the samples. When this option is used, the first measurement is a normal reflectance measurement. The second is a transmission measurement, placing the sample in the transmission chamber, and the appropriate white standard at the instrument port.
- **Over Light and Black Trap or Open Port.** This approach uses two transmittance measurements. The first measurement is a normal transmittance measurement. The second is a transmission measurement made using either an “open” (sample) port, or a black trap placed at the sample port.
- **Opaque and Over Dark (ROO/ROD).** This method uses two reflectance measurements. The first mixture measured is an opaque mixture, and the second is a translucent mixture presented over the dark background.

NOTES

- In the case of ROO/ROD, the opaque mixture is achieved by increasing the film thickness until the sample is opaque.
 - A contrast ratio can be used to determine opacity.
 - The ‘over dark’ mixture should be prepared at the nominal film thickness for the set.
- **Correct for Non-Optical Contact.** This option enables/disables the mathematical correction for non-optical contact between the sample layers.

In some applications, the colored film is applied to a black and white substrate. For example, it is a common practice in ink applications to apply the ink to a black and white contrast card. In this example, the ink layer and the card become a single sample. There is no air interface between the two sample layers, and the ink and card layers are making optical contact.

In other applications such plastic concentrates, translucent chips are produced. In order to achieve a measurement “over light” and “over dark”, the appropriate contrasting background (e.g., white and black card, tiles, etc.) is provided for the purposes of the measurement. There is no seal between the colored chip and

the contrasting background, and the background is removed following the measurement. The sample layers are not in “optical” contact, and an air interface exists between them. This interface introduces an error into the sample measurement, which can be corrected mathematically.

NOTES

- This feature is only valid for transparent and translucent colorant sets.
- Creating a physical contact between the sample layers provides more accurate results than applying a mathematical correction to the measurement. Any modifications to the physical samples must be carried through the entire process. *Contact your Applications Specialist to discuss how best to handle non-optical contact.*
- The correction for non-optical contact is very sensitive to the optical thickness of the sample. An opaque sample measurement remains the same regardless of whether it is in optical contact. However, translucent samples show more differences due to the substrate, and the absence of optical contact can have a significant effect on the measurement. As samples approach complete transparency ($K=0$, $S=0$) the internal (K_2) reflectance approaches the specular (K_1) value (about 4%)
- **Prompt for Substrate Every Sample.** If you will not be using the same substrate for every mixture in the set, the program will prompt you to measure the substrate for each mixture. If this is not enabled, the program will assume the default substrate will be used for all samples.

Surface Tab

The *Surface* tab establishes the values used to correct measurements of the mixture(s) for surface effects.

Handling	Mixtures	Surface	Advanced
Measurement Geometry			
SCI Diffuse Specular Included			
Default Specular %R		Lowest Measured Value	
4.00 %		3.81 %	
Default Internal %R		Widest Spectral Range	
60.00 %		400.00 nm 700.00 nm	
☐ Variable Internal %R		Narrowest Spectral Range:	
Substrate Roughness		400.00 nm 700.00 nm	
0		Interval Range	
		10.00 nm 10.00 nm	

Measurement Geometry. Defines the instrument settings used for the measurements of colorant set samples.

- **SCI (Specular Component Included).** The specular port in the instrument is closed, and the measurement includes the specular reflectance component. This is the most common setting used for measuring mixtures. It is the default selection for the measurement of colorant mixtures.
- **SCE (Specular Component Excluded).** The specular port in the instrument is opened and the measurement excludes the specular reflectance component. SCE simulates a measurement made using 0°/45° instrument geometry.

Default Specular %R. This value is used to adjust the measurement data of the mixtures for the specular component.

- For transparent colorants, the value should be 0.0.
- For opaque and translucent colorants, the default value is 4.00%.

The default setting for this field is taken from the colorant set, and may not be the correct value for a particular colorant. When a measurement lower than the default specular is recorded, the program displays a message prompting the user to do one of the following:

- Lower the specular value.
- Set the measured value equal to the specular value.

Default Internal %R. This value is used to adjust the measurement data of the mixtures for internal reflection component.

- For transparent colorants, the value should be 0.0.
- For translucent and opaque colorants, the default value is 60.00%.

NOTE

This field is displayed regardless of colorant set type. However, surface corrections are not usually applied to transparent colorant sets.

Variable Internal %R. Instead of using a fixed value (60%) for internal reflectance, the system calculates an appropriate value based on the optical thickness. The result is that in a single set, different surface corrections will be used for different samples. Samples with high scattering or absorption will use the default value. However, as K and S decrease, the internal reflectance value is lowered. The variable value ranges from about 60% for opaque samples to about 4% for clear samples. This adjustment can have a significant effect when working with samples having low scattering and low absorption, especially when correction for non-optical contact is used.

Substrate Roughness. This factor is meant to be an indication of the amount of diffusion that happens at the substrate surface. Values can range from 0% to 100%, where 0% means no light is diffused (scattered) by the substrate, and 100% means the light is totally diffused by the substrate. The value is zero (0%) by default. This factor serves as a kind of limit on the "variable internal reflectance" calculation. It can be used to fine-tune the effect of the variable K2 calculation. A substrate roughness of 0% means that K2 can vary across the widest range (from about 4% to about 60%).

A substrate roughness of 100% means that K2 will vary only slightly, staying close to the default K2 value of 60%.

Apply to All Colorants. When you change a value on the Surface tab, the new value will be used for future colorant calibrations. However, the current optical data in the set will remain the same. If you have changed this value, and you want to recalibrate existing colorants using the new values, click on this button. The optical constants in the set will be recalculated.

Lowest Measured Value. Displays the lowest measured reflectance in the colorant record. It considers the spectral measurements of the default substrate, and all of the mixtures in the record. This is used only for translucent and opaque colorant sets.

Widest Spectral Range. Spectrophotometers vary in the range of the visible spectrum that is measured. Some instruments measure from 360nm to 700nm, while others measure from 400nm to 700nm. This field identifies the widest range found across all mixtures in the colorant set.

Narrowest Spectral Range. Spectrophotometers vary in the range of the visible spectrum that is measured. Some instruments measure from 360nm to 700nm, while others measure from 400nm to 700nm. This field identifies the narrowest range found across all mixtures in the colorant set.

Interval Range. Spectrophotometers vary in the interval range covered by the spectral output. Some instruments provide data at 10nm increments, while others provided data at 20nm increments. This field identifies both the widest and narrowest range of data across all mixtures in the colorant set.

Advanced Tab

The **Advanced** tab provides information required to complete the calibration of a colorant set. The default settings for these fields are based on selections made during the creation of the colorant set.

WARNING!

Changing any information on this tab can significantly impact the accuracy of the formulas calculated by the program. We strongly recommend that you consult with your Applications Specialist before making any changes to the information on this tab.

Handling	Mixtures	Surface	Advanced
Default Mixture Grouping Method Independent		Default Colorant Calibration Method Colorant With Resin	
Curve Smoothing Method Interpolating Spline		Default Resin Calibration Method No Mixtures (Assume K=S=0)	
Set Load / Calculation Form Ready			
☐ Allow Negative Absorption Values ☐ Disabled Colorant Set (Hidden)		Optimized Calibration Options Optical Constants Only	

See also *Applications Technology, Colorant Calibration Methods* for a detailed explanation of optical models, mixture grouping methods curve smoothing methods and other aspects of colorant calibration.

Default Mixture Grouping Method. Identifies the default method for using the mixture data to calculate the level data for the colorant.

Default Mixture Grouping Method
Pairs (Original CC)
Pairs (Original CC)
Independent
Optimized (Interdependent)
Combined

- **Pairs.** Level data is calculated from a pair of mixtures. Used for opaque and translucent colorant sets.

NOTE

The minimum number of mixtures required for this method is two (2). For dual pairs, the minimum number of mixtures is three (3). The number of levels is not equal to the number of mixtures.

- **Independent.** Level data is calculated from each mixture. Used for transparent and translucent colorant sets. Also used to calibrate the Master White in an opaque set.

NOTE

The minimum number of mixtures required for this method is one (1). The number of levels is the same as the number of mixtures.

- **Optimized (Interdependent).** Data for all levels is calculated simultaneously, based on all mixtures. Used for transparent, translucent and opaque colorant sets.

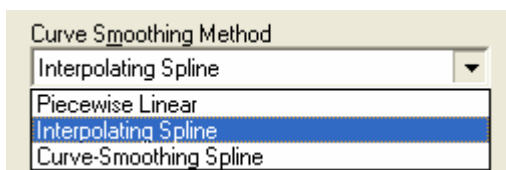
NOTE

The minimum number of mixtures required for this method is one (1). However, to maximize the results of this technique, you should make several mixtures.

- **Combined.** This method involves an optimization process to determine the optical properties (K and S) of the resin, white, black and the colorants.

See also Applications Technology, Colorant Calibration Methods for a detailed explanation of mixture grouping methods, optical models, curve smoothing methods and other aspects of colorant calibration.

Curve Smoothing Method. Set Maintenance offers three different techniques for curve smoothing in set maintenance, and each will produce and use a mathematical method for 'smoothing' the shape of the K/S curve based on the mixtures physically prepared. The user must select one for use with each colorant set created. The approaches do not produce the same optical data.



See also Applications Technology, Colorant Calibration Methods for a detailed discussion of curve smoothing methods.

- **Piecewise Linear.** The curve connecting all of the points is actually a series of line segments, whose endpoints represent the level data available for the colorant. The overall shape of this curve may be jagged depending on the behavior of the colorant, and the number of levels available. The objective of this curve smoothing technique is to include all of the available levels on the curve.
- **Interpolating Spline.** This approach finds a smooth curve that includes all of the levels calculated. The objective of this technique is to include all of the available levels on the curve. This is the default method used for curve smoothing.
- **Curve-Smoothing Spline.** This approach creates a smooth curve that includes 'most' of the levels available. The curve does not include the data point for levels that appear to be erroneous.

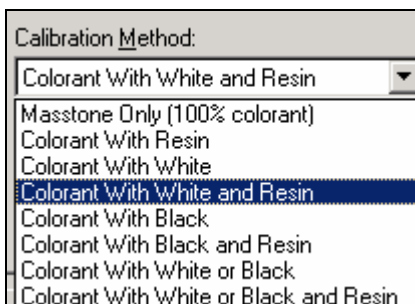
Set Load/Calculation Form. Identifies the *ingredient form* to be associated with the optical constants. *See also Glossary, Ingredient Form for an explanation.*

Allow Negative Absorption Values. For some colorants, usually reds and yellows, the absorption values (K) calculated for the region of the spectrum having the highest reflectance values, can be negative (-K). The Kubelka Munk equation can work with a negative K value, so negative absorption values can be left as is. Questions about this feature should be discussed with your Applications Specialist.

Disabled Colorant Set (Hidden). This option hides the colorant set. It is not deleted from the system, it is simply removed as a selection, and the optical data for the colorant is not available for use in matching or correction. If you have a colorant set that is experimental or has bad data, you will probably not want to make it available for use.

If you do not want to include individual colorants for use, you can also selectively enable and disable colorants in a set. *See also Colorant Set, Maintenance, Colorant Set List for instructions to disable individual colorants.*

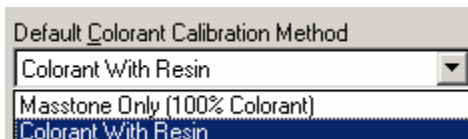
Default Colorant Calibration Method. Identifies the mixtures and method used to calibrate the colorant data. The *Mixture Grouping Method* you select determines the number of mixtures that you will need to prepare.



NOTE

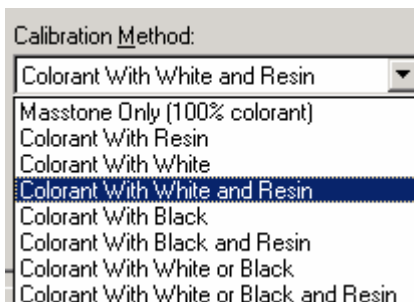
The calibration method selected depends on the type of colorant set you are using. You should discuss this selection with your Applications Specialist.

There are only two calibration methods used for Transparent applications are listed below:



- Masstone Only
- Colorant with Resin

The calibration methods used for Opaque and Translucent applications are listed below:



Below is a description of each calibration method:

- **Masstone Only.** The optical data is derived solely from the measurement of masstone mixture(s) of the colorant. A single mixture can be used, or multiple mixtures can be prepared, each containing a different concentration of colorant. No information regarding the resin in the sample is recorded.

NOTE

To use this calibration method, the *Mixture Grouping Method* must be either *Independent* or *Optimize*.

- **Colorant with Resin.** The optical data is derived from the measurement of masstone samples(s) of the colorant. A single mixture can be used, or multiple mixtures can be prepared, each containing a different concentration of colorant. This method will include information about the resin contained in the mixture.
- **Colorant with White Calibration.** The optical data is derived from the measurement of colorant + white mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different colorant-to-white ratio. No information regarding the resin in the mixture is recorded.
- **Colorant with White and Resin.** The optical data is derived from the measurement of colorant + white mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different colorant-to-white ratio. This method will include information about the resin contained in the mixture.
- **Colorant with Black.** The optical data is derived from the measurement of colorant + black mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different colorant-to-black ratio. No information regarding the resin in the mixture is recorded.
- **Colorant with Black and Resin.** The optical data is derived from the measurement of colorant + black mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different colorant-to-black ratio. This method will include information about the resin contained in the mixture.

- **Colorant with White or Black.** The optical data is derived from mixtures of white + colorant, and black + colorant. A single mixture with white, and a single mixture with black can be used, or multiple mixtures can be prepared, each containing a different colorant-to-white and/or colorant-to-black ratio. No information regarding the resin in the mixture is recorded.

NOTE

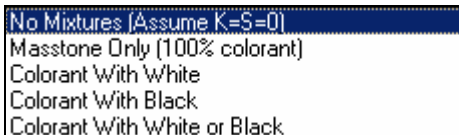
Several “colorant + black” mixtures can be stored. However, only one “colorant-with-black” mixture can be active. Masstone samples can also be used.

- **Colorant With White or Black and Resin.** The optical data is derived from mixtures of white + colorant, and black + colorant. A single mixture with white, and a single mixture with black can be used, or multiple mixtures can be prepared, each containing a different colorant-to-white and/or colorant-to-black ratio. This method will include information about the resin contained in the mixture.

NOTE

Several “colorant + black” mixtures can be stored. However, only one “colorant-with-black” mixture can be active. Masstone mixtures can also be used.

Default Resin Calibration Method. Identifies the default mixture and method used to calibrate the resin.



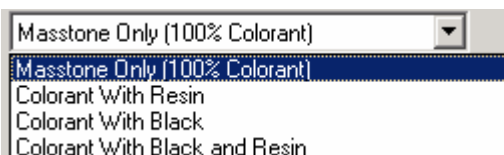
- **No Mixtures (Assume K and S=0).** No mixtures are provided to characterize the resin.
- **Masstone only (100% colorant).** The optical data of the resin are derived through the measurement of a masstone mixture of the resin. This is the default method.
- **Colorant (resin) with White.** The optical data of the resin are derived from a mixture(s) containing of resin and white. Several mixtures can be prepared, each containing a different proportion of resin-to-white.
- **Colorant (resin) with Black.** The optical data of the resin are derived from a mixture(s) of resin and black. Several masstone mixtures can be prepared, each containing a different proportion of resin-to-black.
- **Colorant (resin) with White or Black.** The optical data of the resin are derived from a series of mixtures that include mixtures of resin and white, and/or mixtures of resin and black.

- **Default White Calibration Method.** Identifies the mixtures and method used to calibrate a white in the colorant set. Opaque and translucent colorant sets can contain both master white(s) and alternate white(s).

NOTES

- A master white must be defined for opaque sets.
- An opaque set can have only one master white.
- A translucent set can have several master white colorants.
- The same calibration methods are not available for master white and alternate white calibration.

Master White Calibration Methods. Identifies the mixtures and method used to calibrate the master white included in the colorant set.



Only two of these methods are valid for calibrating a master white.

- **Masstone only (100% colorant).** The optical data of the master white are derived from the measurement of a masstone sample of the white. No information regarding the resin in the mixture is recorded. This option is available to calibrate both the master white and alternate whites.
- **Colorant (White) with Resin.** The optical data for the master white are derived from the measurement of masstone sample(s) of the colorant. This method includes information about the resin contained in the mixture. This option is available to calibrate both the master white and alternate whites.

Alternate White Calibration Methods. An “alternate white” is any white that is not the master white. In opaque sets, the alternate white must be calibrated using a mixture with black. In translucent sets, an alternate white can be calibrated using a “masstone”, “mixture with black”, or “mixture with black and resin”.

- **Masstone only (100% colorant).** The optical data of the master white are derived from the measurement of a masstone sample of the white. No information regarding the resin in the mixture is recorded.
- **Colorant (White) With Resin.** The optical data for the master white are derived from the measurement of masstone sample(s) of the colorant. This method will let you include information about the resin contained in the mixture.
- **Colorant (White) With Black.** The optical data are derived from the measurement of white and black mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different white-to-black ratio. No information regarding the resin in the mixture is recorded.

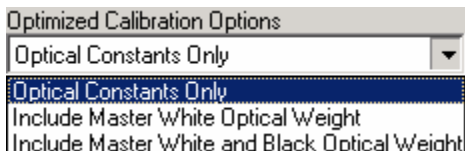
- **Colorant With Black and Resin.** The optical data are derived from the measurement of white and black mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different white-to-black ratio. This method includes information about the resin contained in the mixture.

Default Black Calibration Method. Identifies the mixtures and method used to calibrate a black in the colorant set. Opaque and translucent colorant sets can contain several black colorants.

- **Masstone Only.** The optical data is derived solely from the measurement of masstone mixture(s) of the colorant. A single mixture can be used, or multiple mixtures can be prepared, each containing a different concentration of colorant. No information regarding the resin in the sample is recorded. *To use this calibration method, the Mixture Grouping Method must be either Independent or Optimize.*
- **Colorant with Resin.** The optical data is derived from the measurement of masstone samples(s) of the colorant. A single mixture can be used, or multiple mixtures can be prepared, each containing a different concentration of colorant. This method will include information about the resin contained in the mixture.
- **Colorant with White.** The optical data is derived from the measurement of colorant + white mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different colorant-to-white ratio. No information regarding the resin in the mixture is recorded.
- **Colorant with White and Resin.** The optical data is derived from the measurement of colorant + white mixtures. A single mixture can be used, or multiple mixtures can be prepared, each containing a different colorant-to-white ratio. This method will include information about the resin contained in the mixture.

Optimized Calibration Options. Identifies the optimization technique to be used for calculating the optical constants, when the Mixture Grouping Method Optimized is selected. Three techniques are available:

See also Applications Technology, Colorant Calibration Optimization for a detailed explanation of this feature.

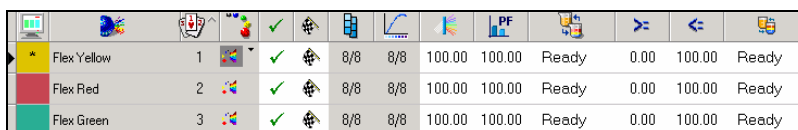


- **Optical Constants Only.** The program looks at all of the mixture data for the colorants and calculates the optical constants. *This optimization can be applied to any colorant set type.*

- **Include Master White Optical Weight.** This technique looks at the mixture data for the colorant + white mixtures and calculates an optical weight for the white. This optical weight is applied to the colorant + white mixtures to recalculate/optimize the optical constants for the colorants. *This optimization technique can only be applied to opaque and translucent samples, when the sample includes colorant + white and/or colorant + black mixtures.*
- **Include Master White and Black Optical Weight.** This technique looks at the mixture data for the colorant + black mixtures and calculates an optical constant for the black. The optical weights for the white and the black are then used to recalculate the optical constants for the colorants. *This optimization technique can only be applied to opaque and translucent samples, when the sample includes colorant + white and/or colorant + black mixtures.*

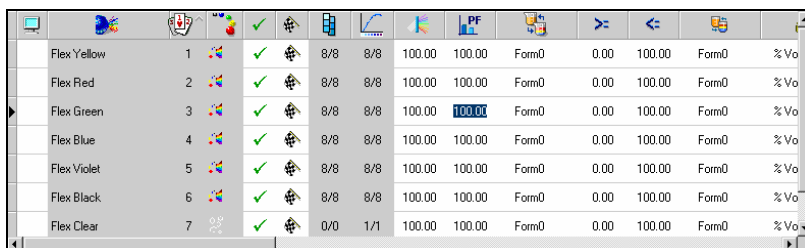
Colorant Set List

Lists of all colorants contained in a set are displayed in a grid at the bottom of the Colorant Set Maintenance window. The default display lists every colorant in the set, and provides summary information about the data available for each colorant.



Flex Yellow	1	✓	8/8	8/8	100.00	100.00	Ready	0.00	100.00	Ready
Flex Red	2	✓	8/8	8/8	100.00	100.00	Ready	0.00	100.00	Ready
Flex Green	3	✓	8/8	8/8	100.00	100.00	Ready	0.00	100.00	Ready

When you add a new colorant or edit the optical data for an existing colorant, this grid will update to reflect the changes. However, unlike Ingredient Maintenance, information edited in this window is not permanently updated unless you explicitly save the changes (*File Menu, Save*) or click the **Save** icon on the toolbar.

Flex Yellow	1	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	%Vo
Flex Red	2	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	%Vo
Flex Green	3	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	%Vo
Flex Blue	4	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	%Vo
Flex Violet	5	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	%Vo
Flex Black	6	✓	8/8	8/8	100.00	100.00	Form0	0.00	100.00	Form0	%Vo
Flex Clear	7	✓	0/0	1/1	100.00	100.00	Form0	0.00	100.00	Form0	%Vo



Color Display. Displays a color patch that represents the colorant.

- When working with transparent colorants, the color displayed is the synthesized color over the job substrate, at the nominal film thickness.

- When working with translucent samples, two colors are displayed. One is the synthesized color over the job substrate, at the nominal film thickness. The other is the synthesized color displayed over the contrast (dark) background, at the nominal film thickness.
- When working with opaque samples, the opaque color is displayed.



Ingredient Rank. This is a number representing preferred display order. It is assigned through Ingredient Maintenance. You can decide to display ingredients by *Rank*, *Name* or by *ingredient amount*. If you want the ingredients presented in a particular order other than name, you must assign a rank.



Colorant Name. Displays the colorant name.



Colorant Type. Displays the colorant type assigned to the colorant. Colorant types define the method of calibration used. Colorant types include:

- Master white
- Alternate white
- Color
- Clear (resin)

The method of calibration is defined by the mixture grouping method.



Colorant Enabled. Data for a colorant can be stored in a set, but it can be selectively displayed or hidden. To make the colorant available for matching and correction, it must be enabled.



Colorant Calibrated. Indicates if the colorant has been calibrated. When a colorant is calibrated, optical constants have been calculated for it. Information can be stored in a colorant record, without the optical data being calculated. The colorant must be calibrated, to be used for matching and correction.



Mixtures Enabled/Stored. For most applications, several mixtures are made for each colorant in the set. A mixture is a finished sample containing a specific concentration of color. This sample can also be referred to as a “primary.” This field indicates both the number of mixtures stored, and the number of mixtures enabled in the colorant record. When reviewing the colorant set data, you may decide to exclude data for a specific mixture. The mixtures that are enabled are used to calculate level data.



Levels Enabled/Calculated. For most applications, data for several levels can be calculated from the mixtures available. “Level” refers to a particular type of data stored in a colorant record. Level data includes the volumetric concentration of

colorant in the mixture, and the optical data calculated for that volume concentration. This field indicates both the number of levels enabled, and the number of levels stored in the colorant record. When reviewing the colorant set data, you may decide to exclude specific level data. Levels that are enabled are used to calculate matching and correction predictions.



Optical Weight. A factor used to adjust the optical constants for a colorant. It is a multiplier applied to the value of the optical constants, and its value can be edited for each colorant level included in the record. It can also be applied across an entire colorant set.

When the optical weight is 100%, no adjustment is made to the optical constants.

WARNING!

The effects of applying optical weights is cumulative. If you apply an optical weight to individual levels stored in the colorant record, and to the entire colorant set, the optical constants for the level will be adjusted twice, using both multipliers. *You should consult with your Applications Specialist before using this option. Changing this value changes the optical data and will significantly affect color-matching results.*



Performance. A factor used to adjust the performance of a concentration stored with a specific level in a colorant record. The factor is a divisor applied to the calculation of optical data for a single level. Users may define performance factors for individual colorants, and for an entire colorant set.

When the PF is 100%, no adjustment is made. 100% should be the setting for a new colorant.

NOTES

- This is not the *PF* value displayed in the Formula Grid for correction predictions. The *Performance* values displayed in Colorant Set and Colorant Maintenance are applied during the calculation of the optical constants. The PF values that appear in the Formula Central are used to make adjustments to the ingredient concentrations to be used in the formula, based on an analysis of the trial.
- Both the *Performance* value in the colorant record and the PF value in the Formula Grid are used to adjust the colorant concentrations in the formula.

WARNING!

The effects of colorant and level performance factors are cumulative. If you enable the performance adjustment for an individual colorant record and for the entire colorant set, the colorant concentrations will be adjusted twice using both divisors. *You should consult with your Applications Specialist before using this option. Changing this value changes the optical data and will significantly affect color matching performance.*



Input/Output Form. Identifies the default colorant form to be used for matching and correction. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given user-defined labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.



Minimum Concentration. Identifies the minimum concentration allowable for the colorant set.



Maximum Concentration. Identifies the maximum concentration allowable for the colorant set.



Min/Max Form. Specifies the ingredient form associated with the minimum/maximum concentration limits. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given labels that can be customized. The default forms include:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.



Min/Max Mode. Specifies the ingredient mode associated with the minimum/maximum concentration limits. Mode refers to how you measure the ingredients that go into the formula. For example, if you weigh the amounts of each ingredient, the ingredient mode is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the ingredient mode is volume.



Related Ingredient. Identifies the ingredient record that contains the physical and administrative data (i.e., cost, lot, viscosity, etc.) associated with the colorant.



Colorant is a Recycle. Identifies that the colorant is a recycle.



Created. Identifies the date that the colorant record was created.



Created By. Identifies the user that created the colorant record.



Modified. Identifies the date that the colorant record was last edited.



Modified By. Identifies the user that last edited the colorant record.



Calibrating Substrate. Identifies the substrate used for the mixtures. The default selection is the substrate identified for the colorant set. Click on the down arrow to display the substrates available for use, and select the substrate used for the mixtures.

NOTES

- If your colorant type is *translucent*, you must identify a calibrating substrate for the mixtures.
- If your colorant set type is *opaque*, the substrate is not identified.
- You are not required to use the same substrate for every mixture stored in the colorant record.



Calibrating Resin. Identifies the resin used in the mixtures. The default selection is the resin identified for the colorant set. Click on the down arrow to view all of the resins available for use with the set.

NOTES

- When the colorant set type is *translucent*, you must identify a calibrating resin for the mixtures.
- When the colorant set type is *opaque*, identifying the calibrating resin is optional.
- The calibrating resin must remain the same for every mixture in the colorant record.
- If the resin you are using is not included in the choices, use the **New Colorant Wizard** option to enter a new resin into the system.



Calibrating White. This field identifies the white used in the mixtures. The default selection is the white selected as the default for the colorant set. Click on the down arrow to view the white colorants available for use, and select the white used in the mixtures.

NOTES

- The samples prepared for a translucent set can include a mixture of each color with white.
- The calibrating white used for a translucent set can either be a master white or an alternate white.
- The samples prepared for an opaque set usually include a mixture of each color with white.

- The calibrating white used for an opaque set must be designated as the “master” white.
- If the white you are using is not included in the choices, use the New Colorant Wizard icon to enter a new white into the system.



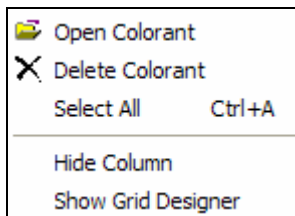
Calibrating Black. This field identifies the black used in the mixture. The default selection is the black selected as the default for the colorant set. Click on the *down arrow* to view the black colorants available for use, and select the black used in the mixtures.

NOTES

- The samples prepared for a translucent colorant set can include a mixture of each color with black.
- The samples prepared for an opaque colorant set usually include a mixture of each color with black.
- If the black you are using is not included in the choices, use the **New Colorant Wizard** icon to enter a new white into the system.

Menu

If you place the cursor anywhere in the Colorant Set List and right-click, a menu displays:



Some of the options displayed in this menu can be executed for multiple colorants. See Multiple Selections in the Set List for selection instructions.

- **Open Colorant.** Opens the colorant record for the selected colorant. To select a colorant, use the mouse to move the pointer in the far left column.
- **Delete Colorant.** Deletes the colorant currently selected. If multiple colorants are selected in the list, all of the selected colorants will be deleted.

A colorant can only be deleted if it has not been stored in the database as part of a record. If the colorant you have selected is included in a job, job template or formula stored in the database, you cannot delete it. You must first delete it from all of the records that include it.

- **Select All.** Selects the entire grid.
- **Hide Column.** Hides the column currently selected.

- **Show Grid Designer.** Displays the Grid Designer, which allows you to customize the columns to be displayed in the grid.

Selecting Multiple Colorants

Many of the editing options allow you to execute a function for multiple colorants. To select multiple colorants:

1. Using the mouse pointer, in the *Colorant Set List* click in a row to select a colorant.

		YELLOW P162	1				6/6	5/5	
		YELLOW P159	1				5/5	4/4	
		RED XP441	2				5/5	4/4	
		RED P481	2				6/6	5/5	

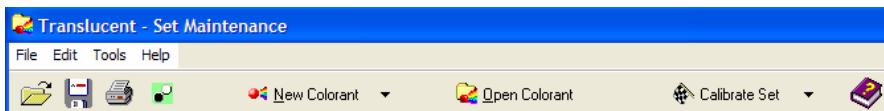
2. Press the **CTRL** button on the keyboard. Continue holding this key down, and **select another colorant** in the grid.

		YELLOW P162	1				6/6	5/5	
		YELLOW P159	1				5/5	4/4	
		RED XP441	2				5/5	4/4	
		RED P481	2				6/6	5/5	
		MAGENTA P412	3				3/3	2/2	

3. Repeat this process until you have made all of the desired selections.
4. When you are finished, release the **CTRL** button.
5. Display the menu option you want to execute, and select it.

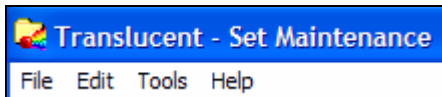
Set Maintenance Menu/Toolbar Options

This section covers the menus and toolbar options included in the Ingredient Maintenance program module:



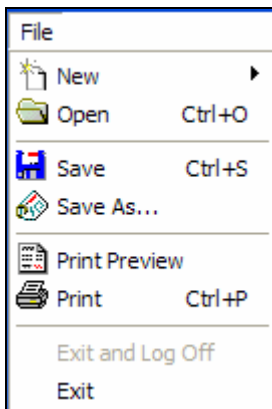
Set Maintenance Menu Options

The menu options include limited options to create, store, edit and retrieve data in a colorant set.

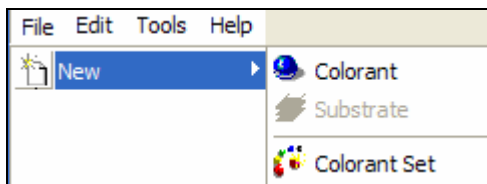


File Menu

This menu includes basic options to create, open, save and print colorant set data.



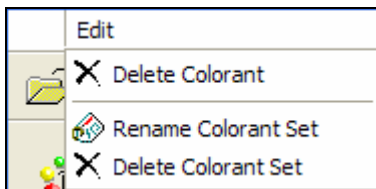
- **New.** This submenu includes options to store new colorants, colorant sets, and substrates.



- **Colorant.** Opens the New Colorant wizard.
 - **Substrate.** Starts the procedure to store a new substrate.
 - **Colorant Set.** Starts the procedure to create a new colorant set.
- **Open.** Opens an existing colorant set.
- **Save.** Saves changes made to the colorant set.
- **Save As.** Saves the colorant set under a different name.
- **Print Preview.** Opens the *Reports* option. You can select a print to report, and it displays the report on the screen. *See also Formula Central, Tools Menu, Reports for details on the reports available.*
- **Print.** Opens the Reports option. You can select a print to report, and it displays the report on the screen.
- **Exit.** Closes the colorant set.

Edit Menu

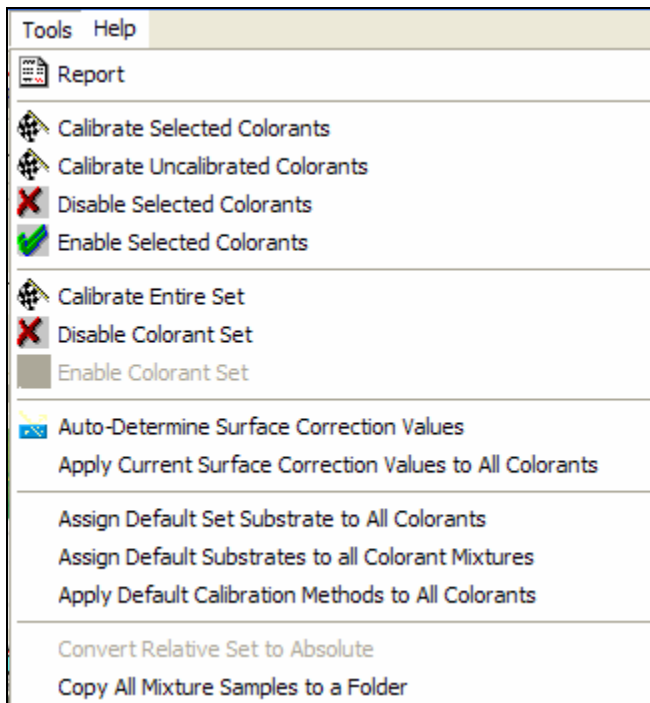
This menu includes options to delete individual colorant records and entire colorant sets. It also provides an option to rename existing colorant sets.



- **Delete Colorant.** Deletes the colorant currently selected.
- **Rename Colorant Set.** Renames the set currently open.
- **Delete Colorant Set.** Deletes the entire colorant set that is currently open.

Tools Menu

The menu provides options to calculate/recalculate the optical constants. It includes options to change default values assigned to the set that are used in these calculations.



- **Calibrate Selected Colorants.** This option calibrates colorants that have been selected from the colorant set list. You can select multiple colorants to be calibrated with a single command. See also *Colorant Set List, Selecting Multiple colorants* for instructions.
Calibrate Uncalibrated Colorants. This option calibrates all colorants in the set that are not currently calibrated. Mixtures must be stored for a colorant in order to calibrate the colorant.
- **Disable Selected Colorants.** This option allows you to disable colorants that are available in the colorant set. When a colorant is disabled, all of the data regarding the colorant is retained in the system. However, the colorant is no longer included in the list of colorant selections displayed in Formula Central. See also *Colorant set List, Selecting Multiple Colorants for instructions to select multiple colorants for this option.*
- **Enable Selected Colorants.** This option allows you to enable a colorant that has been disabled at any time. See *Calibrate Selected Colorants* for instructions to select multiple colorants for this option.

- **Calibrate Entire Set.** This option calibrates the entire colorant set.
- **Disable Colorant Set.** This option disables the active colorant set. A disabled set contains optical constants, but is not available for use in Formula Central.
- **Enable Colorant Set.** This option enables a colorant set. A colorant set containing optical constants is not available for use in Formula Central until it is enabled.

NOTE

The options to enable and disable colorant sets are designed for use when a colorant set is under construction. You may be experimenting with the calibration of a particular colorant set, but are not yet ready to make available for use. Disabling the set makes it invisible in Formula Central.

- **Auto Determine Surface Correction Values.** This option allows you to change the default specular value/index of refraction for the set. This value is used in future calculations.

Changing this value does not prompt an automatic recalculation of optical constants that are already stored. To recalculate the values using the new surface correction, you must select *Apply Current Surface Correction Values to All Colorants*.

- **Apply Current Surface Correction Values to All Colorants.** When you change the default surface correction value, the change is applied to all future calculations. This option is used to recalculate stored optical constants using the new value.
- **Assign Default Set Substrate to All Colorants.** If you have calibrated individual colorants using different substrates, this option is used to assign the default colorant set substrate to all colorants. The new substrate selection will be used to calculate future optical constants.

Changing the substrate selection does not prompt an automatic recalculation of optical constants that are already stored. To recalculate the values using the new substrate selection, you must select *Assign Default Substrates to All Colorant Mixtures*.

- **Assign Default Substrates to All Colorant Mixtures.** Recalculates stored optical constants, when the default colorant set substrate is changed.
- **Apply Default Calibration Methods to All Colorants.** You can select different mixture grouping methods to calculate the optical constants for individual colorants. This option enables you to assign the default (set) calibration method to all of the colorants.

Changing the mixture grouping method does not prompt an automatic recalculation of optical constants that are already stored. The selection is applied to future calculations. To recalculate the values using the new selection, you must select *Calibrate Entire Set*.

- **Convert Relative Set to Absolute.** Opaque sets only. Optical constants in an opaque colorant set are recalculated for use in translucent matching applications. This option requires preparation of an additional colorant mixture.
- **Copy All Mixture Samples to a Folder.** Mixture samples are stored as individual sample records. The record includes the mixture name and the spectral data.
- **Copy All Mixtures to a Formula.** Mixture samples are stored as individual formula records. The record includes the mixture name, formula, and spectral data.

Set Maintenance Toolbar Options

The toolbar offers you shortcuts for accessing the Colorant Set Maintenance program options. In many cases, the options available through the toolbar can also be accessed through the drop down menus. In addition, menus may be displayed by clicking either the left or right mouse key while the cursor is sitting on specific data fields in the Colorant Set Maintenance window.



 **Open Colorant Set.** This button is used to select a different colorant set. When selected, the Colorant Set Maintenance – Start dialog box displays. From this window you can either create a new set, or open an existing set.



Save. Saves any changes made to the colorant set.



Print. This opens a dialog box that allows you to select a report to be printed. *See also Report Options.*



Calibration. Opens the instrument calibration window.

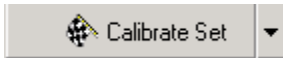


New Colorant. This button opens the New Colorant Wizard.



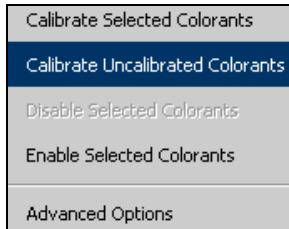
Open Colorant. This button opens the colorant maintenance window for the colorant currently selected in the colorant set list. This provides access to all of the mixture and level data stored for the colorant. A pointer in the far left column of the Colorant Set List indicates the active colorant. Move the pointer to a different row to activate a different colorant record.





Calibrate Set. Displays the colorant calibration options.

This option is used to calculate the optical constants for the colorants. Click on the down arrow to display a menu of colorant calibration options.

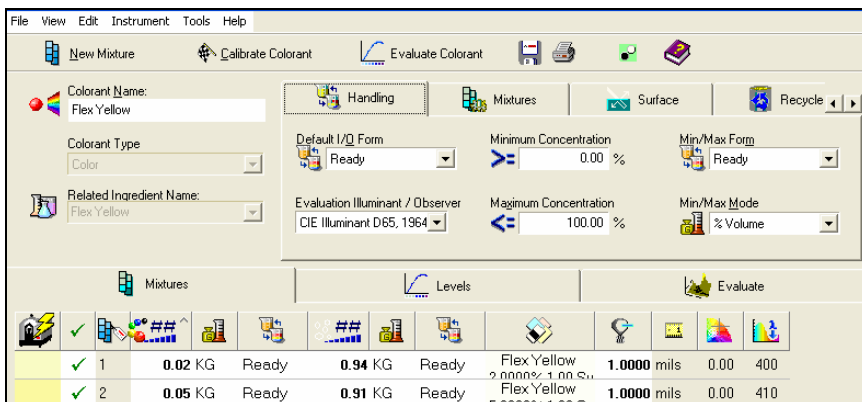


- **Calibrate Selected Colorants.** This option calibrates colorants that have been selected from the colorant set list. This field indicates both the number of levels enabled, and the number of levels stored in the colorant record. *See also Colorant set List, Selecting Multiple Colorants for instructions to select multiple colorants for this option.*
- **Calibrate Uncalibrated Colorants.** This option calibrates all colorants in the set that are not currently calibrated. Mixtures must be stored for a colorant in order to calibrate the colorant.
- **Disable Selected Colorants.** This option allows you to disable colorants that are available in the colorant set. When a colorant is disabled, all of the data regarding the colorant is retained in the system. However, the colorant is no longer included in the list of colorant selections displayed in Formula Central. This field indicates both the number of levels enabled, and the number of levels stored in the colorant record. *See also Colorant set List, Selecting Multiple Colorants for instructions to select multiple colorants for this option.*
- **Enable Selected Colorants.** This option allows you to enable a colorant that has been disabled at any time. This field indicates both the number of levels enabled, and the number of levels stored in the colorant record. *See also Colorant set List, Selecting Multiple Colorants for instructions to select multiple colorants for this option.*
- **Advanced Options.** This option moves you to the Advanced Tab in the Colorant Set Maintenance window.

Help. Provides access to the online help. The "About" option displays the version number of Datacolor MATCH^{PIGMENT} that is currently installed and running.

Colorant Maintenance

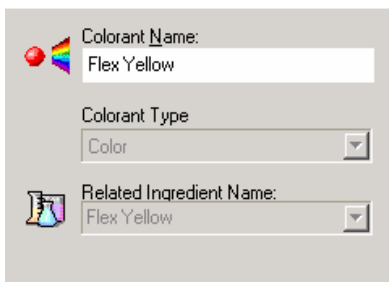
When you enter set maintenance, the default window displays information regarding the entire colorant set. Selecting "New Colorant" or "Open Colorant" from the Colorant Set Maintenance toolbar opens a second window that contains data specific to an individual colorant in the set.



This is the screen used to edit or examine the data for an individual colorant. The layout of the window remains the same despite the colorant set type that is currently active. However, the fields included will change based on the colorant set type.

Colorant Maintenance Window

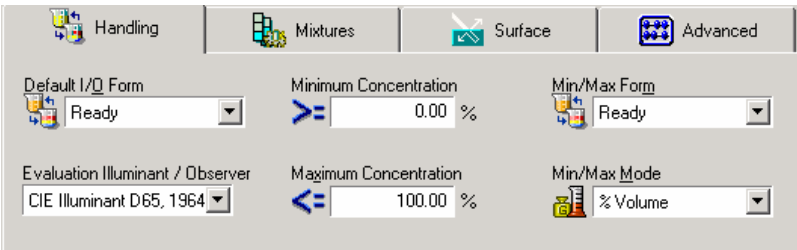
The organization of Colorant Maintenance window remains the same for all colorant set types. The top left contains three fields that are always displayed when you are working in colorant set maintenance:



- **Colorant Name.** Identifies the colorant record being displayed.
- **Colorant Type.** Identifies the colorant type assigned to the record displayed.
- **Related Ingredient Name.** Optical constants are calculated for a colorant. This field identifies the ingredient to which the optical constants are attached.

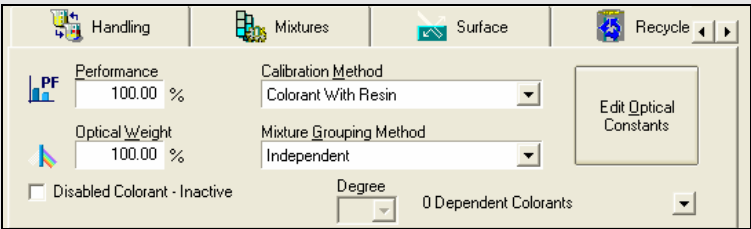
Pages in the Colorant Record

To the right are tabs for each page in the colorant record.



The tabs at the top of the window provide access to individual pages in the colorant record. The information in these pages is used to calculate the optical constants.

NOTE
When the Recycles option is enabled, an additional page, Recycles, is included in the colorant record:



Colorant Maintenance Grids

At the bottom of the window is a grid that provides access to the mixture and level data.

Mixtures				Levels				Evaluate			
✓	1	1.2000 G	Ready	28.8000 G	Read	G	70.0000	0.92	400	2.00	700
✓	2	2.4000 G	Ready	27.6000 G	Read	G	70.0000	0.87	400	2.00	400
✓	3	4.8000 G	Ready	25.2000 G	Read	G	70.0000	0.34	400	1.08	400
✓	4	9.6000 G	Ready	20.4000 G	Read	G	70.0000	0.98	400	3.05	400
✓	5	19.2000 G	Ready	10.8000 G	Read	G	70.0000	2.13	400	3.91	400
✓	6	29.4000 G	Ready	G	Read	0.6000 G	70.0000	7.87	400	4.01	400

This grid is divided into three pages:

- **Mixtures Grid.** Displays the supporting data stored with each *mixture* in the colorant record. This includes colorant concentration, colorant form, colorant mode and other important data.
- **Levels Grid.** Displays the supporting data stored with each *level* in the colorant record. Much of this is theoretical data calculated from the measurements of the mixtures, and the supporting information supplied with them.
- **Evaluate Grid.** This page displays the actual mixture data (spectral values and colorant concentration), and level data (optical constants and theoretical concentration). It includes options to examine the data in text and graphic format.

Colorant Record Pages

This section provides a detailed explanation of the fields on each of the pages in a colorant record including the *Handling*, *Mixtures*, *Surface*, *Recycles* and *Advanced* pages.

Colorant Maintenance Handling Tab

Colorant mixtures are created to simulate a specific production process. The handling information for a colorant provides specific information about the process you are trying to simulate through the colorant mixtures. Handling information is non-colorimetric information including:

- Identification of the mode and form of the color used in the mixtures. These become the default output mode and form for formulas in Formula Central.
- Gloss and film thickness data

This information is required to produce a formula that fits your process.

When the Handling window opens, the defaults for the colorant are displayed. The default settings for these fields are taken from the defaults for the colorant set. The user can change the defaults for the colorant at any time.

The screenshot shows the 'Handling' tab of a software interface. It features four sub-tabs: 'Handling' (selected), 'Mixtures', 'Surface', and 'Advanced'. The 'Handling' tab contains six input fields arranged in a 2x3 grid. The first row includes 'Default I/Q Form' (set to 'Ready'), 'Minimum Concentration' (set to '0.00 %'), and 'Min/Max Form' (set to 'Ready'). The second row includes 'Evaluation Illuminant / Observer' (set to 'CIE Illuminant D65, 1964'), 'Maximum Concentration' (set to '100.00 %'), and 'Min/Max Mode' (set to '% Volume'). Each field has a small icon to its left and a dropdown arrow to its right.

The fields on this screen contain default information used to generate the optical constants for an individual colorant.

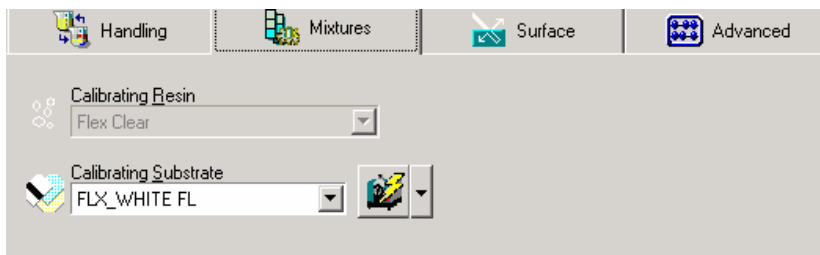
- **Minimum Concentration.** ➤ Identifies the minimum concentration allowable for the colorant.
- **Maximum Concentration.** ➤ Identifies the maximum concentration allowable for the colorant.

The remaining fields on this screen are the same fields found on the Handling Tab, for the colorant set. *See also Colorant Set Maintenance, Handling Tab for details on the remaining fields.*

Colorant Maintenance Mixtures Tab

The mixtures tab contains information about the primary samples. This information is specific to the colorant set type, and includes the reflectance values for the sample, and the formula used to prepare the mixture. For an opaque or translucent colorant, this includes information about the resin, substrate, white and black (when used) used in the mixtures.

When the Mixtures window opens, the defaults for the colorant are displayed. The default settings for these fields are taken from the defaults for the colorant set. The selections on this tab can be changed when the first mixture is stored. All selections made when a mixture is stored become the settings for the individual colorant record.



NOTES

- The fields that appear on this screen depend on the type of colorant set you are using. The example above may not include all of the fields you will see on the Mixtures tab for an individual colorant.
- The user may change the defaults for the colorant at any time.

The fields on this screen are the same fields found on the Mixtures Tab for the Colorant set. *See also Colorant Set Maintenance, Mixtures Tab for details on the remaining fields.*

Colorant Maintenance Surface Tab

This tab establishes the values used to correct measurements of the mixture(s) for surface effects. When the Surface tab window opens, the defaults for the colorant are displayed. The default settings for these fields are taken from the defaults for the colorant set.

The screenshot shows the 'Surface' tab selected in a window with four tabs: Handling, Mixtures, Surface, and Advanced. The 'Measurement Geometry' section includes a dropdown menu set to 'SCI Diffuse Specular Included'. Below this are two input fields: 'Default Specular %R' with a value of 4.00 and 'Default Internal %R' with a value of 60.00. There is also a checkbox for 'Variable Internal %R' which is unchecked, and a 'Substrate Roughness' input field with a value of 0. On the right side, there is an 'Apply To All Colorants' button and a table of spectral range values.

Lowest Measured Value	
3.81 %	
Widest Spectral Range	
400.00 nm	700.00 nm
Narrowest Spectral Range:	
400.00 nm	700.00 nm
Interval Range	
10.00 nm	10.00 nm

The fields on this screen are the same fields found on the Surface Tab for the colorant set. See also *Colorant Set Maintenance, Surface Tab* for details on the remaining fields.

Colorant Maintenance Advanced Tab

This tab provides information required to complete the calibration of a transparent colorant. The default settings for the fields in this window are taken from the colorant set defaults. They can be changed for individual colorant records.

WARNING!

Changing any information on this tab can significantly impact the accuracy of the formulas calculated by the program. We strongly recommend that you consult with your Applications Specialist before making any changes to the information on this tab.

The screenshot shows the 'Advanced' tab selected in a window with four tabs: Handling, Mixtures, Surface, and Advanced. The 'Performance' section has a 'PF' input field with a value of 100.00. The 'Optical Weight' section has an input field with a value of 100.00. There is a checkbox for 'Disabled Colorant - Inactive' which is unchecked. The 'Calibration Method' dropdown is set to 'Colorant With Resin'. The 'Mixture Grouping Method' dropdown is set to 'Independent'. On the right, there is an 'Edit Optical Constants' button. At the bottom, it shows '0 Dependent Colorants'.



Performance. A factor used to adjust the performance of a concentration stored with a specific level in a colorant record. The factor is a divisor applied to the calculation of optical data for a single level. Users may define performance factors for individual colorants, and for an entire colorant set.

When the PF is 100%, no adjustment is made. 100% should be the setting for a new colorant.

NOTES

- This is not the *PF* value displayed in the Formula Grid for correction predictions. The *Performance* values displayed in Colorant Set and Colorant Maintenance are applied during the calculation of the optical constants. The *PF* values that appear in the Formula Central are used to make adjustments to the ingredient concentrations to be used in the formula, based on an analysis of the trial.
- Both the *Performance* value in the colorant record and the *PF* value in the Formula Grid are used to adjust the colorant concentrations in the formula.

WARNING!

Changing this value changes the optical data and will significantly affect color-matching performance. The effects of colorant and level performance factors are cumulative. If you enable the performance adjustment for an individual colorant record and for the entire colorant set, the colorant concentrations will be adjusted twice using both divisors. You should consult with your Applications Specialist before using this option.



Optical Weight. A factor used to adjust the optical constants for a colorant. It is a multiplier applied to the value of the optical constants, and its value can be edited for each colorant level included in the record. It can also be applied across an entire colorant set.

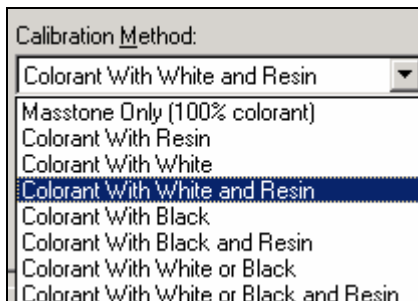
When the optical weight is 100%, no adjustment is made to the optical constants.

WARNING!

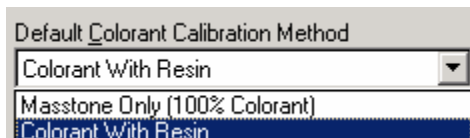
Changing this value changes the optical data and will significantly affect color-matching results. The effects of applying optical weights is cumulative. If you apply an optical weight to individual levels stored in the colorant record, and to the entire colorant set, the optical constants for the level will be adjusted twice, using both multipliers. You should consult with your Applications Specialist before using this option.

Calibration Method. Identifies the mixtures and method used to calibrate the colorant data. The *Mixture Grouping Method* you select determines the number of mixtures that you will need to prepare.

The calibration methods listed below can be used for opaque and translucent colorants:



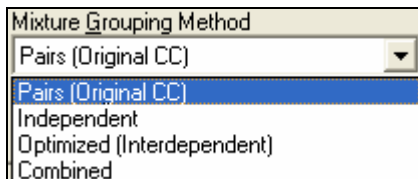
The calibration methods listed below can be used for transparent colorants:



- Masstone Only
- Colorant with Resin

The Colorant calibration options for individual colorants are the same as those provided for the colorant set. *See also Colorant Set Maintenance, Advanced Tab, Colorant Calibration Method for an explanation of each method.*

Mixture Grouping Method. Identifies how the mixture data will be used to calculate the level data for the colorant. The *Mixture Grouping Method* can change from one colorant to another within a set, in order to adjust the optical constants on a colorant-by-colorant basis, as needed.



The Mixture Grouping Methods for individual colorants are the same as those provided for the colorant set. *See also Colorant Set Maintenance, Advanced Tab, Mixture Grouping Method for an explanation of each method.*

Disable Colorant–Inactive. This option hides the colorant. It is not deleted from the system, it is simply removed as a selection, and the optical data for the colorant is not available for use in matching or correction. If you have a colorant set that is experimental or has bad data, you will probably not want to make it available for use.

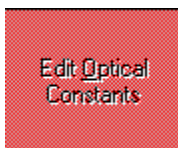
Edit Optical Constants. This option allows the user to edit the optical constants stored in the colorant record.

WARNING!

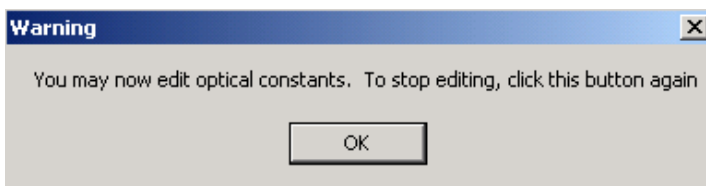
Changing this value changes the optical data and will significantly affect color-matching results. You should consult with your Applications Specialist before using this option.

To edit these values:

1. Click on the **Edit Optical Constants** button. The button will turn red to indicate that the grid will allow editing.



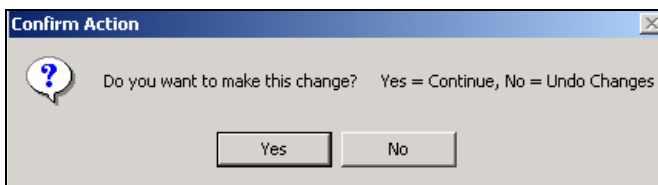
A dialog box displays confirming the action you are about to make:



2. Place the cursor in the grid and edit the optical constants as needed.

λ	K/S: 2.0000%	K/S: 5.0000%	K/S: 10.0000%
400	0.2529	0.6204	1.3476
410	0.2579	0.6543	1.4631
420	0.2530	0.6613	5
430	0.2448	0.6460	1.4836

- Click the **Edit Optical Constants** button a **second time**, or click anywhere outside the grid to stop editing. The program will prompt for confirmation that the changes should be saved.



- Press **Yes** to save the changes, or **No** to cancel the edits.

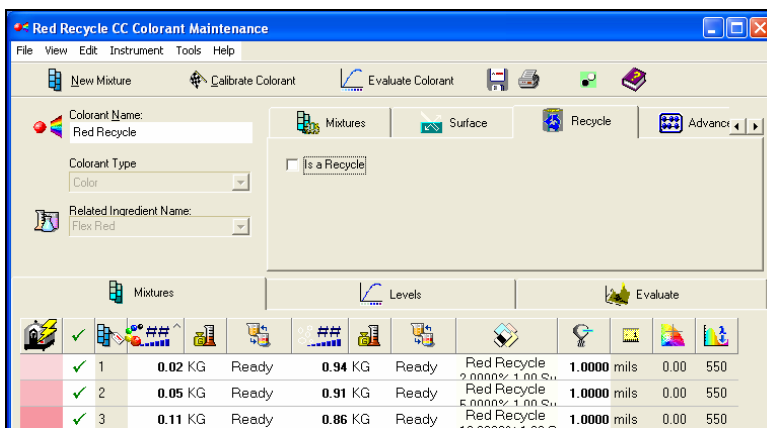
Colorant Maintenance Recycles Tab

When the *Recycle* option is activated in Admin, a new tab, *Recycle*, is displayed in Colorant Maintenance. See also *Admin, All Users for information to enable the Recycles option*.

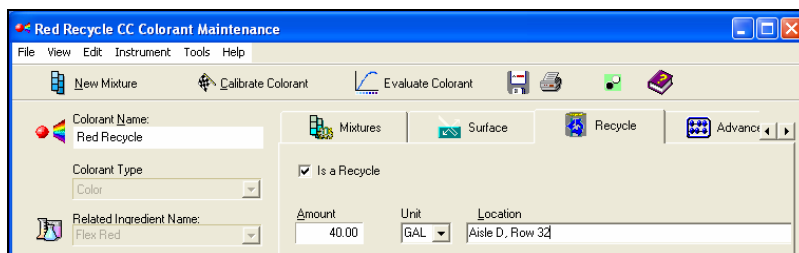
- In Set Maintenance, you can calibrate a recycle using any of the normal colorant calibration options.
- You can convert a colorant into a recycle at any time.

After the Recycles option is enabled in Admin, you can begin working with recycles in *Set Maintenance*. To access this option

- From the Colorant Maintenance window, click on the **Recycle** tab. The field below is displayed:



- To convert a colorant to a recycle, click the *Is a Recycle* checkbox. Additional input fields are displayed regarding recycle amount available, units and location:



- **Amount.** Enter the recycle amount.
- **Unit.** Identifies the units of measurement associated with the amount.
- **Location.** This is an optional field, used to identify where the recycle is currently located.

Colorant Grids

When you are viewing the data for an individual colorant, the grid configuration shown below is displayed. This grid consists of three pages or grids, containing specific types of information on each page.

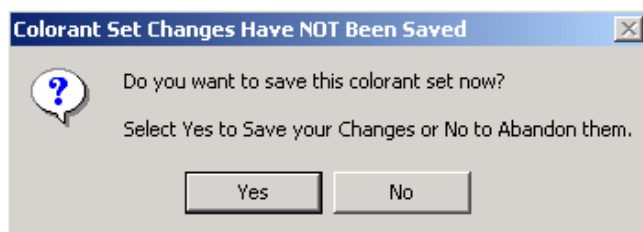
- Click on the tab corresponding to the information you want to display:



✓	1	1.2000 G	Ready	28.8000 G	Read	G	70.0000	0.92	400	2.00	700	
✓	2	2.4000 G	Ready	27.6000 G	Read	G	70.0000	0.87	400	2.00	400	
✓	3	4.8000 G	Ready	25.2000 G	Read	G	70.0000	0.34	400	1.08	400	
✓	4	9.6000 G	Ready	20.4000 G	Read	G	70.0000	0.98	400	3.05	400	
✓	5	19.2000 G	Ready	10.8000 G	Read	G	70.0000	2.13	400	3.91	400	
✓	6	29.4000 G	Ready		Read	0.6000 G	70.0000	7.87	400	4.01	400	

- Mixtures.** Displays all of the information used to calculate the mixture data stored in the record. *See also Mixtures Grid for detailed information.*
- Levels.** Displays all of the information used to calculate the level data stored in the record. *See also Levels Grid for detailed information.*
- Evaluate.** Provides options to display and evaluate level and mixture data. The data is presented in either text or graphic format. *See also Evaluate Grid for detailed information.*

5. **Editing Mixture and Level Data.** When you change any information in the colorant record and try to exit the program module, the program will request a confirmation that any changes made should be saved.



6. Select **Yes** to make the changes permanent. Select **No** to cancel the changes you have made.

Mixtures Grid

This tab contains detailed information regarding each colorant mixture stored in the record. This includes the formula used, substrate, film thickness, wavelength of maximum absorption, and other information specific to the mixture sample(s). This information is used to calculate the colorant levels.

Mixtures					Levels			Evaluate					
													
			1	Ready	70.0000 G	Ready	YELLOW P159 2 minny Substr	1.00	mils	1.04	400	1.74	700
			2	Ready	70.0000 G	Ready	YELLOW P159 2 minny Substr	1.00	mils	1.25	400	2.24	400
			3	Ready	70.0000 G	Ready	YELLOW P159 8 minny Substr	1.00	mils	0.05	400	0.76	400
			4	Ready	70.0000 G	Ready	YELLOW P159 18 minny Substr	1.00	mils	3.10	400	2.29	400
			5	Ready	70.0000 G	Ready	YELLOW P159 20 minny Substr	1.00	mils	5.79	410	1.07	400

Mixtures Grid Fields



Measurement Method. Left click in this column heading to view the Measurement Menu.



- To change the default measurement method, highlight a selection on this menu. The icon will be updated to display the measurement method selected.
- Right-click in this field to access the *Mixture Editing* options.

NOTE

When the measurement method is the instrument, place the mixture sample at the measurement port before you click in the measurement field.



Color Display. Displays the color of the mixture.

- **Opaque Samples.** If the sample is opaque, the color displayed in this column is the color of the opaque measurement.
- **Transparent Samples.** Displays the color of the sample, as measured.
- **Translucent Samples.** For translucent samples, the color displayed is the color of the “over dark” measurement. *See also Applications Technology, Sample Types.*

✓ **Mixture is Active.** Data for a mixture can be stored in a record, but it can be selectively activated and deactivated. Active mixture data is used to calculate optical constants.



Mixture ID Number. Mixtures stored for a colorant are numbered.



Colorant Amount. Identifies the amount of the colorant contained in the mixture.



Colorant Unit. Identifies the unit used to express the colorant amount contained in the mixture. For example, if you weigh the colorant, the ingredient unit is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the unit is volume. This is also referred to as the ingredient or colorant “mode.”



Colorant Weight Percent. Amount of colorant contained in the mixture, expressed as a weight percent



Colorant Volume Percent. Amount of colorant contained in the mixture, expressed as a volume percent.



Colorant Input Form. Identifies the default colorant form to be used for matching and correction. Ingredients may contain any number of components that may, themselves, have components. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms can be assigned user-defined labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

The default choices for the colorant form are defined in the colorant set.



White Amount. Amount of white contained in the mixture. This field is not used by all applications.



White Unit. Identifies the unit used to express the white amount contained in the mixture. For example, if you weigh the colorant, the ingredient unit is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the unit is volume. This is also referred to as the white “mode”. This field is not used by all applications.



White Weight Percent. Amount of white contained in the mixture, expressed as a weight percent. This field is not used by all applications.



White Volume Percent. Amount of white contained in the mixture, expressed as a volume percent. This field is not used by all applications.



White Input Form. Identifies the default form of the white to be used for matching and correction. Ingredients may contain any number of components that may, themselves, have components. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given user-definable labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

The default choices for the white form are defined in the Colorant Set. *This field is not used by all applications.*



Black Amount. Amount of black contained in the mixture. This field is not used by all applications.



Black Unit. Identifies the unit used to express the black amount contained in the mixture. For example, if you weigh the colorant, the ingredient unit is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the unit is volume. This is also referred to as the black “mode”. This field is not used by all applications.



Black Weight Percent. Amount of black contained in the mixture, expressed as a weight percent. This field is not used by all applications.



Black Volume Percent. Amount of black contained in the mixture, expressed as a volume percent. This field is not used by all applications.



Black Input Form. Identifies the default form of the black to be used for matching and correction. Ingredients may contain any number of components that may, themselves, have components. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given user-definable labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

The default choices for the black form are defined in the Colorant Set. *This field is not used by all applications.*



Resin Amount. Amount of resin contained in the mixture.



Resin Unit. Identifies the unit used to express the resin amount contained in the mixture. For example, if you weigh the resin, the ingredient unit is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the unit is volume. This is also referred to as the black “mode”. *This field is not used by all applications.*



Resin Weight Percent. Amount of resin contained in the mixture, expressed as a weight percent. *This field is not used by all applications.*



Resin Volume Percent. Amount of resin contained in the mixture, expressed as a volume percent. *This field is not used by all applications.*



Resin Input Form. Identifies the default form of the resin to be used for matching and correction. Ingredients may contain any number of components that may, themselves, have components. “Form” describes a level of expansion of a colorant into component ingredients. Three “special” forms are given user-definable labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

The default choices for the resin form are defined in the Colorant Set.



Substrate. Identifies the substrate used for the mixture.



Film Thickness. Identifies the film thickness of the mixture.



Film Thickness Unit. Identifies the film thickness unit.

Levels Grid

This tab contains detailed information regarding each level stored in the record. This includes the theoretical colorant concentration, wavelength of maximum absorption, and other information specific to the level. This information is used to calculate the optical constants for the colorant.

Mixtures			Levels			Evaluate		
		✓	657	2.4000	Ready	100.00	100.00	410
		✓	658	4.8000	Ready	100.00	100.00	420
		✓	659	9.6000	Ready	100.00	100.00	420
		✓	660	19.2000	Ready	100.00	100.00	420

Levels Grid Fields



Color Display. Displays the level color over the calibrating substrate. Depending on the colorant type, this color may be displayed over the light background, or over a contrasting background. For opaque colorants the substrate will have no influence on the color displayed.

✓ **Level is Active.** The level data is active and available for use by Formula Central



Level ID. Levels are numbered based on the colorant concentration. Level 1 contains the lowest concentration of colorant.



Volume %. Amount of colorant contained in the level, expressed as a volume percent.



Load/Calculation Form. Identifies the colorant form to be used as the basis for loading calculations



Linear Fit. Indicates the degree to which the optical constants for a particular level can be predicted, based on level data stored in the record.

The optical constants for the level selected are predicted using the remaining level data in the record, and compared to the optical data actually stored for the level. A perfect fit indicates that the optical behavior of the colorant is linear.

When this evaluation is repeated for each level in the record, it will reveal if there are concentration ranges in which the optical behavior of the colorant is not linear. In those concentration ranges where the behavior is not linear, the accuracy of the optical data can be improved by introducing additional mixtures.



Optical Weight. A factor used to adjust the optical constants for a colorant. It is a multiplier applied to the value of the optical constants, and its value can be edited for each colorant level included in the record. It can also be applied across an entire colorant set.

When the optical weight is 100%, no adjustment is made to the optical constants.

WARNING!

Changing this value changes the optical data and will significantly affect color-matching results. The effects of applying optical weights is cumulative. If you apply an optical weight to individual levels stored in the colorant record, and to the entire colorant set, the optical constants for the level will be adjusted twice, using both multipliers. You should consult with your Applications Specialist before using this option.



Performance. A factor used to adjust the performance of a concentration stored with a specific level in a colorant record. The factor is a divisor applied to the calculation of optical data for a single level. Users may define performance factors for individual colorants, and for an entire colorant set. When the PF is 100%, no adjustment is made. 100% should be the setting for a new colorant.

NOTES

- This is not the PF value displayed in the Formula Grid for correction predictions. The Performance values displayed in Colorant Set and Colorant Maintenance windows are applied during the calculation of the optical constants. The PF values that appear in the Formula Central are used to make adjustments to the ingredient concentrations to be used in the formula, based on an analysis of the trial.
- Both the Performance value in the colorant record and the PF value in the Formula Grid are used to adjust the colorant concentrations in the formula.

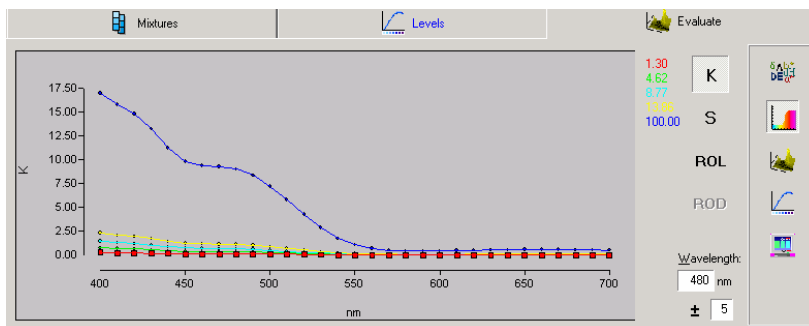
WARNING!

Changing this value changes the optical data and will significantly affect color-matching performance. The effects of colorant and level performance factors are cumulative. If you enable the performance adjustment for an individual colorant record and for the entire colorant set, the colorant concentrations will be adjusted twice using both divisors. You should consult with your Applications Specialist before using this option.

Wavelength of Maximum Absorption. Identifies the wavelength of maximum absorption (lowest point in the spectral curve) for the mixture. This information is used to plot the *Build Profile*. *If the wavelength is not the same for all mixtures, discuss this with your Applications Specialist.*

Evaluate Grid

This grid displays the actual mixture data and level data for an individual colorant. It includes options for both text and graphical displays of the data.



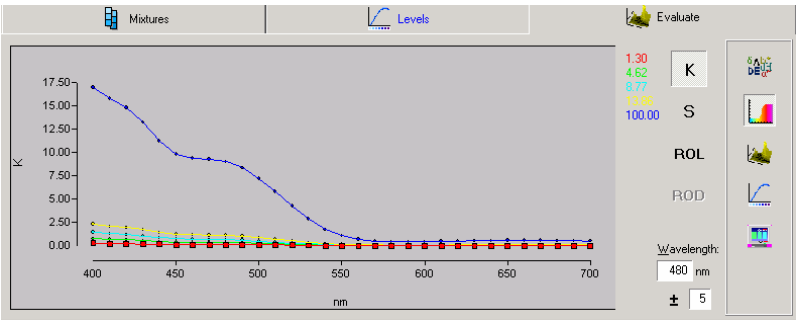
Evaluate Grid Configuration

You must make selections regarding the format of the data, and the type of data to be displayed.

Displaying Information in Text Format. Below is an example of a display of the data in text format. In the example below, level data ("K" values vs. wavelength) are displayed in a "text" format:

Mixtures				Levels				Evaluate			
λ	K: 1.2965%	S: 1.2965%	K: 4.6208%	S: 4.6208%	K: 8.7740%	S: 8.7740%	K: 13.8609%				
400	0.2675	0.0274	0.7747	0.0796	1.4224	0.1461	2.2896	K			
410	0.2225	0.0252	0.6757	0.0765	1.2667	0.1435	2.0760	S			
420	0.1969	0.0258	0.6128	0.0803	1.1639	0.1525	1.9247	ROL			
430	0.1682	0.0277	0.5295	0.0875	1.0187	0.1683	1.6993	ROD			
440	0.1352	0.0295	0.4306	0.0944	0.8397	0.1839	1.4178				
450	0.1129	0.0296	0.3624	0.0955	0.7141	0.1879	1.2205				
460	0.1045	0.0291	0.3380	0.0944	0.6703	0.1868	1.1545				
470	0.1007	0.0291	0.3274	0.0951	0.6526	0.1891	1.1321				
480	0.0955	0.0298	0.3120	0.0977	0.6261	0.1955	1.0916				
490	0.0866	0.0308	0.2839	0.1014	0.5731	0.2040	1.0065				
500	0.0724	0.0321	0.2389	0.1063	0.4958	0.2151	0.8595				
510	0.0564	0.0334	0.1866	0.1113	0.3820	0.2285	0.6822				
520	0.0406	0.0347	0.1345	0.1161	0.2773	0.2371	0.4996				
530	0.0265	0.0355	0.0883	0.1196	0.1831	0.2443	0.3316				
540	0.0160	0.0358	0.0536	0.1216	0.1115	0.2471	0.2026				

Displaying Information in a Graphical Format. Below is an example of the data displayed in a graphic format. In this example the same level data ("K" values vs. wavelength) are displayed in a "2-D spectral graph":



Selecting Data Format/Data Type

In the Levels Grid, you can display mixture data and level data in either text or graphic format. You must choose both the type of data (mixture or level data) and the type of display (text or graphic). These selections are made through buttons on the Evaluation grid.

Data Format Selection. You can display the data in either a text or graphic format.



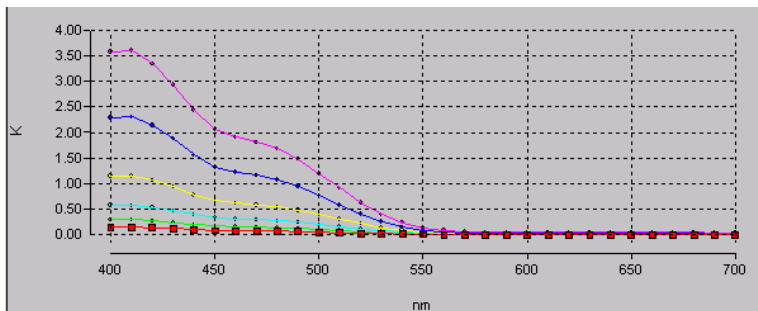
 **Text Display.** If you want to display the data in numerical format, click on this button.

Graphic Display. There are several types of graphic displays available.

Graphic Formats



2-D Spectral Graph. Displays a two-dimensional plot of data selected. Below is an example of the plot displayed when optical data (K) is selected as the data to be plotted.



This plot includes the data for all active mixtures/levels stored in the record. The curve shapes for each sample should be similar. Irregularities in the curve shape can indicate that there is a problem with one/several of the samples.

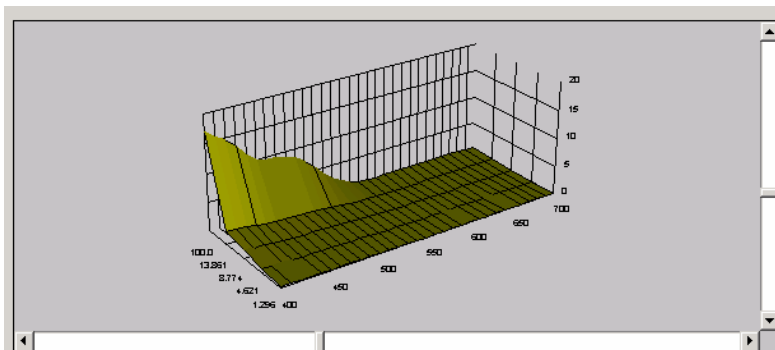
When you right-click in this plot the following menu displays:



A check next to the scaling option indicates that it is enabled.

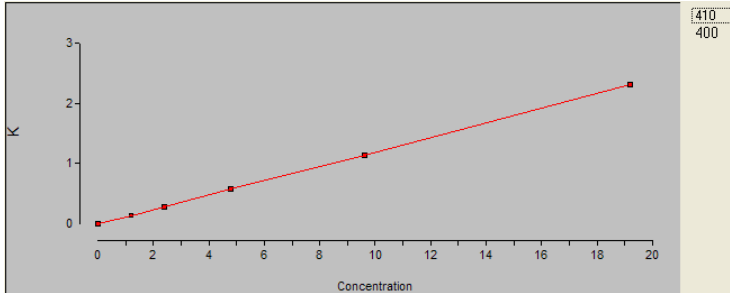


3-D Plot. Displays a three-dimensional plot, for any mixture data collected wavelength-by-wavelength. This includes spectral data vs. wavelength, optical constants vs. wavelength, or optical constants vs. concentration. The horizontal (y) axis always plots wavelengths, and the z-axis always plots the concentration. The vertical (x) axis plots either spectral data or optical constants, depending on the data type selected for the evaluation.





Build Profile. Plots optical constant vs. colorant concentration at a particular wavelength. The wavelength used is *the wavelength of maximum absorption* and includes points for all of the active levels in the colorant record.

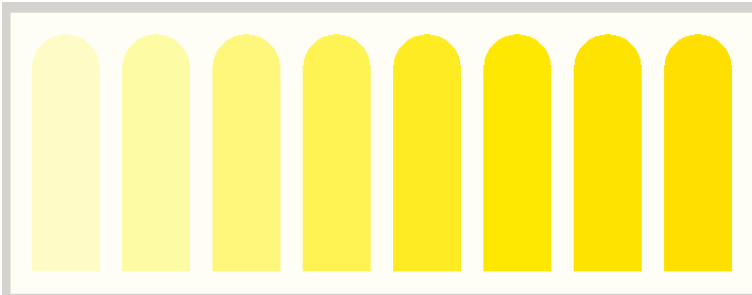


The shape of the build curve should be smooth. Any sharp changes from one level to next indicate that there may be an error in the data.

When there is more than one “wavelength of maximum absorption” identified for the colorant, you can look at both build curves. Click on one of the wavelengths that appear in the upper right corner of the plot to select the build profile to be displayed.



Color Display. Onscreen simulation of the mixtures stored/enabled for the colorant.

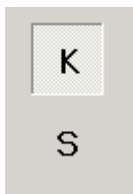


The color displayed on the monitor is configured for Illuminant/Observer D65/10.

Data Type Selection

You can display either mixture data or level data in the Evaluation grid. Mixture data are the spectral data stored for the mixtures. Level data are the optical constants calculated for the colorant, and are based on the mixture data.

Display Optical Constants. Select one of these buttons on the evaluation grid to display the level data for the colorant. Depending on the application type, the data displayed are K/S, K, S, or A values.

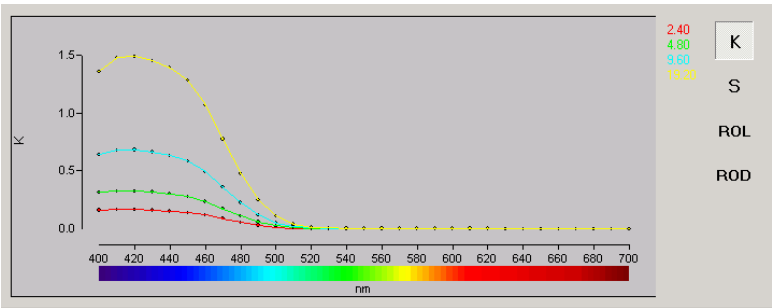


NOTES

- For most transparent applications, the type of optical data calculated is K/S or A values.
- For most opaque and translucent applications the type of optical data calculated is K and S, or K/S Data.

Type Of Optical Constant Data Plotted	Description
	K/S is a ratio of the absorption/scattering constants of a colorant. In transparent applications, typically the K value is contributed by the colorant, and the S values are contributed by the substrate. When this is selected, K/S vs. wavelength will be plotted.
	Absorption coefficient of a colorant. In translucent and opaque applications, a separate absorption and scattering coefficient is calculated for a colorant. When this is selected, K vs. wavelength will be plotted.
	Scattering coefficient of a colorant. In translucent and opaque applications, a separate absorption and scattering coefficient is calculated for a colorant. When this is selected, S vs. wavelength will be plotted.

Below is a plot of level data:



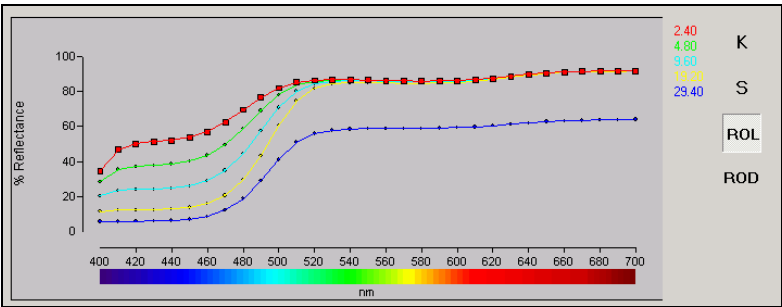
Display Mixture Data



Select one of these buttons on the evaluation grid to display the mixture data for the colorant. *See also Applications Technology, Sample Types for a discussion of ROL and ROD measurements.*

Type of Measurement Data Displayed	Description
%R	A single measurement of the mixture is made, and the reflectance data is plotted. This measurement method is referred to as 'single' or 'regular'. It is typically used for opaque materials, or for transparent materials applied to an opaque substrate.
ROL	Two measurements of the mixture are made. When this option is selected, the reflectance data from the sample, measured over a light background, is plotted. The mixture is usually presented over the calibrating substrate. This measurement method is also identified as DR/DT, and is typically used for translucent materials.
ROD	Two measurements of the mixture are made. When this option is selected, the reflectance data from of the sample, measured over a dark background, is plotted. The mixture is usually presented over a contrasting background. This measurement method is typically used for translucent materials.

Below is a plot of mixture data:



Colorant Set Wizards

Set Maintenance includes two wizards, the *Colorant Set* wizard and the *New Colorant* wizard. The *Colorant Set* wizard provides for the selection of default values that are applied to an entire colorant set. The *New Colorant* wizard is used to store data for each colorant included in the set. There is also a *New Mixtures* wizard available in Set Maintenance. This wizard guides you through the process of adding mixture samples to a colorant record. Mixtures information can be added to an existing colorant set at any time.

Before You Begin

The materials to be included in the colorant set must first be entered into the ingredient system (Ingredient Maintenance). The ingredient record includes the physical properties of the material, which may be needed to calculate a formula.

Once a colorant set is created, you can begin to add data for your materials. The New Colorant wizard is used to enter or add information about colorants into a set. Colorant information can be added to an existing colorant set at any time.

Set Maintenance Wizard

This wizard is used to make default selections for the colorant set. When you open Colorant Set Maintenance, the following screen displays:

Colorant Set Name	Modified	Modified by	Created	Created by
Transparent	10/1/2004 8:31:52 AM	User	9/10/1999 11:52:00 AM	dci
Opaque	9/16/2003 9:50:17 AM	dci	9/21/1999 2:12:00 PM	dci
Translucent	9/16/2003 9:50:44 AM	dci	10/9/2001 3:58:08 PM	dci
Opaque_45	6/15/2004 12:11:25 PM	dci	6/15/2004 11:50:52 AM	User

From this screen you can create, open or delete a colorant set. When you select **Create a New Colorant Set**, the Colorant Set wizard opens.



On the left pane is a list of the steps that must be completed for a new colorant set. The Wizard will prompt you through each step in the process, and will repeat it for each colorant you need to enter.

This wizard can also be opened from the Colorant Set Maintenance window (*File Menu, New, Colorant Set*) or click the *New Colorant* button.



The screens included in the wizard are based on the colorant set type you have selected, and each one must be completed. *See also Colorant Set Maintenance, Colorant Set Type.*

New Colorant Wizard

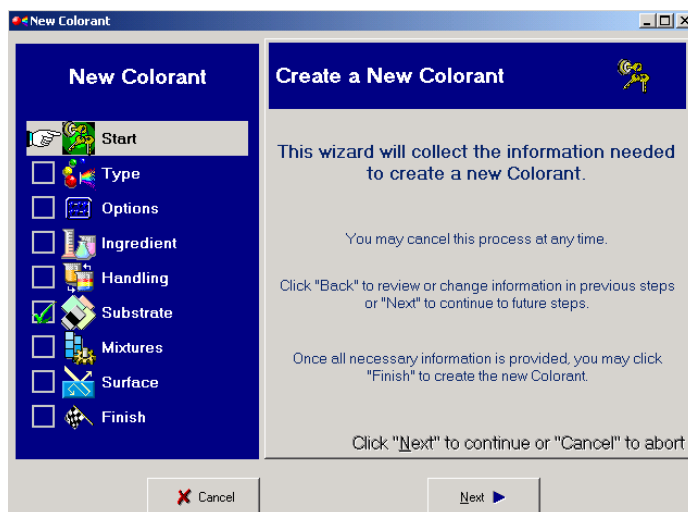
When you are in Colorant Set Maintenance or Colorant Maintenance, you may need to add raw materials to the ingredient system. If the materials are either solvents or auxiliary ingredients, they are added through Ingredient Maintenance. For new colorants, resins, and substrates you will use the *New Colorant* wizard.

To access the New Colorant wizard:

1. Close the *Colorant Maintenance* window. The Set Maintenance window will remain open.
2. From the Set Maintenance toolbar, select the **New Colorant Wizard** icon.



The New Colorant wizard displays.



The list on the left contains all of the steps that must be completed to add a new colorant to a set.

NOTES

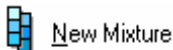
Depending on the on the colorant type you are adding, some of the steps shown above may not appear. Depending on the colorant type, the fields included for a particular step may change.

New Mixtures Wizard

To generate the optical data, you must measure samples, referred to as mixtures, and store them in a colorant record. Over time, you may want to add or change the mixture information for a particular colorant. The *New Mixtures* wizard is a feature that guides you through the procedure to enter mixture data for the colorants. It is accessed from the *New Colorant* wizard, or by clicking on the *New Mixture* button found on the Colorant Maintenance window.

To open the *New Mixtures* wizard, do the following:

1. From the toolbar, select the **New Mixture** button.



The window below displays.

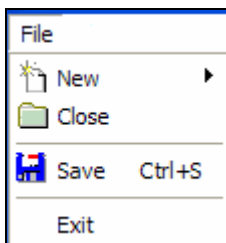
The screenshot shows the 'New Mixture' dialog box. It has a title bar with the text 'New Mixture'. Below the title bar is a blue header with the text 'New Mixture'. Underneath the header is a grey area with instructions: 'Enter a formula and measure a Sample for the new mixture, then click "Finish" or "Make Another Mixture." Click "Cancel" to abort.' The main area is divided into two columns. The left column is titled 'Amounts' and contains a list of colorants: 'GREEN P509', 'WHITE', 'BLACK', and 'CLEAR'. Each colorant has a small icon, a text input field with '0.0000', a unit 'G', and a status 'Ready'. The right column is titled 'Measurement' and contains a 'Mixture' dropdown menu, a 'Substrate' dropdown menu, a checkbox for 'Use Default Substrate: CARD', a 'Measurement Type' dropdown menu with 'Over & Light and Dark (ROL/ROD)' selected, and a 'Mixture Sample film thickness' input field with '1.00' and 'mils' units. At the bottom are three buttons: 'Cancel', 'Make Another Mixture', and 'Finish'.

2. Complete the fields on the window, and measure the mixture sample.

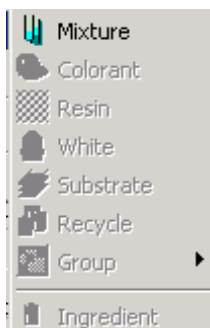
Colorant Maintenance Menus

File Menu

The File Menu in the Colorant Maintenance window includes basic options to open and close the colorant record. Click on *File* to view the list of options.



- **New.** Provides options for adding new mixtures to the colorant record currently open. Slide the cursor over the left arrow to see the choices.



- **Mixture.** Opens the New Mixtures Wizard.

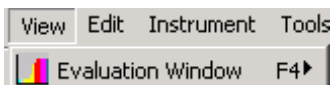
NOTE

The remaining options on the menu are accessed through the New Mixtures Wizard. For this reason they are not enabled on this menu.

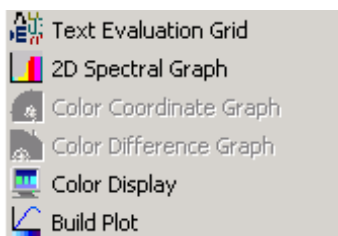
- **Close.** Closes the colorant record currently open. The colorant set maintenance window is displayed.
- **Save.** Saves changes made to the colorant record.
- **Exit.** Exits the colorant record that is open. The colorant set maintenance window is displayed.

View Menu

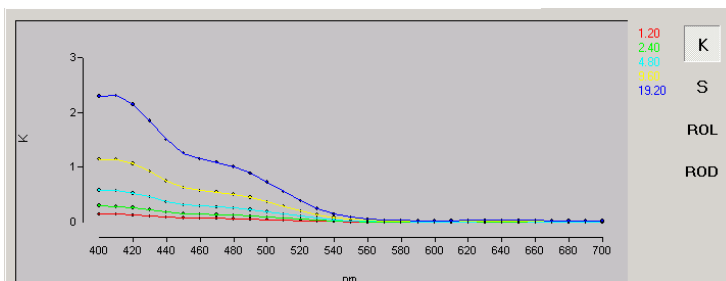
The View Menu provides access to the display options on the Evaluate Grid.



Evaluation Window. Slide the cursor over the left arrow to see the choices.

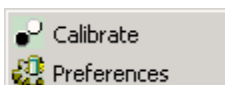


When you select an option, the evaluation selected is displayed at the bottom of the window in the Evaluation Grid.



Instrument Menu

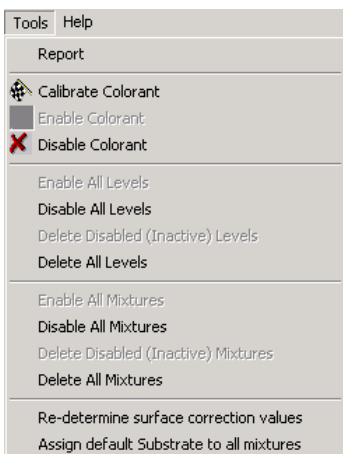
The Instrument Menu provides access to the instrument setup and calibration.



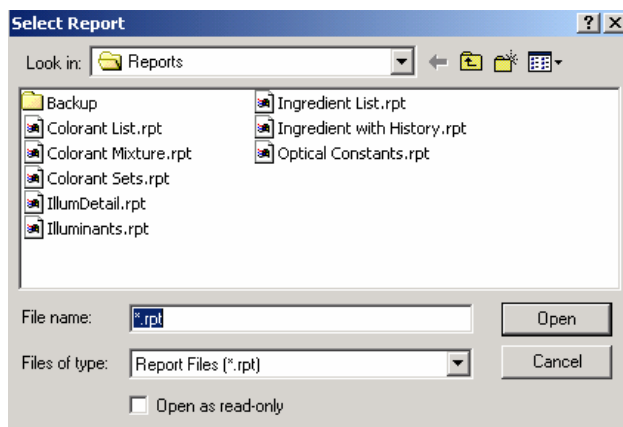
- **Calibrate.** This option opens the dialog box for instrument calibration. See *Instrument Menu, Calibrate for details on this option.*
- **Preferences.** Opens the dialog box for the instrument settings. See *Instrument Menu, Preferences for details on this option.*

Tools Menu

The Tools Menu provides access to options used to generate optical data for a colorant. This includes options regarding options to create and edit both mixture data and level data.



Report. Opens a dialog box containing a list of reports that can be printed.



See *Formula Central, Tools Menu, Reports* for detailed information regarding the reports provided.

Calibrate Colorant. Calculates the optical constants for the colorant.

Enable Colorant. In order for Formula Central to consider a colorant for matching and correction predictions, the colorant must be enabled. This option enables a colorant for use by Formula Central.

Disable Colorant. This option "hides" a colorant from Formula Central.

NOTES

- The options to "enable" and "disable" colorants are designed for use when a colorant set is "under construction". You may be experimenting with data for a particular colorant, but are not yet ready to make it available for use in Formula Central. Disabling the colorant hides the colorant from Formula Central. Enabling the colorant makes it visible to Formula Central.
- If no level data is available for a colorant that has been enabled, the colorant will not be available to Formula Central. Formula Central will "see" it, but if it sees that no level data is available, the colorant will not be available for Ingredient Selection.
- The status of the mixture and level data for each concentration in a colorant record is not affected by selecting "enable colorant" or "disable colorant". For example, if mixture data or level data for one individual concentration is disabled, it will remain disabled when "Enable Colorant" is selected.

Enable All Levels. Activates all of the level data that is stored in the colorant record.

Disable All Levels. The level data in the colorant record is not available for use in matching or correction. The data is stored, but not available for use.

Level data for another colorant that is calculated from the disabled level data, will also be disabled. A list of these "dependent" colorants is found on the *Advanced Tab, Dependent Colorant* field.

Delete All Levels. All level data for the colorant is deleted from the record. However, the mixture data used to calculate the level data is *not* deleted.

Disable All Mixtures. All mixture data in the colorant record are disabled. Disabled mixture data cannot be used in the calculation of the optical data for the colorant.

If the disabled mixture is active, all level data dependent on the mixture is also disabled. For example, if you delete a white mixture used to calculate level data for colorant(s), all of the level data based on the white mixture is disabled.

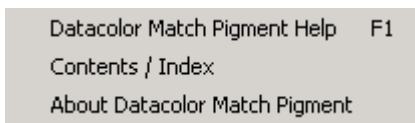
Delete All Mixtures. All mixtures in the colorant record are deleted.

Re-determine all surface correction values. Reselects the values used to correct measurements of the mixture(s) for surface effects.

Assign default substrate to all mixtures. All mixture data in the colorant record is calculated based on the measurement values for the same, default substrate.

Help Menu

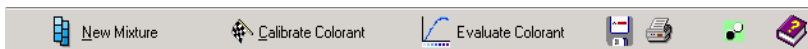
Each program module includes the same Help Menu. This menu provides access to the on-line help system, and to information about the program version you are running. When you click on the Help Menu, the following choices are displayed:



- **Datacolor MATCH^{PIGMENT} Help.** This option opens the on-line help. All of the information in this user's guide is available in the help.
- **About Datacolor MATCH^{PIGMENT}.** Displays the version number of the module you are using. When you are troubleshooting a problem with Datacolor service personnel, you may need to provide this information.

Toolbar

The toolbar offers you a shortcut for accessing the Colorant Maintenance program options. In many cases, the options available through the toolbar can also be accessed through the drop down menus. Below is the Colorant Maintenance toolbar:



- **New Mixture.** This button opens the New Mixtures Wizard.

- **Calibrate Colorant.** Calculates the optical constants for the colorant.
- **Evaluate Colorant.** Displays the *Evaluate Grid* at the bottom of the window. This provides access to graphic and text displays of both mixture and level data for the colorant.
- **Save.** Saves changes made to the colorant record.
- **Print.** This opens a dialog box that allows you to select a report to be printed. *See also Report Options.*
- **Open.** Opens the instrument calibration window.
- **Help.** Provides access to the help.



 **Open Colorant Set.** This button is used to select a different colorant set. When selected, the Colorant Set Maintenance – Start dialog box displays. From this window you can either create a new set, or open an existing set.



Save. Saves any changes made to the colorant set.



Print. This opens a dialog box that allows you to select a report to be printed. *See also Report Options.*



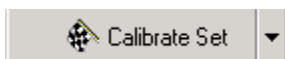
Calibration. Opens the instrument calibration window.



New Colorant. This button opens the New Colorant Wizard.

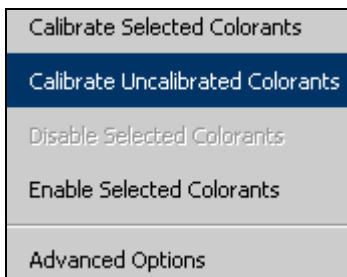


Open Colorant. This button opens the colorant maintenance window for the colorant currently selected in the colorant set list. This provides access to all of the mixture and level data stored for the colorant. A pointer in the far left column of the Colorant Set List indicates the active colorant. Move the pointer to a different row to activate a different colorant record.



Calibrate Set. Displays the colorant calibration options.

This option is used to calculate the optical constants for the colorants. Click on the down arrow to display a menu of colorant calibration options.



- **Calibrate Selected Colorants.** This option calibrates colorants that have been selected from the colorant set list. *See also Colorant Set List, Selecting Multiple Colorants for instructions to select more than one colorant.*
- **Calibrate Uncalibrated Colorants.** This option calibrates all colorants in the set that are not currently calibrated. Mixtures must be stored for a colorant in order to calibrate the colorant.
- **Disable Selected Colorants.** This option allows you to disable colorants that are available in the colorant set. When a colorant is disabled, all of the data regarding the colorant is retained in the system. However, the colorant is no longer included in the list of colorant selections displayed in Formula Central. *See also Calibrate Selected Colorants for instructions to select multiple colorants for this feature.*
- **Enable Selected Colorants.** This option allows you to enable a colorant that has been disabled at any time. *See Calibrate Selected Colorants for instructions to select multiple colorants for this feature.*
- **Advanced Options.** This option moves you to the Advanced Tab in the Colorant Set Maintenance window.
- **Help.** Provides access to the online help. The "About" option displays the version number of MATCH^{PIGMENT} that is currently installed and running.

Queue Maintenance

Overview

A queue automates the matching process. A basic queuing feature is available in Formula Central that allows you to queue samples for matching at a later time. In addition to that, there is a suite of Advanced Queuing options developed for users that do a high volume of color matching. Queue Maintenance is included in this group of options, and is used to build and edit the queues. *See also Applications Technology, Advanced Queuing Options for a comprehensive discussion of these features.*

The queues built using Queue Maintenance require the same input that you provide when you run a single match in Formula Central. You are required to provide two pieces of information:

- **Target color.** In the case of a queue, you select multiple targets.
- **Job Template.** The job requirements are defined by the same job templates you use for a single match.

The Queue Maintenance program module includes all maintenance functions required to support a queue. Specifically:

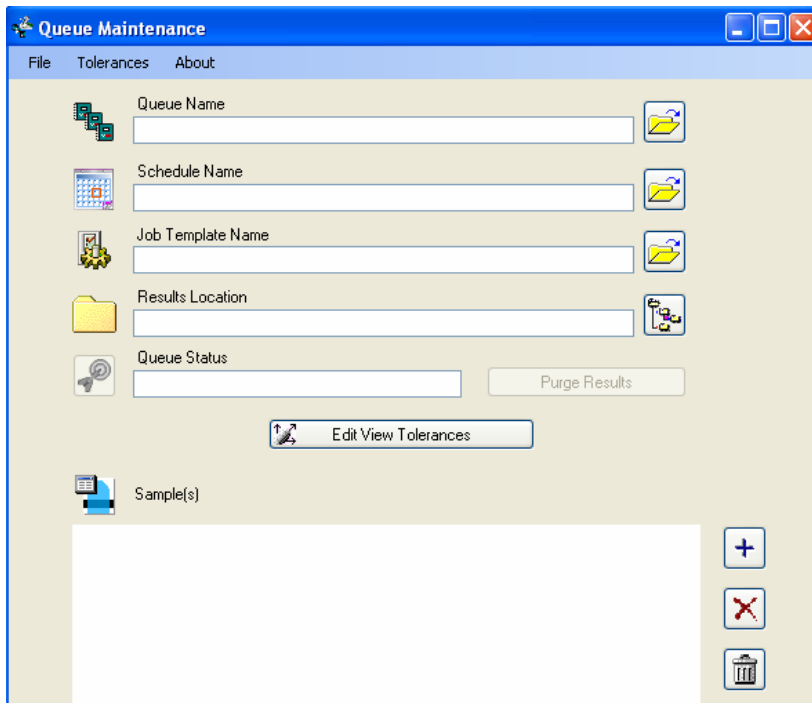
- Create, store and retrieve queues
- Process queues
- Delete queue results

NOTE

Queue results are displayed using the program module Queue Viewer.

Queue Maintenance Window

Below is the Queue Maintenance main window:



The window makes use of several function buttons to execute a task. Drop-down menus provide access to additional program options.

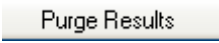
Queue Maintenance Window Fields

- **Queue Name.** Identifies the queue currently active. Use this field to assign a name to a new queue, or to retrieve a queue previously stored.
- **Schedule Name.** Identifies the *Schedule* assigned to the queue. A schedule is a collection of job templates to be used for the queue matching. This is an optional field. *See also Schedule Maintenance for an explanation of the Schedule feature.*
- **Job Template Name.** Identifies the job template to be used to match the targets in the queue.
- **Results Location.** Identifies the folder containing the queue results.
- **Queue Status.** Identifies the current condition of the queue
 - **(Blank).** The queue information has not yet been saved.

- **Ready.** The queue information has been saved, and the queue is available to be run.
- **Complete.** The queue matching is completed and the results are available for viewing. The Queue Viewer program module is used to view these results.
- **Purge Results.** Deletes the formulas in the queue. All other information in the queue (e.g. targets, folder locations, etc.) is still available. When a queue is purged, the status changes from *Completed* to *Ready*.
- **Edit/View Tolerances.** Opens the window that allows you to set tolerances for specific properties of the formulas in the queue. These tolerances are used in the Queue Viewer to filter and sort the formula results. *See also Other Queue Maintenance Functions, Edit View Tolerances for detail on this feature.*
- **Samples.** Identifies the target samples included in the queue.

Queue Maintenance Window Buttons

The most frequently used options in Queue Maintenance are initiated through the buttons on the window. Below is a summary:

	Open. Click on this button to open an existing queue, schedule or job template.
	Select Folder. Click on this button to select a folder for the queue results.
	Match Current Queue. Starts the queue matching.
	Edit/View Tolerances. Opens the tolerance window to display the tolerances applied to the filtering and sorting of queue results.
	Purge Results. Deletes the queue results. All of the queue requirements (e.g. template, folder locations, samples to match) are saved, allowing you to quickly clear the queue results and rerun the queue.
	Add Samples. Used to add individual target samples to a queue. The samples must already be stored in Data Navigator. Samples cannot be measured directly from this program.
	Remove Highlighted Samples. Used to selectively delete individual target samples from the queue.
	Remove All Samples. Deletes all target samples in the queue.

Creating a Queue

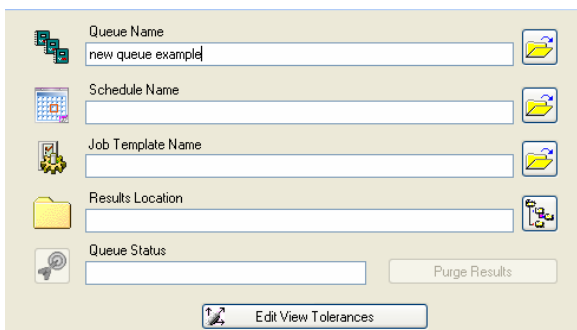
Below are detailed instructions to create a new queue.

1. From the Data Navigator Go menu, click on **Queue Maintenance**:



The Queue Maintenance window displays.

2. In the *Queue Name* field, enter a name.

A screenshot of the 'Queue Maintenance' window. It has a light beige background. At the top left is a small icon of a calendar. The window contains five input fields, each with a label and a small icon to its left: 'Queue Name' (with a calendar icon), 'Schedule Name' (with a calendar icon), 'Job Template Name' (with a folder icon), 'Results Location' (with a folder icon), and 'Queue Status' (with a gear icon). Each input field has a small 'Open' icon (a magnifying glass over a document) to its right. The 'Queue Name' field contains the text 'new queue example'. Below the input fields is a 'Purge Results' button and an 'Edit View Tolerances' button.

3. If you are using a Schedule, click on the **Open** icon to the right of the field, and select the Schedule.

NOTE

The Schedule is created through the Schedule Maintenance module. See *also Schedule Maintenance for information on this program module.*

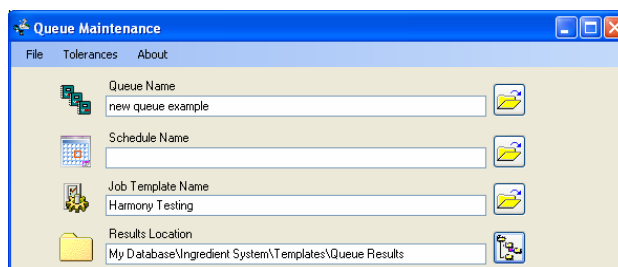
4. In the *Job Template Name* option, click on the **Open** icon to the right of the field, and select the template to use.

NOTES

When using a Schedule, this field is left blank.

Job templates are created in Formula Central. See *also Program Features Jobs and Templates for instructions to create or edit job templates.*

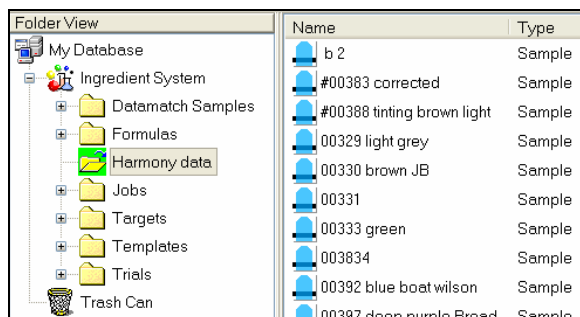
5. In the *Results Location* field, enter a folder location for the queue results. You can also click on the **Select** icon to the right of the field, and browse to the folder to be used.



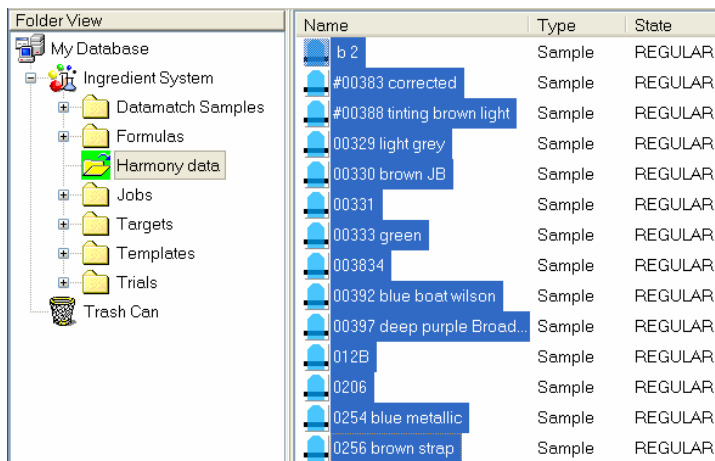
6. Select the target samples to be matched.



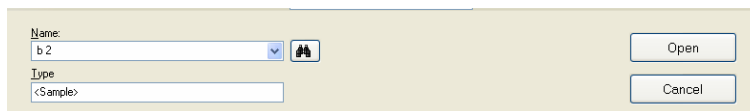
7. Click on the **Add** button in the lower window. The browser opens.



8. Highlight the samples to be included in the queue. You can select multiple samples in this window:



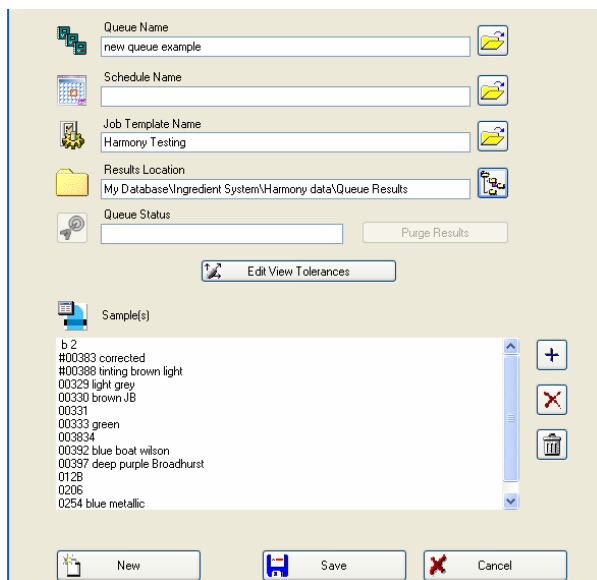
9. Click on the **Open** button at the bottom of the Open Dialog:



The Open Dialog closes, and the targets selected are listed under *Sample(s)* in the Queue Maintenance window:



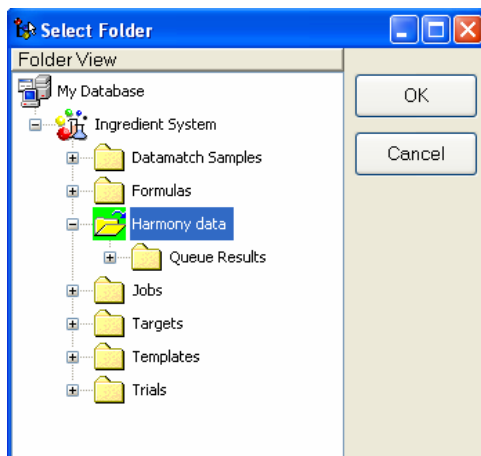
10. Click the **Save** button at the bottom of the window:



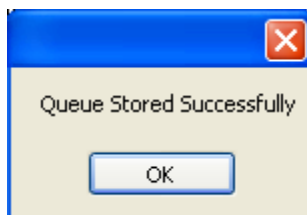
The screenshot shows a 'Queue Maintenance' dialog box with the following fields and controls:

- Queue Name:** new queue example
- Schedule Name:** (empty)
- Job Template Name:** Harmony Testing
- Results Location:** My Database\Ingredient System\Harmony data\Queue Results
- Queue Status:** (empty)
- Purge Results:** (button)
- Edit View Tolerances:** (button)
- Sample(s):** A list box containing the following text:
 - b 2
 - #00383 corrected
 - #00388 tinting brown light
 - 00329 light grey
 - 00330 brown JB
 - 00331
 - 00333 green
 - 003834
 - 00392 blue boat wilson
 - 00397 deep purple Broadhurst
 - 0128
 - 0206
 - 0254 blue metallic
- Buttons:** New, Save, Cancel

11. The program prompts you for a folder location for the queue:



Highlight the folder location for the queue, and click **OK**. The program will confirm that the queue is stored.



The *Queue Status* will change to **Ready**.

 A screenshot of the 'Queue Maintenance' dialog box. It has a light beige background. On the left, there are five icons: a stack of papers, a calendar, a person with a gear, a folder, and a coin with a gear. To the right of each icon is a text field. The fields are: 'Queue Name' with 'new queue example', 'Schedule Name' (empty), 'Job Template Name' with 'Harmony Testing', 'Results Location' with 'My Database\Ingredient System\Harmony data\Queue Results', and 'Queue Status' with 'Ready'. To the right of the 'Queue Status' field is a 'Purge Results' button.

You can now process this queue.

Processing a Queue

You can process a queue immediately after creating it, or you can process it at a later time.

1. From the Navigator Go menu, launch **Queue Maintenance**, and select the queue to be run.

 A screenshot of the 'Queue Maintenance' dialog box, identical to the one above. It shows the same fields and icons: 'Queue Name' (new queue example), 'Schedule Name' (empty), 'Job Template Name' (Harmony Testing), 'Results Location' (My Database\Ingredient System\Harmony data\Queue Results), and 'Queue Status' (Ready). The 'Purge Results' button is also visible.

2. Click on the **Match Current Queue** icon.



A wizard opens:

Queue Matching

Start Queue Matching

Queue to be matched:

Number of samples in queue: 4

Job Template: Harmony Testing

Match Method: Combinatorial

Begin

Cancel

3. **Match Method.** The system displays the Match Method to be used for the queue. *See also Formula Central Matching/Correcting Colors, Matching Features for an explanation of the matching features available.*
 - When using a single template, you always make this selection at the time you run the queue.
 - You can configure a Schedule to prompt the user for a match type at run time (e.g. Ask at Match Time). When this is selected, the user will be prompted for this selection at run time. *See also Schedule Maintenance, Create a Schedule for information on this option.*
4. Click the **Begin** button. A status message displays:

Start Queue Matching

Queue to be matched: new queue example

Number of samples in queue: 14

Job Template: Harmony Testing

Match Method: Combinatorial

Begin

Cancel

Matching in Progress

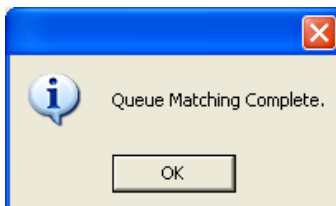
Samples matched: 1

Sample currently being matched: b 2

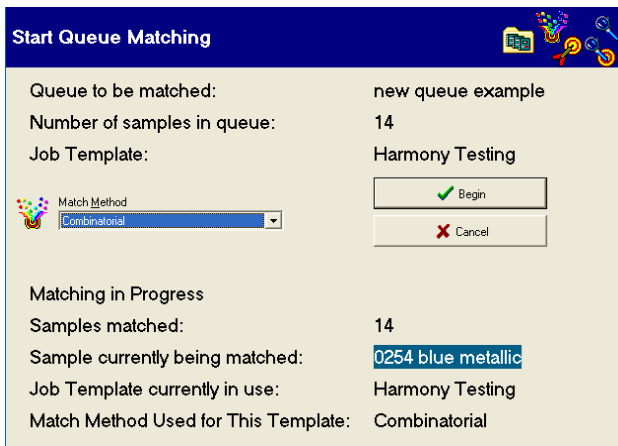
Job Template currently in use: Harmony Testing

Match Method Used for This Template: Combinatorial

5. The system will notify you when the queue is completed:



Click **OK**.



6. Close this window. The *Queue Status* changes from *Ready* to *Complete*:

Use the Queue Viewer program module to view the results. See also *Queue Viewer for instructions*.

Editing a Queue

You cannot edit any of the queue information until you purge the queue. A purge deletes all formulas found for the targets in the queue. However, all of the remaining information, including the targets, remains intact.

See also *Other Queue Maintenance Functions, Purge Results* for instructions to edit the targets included in the queue.

Once you have purged the queue results, you can change the information in any of the fields on the screen. See also *Creating a Queue for information about each field in the queue maintenance window*.

Deleting a Queue

You must use the Data Navigator to delete an entire queue.

1. In Data Navigator, browse to the folder containing the queue and highlight it:

Folder View	Name	Type	State
My Database	New Queue Example	Queue	Complete
Admin View	Job 260 Prediction 1 RAL1001-HR 01/98-...	Job	Correction In...
Ingredient System	Job 261 Prediction 1 RAL1001-HR 01/98-...	Job	Correction In...
Datamatch Samples	Job 262 Prediction 1 RAL1001-HR 01/98-...	Job	Queue Ready
Formulas	Job 524 BATCH2	Job	Match Output
Harmony Data	Prediction 1 RAL1001-HR 01/98- Formul...	Formula	Demo Paint

2. Right-click on the highlighted queue to display the Navigator menu:

Open
Open With
New Folder
New Schedule
New Queue
Cut
Copy
Paste
Delete

3. Click **Delete**. The queue will be deleted. No confirmation message will display before it is deleted.

Other Queue Maintenance Functions

Edit View Tolerances

In the Queue Viewer program you can filter and sort the formulas, based on both colorimetric and non-colorimetric properties. The values used as cut-off points to filter/sort the formulas for the specified properties, are assigned as *tolerances* in Queue Maintenance.

These tolerances are distinct from the tolerances defined in the job template you are using. The tolerances in the job template are used to determine if a formula is an acceptable match. *See also Formula Central, Tools Menu, Job Preferences for instructions to access these acceptability tolerances.* The tolerances assigned here in Queue Maintenance are used only as the basis for filtering and sorting the queue results. This feature includes an option to restrict the tolerances to the active user, or to apply these values to all login users.

To access the Queue Maintenance tolerances:

1. Launch Queue Maintenance.

2. Create or retrieve a queue, and click on **Edit View Tolerances**. The window below displays the default tolerance values.

Edit Tolerances Fields

- **Compatibility.** Displays all formulas having a compatibility value *greater than* this value. *See also Ingredient Maintenance, Ingredient Compatibility Manager for an explanation of this feature.*
- **Compatibility and Priority.** Displays all formulas having a combined Ingredient Compatibility and Priority value *greater than* this value. *See also Ingredient Maintenance for an explanation of the compatibility and priority features.*
- **Cost.** Displays all formulas having a total cost *less than* this value. The cost displayed for the formula is the total formula cost. This field can accept a

maximum of 8 characters (00,000,000). *See also Ingredient Maintenance for instructions to assign a cost to an ingredient.*

- **CR (contrast ratio).** Displays all formulas having a CR (contrast ratio) that is *greater than* this value. Contrast ratio is only available for translucent colorant sets. *See also Formula Central, Tools Menu, Job Preferences, Appearance for instructions to display the contrast ratio for a formula.*
- **Metamerism.** Displays all formulas having a metamerism index value that is *less than* this value.

NOTE

The default metamerism index used is *Curve Fit*. Contact your Applications Specialist for instructions to enable a different metamerism index.

- **Measured DE.** For some formulas, you may have a physical sample made from a formula that is stored as a trial. This entry displays all formulas with a trial sample, which have a measured DE *less than* this value.
 - Targets that do not have a measured DE (measurement of a physical Trial sample) are excluded from the display.
- **Primary DE.** Displays all formulas having a DE in the primary illuminant that is *less than* this value. *See also Formula Central, Tools Menu, Job Preferences, Tolerances for instructions to select the illuminant used for the Primary DE.*
- **Priority.** Displays all formulas having an Ingredient Priority value that is *greater than* this value. A priority value is calculated for a formula based on the priority values assigned to each ingredient in the formula. *See also Ingredient Maintenance, Ingredient Priority for an explanation of this feature.*

Edit Tolerances Procedure

1. Launch Queue Maintenance, and create or retrieve a queue.
2. From the Queue Maintenance menu, click on **Edit View Tolerances**.
3. Restore default tolerance values for the queue results as necessary.
 - To restore the system default tolerances, Click **Reset All to Global**.
 - To restore the default tolerances for the active user, click **Reset All to User**.
4. Enter a value for any of the criteria you want to use to sort/filter the queue results. You do not have to enter a value in every field. *See also Edit Tolerances Fields for a description of each field.*
5. Store the changes made as necessary. Changes made here are only applied to the current queue results. They are not permanently saved unless you place a check in one of the Save As boxes.
 - **Save As Defaults for User.** The tolerances currently displayed are stored as the defaults for the active user. The next time this user works with the filter/sort options in the Queue Viewer, these tolerances are applied.

- **Save As Global Defaults.** The tolerances currently displayed are stored as the tolerance defaults for all Datacolor MATCH^{PIGMENT} users. The next time any user works with the filter/display options in Queue Viewer, these tolerances are applied.

Purge Results

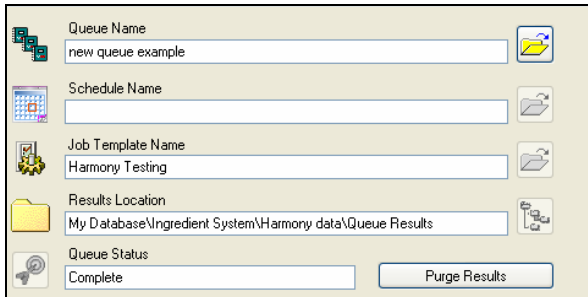
This button purges the results for the queue currently selected. This feature allows you to quickly make changes to the existing queue requirements and rerun the same queue. When **Purge Results** is selected, the formulas are deleted, but the rest of the information in the queue, including the standards, filtering/sorting tolerances etc., remain intact.

You can make the following changes to the queue:

- add or delete standards
- change the filtering/sort tolerances in Queue Maintenance
- change the template used
- change the folder location for the queue results

To use this option:

1. Open a queue with the status *Complete*.

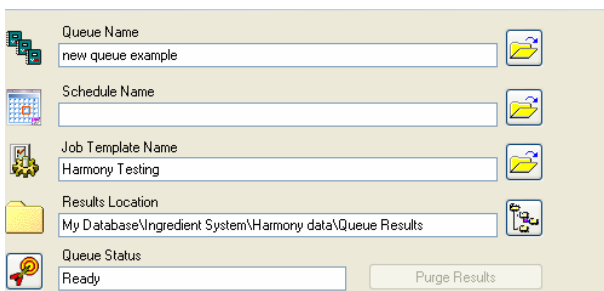


The screenshot shows the Queue Maintenance dialog box with the following fields and values:

- Queue Name: new queue example
- Schedule Name: (empty)
- Job Template Name: Harmony Testing
- Results Location: My Database\Ingredient System\Harmony data\Queue Results
- Queue Status: Complete

A "Purge Results" button is visible at the bottom right of the dialog.

2. Click on **Purge Results**. The Queue Status changes from *Complete* to *Ready*.



The screenshot shows the Queue Maintenance dialog box after the "Purge Results" button was clicked. The Queue Status has changed to "Ready".

- Queue Name: new queue example
- Schedule Name: (empty)
- Job Template Name: Harmony Testing
- Results Location: My Database\Ingredient System\Harmony data\Queue Results
- Queue Status: Ready

The "Purge Results" button is still visible at the bottom right of the dialog.

All other information in the queue remains the same.

3. Make changes to the queue as appropriate, and save the queue.
4. You can now rerun the queue.

Queue Maintenance Menus

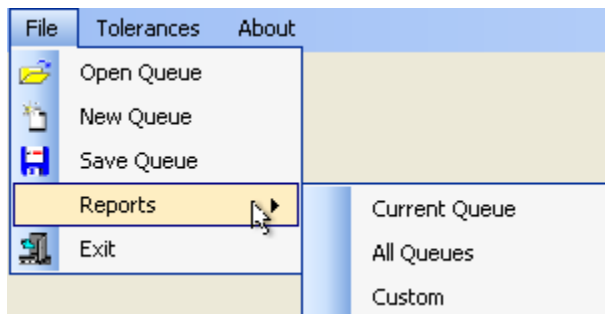
Queue Maintenance includes menus which provide another method to access the major program options.

File Menu

Below is the Queue Maintenance File Menu:



- **Open Queue.** The program prompts you to browse to a folder and highlight a queue.
- **New Queue.** Refreshes the screen, and removes all existing information.
- **Save Queue.** Saves the current queue. The program will prompt you for a folder location.
- **Reports.** Displays a submenu containing all report options available in Queue Maintenance:



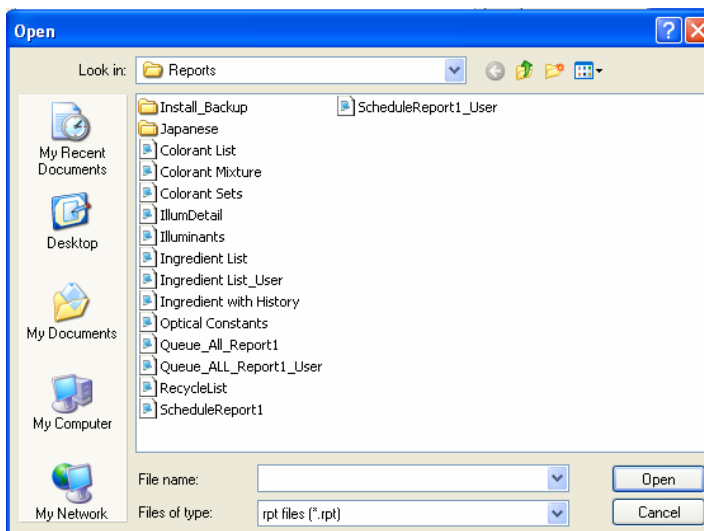
- **Current Queue.** Displays information regarding the active queue:

		Queue List Monday, May 12, 2008 2:43:18PM	
Queue Name:	FG Queue	Queue Status:	Matched
<u>Samples in Queue</u>		<u>Job Name[]</u>	
b 2		Job 3622 b 2	
#00383 corrected		Job 3623 #00383 corrected	
#00388 tinting brown light		Job 3624 #00388 tinting brown	
00329 light grey		Job 3625 00329 light grey	
00330 brown JB		Job 3626 00330 brown JB	
00331		Job 3627 00331	
00331		Job 3628 00331	
00333 green		Job 3629 00333 green	
003834		Job 3630 003834	
00392 blue boat wilson		Job 3631 00392 blue boat wils	
00397 deep purple Broadhurst		Job 3632 00397 deep purple E	
012B		Job 3633 012B	
0206		Job 3634 0206	
0254 blue metallic		Job 3635 0254 blue metallic	
0256 brown strap		Job 3636 0256 brown strap	

- **Queue Name.** Displays the queue name.
 - **Queue Status.** Indicates whether the queue has been processed. In this example, the queue has been matched.
 - **Samples in Queue.** Displays the name of each target in the queue.
 - **Job Name.** A separate job is generated for each target in the queue. This column displays the job name for each samples in the queue.
- **All Queues.** Displays information for all queues in the system.

		List All Queues Monday, May 12, 2008 2:36:58PM	
<u>Queue Name</u>	<u>Schedule Used</u>	<u>Job Template Used</u>	
test correction		Harmony Testing	
<u>Queue Status</u>			
Matched			
<u>Standards To Match</u>	<u>Matched Jobs</u>		
L90 G1	Job 3598 L90 G1		

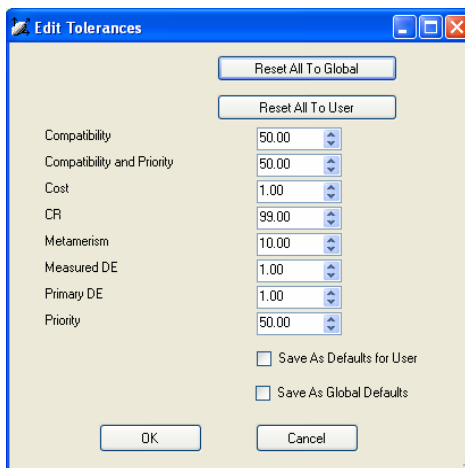
- **Custom.** Displays reports available for all program modules in Datacolor MATCH^{PIGMENT}. When this is selected, the program prompts you to select the report to display:



- Select a report and click **Open**. The report will be displayed on the monitor.

Tolerances Menu

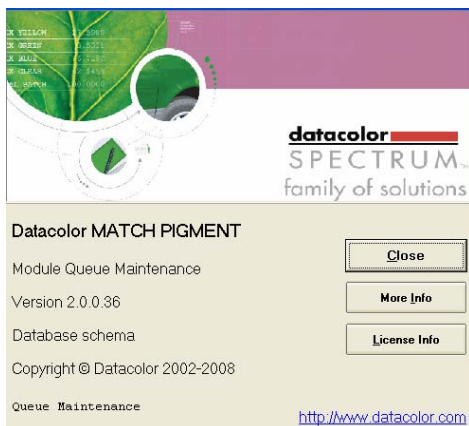
Clicking on this menu automatically opens the Edit Tolerances window:



See also Other Queue Maintenance Functions, Edit View Tolerances for an explanation of this option.

About Menu

Click on this menu to display the Datacolor licensing window:



- **More Info.** Displays additional technical information about the system including operating system, user login , etc. It is displayed in a Notepad format.
- **License Info.** Accesses the Datacolor licensing software.

Schedule Maintenance

Overview

The advanced queuing options include the program module, *Schedule Maintenance*. This program enables you to create and edit *Schedules*, a *super-queue* tool which incorporate several job templates into a single queue. By considering multiple job templates, the *Schedule* feature automates the use different templates (strategies) to achieve specific colorimetric and non-colorimetric requirements for the jobs in the queue.

For example, you may have one job template that limits the colorants considered for a match. When you run a queue using this template, the limited colorant selection may prevent the system from matching every target color in the queue. In this case, you may decide to use a different job template that expands the colorant selection, and re-run the unmatched targets in the queue. To do this, you must edit the job template, and manually rerun the matches.

Using a *Schedule* automates this process. It allows you to string together several templates for a single queue. When the schedule is attached to a queue, it will automatically use the second job template, when it fails to find an acceptable match to a target *using the first job template*. It will repeat this process for all of the templates in the schedule, until it finds an acceptable formula. The schedule is applied to each target in the queue, and increases the prospect that you will find a least one acceptable match for every target in the queue.

See also Applications Technology, Advanced Queuing Options for a comprehensive discussion of all program modules that are related to the advanced queuing features.

Job Templates

The Schedule option does not limit the number of templates in a single schedule. This allows you flexibility to capture a variety of different match requirements for the system to consider. Some job templates may contain different job preference selections, such as ingredient choice, acceptability tolerances, sorting preferences, etc. Other job templates may vary formula constraints such as fixed colorant amounts, or total batch size. By creating a variety of job templates, you will help the system find the best matches for your operating circumstances.

Name	Type
 All_Show Best	Job Template
 All_Show Best FF	Job Template
 Deep Base	Job Template
 Deep Base FF	Job Template
 Default Template	Job Template
 Extra Deep Base	Job Template
 Extra Deep Base FF	Job Template
 Medium Base	Job Template
 Medium Base FF	Job Template
 Pastel Base	Job Template
 Pastel Base FF	Job Template
 Transparent Base	Job Template
 Transparent Base FF	Job Template

See also *Program Features, Jobs and Templates* for a discussion of job templates.

Advancing through Templates in the Schedule

When an acceptable formula is found using the first job template in the schedule, it will not continue to the second template. This is true regardless of the number of formulas you have specified in the template. For example, if job template #1 specifies 5 formulas, and the system finds 3 formulas using template #1, it will not advance to the template #2.

This behavior remains the same as it moves through each template in a schedule. When it finds at least one answer for a target, the program will move on to the *next target color* in the queue, using the first job template in the schedule.

Show Best Formula Options

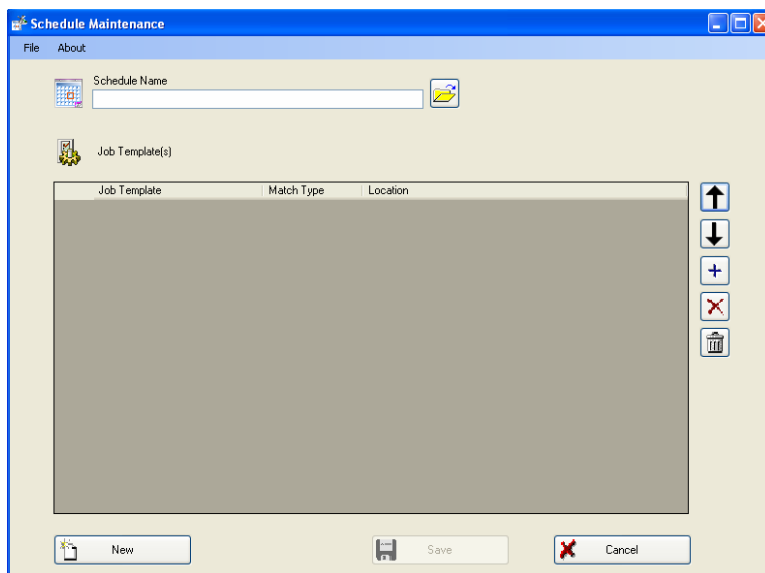
The job templates used in a *Schedule* should have the *Show Best Formula* feature disabled. If a job template in the schedule has *Show Best Formula* enabled, it will display the best formula it finds using the template, regardless of whether the formula

satisfies your requirements. When this happens, it will move on to the next target color in the queue.

The only exception to this job template configuration should be considered for the final job template in the schedule. If the system tries all of the previous templates without finding a match, enabling *Show Best Formula* will produce the best formula it can find for the target, *using the final template* in the schedule. By enabling this option in the last template, the system will produce a formula for each target color in the queue. See also *Tools Menu*, *Job Preferences*, *Results tab* for instructions to enable/disable *Show Best Formula*.

Schedule Maintenance Window

1. From the *Go* menu, click on **Schedule Maintenance**. The main program window displays:



The window makes use of several function buttons to execute a task. Drop-down menus provide access to additional program options.

Schedule Maintenance Window Fields

- **Schedule Name.** Identifies the schedule currently active. Use this field to assign a name to a new schedule, or to retrieve a schedule previously stored.
- **Job Template(s).** Identifies the job templates to be used in the Schedule.

Schedule Maintenance Window Buttons

The most frequently used options in Schedule Maintenance are initiated through the buttons on the window. Below is a summary:



Open. Click on this button to open an existing schedule.



Move template forward. Moves the template forward one position in the schedule. The position of a template in a schedule is an important consideration. Templates having the most desirable formula requirements should be placed at the beginning of a schedule.



Move template backward. Moves the template backward one position in the schedule. Templates having less desirable requirements should be placed at the end of a schedule.



Add templates. Used to add individual templates to a schedule. The templates must already be stored in Data Navigator. See also *Formula Central Jobs and Templates for instructions to create/edit job templates.*



Remove Highlighted Templates. Used to selectively delete individual templates from the schedule.



Remove All Templates. Deletes all templates in the schedule.

Creating a Schedule

Below are detailed instructions to create a schedule.

1. From the Go menu, launch Schedule Maintenance.
2. In the *Schedule Name* field, enter a name:

The screenshot shows a window titled 'Schedule Maintenance'. It has a 'Schedule Name' label above a text input field. The input field contains the text 'New Schedule Example'. To the left of the input field is a small calendar icon, and to the right is a folder icon with a blue arrow.

- Click on the **Add Templates** button next to the job templates box.



The Navigator displays:

Folder View	Name	Type	Created by	Created	Mod
My Database	All_Show Best	Job Template	User	1/15/2008 2:33:15 PM	dci
Ingredient System	All_Show Best FF	Job Template	User	4/7/2008 4:16:01 PM	dci
Demo Folder	Deep Base	Job Template	User	1/15/2008 2:16:46 PM	dci
RAL	Deep Base FF	Job Template	User	4/7/2008 4:01:22 PM	dci
Results	Default Template	Job Template	dci	2/25/2000 10:11:02 AM	Use
Trash Can	Extra Deep Base	Job Template	User	1/15/2008 2:17:08 PM	dci
	Extra Deep Base FF	Job Template	User	4/7/2008 4:01:47 PM	dci
	Medium Base	Job Template	User	1/15/2008 2:16:24 PM	dci
	Medium Base FF	Job Template	User	4/7/2008 4:00:56 PM	dci
	Pastel Base	Job Template	User	1/15/2008 2:15:54 PM	Use
	Pastel Base FF	Job Template	User	4/4/2008 11:13:55 AM	dci
	Transparent Base	Job Template	User	4/9/2008 9:57:04 AM	dci
	Transparent Base FF	Job Template	User	4/9/2008 9:57:39 AM	dci

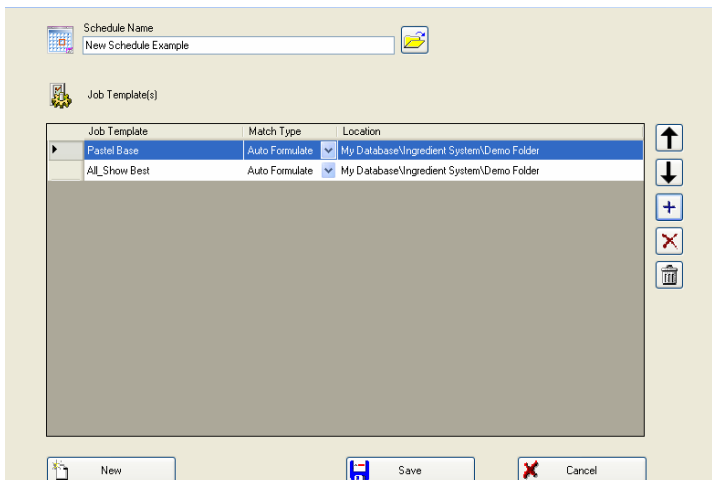
- Browse to the appropriate folder, highlight a job template to be added to the schedule, and click **Open**. Data Navigator will close, and the Schedule window will display the template just added.

Schedule Name

Job Template(s)

Job Template	Match Type	Location
Pastel Base	Auto Formulate	My Database\Ingredient System\Demo Folder

5. Use the **Add Template** button to continue adding the job templates to this schedule.

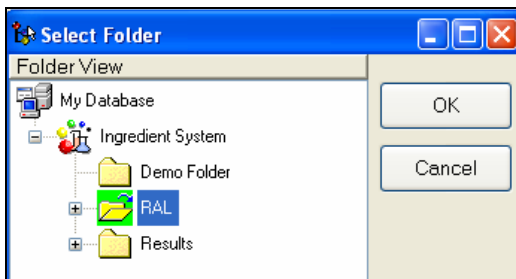


6. **Match Type.** You must select the match type to be used for each template in the Schedule. Four choices are available:

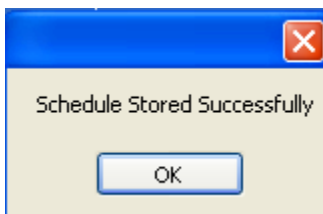
- *Autoformulate*
- *Search*
- *Search & Correct*
- *Combinatorial*
- *Ask.* When this option is selected, the program prompts for a match type when the queue is run.

See also Formula Central, Matching and Correcting Colors, Matching Features for a description of the match types available.

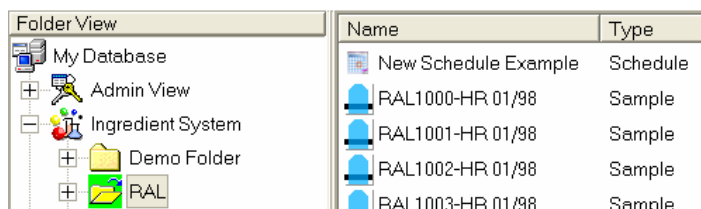
7. When all templates are added and match types selected, click on the **Save** button. The Navigator will open and prompt you for a folder destination for the schedule:



- Highlight the folder to hold the schedule, and Click **OK**. The program will confirm that the schedule has been stored.



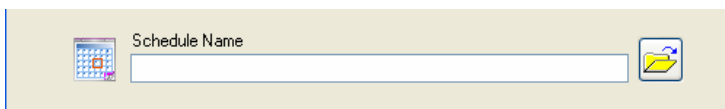
The schedule displays in the Navigator folder list.



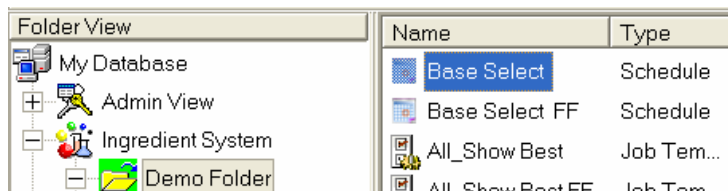
This schedule can now be added to a queue. *See also Queue Maintenance for instructions to add a schedule to a queue.*

Editing a Schedule

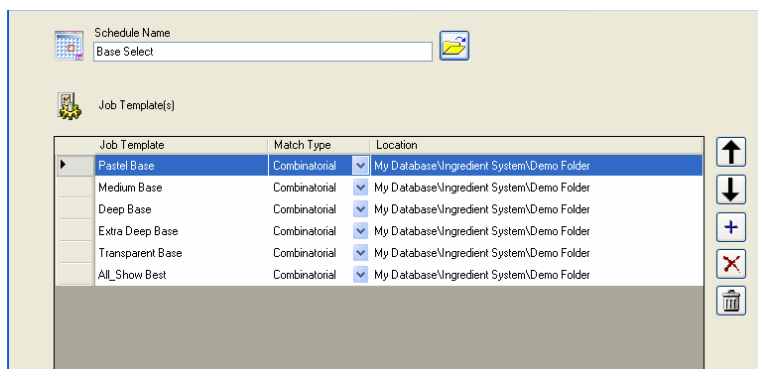
- From the Navigator Go menu, launch **Schedule Maintenance**.
- At the end of the *Queue Name* field, click on the **Open Folder** button.



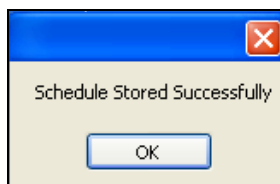
- Browse to the schedule you want to edit, and highlight it.



- Click **OK**. The window refreshes and the schedule information displays.



- Change the *Match Type* as necessary.
- Use the navigation buttons to add/delete templates or change the template order in the schedule. *See also Schedule Maintenance Windows for a description of each button.*
- When you have made all of the changes, click the **Save** button. The program confirms that the changes have been saved:

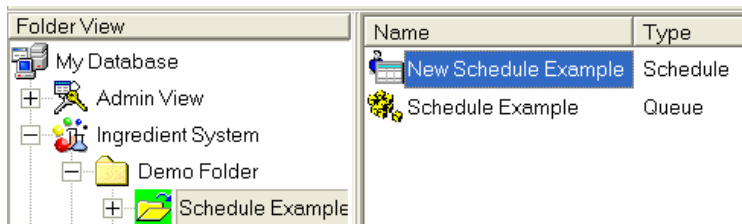


- Click **OK**.

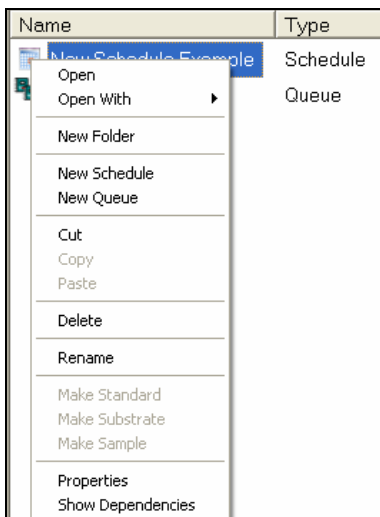
Deleting a Schedule

You must use the Data Navigator to delete an entire schedule.

- In Data Navigator, browse to the folder containing the schedule to be deleted, and highlight the schedule to be deleted.



- Right-click on the highlighted schedule to display the Navigator menu:



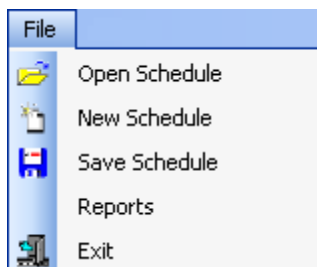
- Click **Delete**. The schedule is deleted. No confirmation message displays before it is deleted.

Schedule Reports

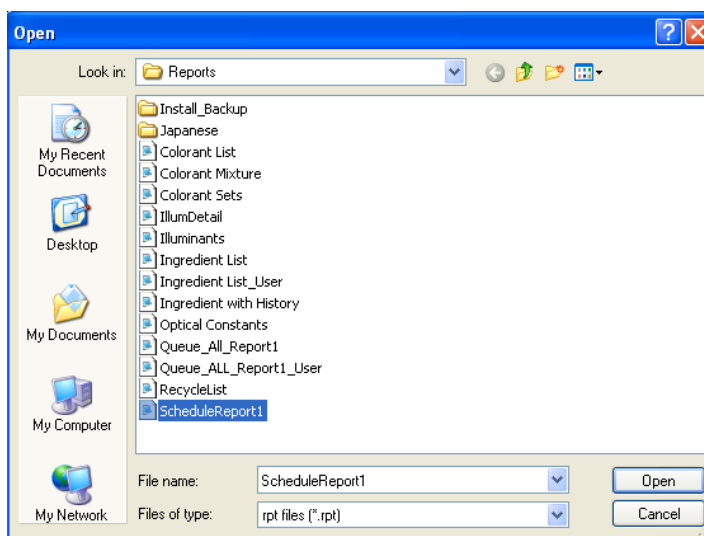
The reports are an essential tool for reviewing the important details of the schedules you are using. To revise the strategy you are designing with a schedule, you need to see some essential settings in the job template. The Schedule report displays the fundamental job requirements for every job template in the schedule:

To access the Reports option, do the following:

- From the menu bar, select **File, Reports**.



The Open dialog box displays.



2. Highlight the **Schedule Report** and click **Open**. The Schedule List report displays.

NOTES

This report includes all schedules included in the system. There is currently no feature available to display the information for a single schedule.

This report includes the detail for all schedules that are stored on your system. The information is taken directly from the job templates included in the schedule.

The order in which the schedules are displayed depends on an internal number the program assigns to the schedule when it is created. Currently there is no option to filter or sort the schedule report.

Schedule Report Fields

Below is a description of the data included for each *job template* in the Schedule report. The tolerances included in this report are the tolerances used by the job

template to determine if a formula is acceptable.

		Schedule List Friday, May 16, 2008 10:58:55AM	
Schedule Name: Base Select			
Job Template Name: Pastel Base		Colorant Set: Demo Paint	Match Type: Combinatorial
DE1 Tol	DE2 Tol	CR Tol	Met Tol
0.10	0.50	0.00	10.00
ShowBest		Sort 1	Sort 2
False		Sort 3	Goal1
		Goal2	Wgt1
		C_Fit	60.00
		Wgt2	40.00
		Goal3	Wgt3
			0.00

- **Schedule Name.** Identifies the schedule that is using the job template.
- **Job Template Name.** Identifies the job template associated with the information displayed.
- **Colorant Set.** Identifies the colorant set used by the template.
- **Match Type.** Identifies the matching tool used for the template. The choices can include AutoFormulate, Search, Search & Correct, and Combinatorial. *See also Formula Central Matching and Correcting Colors, Matching Features for a description of each.*
- **Match Order.** Identifies the position of the job template in the Schedule. *Not shown in example.*
- **DE1 Tol.** The maximum acceptable color difference permitted under the primary illuminant.
- **DE2 Tol.** The maximum acceptable color difference permitted under the secondary illuminant.
- **CR Tol.** The contrast ratio required for the match. When 0.0 is displayed, a contrast ratio value is not specified.
- **Met Tol.** The maximum acceptable value for the metamerism index of the formula.
- **ShowBest.** Identifies whether the *Show Best Formula* option is enabled. This should be disabled for most of the job templates in the schedule. If it is not, the queue will not advance to the next job template in the schedule.
- **Sort 1.** Default sort order applied to the queue results. This is the first choice for the sort order.
- **Sort 2.** Default sort order applied to the queue results. This is the second choice for the sort order.
- **Sort 3.** Default sort order applied to the queue results. This is the third choice for the sort order.

See also Matching Features, Formula Sorting for a discussion of Formula Central sorting options.

- **Goal 1.** In each job template, an objective, or *goal function* is defined for the job. The goal can have multiple components. This column identifies the first goal component for the template.
- **Wgt 1.** The components of a goal function are *weighted* for relative importance in the overall goal function. This column identifies the weight assigned to goal component 1.
- **Goal 2.** Identifies the second component of the goal function.
- **Wgt 2.** Identifies the weight assigned to the second component of the goal function.
- **Goal 3.** Identifies the third component of the goal function.
- **Wgt 3.** Identifies the weight assigned to the third component of the goal function. *See also Applications Technology, Optimizer Goal for a detailed discussion of the optimizer goal function used in matching and correction.*

NOTES

The tolerances displayed in this report are based on the *job template* settings. These tolerances are used by the program to determine whether a formula is acceptable. *See also Tools Menu, Job Preferences for information to view or edit these acceptability tolerances.*

A separate set of tolerances are used by the Queue Viewer to filter and sort the queue results. The queue results have already satisfied the tolerances in the job template. *See also Queue Maintenance, Edit View Tolerance, and Queue Viewer, Filter and Sort Options for information on the tolerances used to filter and sort the queue results.*

Queue Viewer

Overview

Queue Viewer is the program module which allows you to view the advanced queue results. It includes tools to help you maximize your efficiency in displaying and evaluating the formulas. This program enables you to select the best formula for each target, based on both the colorimetric and non-colorimetric requirements for each product.

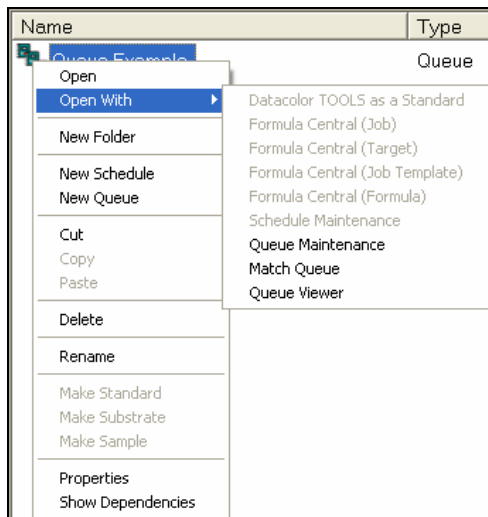
See Applications Technology, Advanced Queuing Options for a detailed discussion of this group of program options.

Queue Viewer Window

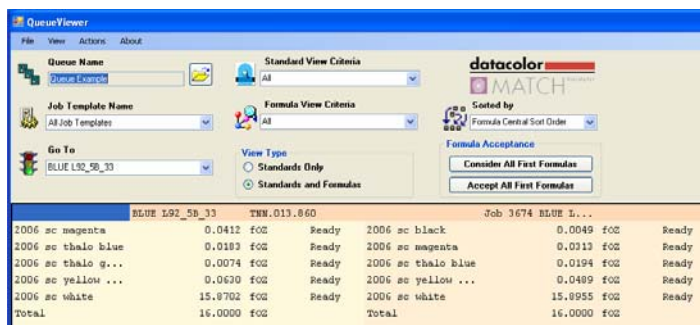
1. From Data Navigator, highlight the queue results to open. The queue you are viewing must have a *Complete* state.

Name	Type	State
 Queue Example	Queue	Complete

2. Right-click to display the Navigator menu and select **Open With/Queue Viewer**:



The Queue View opens and all results for the queue are displayed:



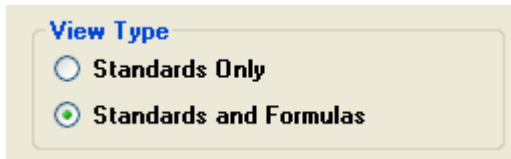
- Use the scroll bars (right side and bottom) to view the pages of the queue results.

Queue Viewer Window Fields

The fields at the top of the screen are used to select and organize the queue results to display.

- Queue Name.** Select the queue results to be displayed.
- Job Template Name.** Restrict the results display to formulas generated from a specific job template. This is useful when the queue makes use of a Schedule. *See also Schedule Maintenance for a discussion of this option.*
- Go To.** Used to move the results for a specific target to the top of the display.

- **Standard View Criteria.** This field limits the display of standards (rows) based on criteria assigned to the standards. *See also Working with Queue Viewer for instructions to make these criteria assignments.*
- **Formula View Criteria.** This field limits the display of formulas (columns) based on the criteria assigned to the formulas. *See also Working with Queue Viewer for information on each selection, and instructions to make these criteria assignments.*
- **View Type.** You can limit the display to a summary of the target colors, or you can include targets and formulas.



View Type

☐ Standards Only

☒ Standards and Formulas

- **Sorted by.** The default sort order for formulas is based on the sort order in the job template. This option allows you to resort the formula display based on other formula properties. *See also Working with Queue Viewer for information on each selection in this field.*
- **Formula Acceptance.** The *First* formula displayed for each target is the best formula found, based on the requirements of the job template. Using this option you can automatically assign one of two criteria, Consider or Accept, to the First formula for each target in the queue. This option speeds the process of formula review.



Formula Acceptance

Consider All First Formulas

Accept All First Formulas

- **Consider All First Formulas.** Automatically assigns the status *Consider* to the first formula for each job.
- **Accept All First Formulas.** Automatically assigns the status *Accept* to the first formula for each job.
See also Working with Queue Viewer to learn how to use these criteria as filters for the results display.

Working with Queue Viewer

Overview

The default display of queue results includes the following information:

- Every standard (job) included in the queue.
- Every formula found for each standard. The formulas are sorted best-to-worst, from left to right, using the sort criteria defined for the template. *See also Job Preferences, Results for instructions to view/edit the sort criteria for the template used.*

Queue Viewer Window Detail

The number of formulas displayed depends on the number of formulas specified in the job template. *See also Job Preferences, Results for information to view/change this selection.*

- **Standard View (rows).** Each row contains the information for a single target color in the queue.

The screenshot shows the Queue Viewer interface with the following settings:

- Queue Name: new queue example
- Job Template Name: All Job Templates
- Go To: b 2
- Standard View Criteria: All
- Formula View Criteria: All
- Sorted by: Formula Central Sort Order
- View Type: Standards Only (selected)
- Formula Acceptance: Consider All First Formulas (selected)

Standard	Formula	Value	Job
b 2	d5N.067.349		Job 3694 b 2
#00383 corrected	F17.121.758		Job 3701 #00383...
#00388 tinting ...	D10.136.268		Job 3695 #00388...

- **Formula View (columns).** Each column contains one formula for the standard. In the example below, two formulas are displayed for standard b2.

Queue Name new queue example				Standard View Criteria All							
Job Template Name All Job Templates				Formula View Criteria All				Sorted by Formula Central Sort Order			
Go To 1%				View Type ☐ Standards Only ☒ Standards and Formulas				Formula Acceptance Consider All First Formulas Accept All First Formulas			
b 2				p5W,067.349				Job 3694 b 2			
2006 sc black	2.8121	f0Z	Ready	2006 sc indo ye...	3.6014	f0Z	Ready	2006 sc indo ye...	3.6014	f0Z	Ready
2006 sc indo ye...	3.3118	f0Z	Ready	2006 sc quindo red	6.6638	f0Z	Ready	2006 sc quindo red	6.6638	f0Z	Ready
2006 sc quindo red	4.4547	f0Z	Ready	2006 sc thalo blue	1.0464	f0Z	Ready	2006 sc thalo blue	1.0464	f0Z	Ready
2006 sc white	5.4215	f0Z	Ready	2006 sc thalo g...	1.2097	f0Z	Ready	2006 sc thalo g...	1.2097	f0Z	Ready
Total	16.0000	f0Z		2006 sc white	3.4787	f0Z	Ready	2006 sc white	3.4787	f0Z	Ready
				Total	16.0000	f0Z					
Priority				Compatibility				Priority			
50.00				50.00				50.00			
DE (1)	DE (2)	DE (3)		DE (1)	DE (2)	DE (3)		DE (1)	DE (2)	DE (3)	
0.01	0.03	0.15		0.03	0.05	0.82		0.03	0.05	0.82	
MI	CR	Cost		MI	CR	Cost		MI	CR	Cost	
0.15	0.00	0.00		0.80	0.00	0.00		0.80	0.00	0.00	
No Selection				No Selection				No Selection			

- The formula output is limited to the *output amount*, (*primary*) *formula mode* and (*primary*) *formula form*. The actual batch size, and selections for formula mode and formula form are defined by the job template used. *See also Job Preferences, Appearances, and Formula Grid Configuration for information on these selections.*
- The formulas are ordered best-to-worst, from left to right. The formula on the far left is the best match found.
- The default sort order for the formulas is based on the sort criteria defined in the job template used. *See also job Preferences, Results for instruction to view/change the default sort criteria.* The formulas can be resorted.

Formula Detail

Below is an example of the entire detail for a single formula. This is the best match found for the standard b2:

		b 2	D5N.067.349	
2006 sc black	2.8121	foZ	Ready	
2006 sc indo ye...	3.3118	foZ	Ready	
2006 sc quindo red	4.4547	foZ	Ready	
2006 sc white	5.4215	foZ	Ready	
Total	16.0000	foZ		
Priority			Compatibility	
50.00			50.00	
DE(1)	DE(2)	DE(3)		
0.01	0.03	0.15		
MI	CR	Cost		
0.15	0.00	0.00		
No Selection	▼	combo		

- **Color Patch.** The color displayed in the top, left corner of the formula cell is a representation of the target color.
- **Standard Name.** The standard name is displayed to the right of the color patch. In this example the standard name is *b2*.
- **Colorants and Amounts.** The top of the formula cell displays the ingredient and amounts to be used in the match:

		b 2	D5N.067.349	
2006 sc black	2.8121	foZ	Ready	
2006 sc indo ye...	3.3118	foZ	Ready	
2006 sc quindo red	4.4547	foZ	Ready	
2006 sc white	5.4215	foZ	Ready	
Total	16.0000	foZ		

- **Total (Batch Size).** The total batch size in this example is 16.00
- **Formula Form.** The formula form is *fluid ounces (foz)*.
- **Formula Mode.** The formula mode is *Ready*.

See also *Job Preferences, Appearances, Formula Grid* for instructions to view/edit batch size, formula form and mode selections.

- **Match Quality.** Several pieces of information are provided to evaluate the match quality:

Priority		Compatibility
50.00		50.00
DE {1}	DE {2}	DE {3}
0.01	0.03	0.15
MI	CR	Cost
0.24	0.00	0.00
No Selection		Combinatorial

- **Priority.** Using Ingredient Maintenance, you can assign a preference or *priority* to individual ingredients. The priority value displayed here is an average of the priority values assigned to individual ingredients in the formula.

The default value for each ingredient is 50. The larger the assigned value, the higher the priority. *See also Ingredient Maintenance, Ingredient Priority for a detailed discussion of this feature.*

- **Compatibility.** In Ingredient Maintenance you can identify ingredient combinations that you prefer to use in the formulas. This field indicates the compatibility value for this formula.

The default compatibility value is 50. The larger the assigned value, the higher the compatibility.

See also Ingredient Maintenance, Ingredient Priority and Ingredient Compatibility for instructions to enable these options. See also Applications Technology, Ingredient Priority and Ingredient Compatibility for a comprehensive discussion of these features.

- **Colorimetric Evaluations**

- **DE (1), (2), (3).** The display includes color difference (DE) reports for Illuminants 1, 2 and 3. *See also Job Preferences, Tolerances for instructions to view and change the DE tolerances, and to identify the illuminants used.*

If you have measured a trial sample, the color difference values are replaced with the *As Is DE*. *See also Working With Batches for information on the use of Trial samples and the As Is DE data.*

- **Metamerism Index (MI).** Displays the metamerism index for the formula. The lower the value, the better the match quality. The default method used is Curve Fit. *See also Formula Central, Tools Menu, Tolerances for additional information on this parameter.*

- **Contrast Ratio.** Contrast ratio indicates the hiding or translucency of the sample. A value of 0.0 indicates it is not active.
- **No Selection (Formula Criterion).** In order to use the filtering tools in the Queue Viewer, you must assign a criterion, or status, to the formula. The default setting for all formulas is *No Selection*. *See also Assigning Formula Criterion below for instructions to make this assignment. See also Sorting and Filtering*

Options below for instructions to use formula criterion to filter or sort the queue results..

- **Combinatorial (Match/Correction Type).** This field identifies how the match was generated. There are 7 matching types, based on the matching and correction methods available in Formula Central:
 - **Combinatorial.** Formula is the result of a combinatorial match.
 - **Search.** Formula is the result of a formula search.
 - **Search & Correct.** Formula is the result of the Search & Correct method.
 - **Search & Adjust.** Formula is the result of the Search & Adjust method.
 - **Auto Add.** Correction is the result of an automatic add.
 - **Auto Reformulate.** Correction is the result of an automatic reformulation.
 - **Manual Add.** Correction is the result of a manual add.
 - **Manual Reformulate.** Correction is the result of a manual reformulation.

See also Formula Central, Matching Features and Correction Features for a discussion of these matching types .

Assigning Formula Criterion

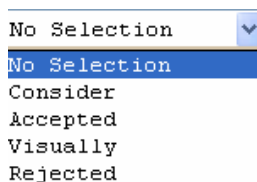
Filtering and sorting formulas based on the *Formula View Criteria* is one a powerful tool to evaluate the queue results. In order to use several of these options, you must assign a *criterion*, or status, to the formula results.

When a queue is matched, the criterion *No Selection* is assigned to each formula. This field is displayed at the bottom of each formula:

b 2		D5N.067.349	
2006 sc black	2.8121	f0Z	Ready
2006 sc indo ye...	3.3118	f0Z	Ready
2006 sc quindo red	4.4547	f0Z	Ready
2006 sc white	5.4215	f0Z	Ready
Total	16.0000	f0Z	
Priority	Compatibility		
50.00	50.00		
DE(1)	DE(2)	DE(3)	
0.01	0.03	0.15	
MI	CR	Cost	
0.15	0.00	0.00	
No Selection	▼	combo	

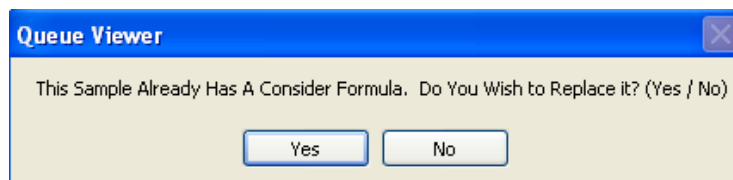
Formula Criterion Labels

There are 5 choices for formula criterion:



- **No Selection.** This is the default criterion, initially assigned to every formula in the queue results.
- **Consider.** The formula has been selected as a potential candidate for use. This criterion can only be assigned to one formula for each standard. You must check the formulas across the row to determine if this criterion is in use.

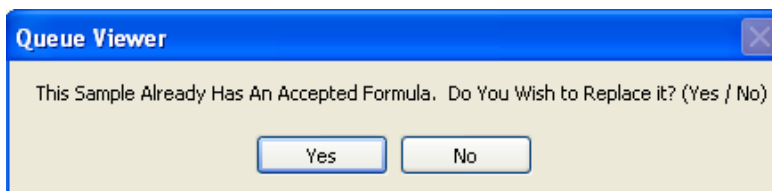
When you assign *Consider* to a formula you will see the following message, if it is currently attached to another formula for the same standard:



Click **Yes** to make the assignment. The formula currently assigned *Consider* will automatically be reset to *No Selection*.

- **Accepted.** The formula is accepted. This criterion can only be assigned to one formula for each standard. You must check the formulas across the row to determine if this criterion is in use.

When you assign Accepted to a formula, you will see the following message, if it is currently attached to another formula for the same standard:



Click **Yes** to make the assignment. The formula currently assigned *Accept* will automatically be reset to *No Selection*.

- **Visually.** The formula has been made, and the sample has been evaluated and accepted visually. This criterion can only be assigned to one formula for each standard.
- **Rejected.** The formula is unacceptable. This criterion can be assigned to multiple formulas for a each target.

NOTES

Only one formula per target can be assigned Accepted, Consider, or Visual. You cannot have an Accepted, Consider and Visual assigned to three different formulas for a single target color.

You can automatically assign the status *Accepted* or *Consider*, using buttons at the top of the window. *See also Formula Acceptance Buttons.*

Once the formulas have been evaluated and assigned a criterion, you can sort or filter the formula display based on these assignments. *See also Organizing the Formula Display for instructions to use these tools.*

Formula Acceptance Buttons

This is an automated method to assign formula criterion.



The *First* formula for each standard, displayed in the far left column, is always the best match found for the standard based on the job template used.

Queue Name: new queue example

Standard View Criteria: All

Job Template Name: All Job Templates

Formula View Criteria: All

Go To: [Dropdown]

View Type: ☐ Standards Only ☒ Standards and Formulas

Sorted by: Formula Central Sort Order

Formula Acceptance:

b 2			DSW.067.349			Job 3694 b 2		
2006 sc black	2.8121	f02	Ready	2006 sc indo ye...	3.6014	f02	Ready	
2006 sc indo ye...	3.3118	f02	Ready	2006 sc quindo red	6.6638	f02	Ready	
2006 sc quindo red	4.4547	f02	Ready	2006 sc thalo blue	1.0464	f02	Ready	
2006 sc white	5.4215	f02	Ready	2006 sc thalo g...	1.2097	f02	Ready	
Total	16.0000	f02		2006 sc white	3.4787	f02	Ready	
				Total	16.0000	f02		

- Click **Consider All First Formulas** to assign the criterion *Consider* to the first formula for every standard. A sort based on the criterion *Consider* will display a single formula for each standard.
- Click **Accept All First Formulas** to assign the criterion *Accept* to the first formula for every standard. This assignment allows you to resort the formulas based on this criterion. A sort based on the criterion *Consider* will display a single formula for each standard.

NOTES

When you use either of these buttons, all other formulas will retain the current formula status.

If the status has already been assigned to another formula for this standard, you may receive an error message.

There are no restrictions to the number of formulas assigned No Selection or Rejected, for each target color.

The status *No Selection* can also be used to filter or sort the formula display. See also *Filtering and Sorting Formulas for instructions to resort the display*.

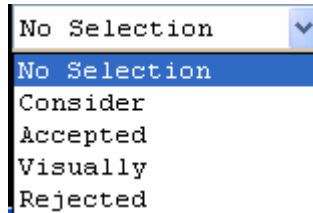
Manual Formula Criterion Assignment

For criterion other than *Accepted* or *Consider*, this assignment must be done manually.

You can only assign the criterion *Accept* or *Consider* to one formula per standard. See also *Formula Criterion Labels for information on duplicate assignments for these labels*.

To manually assign a criterion to a formula:

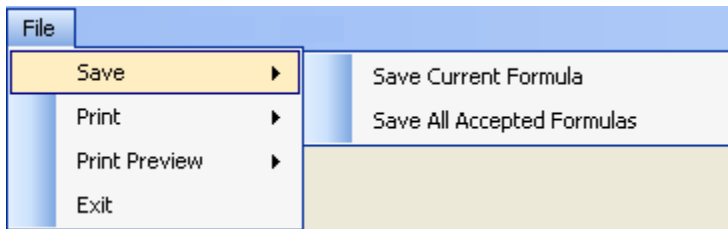
- Click on the down arrow next to the current criterion selection for the formula:



2. Highlight the criterion to be assigned. The field will automatically refresh.

Saving Formulas

The Queue Viewer offers two options for saving formulas:



- **Save Current Formula.** This is used to save an individual formula. You must highlight an individual formula in the display to enable this option.

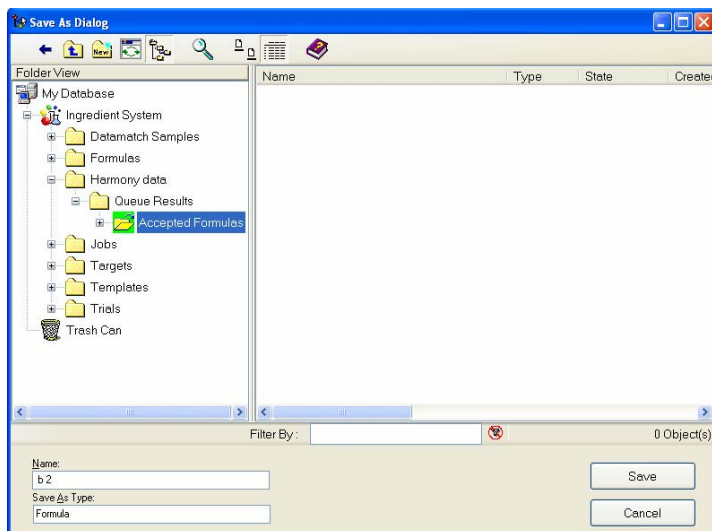
When saving a single formula, you can assign a new name to the formula when saving it.

- **Save All Accepted Formulas.** This saves all formulas assigned the criterion *Accepted*.

When this option is selected, the formula name cannot be changed. It is automatically saved under the target name assigned in the queue.

To save a formula:

1. From the *File* menu, highlight the *Save* option you want to use. The *Save As* dialog displays:



2. Highlight the folder where the formula will be stored, and click **Save**. The screen will refresh and the formulas will appear in the list:

Folder View	Name	Type	Created by	Created
My Database	b 2	Formula	User	4/24/2008
Admin View	#00383 corrected	Formula	User	4/24/2008
Ingredient System	#00388 tinting brown light	Formula	User	4/24/2008
Datamatch Samples	00329 light grey	Formula	User	4/24/2008
Formulas	00330 brown JB	Formula	User	4/24/2008
Harmony data	00331	Formula	User	4/24/2008
Queue Results	00333 green	Formula	User	4/24/2008
Accepted Formulas	003834	Formula	User	4/24/2008
Jobs	00392 blue boat wilson	Formula	User	4/24/2008
Targets	00397 deep purple Broadhurst	Formula	User	4/24/2008
Templates	012B	Formula	User	4/24/2008
Trials	0206	Formula	User	4/24/2008
Trash Can	0254 blue metallic	Formula	User	4/24/2008
	0256 brown strap	Formula	User	4/24/2008

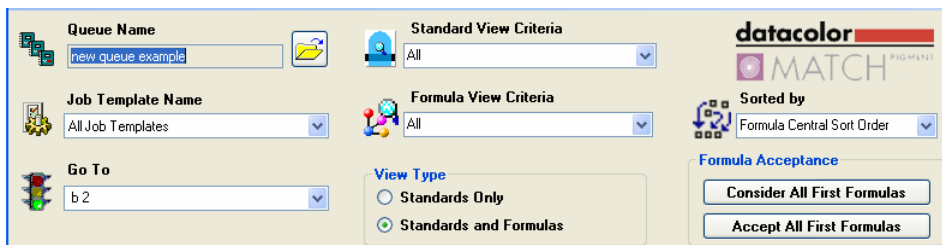
Exporting Formulas to Datacolor PAINT

The saved formulas can be converted for use with the Datacolor PAINT POS matching system. The program module Data Exchange is used to perform this conversion. *See also Data Exchange for detailed instructions to complete this data transfer.*

Organizing the Formula Display

Overview

There are several options available in the Queue Viewer to sort and filter the queue results. These features help you to better manage the formula display and evaluate the results.



The screenshot shows the Queue Viewer interface with the following controls:

- Queue Name:** A text input field containing "new queue example" and a search icon.
- Job Template Name:** A dropdown menu showing "All Job Templates".
- Go To:** A dropdown menu showing "b 2" with a traffic light icon.
- Standard View Criteria:** A dropdown menu showing "All".
- Formula View Criteria:** A dropdown menu showing "All".
- View Type:** Two radio buttons: "Standards Only" (unselected) and "Standards and Formulas" (selected).
- Sorted by:** A dropdown menu showing "Formula Central Sort Order".
- Formula Acceptance:** Two buttons: "Consider All First Formulas" and "Accept All First Formulas".
- Logos:** "datacolor" and "MATCH PIGMENT" logos are visible in the top right.

Filter and Sorting Options

Filter options are used to *restrict* the display of the queue results. Sorting options are used to *organize* the display of the formula results. You can use the filter and sort options separately, or you can combine them to isolate specific formulas for closer evaluation.

Queue Viewer includes the following filter options:

- **Job Template Name.** If you are using the *Scheduling* option, you will be using several different job templates in a single queue. This option restricts the formulas displayed to those from a single template. *See also Scheduling for a detailed discussion of this option.*
- **Standard View Criteria.** Applying these criteria restricts the display of standards. *See also Standard View filters below for detailed instructions to use this filter.*
- **Formula View Criteria.** Applying these criteria restricts the display of formulas. *See also Applying Filter Options, Formula View Filters below for detailed instructions to use this filter.*
- **View type.** The default view includes all standards and all formulas. You can limit the display to standard information, to quickly examine the target colors in the queue.

Sorting options are used to *order* the display of formula results. Queue Viewer includes the following sorting options:

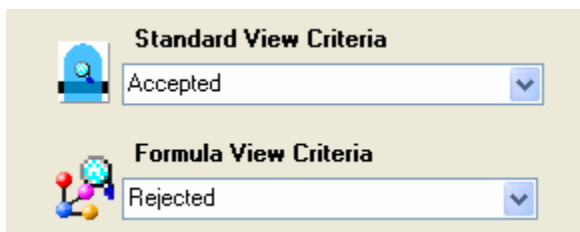
- **Go To.** This option is used to locate a particular standard in the results display. When you have a large queue, you may find yourself navigating through pages of formulas to find a standard you need to evaluate. This option moves to the

standard of interest, and scrolls the results window to locate the standard information at the top of the display window. *See also Working with Sorting options for instructions to use this option.*

- **Sorted By.** The formula results for each standard are displayed best-to-worst, from left-to-right across a row. You can re-order the results based on a variety of standard and formula properties. The choices for this field are based on the sorting preferences selected for the job template, as well as the tolerancing properties specifically applied to the queue results. *See also Working with Sorting Options for a detailed explanation of this selection.*

Working with Filter Options

The *Standard View Criteria* and *Formula View Criteria* options provide powerful tools for filtering the queue results.

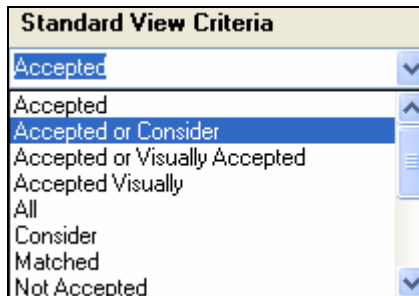


- Applying the *Standard View* filters limits the number of *standards* displayed. This effectively limits the number of rows displayed.
- Applying the *Formula View* filters limits the number of *formulas* displays. This effectively limits the number of columns displayed.
- These view options can be used separately, or combined to filter the queue results in subtle and meaningful ways.

Standard View Filters

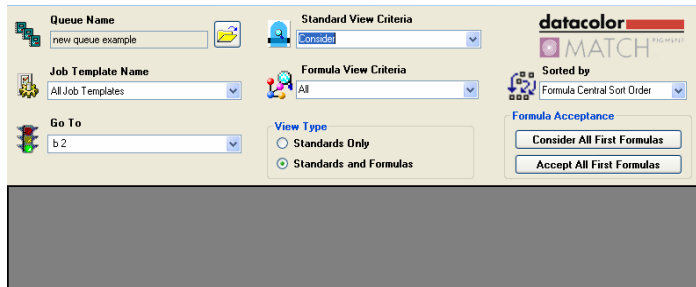
This filter controls the number of standards displayed. When applied, the data displayed includes only the results for those standards that include the criterion selected in this field. If the standard does not include a formula with the criteria selected, it will not be displayed. This tool limits the number of rows in the results display.

1. Click on the down arrow to view the choices to be applied to the standard:



2. Highlight the criteria to be applied. The window will immediately refresh and display only those standards that satisfy the criteria.

If no standards satisfy the criteria, the display will be empty:



Below are definitions for each of the *Standard View Criteria*:

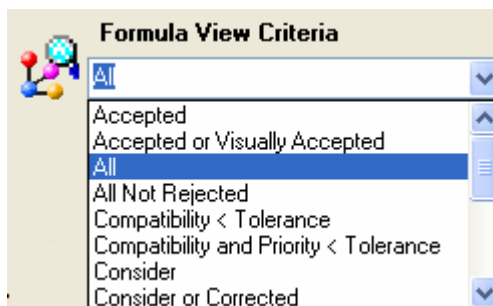
- **Accepted.** Limits the display to those standards that have a formula assigned as *Accepted*. Only one formula can be marked *Accepted* for each standard, so this limits the display to a maximum of one formula per standard. Standards not having a formula with the criterion *Accepted* are excluded from the display.
- **Accepted or Consider.** Limits the display to those standards that have a formula assigned as *Accepted* or *Consider*. For each standard, only one formula can be assigned *Accepted* or *Consider*, so this limits the display to a single formula per standard.
- **Accepted or Visually Accepted.** Limits the display to those standards that have a formula assigned as *Accepted* or *Visual*. For each standard, only one formula can be assigned *Accepted* or *Visual*, so this limits the display to a single formula per standard.
- **Accepted Visually.** Limits the display to those standards with a formula assigned as *Visual*. Only one formula can be assigned *Visually* for each standard, so this limits the display to a single formula per standard.
- **All.** Displays all formulas for each standard.

- **Consider.** Limits the display to those standards with a formula assigned as *Consider*. Only one formula can be marked *Consider* for each standard, so this limits the display to a single formula per standard.
- **Matched.** Displays results for all standards that have matches. When this filter is selected, standards without formulas are excluded.
- **Not Accepted.** All formulas having the status *Accepted* are excluded from the display. This will likely result in multiple formulas displayed for a single standard.
- **Not Accepted and Not Considered.** All formulas having the status of *Accepted* or *Considered* are excluded from the display. This will likely result in multiple formulas displayed for a single standard.
- **Not Accepted and Not Visually Accepted.** All formulas having the status of *Accepted* or *Visual* are excluded from the display. This will likely result in multiple formulas displayed for a single standard.
- **Not Considered.** All formulas having the status *Considered* are excluded from the display. This will likely result in multiple formulas displayed for a single standard.
- **Not Rejected.** All formulas having the status *Rejected* are excluded from the display. This will likely result in multiple formulas displayed for a single standard.
- **Not Visually Accepted.** All formulas having the status *Visual* are excluded from the display. This will likely result in multiple formulas displayed for a single standard.
- **Rejected.** Display formula results only for those standards that have a *Rejected* status assigned to a formula.
- **Unmatched.** Displays only those standards that have no formulas.

Formula View Filters

This filter controls the number of formulas displayed. When applied, the data displayed includes only the results for those formulas that include the criterion selected in this field. This tool limits the number of columns in the results display.

1. Click on the down arrow to view the choices:



- Highlight the criteria to be applied. The window will immediately refresh and display only those formulas that satisfy the criteria.

When a *Formula View Criterion* is selected and there are no formulas that satisfy the criteria, no formulas are displayed. Below is an example:

Formula Name	Value	Job ID
b 2	D5N.067.349	Job 3694 b 2
#00383 corrected	F17.121.758	Job 3701 #00383...
#00388 tinting ...	D10.136.268	Job 3695 #00388...
00329 light grey	E8N.090.566	Job 3702 00329 ...
00330 brown JB	D79.241.374	Job 3696 00330 ...
00331	B44.175.258	Job 3703 00331
00333 green	N3N.095.266	Job 3704 00333 ...
003834	F15.119.763	Job 3697 003834
00392 blue boat...	U05.352.273	Job 3705 00392 ...
00397 deep purp...	Y0N.037.257	Job 3698 00397 ...
012B	F05.154.453	Job 3706 012B
0206	F4N.041.803	Job 3699 0206
0254 blue metallic	S36.455.331	Job 3707 0254 b...
0256 brown strap	D57.253.313	Job 3700 0256 b...

In the queue above, there are no formulas that have (batch) measurement data.

Below are definitions for each of the Formula View Criteria:

- **Accepted.** Limits the display to those formulas that are assigned the criterion *Accepted*. If a standard does not have an *Accepted* formula, only the standard name displays.
- **Accepted or Visually Accepted.** Limits the display to those formulas marked as either *Accepted* or *Visual*. If a standard does not have an *Accepted* or a *Visual* formula, only the standard name displays.
- **All.** Displays all formulas for all standards. Selecting this option effectively resets the results display to include all formulas.
- **All Not Rejected.** Displays all formulas except those marked *Rejected*.
- **Compatibility >= Tolerance.** Displays all formulas that have an Ingredient Compatibility greater than/equal to the specified Compatibility tolerance. This is based on the tolerances set in Queue Maintenance. *See also Queue Maintenance, Edit Tolerances for an explanation of this feature.*
- **Compatibility and Priority >= Tolerance.** Displays all formulas that have both Ingredient Compatibility and Priority values greater than/equal to the specified tolerance for each. This is based on the tolerances set in Queue Maintenance. *See also Queue Maintenance, Edit Tolerances for an explanation of this feature.*
- **Consider.** Displays all formulas that are marked *Consider*.

- **Consider or Corrected.** Displays all formulas that are marked either *Consider* or *Corrected*.
- **Cost < Tolerance.** Displays all formulas that have a cost less than the specified cost tolerance. This is based on the tolerances set in Queue Maintenance. See also *Queue Maintenance, Edit Tolerances for an explanation of this feature*.
- **CR > Tolerance.** Displays all formulas that have a Contrast Ratio greater than specified Contrast Ratio tolerance. This is based on the tolerances set in Queue Maintenance, and is not related to the tolerances in the job template. See also *Queue Maintenance, Edit Tolerances for an explanation of this feature*.
- **Measured.** Displays formulas that include a measured sample. See also *Working with Batches, for information on the Measure option in Queue Viewer*.
- **Measured DE < Tolerance.** Displays all formulas whose measured sample has a DE less than specified DE tolerance. This is based on the tolerances set in Queue Maintenance. See also *Queue Maintenance, Edit Tolerances for an explanation of this feature*.
- **Metamerism < Tolerance.** Displays all formulas that have a metamerism index less than the specified Metamerism tolerance. This is based on the tolerances set in Queue Maintenance. See also *Queue Maintenance, Edit Tolerances for an explanation of this feature*.
- **Primary DE < Tolerance.** Displays all formulas that have a DE1 (Primary DE) value less than the specified DE1 tolerance. This is based on the tolerances set in Queue Maintenance. See also *Queue Maintenance, Edit Tolerances for an explanation of this feature*.
- **Priority >= Tolerance.** Displays all formulas that have an Ingredient Priority value less than the specified Priority tolerance. This is based on the tolerances set in Queue Maintenance. See also *Queue Maintenance, Edit Tolerances for an explanation of this feature*.
- **Rejected.** Displays all formulas that are marked *Rejected*.
- **Visually Accepted.** Displays all formulas that are marked *Visual*.

NOTE

When a queue is created, the default tolerances assigned to these criteria will not yield meaningful results. You must edit these tolerances to make this tool useful. See also *Queue Maintenance, Edit/View Tolerances for instructions to view/change these tolerances*.

Tips for Using the Filter Options

When using the filter options keep in mind the following:

- The filter functions are cumulative. When you apply a second filter to the display, that filter is applied only to the formula results produced on the previous filter.
- The default for both the Standard View and Formula View Criteria is *ALL*. The first filter selected is applied to all formulas in the queue.

- To clear the filter restrictions, select **All** for the *Formula View* and *Standard View Criterion*. This will restore the display of all queue results.

Working with Sorting Options

The Queue Viewer Window includes two options for sorting the formulas. These are the *Go To* field, and the *Sorted by* field:

- Go To.** This option is used to locate a particular standard in the results display. When you have a large queue, you may have pages of formulas to evaluate. This option scrolls the results window to display the information for the standard of interest at the top of the display window.

Click on the arrow in the *Go To* field to find the standard name:

The standards are listed in alphabetical order. Highlight the standard results you want to see. The results for the selected target appear at the top of the display.

Queue Name: new queue example

Job Template Name: All Job Templates

Go To: 00333 green

Standard View Criteria: All

Formula View Criteria: All

View Type: ☐ Standards Only ☒ Standards and Formulas

Sorted by: Formula Central Sort Order

Formula Acceptance:

	00333 green	N3N.095.266		Job 3704 00333 ...	
2006 sc black	2.4259 foz	Ready	2006 sc indo ye...	3.0678 foz	
2006 sc thalo blue	2.6367 foz	Ready	2006 sc magenta	3.6819 foz	
2006 sc thalo g...	3.9931 foz	Ready	2006 sc thalo blue	1.8310 foz	
2006 sc yellow ...	5.8678 foz	Ready	2006 sc thalo g...	5.8997 foz	
2006 sc white	1.0765 foz	Ready	2006 sc white	1.5196 foz	
Total	16.0000 foz		Total	16.0000 foz	

- **Sorted by.** This option enables you to change the sort criteria used to order the display of formulas for each standard.

NOTE

The sort is based on the current results display. If you want a sort performed on the complete results, you must first resort the display using the All criteria.

Click on the down arrow in the *Sorted By* field to view the choices:

Sorted by

Formula Central Sort Order

- Compatibility
- Compatibility and Priority
- Cost
- CR
- Formula Central Sort Order
- Metamerism
- Primary DE
- Priority

Below are definitions for each of the sort options:

- **Compatibility.** Resorts the formulas from highest to lowest Ingredient Compatibility value. Compatibility is assigned to combinations of ingredients. *See also Ingredient Maintenance, Ingredient Compatibility for instructions to assign this value.*
- **Compatibility and Priority.** The formulas are resorted based on a average calculated for the Ingredient Compatibility and Priority values accumulated for each formula. Compatibility is defined for groups of ingredients. Priority is defined for individual ingredients. *See also Ingredient Maintenance, Ingredient Priority and Compatibility for instructions to assign this value.*
- **Cost.** Resorts the formulas from *lowest to highest* cost.
- **CR.** Resorts the formulas from *highest to lowest* contrast ratio.

- **Formula Central Sort Order.** This is the default sort criteria for the queue results. It uses the Sorting Preferences defined in the job template used. *See also Job Preferences, Results for instructions to view/edit the sort criteria in a job template.*
- **Metamerism.** Resorts the formulas from *lowest to highest* metamerism index. .
- **Primary DE.** Resorts the formulas from *lowest to highest* DE1. .
- **Priority.** Resorts the formulas based on the Ingredient Priority assigned to the colorants. Priority is assigned to individual ingredients.

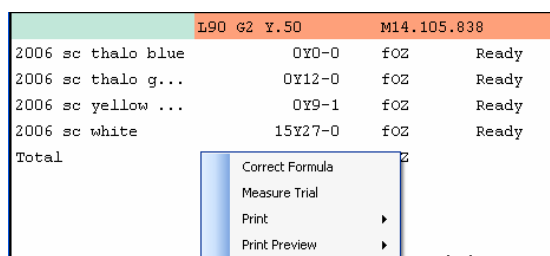
Working with Batches

Two options are included in Queue Viewer that enable you to work with physical samples of the formulas. These options are:

- **Measure Trial.** Opens a window that allows you to measure the batch sample.
- **Correct Formula.** Opens Formula Central, and provides all of the relevant information needed by the program to perform a correction.

To access these options:

1. Place the cursor in the formula to be corrected, and right-click the mouse. A menu displays:



2. Highlight the menu option you want to use.

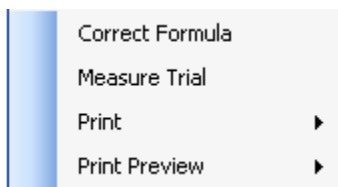
Measure Trials

This option enables you to measure a sample. The sample measurement becomes part of the formula record.

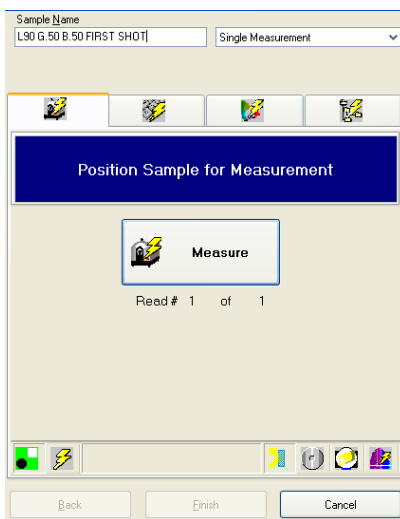
1. Highlight the formula you used to make the sample:

		L90 G2 Y.50	M17.104.839	
2006 sc thalo blue		0.00	f0Z	Ready
2006 sc thalo g...		0.24	f0Z	Ready
2006 sc yellow ...		0.19	f0Z	Ready
2006 sc white		15.57	f0Z	Ready
Total		16.00	f0Z	
Priority			Compatibility	
50.00			50.00	
DE(1)	DE(2)		DE(3)	
0.64	0.14		0.61	
MI	CR		Cost	
1.30	0.00		0.00	
No Selection	▼		Combinatorial	

2. Right-click to display the Queue Viewer correction menu.



3. Click **Measure Trial**. The Measurement Wizard displays.
4. Enter a *Sample Name*, and place the sample at the instrument port.



5. Click **Measure**. The window refreshes and the *Finish* button is enabled.
6. Click **Finish**. The window closes. In the Queue Viewer, the formula output will change. The color difference reports DE(1), DE(2) and DE (3) are replaced by As /s DE values:

	L90 G2 Y.50	M17.104.839	
2006 sc thalo blue	0.00	f0Z	Ready
2006 sc thalo g...	0.24	f0Z	Ready
2006 sc yellow ...	0.19	f0Z	Ready
2006 sc white	15.57	f0Z	Ready
Total	16.00	f0Z	
Priority		Compatibility	
50.00		50.00	
AsIs DE(1)	AsIs DE(2)	AsIs DE(3)	
2.66	3.44	2.93	
MI	CR	Cost	
1.30	0.00	0.00	
No Selection		Combinatorial	

These are the measured differences between the original standard and the sample you just measured. The system assumes the sample was made using the selected formula. You can now run a correction based on this measurement.

Correcting Formulas

You can launch a correction directly from the Queue Viewer. This option transfers the highlighted formula from the Queue Viewer to Formula Central, using the job template selected for the queue.

When preparing to run a correction keep in mind the following:

- You should eliminate most of the formula candidates before you run a correction. The correction results are added to the formula display for the standard. If you are holding several formulas for every standard, managing the corrected formulas can become difficult.
- The job template you are using must be customized for the correction display as well as the formulation display. Make sure it is configured properly for correction output—that the formula modes and forms are consistently with the formula output.

To run a correction:

1. Highlight the formula to be corrected, and right-click in the formula cell to display the Queue Viewer menu:

	L90 G2 Y.50	M17.104.839
2006 sc thalo blue	0.00	fOZ Ready
2006 sc thalo g...	0.24	fOZ Ready
2006 sc yellow ...	0.19	fOZ Ready
2006 sc white	15.57	fOZ Ready
Total	16.00	fOZ
Priority	50.00	

Correct Formula
Measure Trial
Print
Print Preview

2. Click on **Correct Formula**. Formula Central opens, and is configured to run a correction:

Target
L90 G2 Y.50

Trial

Formula
Prediction 7 L90 G2 Y.50

2006 sc thalo blue	0.00 fOZ
2006 sc thalo green	0.24 fOZ
2006 sc yellow oxide	0.19 fOZ
2006 sc white	15.57 fOZ
Total Batch	16.00 fOZ

3. Enter a **Trial** name.

Target
L90 G2 Y.50

Trial
1st Shot

Formula

If you have already measured the Trial in Queue Viewer, it will be displayed in the Trial field. You can continue to step 5 below.

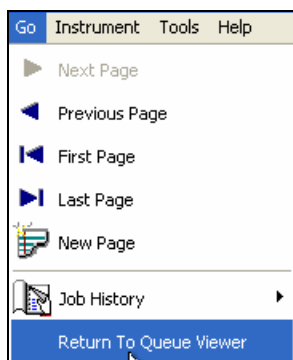
CIELAB		L*	a*	b*	C*	h	CF
Target		89.86	-14.93	3.08	15.25	168.35	
Trial As Is		90.30	-13.39	5.27	14.39	158.51	2.23
Trial Corrected		89.92	-14.95	3.28	15.31	167.64	2.23
Trial As Is	DE*	DL*	Da*	Db*	DC*	DH*	MI
D65/10	2.72	0.45	1.55	2.19	-0.86	-2.54	0.87
A/10	3.51	0.77	2.00	2.78	-1.82	-2.91	
F11/10	2.99	0.64	1.64	2.42	-0.94	-2.77	

						
2006 sc thalo blue		0.00	0.01	0.01	f0Z	
2006 sc thalo green		0.24	0.50	0.25	f0Z	
2006 sc yellow oxide		0.19	0.19	0.00	f0Z	
2006 sc white		15.57	26.90	11.32	f0Z	
Total Batch		16.00	27.59	11.59	f0Z	

The program will calculate and display a corrected formula:

Target		L*		a*		b*		C*		h		CF	
L90 G2 Y50		89.86		-14.93		3.08		15.25		168.35			
Trial As Is		90.30		-13.39		5.27		14.39		158.51		2.23	
Trial Corrected		89.92		-14.95		3.28		15.31		167.64		2.23	
Trial As Is		DE*	DL*	Da*	Db*	DC*	DH*	MI					
D65/10		2.72	0.45	1.55	2.19	-0.86	-2.54	0.87					
A/10		3.51	0.77	2.00	2.78	-1.82	-2.91						
F11/10		2.99	0.64	1.64	2.42	-0.94	-2.77						
Trial Corrected													
D65/10		0.21	0.06	-0.02	0.20	0.06	-0.19	0.77					
A/10		0.40	0.07	0.35	0.18	-0.36	-0.17						
F11/10		0.62	-0.03	0.62	0.02	-0.61	-0.13						

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The Queue Viewer will display. The corrected formula will be placed in the first formula position for the standard:

2006 sc thalo blue	0.01	fOZ	Ready
2006 sc thalo g...	0.29	fOZ	Ready
2006 sc yellow ...	0.11	fOZ	Ready
2006 sc white	15.60	fOZ	Ready
Total	16.00	fOZ	
Priority	Compatibility		
50.00	50.00		
DE(1)	DE(2)	DE(3)	
0.21	0.40	0.61	
MI	CR	Cost	
0.00	0.00	0.00	
No Selection		Auto Add	

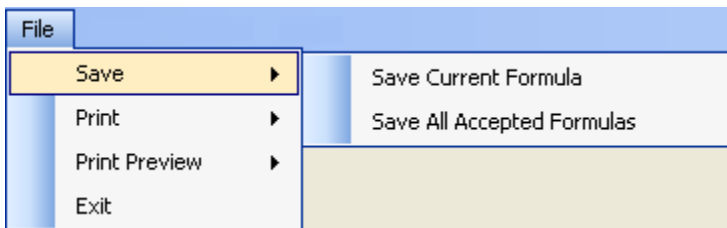
- **Ingredient and Amounts.** This is the corrected formula.
- **DE.** This is the projected color difference between the target and the corrected formula, for each Illuminant/Observer condition.
- **Auto Add.** Identifies that the source of this formula was an automatic correction (add).
- **Formula Status (*No Selection*).** When you perform a correction, the new formula is assigned the *No Selection* status. You should assign a status to this formula that reflects its progress through the evaluation process. *See also Assigning a Formula Criterion for a detailed discussion of this field.*

Saving Formulas

When you have completed the color matching work, you will have a single formula for each standard. Saving it as a permanent formula record allows you to work with it in Formula Central. Specifically:

- Include it in the formula library used by the Search & Correct options in Datacolor MATCH^{PIGMENT}.
- Transfer it for use with retail (POS) color matching systems.
- View or print the formula.

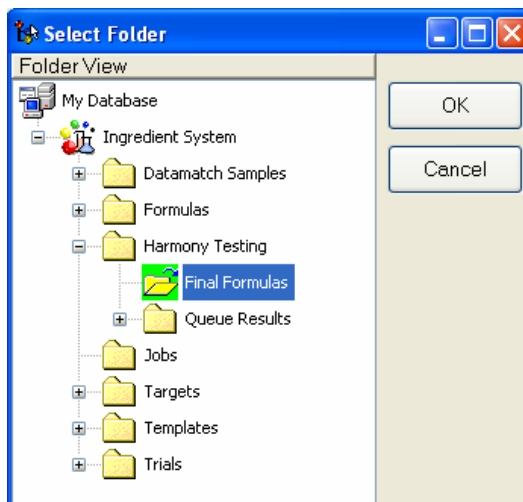
The Save options are accessed from the Queue Viewer File menu:



- **Save Current Formula.** Used to save a single formula. Saves the current highlighted formula.
- **Save All Accepted Formulas.** Saves all of the formulas assigned the status *Accepted*.

To save a formula, do the following:

1. Select one of the Save options. The program prompts you for a folder location:



2. Highlight the folder to use.
3. Click **OK**. The window will close and the program will save the formulas.

You can use the Data Navigator to view the formulas saved in the folder:

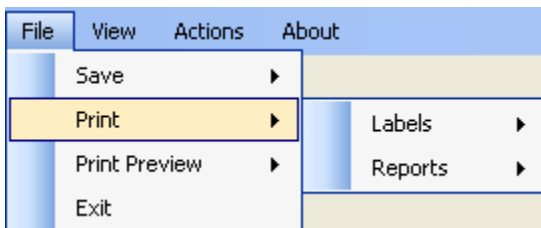
Folder View	Name	Type
My Database	b 2	Formula
Admin View	#00383 corrected	Formula
Ingredient Syst	#00388 tinting brown light	Formula
Datamatch	00329 light grey	Formula
Formulas	00330 brown JB	Formula
Harmony T	00331	Formula
Final F	00333 green	Formula
Queue	003834	Formula
Jobs	00392 blue boat wilson	Formula
Targets	00397 deep purple Broadhurst	Formula
Templates	012B	Formula
Trials	0206	Formula
Trash Can	0254 blue metallic	Formula
	0256 brown strap	Formula

These formulas are now available for use with Formula Central. They can be added to the formula library for the Search & Correct options, and can be retrieved for examination at a later time. *See also Formula Central, Matching/Correcting Colors for an explanation of the Formula Search features. See also Applications Technology, Formula Storage and Retrieval for a comprehensive discussion of the formula storage and retrieval features.*

Printing/Report Options

The Queue Viewer includes options to display and print formula labels and formula reports. You have the choice to display and print the results for the entire queue, or to selectively print the queue results.

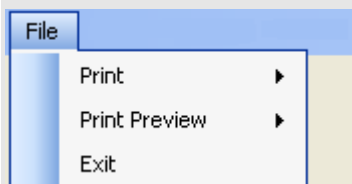
1. Click the **File** menu, select **Print**.



2. From the submenu, do either of the following:
 - To view/print labels, click **Labels**.
 - To view/print reports, click **Reports**.

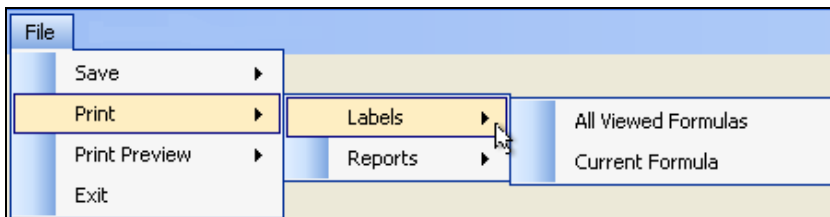
NOTE

To access the complete selection of file management options, you must highlight a formula in the queue, before opening the File menu. If you do not, you will only see a partial listing of the File menu:



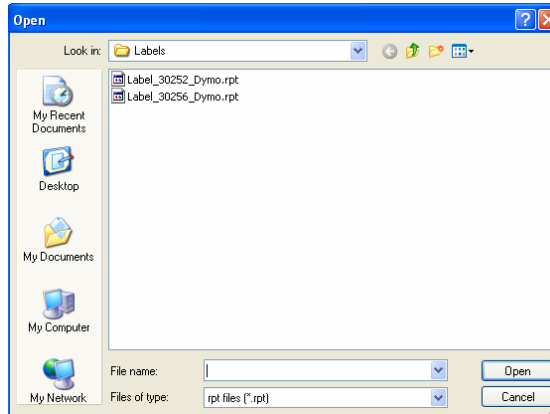
Printing Labels

1. Select **File, Print, Label**. The program will prompt you for a label selection.



- **All Viewed Formulas**. Includes complete formula information for all jobs in the queue.

- **Current Formula.** Includes the complete formula information for a single formula.
2. Select the formula information to be printed. A dialog box will open, allowing you to browse to the label to be printed:



Datacolor provides label forms for two different Dymo label styles.

- Label 30252 Dymo report
- Label 30256 Dymo report

NOTE

You can print custom labels by placing them in the labels folder. The path for the labels folder is:

C:\Program Files\Datacolor\Spectrum\Datacolor Match Pigment\Labels

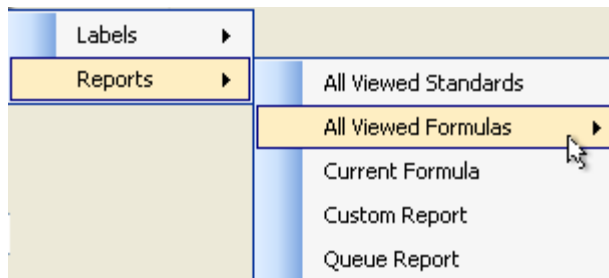
3. Click on the label to use. A label similar to the one below will be generated:

L90 B.50	2006 sc indo ye	0ozY1
	2006 sc thalo t	0oz1Y1
	2006 sc white	15.86
	2006 sc mager	0oz3Y1
23-Apr-08		

Printing Reports

The system can generate detailed reports of the queue results. To access this option:

1. Click **File, Print, Reports**.



The Reports submenu displays. It includes choices regarding the precise information to be printed, and the report to use:

- **All Viewed Standards.** Includes only standard information.
- **All Viewed Formulas.** Includes complete formula information for all jobs in the queue.
- **Current Formula.** Includes the complete formula information for a single formula.
- **Custom Report.** Opens a dialog box to access a custom report you have created.
- **Queue Report.** Includes information about the queue you are using.

Below are examples of the reports provided with the program:

Standard Report

 Standard List Tuesday, May 20, 2008 1:36:57 PM	
Standard Name	Status
b 2	All
L90 G1	All
L90 R1	All
L90 R1.5 Y1	All
L90 G1 B.50	All
L90 B.50	All
L90 R.50 B.50	All
L90 G1 Y1	All
L90 G2 Y.50	All
L90 G.50 B.50	All

Formula Report



Formula Results

Tuesday, May 20, 2008 1:37:54PM

Target Name	ACC Code	Job Name	
b 2	D5N.067.349	Job 3696 b 2	
Formula Name		Job Template Name	Optimizer
Prediction 1 b 2		Harmony Testing	1 0

Predicted Color Difference of Formula						CIELAB
Illuminant	DE*	DL*	Da*	Db*	DC*	DH*
D65/10	0.01	0.00	0.00	0.00	0.00	0.00
A/10	0.03	0.00	0.01	-0.03	-0.01	-0.03
F11/10	0.15	0.08	0.01	0.13	0.11	0.07

<u>Metamerism</u>	<u>Priority</u>	<u>Compatibility</u>	<u>Cost</u>	<u>Selection Status</u>
0.24	50.00	50.00	0.00	0

<u>IngredientName</u>	<u>OutputAmount</u>	<u>Unit</u>
2006 sc black	2.81	fOZ
2006 sc indo yellow	3.31	fOZ
2006 sc quindo red	4.45	fOZ
2006 sc white	5.42	fOZ

Queue Report



Queue List

Tuesday, May 20, 2008 1:40:05PM

Queue Name:	Queue Example	Queue Status:	Matched
<u>Samples in Queue</u>		<u>Job Name[]</u>	
b 2		Job 3696 b 2	
L90 B.50		Job 3697 L90 B.50	
L90 G.50 B.50		Job 3698 L90 G.50 B.50	
L90 G1		Job 3699 L90 G1	
L90 G1 B.50		Job 3700 L90 G1 B.50	
L90 G1 Y1		Job 3701 L90 G1 Y1	
L90 G2 Y.50		Job 3702 L90 G2 Y.50	
L90 R.50 B.50		Job 3703 L90 R.50 B.50	
L90 R1		Job 3704 L90 R1	
L90 R1.5 Y1		Job 3705 L90 R1.5 Y1	

Print Preview Option

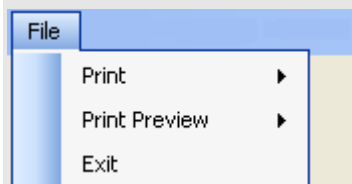
You can display the contents of a printed label or report before printing it. To access this option:

1. Click **File, Print Preview**.



NOTE

To access the complete selection of file management options, you must highlight a formula in the queue, before opening the File menu. If you do not, you will only see a partial listing of these options:



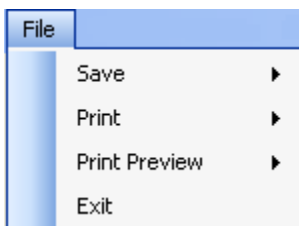
2. From the submenu, select the document type, label or report, to be printed. *See also [Printing Labels](#) and [Printing Reports](#) for details on the information displayed.*

Queue Viewer Menu Options

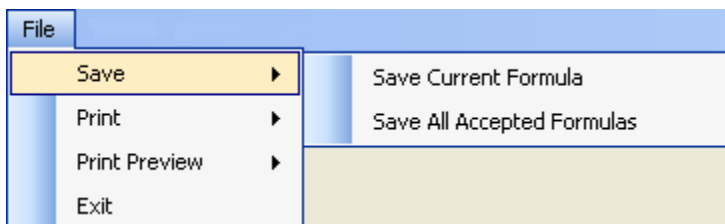
The drop-down menus in Queue Viewer provide access to data management options frequently used.

File Menu

This menu includes options for managing the queue data:

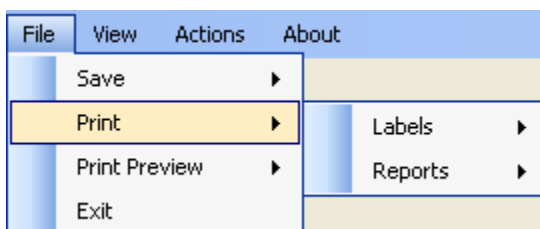


- **Save.** This option saves the data in the queue as permanent formulas. These formulas can be retrieved, or used by Search and Search & Correct as the basis of color matches for other targets. Click on **Save** to view the options.



See also *Saving Formulas* for complete instructions on these options.

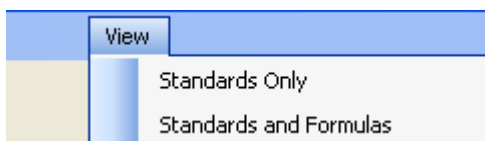
- **Print.** You can print formulas in the queue, either as a report or as a label. Click on **Print** to view the options:



See also *Printing and Report Options* for complete instructions.

View Menu

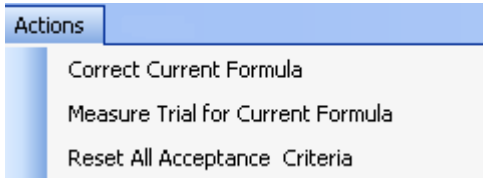
This menu provides alternate access to options for filtering the queue display:



- **Standards Only.** Displays only the standard information. This display is helpful in confirming the targets that are included in the queue.
- **Standards and Formulas.** Provides a complete display of the queue results.

Actions Menu

This menu provides alternate access to essential program features.



- **Correct Current Formula.** This launches the Formula Central program module, enabling you to run a correction. *See also Working With Batches, Correcting Formulas for detailed instructions to correct a queue formula.*
- **Measure Trial for Current Formula.** When you prepare a formula from the queue, you need to measure it. This selection opens the program option to make the measurement. *See also Working With Batches, Measure Trials for detailed instructions to use this option.*
- **Reset All Acceptance Criteria.** Restores the status *No Selection* to all formulas in the queue.

Admin

Overview

This program module contains default selections used throughout the entire suite of programs including:

- Measurement conditions and methods
- Colorimetric and physical properties to be used
- Ingredient/formula modes and forms
- User profiles (logins, passwords, etc.) and data security

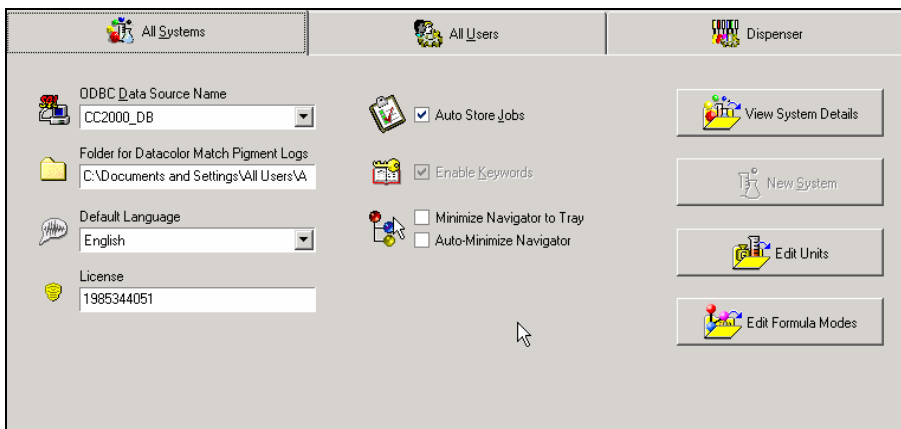
When the program is installed, defaults are included for all of these selections. However, you should customize the selections to the requirements of your application and the needs of your users.

NOTES

- Access to the *System Administration* program module is only available to users that are designated as "Administrators". The default login/password (User/CC3) that ships with the software is designated as an "Administrator". See also *System Administration, All User Tabs, View Details* to view/change this designation.
- A "Windows Administrator" is not the same as a "Datacolor MATCH^{PIGMENT} Administrator". While you must be a *Windows* Administrator to install the Datacolor software, you do not need to be a *Windows* Administrator to use the Datacolor programs, or to have access to the *System Administration* program module in \Datacolor MATCH^{PIGMENT}.
- Any setting that is "grayed out" cannot be changed. If a check displays in the box next to a field that is grayed out, the feature is permanently enabled. If no check displays, the feature is permanently disabled.

Admin Window

When you open this program module, the window below displays:

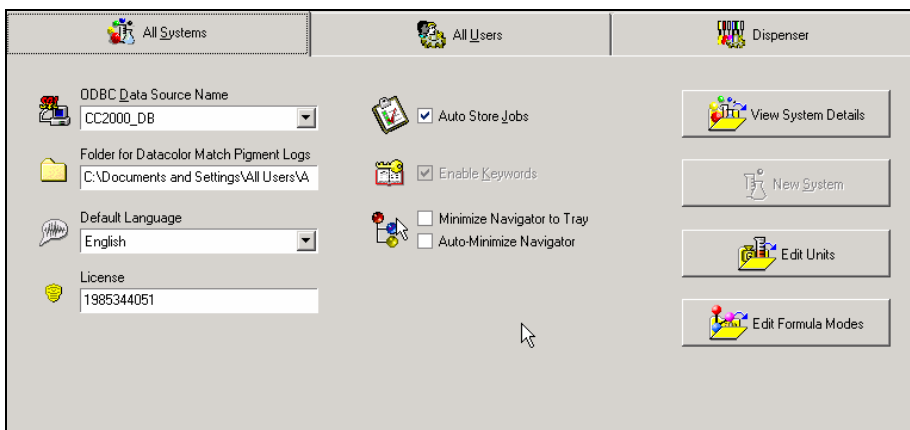


All Systems Tab

This is the default window for the Admin program module. It provides fundamental system settings that are applied to program modules. This tab controls all settings that are applied system-wide including colorimetric defaults, formula defaults, customized labels, folder locations and language selection.

NOTE

Many of the defaults selected in this program module can be overridden at run time. Others are not applied to all program modules that include the feature. These distinctions are included as part of the documentation for specific field.



- **ODBC Data Source.** Identifies the data source to be used.
- **Folders for Datacolor MATCH^{PIGMENT} Logs.** Identifies the directory/folder location where all exported files and error logs will be stored
- **Default Language.** Identifies which language version of the program is launched. This does not control the language selection for the login script. It controls the language used for all program modules. Different language selections can be set up for different users.
- **License.** You must validate a license to run Datacolor MATCH^{PIGMENT}. This field identifies the license number assigned to the active user.

If you are running the program/opening the user for the first time, this field is blank. Clicking on the license icon to the left of the field will start the license validation process.



- **Autostore Jobs.** When this option is enabled, all jobs created in Formula Central are automatically stored. When it is disabled, the user must instruct the program to store the job. Place a check in the box to enable this feature.
- **Enable Keywords.** Currently, the keywords option in the program is permanently enabled. *See also Program Features, Keywords in for a discussion of this feature.*
- **Navigator Configuration.** The Navigator module is always running when the program suite is open. You can choose to “auto minimize” the module when it is launched. The program can be minimized to the task bar at the bottom of the window, or to the system tray located in the lower left corner of the window. If you choose not to minimize Navigator, the window will continually display on the monitor.
 - **Minimize Navigator to Tray.** Whenever you minimize the Navigator module, it will be placed in the system tray. Place a check in the box to enable this feature. When this feature is disabled, Navigator will be placed on the task bar whenever it is minimized.
 - **Auto-Minimize Navigator.** Navigator is automatically minimized at program launch when this feature is enabled. When it is disabled, you must minimize the Navigator window manually.

When you enable *Auto Minimize Navigator* but do not enable *Minimize Navigator to Tray*, Navigator will be placed on the task bar whenever it is minimized.

System List. The lower half of the *Admin* window contains summary information regarding all users currently available on the system.

	System Name	Modified	Modified By	Created	Created By
▶	Paint	1/16/2002 9:59:39 AM	dci	10/21/1999 12:32:56 PM	dci

- **System Name.** Identifies the name of the ingredient systems available.
- **Modified.** Displays the most recent date administrative information for the system was updated.
- **Modified By.** Identifies the User responsible for the changes to the administrative information.
- **Created.** The date the system was originally created.
- **Created By.** Identifies the user that created the system.

View System Details

Click on **View Details** to display the default system categories. System defaults are divided into five information tabs.

- **Colorimetric Selections.** These include color space and color difference equation selection; Illuminant/Observer selection; and metamerism index selection.
- **Material handling.** These settings control the display of ingredient information and include: weight, volume and density units; film thickness units; formula mode and formula form.
- **Industry.** These settings enable/disable specific program defaults, based on the industrial application. These include recycles, viscosity defaults, contrast ratio reports and gloss compensation.
- **User-Defined Labels.** Create custom field labels that appear in program windows. This includes labels used to identify ingredient types and forms, and automatic naming sequences used for jobs.
- **Measurements.** Default selections regarding instrument measurements.

NOTE

Default system selections can be overridden at various points in Formula Central, Ingredient Maintenance and Colorant Set Maintenance.

Colorimetry Tab

The selections on this tab are the default system settings for all colorimetric fields. These selections do not override selections in the job templates for Formula Central. Other program modules that require this information, such as Set Maintenance, use these defaults. They are referenced in Formula Central when no selection is made for the current job template.

The selections include a color difference equation and any factors required by the equation selected, Illuminant/Observer combination(s), metamerism index and any details associated with the index selected, among others.

The screenshot shows the 'Colorimetry' tab selected in a software interface. The tab is part of a larger window with other tabs like 'Material Handling', 'Industry', 'User Defined Labels', and 'Measurements'. The 'Colorimetry' tab contains several settings:

- Default Color Equation:** A dropdown menu showing 'CIELAB L* a* b* C* h'.
- Default Tolerance:** A dropdown menu with a small icon to its left.
- Factors for CMC (l:c):** Three input fields: 'l' with value 2.0, 'c' with value 1.0, and 'CE' with value 1.0.
- Factors for CIE94:** Three input fields: 'KL' with value 1.0, 'KC' with value 1.0, and 'KH' with value 1.0.
- Default Illuminant/Observers:** A section with five dropdown menus labeled 1 through 5. The second dropdown (2) is currently selected and shows a blue bar.
- Color Display Options:** A checkbox labeled 'Correct for Chromatic Adaption' which is currently unchecked.
- Decimal Places for Recursive Sorting:** A spinner control set to 0.

NOTES

- Default system selections can be overridden at various points in Formula Central, Ingredient Maintenance and Colorant Set Maintenance.
- When all changes are made to the fields in the window, press **OK**. If you do not, the changes will not be stored.

Default Color Equation. Identifies the color space coordinates and color difference equation to be used for color evaluations for all program modules.

NOTE

These selections are used by all program modules except Formula Central. The default selected here is used in Formula Central only when there is no color equation selected in the job template that is being used.

Default Tolerance. Not currently available in this version.

Default Illuminant/Observers. Identifies the default Illuminant/Observer selections used by Ingredient Maintenance and Colorant Set Maintenance. In those modules, color evaluations will be displayed for all Illuminant/Observer selections included here. You can select a maximum of 5.

NOTE

These selections are used by all program modules except Formula Central. The default selected here is used in Formula Central only when there is no Illuminant/Observer selected in the job template that is being used.

Decimal Places for Recursive Sorting. In Formula Central, formulas are sorted from best to worst, based on sort characteristics selected for the job (*Tools Menu, Job Preferences, Results Tab*). The program employs a recursive sorting method to sort the formulas, and the number of decimal places to use becomes important to the sorting function. This field defines the precision applied to the recursive sort. The default is 1. The program will not accept a zero (0), or a negative number.

See also Applications Technology, Sorting Options for a detailed explanation of the formula sorting options available in the program.

CMC Factors. If CMC is selected, additional factors must be defined for the equation. These are weighting factors applied to Lightness differences, Chroma differences and the overall color tolerance. Commonly used values for these defaults are:

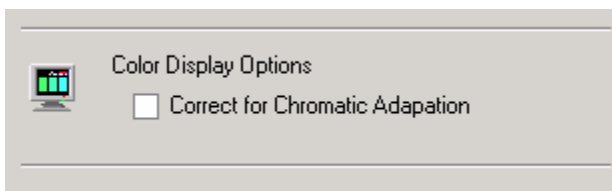
- **(l) Lightness.** Default value is 2.0.
- **(c) Chroma.** Default value is 1.0.
- **(CF) Commercial Factor.** Default value is 1.0.

This is the only place in the program where CMC factors are defined. When CMC is the color equation selected for an operation, the program looks here for the factors to use.

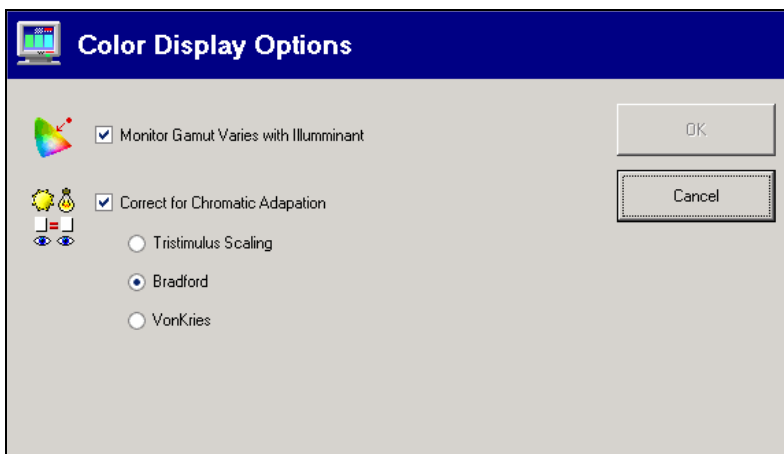
CIE 94 Factors. When the CIE 94 color difference equation is selected, additional factors must be defined for the equation.

- **KL.** Factor is applied to the Lightness value. Default value is 1.0
- **KC.** Factor is applied to the Chroma value. Default value is 1.0
- **KH.** Factor is applied to the Hue value. Default value is 1.0

Color Display Options. This group of options controls the display of sample colors on the monitor. The selections also determine the method for finding the closest color (RGB value) when the sample color falls outside the color gamut of the monitor.



Click the  icon to view the options. The following window displays:



Monitor Gamut Varies with Illuminant. When you change the Evaluation Illuminant/Observer selection, the RGB values for samples are calculated using the Evaluation Illuminant/Observer currently selected. When this is not enabled, the RGB values for "out of gamut" colors are calculated using D65/10 Illuminant/Observer condition.

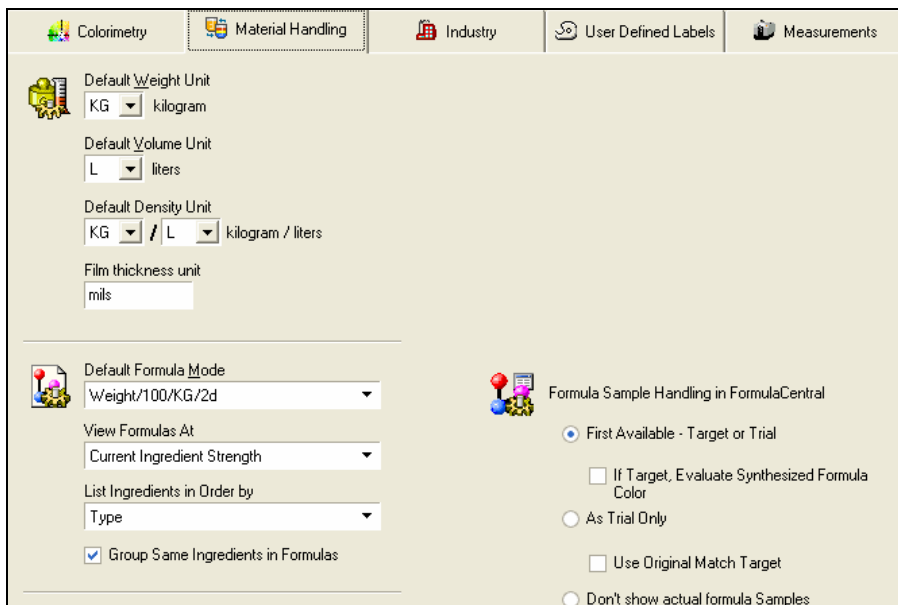
Correct for Chromatic Adaptation. Enabling this option preserves the white balance of the color displayed regardless of the Illuminant/Observer selected. When the option is not enabled and the illuminant is changed from Ill D65 to Il A, white samples often appear orange on the monitor. The remaining selections in this screen determine the factors used to balance the white point for the monitor.

- **Tristimulus Scaling.** Uses the XYZ values of the sample to find the closest RGB value.
- **Bradford.** Applies an additional factor to the transformation of the XYZ values to RGB values. Uses a different factor from the Von Kries equation.

- **Von Kries.** Applies an additional factor to the transformation of the XYZ values to RGB values. Uses a different factor from the Bradford equation.

Material Handling Tab

The settings on this tab control the handling of ingredient information for both formulas and samples.

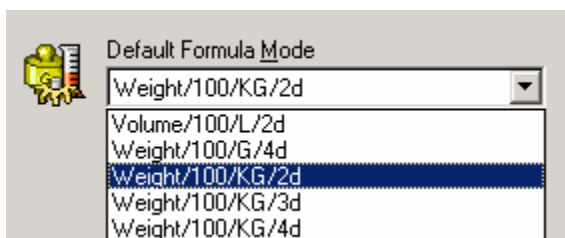


The screenshot shows the 'Material Handling' tab selected in a software interface. The tab bar at the top includes 'Colorimetry', 'Material Handling', 'Industry', 'User Defined Labels', and 'Measurements'. The main content area is divided into two sections. The left section contains settings for units: 'Default Weight Unit' (KG, kilogram), 'Default Volume Unit' (L, liters), 'Default Density Unit' (KG / L, kilogram / liters), and 'Film thickness unit' (mils). The right section is titled 'Formula Sample Handling in FormulaCentral' and contains several options: 'First Available - Target or Trial' (selected with a radio button), 'If Target, Evaluate Synthesized Formula Color' (unchecked checkbox), 'As Trial Only' (radio button), 'Use Original Match Target' (unchecked checkbox), and 'Don't show actual formula Samples' (radio button). Below the unit settings, there are three dropdown menus: 'Default Formula Mode' (Weight/100/KG/2d), 'View Formulas At' (Current Ingredient Strength), and 'List Ingredients in Order by' (Type). A checkbox 'Group Same Ingredients in Formulas' is checked.

NOTES

- Default system selections can be overridden at various points in Formula Central, Ingredient Maintenance and Colorant Set Maintenance.
- When all changes are made to the fields in the window, click **OK**. If you do not, the changes will not be stored.
- **Default Weight Unit.** Identifies the system default unit used for all formulas expressed in weight. The default is used whenever a weight unit is required, and no option exists to enter a selection. This selection can be changed from the grid in Formula Central. Click the down arrow to view the choices, and highlight your selection.

- **Default Volume Unit.** Identifies the system default unit used for all formulas expressed in volume. The default is used whenever a volume unit is required, and no option exists to enter a selection. This selection can be changed from the grid in Formula Central. Click the down arrow to view the choices, and highlight your selection.
- **Default Density Unit.** Identifies the default unit for all formulas expressed in density. The default is used whenever a density unit is required, and no option exists to enter a selection. This selection can be changed from the grid in Formula Central. Click the down arrow to view the choices, and highlight your selection.
- **Film Thickness Unit.** Identifies the unit associated with film thickness expressions. This is a label than you can customize, and it cannot be changed anywhere. Enter the name of the film thickness unit. You can use a maximum of 50 characters
- **Default Formula Mode.** Identifies the system default for the formula mode. The default is used whenever a formula mode is required, and no option exists to enter a selection.



See also *Edit Formula Modes* for instructions to create or edit a formula mode.

Reading the Default Notations. The notations for the default formula modes that ship with the program are read as follows:

- **Weight.** Identifies the formula mode (e.g., weight or volume units).
- **100.** In some cases, the ingredient amount is actually a proportion based on a fixed amount of a second mode. In the examples above, the options include weight/100 liters, weight/100 grams, weight/100 kilograms, etc. This term identifies the number of units in the second formula term used.
- **L/G/KG.** Identifies the second mode used in the notation. In some cases, the proportion expressed combines different modes. For example, a density expression includes a *weight* and *volume* unit; i.e., grams/liter.

- **2d.** Identifies the precision of the ingredient amounts in the formula. For example, “2d” indicates the precision will be 2 decimal places. “3d” indicates the formula will include 3 decimal places, etc.

NOTE

The default formula mode is strictly a label. The formula mode used can be changed in the Formula Central grid at run time.

- **View Formulas At.** This option determines whether a displayed formula has been calculated based on the standard strength of the colorant, or based on the strength of the individual lot used in the formula.
 - **Current Ingredient Strength.** Formula displayed is based on the strength of the lot of colorant being used. This information is found in Ingredient Maintenance.
 - **Standard Ingredient Strength.** Formula displayed is based on the standard strength of the colorant (100%).
- **List Ingredients in Order By.** Controls the order in which the ingredients in a formula are displayed in the grid.
 - **User Ranking.** If ranks have been assigned to ingredients, the ingredients in the formula will be displayed in ascending order based on rank.
 - **Ingredient Type.** All ingredients are assigned an ingredient type. The ingredients in the formula are sorted based on ingredient type.
 - **Amount.** Ingredients are sorted based on the individual amounts used in the formula. They appear in descending order.
 - **Alpha by Name.** Ingredients are sorted based on the alphanumeric characters used in the name. The order is numbers (1-9) followed by letters (A-Z).
- **Group Same Ingredients in Formulas.** When formulas include ingredients that are expanded one level, the same solvents, resins and/or thinners may appear several times in the formula. For example, “Solvent Blend” may be used with red paste, green paste and black paste. When this option is enabled, “Solvent Blend” will only appear once in the formula. When the option is disabled, “Solvent Blend” displays three times.

							
1	Flex Yellow Paste			1.9894	KG		▼
4	Flex Blue Paste			1.1698	KG		▼
5	Flex Violet Paste			1.8608	KG		▼
20	Flex Clear Paste			44.9800	KG		▼
30	Solvent Blend			50.0000	KG		▼
	Total Batch			100.0000	KG		▼

			
1	Flex Yellow Paste	1.9894	KG
4	Flex Blue Paste	1.1698	KG
5	Flex Violet Paste	1.8608	KG
7	Flex Clear	89.9600	KG
30	Solvent Blend	1.9893	KG
30	Solvent Blend	1.1698	KG
30	Solvent Blend	1.8608	KG
Total Batch		100.0000	KG

- **Formula Sample Handling.** This group of options instructs the program regarding the use of formula information in Formula Central, when the information is recalled from the database.

See also Applications Technology, Formula Storage and Retrieval, Formula Sample Handling for a detailed explanation and tips on this feature.

- **Formula Sample Handling First Available.** The sample measurement data retrieved with the formula is placed in the first field available, Target or Trial.
 - **Target Field Empty.** When the *Target* field is empty, the sample data in the formula record is always assigned to the Target. This method is frequently used when the formula and sample data represent an actual production standard, and a new lot of the same product is being prepared. You can quickly display an evaluation of the two samples, and run a correction for the batch that is in process. In this situation, the correction typically involves a small adjustment to the original formula.
- **If Target, Evaluate Synthesized Formula Color.** When *First Available* is selected, and the *Target* field is empty, the stored data is placed in the Target field. Although there is no *Trial* sample, a color difference is displayed in the Evaluation Window. When this option is enabled, the color difference is the difference between the Target and the synthesized formula. When it is disabled, no color difference is displayed.

TIP

This feature can be used to detect formula input errors. If you retrieve a formula and a large color difference is displayed, you should check that the stored formula is correct.

- **Target Field Occupied.** When Target data already exists, the sample data from the formula record is placed in the Trial field. A new sample can be measured as the Target, and the sample retrieved with the formula becomes the Trial. An “as is” color difference is displayed immediately, and you are ready to run a correction. The correction will modify the stored formula to match the new target, and may change the original formula significantly.

NOTE

First Available provides you the most flexibility to set up the conditions you need at run time. You simply provide either Target or Trial data before you recall the formula, based on the current task.

- **As Trial Only.** The sample data stored with the formula is always used as the trial. When this option is selected, you will always be running a manual Search & Correct when you retrieve a formula by name.
 - **Use Original Match Target.** When *Trial Only* is selected, you must still provide target data. This option directs the program to place the original match target data in the target field. When you select this feature, you are repeating the original sequence used to generate the formula.

This can be helpful if you want to compare the differences between a master standard and a working standard. The master sample data is stored with the formula and recalled as the Target. The working standard is measured as the Trial. The formula used for both remains the same, until you run a correction.

- **Don't Show Actual Formulas.** When selected, no data is assigned to either the target or trial fields. Only the formula (including formula name) is recalled, and is displayed in the Formula Grid.

TIP

If you are only interested in printing a batch ticket containing the formula, you may want to exclude the sample information.

Industry Tab

The selections on this tab become the default setting for fields that are industry-specific.

The screenshot shows the 'Industry' tab selected in a software interface. The tab is part of a larger window with other tabs like 'Colorimetry', 'Material Handling', 'User Defined Labels', and 'Measurements'. The 'Industry' tab contains several settings:

- Use Viscosity Calculations:** Checked. A dropdown menu shows 'Multi-Level'. Below it, 'Viscosity Unit' is set to 'secs'.
- Enable Concentrate Scaling:** Unchecked. Below it, 'Express Concentration as' is set to 'Percent of Resin (Concentrate / Resin)'.
- Use Recycle:** Unchecked.
- Enable Substrate Use:** Checked. Below it, 'Min. CR for Visual Opacity' is set to '99.00' with a unit of 'CR'.
- Enable Diffuse Transmission:** Checked. Below it, 'Min. DCT for Visual Opacity' is set to '90.00' with a unit of 'DT'.
- Enable Gloss Compensation:** Checked. Below it, 'Default Gloss Value' is set to '0.0' with a unit of 'G'.

NOTES

- Default system selections can be overridden at various points in Formula Central, Ingredient Maintenance and Colorant Set Maintenance.
- When all changes are made to the fields in the window, press **OK**. If you do not, the changes will not be stored.

Use Viscosity Calculations. Activates viscosity options. Place a check in the box to enable the option. Remove the check to disable the option.

Viscosity Calculations. *Not currently available in this version.* This option enables the display of information regarding the solvent (thinner) included in a formula. When it is disabled, no information about the solvent is included in a formula.

Viscosity Unit. A customized label for the units used.

Concentrate Scaling. The field enables/disables the concentrate scaling features used in plastics applications.

Enable Concentrate Scaling. Activates the concentrate scaling options. Additional ingredient subtotals displays in the formula grid.

Express Concentration As. In the plastics concentrate industry there are 3 different methods commonly used to express the colorant load. They are:

- **Ratio Resin:Concentrate.** Enter the ratio of resin-to concentrate. For example, in a 100 gram batch, 1 part of dry pigment is combined with 99 parts of resin. The expression is 99:1.
- **Percent of Resin (concentrate/resin).** If you combine 1 part concentrate and 100 parts of resin, the batch total is 101. The percent of concentrate is 1/100 or 1%.
- **Percent of Total (concentrate/total).** If you combine 1 part concentrate and 99 parts resin, the batch total is 100. The percent of total is 1/100 or 1%.

Recycles. This field enables the Recycles options throughout the program. The Recycles options in Formula Central and Set Maintenance are not available until this option is enabled.

- Click in the box to place a check, and *enable* the Recycle options.
- Click in the box a second time, to remove the check and *disable* all Recycle options.

See also Applications Technology, Recycles for a detailed discussion of the Recycles feature.

Enable Substrate (always enabled). Enables the use of a substrate.

Minimum CR Value for Visual Opacity. Enter a contrast ratio value that defines opacity for your application. When the CR of the target is greater than this value the sample is considered opaque, and the program will drive to a match using the CR entered in this field, rather than the measured CR.

Diffuse Transmission. Some translucent applications require both a reflectance and transmittance measurement (ROL/T). These are considered diffuse transmission applications.

Min DCT for Visual Opacity. When working with translucent samples using both reflectance and transmission measurements, a measurement of the transmission opacity is required. It is based on the transmission measurement alone, and is referred to as DCT. When the DCT of the target is greater than this value, the sample is considered opaque, and the program will drive to a match using the DCT entered in this field, rather than the measured DCT.

Gloss Compensation. Enables the use of gloss compensation features in all of the Datacolor MATCH^{PIGMENT} program modules. This feature is selectively enabled/disabled in each program module. However, if gloss compensation is not enabled system-wide through this option, you will not be able to enable/disable it in the individual program modules.

Default Gloss Values. Gloss values are specified using a particular viewing geometry. In these fields you identify the target gloss value and the viewing geometry (gloss meter) to be used.

User Defined Labels Tab

The tab provides the option to customize labels that appear in Formula Central, Ingredient Maintenance and Colorant Maintenance.

Default Label		Label To Use	
\$		\$	
Auxiliary		Auxiliary	
Base		Base	
Batch		Batch	
Black		Black	

Automatic Naming Seeds

 Job	Serial Number	6	☐ Append Target Name
 Trial Sample	Serial Number		☐ Append Target Name
 Predicted Formula	Serial Number		☐ Append Target Name
Trial Formula	Trial Name		
Corrected Formula	Trial Name		

NOTES

- Default system selections can be overridden at various points in Formula Central, Ingredient Maintenance and Colorant Set Maintenance.
- When all changes are made to the fields in the window, press **OK**. If you do not, the changes will not be stored.

Creating and Editing Labels. The fields below are used for customizing the field labels that appear in the program.

This feature allows you to customize the program to display terms that are commonly used in your application.

- **Default Label.** Any term that displays under “Default Label” can be customized. To change the label, click in the *Label to Use* cell opposite the *Default Label*:

Default Label	Label to Use
Auxilliary	Other
Form(0) No Component Expansion	Ready-To-use
Form(1) Expanded One Level	Paste
Form(n) Fully Expanded	Dry
Product	Paint
Consumption	Coverage
Viscosity	Viscosity
*	

- **Label to Use.** Enter the term to be substituted for the default term. For example, in the list above there is a default label, *Auxiliary*. In the example below, the corresponding *Label to Use* is being edited to *Additive*.

Default Label	Label to Use
Base	White Base
Recyle	Waste
 Auxilliary	Additive
Form(0) No Component Expansion	Ready-To-use
Form(1) Expanded One Level	Paste
Form(n) Fully Expanded	Dry
Product	Paint
Consumption	Coverage

Wherever the word “auxiliary” displays in any program module, it will now be replaced with “additive”.

Automatic Naming Seeds. The fields below are used for customizing the default names assigned to targets, trials and formulas.

This group of selections controls the labels that appear in Formula Central for jobs, trial samples and formulas.

Automatic Naming Seeds

	Job Job	+	Serial Number 75	+	☐ Append Target Name
	Trial Sample Trial	+	Serial Number	+	☐ Append Target Name
	Predicted Formula Prediction	+	Serial Number	+	☐ Append Target Name
	Trial Formula Formula For	+	Trial Name		
	Corrected Formula Correction For	+	Trial Name		

- **Job.** Enter the name you want to assign to jobs that are run.
 - **Serial Number.** A number can appear as part of the job label. The program will number each job sequentially as part of the job name. The starting job number is entered into this field. *The serial numbering series defined here is used for the job, trial sample and predicted Formula serial numbers.*
 - **Append Target Name.** The *Target Name* is added to the end of the job name. Click to place a check in the box to enable this option. To disable this feature, click to remove the check.
- **Trial Sample.** Enter the name you want to assign to trial samples.
 - **Serial Number.** A number can appear as part of the trial label. The program will number each trial sequentially as part of the trial name. The starting job number is entered into this field. *The serial numbering series used is defined by the job serial number.*
 - **Append Target Name.** The *Target Name* is added to the end of the job name. Click to place a check in the box to enable this option. To disable this feature, click to remove the check.
- **Predicted Formula.** Enter the name you want to assign to formulas displayed and stored with the job. *See also View Menu, Multi-Formula Display, Display Fields for additional information on formula displays.*
 - **Serial Number.** A number can appear as part of the predicted formula label, and the program will number each formula sequentially as part of the name. The starting number is entered into this field. *The serial numbering series used is defined by the job serial number. The serial numbering series defined for the target is also applied to the job, trial sample and predicted formula.*

- **Append Target Name.** The *Target Name* is added to the end of the formula name. Place a check in the box to enable this option, and remove the check to disable it.
- **Trial Formula.** Enter the name to be assigned to trial formulas.
 - **Trial name.** The *Trial Name* will be included in the trial formula name.
- **Corrected Formula.** Enter the name to be assigned to corrections.
 - **Trial Name.** The *Trial Name* will be included in the corrected formula name.

Measurements Tab

This tab includes selections to be used when measurement averaging is enabled, and when it is applied to tolerancing limits (auto tolerancing).

Default Measurement Method. Identifies the type and number of measurements made of each sample. Five methods are available:

See also Applications Technology, Sample Types for a detailed discussion of the application of each of these measurement methods.

Single Measurement. A single measurement is used to represent the sample. The sample can be transparent, translucent or opaque, and the spectral data can be either reflectance or transmittance. Regardless of the sample opacity or type of data generated, the data is based on a single measurement.

For translucent applications you are required to make two measurements of each mixture sample. One measures the color over a light background (“over light”), and the second measures the color over a dark or contrasting background (“over dark”). There are several different measurement methods available to complete the measurements required for translucent applications.

Over Light and Dark (ROL/ROD). The sample is prepared over a contrasting background, typically a black/white contrast card. The program prompts you for 2 reflectance measurements, “measurement over light” and “measurement over dark.”

NOTE ABOUT ROL/ROD

This approach assumes that you have sufficient process control to insure that the film thickness is constant for both measurements.

Reflectance and Transmission (R/T). Some translucent applications (primarily translucent plastics) make use of both reflectance and transmittance measurements of the samples. When this option is used, the first measurement is a normal reflectance measurement. The second is a transmission measurement, placing the normal white standard at the instrument port.

Over Light and Black Trap or Open Port. This approach uses two transmittance measurements. The first measurement is a normal transmittance measurement, made with the white tile at the port. The second is a transmission measurement made using either an “open” (sample) port, or a black trap placed at the sample port.

Opaque and Over Dark (ROO/ROD). This method uses two reflectance measurements. The first mixture measured is an opaque mixture, and the second is a translucent mixture presented over the dark background. Opaque colorant sets are typically limited to considering color-only when calculating formulas. However, this option can be used to expand the capability of an opaque colorant set to consider color and opacity. *See also Applications Technology, Color Matching with White for a detailed discussion of the requirements to match color and opacity.*

NOTES ABOUT ROO/ROD

- The opaque mixture is achieved by increasing the film thickness until the sample is opaque. A contrast ratio can be used to determine opacity.
- The “over dark” sample should not be opaque.
- The ‘over dark’ mixture should be prepared at the nominal film thickness for the set.

- This method is used as to convert a relative (opaque) set to an absolute file. Information about the pigment content and the film thickness of the ROD sample are required to convert the sample.

Automatically Store to Folder (data storage defaults). This group of options instructs the program regarding the data to be stored separately from the job record. For example, you may want to use the target, trial or substrate data for QC evaluations. If you do not store the data separately in a folder, the sample data will not be easily accessible. If you delete the job, you will no longer have a record of the sample data.

– Automatically store to folder: _____

☒ Target Samples

☒ Trial Samples

☒ Substrate Samples

☐ Only automatically store Samples when storing a Formula

Place a check in any of the boxes to automatically store the sample information separately, each time a sample is entered. Remove the check to disable the option.

NOTE

If you disable these storage options, the information will still be automatically stored with the job. You can also use the *Save As* option in Formula Central (*Formula Central, File Menu, Save As*) to store the samples manually into a folder.

Target Samples. Each time a target is entered into Formula Central, it is saved as a sample in a separate folder.

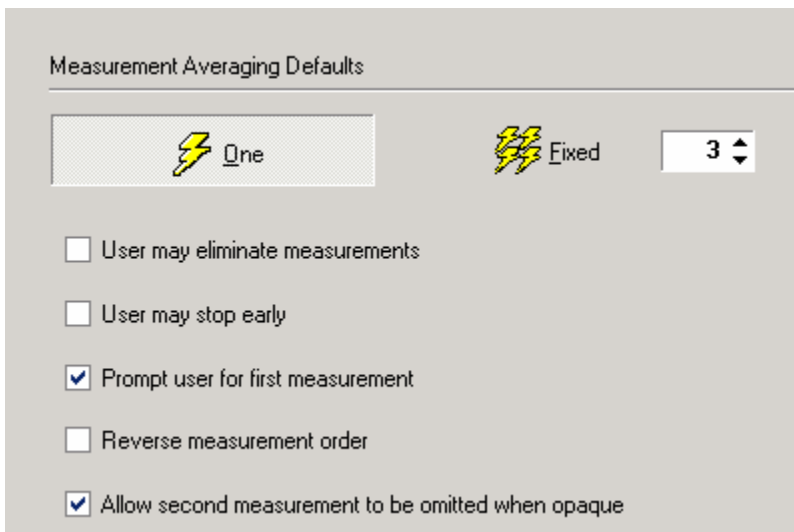
Trial Samples. Each time a trial is entered into Formula Central, it is saved as a sample in a separate folder.

Substrate Samples. Each time a substrate is entered into Formula Central it is saved as a substrate in a separate folder.

- **Only automatically store samples when storing a Formula.** The sample storage selections made above, are only applied when you store a formula to the database (Formula Central).



Measurement Averaging Defaults. This group of options instructs the program regarding the use of measurement averaging.



One/Fixed (Number of Scans). You have the option to perform a single scan on a sample, or to make a series of scans, and then average them. Measurement averaging is commonly used for samples with irregular surfaces.

Click on the button representing the number of measurements to average for a single sample.

- **One.** All sample measurements will be based on a single scan of the sample.
- **Fixed.** For each sample measurement, multiple measurements are made, and the measurements are averaged. The same number of measurements is used for every sample. Enter the number of scans to be completed for each measurement.

User may eliminate measurements. The user may selectively exclude measurements included in the average. This is useful when you are averaging measurements and suspect that an individual measurement is 'bad'. It is applied to both *Fixed* and *Auto Target* options. *If you exclude a measurement, the program will prompt you for a measurement to replace it. This setting can only be edited from System Administration.*

User may stop early. Offers the user the option to terminate the measurement sequence before the total number of specified measurements is made. The program will average the measurements completed, to produce a spectral curve. It is applied to both *Fixed* and *Auto Target* options.

Prompt User for first measurement. When measurement averaging is enabled, the user will always be prompted for the first measurement.

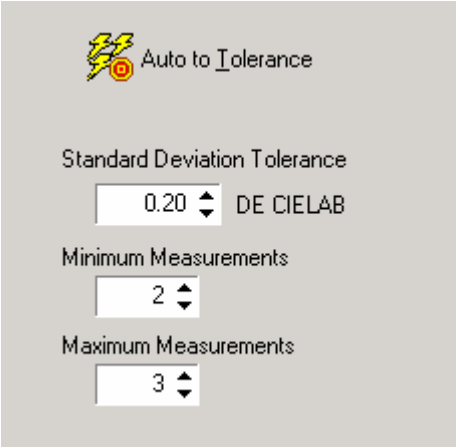
Reverse measurement order. When the sample type being measured requires two measurements (over light and over dark), the order of sample measurements is reversed. The “over dark” measurement is first, followed by the “over light” measurement.

Allow second measurement to be omitted when opaque. If the sample type being measured normally requires two measurements, the second measurement can be skipped when the sample is opaque.

Measurement Tolerancing

When measuring samples that are not uniform, you can use these options to determine how many scans are required to produce a valid measurement. To use this option, you must specify a tolerance, a minimum and maximum number of scans.

The options below are used for the Auto to Tolerance feature:



Standard Deviation Tolerance. Enter a color difference tolerance that represents an acceptable deviation in the measurements. The program will make the first scan, the standard. For each subsequent scan, the program will calculate the color difference between the composite measurement and each individual measurement. The standard deviation is calculated as follows:

Measurement #	DE Std. Deviation
Measurement #1	-----
Measurement #2	Average #1 and #2 and compare to #1 Average #1 and #2 and compare to #2
Measurement #3	Average #1, #2, #3 and compare to #1 Average #1, #2, #3 and compare to #2 Average #1, #2, #3 and compare to #3

When the standard deviation of the color differences for a group of measurements falls below the value entered into this field, it will no longer prompt you for a measurement.

NOTE

The total number of scans required to achieve the specified standard deviation will vary from one sample to another.

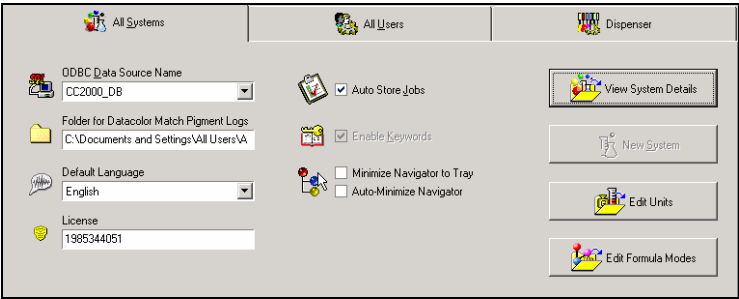
Minimum Measurements. Enter the minimum number of measurements to be made when *Auto to Target* feature is enabled. The program will prompt for this number of measurements, regardless of the calculated standard deviation.

Maximum Measurement. Enter the maximum number of measurements to be made when *Auto to Target* feature is enabled. The program will stop prompting for measurements when this number is reached, regardless of the calculated standard deviation.

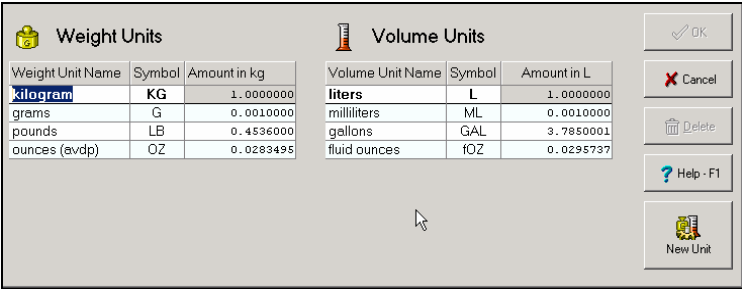
Edit Units

The program allows you to customize the labels for the units used in the formulas. Standard units such as grams, pounds, liters, gallons, etc. are included as defaults, but you can customize the unit expression to your needs. You provide a conversion factor that allows the program to convert the formulas to your custom unit.

This feature is accessed through *Admin, All Systems, Edit Units*.



The window below displays:



The window displays the weight and volume units currently available for use. You can edit existing units, or create a new unit.

Weight Units	Volume Units
Weight Unit Name. Enter the name you want to use.	Volume Unit Name. Enter the name you want to use.
Symbol. Enter the symbol to be used for the unit.	Symbol. Enter the symbol to be used for the unit.
Amount in kg. Enter the number of custom units contained in 1kg of material.	Amount in L. Enter the number of custom units contained in 1 liter of material.
New Unit. Click on this button to add a new unit to the selection. You will be asked to identify the unit type (weight or volume). Complete all of the information required.	

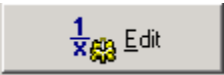
When you have completed the entry, click **OK**.

If you routinely use the new unit, you can make it the default unit for the system. See *Admin, All Systems, View Details, Material Handling* for instructions to edit the system unit.

Edit Formula Modes

This option allows you to customize formula modes. You can customize the name, and the unit expression to be used.

This option is also used to create/edit fractional part expressions. You can only create a single setup for fractional parts output. This option is accessed by clicking on the fractional parts icon.



This option is used almost exclusively by the coatings industry. See also *Applications Technology, Fractional Parts Output* for step-by-step instructions to enable fractional parts output.

NOTES

- After you have made your selections, click **OK**. The changes made here will not be enabled in any of the program modules immediately. You must log off Datacolor MATCH^{PIGMENT}, and restart the program for the changes to take effect.
- For ingredient units, the only requirement is that you can convert the unit to an equivalent standard unit, such as kilograms, gallons, etc.

This feature is accessed through **Admin, All Systems, Edit Units**.

When **Edit Formula Modes** is selected, the window below displays:

Formula Mode Name	Fixed Type	Fixed Amount
Weight/100/KG/2d	Batch	100.00
Volume/100/L/2d	Batch	100.00
Weight/100/KG/3d	Batch	100.0000
Weight/100/G/4d	Batch	100.0000
Weight/100/KG/4d	Batch	100.0000
fp gal and oz	None	

You must define a name for the mode. You can also fix the amount used for particular ingredient type or ingredient total.

- **Name.** Enter the name for the formula mode.
- **Fixed Type.** You can fix an amount for a particular ingredient type in the formula. Click on the down arrow to view the choices, and highlight a selection. If there is no fixed ingredient type required, select *None*.
- **Fixed Amount.** If you are fixing an ingredient type or total, enter the fixed amount in this field.

All Users Tab

This tab provides access to options used to create, modify and delete Users from the system. The program is initially configured for a single user. The options on this tab are used to create additional users, and to customize the settings for each of the users. The selections include:

- Login name, user identification, creation and modification dates for each user.
- Default folder, job template, and language for each user.
- Selection of the program module that is automatically opened at startup.

NOTE

When all changes are made to the fields in the window, press **OK**. If you do not, the changes will not be stored.

Admin	Login Name	Full Name	Modified	Modified by	Created	Created by
	User	User Full Name	2/5/2004 2:39:38 PM	dci	2/28/2001 5:53:18 PM	dci

User Settings

Datacolor Match Pigment User Settings

☒ Datacolor Match Pigment users have individual profiles

☐ All Datacolor Match Pigment users share the same profile

- **Datacolor MATCH^{PIGMENT} users have individual profiles.** When this option is enabled, each user can have a profile tailored to the specific use. This includes defaults for the location of data folders, job template, and program module to be launched when the user logs in.
 - Click in the radio button to enable this option.
 - Click again to disable this option.

- **All Datacolor MATCH^{PIGMENT} Users Share Same Profile.** When this option is enabled, the same login/user profile is assigned to all users. Click in the radio button to enable this option. Click again to disable this option.
- **Write all login/logout activity to a log file.** The program provides the ability to track the activity of all system users. This can be helpful in troubleshooting system problems and/or color matching problems. When this option is enabled, a file called **cclogin.log** is created. The location of the folder is defined in the All Systems window. This file expands as new login activity is recorded. To enable the option, click to place a check in the box. Click again to remove the check, and disable the option.

User List. At the bottom of the All User's window is a list of all of the user profiles currently stored.

Admin	Login Name	Full Name	Modified	Modified by	Created	Created by
	User	User Full Name	1/29/2002 3:04:13 PM	dci	2/28/2001 5:53:18 PM	dci

The fields summarize the profile information for each user.

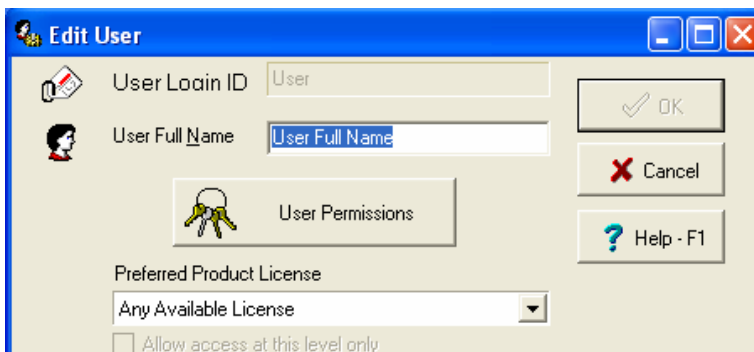
- **Admin.** Identifies whether the user has administrator rights.
- **Login Name.** Identifies the user login.
- **Full Name.** Identifies the user.
- **Modified.** Identifies when the user profile information was last modified.
- **Modified By.** Identifies the user that made the last modification.
- **Created.** Identifies the date and time the user was created.
- **Created by.** Identifies the user that created the profile.

View Details

This button provides access to details regarding the login, password and program configurations for an individual user. This option is also used to configure the data security feature.

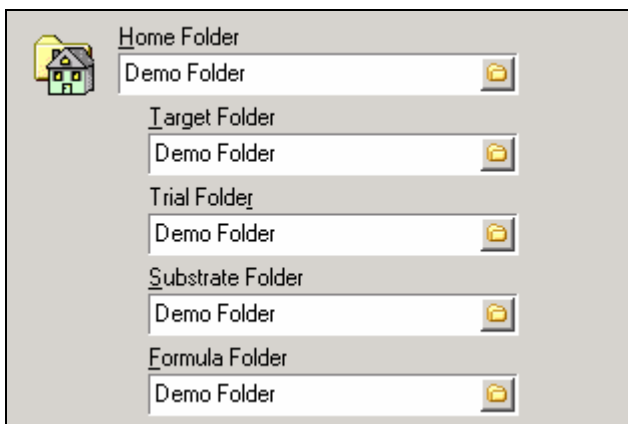
The user is selected from the User List at the bottom of the window. Highlight the user information to be viewed, and click on the **View Details** button.

User Login, Password and Licensing



- **User Login ID.** The login entered when the user launches the program. It should meet the following requirements:
 - The user login cannot be the same as the password
 - The login ID should have 3-25 characters
 - Use only alpha-numeric characters in the login
- **User Full Name.** This field is used simply for identification purposes. There are no restrictions on the input to this field.
- **User Permissions.** This selection opens the program options for creating Users and user groups. *See also Applications Technology, Data Security for a detailed explanation for creating, editing and deleting users and user groups.*
- **Preferred Product License.** The program features available to the user are divided into several different “levels”, and require specific licenses. Depending on the license purchased, one user may only have access to Formula Central for matching and correction, while another may have access to Set Maintenance and Admin. The licenses are assigned to the user. This field identifies the license assigned to the user.
- **Allow access at this level only.** Allows a single user to access different program levels. If the preferred product for the user is identified as a workstation, but the only “seat” available at the time of login is a full user, the program needs to know if the user may be allowed to run that licensing level. When this field is enabled, the user can only have access to the licensing level identified in the *Preferred Product License* field.

User Folders



Home Folder
Demo Folder

Target Folder
Demo Folder

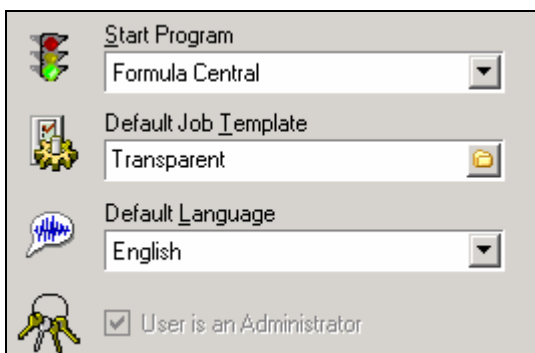
Trial Folder
Demo Folder

Substrate Folder
Demo Folder

Formula Folder
Demo Folder

- **Home Folder.** Identifies the default folder for the user. This will be the default location used to store jobs, job templates and formulas for this user. The user can override this location when the information is stored.
- **Target Folder.** All targets stored by this user will be stored to this folder. The user can override this folder designation at run time. Different target folders can be identified for different users.
- **Trial Folder.** All trials stored by this user will be stored to this folder. The user can override this folder designation at run time. Different trial folders can be identified for different users.
- **Substrate Folder.** All substrates stored by this user will be stored to this folder. The user can override this folder designation at run time. Different substrate folders can be identified for different users.
- **Formula Folder.** All formulas stored by this user will be stored to this folder. The user can override this folder designation at run time. Different formula folders can be identified for different users.

Additional User Selections



Start Program
Formula Central

Default Job Template
Transparent

Default Language
English

☒ User is an Administrator

- **Start Program.** Identifies the program module to be launched when the user accesses Datacolor MATCH^{PIGMENT}. Depending on the work requirements, this can vary from one user to another. For example, one user may only use Formula Central, another may be responsible for system security, and a third may be dedicated to creating and updating colorant and/or ingredient information.
- **Default Job Template.** Identifies the job template automatically used to create jobs for the user. The selections made in the job template can be customized to the work done by the user, and each user profile can have a different job template selected as the default. The user can override this selection in Formula Central.
- **Default Language.** The program is translated into several languages, and different languages can be activated for different users. Select the language to be loaded for this user. *This selection does not control the language displayed in the login window.*
- **User is an Administrator.** Identifies whether the user has administrator privileges. A user designated as “administrator” has full rights to run all program modules, and to edit data in them. Users that are not administrators do not have access to Ingredient Maintenance, Set Maintenance, System Admin, or Import program modules.

New User

This button creates a new user profile. *See also Applications Technology, Data Security, Create a User for an explanation of the procedure to create a new user.*

Dispenser Tab

This tab controls the default settings used to dispense formulas. This includes the selection of the unit dispensed, batch size, etc.

The screenshot shows the 'ChromaCalc Global Settings' window with the 'Dispenser' tab selected. The window has a title bar with 'ChromaCalc Global Settings' and standard window controls. Below the title bar is a menu bar with 'Help'. A tabbed interface at the top shows 'All Systems', 'All Users', and 'Dispenser' (which is active). The main area contains two columns of settings:

- Left Column:**
 - Dispense Unit: A dropdown menu showing 'IOZ'.
 - Can Size Label: A text input field.
 - Batch Size Unit: A dropdown menu showing 'GAL'.
 - Default Batch Size: A text input field showing '1.0000'.
 - ☒ Use Variable Batch Size
- Right Column:**
 - Fractional Part: A text input field showing '48'.
 - Part Denominator: (1 = None ; 2 = Half Part) - A text input field showing '1'.
 - Fractional Delimiter: A text input field.
 - Shot Delimiter: A text input field.

This tab is empty when a dispenser is not connected.

Fields on the Dispenser Tab

Dispense Unit. Identifies the mode of the formula being dispensed. The units must be defined in Admin to be available here. *See also System Administration, Edit Units.*

Can Size Label. Identifies the size of the container. *For some dispensers, this information is used to determine if the formula will fit the can.*

Batch Size Unit. Identifies the total formula amount.

Default Batch Size. Batch size used for dispensed formulas. It is commonly the same as the can size.

Use Variable Batch Size. The formula produced by Formula Central may not match the batch size required by the dispenser. A check in the box enables the feature.

- When this feature is enabled, the formula displayed in Formula Central is dispensed.
- When this feature is disabled, the formula is converted to equivalent amounts, based on the selections in this tab.

Fractional Parts Output. The fields below are used to configure fractional parts output. *See also Applications Technology, Fractional Parts Output for a complete explanation of this option.*

- **Fractional Part.** Identifies the fractional part to be used.
- **Part Denominator.** Determines how the dispenser will treat an ingredient amount that is less than $\frac{1}{2}$ of the fractional part identified. 1 = not displayed, 2 = displayed
- **Fractional Delimiter.** When using fractional part notation, this character is used to identify the fractional part. For example, in trade sales paint applications, it is common to use the notation “Y”.
- **Shot Delimiter.** Label used for the half-fractional part.

Navigator

Overview

Data Navigator is a program module that provides centralized access to the data used by Datacolor MATCH^{PIGMENT} and Datacolor TOOLS. It is similar to the Windows Explorer feature found on all Windows-based computers. From Data Navigator, the user can access individual data objects including samples, standards, batches, formulas, jobs, substrates, etc. It includes powerful sorting and filter functions to allow quick retrieval of records from large databases. Navigator also offers data management options for creating, storing, editing, deleting and exporting data objects created and used by both programs.

Data Navigator also provides access to all of the modules in the Datacolor MATCH^{PIGMENT} program suite (i.e., Formula Central, Ingredient Maintenance, Colorant Set Maintenance and System Administration), and to a companion product, Datacolor TOOLS, used for color QC evaluations.

Data Navigator is automatically launched as part of the login procedure.

What is a data object? A data object is a data component needed to run Datacolor MATCH^{PIGMENT}. The data objects used by Datacolor MATCH^{PIGMENT} include:

-  **Sample.** A sample record that includes a name and a set of measurement data that describes the color quantitatively.
-  **Standard.** A sample record that is specifically identified as a standard.

-  **Batch.** A sample record that is specifically identified as a batch.

NOTE

When working with Datacolor TOOLS, the program requires the record containing sample information to be labeled as either a *standard* or *batch*. It does not recognize the data record labeled *Sample*, that is created by Datacolor MATCH^{PIGMENT}.

-  **Substrate.** A sample record that contains measurement data for a substrate sample. For translucent applications, the program needs this data to identify the color contribution of the background used.
-  **Formula.** A record that includes ingredient information for a single formula, and a measurement of the sample produced using the formula.
-  **Job.** Contains all instructions and data used to complete matching and correction activities. It includes sample and ingredient information, software settings, tolerances, screen configuration, etc. It contains all sample data used, and all formula predictions that were generated while the job was processed.
-  **Job Template.** Contains information and instructions need to start a job. This can include software settings, tolerances, screen configuration, ingredient information, etc. However, unlike a job, it does not typically include any job-specific data such as sample information. Job templates are used to guide the user through the matching and correction process, and can be re-used.
-  **Queue.** A queue is a job that contains matching and correction information for multiple target samples. The information includes target name and spectral data, job requirements defined by a job template, and ingredients to be used. A queue can be in one of two states: *Ready* and *Complete*.
 - **Ready** indicates that all of the information to run the queue has been stored. You can retrieve a queue labeled *Ready*, and match it at your convenience.
 - **Complete** indicates that the queue has been processed and formula results are available for your review. You can open a queue labeled *Complete*, and review the results.
- **Schedule.** A schedule is a tool that incorporates several job templates into a single queue. By considering multiple job templates, the *Schedule* feature automates the use of different templates (strategies) to achieve specific colorimetric and non-colorimetric requirements for the jobs in the queue

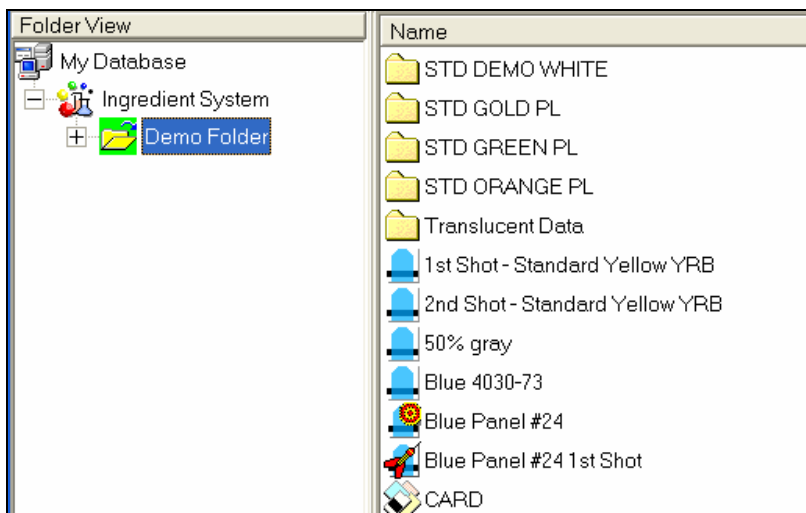
Each data object is an individual record, and the program typically requires several objects to execute a particular user request. For example, to perform a color match in Formula Central the program needs a sample, and a job template. Depending on the requirements of the task, the program may need additional data objects, such as

substrate information, additional sample data (e.g. trial data to perform a correction, etc.).

How Fast Are Records Retrieved? The time it takes to retrieve data from the database depends on the number of times that a particular folder is accessed. The first access of a folder will represent the slowest time to display. Subsequent access will be much faster since the data is cached when the folder is accessed.

Default Folders

Default data is provided with the program to allow you to begin using it immediately. This data is stored in several default folders that are created.



NOTE

Colorant and ingredient data can only be viewed through the program modules, Ingredient Maintenance and Colorant Set Maintenance. Standards, batches, samples, substrates, jobs, job templates and formulas can be viewed from the Navigator.

- **Demo Folder.** Contains sample data that allows you to run every program option. This data is provided simply to enable you to run the software features.

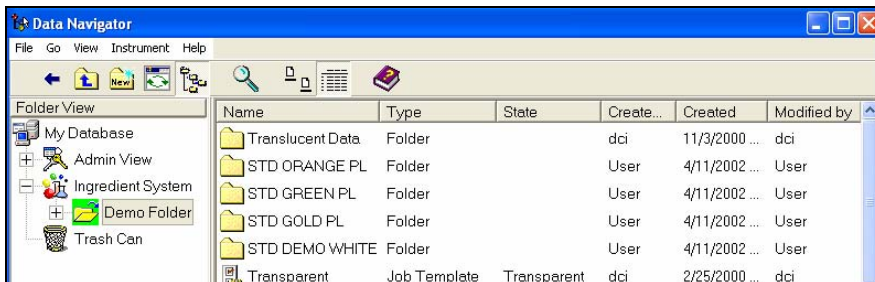
Data Navigator and Datacolor TOOLS

Data Navigator has been designed to allow Datacolor MATCH^{PIGMENT} and Datacolor TOOLS to share data objects. These include standards, batches, samples and substrates.

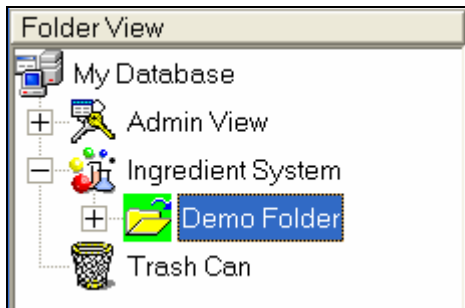
Working with Data Navigator

Navigator Window

The Navigator Window is divided into two sections or panes:



- **Folder View.** The left pane is referred to as the Folder View, and displays the structure used for data storage. The data is organized into a series of folders and subfolders similar to the design of Windows Explorer. This is also referred to as a *Tree View*. A "+" next to a folder indicates there are subfolders inside the folder. Click on the "+" to see the names of the subfolders.



Click on the folder names to display contents of the folder in the right pane of the of the Navigator window. Double-click on a folder name to expand the folder in *Tree view*.

- **List View.** Click on a folder in the *Folder view*. The contents of the selected folder are displayed in the right pane. This pane is referred to as the *List View*. From this view, you can sort the data, and perform standard maintenance functions.

Name	Type	Creation User	ModificationDate
 100%_16	Sample	dci	1/3/2002 8:46:23 AM
 100%_22	Sample	dci	1/3/2002 8:46:23 AM
 100%_31	Standard	dci	1/3/2002 8:46:23 AM
 100%_43	Standard	dci	1/3/2002 8:46:23 AM

A display field at the bottom right of the Data Navigator screen displays the total number of objects in the current folder.

 YELOX 64	Sample	ROL/ROD	dci	10/9/2001 3:58:11 PM	dci	8/31/2002 9:2
 YELOX 8	Sample	ROL/ROD	dci	10/9/2001 3:58:11 PM	dci	8/31/2002 9:2
 YELOX 98	Sample	ROL/ROD	dci	10/9/2001 3:58:12 PM	dci	8/31/2002 9:2

filter By : 80 Object(s)

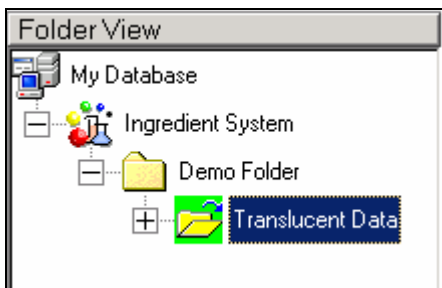
If you move the mouse pointer over this field, a text box displays how many of each object type are in the folder.

Object Selection

You can select a single data object or multiple objects to work with using Data Navigator.

Selecting a Single Object

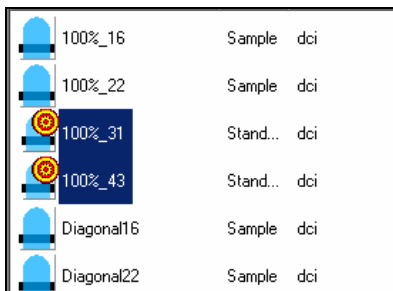
To select a single entry, place the cursor over the item and click to highlight.



Selecting Multiple Objects

To select multiple, continuous items, do the following:

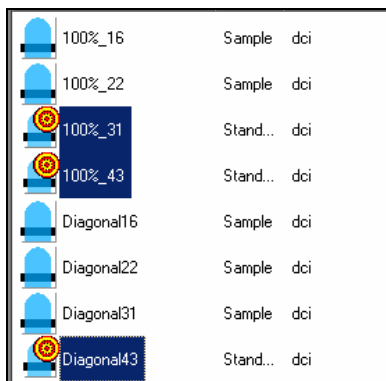
1. Highlight the first selection.
2. Hold the shift key down and highlight the last item in the list. The entire range will be selected.



To select multiple items that *are not* continuous, do the following:

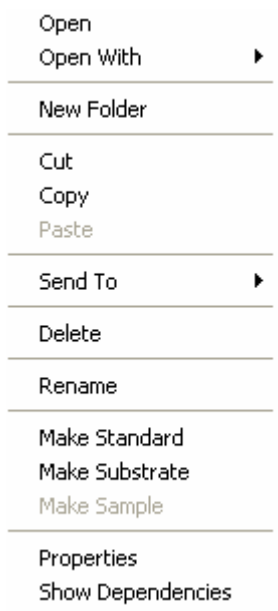
1. Highlight the first selection.
2. Hold the **Ctrl** button down, and make the second selection.
3. Continue to hold down the **Ctrl** button while making additional selections. All of the selections made will remain highlighted.

When multiple items are selected you cannot open the individual records. You can use cut, copy, paste, delete, send and make options.



Once the object is selected, there are several options available for manipulating the data. To access these options:

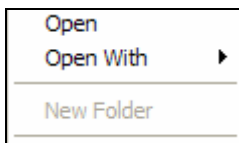
- From the List View (right window pane), place the cursor over an individual entry and click the right mouse key. A menu is displayed:



This menu includes all functions for viewing, editing and exporting data created and used by Datacolor MATCH^{PIGMENT}.

Viewing Object Contents

In Navigator, you can view the contents of samples, standards, batches, and job records. The type of data selected determines the program used to open the record. For example, standards, batches and samples are opened by Datacolor TOOLS. Jobs and Formulas are opened by Formula Central.



Open. When this option is selected, the program automatically selects the correct Datacolor program option needed to open the record. When this is selected, the correct program will open, and the data selected will be displayed.

When you double-click on the record, the appropriate program module will automatically open and the data will be displayed.

Open With. When this option is selected, a submenu is displayed.



- Click to highlight the program module to be used to open the record.

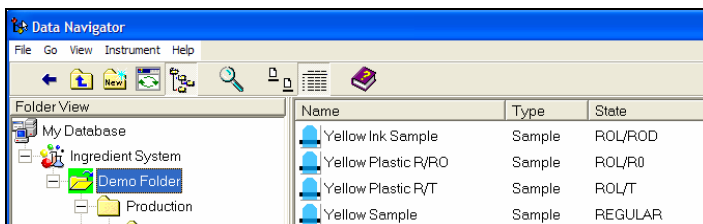
Object States

The property object state provides additional information for objects in the List View. The definition of *State* is different for each data object type.

Sample State

For samples, the *State* property The *State* identifies the number and kind of measurements included in the record.

- **REGULAR.** Single %R measurement
- **ROL/ROD.** %R over white background and %R over black background
- **ROL/T.** %R over white background and %T measurement
- **ROL/RO.** %R over white background and %R over black trap or open port.



Job States

For jobs, the *State* property displays the status of the job.

Name	Type	State
 Job 2	Job	Correction Input
 Job 3	Job	Match Output
 Job 5	Job	Queue Ready
 Job 6	Job	Queue Ready
 Job 7	Job	Queue Ready
 Job 8	Job	Match Input
 Job 9	Job	Correction Output

A job can be assigned the following states:

- **Queue Ready.** Job ready to match (Formulation Input State on Page 1 of job)
- **Match Input.** Job ready to match (Formulation Input State on Page 2 of job, or higher)
- **Match Output.** Job has formulas (Formulation Output State)
- **Correction Input.** Job ready to correct, trial is measured (Correction Input State)
- **Correction Output.** Job has correction (Correction Output State)

See also *Formula Central*, *Formula Grid*, *Job States* for a detailed discussion of job states.

Job Template/Formula States

For job templates and formulas, the *State* property will display the name of the colorant set associated with the template or formula.

Job Template

Name	Type	State
 Opaque	Job Template	Opaque
 Transparent	Job Template	Transparent
 Translucent - Fixed % Load	Job Template	Translucent
 Translucent - CR Match	Job Template	Translucent

Formula

Name	Type	State
 Formula 1254	Formula	Opaque
 Formula For Glediola	Formula	Transparent
 Formula For Std Orange 5A	Formula	Transparent

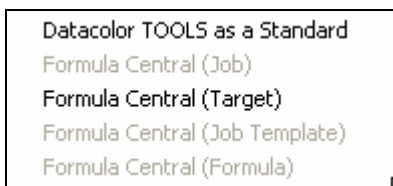
Editing Options

To access the data editing options, right-click on a folder or data object. The menu below is displayed:



Open. Opens the data object selected.

Open With. Some of the data objects require a specific Datacolor program module to be used to open the object. When this option is selected, a list of Datacolor program options is displayed:



- Highlight the program to be used to open the data object selected.

New Folder. Creates a new folder inside the active folder.

Cut. Move data from one folder location to another. This option removes the record from the current folder. It has to be “pasted” into another folder. *See also Cut and Paste procedure below for complete instructions.*

Copy. Store the same data in multiple folder locations, using “copy” and “paste” procedure. *See also Cut and Paste procedure below for complete instructions.*

Paste. Stores the record previously selected into a different folder. It is used with both the cut and copy options. *See also Cut and Paste procedure below for complete instructions.*

Delete. Deletes the sample currently highlighted. Click **Delete** to execute. This moves the object to the trash can, but it is not yet permanently deleted. *See also Trash Can Option for instructions to permanently delete an object.*

NOTE

An item cannot be deleted if it has dependencies. For example, a sample cannot be deleted if it is also stored with a formula. You must delete the sample from the formula before you can delete the sample from the system. *See also Data Dependencies for additional information.*

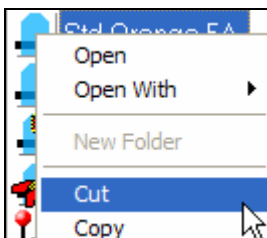
WARNING!

If the object has no dependencies, the system automatically deletes the record without any further warning or confirmation.

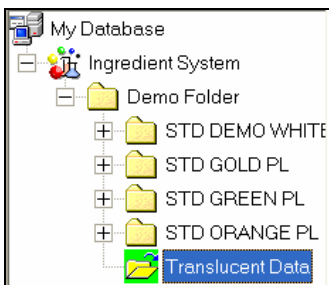
Rename. Renames the sample currently highlighted. *Rename is not available when a range of items is selected.*

Cut/Copy and Paste Procedure

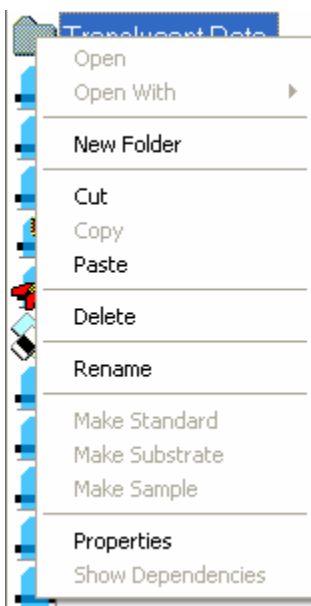
1. Highlight the record to be cut or copied, and right-click on the record to display the editing menu.



2. Click on the option to be executed, *Cut* or *Copy*. *See also Other Options, New Folder for instructions on creating a new folder for the data.*
3. In the folder view (left pane) of the Navigator, highlight the folder to receive the data record.



4. Right-click to display the editing menu.



5. Click **Paste** to execute. The right pane will refresh and the data record will be displayed in the list of folder contents.

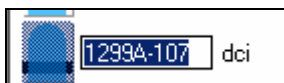
Folder View	Name	Type	State	Created by
My Database	REDOX 4	Sample	ROL/ROD	dci
Ingredient System	REDOX 8	Sample	ROL/ROD	dci
Demo Folder	REDOX 98	Sample	ROL/ROD	dci
STD DEMO WHITE	Std Orange 5A 1st Shot	Sample	REGULAR	User
STD GOLD PL	WHITE 30 0000%	Sample	ROL/ROD	dci
STD GREEN PL	YELLOW 16	Sample	ROL/ROD	dci
STD ORANGE PL	YELLOW 32	Sample	ROL/ROD	dci
Translucent Data	YELLOW 64	Sample	ROL/ROD	dci

NOTE

If copy was selected, the record displays in both folders.

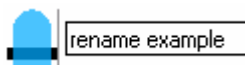
Rename Procedure

1. Highlight the object to be renamed, and click on **Rename**. The current name of the sample will be highlighted:



2. Place the cursor in the highlighted area.
3. Use the 'Backspace' key on the keyboard to remove the current letters.

4. From the keyboard enter a new name.



5. When you are finished, click anywhere in the window. The sample name will be updated immediately.

Delete Data

Navigator uses the same conventions used by Windows Explorer to delete data. It includes a trash can option that is similar to the Recycle Bin offered by Windows Explorer.

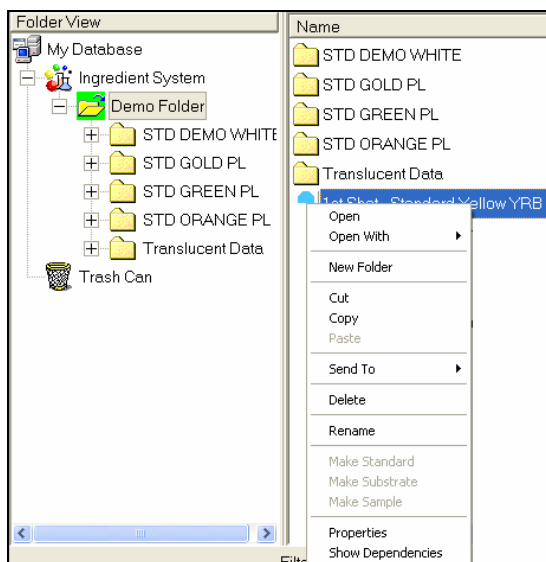
NOTE

These instructions assume that you have permission(s) to delete data objects and/or folders. Permissions to delete data are assigned to user groups. If you are logged in as a user that does not have rights to delete data objects or folders, you must exit the program and login as a different user with the correct permissions to delete the data. *See also Applications Technology, Data Security Option for a complete discussion of the data security capabilities.*

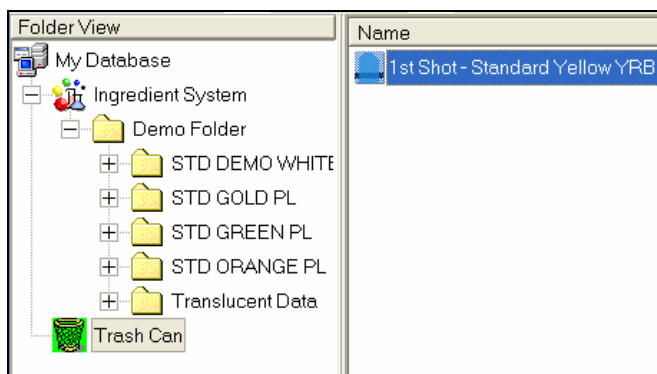
Deleting Objects from the Database

To delete an object from the database:

1. Highlight the object to be deleted, and right-click to display the Navigator menu:



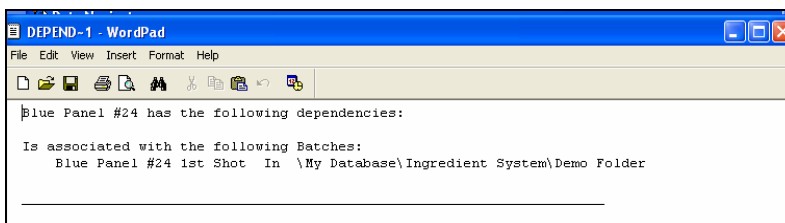
2. From the menu, click **Delete**. The object is moved to the Trash Can:



The folder has been moved from the folder to the trash can, but it is still in the database. See also *Trash Can Option* for instructions to restore the deleted folder, or to permanently delete it from the database. See also *Folder Dependencies* for information about exceptions to the Delete Folder command.

Data Dependencies

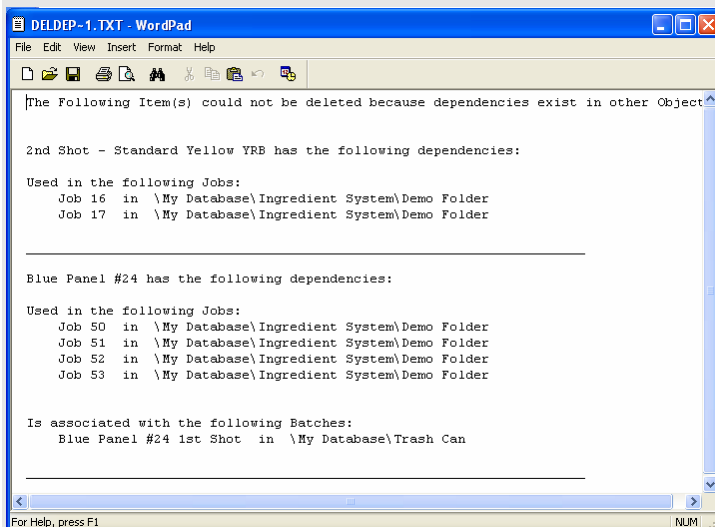
You cannot delete data objects that are active in other data objects. For example, a target or trial sample may be part of a job record, or a formula record, etc. This is referred to as a dependency. When you select an item to delete that has dependencies, a message similar to the one below is displayed:



You cannot delete the data record *Blue Panel #24* until the dependencies are removed.

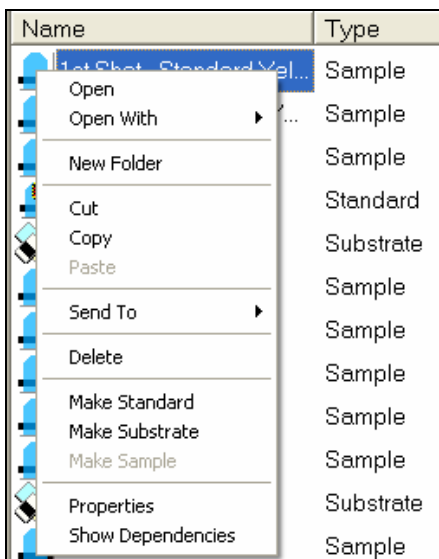
NOTE

You can select multiple objects to be deleted. Dependencies for each of the objects selected will be included in the message. Below is an example:

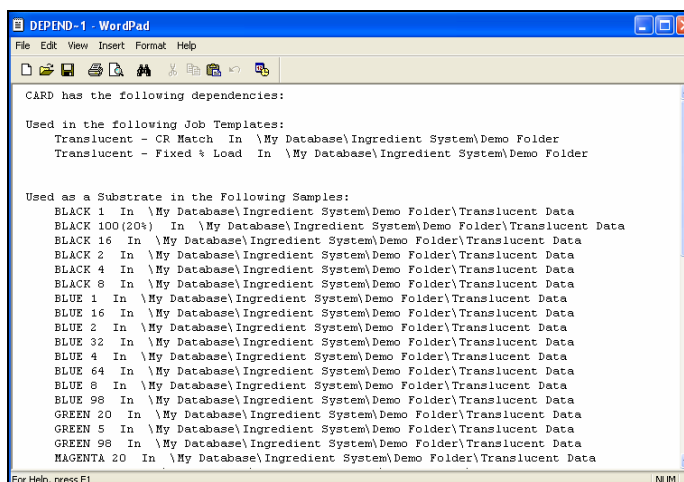


You can view the dependencies for any data object at any time. To do this:

1. Highlight a data object, and right-click. The Navigator menu is displayed:



2. Click **Show Dependencies**. A dialog that itemizes every dependency for the object is displayed:

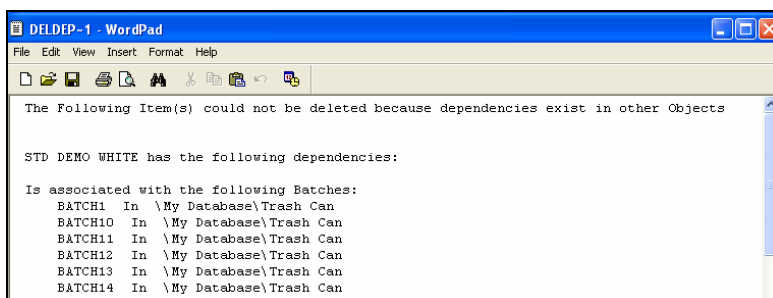


The data object CARD has numerous dependencies. The program will not let you delete this data object.

Folder Dependencies

When you delete a folder, the program checks the contents of the folder for data dependencies. For example, a target or trial sample in the folder may be part of a job record, or a formula record, etc. This is referred to as a dependency.

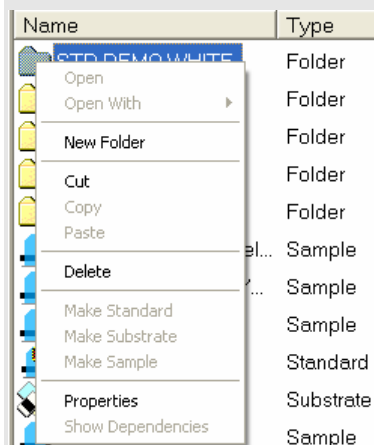
When you delete a folder that contains data active in other objects, the message below is displayed:



The program will delete all of the folder contents that do not have any dependencies. However, the folder itself will not be moved to the trash can for permanent deletion. To delete the entire folder, you must first remove all of the data objects in the folder that have dependencies.

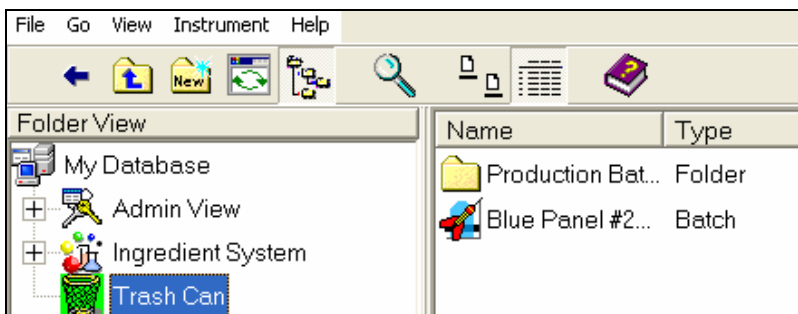
NOTE

Unlike data objects, you cannot view the dependencies for a folder. The menu option Show Dependencies is disabled when a folder is selected:



Trash Can Option

When data objects or folders are deleted from the Navigator, they are placed in the trash can folder. This data remains in the trash can until it is permanently deleted.

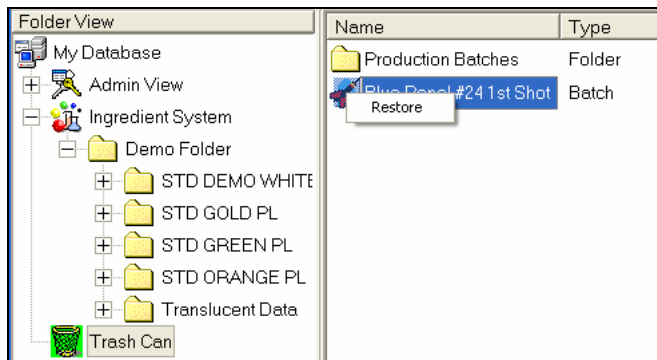


Any item in the trash can folder can be restored to its previous location or permanently deleted.

Restore Data from the Trash Can

To restore a single object:

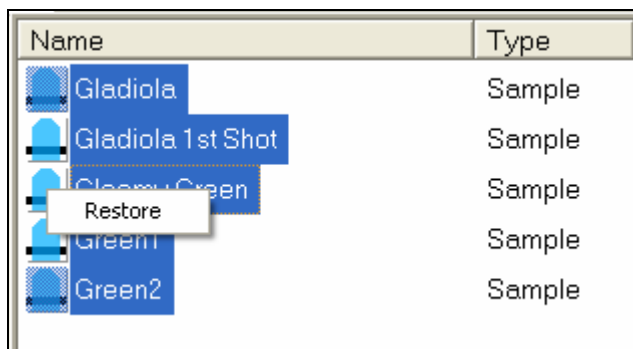
1. Highlight an object in the trash can, and right-click to display the option:



2. Click **Restore**. The object will be restored to the folder that previously held it.

To restore multiple objects:

1. Highlight the objects from the menu, and right-click to display the option:



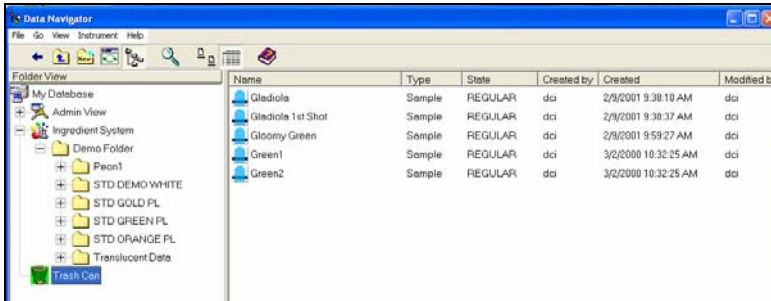
2. Click **Restore**. Each object will be restored to the folder that previously held it.

Empty the Trash Can

Emptying the trash can removes the data objects and folders permanently from the DMP database. *You must have Administrator rights to empty the trash can.*

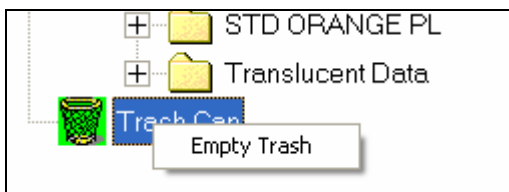
When you empty the trash can, all contents are deleted. You cannot selectively delete items in the trash can.

The trash can folder below contains 5 samples that were deleted:



To empty the trash can:

1. Right-click on the Trash Can icon in the Folder View. A menu is displayed:



2. Click **Empty Trash**. All of the folder contents are deleted.

Disabling Trash Can Option

The Trash Can option can be disabled for all users (including Admin) through a setting in the CC_Global.Ini file.

WARNING!

Making changes to the CC_Global.Ini file can significantly impact the program functions. This should be done under the supervision of Datacolor support personnel.

To disable the trash can option:

- In a [DCNavigator] section add the line "UseTrashFolder= 0".

This setting bypasses the trash can, and all deleted data is deleted **permanently**.

Editing Data Object Types

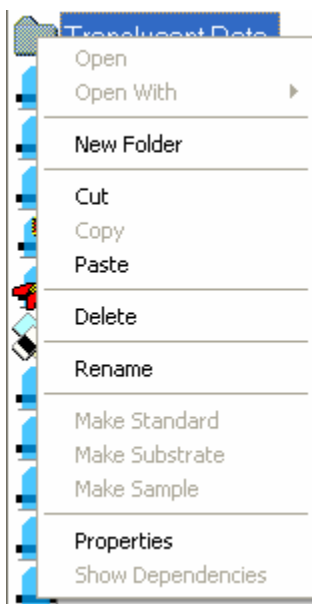
Data Navigator includes options to change the object type assigned to the record. This is useful when you are working with data in both Datacolor TOOLS and Datacolor MATCH^{PIGMENT}. In Datacolor TOOLS, the program does not recognize data called samples. All sample data retrieved to the TOOLS desktop must be labeled as either a standard or a batch. Datacolor MATCH^{PIGMENT} recognizes and use sample data interchangeably as targets, trials and substrates. This group of editing options provides the flexibility to change data types to make them available to either program.

NOTE

Administrator rights are required to use the Make Sample, Make Standard, and Make Substrate options. *See also Admin, All Users Tab for information to create and edit user settings.*

To access the options for modifying the data type:

- Highlight a record to be edited in the List view (right pane). Right-click on the highlighted record to display the Navigator menu options:



- **Make Standard.** Use this option to convert a sample, batch or substrate record to a “standard” for use in Datacolor TOOLS. Samples measured as “targets” in Formula Central are not saved as a “standard”. This option allows you to change a sample into a standard without having to retrieve and restore it with Datacolor TOOLS.

1. Highlight the sample/substrate record to be converted.



2. Right-click to display the Navigator menu options:

Make Standard
Make Substrate
Make Sample

3. Click **Make Standard**. The record will automatically update and the Type will be updated to reflect the change.



- **Make Sample.** Use this option to convert a standard, batch or substrate record to a sample, for use in either Datacolor MATCH^{PIGMENT} or Datacolor TOOLS.

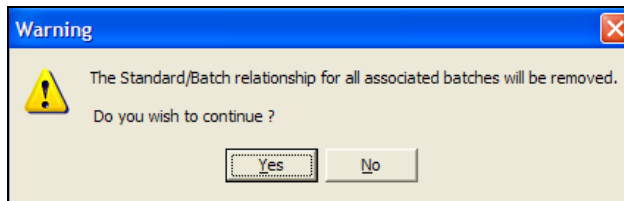
1. Highlight the standard/substrate record to be converted:



2. Right-click to display the Navigator menu options:

Make Standard
Make Substrate
Make Sample

3. Click **Make Sample**. If the record is a Standard, there may be batch records associated with it for use in Datacolor TOOLS. This connection is lost when you change the type to Sample. The program alerts you to this change, and you must confirm that you want to continue.



4. Click **Yes**. The list will update, and the data type will reflect the change.

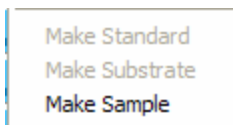


- **Make Substrate.** Use this option to convert a sample or batch record to a substrate record for use in Datacolor MATCH^{PIGMENT}.
 1. Highlight the record to be converted.



Sample

2. Right-click on the record to display the Navigator menu options:



3. Click on **Make Substrate**. The list will update, and the data type will reflect the change.



Substrate

Display/Select Data Objects

Data Navigator provides both Filter and Find options to select and display data objects. The Filter options are applied to the selection and display of data objects within a single folder. The Find option is used to search across the entire Datacolor MATCH^{PIGMENT} database to locate a particular data object(s) or folder(s). Each of these features uses pattern matching to select data.

Filter Options

The filter input is located at the bottom of the Data Navigator window:

	YELOX 64	Sample	ROL/ROD	dci	10/9/2001 3:58:11 PM	dci
	YELOX 8	Sample	ROL/ROD	dci	10/9/2001 3:58:11 PM	dci
	YELOX 98	Sample	ROL/ROD	dci	10/9/2001 3:58:12 PM	dci

filter By :

Several filter operators are available, which enable you to find specific character strings anywhere in a name. The filter function is applied to the *active* folder. See *also Find Options for instructions to search across the entire database for a particular data object or folder.*

Summary of Filter Operators

Symbols	Meaning
%	Matches any string of 0 or more characters. The '%' character is a special wild card operator and it indicates that a number of characters may follow.
_	Matches any one character.
[specifier]	The specifier in the brackets may take the following forms: Range. A range is of the form rangespec1-rangespec2 where rangespec1 indicates the start of a range of characters, the hyphen indicates a range, and rangespec2 indicates the end of a range of characters. Set. A set can be comprised of any discrete set of values, in any order. For example, [a2bR]. Note that the range [a-f] and the sets [abcdef] and [fcbaed] return the same set of values.
[^specifier]	The caret symbol (^) preceding a specifier indicates non-inclusion. [^a-f] means not in the range a-f; [^a2bR] means not a, 2, b, or R.

NOTE

If you need to include either the '%', the '_', or the '^' character in the string, you must place the character inside square brackets '[]'. Below are 2 examples:

%2[%]% - Finds all names that have '2%' in them.

%2[%] - Finds all names that end in '2%'.

% Operator Examples

This section includes a series of filter examples that use the % operator. This operator can be used to search strings occurring in the beginning, middle or end of the record name.

Objective: Find all names that start with 'D' and have any other characters following.

- Enter **D** in the *Filter By* field.

Filter By : 

The list below is produced:

Name	
	Dish
	DW00075517 1%PSMIX L92 A-2.2 B-2.7
	DW00075517 1%PSMIX L92 A-2.2 B-2.7
	DW00075518 1%PSAU L90 A-1.4 B2.3
	DW00075518 1%PSAU L90 A-1.4 B2.3
	DW00075523 2%POM L91 A-0.8 B2.3
	DW00075523 2%POM L91 A-0.8 B2.3

NOTE

The '%' character is optional when searching for names that begin with a specific character (or characters). The '%' character is added internally by the filter control if it is not at the end of the string.

Objective. Display all records having "%L50" as the final three characters.

- In the *Filter By* field, enter %L50. The '%' character means any number of characters can precede the string 'L50'.

Filter By : 

The list below is produced:

Name	
	13732/1 H268 C33 L50
	13732/1 H268 C33 L50
	14859/1 LDPE 1% H42 C47 L50
	14859/1 LDPE 1% H42 C47 L50
	17706/3 1%PPR H40 C50 L50
	17706/3 1%PPR H40 C50 L50
	23692/1 1% H20 C59 L50

Objective: Find all the names that have the string 'L50' anywhere in the name. This '%' sign on either side of the string indicates that 0 or any number of characters can come before and after the string.

- In the *Filter By* field, enter %L50%.

Filter By : 

The list below is produced:

Name	
	25281/1 2%PPR H23 C61 L50
	27698/1 2% H281 C26 L50
	2L5028A/1 1%PEHD H92 C68 L89
	2L5028A/1 1%PEHD H92 C68 L89
	2L5082A/1 1.5% H89 C60 L88
	2L5082A/1 1.5% H89 C60 L88

'_' Operator Examples

The underscore '_' character is another special operator. It matches exactly one character in a string. When using the '_', character, you must place the character inside square brackets '['']'.

Objective: Find all names that have any first character and the next 3 characters equal to 'ish'.

- In the *Filter By* field, enter **_ish**. The '_' operator means any single character can be in this position.

Filter By : 

The list below is produced:

Name	
	Dish
	Fish

In this example, this query effectively finds all 4-letter words that end in 'ish'.

Objective: Find all names that start with '10', have any character in the 3rd position, have a '7' in the 4th position, followed by any other characters.

- In the *Filter By* field, enter **10_7**.

Filter By : 

The list below is produced:

Name	
	10176/1 1% H142 C18 L79
	10176/1 1% H142 C18 L79
	10176/2 1%PSAU H137 C18 L80
	10176/2 1%PSAU H137 C18 L80
	10973/1 H68 C68 L68
	10973/1 H68 C68 L68

Objective: Find all names that end with 1 in the 4th to last position, 0 in the 3rd to last position, any character in the 2nd to last position and a '7' in the last position.

- In the *Filter By* field, enter **%10_7**.

Filter By : 

The list below is produced:

Name	
	20971/1 1% H88 A0.4 B10.7
	20971/1 1% H88 A0.4 B10.7
	3M8CWH817 1% L60 A-2.4 B-10.7

Objective: Find all names that have the string '10_7' anywhere in the name with any character in the 3rd position of the string.

- In the *Filter By* field, enter **%10_7%**.

Filter By : 

The list below is produced:

Name
 10973/1 H68 C68 L68
 20971/1 1% H88 A0.4 B10.7
 20971/1 1% H88 A0.4 B10.7
 21007/1 2% H51 C29 L85
 3M8CWH817 1% L60 A-2.4 B-10.7
 B11067/1 H59 C34 L50
 B11067/1 H59 C34 L50

Specifier [^specifier] Examples

The specifier encloses a specific set of characters in brackets. The program filters record names for those containing the specified characters. The contents of the brackets may take the following forms:

- **Range.** A range takes the form rangespec1-rangespec2. Rangespec1 indicates the start of a range of characters, the hyphen indicates a range, and rangespec2 indicates the end of a range of characters.
- **Set.** A set can be comprised of any discrete set of values, in any order. For example, [a2bR].
- **Objective.** Find all names that have L50 or L60 or L70 anywhere in the name.
 - In the *Filter By* field, enter %L[567][0]%.

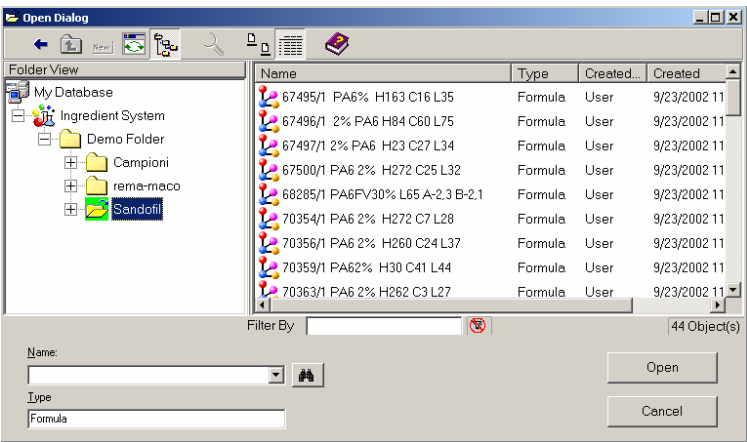
Filter By : 

The list below is produced:

Name
 23692/1 1% H20 C59 L50
 24885/1 2%RAND H159 C56 L60
 25281/1 2%PPR H23 C61 L50
 25439/1 1% H147 C63 L60
 25439/2 1% H155 C60 L60
 27698/1 2% H281 C26 L50

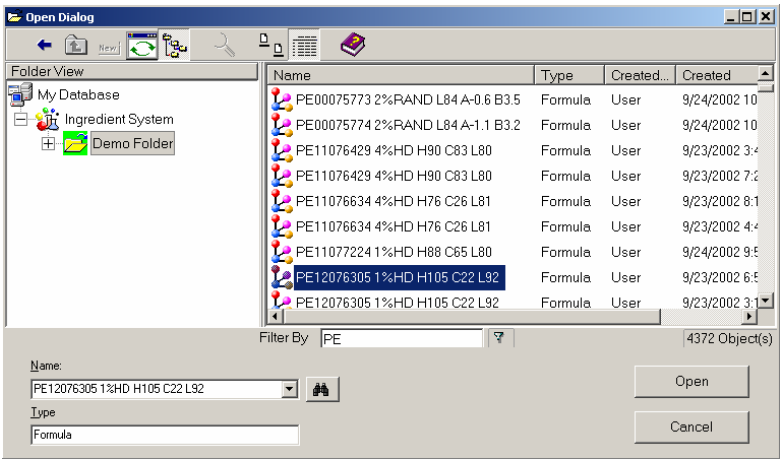
Filter Option in Open Dialogs

The filter option is also available in Open dialog options:



The *Filter By* entry can be combined with the *Name* option. The filter option will set the items available in the folder list view. When a name is input in the selection field, the program will only look in the filtered list and not the entire folder. You can enter a partial or complete name, and move immediately to the first occurrence of that name in the folder list. This creates a very powerful tool for filtering and searching records in large databases.

- **Input.** In the *Filter By* field enter **PE**. In the *Name* field, enter **PE 120**.
- **Result.** The program will find the first occurrence of **PE 120** in the folder list view.

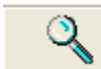


Find Option

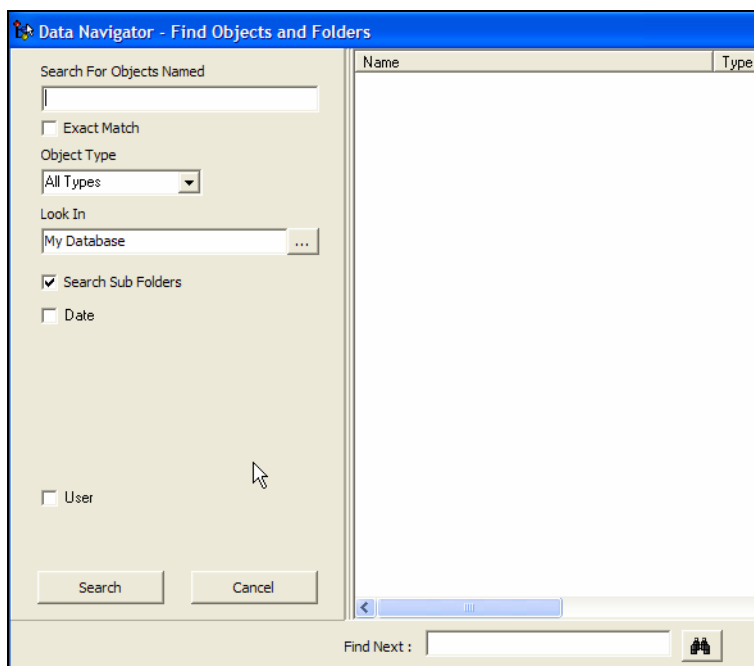
The Find option is used to search across the entire Datacolor MATCH^{PIGMENT} database for a particular data object(s) or folder(s). *See also Filter Options for instructions to restrict the display of data objects included in a single folder.*

To use the Find option:

- On the Navigator toolbar, click on the **Find** icon.

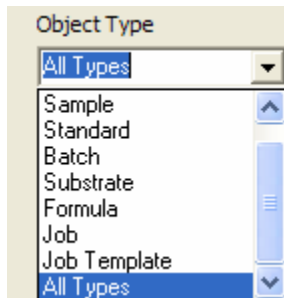


The window below displays:



- Search for Objects Named.** Enter a text string for the program to use for the search. You can limit your entry to a single character, or provide a more detailed text string.
- Exact Match.** Click the box to instruct the program to find an object with the exact name entered.
- Object Type.** You can limit the type of objects included in the search. Limiting the type of objects will speed the search.

1. Click on the down arrow to view the object choices.

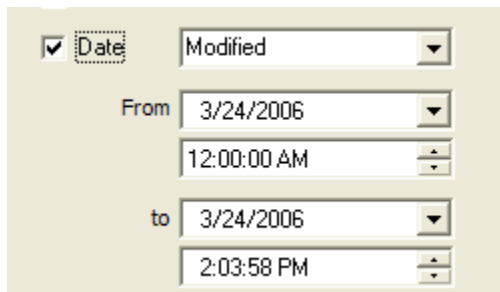


2. Click to highlight the object type to be found.

- **Look In.** Select the folder to be searched. To open the browse dialog box, click the **Browse** button:



- **Search Sub-Folders.** Expands the search to include sub-folders in the folder selected. To enable this option, click to place a check in the box.
- **Date.** This option will limit the search to objects with a specific date or date range. When selected, the dialog box below displays:



To specify a date of creation or modification, click on the down arrow in the *Date* field, and highlight a selection.

To search a date range:

- Enter a starting (from) and ending (to) date. Click on the drop down arrow to view a calendar and make the appropriate selections.
- You can narrow the search to a time range within a particular date range. Click on the arrows next to the *Time* fields, to further narrow the search range.

- **User.** This option limits the search to objects created or modified by a particular user. When selected, the dialog box below displays:

The screenshot shows a search dialog box with a 'User' checkbox checked. Below the checkbox are two dropdown menus. The first dropdown menu is labeled 'Modified' and the second is labeled 'User'.

You must *indicate if you are looking for files that were created or modified*. Click on the down arrow in this field and make the appropriate selection.

You must *identify the user*. Click the down arrow to view all of the users on the system, and highlight the user to be the object of the search.

When you have made all selections, Click **Search**.

The program displays the objects it found that satisfied your specifications:

Search For Objects Named	Name	Type	State	Create
Blue	Blue 4030-73	Sample	REGULAR	dci
☐ Exact Match	Blue Panel #24	Standard	REGULAR	dci
Object Type	Blue Panel #24 1st Shot	Batch	REGULAR	dci
All Types	BLUE 1	Sample	ROL/ROD	dci
Look In	BLUE 16	Sample	ROL/ROD	dci
My Database\Ingredient System\Demo ...	BLUE 2	Sample	ROL/ROD	dci
☒ Search Sub Folders	BLUE 32	Sample	ROL/ROD	dci
☐ Date	BLUE 4	Sample	ROL/ROD	dci
	BLUE 64	Sample	ROL/ROD	dci
	BLUE 8	Sample	ROL/ROD	dci
	BLUE 98	Sample	ROL/ROD	dci
☐ User				

Advanced Find Queries

Below are examples of operators you can use in the query to refine the search.

Query by Name Ending

Use the % character to find a specific string at the end of a name.

Syntax: **%string**

In this example, the user input the string *%Blue Panel #24*.

Search For Objects Named

☐ Exact Match

Object Type

Look In

☒ Search Sub Folders

The % indicates any characters preceding the input string are acceptable for the query. The query says *find all objects that end with the string "Blue Panel #24"*.

Below are the results of this query. Notice that the results cover several locations:

Name	Type	State	Location
 Test Blue Panel #24	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Blue Panel #24	Standard	REGULAR	My Database\Ingredient System\Demo Folder\Production 1\Lab A\Standards
 New Blue Panel #24	Standard	REGULAR	My Database\Ingredient System\Demo Folder\Production 1\Lab A\Standards

Query by Name, Mid String

Use the "%" character to find a specific string anywhere in a name.

Syntax: **%string%**

In this example, the user input the string *%Blue Panel #24%*.

Search For Objects Named

☐ Exact Match

Object Type

Look In

☒ Search Sub Folders

The “%” characters indicate any characters preceding or following the input string are acceptable for the query. This query says *find all objects that have the string “Blue Panel #24” anywhere in the name.*

Below are the results of this query:

Name	Type	State	Location
 Test Blue Panel #24	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Test Blue Panel #24 test	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Blue Panel #24 1st Shot	Batch	REGULAR	My Database\Ingredient System\Demo Folder\Production\Location 1\Lab A\Batches
 Blue Panel #24	Standard	REGULAR	My Database\Ingredient System\Demo Folder\Production\Location 1\Lab A\Standards
 New Blue Panel #24	Standard	REGULAR	My Database\Ingredient System\Demo Folder\Production\Location 1\Lab A\Standards
 New Blue Panel #24 VCN	Standard	REGULAR	My Database\Ingredient System\Demo Folder\Production\Location 1\Lab A\Standards

Find by Name Operators Summary

Several *Find by Name* operators are available, which enable you to find specific character strings anywhere in a name.

NOTE

The word *string* represents the characters that you will input into the name field of the Find Dialog.

Symbols	Meaning
string	Matches “string” and any number of characters following. NOTE: The ‘%’ character is automatically appended to the string in the query.
String with Exact Match Option	Matches “string” only.
%string	Matches any number of characters preceding “string”.
%string%	Matches any number of characters before and after “string”.
_ Bl_e	Underscore “_” matches any one character. This example finds names starting with “Bl”, have any character in the 3rd position, and end with “e”.
[specifier]	The specifier in the brackets may take the following forms: Range. A range is of the form rangespec1-rangespec2 where rangespec1 indicates the start of a range of characters, the hyphen indicates a range, and rangespec2 indicates the end of a range of characters. Set. A set can be comprised of any discrete set of values, in any order. For example, [a2bR]. NOTE: The range [a-f], and the sets [abcdef] and [fcbdae] return the same set of values.
[^specifier]	The caret symbol (^) preceding a specifier indicates non-inclusion. [^a-f] means not in the range a-f; [^a2bR] means not a, 2, b, or R.

Names Using Special Characters

If either the '%', the '_', or the '^' character is in the name and you need to query with these characters, you must place the character inside square brackets '[]'.

Example: %2[%]%

Finds all names that have '2%' in them.

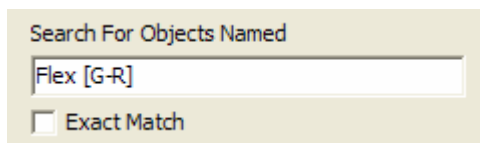
Example: %2[%]

Finds all names that end in '2%'.

Using the Specifier with a Range of Values

The query below finds names that have:

- the beginning string *Flex* and,
- in the 6th position, any character *from G through R*. The range of acceptable characters is "GHIJKLMNOPQR".



Search For Objects Named

Flex [G-R]

☐ Exact Match

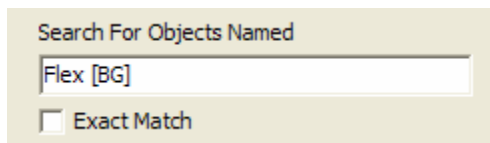
Below are the results of this query:

Name	Type	State	Location
 Flex Green 5.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Green 60.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Green 80.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Red 10.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Red 100.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Red 2.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder

Using the Specifier with a Set of Values

The query below finds names that have:

- the beginning string *Flex* , and
- have either a *B* or *G* in the 6th position.



Search For Objects Named

Flex [BG]

☐ Exact Match

[BG] indicates the set of acceptable characters in the 6th position.

Below are the results of this query:

Name	Type	State	Location
 Flex Blue 2.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Blue 40.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Blue 5.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Blue 60.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Blue 80.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Green 10.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Green 100.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder
 Flex Green 2.0000% 1.00	Sample	REGULAR	My Database\Ingredient System\Demo Folder

Sorting Options

There are sorting options available in Data Navigator. These options are used for a summary review of the contents of a folder.

In the List view, column headings are displayed, which represent specific contents of a data record. The data can be sorted alpha-numerically based on any of these parameters.

Name	Type	State	Created by	Created	Modified by	Modified	Location	GUID

- **Name.** Sorts the data alphabetically by name. This sort is limited to the first letter of the first name of the record.
- **Type.** Sorts the data by type.
- **State.** Sorts the data by object state.
- **Created by.** Sorts the data by user that created the record.
- **Created.** Sorts data by date created.
- **Modified By.** Sorts data by user who made the last change to the record.
- **Modified.** Sorts the data by date of last modification.
- **Location.** Sorts the data by folder location.
- **GUID.** This is an alpha-numeric code assigned to a record by Datacolor TOOLS. The data can be sorted by this code.

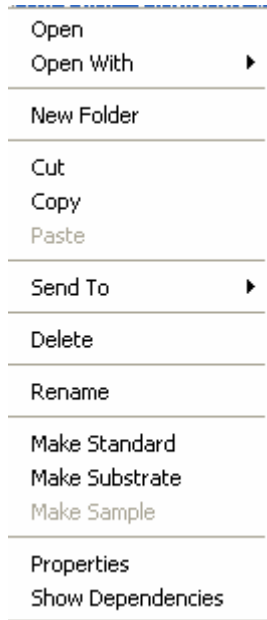
NOTE

This code is only assigned to records created from Datacolor TOOLS.

Other Options

This section includes options on the Navigator data management menu not previously discussed. To access this menu:

1. Highlight an item in the right pane.
2. Right-click on the highlighted item. The menu below is displayed:



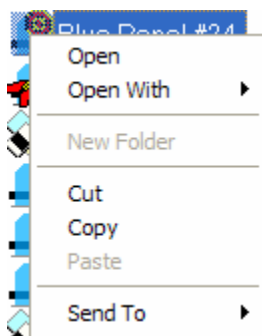
Send To

This option allows you to export individual data objects, to another location. You can choose either a QTX or XML file format. These file formats enable the sharing of this data with other Datacolor users, and other 3rd party applications.

NOTE

The data included in the XML record can be viewed by examining the properties of the data record. *See also Properties below for information to display the object properties.*

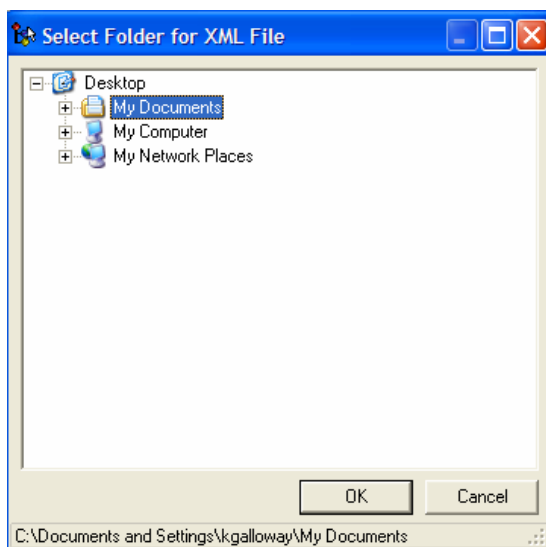
1. Highlight the record to be sent, and right-click to display the Navigator Menu:



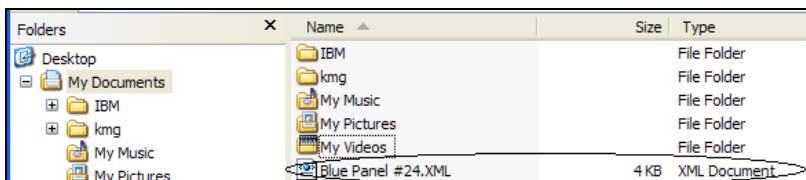
2. Click **Send To**. A submenu is displayed:



3. Select the file type to be exported. The program will open a dialog box to select the folder to receive the XML file:



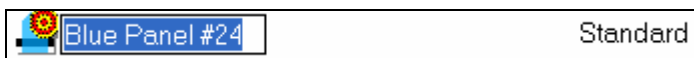
4. Highlight the folder to receive the XML file, and click **OK**. The window closes.
5. Browse to the folder selected to receive the file. The record will be displayed as and XML document:



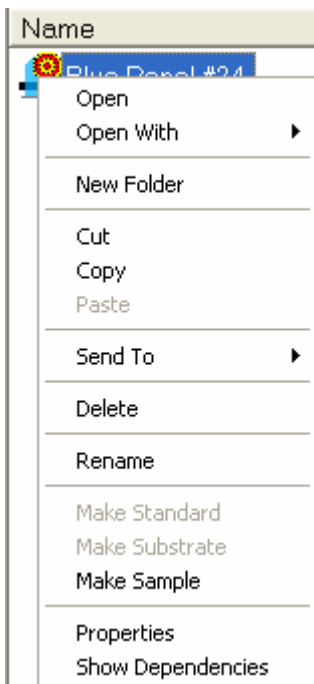
Properties

This option is used to examine the properties of a particular data object.

1. Highlight the object to be examined:



2. Right-click on the data object to display the Navigator menu, and click **Properties**.



A window will open, displaying information for the object selected.

NOTES

The property information displayed is the information exported to an XML file when the *Send To* option is selected.

The properties will vary depending on the type of object selected.

The properties for 3 types of data objects are available. Below is an example of the properties displayed for a standard:

The screenshot shows a window titled "Standard Properties" with a "File" menu. The main content area displays the following information:

Name: Blue Panel #24 **Type:** REGULAR
Location: My Database\Ingredient System\Demo Folder\
Created By: dci On: 2/9/2001 9:47:53 AM
Modified By: dci On: 3/3/2002 11:23:49 AM

Type: Reflectance State: REGULAR
Source: k Specular: Included Area: NONE Spot: 30 UV Contents: NONE
360nm= 6.98 370nm= 8.22 380nm= 10.72 390nm= 16.34 400nm= 24.67
410nm= 31.13 420nm= 32.17 430nm= 32.68 440nm= 33.19 450nm= 33.21
460nm= 32.63 470nm= 31.73 480nm= 30.48 490nm= 29.15 500nm= 27.89
510nm= 27.21 520nm= 26.52 530nm= 25.43 540nm= 24.73 550nm= 24.40
560nm= 23.09 570nm= 20.98 580nm= 19.30 590nm= 18.10 600nm= 17.03
610nm= 16.15 620nm= 15.82 630nm= 15.73 640nm= 15.79 650nm= 16.16
660nm= 16.62 670nm= 16.85 680nm= 16.61 690nm= 15.97 700nm= 15.43

Below is an example of the properties displayed for a folder:

The screenshot shows a window titled "Folder Properties" with a "File" menu. The main content area displays the following information:

Folder Name: Demo Folder **Folder Type:** Folder
Location: My Database\Ingredient System\Demo Folder\
Created By: dci On: 11/2/2000 4:41:30 PM
Modified By: dci On: 3/1/2002 2:40:38 PM

Number of Objects in Folder
Folder : 6
Sample : 77
Substrate : 2
Job : 99
Job Template : 5
Formula : 51

The property display for a folder will include a list of the number of each object type contained in the folder.

Below is an example of the properties displayed for a formula:

Formula Properties

File

Formula Name: Formula For Yellow Sample

Location: My Database\Ingredient System\Demo Folder\

Created By: UserOn: 2/21/2006 3:29:36 PM

Modified By: UserOn: 2/21/2006 3:29:36 PM

Colorant Set: Transparent

CR Ratio: 0Colorant Load: 100Film Thickness: 1Yield Factor: 100

Actual Sample Name: Yellow Sample

Type: ReflectanceState: REGULAR

X = 76.52Y = 83.19Z = 45.83

L = 93.10a = -4.72b = 37.48

Source: InstrumentSpecular: IncludedArea: LAVUV Contents: GG-D65

Instrument: DatacolorModel: SF600Geometry: d/8

Serial Number: 4829Firmware Version: V9.12

360nm= 41.25370nm= 39.95380nm= 38.41390nm= 36.98400nm= 35.03

410nm= 33.62420nm= 33.33430nm= 33.82440nm= 35.69450nm= 38.88

460nm= 43.20470nm= 49.11480nm= 56.72490nm= 64.50500nm= 71.65

510nm= 77.73520nm= 81.84530nm= 84.56540nm= 86.23550nm= 87.44

560nm= 88.57570nm= 89.64580nm= 90.50590nm= 91.00600nm= 91.48

610nm= 91.83620nm= 92.08630nm= 92.29640nm= 92.48650nm= 92.79

660nm= 93.05670nm= 93.29680nm= 93.53690nm= 93.71700nm= 93.87

Target Sample Name: Yellow Target

Type: ReflectanceState: REGULAR

X = 74.75Y = 81.00Z = 46.72

L = 92.13a = -4.18b = 34.85

Source: InstrumentSpecular: IncludedArea: LAVUV Contents: GG-D65

Instrument: DatacolorModel: SF600Geometry: d/8

Serial Number: 4829Firmware Version: V9.12

360nm= 19.00370nm= 18.84380nm= 26.08390nm= 37.13400nm= 36.67

410nm= 35.36420nm= 34.95430nm= 35.40440nm= 37.09450nm= 40.02

460nm= 43.95470nm= 49.35480nm= 56.41490nm= 63.59500nm= 70.18

510nm= 75.75520nm= 79.59530nm= 82.04540nm= 83.72550nm= 84.90

560nm= 85.88570nm= 86.98580nm= 87.92590nm= 88.38600nm= 88.84

610nm= 89.24620nm= 89.56630nm= 89.80640nm= 90.09650nm= 90.48

660nm= 90.82670nm= 91.11680nm= 91.53690nm= 91.78700nm= 91.95

Substrate Name: FLX_WHITE FL

Type: ReflectanceState: REGULAR

Source: InstrumentSpecular: Included

Instrument: DatacolorModel: SF600Geometry: EveryGeometry

Serial Number: 1Firmware Version: 1.0

400nm= 68.55410nm= 73.17420nm= 76.44430nm= 78.04440nm= 78.90

450nm= 79.95460nm= 80.95470nm= 81.95480nm= 82.94490nm= 83.99

500nm= 84.98510nm= 85.83520nm= 86.56530nm= 87.16540nm= 87.65

550nm= 88.02560nm= 88.34570nm= 88.68580nm= 88.98590nm= 89.15

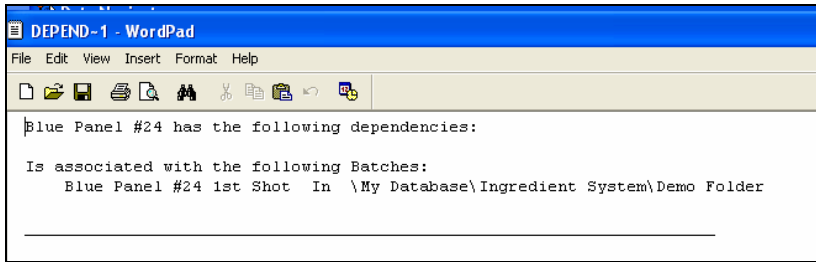
600nm= 89.27610nm= 89.39620nm= 89.49630nm= 89.60640nm= 89.67

650nm= 89.65660nm= 89.62670nm= 89.62680nm= 89.62690nm= 89.62

700nm= 89.62

Show Dependencies

When using Datacolor MATCH^{PIGMENT}, it is common for data objects to become part of multiple data records. A target sample may be included in one or several job records, a formula record, etc. This is referred to as a data dependency. This option displays the data dependencies for the selected data object. When you select this option, a message similar to the one below is displayed:

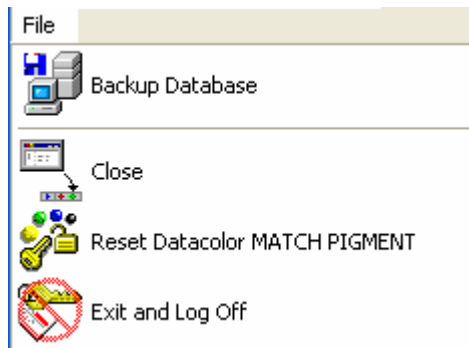


The program will not allow you to delete any data objects that have dependencies. In this example, you cannot delete the sample *Blue Panel #24* until the dependencies are removed. *See also Trash Can Option for instructions to permanently delete objects.*

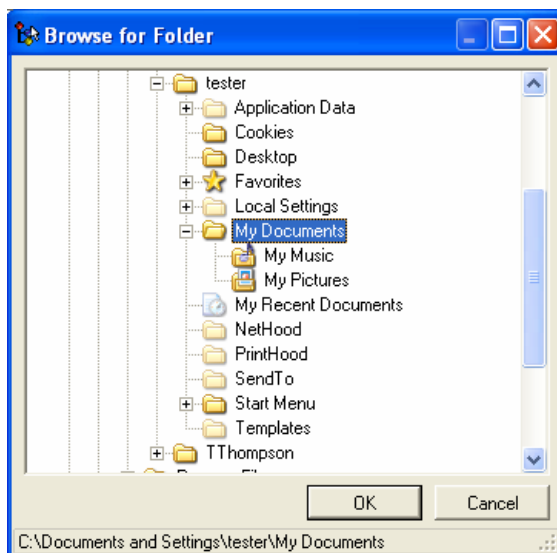
Backup Database

You can backup the entire Datacolor MATCH^{PIGMENT} database from the Navigator. To do this:

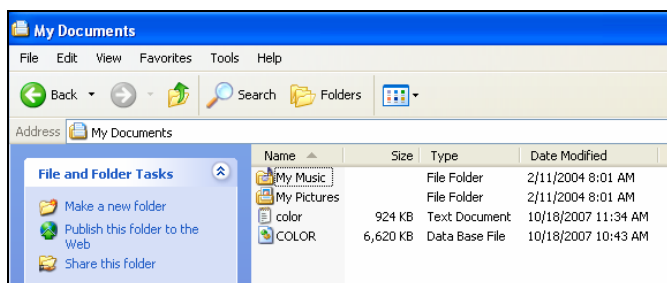
1. Click on the **File** menu.



2. Click on **Backup Database**. The program will prompt you for a folder location.

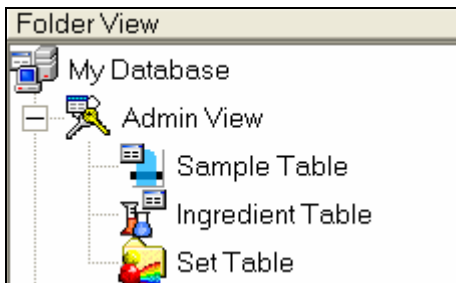


3. Highlight a folder and click **OK**. The backup procedure will start immediately. When completed, two files are added to the folder.



Admin View

The Admin View enabled a system administrator to view data in specific database tables directly from the Navigator.



The data is presented in tables, and it is possible to access related database tables from the three primary tables:

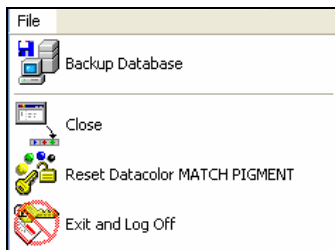
- **Sample Table.** The Sample Table view allows you to view all samples in the database table “Sample”. This will include not only samples that are visible in folders but also all hidden samples used by colorants, jobs, formulas, etc. For an individual measurement, you can select the spectral data from the “Spectrum” table. You can edit the sample “Name” as well as the spectral data.
- **Ingredient Table.** The Ingredient Table view allows you to view all of the ingredients in the database table “IngredientProfile”.
- **Set Table.** The Set Table view allows you to view all of the colorant sets in the database. For an individual set, you can view all of the colorants for that set. Double-click on a table to open it.

Menus

File Menu

The File Menu includes options for data and program management.

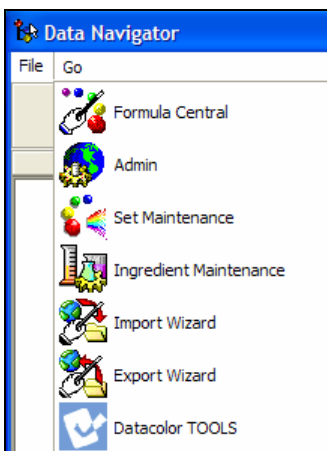
- Click on **File** to view the list of options.



- **Backup Database.** Makes a complete backup of the Datacolor MATCH^{PIGMENT} database. *See also Navigator, Backup Database for complete instructions.*
- **Close.** Closes the active program module.
- **Reset Datacolor MATCH^{PIGMENT}.** Closes all Datacolor MATCH^{PIGMENT} program modules that are open.
- **Exit and Log Off.** Exits the program, and logs user off system. This is the only legal procedure to close the Navigator.

Go Menu

This menu provides options to launch all program modules, including the Datacolor TOOLS program.



NOTES

When a program module is grayed-out, the program module is already open.

For systems that have Datacolor MATCH^{PIGMENT}, this menu provides the *only* access to Datacolor TOOLS.

The Go Menu options include the following:

- **Formula Central.** Launches the Formula Central module.
- **Admin.** Launches the System Administration module.
- **Set Maintenance.** Launches the Colorant Set Maintenance module.
- **Ingredient Maintenance.** Launches the Ingredient Maintenance module.
- **Import/Export Wizards.** These options open wizards used to convert data from Datacolor legacy programs for use with current Datacolor programs. This option has both **import** and **export** options that allow for two-way data exchange

between the programs. It also provides the ability to export data into a file format compatible with other third-party programs.

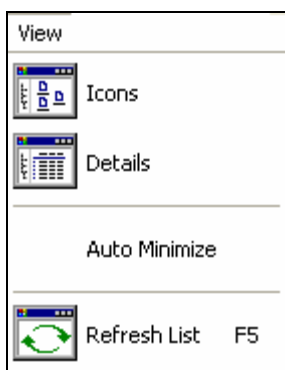
WARNING!

This should only be done under the direction of an Applications Specialist.

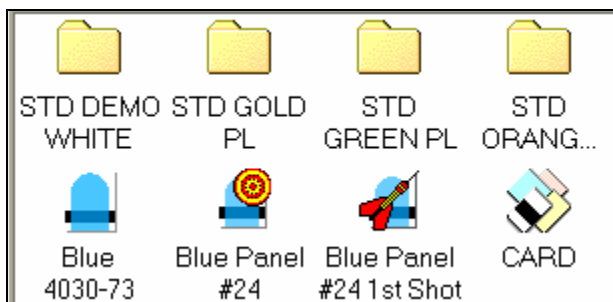
- **Datacolor TOOLS.** Launches the Tools program.

View Menu

This menu provides options to change the appearance of the Navigator window.



Icons. The List view offers two types of data display. "Icons" display the icons and program names.



Details. This view includes details about the data. This includes the folder name, folder type, creation user, etc.

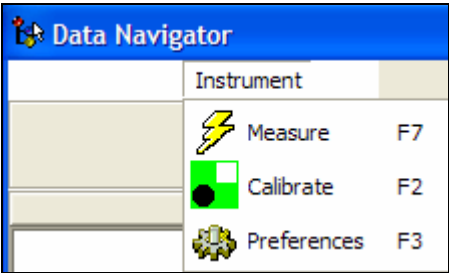
Name	Type	Creation ...	Creation Date	Modificat...	ModificationDate
Translucent Data	Folder	dci	11/3/2000 ...	dci	3/3/2002 11:24:22 AM
1st Shot - Stand...	Sample	dci	3/2/2000 1...	dci	3/3/2002 11:23:49 AM
2nd Shot - Stand...	Sample	dci	3/2/2000 1...	dci	3/3/2002 11:23:49 AM

Autominimize. Navigator is automatically minimized when another Datacolor MATCH^{PIGMENT} program module is launched. When it is disabled, you must minimize the Navigator window manually.

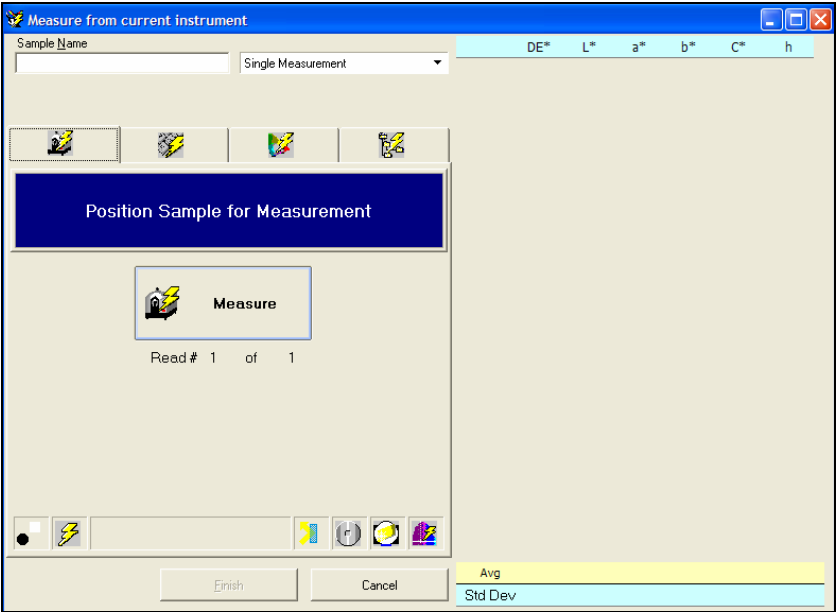
Refresh List. Refreshes the data list displayed in the Navigator window.

Instrument Menu

This menu provides options for using the color measuring device. This includes selecting instrument conditions, calibrating the instrument, and making and storing measurements without opening either Datacolor MATCH^{PIGMENT} or Datacolor TOOLS.



Measure. When this option is selected the *Measurement Wizard* opens:



1. In the *Sample Name* field, enter the name to be assigned to the measurement.

2. Select the *measurement type* (single or multiple measurements).
3. Place the sample at the instrument port, and click on the **Measure** button.
4. When the measurement is completed, click the **Finish** button at the bottom of the window. The measurement will be stored in the database.

NOTES

The measurement is stored in the folder selected as the Home Folder for the user. *See also Admin, All Users Tab to view and change the default folder selections.*

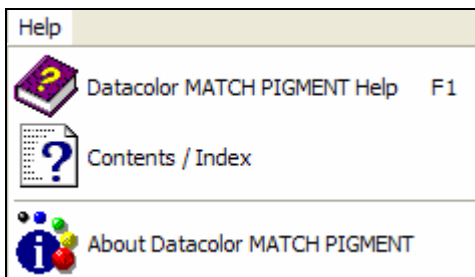
See also Formula Central, Sample Measurement for instructions to use the alternate measurement methods (keyboard spectral data, keyboard colorimetric data, retrieve sample data).

Calibrate. This selection opens the calibration window. If the calibration interval has expired, you must calibrate the instrument before you make any new measurements. *See also Instrument Menu, Calibrate for instructions to complete the calibration procedure.*

Preferences. This option opens the instrument setup window. Using this option you make selections regarding the aperture size and the position of the specular port, as well as enabling various UV filter options. *See also Instrument Menu, Preferences, for details on these features.*

Help Menu

The Help menu provides access to the help options, and to Datacolor software licensing information.



Datacolor MATCH^{PIGMENT} Help. Opens the help system and displays the table of contents.

Contents/Index. Opens the same window as Datacolor MATCH^{PIGMENT} Help.

About Datacolor MATCH^{PIGMENT}. Displays a window providing information regarding the program licensing, and access to additional licensing and system information.

Toolbar

The Toolbar is located directly below the menu bar. It contains icons that duplicate the functions included in the drop-down menus in the Navigator window.



Toolbar Options

Below is a description of all icons on the Navigator toolbar:



Back. Returns to previous folder.



Up. Moves up one level in the folder structure.



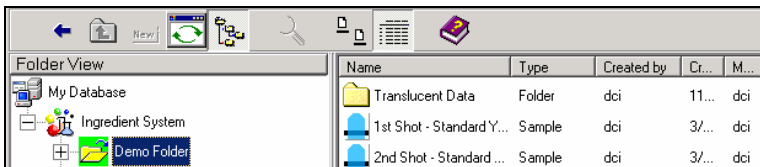
New. Creates a new folder. Not currently enabled.



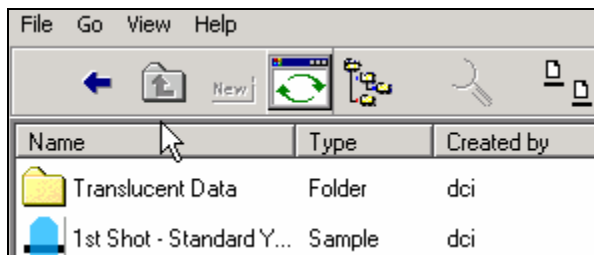
Refresh List. Updates the data listed in the window.



Show/Hide Folder Tree. Changes the Navigator window view. The default view displays two panes, including both the Folder and List view.



1. Click on the **Show/Hide Folder Tree** icon to change the view to single pane, displaying the List View:



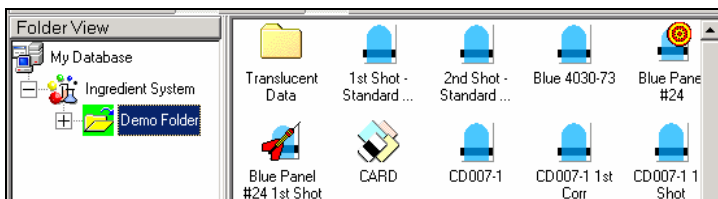
- Click on the icon again to restore the Folder View.



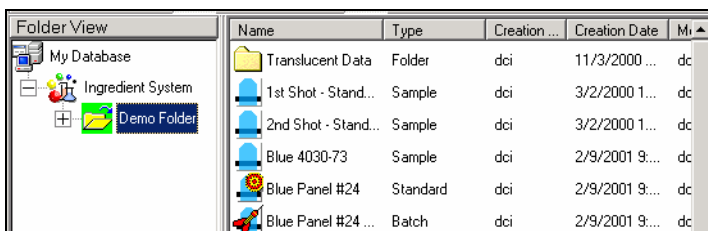
Find. Find can search for samples having a specific property (i.e., date created, date modified, etc.). Find can be used to search jobs, samples, formulas and ingredients. *See also Find Option for a detailed explanation of this feature.*



View Icons. The List View displays icons representing the folder contents:



View Details. The List View displays details of the folder contents:



Help. Opens the Datacolor MATCH^{PIGMENT} help system.

Data Import/Export Wizards

Overview

The Import/Export Wizard provides tools to covert data from Datacolor legacy programs for use with Datacolor MATCH^{PIGMENT}, and to distribute data among multiple systems running the suite programs.

Data Conversion

The Import Wizard provides the ability to convert data from a variety of Datacolor programs and distribute the data to multiple locations that run the program. Data from ChromaCalc DOS and Datamatch PPI can be converted for use with Datacolor MATCH^{PIGMENT}. The data imported can include sample data, formulas, ingredient and colorant data used for color matching.

Data Sharing

This feature allows you to share colorant sets created on different systems. Using the Export Wizard, data from Datacolor MATCH^{PIGMENT} is exported to an XML file format. It can then be transferred, via email or other computer media, to another system. Once copied onto the new system, you use the "Import Wizard" to import it into the active Datacolor MATCH^{PIGMENT} database on another system.

Importing Data

The Import Wizard is used to convert data from Datamatch/PPI or Chroma-Calc Dos for use with Datacolor MATCH^{PIGMENT}.

Before You Begin

- If you are converting data from Datamatch/PPI, both Datamatch and Datacolor MATCH^{PIGMENT} must be loaded onto the system.
- The density unit conversion factor used for Datamatch databases equals 1/density. For example, if the weight/volume value for this conversion is 8.33 lbs, the conversion is 1/8.33 or .12.
- To convert colorant sets from Datamatch, you need to know the weight and volume units used in the Datamatch database.

Exporting Data

All data is exported to an XML file format. This format makes the data available for import to other 3rd party software packages.

NOTES

Data Exchange

Overview

Data Exchange is the program module used to transfer sample and formula data between Datacolor PAINT/ Lab Paintmaker and Datacolor MATCH^{PIGMENT}. Datacolor MATCH^{PIGMENT} has replaced Lab Paintmaker as the program used to generate colorant, sample and formula data for Point-of-Sale (POS) paint applications. Data Exchange is an essential program for laboratories using Datacolor MATCH^{PIGMENT} to provide data to Datacolor retail POS products.

The data exchange is a two-way transfer, and operates like other wizards in Datacolor MATCH^{PIGMENT}. It creates a bridge between the data format used by the POS software including Paintmaker, Lab Paintmaker and Datacolor PAINT, and the format used by Datacolor MATCH^{PIGMENT}. This data transfer makes it possible to continue adding sample and formula data to existing files originally created using Lab Paintmaker, and to convert new data generated from Datacolor MATCH^{PIGMENT} for use with the POS software.

The wizard guides you step-by-step through the transfer process you have selected. The discussion below provides a general overview of the program operation, and highlights aspects of the process that need careful attention to insure the data is properly transferred.

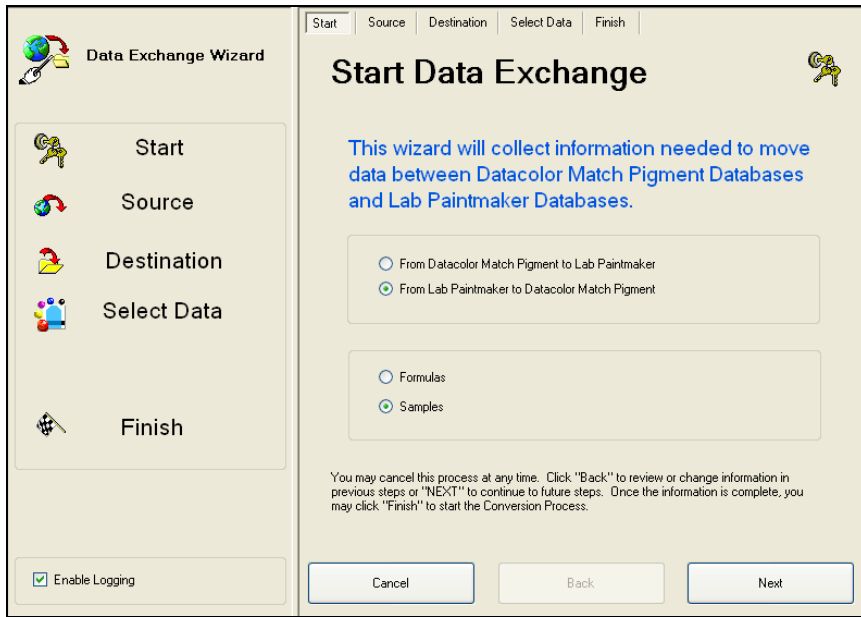
Data Exchange Procedure

The data exchange procedure consists of five steps:

- Start
- Source
- Destination
- Select Data

- Finish

These five steps are represented in both panes of the Data Exchange window:



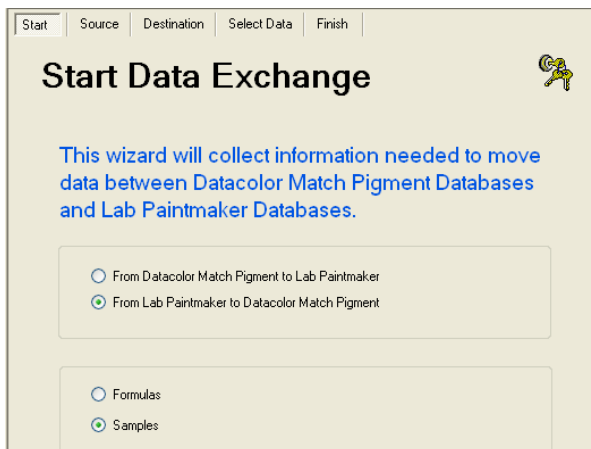
- The *tabs* across the top of the window provide access to each step in the process. You can click on them to view/change the input for the step.
- As you complete each step in the process, a check is displayed on the left side of the window, tracking the progress of the data exchange.
- The buttons along the bottom of the window (*Cancel*, *Back*, *Next*) can also be used to navigate forward and backward through the procedure.
- The *Finish* button executes the transfer.
- **Enable Logging.** We strongly recommend that this option is enabled. When enabled, a log file is created to record the events of the data transfer. This is valuable when problems are encountered during the transfer. The log file (DataExchange.log) is a text file stored in the following location:

C:\Documents and Settings\All Users\Application Data\Datacolor\Match Pigment\Match Pigment_Global

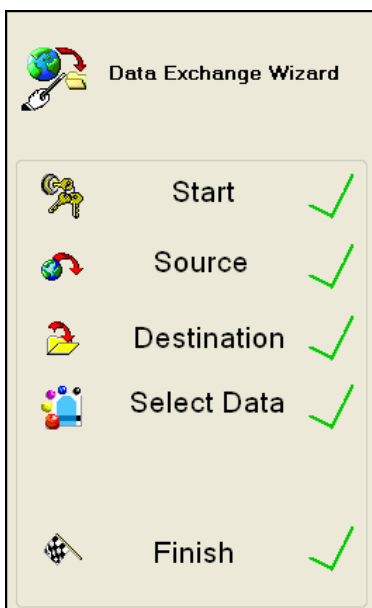
- Place a check in the box to enable logging.

Launching Data Exchange

1. From the Navigator **Go** menu, launch **Data Exchange**. The Start window is displayed:



2. Identify the *file type* and the *data type* to be transferred, and click the **Next** button at the bottom of the window. Follow the prompts through the wizard to complete the data transfer. As you complete each step, your progress is updated in the left window pane:



Data Specifications for Exchange

Below is a summary of the data that can be exchanged between Paintmaker and Datacolor MATCH^{PIGMENT}.

- Data originating from Paintmaker are specified by file extensions.
- Data originating from Datacolor MATCH^{PIGMENT} are specified by object type.

Paintmaker File Extensions

File Extension	Contents
*.mdbunv	A <i>universal</i> database used by Paintmaker. The database includes color card, formula book or palette files. It is the Paintmaker file that provides the sample and formula data that is transferred to Datacolor MATCH^{PIGMENT}. It is the Paintmaker file that receives the sample and formula data transferred from Datacolor MATCH^{PIGMENT}. It must be identified for all data exchange functions.
*.mdbfdt	Formulation database used by Paintmaker. The database includes all of the colorant data, which is required when transferring formulas. When you transfer formulas from Paintmaker to Datacolor MATCH^{PIGMENT}, the program does not request this information. When transferring data from Datacolor MATCH^{PIGMENT} to Datacolor PAINT/Paintmaker, the program requests this information, but it is not required to complete a formula transfer.

Datacolor MATCH^{PIGMENT} Data Objects

Below is a summary of the data objects created using Datacolor MATCH^{PIGMENT} which can be transferred to a Datacolor PAINT/Paintmaker universal database:

Object Type	Use				
Standard <table><tr><td>Name</td><td>Type</td></tr><tr><td> gold</td><td>Standard</td></tr></table>	Name	Type	 gold	Standard	The data transferred includes the name and the spectral data. When you choose to transfer samples from Datacolor MATCH^{PIGMENT}, Standards are automatically included in the transfer.
Name	Type				
 gold	Standard				

The Standard data is stored in a color card file in Datacolor PAINT/Paintmaker.

Batch

Name	Type
 BAT 1	Batch

The data transferred includes the name and the spectral data.

When you choose to transfer samples from Datacolor MATCH^{PIGMENT}, *Batches* are automatically included in the transfer.

The *Batch* data is stored in a color card file in Datacolor PAINT/Paintmaker.

Sample

Name	Type
 BLACK 1	Sample

Sample are retrieved from the Datacolor MATCH^{PIGMENT} database. The data transferred includes the name and the spectral data.

The *Sample* data is stored in a color card file in Datacolor PAINT/Paintmaker.

Formula

Name	Type
 b 2	Formula

When you choose to transfer formulas from Datacolor MATCH^{PIGMENT}, data objects of type *Formula* are retrieved. The data transferred includes the name, spectral data, and ingredient amounts.

When transferring formula data from MATCH^{PIGMENT}, you must identify the type of data, Formula Book or Palette data, in Datacolor PAINT/Paintmaker.

Name	Type
 b 2	Sample

The target color included in this formula also exists as a sample data object. If you also want the target information to be available in Datacolor PAINT/Paintmaker for a color card search, you must transfer the data object separately as a sample.

Depending on the naming conventions you have used, the sample data and the formula may/may not have the same name.

Data Exchange Requirements

When running this program you must provide the following information:

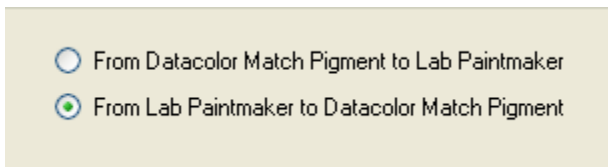
- The file type being converted (Datacolor PAINT/Paintmaker or Datacolor MATCH^{PIGMENT}).
- The data type being converted (sample or formula data).
- Source file name and location.
- Destination file name and location.

- When transferring formula data, you must provide links between colorants used by Lab Paintmaker and Datacolor MATCH^{PIGMENT}.

The data exchange procedure varies depending on the file type and data type you are converting. The procedure is driven by a wizard. Below you will find important aspects of each step addressed.

File Types

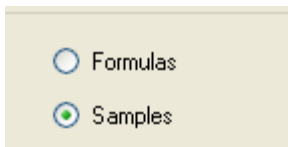
You must identify the type of file being transferred:



- **From Datacolor MATCH^{PIGMENT} to Lab Paintmaker.** You are converting data generated from Datacolor MATCH^{PIGMENT} for use with Paintmaker/Datacolor PAINT.
- **From Lab Paintmaker to Datacolor MATCH^{PIGMENT}.** You are converting data generated from Paintmaker for use with Datacolor MATCH^{PIGMENT}.

Data Types

You must identify the type of file being transferred:



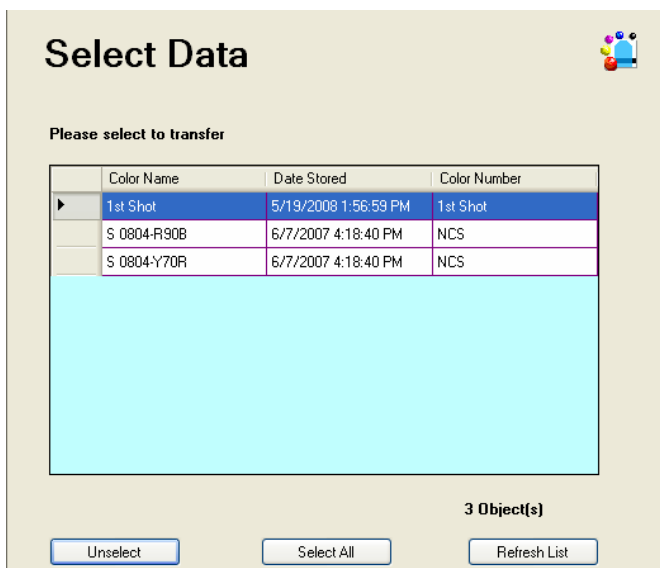
- **Formulas.** The data transferred includes the color name, spectral data and complete formula information. When you select formulas to be transferred, the program will prompt you for information regarding the colorant data associated with the formula information.
 - When transferring formulas, you must create a link between the colorant data used by Paintmaker, and the corresponding data used by Datacolor MATCH^{PIGMENT}. This procedure differs slightly depending on the direction of the data transfer. *See also Formula Transfer, Linking Data for information on this requirement.*
 - **Formula Units.** When transferring formula data from Paintmaker to Datacolor MATCH^{PIGMENT}, you are prompted for type of formula units used. This refers to the units used in the Paintmaker formulas. The equivalent formula units must exist in Datacolor MATCH^{PIGMENT} to preserve the integrity of the formulas when they are transferred. *See*

also Admin, All Systems Tab, Edit Units for instructions to create the correct formula units.

- **Samples.** The data transfer will be limited to sample data only. This includes the sample name and the spectral data.

Data Selection for Transfers

Regardless of whether you are transferring samples or formulas, the program will prompt you to select the data:



You can click on an individual sample to highlight it, or use the buttons on the window to select/unselect groups of samples:

- **Unselect.** Cancels the selection of the highlighted data.
- **Select All.** Selects all of the samples/formulas in the source location for transfer.
- **Refresh List.** Restores the original data list, allowing you to undo any previous selections.

Sample Transfer

When you transfer samples *only*, you transfer the name and the spectral data for the sample. Regardless of the direction of the transfer, you must provide two pieces of information:

- Identification of the source file
- Identification of the destination file

NOTES

When samples are transferred from Lab Paintmaker to Datacolor MATCH^{PIGMENT}, the data are treated in Datacolor MATCH^{PIGMENT} as *Sample* data objects.

- The *Sample* data can be added to a queue using Queue Maintenance.
- Using Navigator, you can convert these *Sample* data objects to Standard and Batch object types, for use with other Datacolor MATCH^{PIGMENT} program modules including Formula Central, Queue Maintenance, and Datacolor TOOLS. See *also Navigator, Editing Data Object Types* for instructions on this option.

Formula Transfer

When you transfer formulas, sample data and ingredient amounts are transferred between the PAINT/Paintmaker and Datacolor MATCH^{PIGMENT} data formats. Regardless of the direction of the transfer, when you transfer formulas you must provide the following information:

- Identification of source file
- Identification of destination file
- Identification of colorant data to be used
- Creation of links between the colorant data

Linking Colorant Data

When you select a formula transfer, the program prompts you for the name of the Datacolor MATCH^{PIGMENT} colorant set to use:

The image shows a software interface with a light beige background. In the center, there is a white rectangular box. Inside this box, on the left, are two radio buttons. The top one is selected and has a green dot; it is labeled 'Formulas'. The bottom one is unselected and has a blue outline; it is labeled 'Samples'. To the right of the radio buttons, the text 'Colorant Set :' is followed by a blue dropdown menu. The dropdown menu is open, showing the text 'cc color coat d' in white. A small downward-pointing arrow is visible on the right side of the dropdown menu.

In order to transfer formula information, the ingredient information used by each product (Datacolor PAINT/Paintmaker and Datacolor MATCH^{PIGMENT}) must be linked in order to insure the integrity of the formula after it is transferred. You do this by mapping the colorants used by Paintmaker, to the colorants used by Datacolor MATCH^{PIGMENT}. If the link you create is not valid, the transferred formula will not produce a valid match to the target color.

The screens and prompts differ slightly, depending on the direction of the formula transfer. Screens are provided below to detail the procedure for each direction, Transferring from Paintmaker to Datacolor MATCH^{PIGMENT}, and Transferring from Datacolor MATCH^{PIGMENT} to Paintmaker.

NOTES

- This is a one-to-one mapping relationship. You create an individual link for each colorant.
- The colorants used by Datacolor MATCH^{PIGMENT} are assigned an *abbreviation* that matches abbreviations used by Datacolor PAINT/Paintmaker.
- The abbreviation assigned to the Datacolor MATCH^{PIGMENT} colorants may be stored in the Ingredient file. This depends on the direction of the transfer, and selections made at the time of the transfer.
- When the abbreviation is stored in the ingredient data used by Datacolor MATCH^{PIGMENT}, it will be referenced whenever you transfer data using the same colorant information.

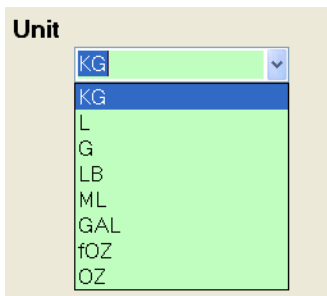
Formula Transfer from Lab Paintmaker to Datacolor MATCH^{PIGMENT}

When you are transferring data from Datacolor PAINT/Paintmaker to Datacolor MATCH^{PIGMENT}, the only formulas available for transfer are *palette* formulas.

1. On the Select Data screen, select the formula data to be transferred. The *Link Data* fields are displayed:



2. **Unit.** Identifies the type of units used in the formula expression. This selection refers to the type of formula units used in the Datacolor PAINT/Paintmaker formulas. This selection is critical to accurate conversion of formula amounts. Click the down arrow, and select a unit:



NOTE

The exact units you use for formulas in PAINTMAKER ***must*** appear in this list. If the correct unit does not exist, you must create it ***before*** you continue. If you do not, the integrity of the formula will not be maintained when it is transferred from Paintmaker to Datacolor MATCH^{PIGMENT}. See also *Admin, All Systems Tab, Edit Units for instructions to create formula units.*

3. When you have made the selection, click the **Next** button at the bottom of the window. The colorant selections for both Datacolor PAINT/Paintmaker and Datacolor MATCH^{PIGMENT} are displayed. This screen is used to establish a direct link between the colorants in Lab Paintmaker and those used in the colorant set you have selected for use with Datacolor MATCH^{PIGMENT}.
 - Lab Paintmaker works with *abbreviations* for the colorants. These are displayed in the *Lab Paintmaker Ingredient* column.
 - Complete names are displayed for the colorants in the *Datacolor MATCH^{PIGMENT} Ingredient* column.

Lab Paintmaker Ingredient	Datacolor Match Pigment Ingredient
TR	sc black
LS	sc clear
QS	sc indo yellow
TS	sc magenta
KU	sc quindo red
XS	sc red oxide
YS	sc silver
JS	sc thalo blue
MS	sc thalo green
ZS	sc white
WS	sc yellow oxide

Save Abbreviations with DataColor Match Pigment

4. In the *Lab Paintmaker Ingredient* list, click in a row to select a colorant.
5. Click anywhere in the corresponding *Datacolor MATCH^{PIGMENT} Ingredient* row to display all of the colorants available in the colorant set.
6. Highlight the colorant that corresponds to the selected colorant in the *Lab Paintmaker ingredient* column. The link will be created, and the list of colorants will close.

Lab Paintmaker Ingredient	Datacolor Match Pigment Ingredient
TR	sc indo yellow
LS	

NOTES

- Since this is a one-to-one relationship, as each Datacolor MATCH^{PIGMENT} colorant is linked, it is removed from the list.
 - You can clear a link at any time before the transfer is completed. Simply return to this screen and right-click in the appropriate colorant row.
 - The abbreviation displayed in the *Lab Paintmaker Ingredient* column will be assigned to the Datacolor MATCH^{PIGMENT} colorant. This information is recorded in the *Ingredient* file.
7. Move to the next colorant in the *Lab Paintmaker Ingredient Column* and select it.
 8. Repeat this linking process for each colorant in the Lab Paintmaker column. To insure that all formulas from Paintmaker are successfully transferred, you must create links for *all colorants* in the Lab Paintmaker Ingredient column.
 9. **Save Abbreviations with Datacolor MATCH^{PIGMENT}**. Place a check in the box to store the abbreviation in the *Lab Paintmaker Ingredient* column to the ingredient record in Datacolor MATCH^{PIGMENT}, for each linked colorant.
 - If you will be repeating data transfers between the same two colorant files, saving the abbreviations will speed the process.
 - When there is no check in the box, the links are discarded after the transfer.
 10. When you have linked all of the colorants, click the **Finish** button at the bottom of the window.

Formula Transfer from Datacolor MATCH^{PIGMENT} to Lab Paintmaker

The procedure for transferring formulas in this direction is similar, but not identical to the transfer from Paintmaker to Datacolor MATCH^{PIGMENT}.

1. Following the selection of the Paintmaker destination database, the *Link Data* window displays:

Link Data

Manufacturer

Geometry: ☐ 20° ☒ 60° ☐ 85°

 DataType: ☒ Color Card

NOTE

Paintmaker organizes its data based on *Manufacturer*, *System*, and *Brand* designations. Depending on the selections you make during the Link Data step, this information may be displayed.

2. **Manufacturer.** You must provide an entry for the Manufacturer. If none exists, you must still enter at least one character into this field. Enter a name, and click the *Next* button. The screen refreshes, and additional fields are displayed:

Link Data

Manufacturer

Unit

Select the Formulation Database

Geometry: ☐ 20° ☒ 60° ☐ 85°

 DataType: ☐ FBook ☐ Palette

3. Verify the *Unit* selection, and edit as needed. When transferring formulas, the program must know the type of units used for the formula expression. Since these formulas are originating from Datacolor MATCH^{PIGMENT}, the default unit displayed is the *unit type* selected as the default for Datacolor MATCH^{PIGMENT}. See also *Admin, All Systems Tab, Edit Units* for information to view/change this default selection.

NOTES

- If you are adding formulas to an existing Datacolor PAINT/Paintmaker database, you should override the unit selection with information from your Paintmaker system. This cannot be done until you identify a Formulation Database (step 4, below).
- If you are a new user creating a new database for Datacolor PAINT in-store use, a Paintmaker formulation database will not exist. In this case, simply verify that the unit selected in this screen is the unit used for your formulas. You can make changes to the *Unit* selection as required, and proceed directly to step 8, below, to continue the data transfer process.
- When necessary, identify the Datacolor PAINT/Paintmaker *formulation database* to be referenced for the formula transfer.

4. **Select the Formulation Database.** The *Formulation Database* field identifies an existing Datacolor PAINT/Paintmaker formulation database to be associated with the formulas you are transferring from Datacolor MATCH^{PIGMENT}.

If you do not need to link the formulas being transferred to existing Datacolor PAINT/Paintmaker data, *leave this field blank*, and proceed directly to step 8.

NOTE

This field identifies the colorant database in Datacolor PAINT/Paintmaker that corresponds to the colorant set data used in Datacolor MATCH^{PIGMENT}.

The formulation database used by Datacolor PAINT/Paintmaker contains *System, Brand, Unit* and *Fill* information. When you identify a formulation database, the *Unit* field updates and additional fields are displayed in the window:

Link Data

Manufacturer
Floyd

System
CCryl

Brand
CCryl Soft

Unit
VOLUME

Short Fill
152.0487

Select the Formulation Database
C:\Documents and Settings\tester\Des... [Browse]

Geometry
☐ 20°
 ☒ 60°
 ☐ 85°

Data Type
☐ FBook
 ☐ Palette

5. **System.** If the *Manufacturer* includes more than one system, click on the down arrow and select the system to be associated with the formulas being transferred.
6. **Brand.** Click on the down arrow and select the brand to be used.
7. **Unit.** The program displays the unit expressions that exist in the Datacolor PAINT/Paintmaker database. If there is more than one, select the correct unit to be used for the data you are currently transferring.
 - **Short Fill.** The program displays the short-fill amounts that exist in the Datacolor PAINT/Paintmaker database. If there is more than one, select the correct unit to be used for the data you are currently transferring.
8. **Geometry.** Make the appropriate *Geometry* selection. Datacolor PAINT/Paintmaker offers a gloss adjustment feature. You must identify the gloss geometry (20°, 60°, or 85°) associated with the formula data you are transferring.

NOTE

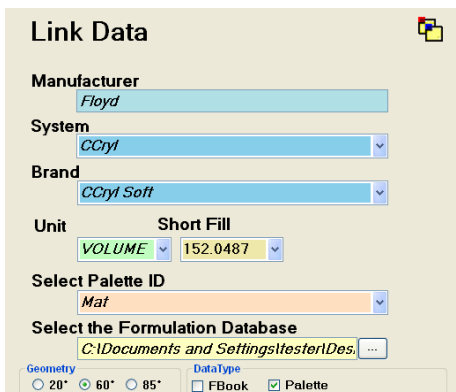
If you are not concerned with the gloss adjustment feature, accept the default selection.

9. **Data Type.** Make the appropriate *Data Type* selection. When you are transferring formula data, you must specify the types of formula files used by Datacolor PAINT/Paintmaker, *Formula Book* (FBook) and *Palette* files, for which the transferred data will be available.

NOTE

You can enable the formulas for use with both data types. To do this, place a check in each box.

10. When you enable the formulas for use with a *Palette* file, an additional field is displayed:



Link Data

Manufacturer
Floyd

System
CCryl

Brand
CCryl Soft

Unit **Short Fill**
VOLUME 152.0487

Select Palette ID
Mat

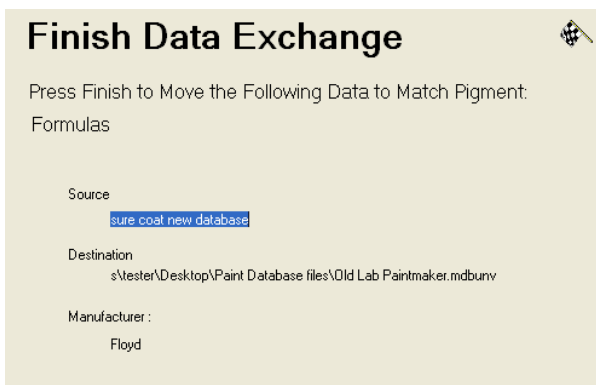
Select the Formulation Database
C:\Documents and Settings\tester\Des, ...

Geometry **DataType**
☐ 20° ☒ 60° ☐ 85° ☐ FBook ☒ Palette

Select Palette ID. You must identify the palette file in the Datacolor PAINT/Paintmaker database to receive the formula.

The program reads the palette file names from the Datacolor PAINT/Paintmaker database. If more than one exists, you must choose the palette file to receive the formula.

- If you are working with a clean (new) Paintmaker database, no choices will exist. You must enter a name for the palette file, which will be added to the Paintmaker database.
11. When you have completed all of the selections on the screen, click the **Finish** button at the bottom of the window. The *Link Data* window will close, and a summary of the transfer information will be displayed:



Finish Data Exchange

Press Finish to Move the Following Data to Match Pigment:

Formulas

Source
sure coat new database

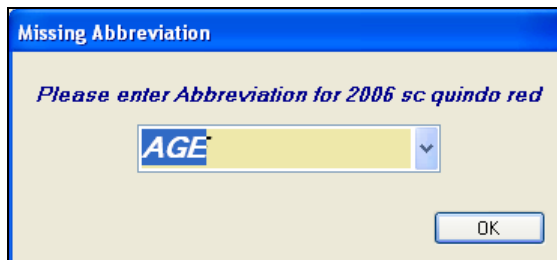
Destination
s:\tester\Desktop\Paint Database files\Old Lab Paintmaker.mdbunv

Manufacturer :
Floyd

12. At this point, you can make changes to any of the selections for this transfer.
13. Click on the **Finish** button to start the data transfer. During the formula transfer procedure, the program checks for links between each colorant in

the Datacolor PAINT/Paintmaker formulation database, and the Datacolor MATCH^{PIGMENT} colorant set.

If any of the colorants in the MATCH^{PIGMENT} database do not have a link to a colorant in the PAINT/Paintmaker formulation database, the program prompts you to provide the information:



14. Match the colorant with an entry in the Datacolor PAINT/Paintmaker database. To do this, click on the down arrow to highlight the colorant to be linked, and click **OK**.

If this field is blank, you must enter something in this field to complete the transfer. This information is stored as an abbreviation in the Ingredient file. *See also Ingredient Maintenance for instructions to view/edit this information.*

15. When all of the colorant abbreviations are provided, click the **Next** button at the bottom of the window, and finish the data transfer process.

Applications Technology

Overview

Datacolor MATCH^{PIGMENT} provides many powerful tools for evaluating and solving color problems. This section provides a detailed explanation of the color science concepts, applications issues and program operation that often generate questions from users. References to these topics are found throughout this guide, and links to these topics are also found throughout the help system.

- **Data Security.** Datacolor MATCH^{PIGMENT} includes the capability to selectively limit user access to the data management functions. This feature was created to protect proprietary color data, such as standard measurements and colorant data, that you generate using the program. This section explains each of the features available with this option.
- **Recycles.** A recycle is a material that typically has been rejected as “off-color”, or is leftover from a production run. Disposing of this material is very expensive, and Datacolor MATCH^{PIGMENT} offers options to recycle, or “work off” this excess material into another production batch. This section explains in detail the recycle tools provided.
- **Advanced Queuing Options.** Datacolor MATCH^{PIGMENT} includes a suite of program modules dedicated to running queues. These Advanced Queuing options were developed for users required to produce a high volume of color matches. This program suite includes program modules designed to facilitate matching speed and accuracy in high-volume color matching applications.
- **Ingredient Priority and Ingredient Compatibility.** Ingredient Priority and Ingredient Compatibility are tools used for evaluating candidate formulas. They can be used to eliminate formulas based non-colorimetric properties of the ingredients, and to weight formulas based on these properties. They are powerful tools that help you to screen candidate formulas based on important non-colorimetric properties.

- **Formula Storage and Retrieval.** This discussion explains the concept and operation of formula storage. It also includes a detailed explanation of the *Formula Sample Handling* options that are applied to formula retrieval.
- **Formula Sorting Options.** Explains in detail recursive sorting, multiple sort and custom sort features available in Formula Central.
- **Optimizer Goal.** Provides a theoretical explanation of the optimizer goal function used by Formula Central to calculate the "best" formula predictions.
- **Sample Types.** In Set Maintenance and Formula Central, the program needs to know how many samples you will be measuring, and what type of samples they are. This information is referred to as "sample type", and this section provides a detailed discussion of all of the types available.
- **Ingredient Density.** Providing correct ingredient densities is crucial to the calculation of accurate formula predictions. This section is a primer on ingredient density, and its application to colorant calibration and formula predictions.
- **Colorant Calibration Methods.** This is an in-depth discussion of the optical models, curve smoothing techniques and mixture grouping methods that are used in Datacolor MATCH^{PIGMENT} to calibrate a colorant set.
- **Colorant Performance and Level Performance.** Discusses the various factors available in Set Maintenance for adjusting the accuracy of the optical constants in a colorant set.
- **Optical Thickness (Variable K2) Correction.** Explains an alternative approach available for calculating the correction factor for internal reflectance (K2).
- **Correction for Non-Optical Contact.** Explains the correction applied to samples that are not in optical contact with the background substrate presented.
- **Fractional Parts Output.** This feature is used almost exclusively by the coatings industry, to configure formula output for use in retail application. It provides a step-by-step procedure for configuring program options involved in producing customized fractional parts output.
- **Legacy Combinatorial Correction.** This section explains the program logic used to calculate a combinatorial correction. The logic used by ChromaCalc DOS and Datacolor PPI is different from that used by Datacolor MATCH^{PIGMENT}, and you may see differences when comparing the results provided by the respective programs.

Data Security

Datacolor MATCH^{PIGMENT} includes the capability to selectively limit a user's access to the data management functions. This feature was created to protect proprietary color data, such as standard measurements and colorant data, that you generate using the program. The data security feature is configured using the *Admin* program module.

NOTE

A user must have Administrator Rights to have access to the Admin program module. See also *Admin* in this user's guide for a discussion of users and administrator rights.

To implement the data security feature, you will work with *users* and *user groups*, and *user permissions*.

Users

Two default *users* having administrator rights are provided with the program installation.

- **Admin.** This user is assigned to the Administrator user group. This is a special user that cannot be deleted or removed. You cannot apply any restrictions to the *Admin* user permissions, and the *Admin* user cannot be deleted.

NOTES

Admin does not appear in the list of Datacolor MATCH^{PIGMENT} users, but you can access to the program by entering **Admin** as a user login.

No default password is assigned to this login. We suggest that you assign a password to this user, since it has full administrator rights.

- **User.** This user is assigned to the Administrator user group. The default password for this user is "CC3". This user can be removed from the *Administrator* user group, and deleted from the system.

NOTE

Both default users are assigned to the Administrator user group, and have full administrator rights. This includes full access to data types and folders, and rights to create users and user groups, and to assign permissions.

User Groups

When Datacolor MATCH^{PIGMENT} is installed, two *user groups* are provided:

- **Administrator.** This is the only user group that is active in the default program configuration. Both default users are assigned to this group.
 - No restrictions can be assigned to this user group regarding data object and folder access. Data security features can only be applied to non-administrator groups.
 - Placing a user in this group removes all restrictions.
 - You cannot create another Administrator group. Additional user groups created are non-administrator user groups.
 - This user group cannot be deleted.
 - Users can be removed from this group.

NOTE

For Datacolor MATCH^{PIGMENT} program upgrades, all existing *Admin* users are automatically made members of the *Administrator* group.

- **General Users.** Users assigned to this group do ***not*** have administrator rights. They cannot create users or user groups, and they cannot assign permissions to user groups. In the default program configuration, there are no users assigned to this group.

NOTE

For Datacolor MATCH^{PIGMENT} program upgrades, all existing non-admin users are automatically made members of the General Users group.

User Permissions

Permissions to access data are applied to two data categories:

- **Data Type.** These are specific data objects created and used by Datacolor MATCH^{PIGMENT} such as samples, substrates, jobs, etc. You can selectively expand or restrict access to individual data objects.
- **Folder.** Permissions are selectively assigned with regard to viewing and editing contents of individual folders used by the program.

Data access permissions are assigned to *user groups*, not to individual users.

Implementing the Data Security Option

When Datacolor MATCH^{PIGMENT} is installed, the default program configuration assigns the two default users to the Administrator user group. These users have full permissions to access data. To protect your valuable data, we strongly encourage you to review the users, user groups and user permissions configured for your system, and customize these configurations to your needs.

The procedure to configure users and assign data permissions includes the following tasks:

- Create users as needed.
- Create user groups as needed.
- Assign users to the appropriate user group.
- Assign permissions to each user group.

There is no specified order in which these tasks must be performed.

NOTES

To work with the data security feature, you must have access to the Admin program module. This module is only available to a user that has administrator rights.

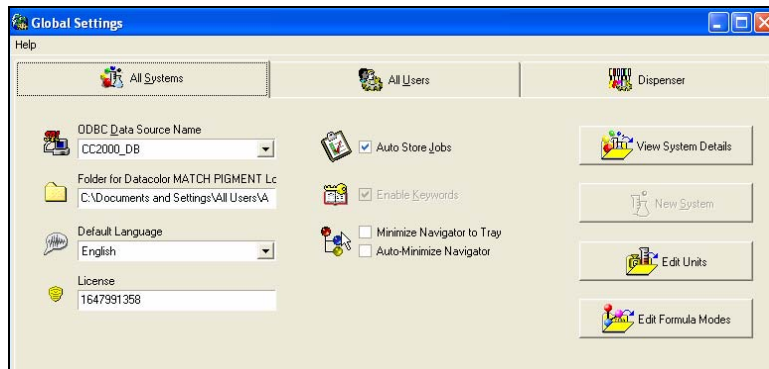
The default program login, *User*, has full administrator rights.

As you continue to work with this program, you might need to create additional users and user groups, and selectively enable/disable access to specific data types and data folders for each group. These changes can be made at any time, by any user that has administrator rights.

Getting Started

The Admin program module includes all of the program features that must be configured to customize the data security for your system. To access the Data Security options:

1. Launch the **Admin** module.



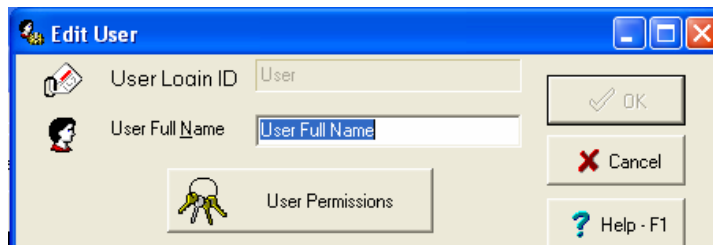
2. Click on the **All Users** tab:



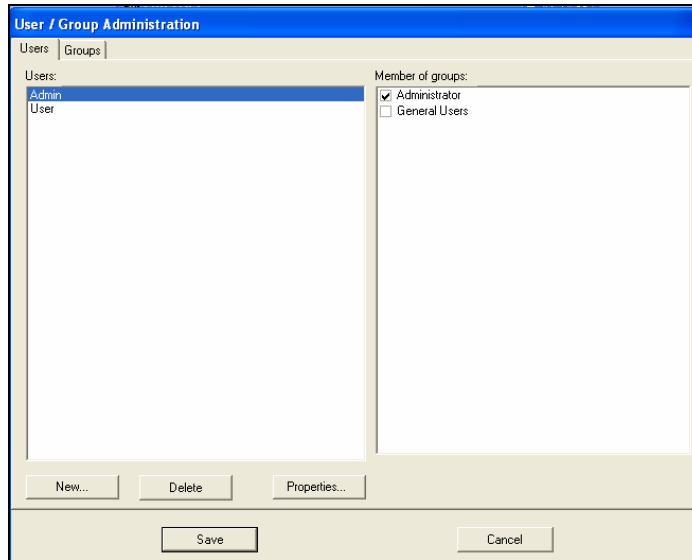
At the bottom of the window is a list of the existing users:

	Admin	Login Name	Full Name	Modified	Modified by	Created	Created by
		User	User Full Name	8/21/2007 1:22:49 PM	dci	2/28/2001 5:53:18 PM	dci
		Bill		8/21/2007 1:21:04 PM	User	8/21/2007 1:21:03 PM	User
		Patrick		8/21/2007 1:21:05 PM	User	8/21/2007 1:21:05 PM	User
		Sandy		8/21/2007 1:21:06 PM	User	8/21/2007 1:21:06 PM	User
		Bob		8/21/2007 1:21:07 PM	User	8/21/2007 1:21:07 PM	User
		Eugene		8/21/2007 1:21:08 PM	User	8/21/2007 1:21:08 PM	User

3. Select a user from the list, and click on **View Details**. The following program options are displayed:

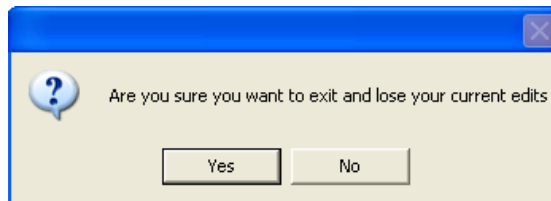


4. Click on **User Permissions**. The User/Group Administration window displays:



This window includes two tabs, *Users* and *Groups*. These two tabs provide access to all of the program options used to implement the data security option.

5. When you have made all of the selections, *you must click the **Save** button to save the changes to the database.* If you click **Cancel**, or close the window without clicking **Save**, the dialog below is displayed:



- Click **Yes** to close the User/Group Administration window without saving the changes.
- Click **No**. The dialog box closes, and User/Group Administration window remains open. *See also User Configuration for instructions to create and edit users.*

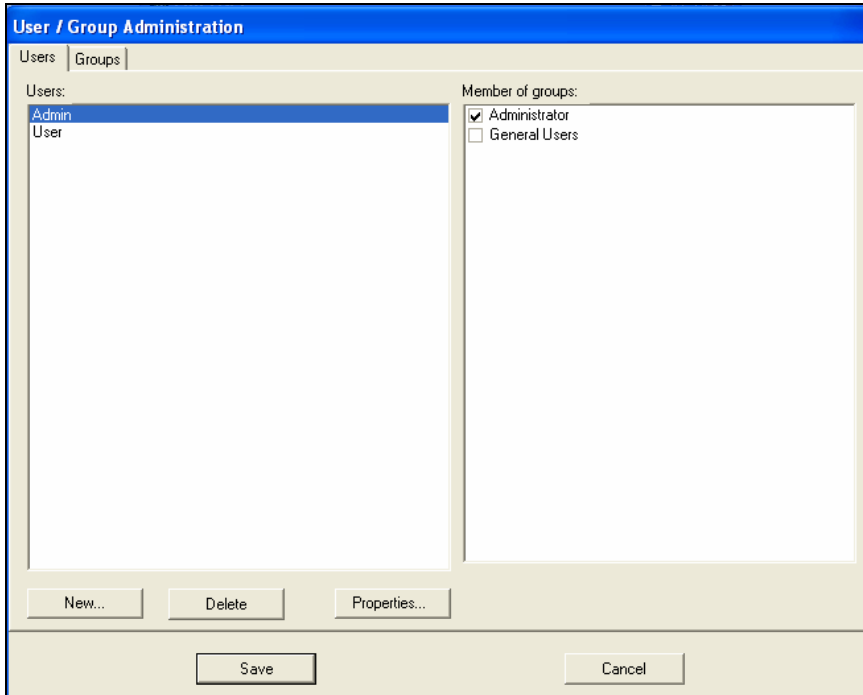
See also Configuring a User Group for instructions to create user groups and to assign users. See also Data Access Permissions for instructions to selectively enable/disable user access to data types and data folders.

User Configuration

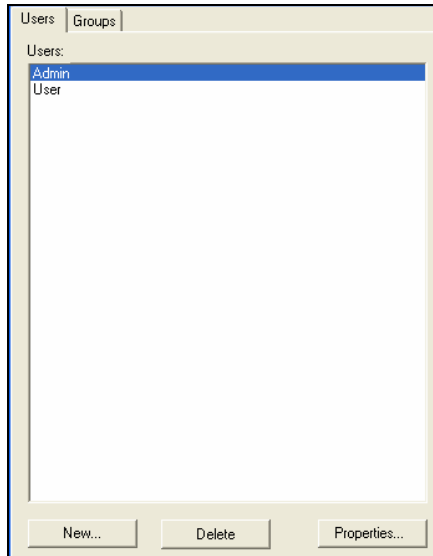
This section provides step-by-step instructions to create, edit, and delete users. See also *Data Security Overview*, *Users* for additional information regarding users.

User Configuration Window

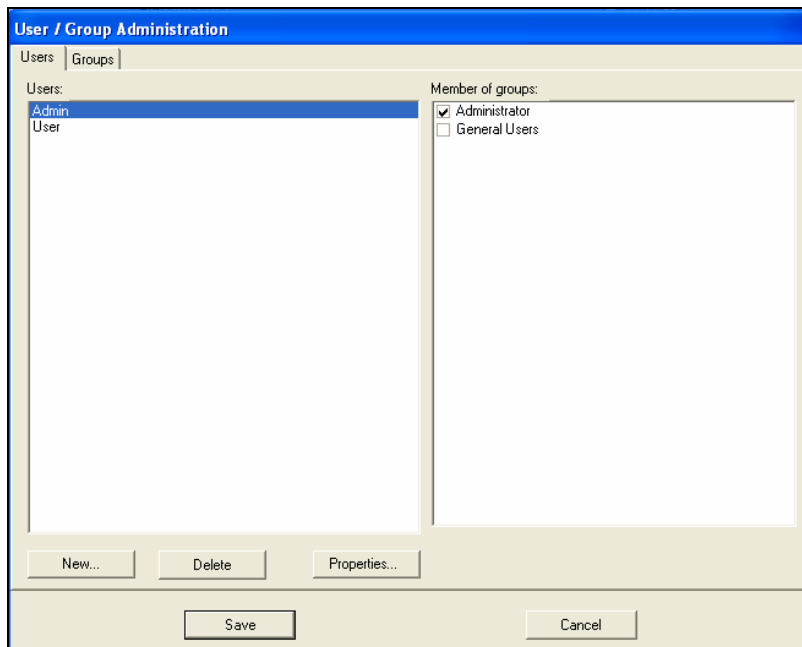
The User/Group Administration window includes a *Users* tab and a *Groups* tab:



- On the User/Group Administration window, click the **Users** tab. The existing users are displayed in the (left) *Users* pane:



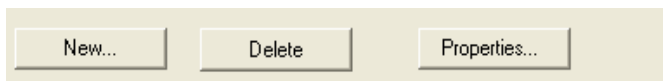
A full list of user groups is displayed In the *Member of groups* (right) pane:



A check identifies the groups that include the highlighted user. A user can be

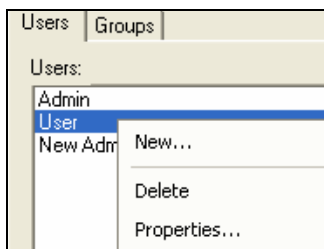
assigned to multiple groups.

Buttons along the bottom of the window are used to configure and edit users:



- **New.** Opens the new user dialog. *See Create User for instructions.*
- **Delete.** Deletes the user currently selected. *See Delete User for instructions.*
- **Properties.** Opens the edit user dialog. *See Edit User for instructions.*

These functions can also be accessed from a menu. To access this menu: Highlight a user and right-click on it. The menu displays:

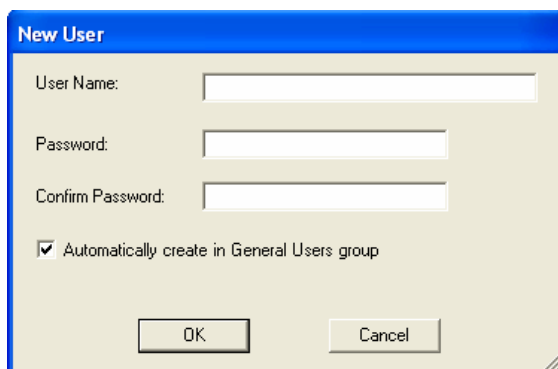


Create User

If you have a large number of program operators, you can create several users and several user groups. Each group can be assigned different permissions. You can then assign each user to a group having the appropriate data access permissions.

To create a new user:

1. On the Users tab, click the **New** button. The dialog below displays:

A 'New User' dialog box with a blue title bar. It contains three text input fields labeled 'User Name:', 'Password:', and 'Confirm Password:'. Below these fields is a checkbox labeled 'Automatically create in General Users group' which is checked. At the bottom are 'OK' and 'Cancel' buttons. The dialog has a light beige background and a thin border.

2. **User Name.** This name is input as the login when the program is launched. Enter a user name that contains 3-25 alpha-numeric characters.
3. **Password.** This password is input for this user when the program is launched. This cannot be the same as the user name, and should contain 3-25 alpha-numeric characters.
4. **Confirm Password.** Re-enter the password.
5. **Automatically create in General Users group.** Place a check in this box to automatically assign this user to the General Users group. The General Users group does *not* have administrator rights.

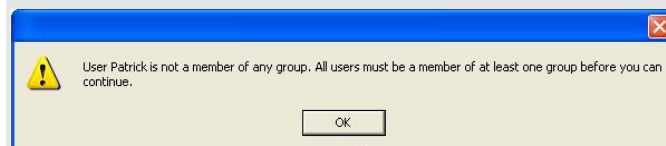
NOTES

- If you do not place a check in this box, the user will not be assigned automatically to the default user group. You will have to manually assign the user to a group.
- You must assign a user to a group to complete the record and make the user available.

6. Enter information for the *user name* and *password*.
7. Click **OK** to close the dialog box.
8. Assign the user to a user group. *See also Create a User Group, Assign User for instructions.*
9. On the User Group/Administration window, click **Save** to save these changes to the database.

NOTE

When you click **Save**, the program verifies that all users are assigned to at least one user group. You will see the dialog below for each user you have created, which is not assigned to a user group:



10. Click **OK**. The User Group/Administration window remains open. You must assign the user to a group, to complete the record. When the data is saved the dialog closes, and the Edit User window displays:

Edit User

User Login ID: User

User Full Name: User Full Name

User Permissions

Preferred Product License: Any Available License

☐ Allow access at this level only

Home Folder: Demo Folder

Target Folder: Demo Folder

Trial Folder: Demo Folder

Substrate Folder: Demo Folder

Formula Folder: Demo Folder

Start Program: Formula Central

Default Job Template: Transparent

Default Language: English

☒ User is an Administrator

OK Cancel Help

dci Created: 2/28/2001 5:53:18 PM dci Edited: 10/2/2007 10:41:33 AM

11. Click **OK** to close the window.

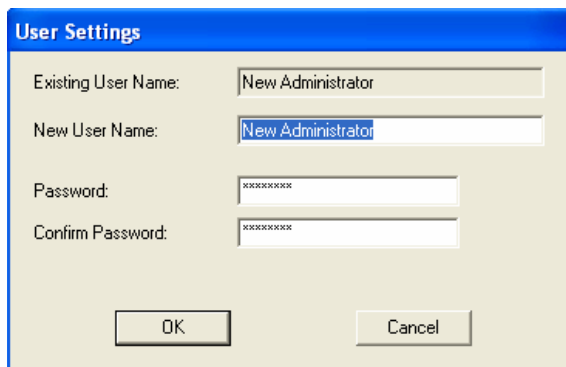
NOTES

- When you create multiple users and close the User Group/Administration window, the Edit User window will display once *for each user created*.
- For new users, default settings will be assigned for the product license, folder designations, start program, default job template, and language selections.
- You must close Datacolor MATCH^{PIGMENT} and restart the program to enable these changes.

Edit User

This option is used to change the *User Name*, the *Password*, or both entries for an existing user. To make these changes:

1. On the Users tab, highlight the user to be edited, and click **Properties**. The dialog below displays:

The image shows a 'User Settings' dialog box with a blue title bar. It contains four input fields: 'Existing User Name' (containing 'New Administrator'), 'New User Name' (containing 'New Administrator'), 'Password' (containing 'xxxxxxx'), and 'Confirm Password' (containing 'xxxxxxx'). At the bottom are 'OK' and 'Cancel' buttons.

2. **Existing User Name.** This field displays the existing user name, and is for display purposes only. No information can be entered.
3. **New User Name.** Enter a new user name of 3-25 alpha-numeric characters.
4. **Password.** Placeholders are displayed for the current password. Enter a new password containing 3-25 alpha-numeric characters.
5. **Confirm Password.** Re-enter the new password.
6. Enter the changes to these fields as needed, and click **OK**. The program confirms that the user name does not currently exist, and that the entries in the *Password* and *Confirm Password* fields match and that they do not contain prohibited characters.

NOTES

If the password entries do not match, you will receive an message. You must re-enter the information and click **Save**.

Click **Cancel** to close the window without saving any changes.

7. On the User Group/Administration window, click **Save**.

NOTE

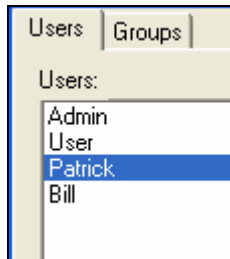
To enable these changes, logoff Datacolor MATCH^{PIGMENT} and restart the program.

Delete User

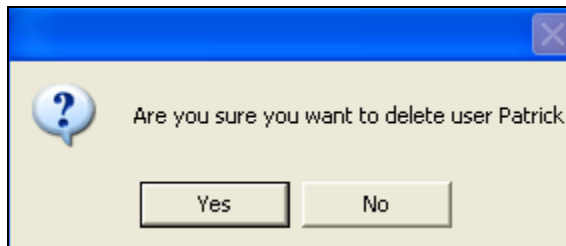
- If a user is no longer active, you can delete it from the system at any time.
- When you delete a user, it is no longer available as a program login. However, it is not deleted from the database, because the user may have created data objects (targets, trials, formulas, etc) that remain active in the database.
- The deleted user will no longer appear in the Admin users list.
- Any objects created by the user will display the (deleted) user name in the *Created By* field.

To delete a user:

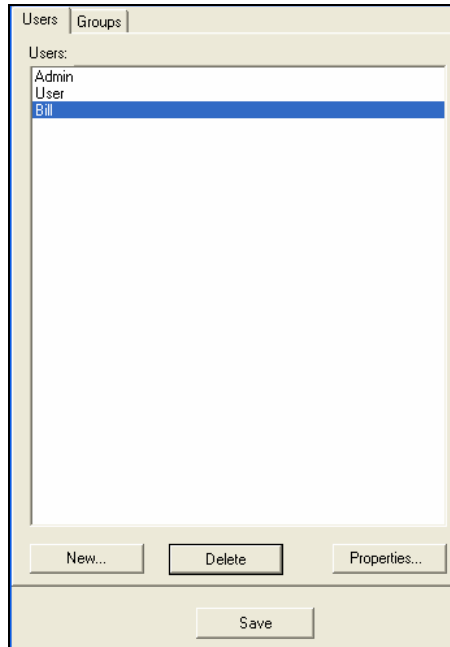
1. From the User/Group Administration window, Users Tab, highlight the user to be deleted:



2. Click the **Delete** button at the bottom of the window. The program will ask you to confirm the delete command:



3. Click **Yes** to continue, or **No** to cancel the function.
4. On the User/Group administration window, you must click the **Save** button at the bottom of the window to make this change permanent.



The user *Patrick* will not longer appear in the Users List. However, you may see the user *Patrick* in a Navigator list in the *Created By* or *Modified By* fields.

You must close Datacolor MATCH^{PIGMENT} and restart the program to enable these changes.

User Group Configuration

Once you have created the necessary users, you must assign them to a user group. When you install the program, two user groups, *Admin* and *General Users*, are provided.

Admin. The permissions to access data types and data folders for this user group are not restricted. This user group should be restricted to a limited number of users to protect your data.

- In the default program configuration, all default users are assigned to this user group. In the case of Datacolor MATCH^{PIGMENT} program upgrades, all existing users with Admin status are automatically assigned to this group.
- Users included in this group can be reassigned at any time to other user groups, having restricted data management permissions.
- The program will not allow you to create another administrator group.
- This user group cannot be deleted.

General Users. The default configuration of this user provides full permissions to access data types and data folders.

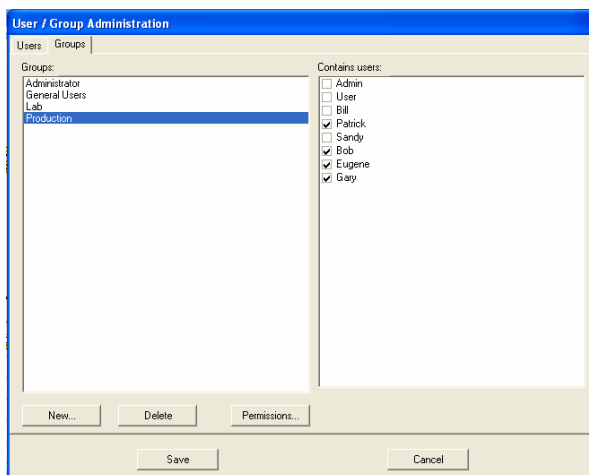
- In contrast to the Administrator group, permissions to access all data types and all data folders can be restricted.
- This user group can be deleted.

User group configuration includes the following steps:

- Create a user group
- Assign users to the group
- Assign data permissions to the group

User Group Configuration Window

- On the User/Group Administration window, click on the *Groups* tab. The existing Groups are displayed in the (left) *Groups* pane. A list of all users in the system are displayed in the *Contains users* pane. Details regarding the members of the highlighted Group are displayed:

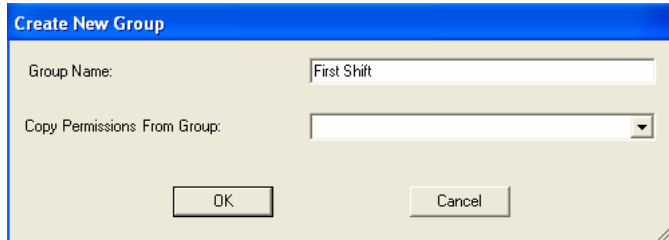


A **check** in the *Contains users* pane indicates the users that are assigned to the highlighted user group.

Create a User Group

Below are instructions to create a new user group.

1. From the User/Group Administration window, *Users* tab, click the **New** button. The window below displays:

A screenshot of the 'Create New Group' dialog box. It has a blue title bar with the text 'Create New Group'. Inside, there are two input fields: 'Group Name:' with the text 'First Shift' entered, and 'Copy Permissions From Group:' with a dropdown arrow. At the bottom, there are 'OK' and 'Cancel' buttons.

2. **Group Name.** Enter a name for the new user group.
3. **Copy Permissions From Group.** You can duplicate data permissions from another user group. This option speeds the user creation process, and will minimize mistakes made when trying to recreate a set of permissions manually. If this field is left blank, default permission settings are assigned to the new user.
4. Click on the down arrow and view the choices:

A screenshot of a dropdown menu. The menu is open, showing a list of options: '<None>', 'Administrator', 'General Users', 'Lab', and 'Production'. The dropdown arrow is visible at the top right of the menu.

5. Highlight a group having the permission configuration you want applied to the group.
 - **None.** When this is selected, the new user group will have the default permission settings, giving the user complete access to data types and data folders.
 - **All other choices.** Copies the folder permissions and data type permissions for the group selected. *See also User Group Permissions for a complete explanation of the data type and folder permissions that can be assigned.*
6. Make the appropriate selection and click **OK**. You must close Datacolor MATCH^{PIGMENT} and restart the program to enable these changes.

Assign Users

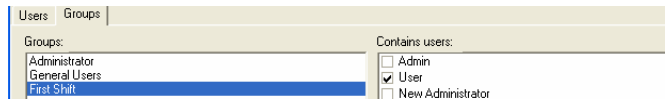
A user can be a member of multiple groups. For users with membership in multiple groups, the user is granted all of the permissions assigned to each user group.

NOTE

A *User Group* can exist without having any users assigned to it.

Once you have created a user group, you must assign users to it by doing the following:

1. From the User/Group Administration window, *Users* tab, click to highlight a user to be assigned to a group. The *Member of groups* pane lists all of the existing groups.
2. Place a **check** in the group to which the user will be added.

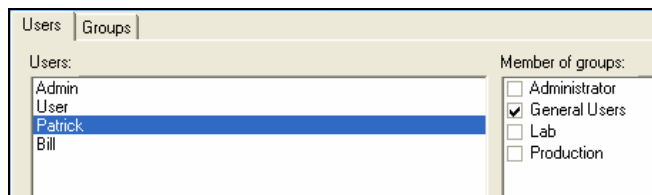


3. On the User/Group administration window, you must click the **Save** button at the bottom of the window to make this change permanent.

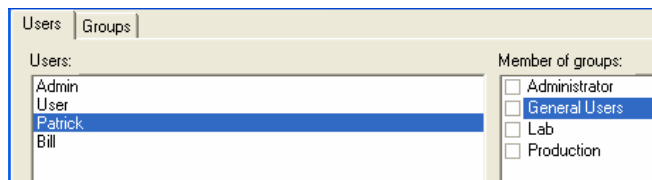
Delete Users from a Group

You can delete a user from a group at any time. To delete a user from a group:

1. From the User/Group Administration window, *Users* tab, click to highlight a user to be deleted from a group. The right window pane will display the user's membership status for each users group:

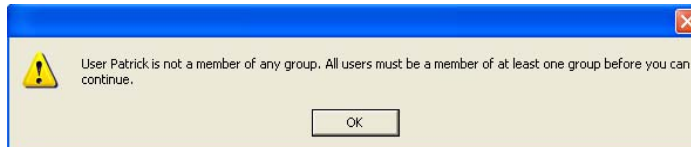


2. Click in the box to remove the user from a group:



The user is removed from the group, but is still active in the system and can be assigned to a different group.

3. Click **Save** to save the change. The User/Group Administration window closes.
4. Since a user must be a member of at least one group. If it is not assigned to any user group, when you click **Save** the message below displays:



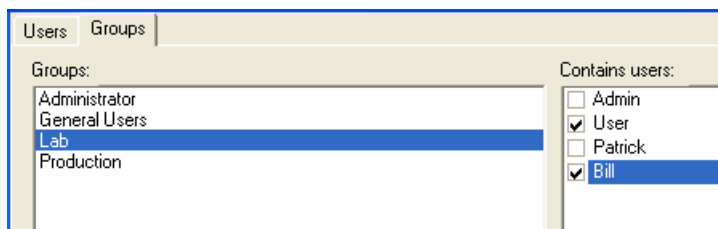
5. Click **OK** to close the dialog box, and assign the user to one user group.

Delete User Group

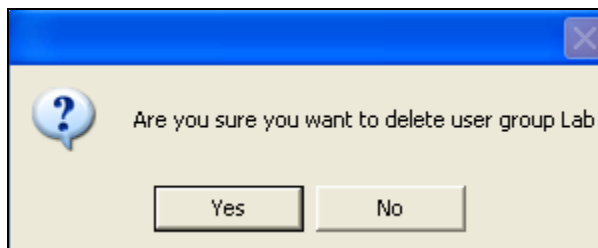
You can delete a Users Group at any time. However, you must remove all users from the group before you can delete it. *See also Delete Users from Groups for instructions.*

To delete a User Group:

1. On the User/Group Administration, click on the *Groups* tab to view the choices:



2. Highlight the group to be deleted, and click the **Delete** button at the bottom of the window. A confirmation message is displayed:



3. Click **Yes** to delete the selected user group, or **No** to cancel the delete command.

- On the User/Group administration window, you must click the **Save** button at the bottom of the window to make this change permanent.

User Permissions

Permissions are assigned from the Group Permissions window:

Folder	Inherit	View	Modify	Create	Delete
<Root>	☐	☒	☒	☒	☒
Admin View	☒	☒	☒	☒	☒
Ingredient...	☒	☒	☒	☒	☒
Trash Can	☒	☒	☒	☒	☒

Permissions to access data are assigned to user groups, and are applied to two data categories:

Data Type. These are specific data objects created and used by Datacolor MATCH^{PIGMENT} such as sample and substrate data. You can selectively expand or restrict access of a *user group* to individual data objects. Click on the **Data Type Permission** tab to access the selections.

Folder. Permissions are selectively assigned to a *user group* with regard to viewing and editing contents of individual folders used by the program. Click on the **Folder Permission** tab to access the selections.

NOTE

The *Group Name* field at the top of this window identifies the user group assigned the permissions that are currently displayed.

Below are *partial lists* of the Data Type and Folder Permission privileges used by Datacolor MATCH^{PIGMENT}:

Data Types

Group Name: New Group	
Data Type Permission	Folder Permission
Object	Modify
Folder	☒
Sample	☒
Standard	☒
Batch	☒
Substrate	☒
Formula	☒
Recycle	☒
Job	☒
Tolerance	☒
Illuminant	☒
Job Template	☒

Folders

Group Name: New Group	
Data Type Permission	Folder Permission
Folder	Inherit
<Root>	☐
Admin View	☐
Ingredient System	☒
Demo Folder	☒
STD DEMO WHITE	☒
STD GOLD PL	☒
STD GREEN PL	☒
STD ORANGE PL	☒
Translucent Data	☒
Trash Can	☒

Determining Proper Permissions

Below are some guidelines to use to determine the permissions assigned to user groups:

- Permissions are assigned to *data types* and to the *folder tree*. To selectively assign permissions to a group, the group must have permission to access both the data type AND the folder in question.
- Users can be members of multiple groups. For users with membership in multiple groups, the user is granted all of the permissions assigned to each user group. This can be thought of as an OR permission.
- The permissions applied affect the folder structure that can be viewed in the Navigator module. The Datacolor MATCH^{PIGMENT} application will only display those folders and data objects that are permitted for the active user.
- When a folder permission is denied, the subfolders of the restricted folder will not display in the Navigator module.

Permissions Window

The Permissions Window includes a Data Type Permission tab and a Folder Permission tab:

Group Permissions			
Group Name: General Users			
Data Type Permission Folder Permission			
Object	Modify	Create	Delete
Folder	☒	☒	☒
Sample	☒	☒	☒
Standard	☒	☒	☒
Batch	☒	☒	☒
Substrate	☒	☒	☒
Formula	☒	☒	☒
Recycle	☒	☒	☒
Job	☒	☒	☒
Tolerance	☒	☒	☒
Illuminant	☒	☒	☒
Job Template	☒	☒	☒

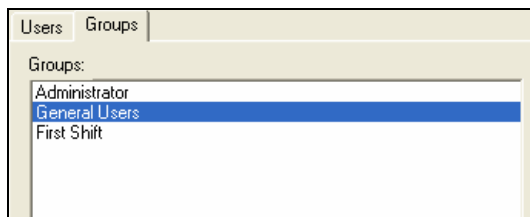
You may configure both *data type* permissions and *folder* permissions for each user group.

Data Type Permissions

This pane is used to selectively assign access rights to *data types*. These are specific data objects created and used by Datacolor programs/Datacolor MATCH such as standards, batches and substrate data, among others. Using these permissions, you can limit access to specific data objects, without restricting user access to a particular folder. For example, you can restrict user group access to all job templates generated by Datacolor MATCH^{PIGMENT}.

To access *Data Type Permissions*:

1. From the User/Group Administration window, click on the **Groups** tab:



2. Highlight the *user group* to be examined, and double click on it. The Group Permissions window is displayed:

Group Permissions			
Group Name: General Users			
Data Type Permission		Folder Permission	
Object	Modify	Create	Delete
Folder	☒	☒	☒
Sample	☒	☒	☒
Standard	☒	☒	☒
Batch	☒	☒	☒
Substrate	☒	☒	☒
Formula	☒	☒	☒
Recycle	☒	☒	☒
Job	☒	☒	☒
Tolerance	☒	☒	☒
Illuminant	☒	☒	☒
Job Template	☒	☒	☒

Fields on the Data Type Permission Tab

A check assigns the permission to the group. An empty box denies the permission to the user group. Below is a summary of the fields on this window:

- **Object.** Identifies the data type.

The security settings that can be assigned to data types are:

- **Modify.** The data type can be modified, subject to other rights.
- **Create.** New items of this data type can be created by the user, subject to other rights. *Create* rights are required for an object in order for the *copy*, *paste* and *move* functions to work.
- **Delete.** The user may delete items of this data type, subject to other rights.

Folder Permissions

The Folder Permissions option limits access to an *entire folder*. The restricted folder may include all object types generated by Datacolor programs.

Group Name: General Users					
Data Type Permission		Folder Permission			
Folder	Inherit	View	Modify	Create	Delete
<Root>	☐	☒	☒	☒	☒
Admin View	☒	☒	☒	☒	☒
Ingredient System	☒	☒	☒	☒	☒
Demo Folder	☒	☒	☒	☒	☒
STD DEMO...	☒	☒	☒	☒	☒
STD GOLD PL	☒	☒	☒	☒	☒
STD GREEN...	☒	☒	☒	☒	☒
STD...	☒	☒	☒	☒	☒
Translucent...	☒	☒	☒	☒	☒
Trash Can	☒	☒	☒	☒	☒

Fields on the Folder Permissions Tab

- **Inherit.** The folder inherits all of its rights from its parent folder.
- **View.** The folder and objects within the folder can be viewed, subject to other rights. Denying folder view rights to a parent folder implies denied rights for all sub-branches of that folder.
- **Modify.** Data within the folder can be modified.
- **Create.** The user may create and/or move objects to the folder, and create subfolders, subject to other rights.
- **Delete.** The user may delete objects within the folder, or move objects from the folder, subject to other rights.

NOTES

- *Modify* and *Delete* rights refer to the contents of the folder, not to the folder itself. To have rights to modify or delete a folder, the rights must be set on the parent folder, and on the folder data object type.
- In order to be able to copy and paste an item, *View* rights must exist on the source folder, and *Create* rights must exist on the destination folder.
- In order to be able to cut, paste or move an item, *Delete* rights must exist on the source folder, and *Create* rights must exist on the destination folder.
- In Datacolor MATCH^{PIGMENT}, users are allowed to delete a folder and its contents in one step. In this case the *Delete* function will delete everything possible. If an item cannot be deleted due to permission settings or data dependencies, then the item and its container will not be deleted.

Assigning Permissions

To assign permissions to a user group:

1. Verify the correct User Group is selected.
2. Click on the **Data Type Permission** tab, and highlight the object you want to configure. *See also Data Type Permissions for an explanation of the available permissions.*
3. Place/remove a check in the box representing the permission you want to assign to the user group.
4. When you have assigned all of the *Data Type* permissions, click on the **Folder Permissions** tab, and repeat the procedure. *See also Folder Permissions for an explanation of the available permissions.*
5. When you have made all selections, click **OK**. The Group Permission window closes.
6. On the User/Admin window, click on the **Save** button to make the changes to the database.

Recycles

Overview

A recycle is a material that typically has been rejected as “off-color”, or is leftover from a production run. Disposing of this material is very expensive, and one valuable tool offered by Datacolor MATCH^{PIGMENT} is an option that enables you to *recycle*, or “work off” this excess material into another production batch. The program offers several different strategies to recycle material, in an effort to accommodate your production needs and to maximize the amount of material used. This recycle discussion covers the following aspects of the recycle option:

- Methods for using recycles
- Samples required
- Configuring the Recycle option
- Examples of Recycle results

Methods for Using Recycles

When you create a recycle in Datacolor MATCH^{PIGMENT}, a data record is automatically generated which enables the program to use the recycle as either a colorant, or as a batch. There are two fundamental methods, the *colorant* method and the *batch* method, available to utilize recycles in your production environment.

In some situations, a recycle material is blended with other colorants to match a new target color. The recycle material is treated as a colorant in your inventory, and is included in the initial formula created to match a new target. This is the ***colorant method***.

In other cases, you may be formulating a match to a new standard color, and want to find the closest recycle to start the new batch. You can then shade the batch, using either virgin materials or other recycles, to match the target color for the new production run. This is the ***batch method***.

Every recycle data record includes the following information:

- **Recycle icon.**  A recycle data object displays this icon.
- **Recycle name.** The name assigned to the recycle material.
- **Recycle measurement data.** This is either a synthesized curve, or a measurement of the recycle sample.
- **Recycle formula.** This is either the actual formula used to make the sample, or a theoretical match to the sample using colorants in your inventory.

When you setup the recycle option, you can configure it to consider many of the circumstances you encounter in production, to make the best use of recycle materials.

Generating Recycle Data

Three Datacolor MATCH^{PIGMENT} program modules are used to enable and configure the Recycles option:

- **Admin.** This program option is used to enable the Recycle option. You must have Administrator rights to run this module. If the Recycle option in Admin is not enabled, the Recycle features will not be enabled in any Datacolor MATCH^{PIGMENT} program module. See also *Configuring the Recycle Option, Getting Started for instructions to activate Recycles in the Admin module.*
- **Formula Central.** For each *Recycle*, the required information can be input and generated from Formula Central. When you create a recycle in Formula Central, the program also creates a colorant record for the recycle in a colorant set. See also *Creating Recycles in Formula Central for instructions to store the data through Formula Central.*
- **Set Maintenance.** For each *Recycle*, the required information can be input and generated from Set Maintenance. When you create a recycle in Set Maintenance, the program also stores the sample measurement and/or the formula for use in Formula Central. See also *Creating Recycles in Set Maintenance for instructions to store the data through Set Maintenance.*

NOTE

You will only input the recycle data once, using either Formula Central or Set Maintenance.

Required Information

Recycle data is generated from any one of the following:

- **Sample Measurement (only).** At the conclusion of a production run, you can measure the recycle and store it into the database. You are not required to provide the formula used to make the material.
- **Colorant Formula (only).** You have the formula used to make the recycle, but you do not have a physical sample of the recycle. You input the formula into the program. You are not required to provide a sample for measurement.
- **Sample Measurement and Colorant Formula.** You have a physical sample of the recycle and the formula used to make it, and the sample measurement and formula are provided to the program.

Configuring the Recycle Option

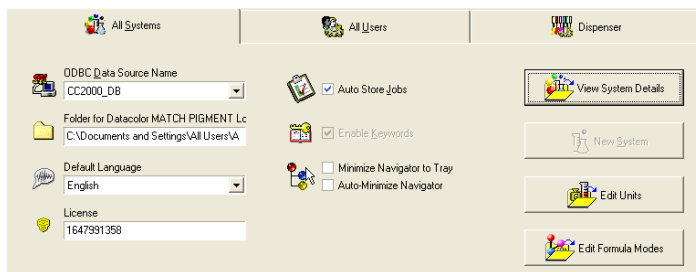
Getting Started

The Recycle option is enabled/disabled through the Admin module. If it is not currently enabled in Admin, you will not be able to access any Recycle program options in either Formula Central or Set Maintenance.

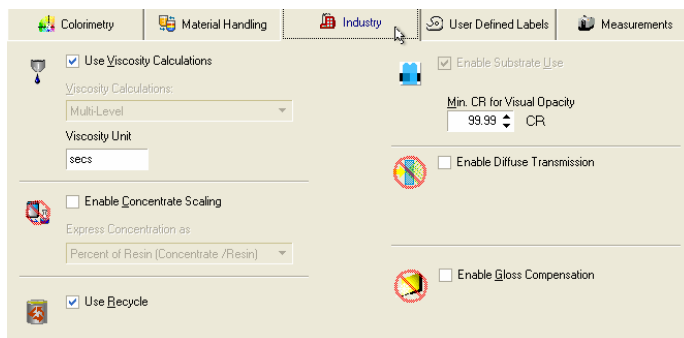
You must be logged in as a user with Administrator Rights to access the Admin option. *See also Applications Technology, Data Security an explanation of user logins and permissions.*

To enable the recycle option:

1. Launch the Admin module. The window below displays:



2. Click on **View System Details** button, **Industry** tab. The window below displays:



- **Use Recycle.** A check indicates the option is enabled.
 - If no check is displayed click in the box.
3. Close the Admin module. You must restart the Formula Central and Set Maintenance modules to enable the use of the *Recycle* option.

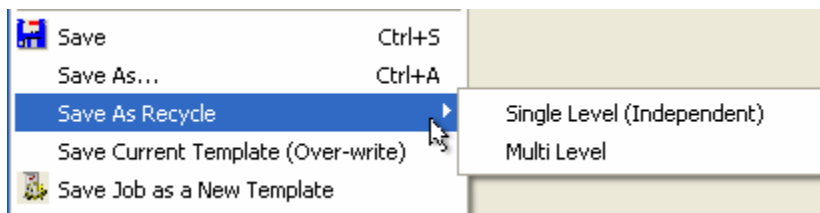
The Recycle program options will be available in both Formula Central and Set Maintenance. Recycles can be stored into the database using either Formula Central or Set Maintenance. *See also Creating Recycles in Formula Central or Creating Recycles in Set Maintenance for details on each procedure.*

Creating Recycles in Formula Central

In Formula Central, any sample (target or trial), any formula, or any combination of sample and formula can be input to create a recycle. This flexibility allows you to add a recycle to your database as it is created in production, without interrupting your normal workflow.

To store a recycle using Formula Central:

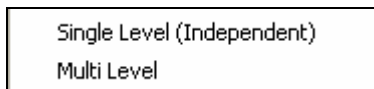
1. Verify that the colorant set currently active in Formula Central is the correct colorant set for the recycle you are using.
2. Measure the recycle sample as either a Target or Trial.
3. Click **File Menu, Save as Recycle**. A submenu displays:



4. From the submenu, select either **Single Level (Independent)** or **Multi Level**. The program will calculate the recycle data and store it in the database. *See also Save as Recycle Submenu below for a discussion of these two selections.*
5. The Save As dialog will display. *See also Naming Recycles below for a detailed discussion of the records created for a recycle, and the naming conventions used.*

Save As Recycle Submenu

When you store a recycle in Formula Central, a submenu containing choices regarding the colorant calibration method is displayed. You must make a choice from this menu:



Single Level (Independent). This calibrates the recycle using only the recycle sample %R data. This is basically the same as the independent calibration option in Set Maintenance.

- The K/S or K&S can be derived directly from the recycle sample data.
- This option is available for transparent and translucent colorant sets.
 - For *transparent* sets, a single sample can be used to calculate the K/S of the recycle.
 - For *translucent* sets, a single ROL/ROD sample can be used to calculate the K and S of the recycle.
- For opaque sets, this option is not available, since 2 samples are required for an opaque K and S calculation.
- The Single Level method creates a 100% formula of the recycle.

Multi Level Calibration. This method requires a recycle formula, and uses the colorants in the formula to create a multi-level (recycle) colorant.

- The optical constants of the colorants in the formula are used to create the multiple calibration levels of the recycle.
- If there is only a sample measurement, the program will run a combinatorial match to find the best formula to use for the recycle.
 - The combinatorial match is based on the current job template and current ingredient selection.
 - Based on this formula, the program will generate 6 calibration levels of the recycle.
- The Multi-Level method creates a formula that includes ingredients from the current colorant set.

NOTES

- *See also Applications Technology, Colorant Calibration for a detailed discussion of Colorant Calibration methods.*
- Since the Multi-Level may run a combinatorial match to find the best recycle formula, this may take some time, depending on the matching parameters set.
- The selections enabled on this submenu are based on the information you have provided about the recycle.
- When you provide only a sample of the recycle, both Single Level (Independent) and Multi Level are enabled, and you must chose one.
- When you provide only a formula for the recycle, both Single Level (Independent) and Multi Level are enabled, and you must chose one.
- The Single Level (Independent) option is disabled when both pieces of information are available. The Multi-Level calibration is the preferred colorant calibration method when a valid formula is available.

Recycle Methods

This section provides a technical discussion of all possible colorant calibration methods available for generating recycle data. *See also Applications Technology, Colorant Calibration for a detailed discussion of colorant calibration methods.*

Save Recycle with Sample Measurement Only

If you have a recycle sample, but do not have a formula, you input the recycle as either a target measurement or trial measurement in Formula Central. In this situation, both *Single Level (Independent)* and *Multi Level* options are available.

Save a Recycle with Colorant Formula Only

When there is only a colorant formula available for the recycle, *Multi Level* calibration is the only option that is enabled on the submenu. In this case, the formula is used to produce a synthesized (theoretical) %R sample. This synthesized data is saved as the recycle sample measurement.

Save a Recycle with Sample Measurement and Colorant Formula

In this case, you have both a sample measurement and a colorant formula for the recycle, and both calibration options are available.

NOTES

- In cases where you have both the target sample and the trial sample available, the trial sample is always used as the recycle sample measurement.
- The Single Level recycle option is not available when a colorant formula is available. The Multi Level option is considered to be superior in cases where a valid formula is available.

There are several job states in Formula Central that allow you to enter the sample measurement and colorant formula for the recycle. *See also Formula Central, Formula Grid, Job States for a full discussion of job states.*

You can store recycles by providing sample measurements and formula information during the following job states:

- **Formulation Output State.** You have performed a match and there is a formula in the Formula Central grid.
 - The formula is the theoretical match to the target.
 - If you select *Save as recycle* at this point, the formula in the grid is stored as the recycle formula, and the target sample measurement is stored as the recycle sample measurement.
 - This would be similar to the case of *saving a recycle with a sample measurement only*, and would rarely be used.

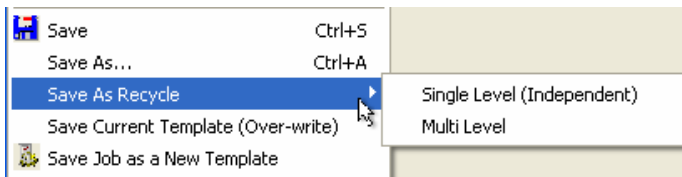
- **Correction Input State.** You have measured a trial sample, but you have not yet performed a correction.
 - If you select *Save as recycle* at this point, the trial formula is saved as the recycle formula, and the trial sample measurement is stored as the recycle measurement.
 - If the trial sample represents material that is ready to be used as recycle, *Save as recycle* here eliminates the need to re-measure at a later time.
 - This procedure assumes that the batch will not be altered further in production, and this sample measurement accurately represents the recycle when the production run is completed.
- **Correction Output State.** You have completed a correction.
 - If you select *Save as Recycle* at this point, the trial formula is stored as the recycle formula, and the trial sample measurement is stored as the recycle sample.
 - This case retains the same logic applies to **Correction Input State**.
- **Manual Formula Input.** You have manually entered a formula into the Formula Central grid, and measured the formula sample as the *trial*.
 - If you select *Save as recycle* at this point, the input formula is stored as the recycle formula and the trial sample measurement is stored as the recycle sample.

Naming Recycles

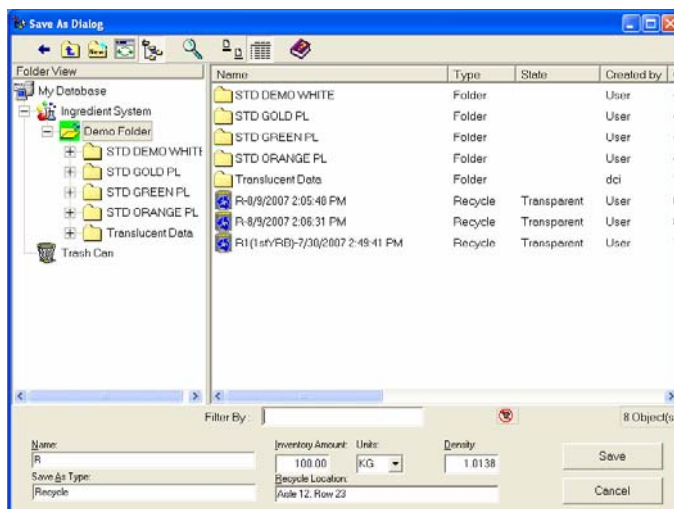
When you save a recycle, you have the option to assign a name to the recycle data object. This data object includes a name, a sample measurement and a formula.

To assign a custom name:

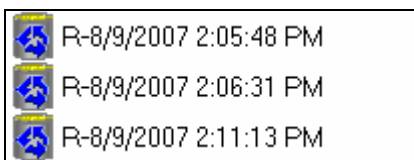
1. In Formula Central, select **File Menu, Save As Recycle**. A submenu displays:



2. Select either option from the submenu. The Save As dialog shown below is displayed:



3. **Name.** The default name “R” is assigned. You can overwrite the default with your own name.
4. **Date and Time.** The current date-time is automatically added to any name you input in this field. This is done to avoid naming conflicts because a recycle creates a formula, a colorant and an ingredient.



5. **Inventory Amount and Unit.** This is the amount of recycle material that you have available.
6. **Recycle Location.** This is a text string where you can put location information about the recycle.
7. **Density.** The density displayed is the calculated density of the recycle formula. This can be over-written with an exact density if required.

Creating Recycles in Set Maintenance

If the *Recycle* option is activated in Admin, a new tab, *Recycle*, is displayed in Colorant Maintenance. You can store and calibrate a colorant using any of the normal colorant calibration options and turn it into a recycle.

- To make a colorant a recycle, select the *Recycle* tab and place a check next to *Is a Recycle*.

	1	2	3
✓	0.02 KG	0.05 KG	0.11 KG
Ready	0.94 KG	0.91 KG	0.86 KG
Ready	Red Recycle 2.0000% 1.00 S...	Red Recycle 5.0000% 1.00 S...	Red Recycle 10.0000% 1.00 S...
	1.0000 mls	1.0000 mls	1.0000 mls
	0.00	0.00	0.00
	550	550	550

Additional input fields will display for information regarding recycle amount available, units and location:

	1	2	3
✓	0.02 KG	0.05 KG	0.11 KG
Ready	0.94 KG	0.91 KG	0.86 KG
Ready	Red Recycle 2.0000% 1.00 S...	Red Recycle 5.0000% 1.00 S...	Red Recycle 10.0000% 1.00 S...
	1.0000 mls	1.0000 mls	1.0000 mls
	0.00	0.00	0.00
	550	550	550

NOTE

If the recycle material is being added to the colorant set, you must first store and calibrate it as a normal colorant. Once this is completed, you can flag it as a recycle through the *Is a Recycle* field. See also *Set Maintenance for instructions to store colorants*.

Naming Recycles in Set Maintenance

If you store a colorant in a set, and flag it as a recycle in Set Maintenance *at a later time*, the colorant name will not change.

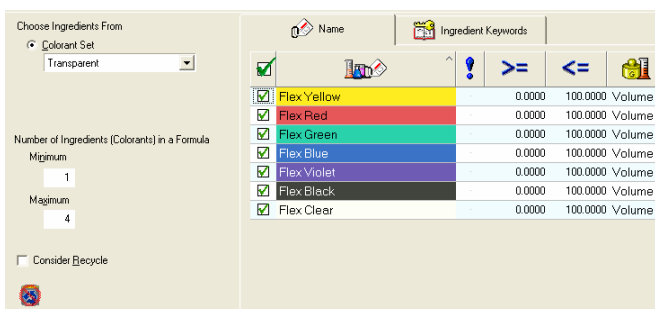
When a colorant is created in Formula Central, the date and time are automatically included in the recycle name. When this recycle record is displayed in Set Maintenance, it retains the name assigned to it in Formula Central.

Using Recycles

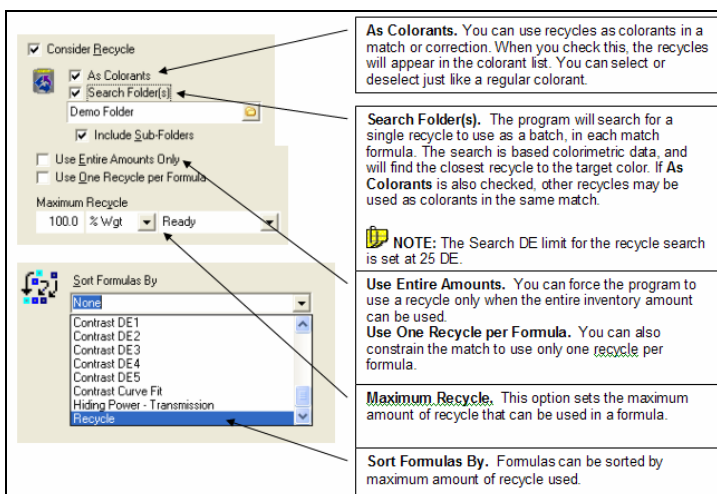
A recycle can be used either as a colorant, as a batch, or as both. This section explains each of these uses.

To enable the use of recycles in Formula Central:

1. Open the Select Ingredients window:



2. Check the *Consider Recycle* check box, to activate the recycles option.

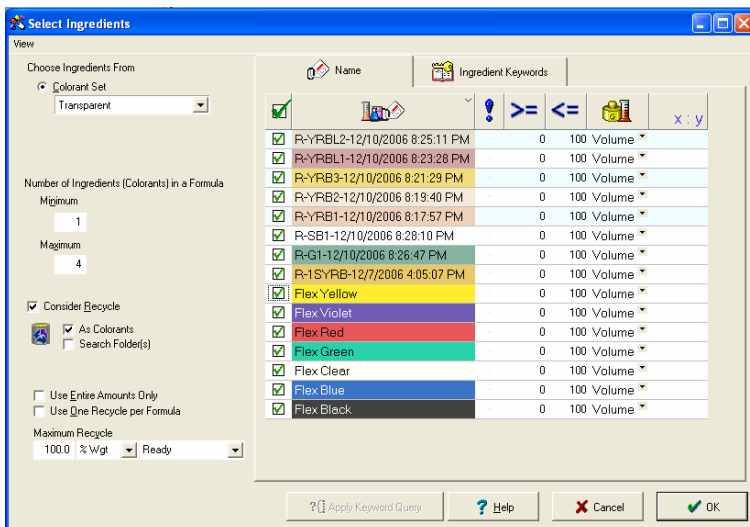


NOTE

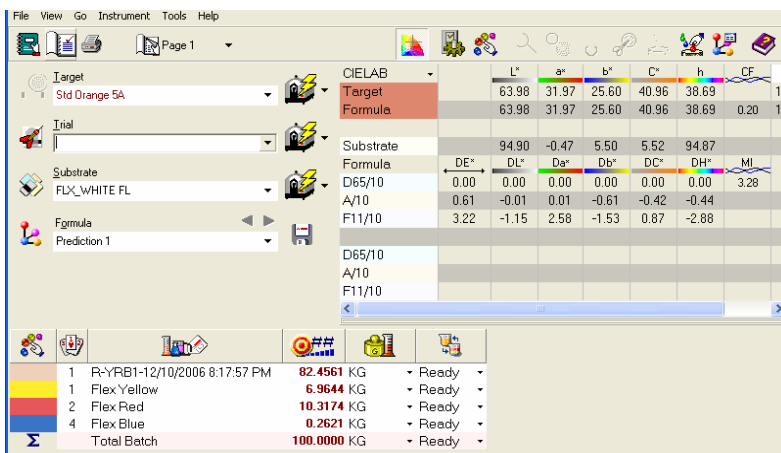
These changes can be saved in a job template for future use. We suggest that you open a job, and configure the *Consider Recycle* options as appropriate. When you are finished, save the job as a job template ***before*** you add any job-specific data, such as target data.

Using Recycles As Colorants (Colorant Method)

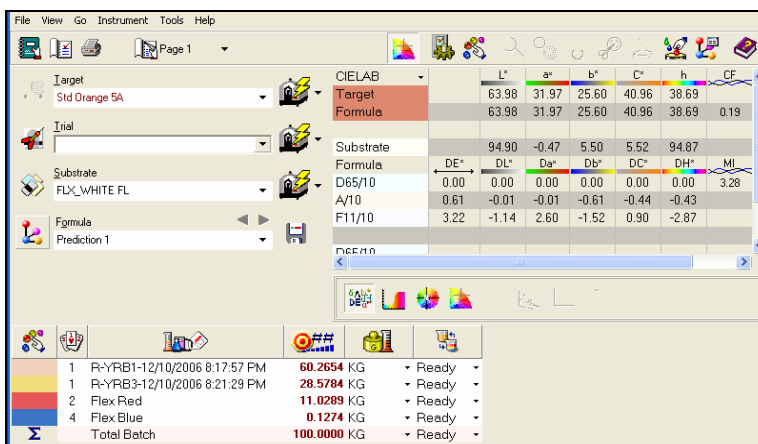
To use recycles as *colorants*, the recycle option is set to *Consider Recycles as Colorants* only. The recycle(s) are added to ingredient selection:



Below is a formula output using one recycle as a colorant in the formula:



Below is a formula output using multiple recycles as colorants in the formula:



CIELAB		L*	a*	b*	C*	h	CF
Target		63.98	31.97	25.60	40.96	38.69	
Formula		63.98	31.97	25.60	40.96	38.69	0.19

Substrate		DE*	DL*	Da*	Db*	DC*	DH*	MI
D65/10		0.00	0.00	0.00	0.00	0.00	0.00	3.28
A/10		0.61	-0.01	-0.01	-0.61	-0.44	-0.43	
F11/10		3.22	-1.14	2.60	-1.52	0.90	-2.87	

1	R-YRB1-12/10/2006 8:17:57 PM	60.2654 KG	Ready
1	R-YRB3-12/10/2006 8:21:29 PM	28.5784 KG	Ready
2	Flex Red	11.0289 KG	Ready
4	Flex Blue	0.1274 KG	Ready
Total Batch		100.0000 KG	Ready

Recycle Search Folder (Batch Method)

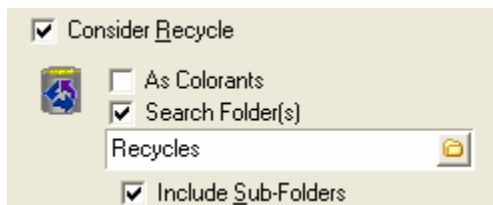
This option is used to search the existing recycle inventory and find the closest recycle to use in the match. Formula Central will calculate a correction to the recycle, to match the target color.

The recycle search function is a separate option independent of the standard Search/Search & Correct options available in Formula Central. Specifically:

- It only considers formula records that are flagged as recycles.
- You must specify the location of the recycle search folder(s). It does not reference the search folder location specified in job preferences. *See also Recycle Technical overview for additional information regarding the recycle search option. See also Formula Central Menus, Tools Menu, Job Preferences for information on Search defaults.*

To enable this option:

- In Formula Central, open the Ingredient Selection screen, and enable *Consider Recycle* and *Search Folders* option:



☒ Consider Recycle

☐ As Colorants

☒ Search Folder(s)

Recycles 

☒ Include Sub-Folders

NOTE

The Search DE limit for the recycle search is set at 25 DE.

To search the recycles for the closest match:

1. Measure the target color that you want to match
2. In Formula Central, click the Combinatorial Match button. If a recycle formula is found, you will get one or more formulas using the *same recycle and new ingredients*. If no recycle is found, you will get the following message:



3. Click the **OK** button continue to a combinatorial match.

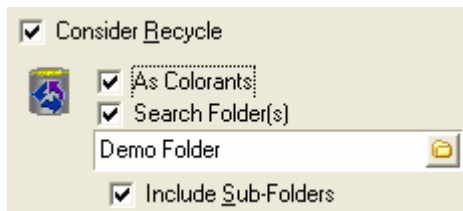
NOTE

When *As Colorants* is not enabled in the Recycles options, the combinatorial formulas it finds will not include any recycles.

Using Both Colorant Method and Batch Method

Recycles can be used simultaneously as colorants, and as a batches in a recycle search. To enable both options:

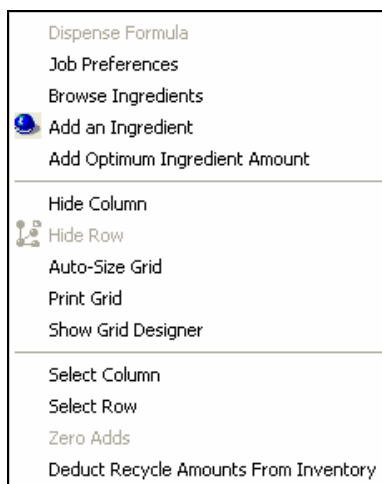
- In Formula Central, open the Ingredient Selection window, and enable the *As Colorants* and *Search Folder(s)* options.



Deduct Inventory Option

When you have selected a recycle for use, you can deduct the amounts used from the inventory. To use this option:

1. After the match/correction is completed, right-click anywhere in the formula grid. The menu below is displayed:

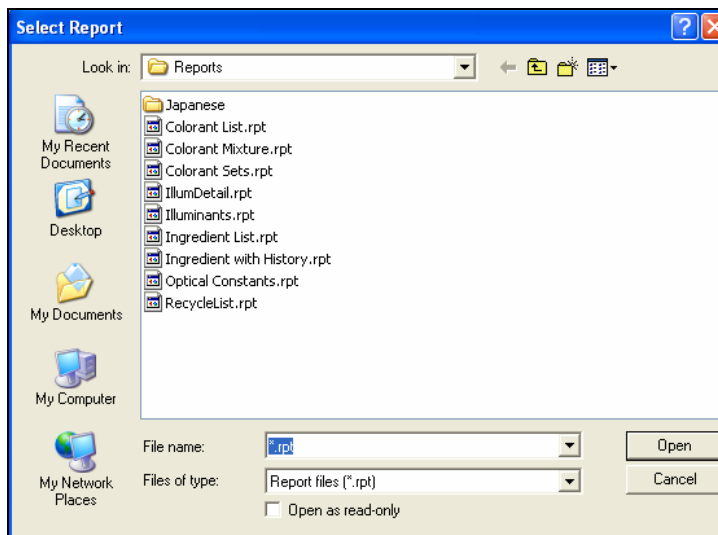


2. Click **Deduct Recycle Amounts From Inventory**.

Recycle Report

You can view a report on the current status of the recycles in your inventory in Formula Central. To access the report:

1. From the **Tools** menu, select **Report**. A list of reports will display:



2. Select the report *RecycleList.Rpt*.

Recycle List		
1 49 16PM 6/18/2007		
Name	Inventory Amount	Location
R1-6/8/2007 11:37:54 AM	250.000 KG	Aisle 12 Row 2
R2-6/8/2007 11:40:29 AM	100.000 KG	Aisle 3 Row 4
R3-6/8/2007 11:42:30 AM	50.000 KG	Aisle 3 Row 6
R4-6/8/2007 12:14:06 PM	25.000 GAL	Aisle 4 Row 3
R5-6/18/2007 1:42:36 PM	50.000 LB	Inkroom - Row 2
R6-6/18/2007 1:43:24 PM	10.000 GAL	Inkroom - Row 12

The report includes the recycle name, inventory amount and location.

Recycle Technical Overview

The following section will explain how recycles are stored in the database, and describe the dependencies with other DMP objects.

Recycles are treated as a unique data type in DMP. Recycles are stored in folders and have their own icon as shown below:

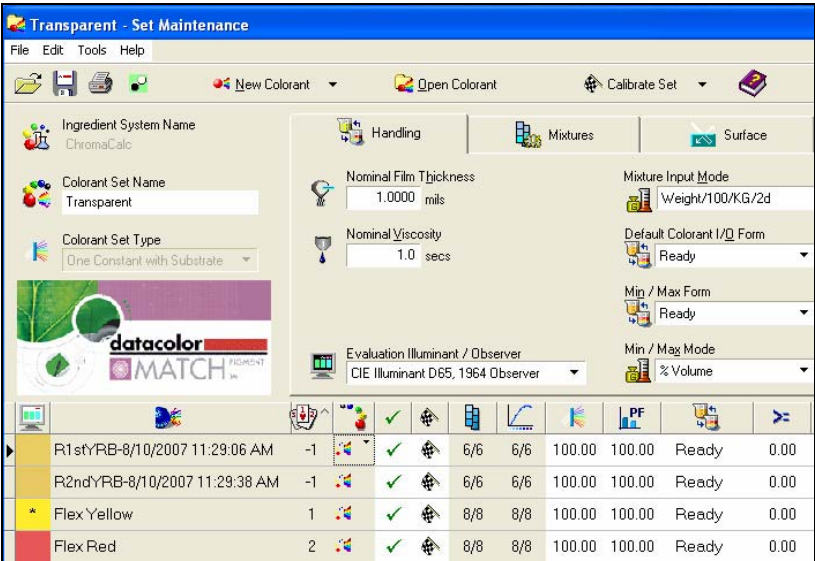
	R2ndYRB-8/10/2007 11:29:36 AM	Recycle	Transparent
	R1stYRB-8/10/2007 11:29:04 AM	Recycle	Transparent

When a recycle is created, the program creates a formula record and also creates a colorant with an associated ingredient. The recycle sample is the actual sample in the formula record.

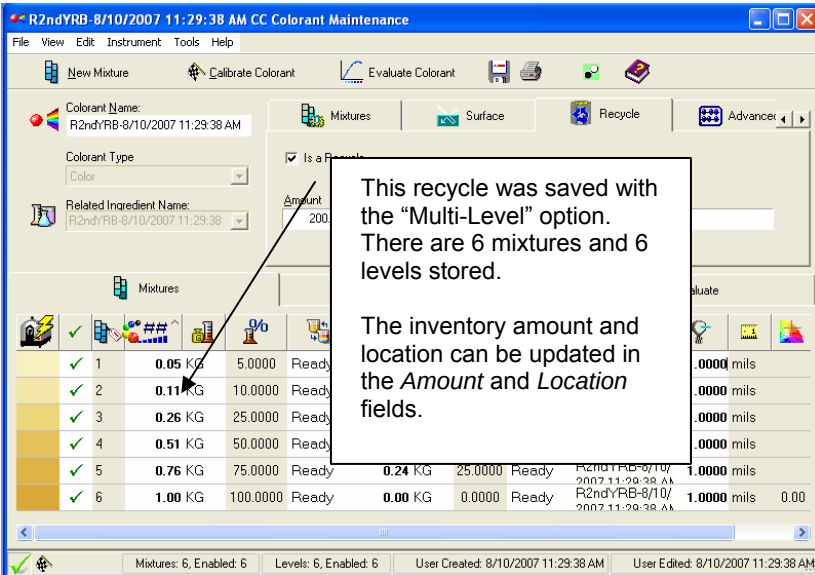
Below is an example of the ingredient record for a recycle. This is accessed from the Ingredient Maintenance program:

	Ingredient Name R2ndYRB-8/10/2007 11:29:38		Ingredient Lot ID R2ndYRB
Ingredient Type Color	Density 1.0138 KG / L	Cost 0.00 \$ / KG	Strength 100.0000 %
Display Rank -1			

Below is an example of the colorant record for the same recycle. This is accessed from the Set Maintenance program:



In Set Maintenance open the recycle record, to see the mixture levels:

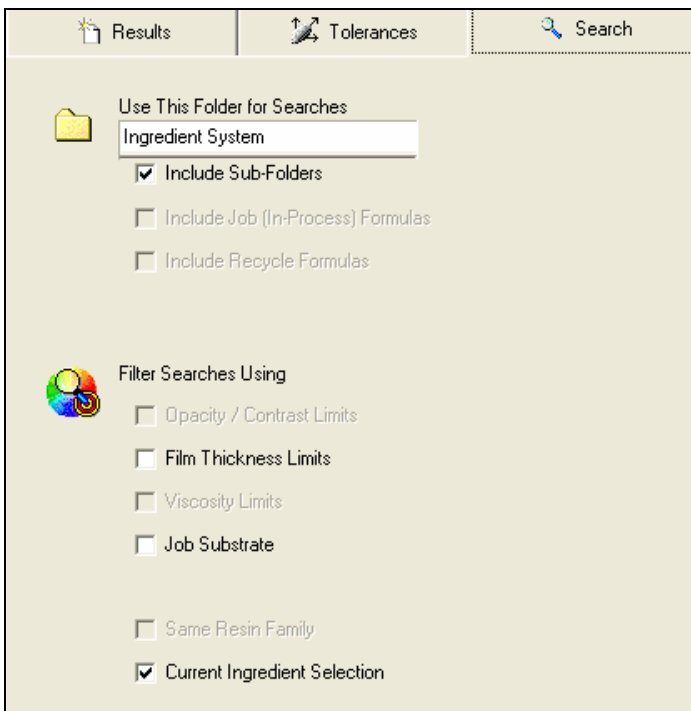


NOTE

The record in the colorant set cannot be viewed from Navigator.

Single Level Recycle

A setting in the Job Preferences affects how a single-level recycle is handled during a search. It is located on the *Job Preferences, Search tab*:



- **Include Recycle Formulas.** If this option is disabled, a single-level recycle will be found in a search.
- If this option is enabled, a single-level recycle will not be found unless the recycle is included in the current ingredient selection.

Name		Ingredient Keywords			
☒	R 2nd shot Yellow FR-10/8/2007 3	0.0000	100.0000	Volume	▼
☒	Flex Yellow	0.0000	100.0000	Volume	▼
☒	Flex Red	0.0000	100.0000	Volume	▼
☒	Flex Green	0.0000	100.0000	Volume	▼
☒	Flex Blue	0.0000	100.0000	Volume	▼
☒	Flex Violet	0.0000	100.0000	Volume	▼
☒	Flex Black	0.0000	100.0000	Volume	▼
☒	Flex Clear	0.0000	100.0000	Volume	▼

See also *Tools Menu, Job Preferences, Search tab* for more information on the search filter options.

Formula Central Search Option vs. Recycle Search Option

Datacolor MATCH^{PIGMENT} includes a data type known as a color library formula. Color library formulas are usually verified formulas that are stored for future use, either as a standard production formula, or as a *starting point for the Search & Correct option*. Color library formulas are typically kept and used over a long period of time, so it is important that the sample measured is actually made using the formula that is stored with it. These formulas should be stored in a folder dedicated to color library formulas.

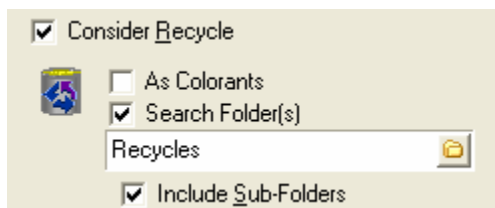
When a recycle is created, a formula record is also created. In contrast to a traditional color library formula, formulas stored for Recycles are theoretical matches, and usually contain numerous ingredients. They have not been verified by making a physical sample. This is acceptable because recycle formulas are usually transient.

However, Because of the differences in the uses of these two formula types, recycle formulas should be saved in a different folder from color library formulas. These formulas are flagged internally as recycles, and are not considered in a standard Search or Search & Correct exercise. They are only used when the recycle search option is enabled.

Configuring the Recycle Search Option

The recycle search options are enabled from the Ingredient Selection window.

1. Open the Ingredient Selection window.
2. Activate the Recycle option.
3. Activate the Search Folder(s) option.
4. Enter the recycle folder name for the recycle search option. In the example below, the folder for recycles is called *Recycles*. That folder is set as the root folder for recycle search:



5. Click **OK** to save the changes, and close the Ingredient Selection window.

NOTES

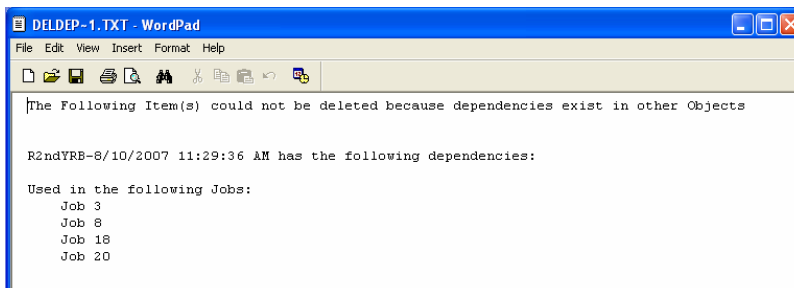
- When **both Consider Recycle *and* Search Folder(s)** are enabled, the program will run a search of the recycles to use as a batch.
- When **Consider Recycle** is enabled, but Search Folder(s) is *not enabled*, the recycles option will be restricted to the use of the recycle as a colorant.

In this configuration, when you select Autoformulate, Search, Search & Correct, in Formula Central, the search is limited to searching color library formulas. The program will ignore recycle formulas.

- These selections can be saved in the job template.

Deleting Recycles

Recycles can be deleted using the Data Navigator or Set Maintenance program modules. When a recycle is used in multiple jobs, it has dependencies. In this situation, when you attempt to delete the recycle, the program will display the following message:



In order to delete a recycle, you must first delete the jobs that include that recycle. You can delete these jobs using the Navigator.

Advanced Queuing Options

Overview

Datacolor MATCH^{PIGMENT} calculates hundreds of formulas in a matter of minutes. The program can instantaneously tell you whether you can match the sample with the colorants available in your inventory, produces a formula, and calculates the cost. For those colors that can be matched, the program usually offers multiple formulas.

A basic queuing feature exists in Formula Central that allows you to store jobs for matching at a future time. This allows you to perform color matching tasks at your convenience. In addition to this basic queuing feature, Datacolor MATCH^{PIGMENT} includes a suite of program modules dedicated to running queues. These Advanced Queuing options were developed for users required to produce a high volume of color matches. This program suite includes program modules designed to facilitate matching speed and accuracy in high-volume color matching applications, such as color card manufacturers, trade sales paint manufacturers etc. Using these program modules you can build multiple queues, each of which can work with multiple job templates, run the queues and review the results at your convenience.

The program modules dedicated to the Advanced Queuing options include:

- **Queue Maintenance.** Used to create and run the queue.
- **Queue Viewer.** Used to view and organize the queue results. Includes options for filtering and sorting queue results, marking formula candidates for further evaluation, and accepting a final formula.
- **Schedule Maintenance.** This tool enables you to run the jobs in a queue through multiple job templates. This is a powerful tool to help you optimize the formula results for colorimetric and non-colorimetric properties. This can be thought of as a super-queue option.

These program options are launched from the Navigator Go Menu, or directly from folders inside the Data Navigator program module.

Other Program Modules Used with Queuing

- **Ingredient Maintenance.** Ingredient Compatibility and Ingredient Priority assignments are made in this program module. They are used to filter and sort the queue results. *See also Ingredient Maintenance for instructions to make these assignments. See also Queue Viewer Filtering and Sorting Options for instructions to use these properties to sort and filter queue results. See also Applications Technology, Ingredient Priority and Ingredient Compatibility for a comprehensive discussion of these options.*
- **Formula Central** (Tools Menu, Job Preferences). Formulas generated from a queue are based on job templates selected for the queue. Job templates provide the acceptability tolerances used for matching queues, and the default rules for

calculating matches, and displaying/sorting the queue results. *See also Program Features, Jobs and Templates for a discussion of Job Templates.*

- **Data Exchange.** This program is used to exchange data between databases used with Datacolor PAINT/Paintmaker, the color matching programs used by retail (POS) locations, and Datacolor MATCH^{PIGMENT}. Laboratories supporting Datacolor PAINT or Paintmaker, may need to transfer final formulas from a queue to a database used in POS locations. This program module is used to complete the formula transfer. *See also Data Exchange for detailed instructions to perform data transfers.*

Accessing the Advanced Queuing Options

The Advanced Queuing options are accessed from **Data Navigator, Go** menu:

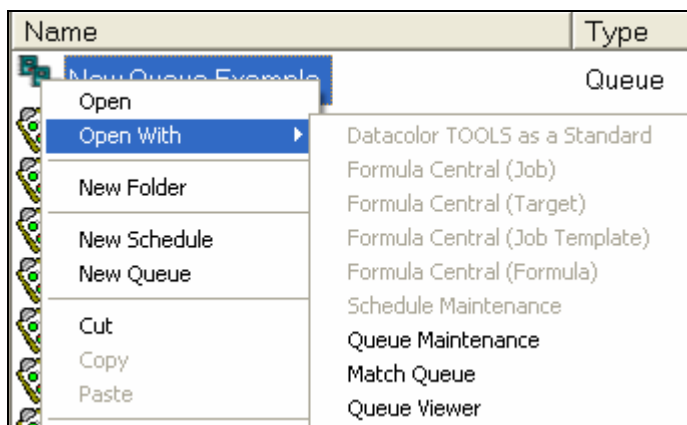


They can also be accessed directly from Navigator. To do this:

1. Highlight a queue data object:

Folder View	Name	Type	State
My Database	New Queue Example	Queue	Complete
Admin View	Job 260 Prediction 1 RAL1001-HR 01/98-...	Job	Correction In...
Ingredient System	Job 261 Prediction 1 RAL1001-HR 01/98-...	Job	Correction In...
Datamatch Samples	Job 262 Prediction 1 RAL1001-HR 01/98-...	Job	Queue Ready
Formulas	Job 524 BATCH2	Job	Match Output
Harmony Data	Prediction 1 RAL1001-HR 01/98- Formul...	Formula	Demo Paint

2. Right-click to display the *Open With* menu:



The *Queue Maintenance*, *Match Queue* and *Queue Viewer* modules are displayed in the list.

3. Click on the module to be launched.

Queue Maintenance

This program is dedicated to building and editing queues, and provides all functions required to support a queue. Specifically;

- **Create, store, edit and retrieve queues.** This program option is used to identify the queue name and location, job template used by the queue, samples to be matched, and the location of the queue results.
- **Process queues.** Queue matching can be launched directly from this program.
- **Purge queue results.** Provides the flexibility to delete the queue results without deleting the entire queue. The purge option retains all of the queue information except the formulas. By retaining all of the samples in the queue, it enables you to quickly re-match the same samples using a different job template or schedule.

Queue Maintenance Tolerances

In the Queue Maintenance program you can also assign tolerances to both colorimetric and non-colorimetric formula properties. These tolerances are distinct from those defined in the job template you are using. The tolerances in the job template are used to determine if a formula is an acceptable match. *See also Formula Central, Tools Menu, Job Preferences for instructions to access these acceptability tolerances.*

The tolerances assigned in Queue Maintenance are used to filter and sort the queue results. The tolerance features created in Queue Maintenance include an option to restrict the use of these tolerances to the active user, or to apply the values to all login users. *See also Queue Maintenance, Edit View Tolerances for complete*

instructions to view/edit the tolerances used to filter and sort queue results. See also *Queue Viewer*, *Organizing the Formula Display*, *Formula View Filters* for details on each tolerance applied to the queue results.

Schedule Maintenance

This program enables you to create and edit *Schedules*, a tool which incorporates several job templates into a single queue. By considering multiple job templates, the *Schedule* feature becomes a *Super-Queue* feature, which automates the use of different templates (strategies) to satisfy specific colorimetric and non-colorimetric requirements for the targets in the queue.

For example, you may have one job template that limits the colorants considered for a match. When you run a queue using this template, the limited colorant selection may prevent the system from matching every target color in the queue. In this case, you will need to expand the colorant selection, and re-run the unmatched targets in the queue. Prior to the development of the Advanced Queuing options, you had to edit the job template requirements, and manually rerun the matches.

Using a *Schedule* automates this process. It allows you to string together several templates for a single queue. The *Schedule* feature automatically directs the program to use the second job template, when an acceptable match to a target is not found *using the first job template*. It will repeat this process for all of the templates in the schedule, until it finds an acceptable formula for the target. The Schedule is applied to each target in the queue, which increases the prospect that you will find a least one acceptable match for every target in the queue.

The *Schedule* option does not limit the number of templates in a single schedule. This allows you flexibility to capture a variety of different match requirements for the system to consider. Some job templates may contain different job preference selections, such as ingredient selections, acceptability tolerances, sorting preferences, etc. Other job templates may vary formula constraints such as fixed colorant amounts, or total batch size. Since each template can use a different colorant set, you can also automate the process to look for matches across different colorant sets. By creating a variety of job templates and including them in a *Schedule*, you have a powerful tool for finding the best matches for your operating requirements. See also *Working with Schedules* below, for a discussion of approaches to use when developing schedules.

Show Best Formula Options

The job templates used in a *Schedule* should have the *Show Best Formula* feature in each job template disabled. If any job template in the schedule has *Show Best Formula* enabled, it will display the best formula it finds using that template, regardless of whether the formula satisfies your requirements. When this happens, it will move on to the next target color in the queue.

The only exception to this job template configuration may apply to the last job template in the schedule. Enabling *Show Best Formula* in the *last template* in the Schedule will produce the best formula it can find for the target, based on the final

template. Configuring a Schedule in this fashion enables the system to produce a formula for each target color in the queue, when the Schedule is used. *See also Tools Menu, Job Preferences, Results tab for instructions to enable/disable Show Best Formula.*

Ingredient Priority/Compatibility

You can configure a job template to accept or reject a formula based on specific non-colorimetric properties assigned to individual ingredients. These properties can become powerful tools for sorting and filtering queue results. The properties are:

- **Ingredient Priority (IP).** Assigns a preference to individual ingredients.
- **Ingredient Compatibility (IC).** Assigns a preference to combinations of ingredients.

Ingredient Maintenance is used assign these values to the colorants. You can assign an Ingredient Priority value of 0 -100 to an individual colorant, or a Compatibility value of 0 -100 to specific combinations of colorants in the formula. Once these values are assigned, job template(s) used in the queuing options can be configured to consider *Ingredient Priority* or *Ingredient Compatibility* during both matching and formula sorting processes.

The Queue Viewer program includes specific options to sort and filter queue results based on Ingredient Priority and Ingredient Compatibility values. This speeds the evaluation of queue results, by enabling you to prioritize non-colorimetric factors that may need to be considered during formula evaluation.

Ingredient Priority

You may have processing requirements that favor the use of one ingredient over another. For example, inorganic pigments such as red oxide, yellow oxide, etc. may be the most reliable colorants to use with respect to your process. You can assign a high priority value to these individual ingredients. In contrast, you may carry some organic colorants in your inventory that are required for special colors, but are very difficult to process. To avoid using these pigments whenever possible, you can assign a very low priority value to each. By assigning different priorities to ingredients in the colorant set, you enable the system to consider these characteristics when finding the best formula for a color. The Ingredient Priority value can be considered during formula matching and formula sorting functions.

Keep in mind the following points when designing an ingredient priority scheme:

- A priority can be assigned to all colorant types.
- The program assigns a default ingredient priority value (50), to every ingredient in the system. A value of 50 indicates that no changes were made to the Ingredient Priority values for the colorants in the formula.
- All ingredients having a priority of 0 are eliminated before the matching begins.

- An average ingredient priority (IP) value is calculated and displayed for a formula.

Ingredient	Ingredient Priority
Yellow	80.0
Red	50.0
Green	50.0
White	50.0
IP Value	57.5

The IP value for a formula is normalized to allow for comparisons of formulas with varying numbers of colorants. To normalize the calculation:

- The program examines all of the formulas found for a job, and determines the maximum number of colorants used.
- For those formulas containing fewer ingredients, it inserts placeholder colorants, so that each formula contains the same number of colorants.
- It assigns an IP value of 50 to each placeholder colorant.

Below is an example of the normalized Ingredient Priority calculation.

- The maximum number of colorants in the formula results is 4.

Formula 1	Formula 2	Formula 3
Yellow	Yellow	Yellow
Red	Red	Red
Green	White	(placeholder 1)
White	(placeholder 1)	(placeholder 2)
Average IP	Average IP	Average IP
230 / 4 = 57.5	180/3 = 60.0	130/2 = 65.0
	Normalized IP	Normalized IP
	180 + 50 = 230	130 + 50 + 50 = 230
	230 / 4 = 57.5	230 / 4 = 57.5

Ingredient Compatibility

The Ingredient Combination Manager option is used to specify combinations of ingredients, and assign a compatibility (IC) value to the combination. The IC value can be considered during matching and formula sorting functions.

Ingredient Compatibility is based on a principle similar to Ingredient Priority. There may be specific combinations of ingredients that perform better or worse than others, in the coloring process. For example, you may know that formulas containing red oxide and yellow oxide consistently perform better than those using a different selection of red and yellow colorants. On the other hand, you may want to avoid a

specific combination of ingredients because they create processing problems when used in combination. In this situation, you can assign low compatibility values to the ingredient combinations you do not want to use.

Consider the following points when assigning compatibility values to combinations of ingredients:

- Compatibility values are assigned to all colorant types.
- The maximum number of ingredients specified for a single combination is three (3).
- All ingredient combinations having a compatibility value of 0 are eliminated before matching begins.
- The program assigns a default ingredient combination value (50), to every ingredient in the system. A value of 50 indicates that no changes were made to the ingredient compatibility values for the colorants in the formula.

When a formula contains more than one identified ingredient combination (IC), a hierarchy exists for assigning the correct ingredient compatibility.

- When the formulas have multiple combinations containing the same number of ingredients, the following logic is applied:
 - For formulas that have multiple combinations with IC values assigned, the lowest IC value will be assigned to the formula. For example, a single formula that contains one combination with a value of 90, and a second combination assigned a value of 70, will be assigned an IC score of 70. Likewise, a formula that contains a combination with an IC value of 70, and a second IC combination assigned a value of 20, will be assigned an IC score of 20.
 - A formula with an IC score of 70 will be preferred over formulas that do not have specific IC data (IC=50). Likewise, a formula with an IC score of 20 will be less preferred over formulas that do not have IC data.
- A single formula may contain multiple ingredient combinations, and those combinations may include a different number of colorants. For example a single formula may include a 3-ingredient combination and a two-ingredient combination, each of which have a distinct IC value. When this occurs the following logic is applied:

In cases with multiple, three-ingredient combinations or multiple two-ingredient combinations, the lowest IC value is assigned to the formula.

See also...

- *Applications Technology, Ingredient Priority and Compatibility for additional discussion of the configuration and use of these options.*
- *Ingredient Maintenance, Ingredient Compatibility and Ingredient Priority for instructions to assign these values to ingredients.*

- *Formula Central, Tools Menu, Job Preferences, Results* for instructions to activate ingredient priority or ingredient compatibility as sort tolerances in the job template.
- *Queue Maintenance, Edit Tolerances* for instructions to assign tolerance to these formula properties. These tolerances are applied when filtering and sorting queue results.
- *Queue Viewer, Filtering and Sorting Options* for instructions to use Ingredient Priority and Ingredient Compatibility when filtering and sorting queue results.

Queue Viewer

Queue Viewer is the program module which allows you to view the queue results. It includes tools to help you maximize your efficiency in displaying and evaluating the formulas. This enables you to efficiently select the best formula for each target, based on both the colorimetric and non-colorimetric requirements for each product.

Job Tolerances vs. Queue Tolerances

The tolerances selected in the *job template* determine whether or not a formula is an acceptable match. The tolerances selected in *Queue Maintenance* are used to sort and filter queue formulas which already satisfy the job tolerances. See also *Formula Central, Tools Menu, Job Preferences* for instructions to view/edit job tolerances. See also *Queue Maintenance, Edit View Tolerances* for instructions to view/edit the queue tolerances.

Filtering and Sorting Queue Results

The default display of queue results includes the following information:

- Every *standard* (job) included in the queue.
- Every *formula* found for each standard. The formulas are sorted best-to-worst, from left to right, using the sort criteria defined for the job template used. See also *Job Preferences, Results* for instructions to view/edit the sort criteria for the template used.

In the example below, a portion of the results for one row (target) is displayed. It contains two formulas included in the queue, which match one standard, *b2*.

Queue Name

new queue example

Standard View Criteria

All

Job Template Name

All Job Templates

Formula View Criteria

All

Go To

12

View Type

☐ Standards Only
 ☒ Standards and Formulas

Sorted by

Formula Central Sort Order

Formula Acceptance

b 2		DSN.067.349		Job 3694		b 2	
2006 sc black	2.8121 f0Z	Ready	2006 sc indo ye...	3.6014 f0Z	Ready		
2006 sc indo ye...	3.3118 f0Z	Ready	2006 sc quindo red	6.6638 f0Z	Ready		
2006 sc quindo red	4.4547 f0Z	Ready	2006 sc thalo blue	1.0464 f0Z	Ready		
2006 sc white	5.4215 f0Z	Ready	2006 sc thalo g...	1.2097 f0Z	Ready		
Total	16.0000 f0Z		Total	3.4787 f0Z	Ready		
				16.0000 f0Z			

Priority

50.00

Compatibility

50.00

Priority

50.00

Compatibility

50.00

DE(1)

0.01

MI

0.15

No Selection

DE(2)

0.03

CR

0.00

DE(3)

0.15

Cost

0.00

combo

DE(1)

0.03

MI

0.80

No Selection

DE(2)

0.05

CR

0.00

DE(3)

0.82

Cost

0.00

combo

You work with the Queue Viewer to determine a single, acceptable formula for each target in the queue. The procedure consists of the following steps:

- Filtering and sorting the formulas, to efficiently review the results.
- Assigning a criterion (status) to formulas.
- Formula correction, as necessary.
- Formula acceptance.

Filter and Sorting Options

Filter options are used to *restrict* the display of the queue results. Sorting options are used to *organize* the display of the formula results. You can use the filter and sort options separately, or you can combine them to isolate specific formulas for closer evaluation.

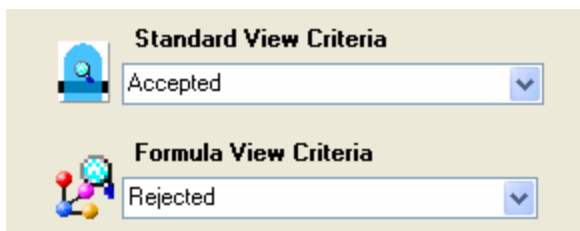
Queue Viewer includes the following filter options:

- **Job Template Name.** If you are using the Scheduling option, you will be using several different job templates in a single queue. This option restricts the formulas displayed to those from a single template. *See also Scheduling for a detailed discussion of this option.*
- **Standard View Criteria.** Applying these criteria restricts the display of standards. *See also Standard View filters below for detailed instructions to use this filter.*
- **Formula View Criteria.** Applying these criteria restricts the display of formulas. *See also Applying Filter Options, Formula View Filters below for detailed instructions to use this filter.*

- **View type.** The default view includes all standards and all formulas. You can change the display to limit the display to standard information, to quickly examine the target colors in the queue. In this situation, no formula detail is included.

Working with Filters

The *Standard View Criteria* and *Formula View Criteria* options provide powerful tools for filtering the queue results.



These view options can be used separately, or combined to filter the queue results in subtle and meaningful ways.

Standard View Filters

This filter determines the number of standards displayed. When applied, the data displayed includes only the results for those standards that satisfy the criterion selected in this field. If the standard is not assigned the criterion selected, it will not be displayed. This tool limits the number of rows in the results display.

Formula View Filters

This filter determines the number of formulas displayed. When applied, the data displayed includes only the results for those formulas assigned the criterion selected in this field. This tool limits the number of columns in the results display.

See also Queue Viewer, Working with Filter Options for an explanation of each criteria available for both the Standard and Formula Views.

Assigning Formula Criterion

When a queue is matched, the criterion *No Selection* is initially assigned to each formula. This field is displayed at the bottom of each formula:

b 2		D5N.067.349	
2006 sc black	2.8121	f0Z	Ready
2006 sc indo ye...	3.3118	f0Z	Ready
2006 sc quindo red	4.4547	f0Z	Ready
2006 sc white	5.4215	f0Z	Ready
Total	16.0000	f0Z	
Priority	Compatibility		
50.00	50.00		
DE(1)	DE(2)	DE(3)	
0.01	0.03	0.15	
MI	CR	Cost	
0.15	0.00	0.00	
No Selection	▼	combo	

To begin the process of eliminating formulas, you must assign a *criterion*, or status, to the formula results. There are 5 choices for formula criterion:

No Selection ▼

No Selection

Consider

Accepted

Visually

Rejected

- **No Selection.** This is the default criterion, initially assigned to every formula in the queue results.
- **Consider.** The formula has been selected as a potential candidate for use. This criterion can only be assigned to one formula for each standard. In addition, it can only be assigned when *Accepted* or *Visually* are not already assigned to another formula for the same standard. You must check the formulas across the row to determine if any of these criteria are already assigned.
- **Accepted.** The formula is accepted. This criterion can only be assigned to one formula for each standard. In addition, it can only be assigned when *Consider* or *Visually* are not already assigned to another formula for the same standard. You must check the formulas across the row to determine if any of these criteria are already assigned.
- **Visually.** The formula has been made, and the sample has been approved visually. This criterion can only be assigned to one formula for each standard. In addition, it can only be assigned if *Accepted* or *Consider* are not already assigned to another formula for the same standard. You must check the formulas across the row to determine if any of these criteria are already assigned.

- **Rejected.** The formula is unacceptable. This criterion can be assigned to multiple formulas for each target.

NOTE

You can automatically assign the status *Accepted* or *Consider*, using buttons at the top of the window. See also *Formula Acceptance Buttons*.

Once the formulas have been evaluated and assigned a criterion, you can sort or filter the formula display based on these assignments. See also *Queue Viewer*, *Organizing the Formula Display for instructions to use these tools*.

Sorting Formulas

Sorting options are used to *order* the display of formula results. Queue Viewer includes the following sorting options:

- **Go To.** This option is used to locate a particular standard in the results display. When you have a large queue, you may find yourself navigating through pages of formulas to find a standard you need to evaluate. This option moves to the standard of interest, and scrolls the results window to locate the standard information at the top of the display window. See also *Queue Viewer*, *Working with Sorting Options for instructions to use this option*.
- **Sorted By.** The formula results for each standard are displayed best-to-worst, from left-to-right across a row. You can re-order the results based on a variety of standard and formula properties. The choices for this field are based on the sorting preferences selected for the job template, as well as the tolerance values specifically applied to the queue results. See also *Queue Viewer*, *Working with Sorting Options for a detailed explanation of this selection*.

Working with Schedules

The purpose of using a schedule is to automate changes to the matching requirements to produce the best possible match for each target. When you create a Schedule, the group of job templates included may be applied to each target color included in the queue. Typically, the first template in the queue uses tolerances, ingredients and other matching requirements, which define the *ideal* match for the product. For example, you can use Ingredient Priority and Ingredient Compatibility scores to restrict ingredient combinations to those materials you prefer to use. However, when it is not possible to achieve an acceptable match under these conditions, the remaining job templates in the Schedule can vary the ingredient choices, tolerances and other requirements to find the best possible solution available under your inventory and processing conditions.

Schedule Example

There are many ways to adapt the Schedule feature to your matching requirements. One example of the use of the Schedule tool is found in retail (POS) paint matching applications. In these applications, several bases are used in a single product line. The challenge is to automate the selection of the correct base for each color match (automatic base selection).

Below is a detailed explanation to create a schedule that will perform *autobase select*:

Schedule Name: Base Select

Job Template(s):

Job Template	Match Type	Location
Pastel Base	Combinatorial	My Database\Ingredient System\Demo Folder
Medium Base	Combinatorial	My Database\Ingredient System\Demo Folder
Deep Base	Combinatorial	My Database\Ingredient System\Demo Folder
Extra Deep Base	Combinatorial	My Database\Ingredient System\Demo Folder
Transparent Base	Combinatorial	My Database\Ingredient System\Demo Folder

This Schedule has the following properties:

- Each job template in this Schedule includes a colorant set with a single white base.
- The amount of white base is fixed in each job template to reflect the amount of base in the can.
- The templates in this schedule are ordered to reflect a decreasing amount of white (TIO2) in the base used by each template.
- The *Show Best Formula* option is disabled in the first four templates in this Schedule. If it is not disabled, the program will not move through the schedule of templates.
- *Show Best Formula* is enabled in the final (Transparent Base) template. Doing this insures that a formula will be generated for each target in the queue.

Below is a report summarizing the contents of each schedule:



Schedule List

Thursday, May 22, 2008 2:00:40PM

Schedule Name: Base Select

Job Template Name: Pastel Base					Colorant Set Demo Paint				Match Type: Combinatorial				Match Order: 1
<u>DE1 Tol</u> 0.10	<u>DE2 Tol</u> 0.50	<u>CR Tol</u> 0.00	<u>Met Tol</u> 10.00	<u>ShowBest</u> False	<u>Sort 1</u>	<u>Sort 2</u>	<u>Sort 3</u>	<u>Goal1</u> DE1	<u>Wgt1</u> 60.00	<u>Goal2</u> C_Fit	<u>Wgt2</u> 40.00	<u>Goal3</u> 0.00	

Job Template Name: Medium Base					Colorant Set Demo Paint				Match Type: Combinatorial				Match Order: 2
<u>DE1 Tol</u> 0.10	<u>DE2 Tol</u> 0.50	<u>CR Tol</u> 0.00	<u>Met Tol</u> 10.00	<u>ShowBest</u> False	<u>Sort 1</u>	<u>Sort 2</u>	<u>Sort 3</u>	<u>Goal1</u> DE1	<u>Wgt1</u> 60.00	<u>Goal2</u> C_Fit	<u>Wgt2</u> 40.00	<u>Goal3</u> 0.00	

Job Template Name: Deep Base					Colorant Set Demo Paint				Match Type: Combinatorial				Match Order: 3
<u>DE1 Tol</u> 0.10	<u>DE2 Tol</u> 0.50	<u>CR Tol</u> 0.00	<u>Met Tol</u> 10.00	<u>ShowBest</u> False	<u>Sort 1</u>	<u>Sort 2</u>	<u>Sort 3</u>	<u>Goal1</u> DE1	<u>Wgt1</u> 60.00	<u>Goal2</u> C_Fit	<u>Wgt2</u> 40.00	<u>Goal3</u> 0.00	

Job Template Name: Extra Deep Base					Colorant Set Demo Paint				Match Type: Combinatorial				Match Order: 4
<u>DE1 Tol</u> 0.10	<u>DE2 Tol</u> 0.50	<u>CR Tol</u> 0.00	<u>Met Tol</u> 10.00	<u>ShowBest</u> False	<u>Sort 1</u>	<u>Sort 2</u>	<u>Sort 3</u>	<u>Goal1</u> DE1	<u>Wgt1</u> 60.00	<u>Goal2</u> C_Fit	<u>Wgt2</u> 40.00	<u>Goal3</u> 0.00	

Job Template Name: Transparent Base					Colorant Set Demo Paint				Match Type: Combinatorial				Match Order: 5
<u>DE1 Tol</u> 0.50	<u>DE2 Tol</u> 1.50	<u>CR Tol</u> 0.00	<u>Met Tol</u> 10.00	<u>ShowBest</u> False	<u>Sort 1</u>	<u>Sort 2</u>	<u>Sort 3</u>	<u>Goal1</u> DE1	<u>Wgt1</u> 60.00	<u>Goal2</u> C_Fit	<u>Wgt2</u> 40.00	<u>Goal3</u> 0.00	

Using this schedule should produce a formula for each target in the queue, using the correct base. *See also Schedule Maintenance, Schedule Reports for details on the report contents.*

Before You Begin

It is best to do some planning before you start using the Advanced Queuing Options. This should include the following considerations:

- The *job template* you use for queuing should be customized to produce formula output that conforms to your needs.
 - The *colorant set, ingredient selection, job preferences* and *formula grid* selections should be tailored to address the needs of your queuing activities. This information is stored in the job template(s) you assign to the queue.
 - When you are configuring the job template, you must consider the correction output as well as the formulation output. If you do not, the correction results may include information that is not included in the original formula, or may include information you don't need.

See also Job Preferences, Results and Job Preferences Formula Grid Configuration for information to customize the template(s) you use for the advanced queuing functions.

Ingredient Priority/Compatibility

Overview

Ingredient Priority and Ingredient Compatibility are tools used for calculating and evaluating candidate formulas. When enabled they can be used to eliminate formulas based on the ingredient contents, and to weight formulas based on the presence of individual ingredients. They are powerful tools that help you to screen candidate formulas based on important non-colorimetric properties. Several program modules are required to assign these values and use them in matching activities. Specifically:

- Ingredient Priority and Ingredient Compatibility values are assigned using the program module, Ingredient Maintenance.
- Ingredient Priority and Ingredient Compatibility are enabled/disabled in the job template.
- Ingredient Priority and Ingredient Compatibility are used by Queue Viewer (Advanced Queuing Options) to filter and sort queue results.

This section provides a comprehensive discussion of the use of Ingredient Priority and Ingredient Compatibility features.

Ingredient Priority (IP)

You may have processing requirements that favor the use of one ingredient over another. For example, inorganic pigments such as red oxide, yellow oxide, etc. may be the most reliable colorants to use with respect to your process. You can assign a high priority value to these individual ingredients. In contrast, you may carry some organic colorants in your inventory that are required for special colors, but are very difficult to process. To avoid using these pigments whenever possible, you can assign a very low priority value to each. By assigning different priorities to ingredients in the colorant set, you enable the system to consider these preferences when finding the best formula for a color.

When considering the use of Ingredient Priority, keep in mind the following points:

- A priority can be assigned to any colorant type.
- The program assigns a default ingredient priority value (50), to every ingredient in the system. A value of 50 indicates that no changes were made to the ingredient priority values for the colorants in the formula.
- All ingredients having a priority of 0 are eliminated before the matching begins.
- Ingredient Priority (IP) is calculated for a formula. An average ingredient priority value is calculated and displayed for a formula, based on the priority value assigned to each ingredient.
- When comparing formulas containing different numbers of colorants, this calculation is normalized.

An average ingredient priority (IP) value is calculated and displayed for a formula.

Ingredient	Ingredient Priority
Yellow	80.0
Red	50.0
Green	50.0
White	50.0
IP Value	57.5

The IP value for a formula is normalized to allow for comparisons of formulas with varying numbers of colorants. To normalize the calculation:

- The program examines all of the formulas found for a job, and determines the maximum number of colorants used.
- For those formulas containing fewer ingredients, it inserts placeholder colorants, so that each formula contains the same number of colorants.
- It assigns an IP value of 50 to each placeholder colorant.

Below is an example of the normalized Ingredient Priority calculation.

- The maximum number of colorants in the formula results is 4.

Formula 1	Formula 2	Formula 3
Yellow	Yellow	Yellow
Red	Red	Red
Green	White	(placeholder 1)
White	(placeholder 1)	(placeholder 2)
Average IP	Average IP	Average IP
$230 / 4 = 57.5$	$180/3 = 60.0$	$130/2 = 65.0$
	Normalized IP	Normalized IP
	$180 + 50 = 230$	$130 + 50 + 50 =$
	$230 / 4 = 57.5$	230
		$230 / 4 = 57.5$

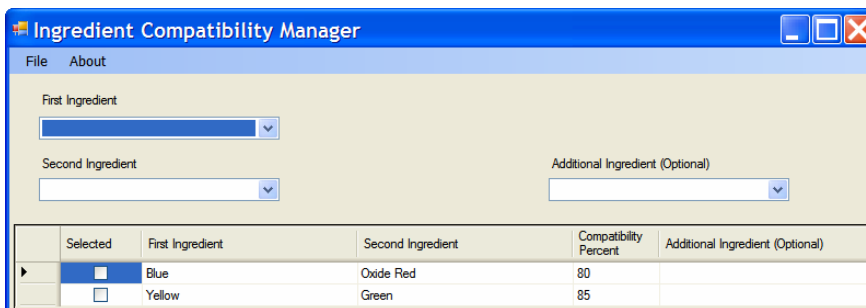
Ingredient Compatibility (IC)

The Ingredient Compatibility Manager specifies preferences for combinations of ingredients, by assigning compatibility values to individual combinations. The Compatibility value has two uses during the matching process:

- Eliminates formulas with specific combinations
- Weights formulas based on an ingredient compatibility score. Formulas with a higher ingredient compatibility score are preferred over those with a lower score.

Ingredient Compatibility is based on a principle similar to Ingredient Priority. There may be specific combinations of ingredients that perform better or worse than others, in the coloring process. For example, you may know that formulas containing red oxide and yellow oxide consistently perform better than those using a different selection of red and yellow colorants. On the other hand, you may want to avoid a specific combination of ingredients because they create processing problems when used in combination. In this situation, you can assign low compatibility values to the ingredient combinations you do not want to use.

Below are examples of IC assignments made using Ingredient Maintenance.



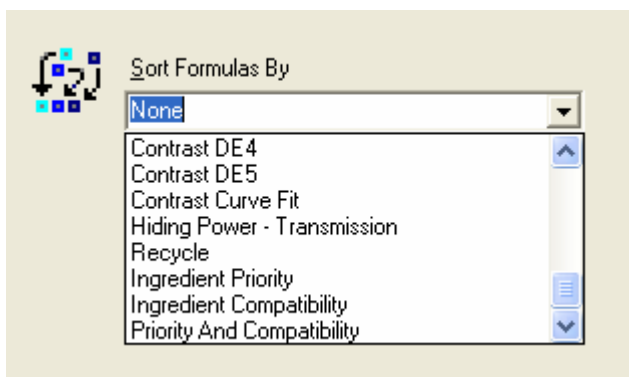
When devising an ingredient compatibility scheme, keep in mind the following points:

- Ingredient compatibility (IC) is a number ranging from 0 to 100. All ingredient combinations having a compatibility value of 0 are eliminated before matching begins.
- Combinations can include any ingredient type.
- The maximum number of ingredients specified for a single combination is three(3).
- The program assigns a default ingredient combination value (50), to every ingredient in the system. A value of 50 indicates that no changes were made to the ingredient compatibility values for the colorants in the formula.
- An IC value of 0 forces the program to discard any formulas that use the combination.
- When you assign an IC value greater than 50 to a combination, any formula using that combination will be chosen over a formula with a default IC value(50). This effectively makes the formula preferable to all formulas without a specific IC value assigned.
- If you assign an IC value less than 50 to a combination, a formula having a default IC value (50) will be chosen over this formula. This effectively makes all formulas without a specific IC value preferable to this formula.

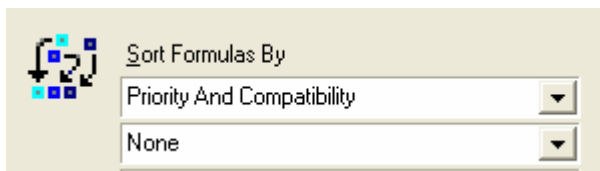
See also Ingredient Maintenance, Ingredient Priority and Ingredient Compatibility for detailed instructions to assign these values to ingredients.

Enabling Ingredient Priority and Compatibility

Once you have assigned Ingredient Priority and Ingredient Compatibility values, you can use them to determine candidate formulas, and to sort the job results. In order to do this, these properties must be selected as a sort option in the job template before the matches are run. You cannot run a match that excludes either from the sort criteria, and select them at a later time.



- **Priority and Compatibility.** This is a sort option that combines ingredient priority (IP) and ingredient compatibility (IC) as a single value. It is the average of IP and IC.



See also...

- *Formula Central, Tools Menu, Job Preferences, Results for* detailed instructions to activate ingredient Priority, Ingredient Compatibility, or Ingredient Priority and Compatibility as sort tolerances in the job template.
- *Queue Maintenance, Edit Tolerances for* instructions to assign tolerances to these formula properties for use when filtering and sorting queue results.
- *Queue Viewer, Filtering and Sorting Options for* instructions to use Ingredient Priority and Ingredient Compatibility as properties for filtering and sorting queue results.

Formula Sorting Logic

Normally the optimizer goal function is used as the matching goal and also to order (and name) the matched formulas. For example, if 20 formulas are requested, the matched formulas will be ordered by the goal function and the 20 that best satisfy the tolerances will be available for display. Any sorting is done on these 20 formulas. If you want to use IP, IC or IP&IC to order the matched formulas, you must put IP, IC or IP&IC as the first sort option. Below are the rules when selecting each of these properties as sorting options in the job template.

Ingredient Priority

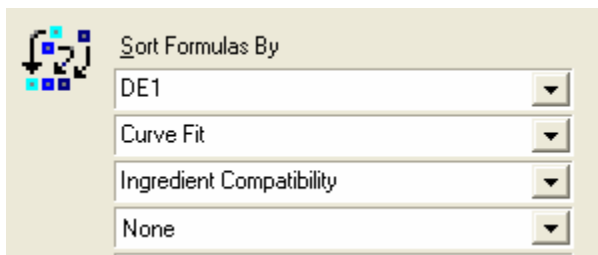
- **IP Is First Sort property.** When Ingredient Priority is in the first sort position for the job template:
 - All ingredients that have priority values of 0 are automatically eliminated before the matching process begins.
 - The formulas will be matched using the goal function as the matching goal.
 - Formula results will be sorted based on the Ingredient Priority value.
- **IP Not First Sort.** When Ingredient Priority is *not* in the first sort position for the job template:
 - All ingredients that have priority values of 0 are eliminated before the matching process begins.
 - The formulas will be matched using the goal function as the matching goal.

- Formula results are *not* sorted based on the Ingredient Priority value. Ingredient Priority values are calculated, but they are used only for recursive sort.

Ingredient Compatibility

- **IC Is First Sort property.** When Ingredient Compatibility is in the first sort position for the job template:
 - All ingredients that have compatibility values of 0 are eliminated before the matching process begins.
 - The formulas will be matched using the goal function as the matching goal.
 - Formula results will be sorted based on the Ingredient Compatibility value.
- **IC Not First Sort.** When Ingredient Compatibility is not in the first sort position for the job template:
 - All combinations having a compatibility value of 0 are eliminated before the matching process begins.
 - The formulas will be matched using the goal function as the matching goal.
 - Formula results are *not* sorted based on the Ingredient Compatibility value. Ingredient Compatibility values are calculated, but they are used only for a recursive sort. This approach eliminates some combinations, while applying a normal sort.

Below is an example:



- This sort orders the formulas based on DE1 and Curve Fit, while also eliminating any combinations with ingredient compatibility of 0.

Ingredient Priority/Compatibility

- **Priority and Compatibility Is First Sort.** If Ingredient Priority and Compatibility is in the first sort position:
 - It will eliminate ingredients that have priority and compatibility values of 0, before the matching process begins.
 - Formulas will be matched using the goal function as the matching goal.

- Matched formulas will be sorted based on the Ingredient Priority and Compatibility value.
- **IC Not First Sort.** If Ingredient Priority and Compatibility is NOT in the first sort position:
 - It will eliminate ingredients that have priority and compatibility values of 0, before the matching process begins.
 - Matched formulas will not be sorted based on the Ingredient Priority and Compatibility value. Ingredient Priority and Compatibility values are calculated, but used only for a recursive sort.

Working with Formulas Containing Multiple Ingredient Combinations

When a formula contains more than one identified ingredient combination (IC), a hierarchy exists for assigning the correct ingredient compatibility.

- When a formula has multiple combinations containing the same number of ingredients, the following logic is applied:
 - The lowest IC value will be assigned to the formula. For example, a single formula that contains one combination with a value of 90, and a second combination assigned a value of 70, will be assigned an IC score of 70. Likewise, if a formula that contains one combination with an IC value of 70, and a second IC combination assigned a value of 20, will be assigned an IC score of 20.
 - A formula with an IC score of 70 is preferred over formulas that do not have specific IC data (IC=50). Likewise, a formula with an IC score of 20 is less preferred over formulas that do not have IC data.
- When a single formula contains multiple ingredient combinations, and those combinations include a different number of colorants, the following logic is applied:
 - In cases with multiple 3-ingredient combinations or multiple 2-ingredient combinations, the lowest IC value is assigned to the formula.

Results Example

Below is a partial example of Formula Central multi-formula results output, sorted based on Ingredient Priority:

Multi-Formula Display							
Target RAL1001-HR 01/98 R = 214, G = 188, B = 141							
Evaluation / Sort	Prediction 183	Prediction 184	Prediction 202	Prediction 283	Prediction 381	Prediction 431	Prediction 429
Ingredient Priority	60.00	60.00	60.00	60.00	60.00	60.00	60.00
DE1	0.01	0.01	0.01	0.01	0.01	0.01	0.01
DE2	0.48	0.46	0.50	0.57	0.65	0.72	0.72
DE3	1.16	3.62	3.66	3.80	3.87	1.03	1.24
None							
Oxide Red	5.34					3.34	5.09
Pastel Base	900.00	900.00	900.00	900.00	900.00	900.00	900.00
Phtalo Green	3.42						
Yellow	37.42					36.32	38.69
Oxide Yellow		48.67	48.40	48.55	47.46		
Phtalo Blue		5.20					
Purple		1.93		2.09			

- **Formula Number (Prediction 183).** Formulas sorted based on Ingredient Priority may have high prediction number. This indicates that the best formulas, based on the goal function, have been discarded when applying the Ingredient Priority sort.
- **Ingredient Priority.** This calculation is the average Ingredient Priority for all the ingredients in the formula. In this example, the Pastel Base has an IP value of 90 while the other ingredients have IP values of 50. This calculates to an average value of 60 (240/4).

Formula Storage/Retrieval

This discussion focuses on the need for formula storage and retrieval options, and provides step-by-step instructions for using these options.

Why Store and Retrieve Formulas?

Why do we go to the trouble of storing a formula? Why don't we just use our colorant set and match every color using the color-matching program directly? Why not run combinatorial matches every time we need a formula?

We store and retrieve proven formulas because color-matching programs are not perfect. Neither are optical models, or colorant database preparation, production and laboratory processes. Because of these variables, first-shot match quality is imperfect. Formulas initially predicted to perfectly match a target (predicted color difference of 0.0), frequently require correction when actual samples of the predicted formula are made. When this happens, colorists do not attempt to adjust laboratory or

production processes until samples of the predicted formula yield the predicted color difference.

Given that the production process is stable, once an actual sample made from a formula is produced, you can be reasonably sure that formula will produce similar samples in the future. A verified formula with an actual sample is a proven and dependable tool you can use to improve the matching process. In fact, a verified formulas and actual samples are the foundation of a colorant set.

Formulas are stored to save work. The program uses these formulas to learn about the colorants. When a formula is stored, the information recorded includes:

- A list of ingredients and amounts in the formula.
- The measurement of an actual sample made from the formula

The following discussion covers the concept and operation of the formula storage and retrieval features included in Datacolor MATCH^{PIGMENT}.

Before You Begin

There are terms used to identify types of formulas and samples that must be clearly defined, before the discussion begins.

Terms

- **Verified Formula.** A verified formula is a list of ingredients and amounts that were used to make a physical sample, either in a laboratory or in production process (also known as a “known” formula).
- **Actual Sample.** An actual sample includes one (or more) measurements of a physical sample.
- **Actual Formula.** An actual formula is a verified formula PLUS an actual measurement. It is a spectral measurement of a physical sample, along with the formula used to make that physical sample. Actual formulas are used as calibration mixtures in colorant sets. An actual formula is required to produce significant performance data (performance factors or SmartMatch adjustments).
- **Predicted Formula.** A predicted formula is a list of ingredients and amounts that are the result of calculation using stored colorant optical constants. A predicted formula is the output of a color match or correction program. A predicted formula is sometimes called a *theoretical* formula or simply a *prediction*.
- **Synthesized Sample.** A synthesized sample is a set of spectral values that are the spectral curve produced by a formula, based on the optical constants in a colorant set. This is the reverse of the normal color matching process – a formula is input to the program and using the optical data of a colorant set, a spectral curve is produced.
- **Target Sample.** A target sample is the *goal* or color *specification* in a color matching sequence.

- **Trial Sample.** The *actual* sample associated with a formula. It is displayed in Formula Central in the *Trial Name* field. The program assumes the trial sample is an *actual* sample and will always treat it as such. Whether it is or not depends on the user. Frequently the trial sample is nearly the same color as the target sample, but there is no reason to expect this as a rule.

Manual Formula Storage—A Practical Example

You have been asked to match a color visually, and have developed the formula below as a visual match to the standard:

Formula KN1MW-70	
Yellow	12
Red	6
Blue	1
White	11
Clear	70

You mix the colorants, mold and cure a chip. The chip is a physical sample of Formula *KN1MW-70*. It is approved as a production match to the standard. You physically label the chip, *KN1MW-70*.

Using a physical sample, a filing cabinet, folders and labels, you can create a manual formula storage system. You can put this physical sample and the written formula into a folder and store it away in a laboratory file cabinet. This system supports the following activities:

- Formula storage
- Formula retrieval
- Formula search and correct

This system can be used in three ways:

- When you need to make more *KN1MW-70* for production, you go to the file cabinet and locate the folder containing Formula *KN1MW-70*. It contains an actual sample to view.
- When you receive a request for a new color match, you take the new standard to the file cabinet, and visually compare the samples in each folder to find one that matches this standard. If *KN1MW-70* looks acceptable, you can get Formula *KN1MW-70* and send it to the client for approval.
- Responding to another request for a new color match, you can again take the standard to the file cabinet, and compare the samples in each folder to find one that matches. If *KN1MW-70* is close but not acceptable, you can still use *KN1MW-70* as a starting point and adjust it, creating both a “Formula 2” and “Sample 2.” You can continue this process creating new formulas and samples, until you make a sample that matches the standard.

Computerized Formula Storage/Retrieval Systems

The design goals of a computerized formula storage and retrieval system are the same as the manual formula storage system. You perform the same formula storage and retrieval tasks described above, using the written formula and physical sample. The difference is that the computerized system has replaced filing cabinets and visual searches with powerful optical models, matching and search algorithms.

Recreating Sample KN1MW-70/Formula KN1MW-70

Using a color-matching program and a colorant set built with your production colorants you can create an experiment to test how the program and data deal with *Formula KN1MW-70* and *Sample KN1MW-70*.

Using *KN1MW-70* as the target, the computer provides the predicted formula shown below. We will call it *Prediction KN1MW-70*.

Yellow	12.29	DE1 = 0.0
Red	6.15	DE2 = 0.0
Blue	0.77	DE3 = 0.0
White	70.00	

While the predicted color differences between the actual sample and the predicted formula are 0.0, the ingredient amounts vary slightly from the amounts actually used in the samples. You will see in the section below, ***Manual Formula Storage and Color Differences***, how the differences in ingredient amounts are expressed in terms of color differences, when you store the formula.

Formula Storage Options

In Formula Central, you can either store a formula manually, or you can store a job formula when you have completed a correction. For either type of formula storage the procedure includes:

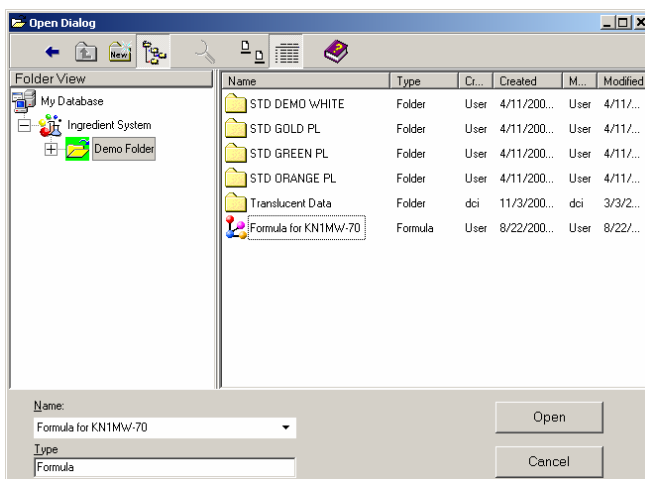
- Creating a physical sample
- Measuring the physical sample
- Verifying/entering the ingredient amounts contained in the sample

Manual Formula Storage Procedure

The procedure to manually store Formula KN1MW-70 is as follows:

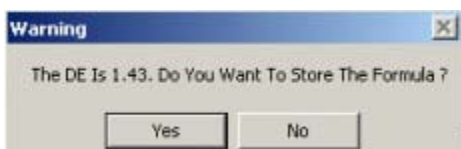
1. Launch Formula Central and create a new job.
2. Select a colorant set and ingredients.
3. Enter the actual ingredient amounts into the formula grid. Measure the actual sample "KN1MW-70" as the trial.
4. Click the **Save** icon in Formula Central

5. The Navigator window displays. In the *Name* field, enter the name you want to assign to the formula. The default is the based on the trial name.
6. Click **Open**. The formula will be stored in the Demo folder.



Manual Formula Storage/Color Differences

When you store a formula manually, you may receive a warning that includes a color difference report:



NOTE

This warning displays when the predicted DE is greater than the DE tolerance limit specified in job preferences.

In this case, the amounts entered were the actual ingredient amounts used in the formula. The variation between the predicted amounts and the actual amounts resulted in color difference of 1.43.

? **How can a formula have a color difference? What is this?** We know that *Formula KN1MW-70* is almost a “definition” of *Sample KN1MW-70*. How can there be any difference? We only measured one sample. Where did the other sample come from?

Simply put, a formula does not have a color. The answer may seem trivial—a sample of the formula can be created and compared to another sample. It is important to remember that a colorimetric evaluation involves one sample. A color difference evaluation requires two samples.

As elementary as this is, it is not always obvious how samples are created or which samples are used for an evaluation—especially when that evaluation may not identify the samples directly. This is especially true when you are in the process of storing or retrieving a formula, and a color difference displays.

Let's analyze what has happened at this point: The program has taken the ingredient amounts input for *Formula KN1MW-70* and made an extrapolation—a *prediction* -- using the optical data from the formulas and sample in our colorant set. The program synthesized a measurement for *Formula KN1MW-70*, based on these ingredient amounts and compared it to the real Sample *KN1MW-70*.

 **What Does This Color Difference Represent?** In our experiment above, our program reported a DE of 1.43 when we tried to store *Formula KN1MW-70* and Sample *KN1MW-70*.

It cannot represent the quality of *Formula KN1MW-70*. There is a physical sample that proves that *Formula KN1MW-70* is a perfect match for Sample *KN1MW-70*.

Using the same logic, the difference cannot represent the quality of Sample *KN1MW-70*. We know that Sample *KN1MW-70* is made exactly from *Formula KN1MW-70*.

The number in the window represents the difference between:

- PREDICTION and EVIDENCE
- THEORY and PRACTICE
- REAL and VIRTUAL

It is the size of the discrepancy between:

- A theoretical sample produced from an extrapolation of colorant set data and
- The actual sample that the formula produced.

It is not a measure of quality or degree of “goodness” or appropriateness of a formula. If you believe you can take this formula and produce equal samples from it, the formula is good even if the DE between the physical sample and the synthesized formula prediction is very, very large.

This color difference tells you:

- How well a colorant set will perform matching that formula.
- How well a colorant set is likely to perform matching similar colors in the future.
- In what areas of color space a colorant set might need more work or extra calibration points.
- Which colorants need updated colorant mixtures.
- How much using the formula for Search & Correct is likely to improve your results.

- The color difference can also identify errors in the ingredient input. If you entered an incorrect amount for any ingredient, this will also produce a significant color difference.

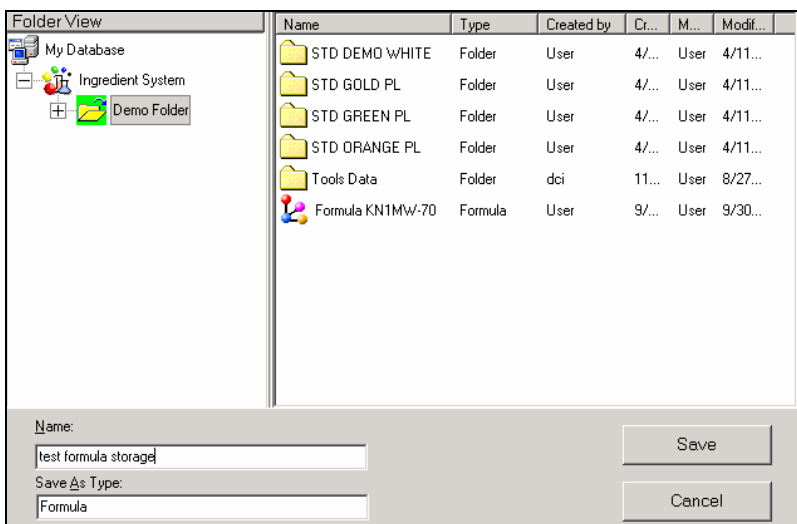
Storing Job Formulas

While manual formula storage is a valuable tool, formula storage is more frequently performed when running a color match or correction in Formula Central. To store a formula created from a job:

1. When you have completed a color match or correction, click on the Save icon on the Formula Central window.



- The Navigator window opens. Browse to the folder that will hold the formula, and enter the name to be assigned to the formula.



- Click **Save**. The formula will be stored in the folder you have selected.

Formula Retrieval

In Datacolor MATCH^{PIGMENT}, formulas can be retrieved one of two ways:

- Retrieve Formula by Name.** In Formula Central, the user can input the formula name and manually retrieve the formula
- Retrieve Formula by Color.** The matching options **Autoformulate**, **Search**, and **Search & Correct** retrieve formulas based on colorimetric or physical properties selected in the job preferences.

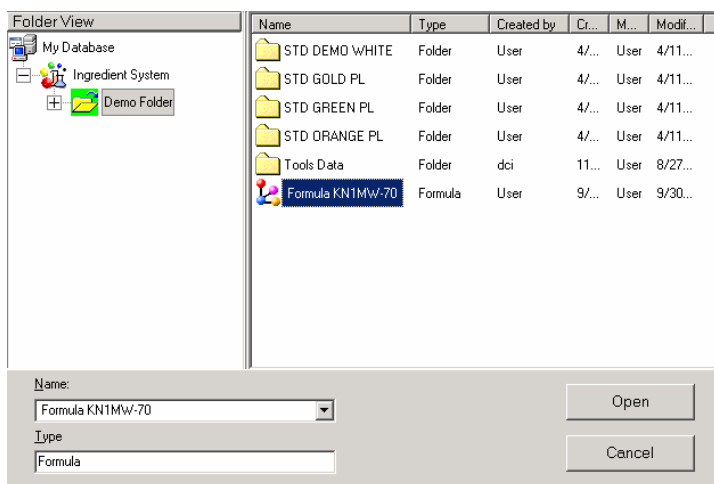
Retrieve Formula by Name

Retrieving a formula by name is a very simple process:

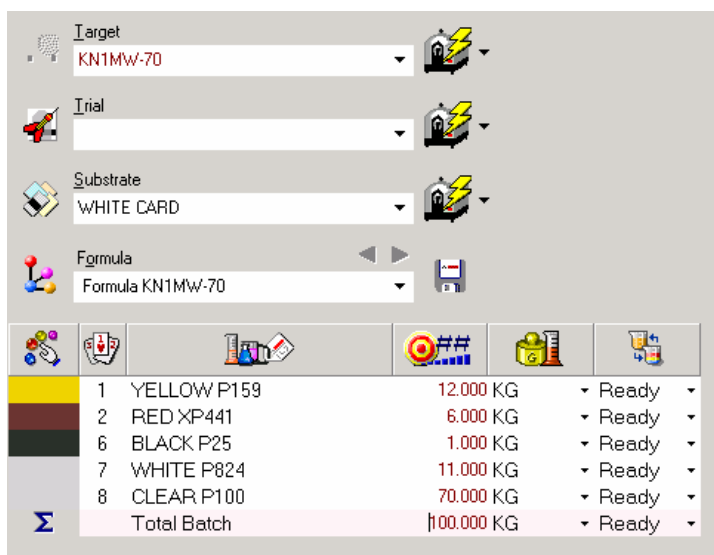
- Click on the **Retrieve Formula** button in Formula Central.



- The Navigator window opens. Browse to the folder containing the formula, and highlight the formula:



- Click **Open**. The formula will be displayed in Formula Central:

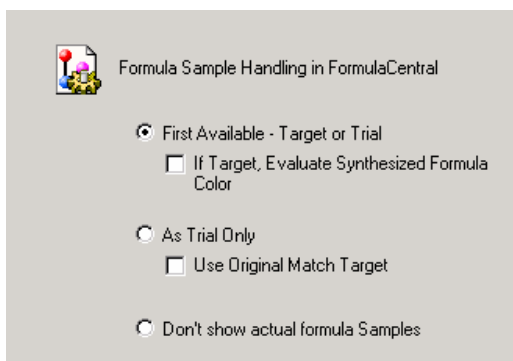


What do you expect to see when you retrieve a formula? When you retrieve a formula by name, there are different ways to use it. For example, you may want to retrieve the formula to make a new batch of the same material. Or, you may simply want to print a batch ticket. Depending on your task, the sample data stored with the formula can be treated differently. Because of this, the program needs to know what, if anything, it should do with the sample measurement data. If it is retrieved, it needs to know whether it should be treated as *Target* data or *Trial* data.

- When the measurement data is placed in the *Target* field, you can measure a sample of the current batch and run a correction. In this situation, all of the ingredient information is automatically recalled, and the correction will typically result in minor adjustments to the original formula.
- If the sample data is placed in the *Trial* field, you can also run a correction using the stored formula as a starting point. However, you can measure a different target sample, and the formula may change significantly during correction.
- If you are retrieving a formula manually simply to print a batch ticket, the placement of the sample data may not be a concern. In fact you may not even need to include the measurement information in the printed record of the formula.

Formula Sample Handling Options

The selections for Formula Sample Handling (*Admin, Material Handling, Formula Sample Handling*) provide the rules for handling the measurement data when a formula is retrieved by name.



NOTE

These settings are only applied to formulas retrieved by name.

First Available, Target or Trial

The sample measurement data retrieved with the formula is placed in the first field available, Target or Trial.

Target Field Available. When the *Target* field is empty, the sample data in the formula record is **always** assigned to the Target. This method is frequently used when the formula and sample data represent an actual production standard, and a new lot of the same product is being prepared. You can quickly display an evaluation of the two samples, and run a correction for the batch that is in process. In this situation, the correction typically involves a small adjustment to the original formula.

Below is the procedure for setting up the job under this condition.

1. Open a new job.
 2. Retrieve the formula by name. Click on the Formula icon to see a list of formulas. The stored sample displays in the Target field. You can now print a batch ticket or measure a trial and start a correction. To run a correction, continue with the procedure below:
 3. Measure the current batch sample as the Trial.
 4. Select a correction tool.
- **If Target, Evaluate Synthesized Formula Color.** When First Available is selected, and the Target field is empty, the stored data is placed in the Target field. Although there is no Trial sample, a color difference is displayed in the Evaluation Window. When this option is enabled, the color difference is the difference between the Target and the synthesized formula. When it is disabled, no color difference is displayed.

TIP

This feature can be used to detect formula input errors. If you retrieve a formula and a large color difference is displayed, you should check that the stored formula is correct.

- **Target Field Occupied.** If Target is empty, the data is placed in the Target slot. I've called that Target Field Available (see above). If it is occupied, the data is placed in the Trial slot. When Target data already exists, the sample data from the formula record is placed in the Trial field. A new sample can be measured as the Target, and the sample retrieved with the formula becomes the Trial. An "as is" color difference is displayed immediately, and you are ready to run a correction. The correction will modify the stored formula to match the new target, and may change the original formula significantly.

NOTE

First Available provides you the most flexibility to set up the conditions you need at run time. You simply provide either target or trial data before you recall the formula, based on the current task.

As Trial Only

The sample data stored with the formula is always used as the trial. When this option is selected, you will always be running a manual Search & Correct when you retrieve a formula by name.

- **Use Original Match Target.** When *Trial Only* is selected, you must still provide target data. This option directs the program to place the original match target data in the target field. When you select this feature, you are repeating the original sequence used to generate the formula.

This can be helpful if you want to compare the differences between a master standard and a working standard. The master sample data is stored with the

formula and recalled as the target. The working standard is measured as the trial. The formula used for both remains the same, until you run a correction.

Do Not Show Actual Formula Samples

When selected, no data is assigned to either the target or trial fields. Only the formula (including formula name) is recalled, and is displayed in the Formula Grid.

TIP

If you are only interested in printing a batch ticket containing the formula, you may want to exclude the sample information.

Retrieving Formulas by Color

Rather than retrieving formulas by name, you can retrieve formulas based on their colorimetric properties. Colorimetric retrieval is done using the Search, Search & Correct or AutoFormulate matching options in Formula Central. These are very powerful tools that allow you to use an established production formula as a starting point for a new color match. However, each option handles the sample data differently.

The discussion below explains the various treatments of the sample data when you retrieve a formula by color.

Search with the Actual Sample as the Target

In this example, a new job is created and actual sample “KN1MW-70” is input as the target. The Search option is selected.

The screenshot shows the Formula Central software interface. The main workspace displays the following data:

CIELAB		L*	a*	b*	C*	h	CR
Target		58.17	13.69	24.35	27.94	60.65	61.20
Formula		58.17	13.69	24.35	27.94	60.65	59.37

Substrate		DE*	DL*	Da*	Db*	DC*	DH*	CDE
Formula		94.09	-0.68	2.79	2.87	103.61		
D65/10		0.00	0.00	0.00	0.00	0.00	0.00	22.04
A/10		0.00	0.00	0.00	0.00	0.00	0.00	26.16
F11/10		0.00	0.00	0.00	0.00	0.00	0.00	24.09

D65/10		A/10

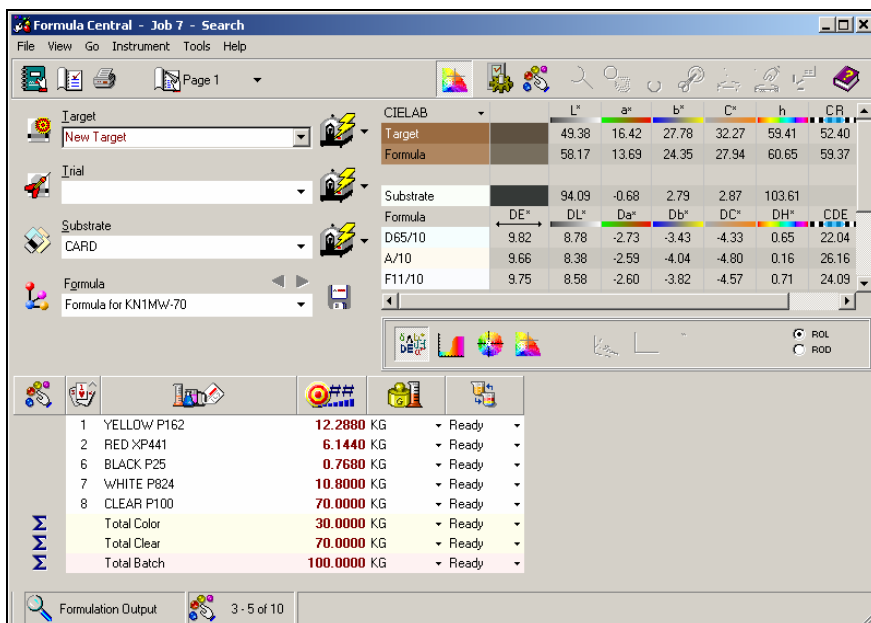
1	YELLOW P162	12.2880 KG	Ready
2	RED XP441	6.1440 KG	Ready
6	BLACK P25	0.7680 KG	Ready
7	WHITE P824	10.8000 KG	Ready
8	CLEAR P100	70.0000 KG	Ready
Total Color		30.0000 KG	Ready
Total Clear		70.0000 KG	Ready
Total Batch		100.0000 KG	Ready

Formulation Output File

In this case, the target and the sample stored with the formula are the same sample, and the color difference is 0.0. The formula is identical to the formula used to make the sample.

New Target and Search – Search Option

In this example, a new target has been measured or input. . The *Search* option was chosen and the program searched the formula file for colors that are close to target color.



The screenshot shows the 'Formula Central - Job 7 - Search' window. The 'Target' is set to 'New Target' and the 'Formula' is 'Formula for KN1MW-70'. The 'Substrate' is 'CARD'. The 'Formula' is 'Formula for KN1MW-70'. The search results are displayed in a table below the main window.

Formula	DE*	DL*	Da*	Db*	DC*	DH*	CDE
Target	49.38	16.42	27.78	32.27	59.41	52.40	
Formula	58.17	13.69	24.35	27.94	60.65	59.37	
Substrate	94.09	-0.68	2.79	2.87	103.61		
Formula	DE*	DL*	Da*	Db*	DC*	DH*	CDE
D65/10	9.82	8.78	-2.73	-3.43	-4.33	0.65	22.04
A/10	9.66	8.38	-2.59	-4.04	-4.80	0.16	26.16
F11/10	9.75	8.58	-2.60	-3.82	-4.57	0.71	24.09

The bottom section of the window shows a list of formulas and their corresponding color values and a 'Ready' status.

Formula	Weight	Status
1 YELLOW P162	12.2880 KG	Ready
2 RED XP441	6.1440 KG	Ready
6 BLACK P25	0.7680 KG	Ready
7 WHITE P824	10.8000 KG	Ready
8 CLEAR P100	70.0000 KG	Ready
Total Color	30.0000 KG	Ready
Total Clear	70.0000 KG	Ready
Total Batch	100.0000 KG	Ready

The actual formula “Formula for KN1MW-70” was found. However the DE between the target and the retrieved formula is 9.82, which would probably be an unacceptable “as is” color difference.

NOTES

- The *DE Limit for Search* (Job Preferences, Search Tab) determines which stored formulas are acceptable matches to the new target. Typically this limit is smaller than 9.82.
- When *Show Best Formula* is enabled (Job Preferences, Tolerances Tab), this formula would be displayed even when the *DE Limit for Search* is less than 9.82.

New Target and Search & Correct (AutoFormulate Option)

In this example, a new target is provided. But rather than selecting *Search*, you select *Search & Correct*.

NOTE

The *AutoFormulate* option in Formula Central may produce the same formula, because it incorporates *Search & Correct* of one of its phases. See also *Formula Central, Matching Features* for a detailed discussion of each matching feature available, including *AutoFormulate* and *Search & Correct*.

CIELAB		L*	a*	b*	C*	h	CR
Target		49.38	16.42	27.78	32.27	59.41	52.40
Formula		49.38	16.42	27.78	32.27	59.41	52.40

Substrate		D65/10	DL*	Da*	Db*	DC*	DH*	CDE
Formula		94.09	-0.68	2.79	2.87	103.61		
D65/10	DE*	0.00	0.00	0.00	0.00	0.00	0.00	25.79
A/10		0.15	0.00	-0.14	0.06	-0.02	0.15	30.11
F11/10		0.11	0.03	-0.11	-0.01	-0.05	0.10	28.03

1	YELLOW P162	18.0460 KG	Ready
2	RED XP441	7.9679 KG	Ready
6	BLACK P25	1.1269 KG	Ready
7	WHITE P824	0.9295 KG	Ready
8	CLEAR P100	71.9297 KG	Ready
Total Color		28.0703 KG	Ready
Total Clear		71.9297 KG	Ready
Total Batch		100.0000 KG	Ready

In this example, the ingredients from the original formula, Formula for *KN1MW-70* have remained the same. However, the amounts have changed. Instead of using the colorant set data alone, *Search & Correct* applies performance data from the stored sample “KN1MW-70”, to the optical data in an effort to improve the accuracy of the match. The color difference is the difference between the target (New Target) and the corrected (theoretical) formula.

In most cases the predicted formula from *Search & Correct* is more accurate than simply using a regular combinatorial match. Since the ingredient combination has been previously run in production, it is also likely to be a more reliable formula in terms of processing.

Formula Sorting Options

The program offers several sorting methods to rank and display the formula predictions. Included in the job preferences is an option to select formula sorting criteria (see also *Job Preferences, Results for selecting sort criteria*). When sort criteria are selected for the job, the multi-formula display ranks the predictions based on the sort criteria defined in the job preferences. When no sort criteria are selected for the job, the formulas are sorted based on optimizer goal selections (*Tools Menu, Job Preferences, Advanced Tab, Optimizer Goal*).

Default Formula Sorting

Formulas displayed in Formula Central are always sorted. The default parameters used to sort formulas are based on the optimizer goal selected for the job (*Tools Menu, Job Preferences, Advanced Tab*). The formula predictions are assigned a number that ranks them based on the optimizer goal function. For example, Prediction 1 would be the best match according to the goal function. If 7 formulas were found, 1 through 7 would be the order based on the optimizer goal.

See also *Tools Menu, Job Preferences, Results Tab for instructions to configure the sort options, and Applications Technology, Optimizer Goal for a detailed discussion of the optimizer goal function*.

NOTES

- When the optimizer goal is used as the sort criteria, the formulas will not always be displayed in order in the Formula Central spreadsheet. When formulas are calculated internally, they are based on volume, and have a batch size of 1L. They are then re-synthesized based on the formula mode selected in the grid. Converting the formulas from a batch size of 1L to a different batch size, or a different mode, may result in formula amounts that are rounded, and may affect the color difference calculation. This may change the display order of the formulas.
- The formula is named by a number, which indicates its position based on the optimizer goal function sort. For example, Formula 1 is always the best formula based on the optimizer goal. However, when the formulas are resorted based on other criteria such as cost, Formula 1 may no longer be the "best formula" and will not be displayed in the first position in the report.

 **Why are Sorting Options Needed?** Below is a table that illustrates the sheer number of formulas that can be generated from a single job:

Number of Colorants Selected	Number of Colorants in a Single Formula	Number of Possible Formulas
15	3	455
7	4	35
3	3	1

Since it is possible that the system can find dozens of formulas to match a target, it is very useful to have the program sort them.

The default sort criteria used is the optimizer goal function. When you specify sort characteristics as part of the job preferences, the order of formulas may change. The program will re-sort the formulas based on the sort criteria defined.

Below is an example formulas sorted based on DE1.

Target: Blue Panel #24		Blue Panel #24: R = 104, G = 140, B = 161					
Evaluation / Sort	Prediction 6	Prediction 2	Prediction 4	Prediction 7	Prediction 3	Prediction 1	Prediction 5
DE1	0.00	0.00	0.01	0.01	0.01	0.01	0.01
None							
None							
None							
None							
Flex Yellow	3.42			4.20			0.71
Flex Green	20.45	27.51	2.09		17.55	21.22	
Flex Violet	13.02	8.43				9.97	
Flex Clear	63.11	58.87	81.25	75.38	65.84	66.43	82.00
Flex Red		5.19		4.37	7.53		
Flex Blue			12.41	16.04	9.09		13.33
Flex Black			4.25			2.38	3.97

Weight/100:KG/2d Form0 100.00 KG

When the formulas were sorted based on DE1, *Prediction 6* became the best formula.

Recursive Sorting

The program provides the option to define multiple sort characteristics. These characteristics are part of the job preferences (*Tools Menu, Job Preferences, Results Tab*). You can include a maximum of five (5) characteristics to be used for formula sorting.

 **Why choose more than one sort characteristic?** If you have selected DE1 as the only sort criteria, you may have several formulas with a DE of 0.0 in the first illuminant. You then need to select another characteristic of the formulas to sort them from best to worst. This process is referred to as "recursive sorting".

 **How Does the Sort Work?** All of the formulas found by the job satisfy all of the colorimetric tolerances, appearance and physical requirements you have created for the job. You then need the formulas sorted from best to worst, based on the sorting characteristics you have selected.

Recursive Sorting Example

You have selected 3 sorting characteristics for your job:

- DE1 (the quality of the formula under the primary illuminant)
- Metamerism
- Cost

Below is a table containing the data for these formulas regarding each of the three characteristics:

	<u>DE1</u>	<u>Metamerism</u>	<u>Cost</u>
Formula A	0.3	.1	7.25
Formula B	0.1	.2	6.00
Formula C	0.2	.6	5.00

Sorting on each of these three characteristics would produce a different sort. For example, the sort based on DE1 would produce select *Formula B* as the best match:

	<u>DE1</u>	<u>Metamerism</u>	<u>Cost</u>
Formula B	0.1	.2	6.00
Formula C	0.2	.6	5.00
Formula A	0.3	.1	7.25

However, a sort based on cost would select Formula C as the best answer.

 **What happens when two formulas have identical values for the first sort field?** Often a job will find several formulas that have the same DE. Below is an example:

	<u>DE1</u>	<u>Metamerism</u>	<u>Cost</u>
Formula A	0.3	.1	7.25
Formula B	0.1	.2	6.00
Formula D	0.3	.6	5.00

When several formulas have the same value for the first sort field, the job goes to the second sort field to make a decision about the sort order. This is a "recursive" sort. In this example, Formula A and Formula C are tied based on DE1. The job would then consider the metamerism of the formulas, and would sort the formulas from best to worst as follows:

	<u>DE1</u>	<u>Metamerism</u>	<u>Cost</u>
Formula B	0.1	.2	6.00
Formula A	0.3	.1	7.25
Formula D	0.3	.6	5.00

Formula B is still the best formula in the group, based on the first field, DE. The metamerism sort is only used to make a decision regarding the sort order for Formula A and Formula D. You can think of the second sort field as a "tiebreaker" for those formulas that have the same value for the first sort field.

 What happens if several formulas have a common value for sort fields 1 and 2?

	<u>DE1</u>	<u>Metamerism</u>	<u>Cost</u>
Formula B	0.1	.2	6.00
Formula A	0.3	.1	7.25
Formula E	0.3	.1	5.00

When several formulas have the same value for the first 2 sort criteria, the job will then go to the third sort field to make a decision regarding the sort order.

	<u>DE1</u>	<u>Metamerism</u>	<u>Cost</u>
Formula B	0.1	.2	6.00
Formula E	0.3	.1	5.00
Formula A	0.3	.1	7.25

In this example, *Formula E* is better than *Formula A* overall because, based on the 3rd field (Cost), it has a lower cost.

Custom Sort

When you choose Custom Sort, you combine several parameters into a single sort criterion labeled *Custom*, and assign a *weight* to each sort characteristic you have selected. This allows you to incorporate several formula characteristics into a single sort criterion. Each parameter selected is assigned a weight.

 **What is a weight?** It is a rank assigned to the importance of each sort characteristic included in the custom sort. For the multi-sort examples discussed earlier, we did not assign a weight to the selections. In that situation, the sort characteristics had equal weight, which made them equally important.

In Custom Sort you can assign different ranks or priority levels to the sort characteristic you have selected. Sometimes, one sort characteristic may be more important than another. For example, metamerism may be more important than either DE1 or cost.

The weights are expressed as percent (%), and the total of the weights you use must be 100%. Below is an example of a custom sort:

Metamerism	40%
DE	30%
Cost	<u>30%</u>
Total	100%

The job accepts a maximum of five characteristics for a custom sort, and *you must assign a weight to each*. There are no default values for custom sort weights. If you applied this custom sort example to the examples discussed earlier, it might change the sorting order of the formulas.

Optimizer Goal

The Optimizer Goal controls the internal decisions made by the program regarding the calculation of matches and corrections. Previously, the goals of the formulation and correction features have been embedded into the program code and could not be changed. In Formula Central, the user defines these goals, and they can be changed at any time.

This information is related to the selections made in Job Preferences. *See also Formula Central Tools Menu, Job Preferences, Advanced Tab.*

 **What is the Optimizer Goal?** For every formulation and correction you run, you define the end point you are trying to achieve as the "Target." You also define the materials that you will use to match the Target. In the case of correction, you provide Trials (batches) as intermediate reference points. The Optimizer Goal controls the route you take on your journey to arrive at the Target.

Historically, the goal of all formulation (and correction) calculations has been embedded in the code of the program. It has been a single goal, focused exclusively on a spectral or colorimetric property of the formula. Achieving the lowest DE possible in the primary Illuminant/Observer condition is an example of the goal that has been embedded in past color matching programs.

Previously, the user has had control over many of the parameters that affect the goal. For example, the user selected the color difference calculation and Illuminant/Observer combination to be used. But the goal itself has never been available to the user for modification. In short, the Optimizer Goal always used the (lowest) DE to decide which formula was the *best* answer.

Clearly, the quality of the color match is a fundamental concern. However, there are other aspects of the formula, sometimes specific to a product or industry that plays a crucial role in determining the acceptability of a formula. In older software packages, the program's single-mindedness with respect to its goal—a perfect match in the primary Illuminant/Observer condition—often produced corrections that were not practical.

For example, it was not uncommon to receive an automatic add that was a perfect match, but did not consider the size of the addition. The add may have doubled or tripled the batch size, but it achieved a 0.0 match. Another example of an impractical correction relates to film thickness. The program may have provided a correction of a reasonable size, but the film thickness required was not possible to achieve.

In Formula Central, the program continues to make every effort to satisfy the goal function. The difference now is that you define the goal, and it can include other colorimetric properties, as well as physical and appearance properties of the product.

The Optimizer Goal you define is not universal. It is specific to a job template. Since you probably have different goals for different customers and/or products, the program offers you the opportunity to create different goals for different job templates.

 **How does the Optimizer Goal work?** The Optimizer Goal determines what makes a match. You set the goal by selecting the features of the formula that must be considered, and assigning a weight to each feature. You can generate a goal that considers aspects of the formula such as film thickness, contrast ratio and load, in addition to the overall color quality of a formula.

It is important to understand that for the Optimizer Goal, you simply select the properties and assign each a weight. For example, if you have selected the DE in the primary Illuminant/Observer combination as the sole requirement, the Optimizer Goal does not direct the job to find a DE of 0.0. It directs the job to find the formula ***with the best possible DE*** based on the circumstances or constraints of the situation.

Constraints

 **What are constraints?** They are obstacles that the program encounters when trying to calculate a formula. For example, you may be trying to match a green, but you have only included red and yellow colorants in your ingredient selection. The program will try all of the available ingredient combinations to find the lowest DE possible. The formula will achieve its goal, lowest DE possible, but will probably not satisfy the job tolerances in this situation, in this case, matching a green.

The program typically encounters many constraints from many sources—ingredient selection, minimum/maximum concentration limits for individual ingredients, colorant loading limits, among others—that can limit its performance. With respect to the requirements included in the Optimizer Goal, the program simply strives to do 'its best' under the circumstances. It does not consider whether what is being asked is logical.

When you select more than one property for the Optimizer Goal, the program assigns weights to each property. The job performs a 'better' or 'worse' evaluation of every formula, based on the properties chosen, and the weights assigned to them. For example, if you have selected DE, metamerism and cost, the program considers how an adjustment to the formula affects each of these qualities. When it reaches a point where it can no longer improve the formula (make it 'better') for *all parameters* included in the goal, it stops the optimization process.

Tolerances and the Optimizer Goal

The tolerances you have set are independent of the goal function. It is important to understand that the 'best' the job can do in terms of its goal, may not satisfy the job tolerances. If you have set a tolerance for a property such as film thickness, but have not included film thickness in the Optimizer Goal, it will not consider the impact of an ingredient combination or ingredient amount on the film thickness of the formula. It will perform the 'better/worse' evaluation based solely on the properties included in the goal. When it reaches a point where it can no longer adjust, or optimize, the ingredient combination and amounts in terms of its goal, it stops. The program then checks the job tolerances to evaluate whether the formula(s) it has found satisfy those tolerances. In the film thickness example, the film thickness tolerance is used to determine the acceptability of the match, but it is not used as a criterion for optimizing the ingredient combination and ingredient amounts in the formula.

NOTES

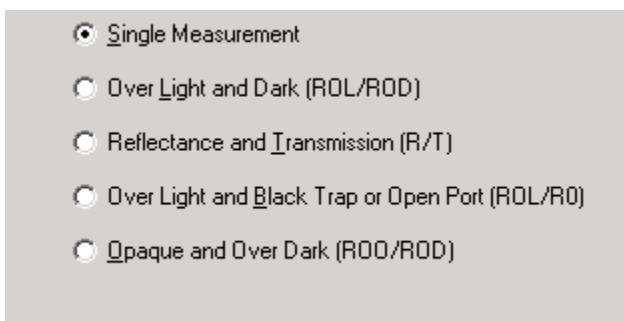
- The optimizer goal function is defined in Job Preferences (*Tools Menu, Job Preferences, Advanced tab*).
- The job tolerances you set (*Tools Menu, Job Preferences, Tolerances tab*) indicate whether the optimized formulas satisfy your requirements.
- The sort options (*Tools Menu, Job Preferences, Results tab*) are used to sort the acceptable formulas from best to worst based on characteristics you select.

Sample Types

Depending on your application, you may have to measure more than one sample in order to collect all of the information required to evaluate, match or correct a color. The program needs to know how many samples you will be measuring, and what type of samples they are. From this information, the program can select the correct calculation to apply to the measurement data, and prompt you for the correct samples. This information is referred to as "sample type".

The sample type is also important information in the creation of a colorant set. Typically, the colorant data used to calculate matches and corrections are generated from the same sample type used for the target and/or trial data.

Five sample types are available, and appear in the list below:



- Some colorant set types require specific sample types. In these cases, not all of the sample types shown above will be available.
- The program modules that prompt you for information about sample type include *Set Maintenance*, *Formula Central*, and *Admin*.
- The field for selecting sample type is sometimes labeled *Measurement Method* on the windows in the program modules.

 **Why is more than one measurement necessary?** For some applications such as industrial coatings, color is the only property considered in the calculation of the formulas. These are referred to as "color only" applications, and usually only require one measurement to gather the required data.

However, there are many applications that work with samples that are translucent—they are not completely transparent or opaque. Translucent matching is more complex than opaque or transparent matching. It must take into account the opacity, film thickness and color of the substrate to calculate and evaluate a color match. Translucent matching requires both color and opacity information, and *two* measurements. These applications are referred to as "color and opacity" applications.

"Color Only" Applications

Products such as industrial coatings are usually developed to achieve total opacity regardless of the color being matched. When color is the only quality being considered, a single measurement of a sample is used to gather data for the colorant set, and/or for the target and trial samples used in Formula Central. The data generated evaluates only the color quality of any formula prediction or sample. Formula output is limited to the ingredients, amounts, and projected color difference. No information is provided about film thickness or the opacity of the samples/formulas.

Transparent printing applications are another case in which only a single measurement is required. Because the inks used are transparent, no opacity adjustment is possible. For this application, a single measurement is used to generate colorant data, formulas and corrections. Applications using transmission measurements of transparent liquids or films are also "color-only" applications.

This sample type requires a single measurement, and the data can only be used to predict and evaluate the quality of the color match. Only one sample type, single measurement, is available for "color-only" applications.

"Color/Opacity" Applications

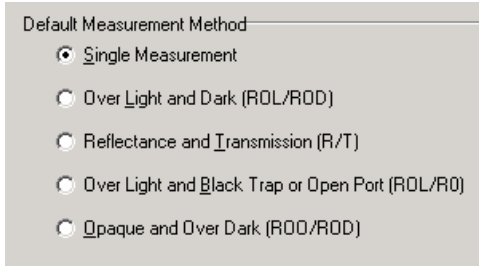
Applications that must consider both color and opacity (also referred to as load), require 2 sample measurements. In some cases, the samples are measured over a pair of contrasting backgrounds (e.g., black/white contrast cards, etc.). In others, both reflectance and transmittance measurements of the sample are used. From two measurements, the program can evaluate the translucency of the material, the film thickness and the influence of the substrate, as well as the quality of the color match. Packaging printers, extruded plastics and plastic films are examples of applications that require two measurements.

Several sample types are available for "*color and opacity*" applications. They include:

- Over Light and Dark (ROL/ROD)
- Reflectance and Transmission (R/T)
- Over Light and Black Trap or Open Port
- Opaque and Over Dark (ROO/ROD)

Sample Type Notation

The screen below includes all of the sample type selections you will see in the program:



Default Measurement Method

- ☒ Single Measurement
- ☐ Over Light and Dark (ROL/ROD)
- ☐ Reflectance and Transmission (R/T)
- ☐ Over Light and Black Trap or Open Port (ROL/RO)
- ☐ Opaque and Over Dark (ROO/ROD)

NOTES

- Some colorant set types require specific sample types. In these cases, not all of these options will be available for use.
- Every sample type except "Single Measurement" requires two measurements of the sample.
- Measurement convenience is a consideration in the selection of the sample type to be used.
- You should discuss the selection of the sample type with your Applications Specialist.

Single Measurement

A single measurement is used to represent the sample. The sample can be transparent, translucent or opaque, and the spectral data can be either reflectance or transmittance. Regardless of the sample opacity or type of data generated, the data is based on a single measurement. *See also Sample Types, Color-Only Applications.*

Over Light and Dark (ROL/ROD)

The sample is prepared over a contrasting background, typically a black/white contrast card. The program prompts you for 2 measurements, "measurement over light" and "measurement over dark." *See also Sample Types, Color/Opacity Applications.*

NOTE ABOUT ROL/ROD

This approach assumes that you have sufficient process control to insure that the film thickness is constant for both measurements.

Reflectance/Transmission (R/T)

The "over dark" measurement is a transmittance measurement rather than a reflectance measurement. Sometimes a transmittance measurement is more accurate than a reflectance measurement made over a dark background. *See also Sample Types, Color/Opacity Applications.*

Over Light and Black Trap or Open Port

The sample measurement "over dark" is made using either the black trap or an open port as the background. This eliminates variations in sample measurement due to differences in the black background. *See also Sample Types, Color/Opacity Applications.*

Opaque and Over Dark (ROO/ROD)

Opaque colorant sets are typically limited to considering color-only when calculating formulas. However, this option can be used to expand the capability of an opaque colorant set to consider color and opacity. One measurement is made of an opaque sample, and the other is a measurement of the sample over a dark background. *See also Sample Types Color/Opacity Applications.*

NOTES ABOUT ROO/ROD

- The "over dark" sample should not be opaque.
- Information about the pigment content and the film thickness of the ROD sample are required to convert the sample.
- This method is used as to convert a relative (opaque) set to an absolute file.

Color Matching With White

Industrial color matching is a very complicated process. Datacolor MATCH^{PIGMENT} offers a wide array of tools to handle most industrial applications in coatings, plastics, ink, and related industries. There isn't a single application approach that will solve all the problems in a single industrial setting. Each situation should be carefully analyzed, to select the appropriate method to solve the problem at hand. In many cases, there will be multiple solutions that will work, and it may take some trial and error to determine the best fit.

In general “matching with white” means that the color is translucent (incomplete hiding), and a white pigment (usually titanium dioxide) is included in the color formula. However, unless the context is clearly defined, it is not easy to know exactly what optical model, application technique or industrial process is implied in the task of “matching with white”. This discussion will highlight some of the technical issues that need to be considered when undertaking the task of color matching using white pigments at incomplete hiding.

The following questions lie at the heart of this discussion:

- Has a colorant load been specified?
- Has a white amount been specified?
- Has opacity (contrast ratio) been specified?

These questions must be answered in order to generate a formula containing a white colorant, which matches a translucent sample.

 **What is the goal of the match?** The fundamental issue is whether the *goal is to match only a target color, or both a target color and opacity*. In other words, would a color match have to achieve a specific pigment load/opacity, or will any load/opacity be acceptable? When matching color and load, the load may be expressed in terms of total colorant, white, clear or some combination of these ingredients.

 **Why is opacity a consideration?** Opacity is determined by one or several of the following considerations: the uses of the product, print quality, need to cover a background, cost or production process. For some, deciding whether to use white and clear, and narrowing the formula choices, from near-infinity to one, is frustrating. This is understandable, especially since *experienced color matchers* know the color can be matched at almost any opacity.

Usually, opacity requirements are determined more by cost or production considerations. For example, Pantone® colors are frequently used for color specification, yet none of the formulas used to produce the standards contain white pigment. *Reproducing* these transparent colors on a white substrate requires that color matchers estimate an opacity specification (contrast ratio). The specification may be based on required pigment load, substrate, cost or production considerations.

The ways in which one can estimate opacity of a sample are also numerous. However, they all rely on more than a single observation or color measurement. One can determine that a common white pigment is present in a measurement, but not whether it is in the sample or the background. Hints can be gleaned from plate marks in printed samples, suggested from universal practices in paint, detected from looking through a plastic chip, magnification or wet chemistry, but every guess relies on more than a single measurement.

The Challenge of Matching Color and Opacity

When matching colors at incomplete hide using a white colorant, there will be an infinite number of formulas, *having different opacities* that will match the target for most substrates. Unless some opacity criteria or load specification is given, there isn't a way for either a computer program or a *visual color matcher* to determine a specific opacity. There will be many correct formulas, at different colorant/white loads, that will match the color over the job substrate.

The Basic Matching Processes

When matching with white, the question is whether you are matching “color only”, or whether you are matching “color and opacity”. This is a very important distinction.

Matching “Color Only”

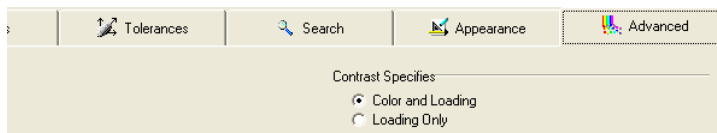
This approach is typically associated with opaque applications. It involves matching a colored sample, and an opacity specification is not provided. If the objective is solely to match a target color, a single measurement is all that is required. It can be a physical sample (color card, paint chip, a piece of plastic, etc.) or a colorimetric representation of a color (Lab, RGB, etc.). In this situation, the information provided is limited to the color of the sample. The measurement provides no information about possible opacity, whether white should be used, the amount of white to use, etc. The prediction provides information only about the quality of the color match.

Match Color and Opacity

This approach is typically associated with translucent applications. When the objective is to match color and opacity, a single measurement is insufficient to accurately determine the concentration of white, regardless of whether it is ink, paint or the plastic. A single measurement of the object and an opacity specification must be provided. The opacity specification can be a contrast measurement (ROD, RO, DT), a CR (contrast ratio) value, or a load constraint. Measuring a working standard over a black and white background is commonly used. Users who adopt this practice are rewarded with faster, more consistent results in production. Correcting future batches (also measured over contrasting backgrounds) is a straightforward process.

Datacolor MATCH^{PIGMENT} includes options that enable you to match the color, and the opacity of a sample. The approach requires the use of a translucent set, and includes the following choices:

- In *Job Preferences, Advanced Tab*, you must indicate that the contrast specification (Contrast Specifies) is to be used for both **Color and Loading**. This activates the translucent color matching model.



The screenshot shows a software interface with four tabs: Tolerances, Search, Appearance, and Advanced. The Advanced tab is selected. Below the tabs, there is a section labeled 'Contrast Specifies' with two radio button options: 'Color and Loading' (which is selected) and 'Loading Only'.

When *Color and Loading* is selected, you must provide the following requirements for the job:

- Define a range of white, colorant or clear concentrations to be used in the formula.
- Input a range of target contrast ratios (or transmission equivalent).
- Accept “any” opacity (* for the target CR).
- Pick a single opacity (CR).

NOTE

Once you have defined the requirements for matching with white, you can create a job template with these selections. By using this job template, the user is not prompted for the information.

Real Color Matching Examples

The examples below illustrate the results obtained from matching a target color only, and matching the same color at a specified opacity. They illustrate that there are many possible formulas to match the color at different colorant (and white) loads.

Examples of Matching “Color Only”

Examples #1 - #7 discussed below are examples of formulas that are generated when the system is asking to match a target color at various opacities (loads). You will notice that white is not included in every ingredient combination, and that the contrast ratios vary from one match to the next. They clearly illustrate that there are multiple formulas, at different loads, that will match the target color,

Below is a summary of the conditions under which examples 1-7 were generated. Included is an explanation of the information provided in the formula examples.

The Target



- For examples 1- 8, the target color is a single measurement of a color card sample named “Keepsake”. From looking at this color, nothing can be determined about loading or white amounts.
- The color was matched using a white background as the job substrate.
- An *arbitrary* colorant load (total colorant) was requested for each example. You’ll notice that in examples #1-7, the load increases in each example.

The Colorant Set

The demo colorant set “Translucent” will be used for the matches.

Presentation of Results

Below is an explanation of the formula results:

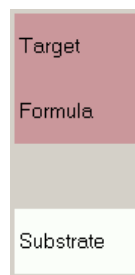
- **Color Over White.** The color shown in the block labeled “Formula” is the formula displayed over the white part of the substrate.
- **Color Over Black.** To the right of the “Formula” block is the formula displayed over the black part of the substrate.
- **Substrates.** The Job and Contrast substrates, without the colored film, are shown at the bottom of the example.

Target. The color to be matched. There is no opacity specification.

Formula. The color of the formula over the white substrate displays here.

Job substrate. This is the substrate to which the formula is to be applied.

T



The color of the formula over the black substrate displays here.

Contrast Substrate. This is the substrate used in the synthesized match to predict a CR.

Formula Results

- Each of the formulas in Examples 1 through 7 will have a 0 DE color difference to the target color.

- Example #1 is matched without any white pigment.
- The other samples are matched with progressively greater colorant loading (and more white).
- Each formula produces a different contrast ratio, which is the result of the load that is specified.
- Example 7 is matched with a 100% colorant load (maximum amount of white) and no clear.

Example 1

Target		YELLOW P162	1.1503	1.1503 KG
		MAGENTA P412	3.4853	3.4853 KG
		BLACK P25	0.2188	0.2188 KG
Formula		WHITE P824	0.0000	0.0000 KG
		CLEAR P100	95.1456	95.1456 KG
		Total Color	4.8544	4.8544 KG
		Total Resin	95.1456	95.1456 KG
Substrate		Total Batch	100.0000	100.0000 KG

- This formula is a color match to the target, *Keepsake*.
- No contrast ratio was specified. The CR indicator was set to “*”, indicating any CR was acceptable.
- The formula does not contain any white.
- The contrast ratio for this formula is 15. This indicates that this is a very transparent film with minimal hiding.

Example 2

Target		YELLOW P162	2.1779	2.1779 KG
		MAGENTA P412	6.7759	6.7759 KG
		BLACK P25	0.4343	0.4343 KG
Formula		WHITE P824	0.6119	0.6119 KG
		CLEAR P100	90.0000	90.0000 KG
		Total Color	10.0000	10.0000 KG
		Total Resin	90.0000	90.0000 KG
Substrate		Total Batch	100.0000	100.0000 KG

- The formula is a color match to the target, *Keepsake*.
- It contains a small amount of white
- The colorant load was specified at 10%.
- The contrast ratio for this match is 24. This formula has greater hiding than Example 1.
- The ingredient amounts are different, but it is still a match to the target.

Example 3



YELLOW P162	2.7061	2.7061 KG
MAGENTA P412	7.8231	7.8231 KG
BLACK P25	0.4278	0.4278 KG
WHITE P824	9.0430	9.0430 KG
CLEAR P100	80.0000	80.0000 KG
Total Color	20.0000	20.0000 KG
Total Resin	80.0000	80.0000 KG
Total Batch	100.0000	100.0000 KG

- The formula is a color match to the target, *Keepsake*.
- This formula contains more white and more total colorant than the previous two examples.
- The CR is 45. This indicates that this formula has greater hiding than Examples 1 and 2.
- The formula amounts are different from previous examples, but it is still a match to the target.
- Notice the film over the black substrate (**Formula**). You can see the effect of the increased hiding.

Example 4



YELLOW P162	3.3219	3.3219 KG
MAGENTA P412	9.0093	9.0093 KG
BLACK P25	0.4174	0.4174 KG
WHITE P824	17.2513	17.2513 KG
CLEAR P100	70.0000	70.0001 KG
Total Color	29.9999	29.9999 KG
Total Resin	70.0000	70.0001 KG
Total Batch	99.9999	100.0000 KG

- This formula is a color match to the target, *Keepsake*.
- This formula contains more white than the previous examples and more total colorant.
- The CR is 60. This indicates that this formula has greater hiding than the previous examples.
- The formula amounts are different from previous examples, but it is still a match to the target.

Example 5



YELLOW P162	4.8220	4.8220 KG
MAGENTA P412	11.8276	11.8276 KG
BLACK P25	0.3837	0.3837 KG
WHITE P824	32.9667	32.9667 KG
CLEAR P100	50.0000	50.0000 KG
Total Color	50.0000	50.0000 KG
Total Resin	50.0000	50.0000 KG
Total Batch	100.0000	100.0000 KG

- This formula is a color match to the target, *Keepsake*.
- This formula contains still more white and more total colorant.
- The CR is 72. This indicates that this formula has greater hiding than Examples 1 -4.
- The formula amounts are different from previous examples, but it is still a match to the target.

Example 6



YELLOW P162	7.1211	7.1211 KG
MAGENTA P412	16.1622	16.1622 KG
BLACK P25	0.3191	0.3191 KG
WHITE P824	51.3977	51.3976 KG
CLEAR P100	25.0000	25.0000 KG
Total Color	75.0001	75.0000 KG
Total Resin	25.0000	25.0000 KG
Total Batch	100.0001	100.0000 KG

- This formula is a color match to the target, *Keepsake*.
- This formula contains still more white, and more total colorant than the others.
- The CR is 85. This indicates that this formula has greater hiding than Examples 1 - 5.
- The formula amounts are different from previous examples, but it is still a match to the target.

Example 7



YELLOW P162	▼	9.6643	9.6643 KG
MAGENTA P412	▼	21.1583	21.1583 KG
BLACK P25	▼	0.2489	0.2489 KG
WHITE P824	▼	68.9285	68.9285 KG
CLEAR P100	▼	0.0000	0.0000 KG
Add Ingredient	▼		
Total Color		100.0000	100.0000 KG
Total Resin		0.0000	0.0000 KG

- This formula is a color match to the target, *Keepsake*.
- This formula contains the maximum amount of colorant (100%), and the maximum amount of white.
- The CR is 91. This indicates that this formula has greater hiding than Example 1 thru 6.
- The formula amounts are different from the previous examples.

Discussion of “Color Only” Matching Examples

As can be seen in Examples #1 - #7, there is no unique solution to the problem of translucent color matching. All of these formulas will produce an acceptable color match over the job substrate. What criteria should the software use to decide which formula was the correct or best one?

This problem will always exist since there isn't a “right” answer. The decision on whether to use white and how much to use, is based on parameters in addition to color. These will vary depending on the industry, and can even vary among companies making exactly the same products.

A good example of this is the different methods used by 3 of the major sheet vinyl flooring manufacturers in the US. Each company produced basically the same type of products using the same type of printing operation (gravure). Each one used a different method for using white in their formulations.

Company “A” used formulations that were made with a white base and colorants. This produced a very opaque ink. This was the method they used when they started the company and they just continued to do it this way. They manufactured their own inks (both white and colors in ball mills), so the expense of the inks was minimal. By using large amounts of white, the formulas had more colored pigment than would have been required had the amount of white been lower. The white (titanium dioxide) is also more abrasive and this wore down the engraved cylinders faster. However, they had their own engraving department, so that cost was not prohibitive. The color matching software used an opaque, two-constant model that worked well. Since every color was basically at maximum opacity, loading wasn't an issue. They used a single measurement (%R) to define the target color.

Company “B” used formulations that were made with a clear base, and varying amounts of white. This produced a less opaque ink film, and gave them the capability to vary the opacity as needed. The introduction of a translucent color matching program provided them with the ability to consistently match both the color and the contrast ratio of an ink film. The color matching software used a translucent, two-constant model. Since every color had a different opacity, loading was very critical. Two measurements, ROL/ROD, were required to define the target. Since the standards were ROL/ROD samples, it was always possible to reproduce both the color and opacity of previous production runs.

Company “C” used formulations that were made with a clear base. White was rarely used, and they produced a very transparent ink film. Their color matching requirements differed from either of the other suppliers. The color matching software used a transparent, single-constant model. Since every color was basically at minimum opacity, loading wasn’t an issue. A single (%R) measurement was used to define the target.

Each of these companies produced nearly identical colors, yet handled white in extremely different ways. Each was very successful with the optical model selection. This illustrates that some hiding criteria must be specified. Without it, a software program must use a set of rules, based on the target measurement, to determine whether to use white, or how much to use. These rules may or may not meet your requirements.

Examples of Color Matches Specifying Color/Opacity

The next group of examples compares the formula for the same sample when a series of requirements are placed in the formula. These requirements include:

- The use of white and clear (“must use” ingredients)
- Opacity specification (a range or a particular contrast ratio value).

Below is an explanation of the formula results that are presented:

Match Preferences

This section identifies the requirements used for each example. They include:

- **Contrast Ratio Requirement.** A contrast is specified for each formula in this set of examples. Two requirements regarding the contrast ratio can be specified:
 - **CR Indicator.** Specifies a discrete contrast value.
 - **CR Range.** Identifies an acceptable range around the contrast value. If you must achieve a specific contrast ratio, the CR Range should be set to ± 0 .
- **“Must Use” Ingredients.** Indicates whether the white and/or clear must be included in the formula. This is included to illustrate how the requirement to use white affects the formula prediction.

- **Optimizer Goal.** The default optimizer goal is (DE1 = 60%, DE2 = 40%). In some of the examples, this goal is modified. See also *Applications Technology, Optimizer Goal for a detailed discussion of this feature.*

RED XP441	5.3922 KG
MAGENTA P412	1.5017 KG
BLACK P25	0.1341 KG
CLEAR P100	92.9721 KG
Total Color	7.0279 KG
Total Resin	92.9721 KG
Total Batch	100.0000 KG

Example 8A: Match Preferences

- **CR indicator:** “*”. This indicates no preference for CR. The opacity of the match is not specified in any way—any contrast ratio is acceptable.
- **CR Limits:** ± 0 . As specified above, any CR is acceptable.
- **“Must Use” Ingredients:** None. The formula is not required to include white, clear or any ingredients.
- **Optimizer Goal Function:** Set to defaults.

Formula Results:

RED XP441	5.3922 KG
MAGENTA P412	1.5017 KG
BLACK P25	0.1341 KG
CLEAR P100	92.9721 KG
Total Color	7.0279 KG
Total Resin	92.9721 KG
Total Batch	100.0000 KG

- This formula is a color match to the target, *Keepsake*.
- The match had a CR of 15.5 but it could have been any CR.

Example 8B: Match Preferences

- **CR indicator:** “*”. This indicates no preference for CR. The opacity of the match is not specified in any way—any contrast ratio is acceptable.
- **CR Limits:** ± 0 . As specified above, any CR is acceptable.
- **“Must Use” Ingredients:** The formula is required to include both white and clear.
- **Optimizer Goal Function:** Set to defaults.

Opacity / Contrast:

* CR

Target	
Formula	
Substrate	

Opacity / Contrast Limits

+ - CR

RED XP441	5.4111 KG
MAGENTA P412	1.4991 KG
BLACK P25	0.1331 KG
WHITE P824	0.1456 KG
CLEAR P100	92.8111 KG
Total Color	7.1889 KG
Total Resin	92.8111 KG
Total Batch	100.0000 KG

Formula Results

- This formula is a color match to the target, *Keepsake*.
- The only difference from Example 8A is that the white and clear are set to *Must-Use*. Notice the small positive amount of white used in the formula to satisfy this requirement.

Example 8C: Match Preferences

- **CR indicator:** “30”. The formula is required to produce a contrast ratio of 30.
- **CR Limits:** +20 and -10. The allowable CR range is CR=20 to CR=50.
- **“Must Use” Ingredients:** None. The formula is not required to include either white or clear.
- **Optimizer Goal Function:** Set to defaults.

NOTE

These parameters are pre-selected in the job template “Translucent – Low Opacity”.

Opacity / Contrast:

= CR CR

Opacity / Contrast Limits

 + - CR

Target	
Formula	
	
Substrate	

RED XP441	6.1607 KG
MAGENTA P412	1.3862 KG
BLACK P25	0.0930 KG
WHITE P824	5.5848 KG
CLEAR P100	86.7753 KG
Total Color	13.2247 KG
Total Resin	86.7753 KG
Total Batch	100.0000 KG

Formula Results

- This formula is a color match to the target, *Keepsake*.
- This formula satisfies the contrast ratio specification and is more opaque than either 8A or 8B.
- The contrast ratio, 31.7 falls within the specified CR range, 20 – 50.

Example 8D: Match Preferences

- **CR indicator:** 65. The formula is required to produce a contrast ratio of 65.
- **CR Limits:** +20 and –15. ± 0 . The allowable CR range is CR=50 to CR=85.
- **“Must Use” Ingredients:** The formula is not required to include either white or clear.
- **Optimizer Goal Function:** Set to defaults.

NOTE

These parameters are pre-selected in the job template “Translucent – High Opacity”.

Opacity / Contrast:
= CR

Target

Formula

Substrate

Opacity / Contrast Limits
+ - CR

RED XP441	7.4714 KG
MAGENTA P412	1.1654 KG
BLACK P25	0.0229 KG
WHITE P824	13.9183 KG
CLEAR P100	77.4219 KG
Total Color	22.5781 KG
Total Resin	77.4219 KG
Total Batch	100.0000 KG

Formula Results

- This formula is a color match to the target, *Keepsake*.
- This formula satisfies the contrast ratio requirement.. It has more opacity than 8A, 8B or 8C.
- The CR of 50 falls within the specified CR range, 50 – 85.

Example 8E: Match Preferences

- **CR indicator: 65.** The formula is required to produce a contrast ratio of 65.
- **CR Limits: +20 and -15. ± 0.** The allowable CR range is CR=50 to CR=85.
- **“Must Use” Ingredients:** The formula is not required to include either white or clear.
- **Optimizer Goal Function:** Contrast ratio was added to the goal function.

In this example, CR was added to the goal.

Weights for Optimizer Goal

DE1	60	%
DE2	30	%
Contrast Ratio	10	%

Opacity / Contrast

= 65.0 CR

65.0 CR

Opacity / Contrast Limits

+ 20.00 - 15.00 CR

Target	
Formula	
Substrate	

YELLOW P162	3.9334 KG
MAGENTA P412	10.1257 KG
BLACK P25	0.4058 KG
WHITE P824	24.1947 KG
CLEAR P100	61.3403 KG
Total Color	38.6597 KG
Total Resin	61.3403 KG
Total Batch	100.0000 KG

Formula Results

- This formula is a color match to the target, *Keepsake*.
- This formula satisfies the contrast ratio requirement. The CR of 65 falls within the specified CR range, 50 – 85.

While the CR limits remained the same, the optimizer placed some weight on getting the input CR. In this case it was able to exactly match the specified CR

Example 9A: Matching with White On the Job Substrate

This example displays options not used in the previous examples.

Match Parameters

- Target:** Sample “K#1”. This is an ROL/ROD sample. In this case we want to match both the color over the job substrate and match the opacity
- CR Indicator:** 33.5. This was calculated based on the ROL/ROD measurements of the target.
- CR Limits:** +0 and –0. The match is required to attain the CR of 33.5

- **“Must Use” Ingredients:** The formula is required to include both white or clear in the formula.

NOTE

These parameters are pre-selected in the job template “Translucent – CR Match”.

Opacity / Contrast:

= CR CR

Target	
Formula	
Substrate	

Actual Amounts in Target “K#1”

YELLOW P159	2.3300 KG
RED P481	1.2400 KG
BLUE ST8298	0.7800 KG
WHITE P824	9.5700 KG
CLEAR P100	86.0800 KG
Total Color	13.9200 KG
Total Resin	86.0800 KG
Total Batch	100.0000 KG

Prediction to Target “K#1”

YELLOW P159	2.3237 KG
RED P481	1.1778 KG
BLUE ST8298	0.7586 KG
WHITE P824	9.1301 KG
CLEAR P100	86.6097 KG
Total Color	13.3903 KG
Total Resin	86.6097 KG
Total Batch	100.0000 KG

Formula Results

- The program did an excellent job of finding the “correct” formula. In this case, there is a unique formula that matches both color and CR.

Example 9B: Match Preferences

- **Target:** Sample “K#1/L”. . This is just the ROL of sample “K#1”. In this case we are not specifying the actual CR of 33.5. We are just matching the ROL or color.
- **CR Indicator:** “**”. This indicates no preference for CR. The opacity of the match is not specified in any way—any contrast ratio is acceptable.
- **CR Limits:** +0 and –0. As specified above, any CR is acceptable.

- **“Must Use” Ingredients:** The formula is required to include both white or clear in the formula.

Opacity / Contrast:

* 0.0 CR

CR

Target	
Formula	
	
Substrate	

Actual Amounts in Target “K#1”

YELLOW P159	2.3300 KG
RED P481	1.2400 KG
BLUE ST8298	0.7800 KG
WHITE P824	9.5700 KG
CLEAR P100	86.0800 KG
Total Color	13.9200 KG
Total Resin	86.0800 KG
Total Batch	100.0000 KG

Prediction to Target “K#1”

YELLOW P159	2.0324 KG
RED P481	1.1537 KG
BLUE ST8298	0.7536 KG
WHITE P824	0.2114 KG
CLEAR P100	95.8488 KG
Total Color	4.1512 KG
Total Resin	95.8488 KG
Total Batch	100.0000 KG

Formula Results

- The program found an acceptable formula. However, it is not the one that actually made sample “K#1”. Without an opacity specification, there are many formulas that will match the color.

Optical Models for Matching With White

As you can see from the examples, when matching colors with white, there are many solutions. There are also many different optical models/colorant set types that can be created for use when matching with white. Below is a detailed discussion of the optical models/colorant set types that are available for this application.

Single-Constant Matching

This model is limited to matching *color only*. Light scattering inside a sample is ignored (assumed to be constant) and only light absorption is considered in the calculation of a match. This is also referred to as the “fixed-white” method. As in textile dyeing, the background (substrate) provides the “white”. In practice, the “fixed white” method is really two distinct approaches. In one, some or all of the calibrating clear in a single-constant colorant set is replaced with white colorant. In the other, a set percentage of white pigment takes the place of “balance vehicle,” or is a component of every colorant and clear in the set.

In the former approach, the amount of white varies in the same way as clear normally varies. The latter method produces formulas in which the amount of white is truly “fixed” at a pre-defined percentage. In both cases, extra attention and work is required of the user to prepare substrates for matching.

The performance of single-constant matching is excellent, and is suitable for use on practically any substrate—absorbent, sealed, plastic, metal or cloth. However, the technique is limited to a single level of light scattering and cannot predict an opacity evaluation for the formula. The number of colorant set samples required can become daunting for large numbers of colorants, or more than a few levels of light scattering.

Two-Constant Matching (Opaque)

This model is also limited to matching *color only*. Substrate, clear amount and film thickness are not used considered in opaque matching calculations. If they are provided at all, the impact is almost insignificant. Opaque colorant sets are often called “relative” sets, because the scattering coefficients of individual pigments are not absolutely determined. They are calculated *relative* to a single reference sample, typically a *master white*. Mixture samples may be made on nearly any background. The model does not provide an opacity evaluation for predicted formulas.

NOTE

Opaque matching with an opacity evaluation or “Load to Contrast” is a special case of translucent matching and is discussed below.

Two-Constant Matching (Translucent)

This model provides the option to match both target color and opacity (or target color and load.) Accurate translucent matching depends on having absolute scattering coefficients for each colorant used in a formula. Substrates, film thickness and opacity are all considered in matching calculations. Opacity evaluations are routinely provided for predicted formulas.

When applied, translucent colorant sets give the best results on non-absorbent substrates, when scattering inside the colored layer is significant. Since at least one colorant set sample must be measured in two conditions (ROL/ROD or ROL/T), film thickness control is critical, since the film thickness over light and over dark must be the same.

Appropriate Optical Model Selection

There are several colorant set types that you can use to address the challenges presented when matching colors using white. However, there may not be a single colorant set type that satisfies all of the color matching requirements. that you encounter. The selection of the colorant set type must consider practical issues as well. Below is a list of some important issues to be considered when you select the colorant set type to be created.

- How many colorants are included in the set?
- How many resins are used?
- How many substrates are used? Does the absorbency vary?
- Does the application require a wide range of film thickness?

- Does the application require infinitely variable white loading?
- Is target opacity a consideration?
- Does the application routinely define one or a few pigment loads?"

Recommendations

- Establish a clear definition of terms such as masstone, colorant, pigment, base, clear, concentrate, substrate, load, etc. These concepts have very specific definitions when applied to the program.
- If the application covers a wide variety of conditions and time permits, it is very useful to experiment with a few colorants, creating a variety of colorant set types.
- A fixed-white colorant set provides advantages and match quality. However, it requires more initial work than translucent set preparation.

Once you have decided the type of colorant set to make, the over-riding goal in creating any colorant set is the calculation of accurate optical constants. Everything else is secondary. Whether it is reproducing a production process, using production film thickness, production substrates or even using production materials for calibrating resin, white or black are all secondary concerns. If one can accurately determine the K & S of production colorants, everything else can be worked out.

Ingredient Density

The accurate expression of ingredient density has a subtle but profound impact on the matching and correction results in Formula Central. In formulation programs, the ability to accurately express an amount in both weight and volume units depends on accurate densities. Ingredient density is requested by several program modules in Datacolor MATCH^{PIGMENT}.

NOTE

The discussion below includes some graphics that are very effective when seen in color. Since the user's guide is printed in black and white, we recommend that you access the Applications Technology section of the on-line help to view the examples in color.

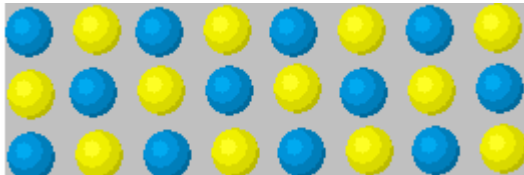
What is Density?

We define Density as the mass of a substance per unit volume. It is commonly understood as the ratio of a weight to a volume. Imagine two pigment particles –

a blue one  and a yellow one 

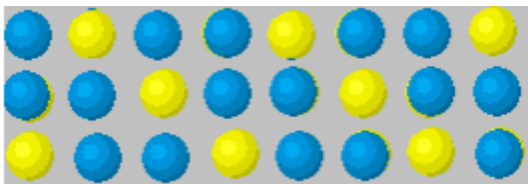
These two particles happen to have exactly the same size. However, the yellow pigment particle weighs twice as much as the blue pigment particle. In other words, the yellow particle is “denser” than the blue particle. Now, imagine making a mixture of equal parts these particles.

If equal VOLUMES of each particle are used, the mixture might look something like this.



On average, light entering the colored layer would be just as likely to interact with a yellow particle as a blue one.

If the particles were mixed equally by **WEIGHT**, the mixture would be quite different.



There would be TWO blue particles for each yellow. On average, light would be twice as likely to interact with a blue particle than with a yellow particle.

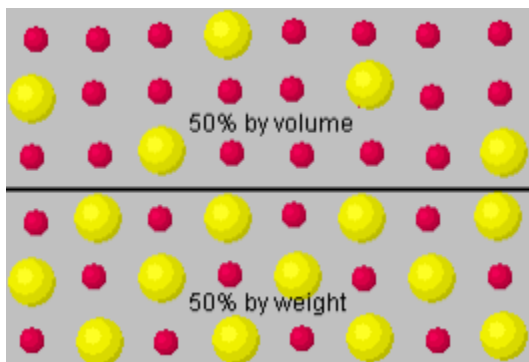
From a distance, these mixtures would show very different colors.



A similar example can be imagined for particles that weigh the same, but have different sizes.



Here we use a red particle that is about one quarter the size of a yellow particle. “Equal” mixtures by size and by weight might appear like this.



And, from a distance, yield colors like this:



Of course particle shape and other properties make differences, but assuming other properties are equal, if all the particles in a mixture have the same weight and the same size, there will be no difference in mixtures made by weight or volume.

If some colorants in a mixture are more or less dense than other colorants, we can expect differences in the mixture's color depending on whether weight or volume amounts are used. It is the differences in colorant density that matter.

Calculating Ingredient Density

In Ingredient Maintenance you are required to enter a density for each ingredient. Density is expressed as:

mass of a substance per unit volume

It may be expressed using any particular units: Pounds per (U.S.) Gallon, Kilograms per Liter, Grams per Fluid Ounce. Below is an example of a density calculation:

- A gallon of paint weighs 12 pounds.
 - The density of this paint is 12/1 or 12 Lbs/Gal.
- A U.S. gallon is approximately 3.79 Liters and a pound is approximately 0.454 Kilos
 - The paint's density is $(12 * 0.454) / (1 * 3.79)$ or about 1.4 KG/L
 - The unit arithmetic is $(\text{Lbs} * \text{KG/Lbs}) / (\text{Gal} * \text{L/Gal}) = \text{KG/L}$

Sometimes density is expressed as "Specific Gravity" which is a ratio of the weight of the material to the weight of an equal volume of another substance. Usually the reference substance is pure water at a specified pressure and temperature. Specific Gravity has no units, but the design of the metric system is such that when water is used, SG is approximately equal to KG/L.

Weight/Volume Amount Conversions

The density of a substance can be used to convert between weight amounts and volume amounts of that substance. If a red paint is known to have a density of 11.6 Lbs/Gallon, one may quickly calculate that ½ gallon of the paint will weigh 5.8 pounds.

To convert from volume to weight, divide by density.

Weight = Volume / Density

KG = Liters/(kilograms/liter)

To convert from weight to volume, multiply by density.

$$\begin{aligned}\text{Volume} &= \text{Weight} * \text{Density} \\ \text{Gallons} &= \text{Lbs} * \text{lbs per gallon}\end{aligned}$$

This table shows the results of some conversions.

Density	Colorant	Weight Amount	Volume Amount
1.1 KG/L	Red	8 KG	7.27 L
0.9 KG/L	Blue	2 KG	2.22 L
1.8 KG/L	White	80 KG	44.44 L
	Total	100 KG	53.94 L

NOTE

You should always check the density expression to verify the correct weight and volume units are used.

The Connection between Density and Optical Constants

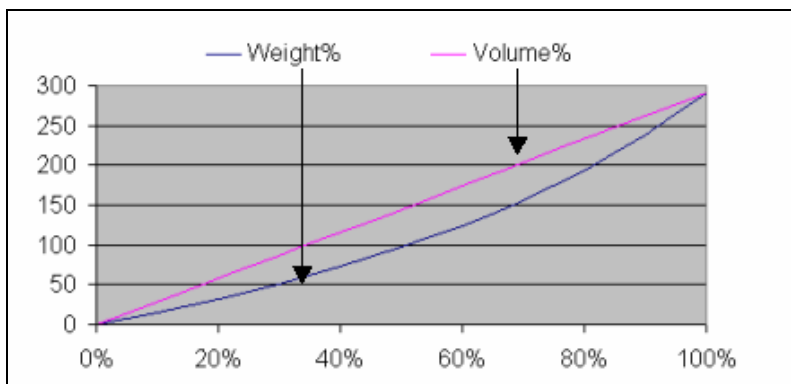
The interaction of light and pigment depends on the pigment particle size (or volume) more than the pigment weight. Because of this, internal calculations in the program programs use volume concentrations. As a result, density does not affect the optical constants. Rather, it affects the concentration to which the optical constants are associated.

In a mixture of two colorants, when the densities of the colorants in the mixture differ, the colorant concentrations expressed in weight are very different from the volume concentrations. However, in industrial practice; it is usually much simpler and more accurate to measure pigment amounts by weighing. To accommodate this preference, weight amounts input into Set Maintenance for a colorant mixture are converted to a volume amount using the ingredient density. When the densities are not accurate, conversion from weight to volume will produce incorrect colorant concentrations.

Below is a comparison of the differences in weight vs. volume concentrations for possible mixtures of blue and yellow:

Blue Weight%	Yellow Weight%	Blue Volume%	Yellow Volume%
0%	100%	0%	100%
10%	90%	5%	95%
20%	80%	11%	89%
30%	70%	18%	82%
40%	60%	25%	75%
50%	50%	33%	67%
60%	40%	43%	57%
70%	30%	54%	46%
80%	20%	67%	33%
90%	10%	82%	18%
100%	0%	100%	0%

This build plot shows the significance of the error that would be introduced in the previous example if we were to use weight instead of volume concentrations.

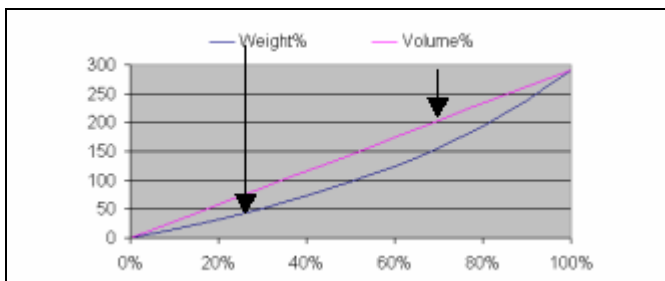


What value should be used for ingredient density? The answer to this question depends on whether all colorants have equal densities. For cases other than 0% or 100% concentration, if density varies from one colorant to another, predictions using real densities will differ from those that do not. How much that difference can affect the accuracy of the match prediction is a matter of some debate.

The size of the error depends on the magnitude of the differences in densities from one colorant to another. For some processes, densities of ingredients fall into a very narrow range. A density value in error by only a few percent is probably less than random process variations in many cases and would not be noticed. In other cases, where inorganic and organic pigments are used simultaneously, errors commonly approach those in the above plot. This is true regardless of whether the colorant set represents transparent, translucent or opaque materials. However this it is not always apparent because:

- The magnitude of potential errors differs with process and application approach, and
- There are often close historical associations between a process and a specific optical model. For example, colorant densities of dyes in solution have a very narrow range, and these processes are strongly associated with the single-constant optical model. This is also the case for some types of fluid inks.

Below is an example of a build plot that shows the significance of the error that would be introduced, if the weight concentrations of the blue and yellow mixtures, listed in the table above, were used:



The program presents amounts in known units – for all ingredient amounts as well as density. It “knows” that a density of 1.0 pound per gallon is 0.12 kilograms per liter. Users who fail to notice the units in which density is expressed have sometimes received unexpected match predictions.

There are those who argue that users who work exclusively in weight units do not really need to use accurate densities. The thinking is that if one never needs to convert between weight and volume units the errors introduced in colorant calibration are canceled out by equal errors in match prediction. With multiple-level calibration, and mixtures/formulas containing more than two ingredients, this is not the case.

NOTES

- It is always safer to use real measured ingredient densities than to simply assume that all ingredients are the same.
- When a colorant is used in multiple forms (Ready, Paste, Dry), the decision regarding which form should be used for a density measurement requires some examination of the nature of the colorant.

Colorant Calibration

Computer color matching works because colorant properties can be reduced to numbers. Those numbers are called, “optical constants” and the process of calculating them is called “colorant calibration.” When one “calibrates” a colorant, one uses a particular theoretical model to calculate a set of numbers that represent how the colorant interacts with light. What we commonly call “calibration methods,” are actually a group of methods and program options that include optical models, curve-smoothing methods, mixture-grouping methods, and mixture types.

Defining a single “best” method of colorant calibration for all production processes and sample properties is probably impossible. Each calibration option has theoretical and practical strengths and weaknesses, and the properties and variations of the physical samples make some options preferable to others.

Issues to consider when selecting a calibration method include:

- The repeatability/reproducibility of the process.
- Variability in thickness of the colored layer.
- Optical contact, surface characteristics.
- The color and absorbency of the substrate, and its variability.
- The optical model selected and the client’s need for specific features (i.e., variable vs. fixed loading, matching opacity, etc.).
- The practical goals and primary focus of the application (i.e., initial matches, fast implementation, production correction, etc.)

The fundamental goal of colorant calibration is to produce accurate optical constants. While goals such as reproducing production variations or laboratory sample properties should be considered, they are secondary concerns.

Optical Models

Optical model refers to the mathematical approach used to calculate the K (absorption) and S (scattering), K/S values or A (absorbance) values for colorants. There are three models to choose from:

- Transparent (including Transmission)
- Translucent
- Opaque

Each type uses a specific method for sample preparation and sample presentation, and a specific mathematical equation for calculating the optical constants.

By definition, a single-constant optical model uses one factor per wavelength. These factors (optical constants, K/S or A) are calculated directly from single reflectance or transmittance values – one mixture, one measurement, and one level.

Two-constant sets use two factors per wavelength. These optical constant (Absorption and Scattering coefficients, K and S) are calculated from two or more measurements. The requirement for two measurements can be met in different ways. Two samples of varying composition may be used, or one sample can be measured in different states:

- Reflectance over light and dark substrates,
- Reflectance over a substrate and a light trap (or open instrument port)
- Reflectance over a substrate and transmittance of the same sample.
- Reflectance of an opaque sample and translucent sample over a dark substrate.

NOTES

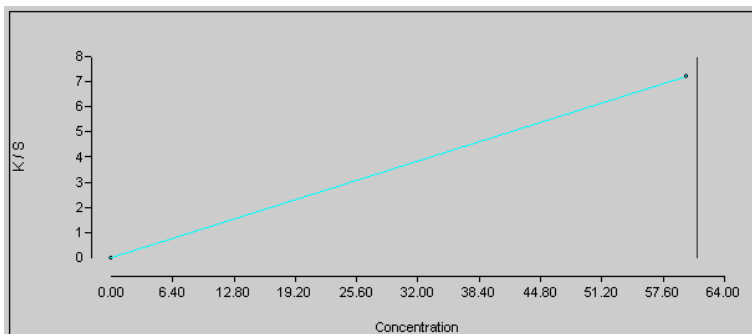
- A master white in an opaque two-constant model is an exception, in that its scattering value (S) is not so much calculated as it is assumed to have a specific value, usually one (1.000).
- Building a two-constant set using opaque mixtures (except the calibrating white) hides substrate variation, absorption and poor film thickness control for all colorants (except the white). The mixture samples may look questionable (e.g., layer upon layer of an ink), may not be easy to handle (e.g., stacked to achieve opacity), and may not look remotely like the product to be made. However, this approach might save hours remaking samples, or diagnosing bad first shot matches.

Curve Smoothing

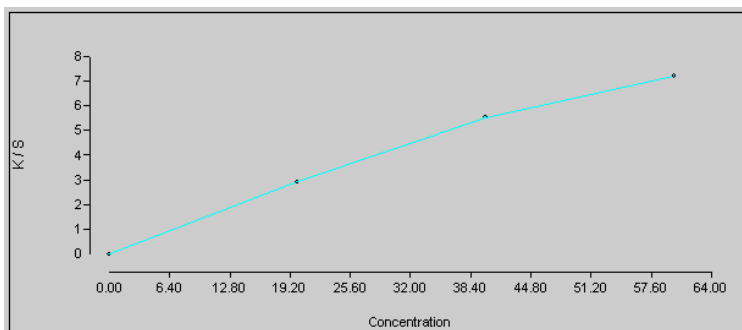
When you calibrate a colorant, you are asked to select a curve smoothing method. This is a mathematical approach for interpolating data for concentration levels not represented by physical mixture samples.

The overriding assumption of color matching calculations is that the behavior of the colorants is linear with respect to colorant concentration. While the assumption is correct within small concentration ranges, when real samples are made, that assumption does not hold up across a wide concentration range (0 – 100%).

Below is a plot of K/S vs. concentration for a yellow colorant. It is based on a single mixture containing 60% of the colorant; values are extrapolated to cover a concentration range from 0.01 to 100.0.



A second plot based on three colorant mixtures (20%, 40% and 60%) is shown below. Notice that when you provide the program with several colorant mixtures across a wide range of concentration and plot the resulting K/S vs. concentration, the result is not a straight line.



When comparing the two plots above, you can see the significant variation in the two curves based on the additional concentration levels. As a result, the formula predictions based on Curve 2 will be different from those based on Curve 1. Because the overall shape of the K/S curve in #2 is derived from a larger number of physical samples, it is generally thought to capture the true behavior of the colorant across a broader concentration range.

In general, the more mixtures prepared (and calibrated) for a single colorant, the more accurate the formula prediction will be for that colorant across a range of concentration (0 – 100%). We understand that you cannot produce 100 physical samples to capture the actual behavior of the colorant across the concentration range. Instead you can create a small series of mixtures, and have the program interpolate the optical data for concentration levels not represented by the physical mixtures. Several curve smoothing methods are available to use for this interpolation, and each produces slightly different data.

The curve smoothing method selected changes the effective shape of a colorant's K/S vs. concentration (or build) curve. For example, in a colorant containing three levels, 1%, 25% and 100%, different curve smoothing methods could result in very different optical constants being assigned to 12% or 65% concentrations. It can have a profound effect on synthesis, matching and correction, but is of no consequence in colorant calibration. Although the optical constants calculated and displayed in Set Maintenance will be the same regardless of the curve smoothing method selected, for most concentrations, the optical constants used in Formula Central will differ depending on the curve smoothing method selected.

Curve Smoothing Options

Set Maintenance offers three different techniques for curve smoothing in set maintenance. The user must select one for use with each colorant set created. The approaches do not produce the same optical data.

Piecewise Linear

This method calculates the optical constants (K, S or K/S) at any given concentration, using a straight line whose endpoints represent the level data available for the colorant. The curve connecting all of the points is actually a series of line segments. The overall shape of this curve may be jagged depending on the behavior of the colorant, and the number of levels available. The objective of this curve smoothing technique is to include all of the available levels on the curve.

Advantages

- The calculated optical constants between any two concentrations change monotonously (linearly) along the concentration, and
- The calculation results are always predictable for either interpolation or extrapolation.

Disadvantages

For a multi-level calibration, this technique may yield curves whose slopes do not change smoothly along a specific concentration range. This method allows gradients (or derivatives) of a curve to be discontinuous at some concentrations. In other words, the method does not ensure that colorant strength increases smoothly with colorant concentration. This can cause problems in color matching when searching for a solution around these concentrations.

Interpolating Spline

This approach uses a standard cubic spline method to find a smooth curve, which includes all of the levels calculated. The objective of this technique is to include all of the available levels on the curve. This is the default method used for curve smoothing.

The optical constants (K, S or K/S) for any given concentration are calculated using a "piecewise cubic polynomial". The polynomial fulfills two conditions:

- It passes through the calibration values at all the active concentration levels; and
- Its first and second derivatives along the concentration are continuous at all levels.

Advantages

- The calculated optical constants are mathematically smooth functions along the concentration, providing favorable conditions for optimization.

Disadvantages

- The interpolation results are less predictable as compared with the piecewise linear method.
- The method can lead to counter-intuitive results for extrapolation or interpolation across large concentration ranges.

To eliminate these effects, the program evaluates each extrapolation or interpolation and when questionable results are obtained, it automatically switches to a linear method.

Curve-Smoothing Spline

This approach creates a smooth curve that includes 'most' of the levels available. The curve does not include the data point for levels that appear to be erroneous. It is a least-square cubic spline method. Similar to the standard cubic spline method, this method calculates the optical constants (K, S or K/S) for any given concentration using a "piecewise cubic polynomial". However, the conditions for determining the polynomial differ regarding the following considerations:

- The best least-square fit to the calibration values at all the active concentration levels
- Continuous first and second derivatives along the concentration axis at all levels.

Because of the first condition, the polynomial is not required to pass through any of the calibration values. This distinguishes the curve-smoothing method from the standard cubic spline method.

Advantages

- It is more tolerant of errors and variation in the colorant calibration data.
- It can help reduce the effects of poor film thickness control in any kind of colorant set.
- If the calibration values are heavily contaminated by measurement or calculation errors, a standard cubic spline may yield an unrealistic interpolation curve, because of the requirement to pass through all the values. In such cases, the smooth spline method can generate a better interpolation curve.

Disadvantages

- Even when the calibration values are absolutely accurate and real, this method is not guaranteed to create an interpolation curve that passes through the “real” calibration values. This creates a somewhat artificial mathematical condition.
- A weighing mistake or one contaminated mixture sample can ruin an entire colorant calibration, rather than one range of concentrations.

Mixture Grouping Methods

The traditional methods used for calibrating colorants are *Independent* (also called Single-film) and *Paired*. The *Independent* method is applicable to all single-constant optical models and for some sample types in two-constant models (ROL/ROD, ROL/T). The *Paired* mixture method is available exclusively for two-constant optical models. Set Maintenance provides two additional methods: *Optimized* (or interdependent), available for both single and two-constant optical models; and *Combined*, available for translucent applications using a two-constant optical model.

NOTE

Each colorant in a set has its own setting for *Mixture Grouping Method*. You are not forced to use one setting for all colorants. If one method works well for most colorants but not all, it is possible to calibrate colorants with different mixture grouping methods.

See also *Applications Technology, Sample Types* for a detailed discussion of sample types.

Independent Mixtures

As the name indicates, this method calculates optical constants for each mixture separately. The quality of the optical constants calculated depends solely on the quality of a single colorant mixture. In other words, mixtures do not affect or interfere with the optical constants calculated for any other mixture. Each mixture will yield one “level,” which is one spectrum of optical constants.

The minimum number of mixtures required for this method is one (1). Traditionally, “independent” was the only mixture grouping method available for single-constant colorants or two-constant master whites.

In two-constant absolute (translucent) colorant sets, the Independent (or single-film) method calculates the K and S of a concentration level based on two measurements of a primary mixture. Traditionally, the two measurements are over light and dark (contrasting) backgrounds. The program allows the second measurement to be a transmission measurement or reflectance over a black trap (or open port).

Advantages

Frequently, the curves synthesized from the calculated optical constants perfectly match the measured curves of the primary mixture.

Disadvantages

The method is very sensitive to the following discrepancies between the two measurements:

- substrate color
- substrate absorbance
- determination of specular and internal correction values
- film thickness

Because of this sensitivity, the shape of the K/S, A, K or S vs. concentration curves are likely to be distorted by these variations. This makes the colorant calibrations less accurate for predictions at concentrations other than those specifically calibrated. Multi-level calibrations and curve smoothing selections can partially compensate for these variations, but do not completely eliminate their effect.

Paired Mixtures

The paired-mixture calibration method uses two primary mixtures, having different concentrations, to calculate K and S for each concentration level. Optical constants are calculated using from two to four separate measurements, depending on whether the mixture sample is translucent or opaque. Each pairing yields one spectrum of K and S data. The minimum number of mixtures required by this method is two (2). Two mixtures can give one level. Three mixtures will give two levels. The number of levels calculated will never be more than the number of mixtures minus one.

This method is available only for two-constant optical models, and it is the default method for most colorants. Calibrating colorant mixtures in pairs eliminates many problems with film thickness variation, and virtually eliminates substrate problems

Advantages

Using this method, relative differences in film thickness between samples is irrelevant to the calculation. However, close control of the film thickness of two measurements of the same sample must still be maintained. It is still critical for non-opaque samples that the over-light and over-dark measurements (or over light and transmission measurements) have the same film thickness and that any absorption into a substrate is controlled.

Successful calibration of opaque mixture samples in pairs offers a great practical advantage for both opaque and translucent colorant sets. It eliminates troublesome variations in proofing, substrate color, substrate surface correction and substrate absorption present in the mixture samples.

Disadvantages

Two drawbacks arise from using this method:

- **It requires distinct mixture spectra.** The two mixtures must be sufficiently different. While this is easy to say, pinning down the minimum difference is not that simple. If the spectral measurements in a pair are too close, the calculation of K & S is less reliable or could be impossible. If the mixture concentrations in a pair are too far apart, the method can introduce error for a more subtle reason.
- **It assumes that K and S are linear with respect to concentration.** To obtain optical constants, the paired-mixture calculation must assume that the K and S are linear functions between the two separate concentrations. The rationale for multi-level colorant calibration is that this assumption is false, over some range of colorant concentrations. Where K or S is not expected to vary linearly with concentration, this logical contradiction creates subtle errors that effect multi-colorant predictions. However, the errors are not always evident to the evaluations routinely performed during colorant set validation.

In many cases, K and S are not linear functions of colorant concentration. Nonetheless, a single mixture (usually with black) is repeatedly paired with other mixtures. Using the linear approximation, the curves synthesized from the calculated K and S normally cannot match the curves measured from the primary mixtures.

Optimized/Interdependent Mixtures

This mixture grouping method is designed to target the problems of the traditional methods and provide flexibility in colorant calibrations. It is primarily intended for use with translucent (two-constant absolute) colorant sets. Unlike the previous methods, "interdependent" calibrations consider all active colorant mixtures as a group. The quality of the optical constant calculated for a colorant depends on the quality of every mixture containing that colorant.

This method has the potential to improve initial match predictions on average. However, the method is not a panacea. Like the other methods, it has distinct advantages and disadvantages in practical use.

Assumptions

The optimized calibration method uses these assumptions as principles:

- Optical data are "mathematically smooth" functions of colorant concentration. The graph of this function across any concentration range is wholly linear, concave or convex.
- Synthesized curves from the calculated optical data should ideally fit measured curves of all the primary mixtures.

Advantages

The most practical advantages of optimized mixture grouping are:

- One is nearly guaranteed to generate results
- It resolves a logical contradiction of paired mixtures for multi-level calibration

NOTE

Comparing “Independent” to “Optimized” mixture grouping methods for single-constant sets, one should expect Independent to produce significantly lower evaluation DE’s for colorant mixtures. Whether this corresponds to better matching results or not depends on the reliability of the mixture data and the nature of variations in the process used to make the samples.

Disadvantages

The disadvantages of this method include the following:

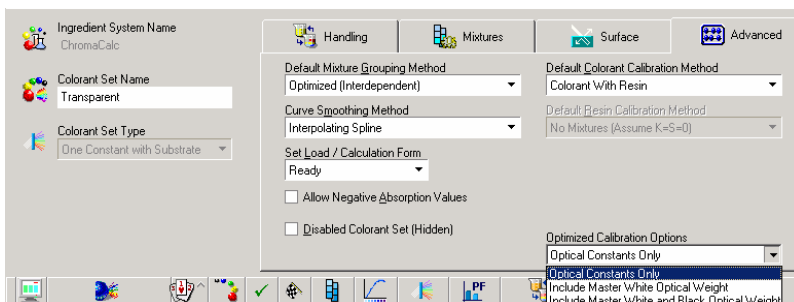
- ***It will not calculate build curves that are concave over one section of the concentration range and convex over another.***
In practice, it is often not feasible to find a smooth curve that would yield a perfect fit between the synthesized curves and the measured curves for all the mixtures.
- ***The build curve must be mathematically smooth.***
Colorant behavior or process variables may or may not support the extra smoothness and curvature constraints of optimized calibration. Therefore, this method normally cannot generate K and S values that yield perfect matches to the primaries. The goal is to improve matches overall, rather than matches to individual colorant set primaries.
- ***It is sensitive to errors in sample preparation.***
Unlike traditional methods, optimized calibration uses all the active mixtures together to calculate the K and S. Errors in one mixture will affect optical constants calculated on other concentration levels. For example, a mislabeled concentration may only generate an abnormal K and S level in the pair-mix calibration, but may ruin the optimized calibration entirely.
- ***It is slower than independent or paired mixture grouping.***
- ***It is intended primarily for improving two-constant translucent calibrations.***
The benefits for one-constant and two-constant opaque cases are less clear.

Procedure

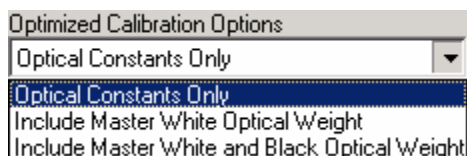
1. Calibrate the K and S of the colorant using a traditional method.
2. For each wavelength, fit the calculated optical constants (K and S) of all the concentration levels to obtain a smooth curve (or curves for two-constant colorants.)

- Adjust the curves using an optimization process to get a best "over-all" fit between the synthesized curves and the measured curves on all the mixtures that are marked as "Active". The curves for all the wavelengths are optimized together.
- From the resulting (optimum) curve, calculate optical constants wavelength by wavelength for each concentration level.

The program options needed to perform the optimized calibration are found on the Advanced tab of the Set Maintenance window:



When the mixture grouping method Optimized is used, the program can recalculate the optical constants up to three (3) times.



NOTES

- A default *Mixture Grouping Method* is identified for the set. However, a *Mixture Grouping Method* is also assigned to each individual colorant.
- For all colorants calibrated using the *Optimized* mixture grouping method, the same optimization technique is used.
- When the Mixture Grouping Method is other than Optimized/Independent, the program ignores the selection in the *Optimized Calibration Options* field.
- The colorant calibration calculation is significantly slower when this mixture grouping method is used.

Optimization Techniques (Optimized Calibration Options)

Optical Constants Only. The program looks at all of the mixture data for the colorants and calculates the optical constants.

NOTE

This optimization can be applied on any colorant set type.

Include Master White Optical Weight. When using the “optimized” mixture grouping method, users have the option to include calculation of an optical weight for the master (calibrating) white.

NOTE

This optimization technique can only be applied to opaque and translucent samples, when the sample includes colorant + white and/or colorant + black mixtures.

During the calibration, the program performs additional calculations to find a factor that, when multiplied by the optical constants of the white, minimizes the overall difference in curve fit between synthesized and measured curves for all mixtures in the set that contain the master white. Using the optimized value it is expected that, on average, initial color matches will improve.

The following processes are involved in this operation:

1. Calibrate the master white using the single-film calibration method.
2. Calibrate the master black optimizing the optical weight of the master white together with the optical constants of the black. Record the optimized optical weight.
3. Using the same process as that for the black, calibrate every active colorant in the colorant set and record the optimized optical weight for each colorant.
4. Calculate an average optical weight for the white using all the optimized optical weights.
5. Change the optical weight of the master white to the average optical weight. Update the optical data of the master white accordingly.

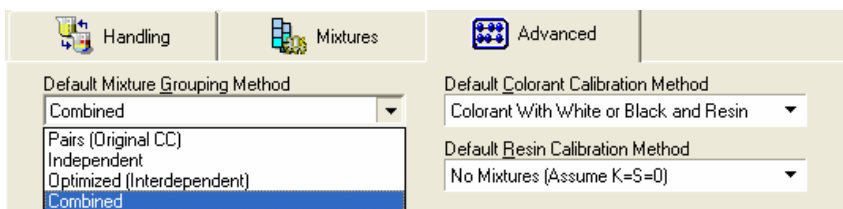
Include Master White and Black Optical Weight. This option is used to optimize the optical weights of both the master white and black. The optical weights for the white and the black are then used to recalculate the optical constants for the colorants. To determine the optimum optical weight for the black, repeat the procedure used for the white.

NOTE

This optimization technique can only be applied to opaque and translucent samples, when the sample includes colorant + white and/or colorant + black mixtures.

Combined Mixtures

The Combined method is intended for use in translucent plastic applications. This method involves an optimization process to determine the optical properties (K and S) of the resin, white, black and the colorants. This method should be used for translucent plastics that range from complete transparency through mid-level of translucency. The primary samples are typically not opaque and do not have very high CR values.

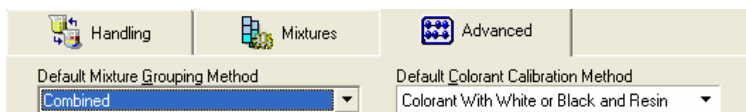


NOTES

- The *Combined* method can be used with measurement methods ROL/T, ROL/ROD, and ROL/ROO.
- Minimum number of mixtures required for each colorant is 2.
- The *Combined* method produces only a single level of K and S data. If you have multiple mixture levels, you will always end up with a single level of optical data.

Advantages

- **The user does not need to determine or adjust surface correction values.** Surface correction coefficients are generated automatically as part of the optimization process. When using this method, the Surface tab does not show on the Colorant Set Maintenance or Colorant Maintenance screens:



- **The user does not have to worry about selecting specular values or levels to be used.**
- **This method applies a correction for non-optical contact.** This is the air interface between the sample and the substrate. This correction attempts to account for the errors introduced by light traversing through the sample into an air layer and then to the substrate. *See also Applications Technology, Correction for Non-Optical Contact for more information on this feature.*

- **Calculates 3 optical film thickness parameters.** Optical film thickness refers to the actual path that light takes going through the physical sample. Actual film thickness represents the measured film thickness of the sample. In a clear resin, the light path basically traverses this physical distance without any obstruction. In a translucent layer there are scattering particles, and the light path is altered due to multiple scattering. This increases the length of the light path, and represents the optical film thickness of the sample.

Optical film thickness is represented by 3 parameters called C1, C2, and C3. These parameters are calculated for the calibrating resin of the set and are stored with the colorant set. There can be only one set of parameters per colorant set. All resins in a set will use the same parameters.

Disadvantages

This calibration will take much longer than a traditional colorant set calibration.

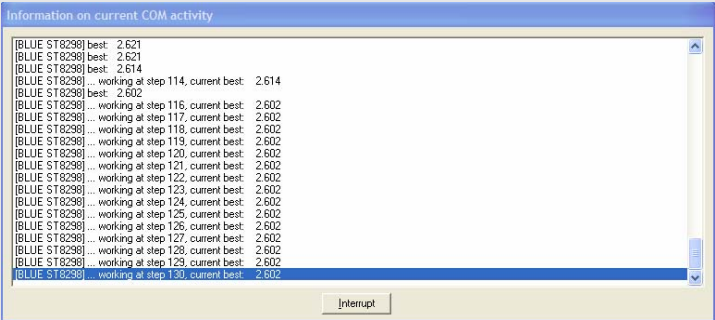
Procedure

You must enable the option to **Correct for Non-Optical Contact**. This option is found on the Mixtures tab:

Handling	Mixtures	Surface	Advanced
Default Calibrating Resin CLEAR		Default Measurement Method ☒ Over Light and Dark (ROL/ROD)	
Default Calibrating White WHITE		☐ Reflectance and Transmission (R/T)	
Default Calibrating Black BLACK		☐ Over Light and Black Trap or Open Port (RO)	
Default Calibrating Substrate CARD		☐ Opaque and Over Dark (ROO/ROD)	
		☒ Correct for Non-Optical Contact	
		☐ Prompt For Substrate Every Sample	

Once this is enabled, the standard procedure is followed to store the mixture data and calibrate the colorant set.

NOTE
When you calibrate using the Combined method, you will see a status dialog box display showing you the results of the optimization process.



Colorant/Level Performance (Performance Data)

In Datacolor MATCH^{PIGMENT} there are several different types of performance factors. In Formula Central, performance factors/performance data are calculated for trial formulas during corrections. They are ratios based on a comparison of user input formula amounts, and “match-to-batch” formula amounts. They are calculated for “colorant” and “clear” ingredient types. These factors are temporary, and used only for a single correction. They are stored only as part of the job information. See also *Formula Central, Matching & Correcting Colors, Performance Factors and Performance Data* for a discussion of the performance factors used in correction.

Performance factors are also used in Set Maintenance. Each colorant has a performance factor, and each level in the colorant record has a performance factor. Colorant performance is permanent factors and are MULTIPLIERS to concentrations of the colorant levels. The performance factor assigned to a colorant is applied to all of the levels stored for the colorant. The performance factor for an individual level applies only to a single level. Both factors are always applied, so their effects are cumulative. To avoid confusion, colorant and level performance are expressed as percent and identified visually with the symbol “%”. A factor of 100% equals a multiplier of 1.0 or no change.

The effective concentration is calculated as follows::

Effective Concentration =

Original Level concentration X Colorant Performance X Level Performance

Colorant and level performance factors greater than 100% effectively WEAKEN the colorant. When used in matching, expect a colorant performance of 120% to increase colorant concentrations in predictions and weaken the synthesized color of previously stored formulas.

										
Flex Yellow	1					8/8	8/8	100.00	120.00	

Prediction with Flex: Yellow Performance = 100%

		
Flex Yellow	10.1718 KG	▼
Flex Red	13.8428 KG	▼
Flex Blue	0.8465 KG	▼
Flex Clear	75.1390 KG	▼
Total Batch	100.0000 KG	▼

Prediction with Flex: Yellow Performance = 120%

		
Flex Yellow	12.1709 KG	▼
Flex Red	13.8114 KG	▼
Flex Blue	0.8417 KG	▼
Flex Clear	73.1760 KG	▼
Total Batch	100.0000 KG	▼

Colorant and level performance factors less than 100% effectively **STRENGTHEN** the colorant. When used in matching, expect a colorant performance of 80% to decrease colorant concentrations in predictions and strengthen the synthesized color of previously stored formulas.

								
* Flex Yellow	1				8/8	8/8	100.00	80.00

Prediction with Flex Yellow: Performance = 100%

		
Flex Yellow	10.1718 KG	▼
Flex Red	13.8428 KG	▼
Flex Blue	0.8465 KG	▼
Flex Clear	75.1390 KG	▼
Total Batch	100.0000 KG	▼

Prediction with Flex Yellow: Performance = 80%

		
Flex Yellow	8.1499 KG	▼
Flex Red	13.8729 KG	▼
Flex Blue	0.8454 KG	▼
Flex Clear	77.1318 KG	▼
Total Batch	100.0000 KG	▼

When this factor is set in Colorant Maintenance, you will not see the concentrations change. The factor is applied at match time. This provides a convenient way to adjust colorant behavior based on historical correction data. Since colorant performance is a multiplier, the colorant pf should be the INVERSE of a decimal strength or an average correction PF.

Examples

If the strength of a colorant's related ingredient were 200%, a colorant performance of 200% would cancel the effect of the ingredient strength, while performance of 50% would double it.

To compensate for correction PF's: if the average PF is 0.8, you would use a colorant performance of 125% or $100\% \times (1 / 0.8)$

Colorant and Level Optical Weight

Similar to film thickness in some optical models, optical weight is a multiplier to optical constants. Unlike the temporary correction adjustments, optical weights are permanent. To avoid confusion, all optical weights are expressed as a percent, and 100% equals a multiplier of 1.0 or no change.

Each colorant has an optical weight and each colorant level has an optical weight. The optical weight for a colorant is applied to all of its levels. Both factors are always applied, so the affects are cumulative. Optical weights are applied at each wavelength equally.

The effective K/S of a level is calculated as follows:

Effective K/S =(see effective concentration equation above for style)

Original K/S $\times$ Colorant Optical Weight $\times$ Level Optical Weight.

Optical weights greater than 100% effectively STRENGTHEN the colorant. When used in matching, expect an optical weight of 120% to decrease colorant concentrations in match predictions and strengthen the synthesized colors of previously stored formulas.

									
	Flex Yellow	1				8/8	8/8	120.00	100.00

Prediction with Flex Yellow: Optical Weight = 100%

		
Flex Yellow	10.1718	KG ▼
Flex Red	13.8428	KG ▼
Flex Blue	0.8465	KG ▼
Flex Clear	75.1390	KG ▼
Total Batch	100.0000	KG ▼

Prediction with Flex Yellow: Optical Weight = 120%

		
Flex Yellow	8.6950 KG	▼
Flex Red	13.8625 KG	▼
Flex Blue	0.8225 KG	▼
Flex Clear	76.6200 KG	▼
Total Batch	100.0000 KG	▼

Optical weights less than 100% effectively WEAKEN a colorant. When used in matching, expect an optical weight of 80% to increase colorant concentrations in match predictions and weaken synthesized color of previously stored formulas.

									
*	Flex Yellow	1				8/8	8/8	80.00	100.00

Prediction with Flex Yellow: Optical Weight = 100%

		
Flex Yellow	10.1718 KG	▼
Flex Red	13.8428 KG	▼
Flex Blue	0.8465 KG	▼
Flex Clear	75.1390 KG	▼
Total Batch	100.0000 KG	▼

Prediction with Flex Yellow: Optical Weight = 80%

		
Flex Yellow	12.5889 KG	▼
Flex Red	13.8028 KG	▼
Flex Blue	0.8642 KG	▼
Flex Clear	72.7441 KG	▼
Total Batch	100.0000 KG	▼

When this factor is set in Colorant Maintenance, you will see the optical constants change. Oddly, compensating for strength differences or average correction performance using optical weight is more direct than using colorant performance. The correct optical weight to compensate for an average correction PF of 0.8 is 80% NOT 120% (the inverse of 0.8).

NOTE

When the same value is used for both the colorant optical weight and performance, each factor will cancel some or all of the effect of the other. For single-level colorants or perfectly linear build curves, the cancellation would be total.

*	Flex Yellow	1				8/8	8/8	80.00	80.00

Prediction with Flex Yellow: Optical Weight = 100%

Flex Yellow	10.1718 KG	▼
Flex Red	13.8428 KG	▼
Flex Blue	0.8465 KG	▼
Flex Clear	75.1390 KG	▼
Total Batch	100.0000 KG	▼

Prediction with Flex Yellow: Optical Weight = 80% & Performance = 80%

Flex Yellow	10.0989 KG	▼
Flex Red	13.8410 KG	▼
Flex Blue	0.8666 KG	▼
Flex Clear	75.1936 KG	▼
Total Batch	100.0000 KG	▼

Optical Thickness Correction (Variable K2/Internal Scattering)

The purpose of the Saunderson surface correction factor (K2) is to account for the internal scattering that occurs inside a colorant layer. This K2 factor is typically assigned a default value of approximately 60%, and the program assumes that this value is valid for all samples in a given colorant set. We know however, that effective K2 values will range from a normal value around 50-60% for optically thick samples, to slightly more than K1 (4%) for those that are optically thin. For example, one could find that a sample of clear resin with an index of refraction of 1.5 has an effective internal reflectance of about 4.1% while an opaque sample of titanium white in the same resin would have an effective K2 value of 58%.

The optical thickness correction (variable K2) is enabled on the Surface Tab in Set Maintenance:

Handling Mixture Surface Advanced

Measurement Geometry

SCI Diffuse Specular Included

Apply To All Colorants

Default Specular %R: 4.00 %

Default Internal %R: 60.00 %

☒ Variable Internal %R

Substrate Roughness: 0

Lowest Measured Value: 3.81 %

Widest Spectral Range: 400.00 nm 700.00 nm

Narrowest Spectral Range: 400.00 nm 700.00 nm

Interval Range: 10.00 nm 10.00 nm

NOTE

When this option is enabled or disabled, the set is automatically uncalibrated, and you will need to recalibrate the set.

When Variable Internal %R is enabled, the K2 can vary non-linearly with the optical thickness of each mixture sample. The default specular %R (K1) and default internal %R (K2) for a colorant set determine the lower and upper bounds within which the model will allow K2 to vary.

An additional parameter, Substrate Roughness, is implemented to account for additional scattering at the substrate/sample interface. Higher substrate roughness values restrict the lower limit of the range over which the internal reflectance of the sample can vary. At the limiting roughness value of 100, K2 will not vary from the default value in the colorant set. At the default value of 0.0, K2 can approach the maximum acceptable value.

NOTES

- Variable K2 can be used with colorant sets using mixtures that are in optical contact with the substrate. This would include traditional translucent sets made on substrates like a black & white contrast card. For these colorant sets, some experimentation may be required to determine the best approximate substrate roughness value.
- Substrate texture and absorbance of the colored layer by the substrate (i.e. mixing paper fibers with paint or ink) are expected to require increases in substrate roughness. A substrate roughness of 60 is a reasonable starting point for evaluation.
- Any colorant set using the correction for non-optical contact can be a good candidate for enabling Variable K2 . Begin evaluations with the default surface roughness of zero (0) and increase the value in small steps, only as necessary.
- For highly textured samples or backgrounds, values close to zero are expected to perform best for non-optical contact cases.
- When using Variable K2, care must be taken to ensure a reasonable estimate of K2 for optically thick (scattering) samples as well as an accurate determination of the colorant system's index of refraction or specular reflectance coefficient (K1) for the colorant system.

Correction for Non-Optical Contact

When measuring a plastic sample over a white and black substrate, there is an air layer between the sample and the substrate. When this air interface exists, we say that the sample is not in *optical contact* with the substrate. This air layer makes the sample appear to be lighter and less saturated than it would be if it were a single layer. Optical contact can be achieved physically by applying a material between the 2 samples. Since in many cases this is messy and involves more work, a mathematical correction is useful.

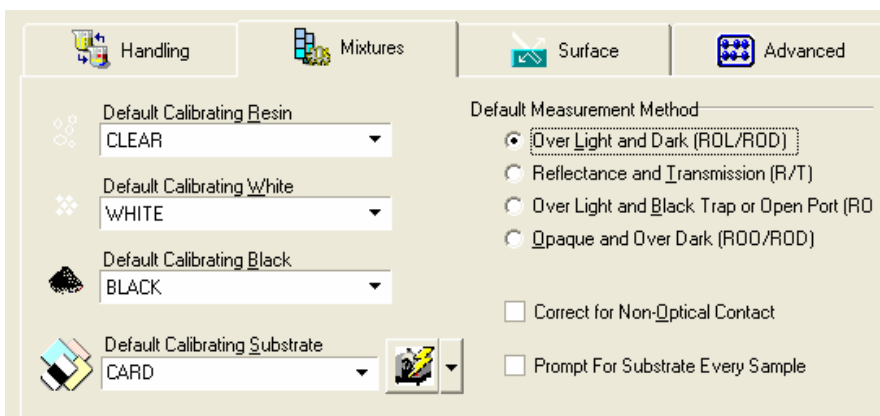
The *Correction for Non-Optical Contact* feature is a theoretical model derived from the Fresnell equations. It is an attempt to account mathematically for the impact of the air interface between the two layers, on the light passing through them.

The derivation is equivalent to the Saunderson correction for an intact air layer imbedded in resin. The conversion is a function of the substrate reflectance, the specular and internal reflectance coefficients of the colored layer and a third factor. This additional factor represents the percentage of substrate surface area in optical contact with resin.

- To activate the *Correct for Non-Optical Contact* option, check the box on the **Mixtures** tab.

NOTE

The set will be uncalibrated and you will need to recalibrate the set.



NOTES

- The quality of the correction for non-optical contact will depend on accurate determination of the internal and specular reflectance coefficients (or index of refraction) of the resin system used.
- When using the correction for non-optical contact, care must be taken to ensure accurate determination of the specular reflectance coefficient, K1 (or index of refraction) for the colorant set.
- Differences caused by presence or absence of an air interface are larger for darker backgrounds (substrates) than for lighter.
- Optical contact is meaningless for measurements without background reflectance (opaque samples or translucent samples measured in transmission or reflection over a black trap or open port). However, you can still use the correction for these sample measurements, but it will only be applied to the ROL measurement.
- ROL/T or ROL/R0 measurements should be attempted for samples that can support such measurements.
- Mathematical correction is assumed to be inferior to creating actual optical contact via physical methods. Creating optical contact between a sample and substrate can be achieved using oils, water, glycerin or glycol.

Fractional Parts Output

The *Fractional Parts* feature was designed to customize the formula output for applications that routinely work in volumetric units. When working with volumetric formulas, it is often the case that a formula expressed in decimals cannot be used directly. Below is an example of a volume formula using gallons, expressed in a decimal format:

	2	Relative Magenta	0.7757	GAL
	4	Relative Blue	1.0006	GAL
	5	Relative Black	0.8647	GAL
	10	Relative White	97.3589	GAL
		Total Batch	100.0000	GAL

In this example, the formula calls for 0.77gallons of *Relative Magenta*. If you are working in gallons and fluid ounces, you must manually convert the .xxx gallons into the equivalent ounces. In this case the equivalent ounces of *Relative Magenta* are:

$$.77 \times 128\text{oz/gal} = 98.56\text{ounces.}$$

A formula that directly expressed ingredient amounts in the number of gallons and fluid ounces would be more useful in this application. The *Fractional Parts* feature in Datacolor MATCH^{PIGMENT} provides this conversion. It allows you to customize volumetric formulas so that they express ingredient amounts in the units that you actually use, rather than in decimal equivalents. This feature enables you to customize volumetric formulas to any unit that is used: gallons and quarts; gallons and ounces; ounces and cups, buckets and cups, etc.

Below is a fractional parts expression of the above formula:

	2	Relative Magenta	99oz	Ready
	4	Relative Blue	1gal	Ready
	5	Relative Black	110oz	Ready
	10	Relative White	97gal 45oz	Ready
		Total Batch	100gal	Ready

Enabling Fractional Parts Output

To enable this feature you must add and/or edit information stored in the Admin program module, and the job template you will use. The procedure consists of three steps:

- Creating a fractional parts formula mode (Admin).
- Customizing the fractional parts expression (Admin)
- Creating a job template customized for fractional parts output. (optional)
 - In the formula grid, enable the fractional parts output for the formula mode.
 - In the formula grid, select the fractional parts mode for all ingredient types displayed in the grid.

Creating a Fractional Parts Formula Mode

The fractional parts output is created in the *Admin* program module. The options appear on the first window displayed when Admin is opened:

NOTES

The program includes a large selection of standard weight and volume units (i.e., grams, liters, pounds, fluid ounces, etc.) that are used in industrial applications. However, if you are working in volumetric units that are not widely used, or customized units (i.e. buckets,) you will need to create the units that you will be using *before* you can customize a fractional parts formula mode. See also **Edit Units** for instructions to create custom formula units.

All changes made in **Admin** do not take effect until you log out of Datacolor MATCH^{PIGMENT} and restart the program.

1. To access Admin, go to the Navigator window and select **Go Menu, Admin**. The window below appears:

System Name	Modified	Modified by	Created	Created by
ChromaCalc	10/7/2003 1:35:05 PM	User	10/21/1999 12:32:56 PM	dci

2. In the *Admin* window, click **on Edit Formula Modes**. The window below appears:

Formula Modes

Formula Mode Name	Fixed Type	Fixed Amount
Weight/100/KG/2d	Batch	100.00
Volume/100/L/2d	Batch	100.00
Weight/100/KG/3d	Batch	100.000
Weight/100/G/4d	Batch	100.00000
Weight/100/KG/4d	Batch	100.0000000

Details Weight/100/KG/2d

Ingredient Type	Unit	Amount	Fixed
Color	KG	2	.00
Resin	KG	2	.00
White	KG	2	.00
Base	KG	2	.00
Thinner	KG	2	.00
Auxiliary	KG	2	.00
Batch	KG	2	.00

3. **Formula Mode Name.** This field identifies the formula modes that are currently available on your system.
 - To **edit** an existing formula mode to provide fractional parts output, highlight the existing mode to be edited. (Go to step 4, below, to edit an existing formula mode.)
 - To **create** a new formula mode, click **New**. The window below appears:

New Formula Mode

Formula Mode Name	Fixed Type	Fixed Amount
	None	

Enter a unique name for the new formula mode, and select an amount type to fix if desired, above

+ Add

X Abort

- Enter the name of the new formula mode. In this example, the name is "FP gallons and ounce".
4. **Fixed Type.** If a specific ingredient type is normally fixed to a specific amount, it can be fixed as part of the formula mode. In the formula mode *FP gallons and ounces* below, the *total batch size* is fixed to 100 units:

 Formula Modes			
	Formula Mode Name	Fixed Type	Fixed Amount
	Weight/100/KG/2d	Batch ▾	100.00
	Volume/100/L/2d	Batch ▾	100.00
	Weight/100/KG/3d	Batch ▾	100.000
	Weight/100/G/4d	Batch ▾	100.0000
	Weight/100/KG/4d	Batch ▾	100.0000000
▶	FP gallons and ounce	Batch ▾	100.00

- Click on the down arrow in the **Fixed Type** column to select the ingredient type to be fixed:

	None
	Color
	Resin
	White
	Base
	Thinner
	Auxiliary
	Batch

- Highlight the ingredient type to be fixed. In the example above, the batch is fixed.
- If you have selected an ingredient type as “fixed”, enter the amount of the ingredient to be fixed. In the example above, the batch size is fixed to 100.00.
- If you have selected an ingredient type as “fixed”, enter the amount of the ingredient to be fixed.

NOTES

If you are working in trade sales paint and there is a fixed amount of white in the can, you can fix the “White”. The amount would be the amount of white already in the can.

If there is no ingredient type that is routinely fixed, select **None**.

Formula Mode Details

When you enter a formula mode name, additional fields appear in the bottom half of the window: These contain the details regarding how the formula amounts will be

expressed in this formula mode:

ChromaCalc Formula Mode Maintenance

New Formula Mode **FP gallons and ounce**

Formula Mode Name	Fixed Type	Fixed Amount
▶ FP gallons and ounce	Batch	100.00

Enter a unique name for the new formula mode, and select an amount type to fix if desired, above

Click Add to save the new formula mode
Click Abort to cancel creating the new formula mode

Select a unit and precision for displaying each amount type below

Details **FP gallons and ounce**

Ingredient Type			?.00	.00 / 1/x
Color	GAL	2	1/x	
Resin	GAL	2	1/x	
White	GAL	2	1/x	
Base	GAL	2	1/x	
Thinner	GAL	2	1/x	
Auxiliary	GAL	2	1/x	
Batch	GAL	2		

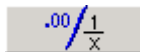
Make the appropriate selections for the *fields in the Details screen*. When you have made all of selections, click **Add** to create the new formula mode. For each ingredient type in the system you must identify the following:



Formula Mode. A mode is independently defined for each ingredient type in the system. This gives you the flexibility to combine weight and volume amounts in a single formula. For example, you may work with ingredient type *color* in weight units, and ingredient type *white* in volumetric units.



Number of decimals. Enter the number of decimals to display in the formula output. This will be used when the formula is expressed in decimals.



Partial Amounts. Identifies whether any partial volumetric units are to be expressed as decimals or fractional parts. Click in the box to toggle between *decimals* and *fractional parts* selections.

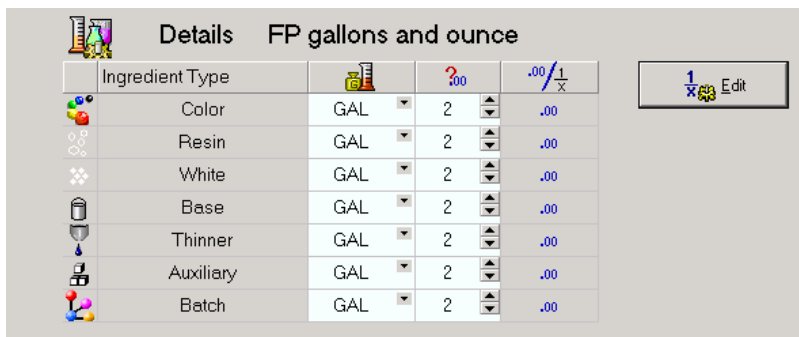
NOTES

When creating a fractional part formula mode, all of the ingredient modes selected are typically volumetric units.

For a fractional parts formula mode, you must next identify the fractional units you are using.

Customizing Fractional Parts Expression

Once you have created a fractional parts formula mode, you must identify the fractional parts units to be used.

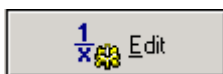


Details **FP gallons and ounce**

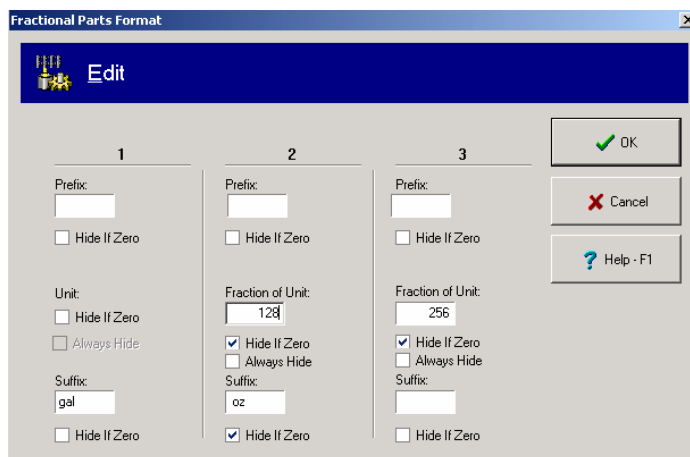
Ingredient Type	Unit	Quantity	Value	Unit
Color	GAL	2	.00	1/x
Resin	GAL	2	.00	
White	GAL	2	.00	
Base	GAL	2	.00	
Thinner	GAL	2	.00	
Auxiliary	GAL	2	.00	
Batch	GAL	2	.00	

 Edit

1. From the Formula Mode Maintenance window, select **Edit Fractional Parts Units**.



The window below displays:



Fractional Parts Format

Edit

1	2	3
Prefix: ☐ Hide If Zero Unit: ☐ Hide If Zero ☐ Always Hide Suffix: gal ☐ Hide If Zero	Prefix: ☐ Hide If Zero Fraction of Unit: 128 ☒ Hide If Zero ☐ Always Hide Suffix: oz ☒ Hide If Zero	Prefix: ☐ Hide If Zero Fraction of Unit: 256 ☒ Hide If Zero ☐ Always Hide Suffix: ☐ Hide If Zero

OK Cancel Help · F1

A fractional parts expression can have a maximum of 3 terms. Each term in the expression (1, 2, 3) can be customized to include a prefix, and a suffix. You must also identify how the program should handle the display of prefixes, suffixes and units when the amount of a fractional unit in the expression is 0.

In the case of the example below, we will only use 2 terms: gallons and ounces.

- **Prefix.** Enter a prefix that will be printed for the first term. If you don't want to include a prefix, leave this field blank.
- **Hide if Zero.** If the amount of this term equals 0, do not print the prefix. Place a check in the box to omit the prefix from the formula display.
- **Unit/Hide if Zero.** If the formula calls for a zero amount of the unit in Term #1, the number zero will not print. Place a check in the box to omit the zero from the formula display.
- **Fraction of Unit.** The unit in Term 1 is subdivided into smaller, or fractional units of equal size. The Fractional Unit identifies the number of smaller units contained in the Term 1 unit. In the example above, the unit in Term 1 is gallons, and is divided in 128 ounces. The fractional unit for Term 2 is 128. There are 128 ounces in 1 gallon.

The fractional unit for Term 3 is 256, or $\frac{1}{2}$ of 128th gallon. The program automatically sets the fractional unit of Term 3 to half the size of Term 2.

- **Suffix.** Enter a suffix that will be printed for the first term. If you do not want to include a suffix, leave this field blank.
- **Hide if Zero.** If the amount of this term equals 0, do not print the prefix. Place a check in the box to omit the prefix from the formula display.

NOTE

When a term has a "0" amount, it indicates that there is a zero amount of the fractional unit. It does not mean that there is a zero amount of the ingredient. In our example, a formula may call for 12 ounces of an ingredient. The formula notation would be **0 gal, 12 oz**. You have the option to print or hide the "0", and/or the suffix "gal" (see below).

Below are two different expressions of the same formula amounts. Included are the Fractional Parts selections that produced each formula expression:

Formula A

In *Formula A* below, the number of gallons of *Relative Magenta* is blank, and the suffix “gal” is hidden.

2	Relative Magenta	99oz	Ready
4	Relative Blue	1gal	Ready
5	Relative Black	110oz	Ready
10	Relative White	97gal 45oz	Ready
Σ	Total Batch	100gal	Ready

Fractional Parts Setup

1	2	3
Prefix: 	Prefix: 	Prefix:
☒ Hide If Zero	☒ Hide If Zero	☒ Hide If Zero
Unit: ☒ Hide If Zero ☐ Always Hide	Fraction of Unit: 128 ☒ Hide If Zero ☐ Always Hide	Fraction of Unit: 256 ☒ Hide If Zero ☐ Always Hide
Suffix: gal ☒ Hide If Zero	Suffix: oz ☒ Hide If Zero	Suffix: ☒ Hide If Zero

Notice for *Term 1*, the *Prefix/Hide if Zero*, *Unit/Hide If Zero/ Suffix/Hide if Zero* are enabled.

Formula B

In *Formula B* below, the number of gallons of *Relative Magenta* is displayed as “0”, and the suffix “gal” appears.

2	Relative Magenta	0gal 99oz	Ready
4	Relative Blue	1gal 0oz	Ready
5	Relative Black	0gal 110oz	Ready
10	Relative White	97gal 45oz	Ready
Σ	Total Batch	100gal 0oz	Ready

Fractional Parts Setup

1	2	3
Prefix: 	Prefix: 	Prefix:
☐ Hide If Zero	☐ Hide If Zero	☒ Hide If Zero
Unit: ☐ Hide If Zero ☐ Always Hide	Fraction of Unit: 128 ☐ Hide If Zero ☐ Always Hide	Fraction of Unit: 256 ☒ Hide If Zero ☐ Always Hide
Suffix: gal ☐ Hide If Zero	Suffix: oz ☐ Hide If Zero	Suffix: ☒ Hide If Zero

Notice for *Term 1*, the *fraction of Unit/Hide if Zero Unit/Hide If Zero/ Suffix/Hide if Zero* are not enabled.

NOTES

You must define the prefix, unit and suffix selections for each term in the fractional part expression.

The program will accept spaces before or after the prefix as part of the term. For example, if you want the term “gal” to be separated from the amount, place a space before the “g” in “gal”.

Fractional Units for **Term #3** is always 2X the fractional unit of the **Term 2**.

The changes you have made will not take effect until you log out of Datacolor MATCH^{PIGMENT} and restart the program.

Alternate Fractional Parts Configurations

Retail, or *trade sales* paint applications routinely use fractional parts output. Below is an example of the output for a 1-gallon formula using fractional parts output:

- The total batch size is 128 ounces (1 gal US)
- A Y identifies number of fluid ounces to be used.

- The fractional part used is 48. Each ounce can be subdivided into 48/48ths. The dispenser used to meter the formula can dispense 1/48th oz.

Below is an example of fractional parts output for this fractional parts configuration:

				
	2	Relative Magenta	1oz 32 Y -1	Ready ▾
	2	Relative Red Oxide	1oz 12 Y -1	Ready ▾
	3	Relative Green	11 Y	Ready ▾
	10	Relative White	124oz 39 Y	Ready ▾
		Total Batch	128oz	Ready ▾

This formula calls for the following amounts of each ingredient:

- Relative Magenta 1 oz, 32/48ths , 1/96th
- Relative Red Oxide 1 oz., 12/48ths, 1/96th.
- Relative Green 11/48ths
- Relative White 124 oz, 39/48ths.
- Total Batch 128 ounces

The fractional parts setup up that produced this formula is below:

1	2	3
Prefix: 	Prefix: 	Prefix: .
☐ Hide If Zero	☒ Hide If Zero	☒ Hide If Zero
Unit: ☒ Hide If Zero ☐ Always Hide	Fraction of Unit: 48 ☒ Hide If Zero ☐ Always Hide	Fraction of Unit: 96 ☒ Hide If Zero ☐ Always Hide
Suffix: oz ☒ Hide If Zero	Suffix: Y ☒ Hide If Zero	Suffix: ☒ Hide If Zero

Term 3 is used for rounding purposes. the program needs to know if you can accurately measure a “half-fractional part”. If this is possible you will need to display the amount . Below is a detailed explanation of the setup for **Term 3**:

- **Prefix.** In the formula output, a dash will be placed in front of the **Term 3** amount. If the amount of Term # is 0, the prefix will not display.
- **Fraction of Unit.** Automatically set to be $\frac{1}{2}$ the size of **Term 2**. In the above example the fractional unit for Term 3 is 1/96th ($\frac{1}{2}$ of 1/48th)
 - When the ingredient amount required is less than $\frac{1}{2}$ of the fractional unit of Term 3, the amount of Term 3 is set to "0". In the example above, when the amount of Term 3 is less than $\frac{1}{2}$ of 1/96th, the amount of 96ths is not displayed.
 - When the amount required is greater than $\frac{1}{2}$ of the fractional unit of Term 3, Term 3 is set to "1". In this example, when the amount required is greater than $\frac{1}{2}$ of 1/96th. An amount of "1" is displayed.
- **Suffix.** No suffix is defined.

Below is an example of a formula that displays **Term 3** in the formula:

	2	Relative Magenta	1oz 32 Y -1	Ready ▾
	2	Relative Red Oxide	1oz 12 Y -1	Ready ▾
	3	Relative Green	11 Y	Ready ▾
	10	Relative White	124oz 39 Y	Ready ▾
		Total Batch	128oz	Ready ▾

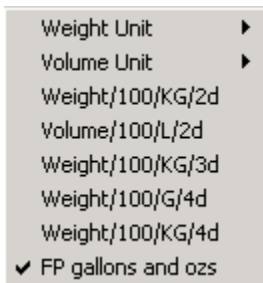
Creating a Job Template for Fractional Parts

If you routinely need volumetric formulas expressed in fractional parts, you can create a job template that uses the fractional parts formula mode as the default. Whenever you open this job template, it will default to the fractional parts formula mode. Below is a template configuration that will produce fractional parts output.

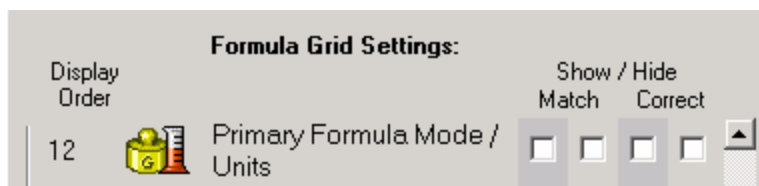
1. Open a new job.

	Target	
	Trial	
	Formula	
	Add Ingredient	▾
	Total Color	KG ▾ Ready ▾
	Total Batch	100Gal KG ▾ Ready ▾

- Right click on the **Formula Mode header**. The list of available formula modes will appear. Highlight the mode created for fractional parts output. A check will appear next to it:



- In the Add Ingredient row, click on the down arrow and select the fractional parts mode.
- Edit the *Job Preferences*. Make the following change to the Formula Grid display (*Job Preferences, Appearance*)
 - Hide the *Primary Formula Mode Units* column in the job template for all job states:



- Save the job template.

Legacy Combinatorial Correction

Overview

A *combinatorial correction* is an attempt by the program to consider every unique combination of colorants possible, to correct a trial formula. The method is exactly analogous to a combinatorial formulation.

In a typical correction, the maximum number of colorants allowed in the formula is the same as the number of ingredients already present in the formula. However, when the maximum number of ingredients allowed in a formula is greater than the number of ingredients in a trial formula, the number of possible combinations for correction is more than one.

This is exactly the rule that Formula Central uses for automatic corrections. No special menu option or button is needed to specify a combinatorial correction. To automatically calculate multiple correction predictions, using different combinations of

ingredients, simply increase the maximum number of ingredients allowed in a formula. You must also select the ingredients to be considered. For example, if the trial formula contains three ingredients, increase the maximum number of ingredients to 4, and select two additional ingredients for consideration. The program will analyze 31 combinations of ingredients to correct the trial.

NOTE

This result assumes that the user *knows* how many ingredients are in the trial formula. If that is not the case, the outcome is less predictable.

Datacolor MATCH^{PIGMENT} Method

Below is an explanation of the correction combinatorial logic used by Datacolor MATCH^{PIGMENT} for three correction scenarios. The differences in the three examples are related to the information regarding the contents of the trial sample.

Ingredients and Amounts are Known

- Formula Central sets the minimum and maximum number of ingredients equal to the number used in the trial formula.
- By changing the maximum number of ingredients, the user has control over the number of combinations the system will try in its attempt to correct the batch.
- The user provides ingredient amounts, which enables either type of performance data (spectral adjustments or performance factors, or both) to be applied to the correction.

Ingredients Are Known, Amounts are not Known

- Formula Central sets the minimum and maximum number of ingredients equal to the number used in the trial formula.
- By changing the maximum number of ingredients, the user has control over the number of combinations the system will try in its attempt to correct the batch.
- Ingredient *amounts* are not provided. Formula Central will internally run a formulation to the *trial* sample to determine the most likely ingredient amounts.
- Because ingredient amounts are not provided, performance factors (and spectral adjustments) are not available.

Ingredients and Amounts Are Not Known

- The user provides a minimum and maximum number of ingredients, and selects potential ingredients for the batch and the correction.
- Neither type of performance data is available.
- Formula Central will internally run a formulation trying all possible ingredient combinations to determine the single “most likely” set of ingredients and amounts, to match the *trial* sample(a match-to-batch).
 - If the most-likely trial formula (match-to-batch) contained three ingredients and the maximum is 4, then program will try to use several

ingredient combinations to correct the trial and will show more than one predicted correction.

- If the match-to-batch formula contains four ingredients, then only one correction combination is possible and Formula Central will show a single prediction for the correction.

ChromaCalc DOS and Datamatch PPI Method

ChromaCalc DOS and PPI did not select a single “most likely” formula for the trial. Instead, they created a different trial formula (match-to-batch) for every combination. For example, if the colorant selection results in 31 combinations to try for correcting a batch, ChromaCalc and Datamatch PPI would use 31 different formulas for the same trial.

ChromaCalc DOS combinatorial correction logic was implemented in Formulation – Measured – Must Use Waste.

Differences

The Daticolor MATCH^{PIGMENT} method differs from that used in previous packages in two ways:

- The single “best” formula for the trial is used consistently for all combinations. ChromaCalc DOS and Datamatch PPI were restricted to trying ONLY colorant combinations that would simultaneously match the target and the trial samples. In Formula Central, the batch ingredients are independent of the match-to-standard. The ingredients used to match-the-batch are not required to be the same ingredients used to match-the-standard.

The best formula is determined by the following Match-To-Batch (MTB) goal:

- 50% DE1
- 50% Curve Fit

The formulas are sorted by curve-fit and the least number of colorants used in the combinatorial.

Setting Legacy Combinatorial Correction Method in DMP

To run the ChromaCalc DOS and Datamatch PPI method, check the option “Legacy Combinatorial Correction” on the Advanced tab of Job Preferences in Formula Central.

☒ Legacy Combinatorial Correction

This method will only work for the correction case where the trial formula and amounts are not known. Below is the correction procedure:

1. Measure a target sample.
2. Measure a trial sample.
3. From Ingredient Selection window, set Min Colorant = 1, and Max Colorant = 4
4. Click on the **Auto Add** button.

Examples of Results

When the legacy logic is enabled, the spreadsheet view will display different adds based on a different match to batch formula for each combination:

Flex Yellow	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Flex Red	1.2291	1.1355	1.3794	0.8964	1.0363	0.8565
Flex Blue	0.3300					
Flex Clear	1.6356	2.3116	1.6128	1.1642		
Flex Black		0.2561				
Flex Green			0.6153		0.1958	
Flex Violet				0.6241	0.7301	0.8993

- The first add was based on the match to batch and match to standard using Flex Yellow, Flex Red, Flex Blue and Flex Clear.
- The second add is based on the match to batch and match to standard using Flex Yellow, Flex Red, Flex Black and Flex Clear.
- The third add is based on the match to batch and match to standard using Flex Yellow, Flex Red, Flex Green and Flex Clear.

Running this same example with the new logic used in Datacolor MATCH^{PIGMENT} would produce a single formula:

							
	1	Flex Yellow	44.1378	44.1378	0.0000	KG	▼
	2	Flex Red	4.2886	5.4239	1.1353	KG	▼
	6	Flex Black	0.8192	1.0752	0.2561	KG	▼
	7	Flex Clear	50.7545	53.0692	2.3147	KG	▼
		Total Batch	100.0000	103.7061	3.7061	KG	▼

- This program considered this formula to be the best match to the batch.
- Since it was a 4-colorant formula and the Min/Max Colorants were set to 1 and 4, only one add formula is displayed.
- If the Min/Max Colorants were set to 1 and 7, more formulas would be available, using the extra combinations.

NOTES

Glossary of Terms

About the Glossary of Terms

Throughout the documentation color science terms, industrial processing terminology and program terminology are used. These terms have highly specialized meanings as used in this software product. These terms are alphabetized below for your reference.

Absorption coefficient (K)

An optical constant that quantifies the ability of a colorant to absorb light. Based on reflectance data for a sample, it is one of the values calculated during colorant set calibration, using the Kubelka-Munk equation. It is part of the data used to calculate color matches and corrections.

Absorption (A)

One type of optical constant that describes the ability of a material to absorb light. It is calculated during colorant set calibration, and is based on transmittance measurements.

(formal) Absorption of radiant energy for a unit concentration through a unit path length for a specified wavelength and angle of incidence and viewing. *See Beer-Bouguer Law, Kubelka-Munk Theory, Mie Theory.*

Acceptability

A subjective evaluation to determine whether a detectable color difference can be tolerated. Color differences may be measurable and perceptible, and still be tolerated.

Additive

One of six ingredient types used by the program. It identifies a collection of ingredients sometimes worked with as a group, usually for purposes of formula scaling. An additive cannot be a colorant and does not have a strength factor. It can only exist as a component ingredient. Use additive for the ingredient type when the material does not fit any other category.

Appearance properties

Appearance properties are attributes of a sample, other than color, that can affect both the instrumental measurement and the visual assessment of a colored sample. These properties include gloss, film thickness, opacity, and surface characteristics such as haze, roughness, etc.

Auxiliary

One of six ingredient types used by the program. It identifies a collection of ingredients sometimes worked with as a group, usually for purposes of formula scaling. An auxiliary cannot be a colorant and does not have a strength factor. It can only exist as a component ingredient.

Use auxiliary for the ingredient type when the material does not fit any other category.

Base

One of six ingredients types used by the program. It identifies a collection of ingredients sometimes worked with as a group, usually for purposes of formula scaling. Ingredients that you may need to scale or constrain as a group can be identified as a base. A base can be a colorant and has a strength factor attached to it.

NOTE

This ingredient type is largely reserved for the "autobase select" feature, yet to be developed.

Carrier resin

This is one six ingredient type used by the program, and displays only when concentrate scaling is enabled in the system.

It identifies the portion of resin that is mixed with the colorant to produce the concentrate, and remains in the concentrate. In effect, it "carries" the concentrate to the end user who will add more resin (the user-supplied resin). It may or may not be the same resin used in the finished product.

The carrier resin is specified at run-time in Formula Central, along with the user-supplied resin.

Clear

One of six ingredients types used by the program. It identifies a collection of ingredients sometimes worked with as a group, usually for purposes of formula scaling or restricting colorant load. It can be a colorant, but does not have strength factor attached to it.

The materials identified as "clears" are typically resins or extenders. All "clears" are assumed to have zero K and zero S, except for those used in translucent colorant sets.

Calibration (colorant or colorant set)

The calculation of optical constants for an individual colorant, or for an entire colorant set. The optical data for colorants can be calculated individually or simultaneously for an entire set.

When an individual colorant has been calibrated and marked active, the colorant can be used for formulation and correction. When a colorant set is calibrated, the colorant set is available for formulation and correction. Depending on the application type, there are a minimum number of samples (types) that must be calibrated in the colorant set.

Calibrating resin

The resin used to prepare the mixture samples.

Calibrating substrate

The substrate used to prepare the mixtures. The spectral values of the substrate are needed to calculate the optical constants for the materials included in the samples.

Color

A color is an ingredient typically used to impart color to a material. It can be a colorant (insert popup) and it has a strength factor. It is also one of the six (6) ingredient types used by the program, and identifies a collection of ingredients sometimes worked with as a group.

Colorimetric data

A set of numbers, usually 3, that locates a sample in a color space. The coordinates are specific to a particular color space. The most commonly used coordinates include XYZ, CIEL*a*b*, and Hunter Lab.

- X,Y,Z coordinates are used to plot samples in the CIE chromaticity diagram
- L*a*b* coordinates are used to plot samples in CIEL*a*b* color space.
- Hunter Lab coordinates are used to plot samples in Hunter Lab space

Colorimetric data is directly linked to one Illuminant/Observer condition. If you do not carefully identify the Illuminant/Observer selection to use, the evaluations you make using this data may be incorrect. In addition, if you input colorimetric to describe a sample, you can only perform color evaluations. You will not be able to perform matching or correction activities.

Also referred to as "color space coordinates."

Color space

Three-dimensional solid enclosing all possible colors. Colors are located in the solid through their calculated color coordinates. The distance between the samples in the color space solid is the color difference. The properties of the solid is transformed through the application of various equations, i.e., giving rise to different calculations of the distance between the samples.

Color difference

Magnitude and character of the difference between two colors located in a color space solid, or map, under specified conditions. The total color difference is generally designated as DE, the lightness difference as DL. In addition, differences are expressed along the redness-greenness axis, and the yellowness-blueness. Certain color difference calculations offer additional components to the color difference expression.

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- Hunter Lab coordinates are used to plot samples in Hunter Lab space.

Colorant

A set of optical constants, and the data used to generate those optical constants. This data includes the optical model, mixture grouping type, colorant concentrations, density, curve smoothing method, instrument geometry, measurement type, and other data used to calculate the optical constants.

Colorant mixture

Colorant "mixture" data includes the formula used to make the primary sample(s), and the measurement data for the sample(s).

Colorant level

Colorant "level" refers to information about the colorant concentration(s) contained in the mixtures, and the optical data calculated for the mixtures.

Colorant set

A collection of colorants and default settings used to create them. The type of colorant set created determines the optical model/type of optical data calculated. Ingredient records for a particular ingredient system contain the physical data (e.g., density, strength, lot identification, etc.) for the colorants in a colorant set. The colorant set contains all of the optical data for a colorant. This includes spectral data, optical constants (K/S, K & S, or A) and specular and internal reflectance values. Optical constants are used to calculate formula predictions.

Colorant set maintenance

A program feature that provides the ability to create, edits, or deletes data *for an entire colorant set*.

Colorant set type

Refers to the method of sample preparation, sample presentation, and optical model used to calculate the optical constants in a colorant set. Four different colorant set types are offered:

- Transparent
- Transmission
- Translucent
- Opaque

Concentrate

An intermediate form of a color used in plastics applications. Typically a concentrate will contain all of the major components of the formula; resin, colorant, and solvent, but not in the proportions required of the finished product.

Concentrate scaling

In plastics applications, when concentrates are added to a batch of virgin resin to achieve the correct color, additional resin must be added to the batch to make it a finished product. The program uses a factor to adjust, or scale, the proportion of color concentrate and resin to create the finished product. Concentrates are used in different proportions for different products, and the factor for a specific concentrate can change from one product to the next.

Consumption (factor)

For some products, the batch size by itself doesn't tell you how much material you need to complete a production run. For example, when you print a pattern on a wall covering, you need enough ink to print an entire roll. In this example, consumption refers to the amount of ink used or 'consumed' to print a roll of wall covering. This field is displayed for informational purposes only.

Contrast ratio

A calculation used to determine if a sample is translucent or opaque. The sample is measured over a light and dark background and the two measurements are compared. When the sample has a contrast ratio greater than 99.9%, it is completely opaque. A number less than 99.9 indicates that some light is passing through the sample.

The contrast ratio of a sample is directly affected by its film thickness. If the material is not applied at the proper film thickness, the contrast ratio and the color tolerance may not be achieved.

Contrast DE

Contrast DE is the color difference between the sample measured over a pair of contrasting backgrounds. Typically the backgrounds are 'light' and 'dark' but there are other types of contrasting background used in industrial applications, such as red and gray primers used in automotive applications and black and white contrast cards.

Curve Fit

A method for evaluating the differences between two spectral curves. It is a comparison, point by point, of the reflectance or transmittance values for each curve. When the curves are an exact fit, the match is referred to as an invariant match, and it is not metameric.

Curve fit is used as a technique for evaluating the differences between a measured target, and formula prediction. A spectral curve is synthesized from the formula prediction, and compared to the measured curve of a target.

Curve fit is also used as a technique for evaluating the performance of colorant data used in correction predictions. The curves of the measured trial sample and the synthesized correction prediction are compared, and the differences are used to adjust the correction prediction.

D65/D6500

A standard daylight illuminant. It refers to the spectral power distribution curve of a daylight illuminant having a correlated color temperature of 6500 K.

Da, Δa

Difference in red-green component. In certain transformed color spaces, generally used as the Da, or difference between a sample and a standard reference color along the redness-greenness axis. It is always calculated for a specific Illuminant/Observer condition. If "a" or Da is plus, the sample has more redness than greenness than the standard. If "a" or Da is minus, there is more greenness than redness. It is normally used with b to express the chromaticity or chromaticity differences between samples. Da* is the redness-greenness differences calculated using the 1976 CIEL*a*b* color difference calculation. Da is the redness-greenness differences calculated using the Hunter Lab color difference calculation.

- **+Da.** More red (less green)
- **-Da.** More green (less red)

Db/ Δb

Difference in yellow-blue component. In certain transformed color spaces, generally used as Db, the difference in "b" between a sample and a standard reference color along the yellowness-blueness axis. It is always calculated for a specific Illuminant/Observer condition. Generally, if "b" is plus, there is more yellowness than blueness, if "b" is minus, there is more blueness than yellowness. . It is normally used with "a" to express the chromaticity or chromaticity differences between the samples. Db* is the yellowness-blueness differences calculated using the 1976 CIEL*a*b* color difference calculation. Db is the yellowness-blueness differences calculated using the Hunter Lab color difference calculation.

- **+Db.** More yellow (less blue)
- **-Db.** More blue (less yellow)

DC*/(Δc)

Difference in chroma. In certain transformed color spaces, generally used as DC, the differences in chroma or chromaticity between a sample and a standard. It is always calculated for a specific Illuminant/Observer condition.

The concept of chroma is used in CIEL*a*b* color difference calculation, and is expressed as deviation from gray, excluding the luminous intensity of the samples.

- **+C.** Sample has higher chroma
- **-C.** Sample has lower chroma.

DE(ΔE)

Total color difference, computed by all color difference equations. It is always calculated for a specific Illuminant/Observer condition. The interpretation of this number is directed related to the color difference equation used to calculate it. DE is always a positive value.

DH*/ ΔH^*

Difference in hue. In certain transformed color spaces, a parameter used to express the differences between the sample and the standard along the hue axis/circle. It is always calculated for a specific Illuminant/Observer condition. Typically, differences in hue have the greatest impact on the visual evaluation of colored samples.

- **+DH.** Sample is moving from standard counter-clockwise around the hue circle.
- **-DH.** Sample is moving from standard clockwise around the hue circle.

DL/ΔL

Difference in lightness. In certain transformed color spaces, generally used as DL to express the differences between the sample and the standard along the achromatic dimension in a three dimensional color space. This axis ranges from black through various levels of gray to white. It is always calculated for a specific Illuminant/Observer condition. This expression is included in all color difference calculations.

- **+DL.** Sample is lighter
- **-DL.** Sample is darker

Density

Density is weight per volume. It is a number used to convert ingredient amounts from a weight form to an equivalent volume form, and vice versa. The specific gravity of an ingredient is one example of a density value. It is expressed as single number that represents the weight of the material per unit volume; for example grams/cc, lbs/Gal, KG/L, etc.

The user can create a density using a combination of any defined weight unit and any defined volume unit.

Dry (colorant)

Colorant in the physical form of a powder.

Evaluation Window

The Evaluation Window controls the display of spectral and colorimetric data for the Target, Trial and current formula displayed. This information is located in the upper left quarter of the Formula Central screen.

Film Thickness

Film thickness is a physical property that is related to the dry film. It can be expressed in percentage (%), or a number representing a unit of measurement.

If you are working with transparent or translucent samples, differences in film thickness have a large impact on the acceptance of a color match. A formula from Formula Central must be applied at the displayed film thickness in order to achieve the other specifications included in the formula display, such as contrast ratio, color difference, or others.

Formula form

The form describes the type of physical material you are using. For example, colorants can be dry powder, dispersions/ concentrates, or finished products.

Formula mode

The mode refers to how you measure the ingredients that go into the formula. For example, If you weigh the amounts of each ingredient, the formula mode is weight units. If you assemble formulas based on volume, or specific gravity (gallons, liters, cc's, etc.) you will need the formula expressed in volumetric units.

Fractional part

When working with volumetric formulas, it is often the case that a formula expressed in decimals cannot be used directly. Below is an example of a volume formula using gallons, expressed in a decimal format:

				
	2	Relative Magenta	0.7757	GAL
	4	Relative Blue	1.0006	GAL
	5	Relative Black	0.8647	GAL
	10	Relative White	97.3589	GAL
		Total Batch	100.0000	GAL

In this example, the formula calls for 0.77 gallons of *Relative Magenta*. If you are working in gallons and fluid ounces, you must manually convert the .xxx gallons into the equivalent ounces. In this case the equivalent ounces of *Relative Magenta* are:

$$.77 \times 128 \text{ oz/gal} = 98.56 \text{ ounces}$$

A formula that directly expressed ingredient amounts in the number of gallons and fluid ounces would be more useful in this application. The *Fractional Parts* feature provides this conversion.

Gloss

Refers to the smooth, mirror-like reflection coming from a sample. It is also referred to as specular. This feature can be measured and evaluated. Gloss values are specific to the type of gloss meter used for the evaluation.

The program has the ability to consider data from 3 gloss meters: 20°, 60° and 85°. To the right of the gloss range field is a second field that contains the gloss meter selections. Please be sure you that your gloss values are from the same gloss meter selected.

Handling

Colorant sets are created to simulate a specific production process. Although you may use the same colors in two different products, separate colorant sets are created for each product because the processing is significantly different. The 'handling' information entered into a colorant record provides specific information about the process you are trying to simulate with the physical samples you have prepared.

Heavy (colorant)

Intermediate, semi-aqueous form of a colorant that contains dry colorant, resin and solvents. Another term for 'heavy' is 'concentrate'. The label used for this material can be customized.

Illuminant/Observer

Mathematical description that integrates the relative spectral power distribution of a real or imaginary light source with the standard observer functions for either the 2° or 10° condition.

Illuminant

Mathematical description of the relative spectral power distribution of a real or imaginary light source. This is the amount of relative energy emitted by a source at each wavelength in its emission spectrum, as compared to an equal energy **source**.

Index of refraction

The index of refraction is the speed at which light travels through a medium. Air is one medium and its index of refraction is 1.0. The colored sample you measure is made of some material, and it has an index of refraction different from air. Because of index of refraction differences, when the light travels through air and encounters the sample, some the light is reflected at the sample surface and never penetrates the sample,

Ingredient

A material used to create a colored sample. In Datacolor MATCH^{PIGMENT}, all raw materials including colorants are considered to be ingredients, and are assigned an ingredient type. The program can break ingredients down into "parent" ingredients and "component" ingredients or sub-ingredients.

Ingredient Type

An ingredient type, or category, is assigned to every material in your system. In a formula, each material has a specific function, and the function determines its ingredient type. A formula can contain the following basic ingredient types:

- Colorant
- Clear
- Thinner
- Auxiliaries
- Bases

Assigning ingredient types to materials allows you to working with ingredients as a group. This may be useful for scaling formulas, and setting constraints on a formula, such as colorant loading.

Ingredient mode (also formula mode). Mode refers to how you measure the ingredients that go into the formula. For example, if you weigh the amounts of each ingredient, the ingredient mode is weight. If you assemble formulas based on volume, or specific gravity (e.g., gallon, liter, cc, etc.) the ingredient mode is volume.

When a mode is defined it includes:

- The unit basis (weight or volume)
- Number of decimal places displayed for the amount. If you are using fractional parts output, the fractional parts must be defined for the mode.
- The weight units (i.e., kilograms, lbs, etc.) or volume units (cups, liters, gallons, cc's, etc.) available are created in the Admin program module. A default mode is defined in the System /Material Handling.

Multiple ingredient modes can be defined for a system. They are used to define the type of units displayed, and control the number of decimal places displayed for the ingredient amounts. At run time, the type of unit can be changed, but the number of decimal places displayed cannot be changed.

Ingredient Form (also formula form and colorant form)

Ingredients may contain any number of components that may, themselves, have components. "Form" describes a level of expansion of a colorant into component ingredients. Three "special" forms are given user-definable labels:

- **Unexpanded.** Typical labels include Base, Ready-To-Use, Light)
- **Expanded One Level.** Typical labels include Heavy, Paste, Neat, Concentrate.
- **Completely expanded into components.** Typical labels include Dry, and Powder.

The default choices for the colorant form are defined in the Colorant Set. The customized labels for ingredient form are defined in System Administration.

Ingredient Rank

A number representing preferred display order. It is assigned through Ingredient Maintenance. You can decide to display ingredients by Rank, Name or by the ingredient amount. If you want the ingredients presented in a particular order other than name, you must assign a rank.

Instrument Calibration

Daily procedure used to standardize the performance of the instrument. It is done to account for changes in the environment (humidity, heat, dust, etc.) that can change the performance of the instrument.

Instrument repeatability

A comparison of measurements made of the same sample, using the same instrument. The variation in measurements is expressed in terms of DE. Manufacturers of spectrophotometers for commercial use include a value for repeatability in the instrument specification. This value is only valid for comparisons of measurements of an achromatic sample (typically a white). The sample being used must have a uniform surface free of defects, and cannot exhibit any characteristics of geometric metamerism.

Inter-instrument agreement/reproducibility

A comparison of measurements made of the same sample by different instruments. The variation in sample measurements is expressed in terms of DE. Manufacturers of spectrophotometers that are used commercially include a value for inter-instrument agreement in the instrument specification.

Instrument manufacturers typically provide a specification for inter-instrument agreement. This specification is valid when comparing the same instrument models. When comparing two different instrument models or manufacturers, you may see significant differences in the inter-instrument agreement.

Internal reflectance

That amount of the energy that enters a sample, and is trapped inside the sample because it is unable to travel across the air/sample boundary.

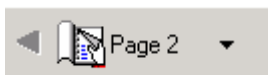
Job

Jobs contain all of the *instructions and data* the program uses to complete matching and correction activities. It includes specific information regarding software options to be activated, tolerances, and the screen configuration. Unlike a job template, a job also contains data, such as spectral data for the standard and batch, and the formula predictions that were both calculated and prepared while the job was being processed, etc.

Job page

All of the activity for a job is stored in the job record. The record consists of pages, each of which records the activity, both input and output, for a particular job state. Before results are displayed, Formula Central is in an "input" state. Each time a user receives results for a discrete activity (formulation, correction, search, manual/modify), a job page is completed.

Pages in the active job can be viewed at any time to clicking on the job page buttons in the toolbar.



Job State

The job state identifies the current condition, or 'state', of Formula Central, and is reported in the status bar at the bottom of the window:



The Formula Grid displays information for two different activities, **formulation** and **correction**.

Input and Output States

- **Input.** The user enters information including sample measurements, ingredient selection, batch size, etc.
- **Output.** Formula results are displayed. There are two additional job states that are associated with the **output state**. They are "display" and "modify", and they are available for both Formulation Output and Correction Output.
- **Display.** This is the default output display state. Input to the grid rescales the formula displayed (i.e., rescales the formula or converts amounts from weight to volume).
- **Modify.** Input to the grid is used to recalculate the formula. This condition is activated using the Manual Add/Modify tool. When the output condition is modify, the *Optimize* field displays in the far left of the grid:

				
	Flex Yellow	▼	1.8344 KG	▼ Ready ▼
	Flex Red	▼	8.2800 KG	▼ Ready ▼
	I	▼	89.8856 KG	▼ Ready ▼
	Add Ingredient	▼		▼ ▼
	Total Batch		100.0000 KG	▼ Ready ▼

Input to the grid during Formulation Output/Modify and Correction Output/Modify may change the **proportions** of each ingredient used in the formula. **NOTE:** The job state description in the status bar does not change when the grid shifts from "display" to "modify" mode.

Job template

A job template contains all of the instructions the program needs to create a job, **but it does not contain any data**. Specifically, the job template provides initial settings for:

- the fields to be displayed in the evaluation screen and the formula grid
- the acceptability tolerances for the match
- the rules for sorting the formulas

The job template serves as the starting point for your work, providing you with the tools needed to complete the job (the correct software options, tolerances, etc.). Because it does not hold on to data specific to a particular color, a job template can be used over and over again—it guides you through the process of matching and correcting colors.

Job tolerances

Limits set on specific properties of a colored sample, such as color difference, film thickness, etc. Job tolerances are used by the program to determine if the differences between two samples are acceptable.

K/S Kubelka Munk

The ratio of the optical constants, K (absorption coefficient) and S (scattering coefficient) for a colorant. It is part of the equation used to calculate formulations and corrections. The equation states that K/S can be calculated from the reflectance of a sample: (this is a division expression)

$$\frac{K/S}{2R_t} = \frac{(1-R_t)^2}{2R_t}$$

It also states that K/S is directly proportional to colorant concentration. Knowing the reflectance measurements of the samples, and the concentration of colorants in the mixtures, the K/S of the mixture can be calculated.

Level

Level refers to a particular type of data stored in a colorant record. Level data includes the volumetric concentration of colorant in the mixture, and the optical data calculated for that volume concentration.

When calculating optical constants, the program always works with the colorant concentration expressed as a volume percent. In most cases, weight concentrations are provided on the Mixtures tab. These are converted to the equivalent volume percent based on the formula used, and the ingredient densities provided. The volumetric concentration is displayed on the Level tab. Because the volume concentration is usually calculated, it is considered "theoretical" data.

Light

Electromagnetic radiation that a human detects through visual sensations that arise from the stimulation of the retina of the eye. This portion of the electro-magnetic spectrum includes wavelengths from about 380nm – 770nm. It is incorrect to refer to electromagnetic radiation outside of this range (i.e., ultra-violet wavelengths) as 'light', since the human observer does not detect it visually.

Adjective meaning high reflectance, transmittance, or level of illumination as contrasted to dark or low level of intensity.

Light source

An object that emits radiant energy (light) to which the human eye is sensitive. The emission of a light source can be described by the relative amount of energy emitted at each wavelength in the visible spectrum. This numeric description is an Illuminant.

The light source can also be described in terms of its color temperature, expressed in Kelvin. For example, there are several daylight sources, such as D5000 and D6500 that have different color temperatures:

Colorant loading

The proportion of a formula represented by the colorant. The proportions of all of the ingredients in a formula must remain balanced in order for the finished product to satisfy the function(s) for which it was developed. For example, house paint must stick to the walls and hide the background. These properties are achieved by mixing the ingredients in specific proportions. When the colorant load exceeds a certain amount, the product loses its integrity.

Masstone

A colorant/vehicle mixture that contains a single colorant.

Measurement Condition

Identifies the settings on the instrument. These include:

- Measurement type (reflectance or transmittance)
- Aperture Size
- Specular Port position (Specular Included or Specular Excluded)
- Position of adjustable UV filter

Measurement Method

Identifies the source of the spectral data for the sample. The choices include:

- Instrument
- Folder
- Keyboard spectral values
- Keyboard Color Coordinates

Metamerism

A phenomenon exhibited by a pair of colors that only match under one set of viewing conditions. Each sample has the same tristimulus values for a described set of viewing conditions (i.e., illuminant, observer, geometry of illumination and viewing), but have different spectral curves. When any of the viewing conditions (the light source, the observer, the orientation of the sample) are changed, the samples no longer appear to match, and are said to be metameric.

Metamerism index/index of metamerism

A metamerism index is used to quantify the amount or degree of metamerism that exists between two samples. It takes into account the color difference between two samples, under two different Illuminant/Observer conditions.

Mixture

A finished sample containing a specific concentration of color. The measurement of the sample, the concentration of color, and other information about the sample is entered using Colorant Set Maintenance. This information is used to calculate the optical data for the color. This sample can also be referred to as a "primary".

Module

A module contains pre-selected answers to the fields appearing on Ingredient Selection screen. If you frequently use the same ingredient selections, number of colorants in formula, etc., you can create a module that automatically makes those selections. Using a module reduces the input for each match or correction, and reduces the possibility of input errors.

Nanometer

One billionth of a meter (10^{-9}). It is also known as a millimicron. It is used to measure the wavelengths of energy found in the electro-magnetic spectrum. Wavelengths of energy in the form of visible light measure from 400 – 700 nanometers.

Opacity

A general term used to describe the degree to which a material obscures a substrate. It is the opposite of 'translucency', the degree to which a material does not obscure a substrate. Opacity and/or translucency are measured in terms of a contrast ratio.

Opaque

Adjective used to describe complete opacity.

Optical brightener

An ingredient that fluoresces. When this happens, the ingredient absorbs light at a specific wavelength in the ultra violet range of the spectrum, and re-emits it at a wavelength in the visible spectrum. The energy is usually re-emitted at the shorter wavelengths of the visible spectrum (i.e., in the blue region of the visible spectrum), and the resulting effect is that the material displays brighter, bluer, or 'whiter than white'. Also referred to as a fluorescent agent or fluorescent brightener.

Optical model

The mathematical approach used to calculate the K (absorption) and S (scattering), K/S values or A (absorbance) values for colorants. There are four models to choose from:

- Transparent
- Transmission
- Translucent
- Opaque

Each type uses a specific method for sample preparation and sample presentation, and a specific mathematical equation for calculating the optical constants.

Optical constants

Also referred to as *optical data/optical properties*. A numerical description of the way an ingredient interacts with light. Optical data is typically generated for colorants, but may also be calculated for other ingredient types such as resins, depending on the ingredient composition. Optical data can be expressed using the following terms:

- K(absorption) and S(scattering) values
- K/S values
- A(absorbance)

The same colorant used in different product lines may generate different optical data.

Optical data

See also *optical constants*.

Optimize - Colorant Calibration

Process by which the program calculates optical constants through a curve fit between the sum of the level data and the sum of the mixtures data.

- **Matching.** In matching operations, the program optimizes formula amounts to minimize differences between the target and predicted formula(s). The criteria used to evaluate these differences, and their relative importance is referred to as the "optimizer goal."

For example, if the criteria include DE1 and cost, the program adjusts the formula to enhance both the DE1 and the cost of the formula. When it fails to make an adjustment that improves both of the qualities specified it stops.

A default optimizer goal is set for the program. This can be modified by the user (**Tools Menu/Job Preferences/Advanced**).

- **Manual Correction.** In manual correction, users may also "optimize" individual colorant amounts in a formula using a single evaluation criterion. The program will automatically calculate the optimal amount of colorant required to minimize the difference between the Target and predicted formula for a single parameter.

For example, you can select CIELAB DE as the parameter to be evaluated. You then can optimize the amount of red color for this parameter. The program will calculate the optimal amount of red needed to reduce CIELAB DE "as much as possible". You can then move to another colorant in the formula and optimize it using the same criterion.

Paste

Intermediate, semi-aqueous form of a colorant that contains dry colorant, resin and solvents.

Perceptibility

Refers to a difference between samples that can be detected visually. In the case of colored samples, color differences detected using an instrument may not be perceptible.

Performance data

Data gathered by the correction program that helps the system to understand how the ingredients in the batch are performing. The program offers two types of performance data:

- Performance factors
- SmartMatch performance data

Selections are made in job preferences regarding the type of performance data to be applied to a correction. *See also Job Preferences, Advanced Options.*

Performance factors

Users may also define permanent Performance Factors for individual colorants in each colorant set. For colorants, a Performance Factor is a multiplier to concentration, similar to ingredient strength. They are used to improve the quality of formula predictions.

Temporary performance factors are calculated during correction, based on the Job Trial formula and measurement.

Primary

A physical sample containing a specific concentration of color. The measurement of the sample, and the formulas used to make the sample is referred to as a mixture, and is entered into the colorant set record using Colorant Set Maintenance.

Recycle

An ingredient that has already been processed, and can be re-used in other formulas. It may also be referred to as 'waste' or 'work off'.

Reflectance

The ratio of the intensity of the reflected light to that of the incident light. In popular usage, it is considered as the ratio of the intensity of reflected radiant energy to that reflected from a defined (white) reference standard.

Sample repeatability

A comparison of differences in samples made using the same raw materials, equipment and processing technique. Repeatability can be expressed through a DE value. The more repeatable your sample preparation techniques are, the more accurate your formulas will be.

Sample reproducibility

A comparison of the differences between samples due to changes in the sample preparation procedure. Differences can be caused by changing one or more of the following:

- Technical
- Type of equipment used
- Mixing Method

- Curing Method
- Method of Application
- Batch size

The degree of reproducibility can be expressed through DE. The more reproducible your process is, the more accurate your formulas will be.

Ready-to-use/press ready/finished product

A finished product that contains resins, solvents, colorants and additives in the correct proportions.

Reproducibility/inter-instrument agreement

A comparison of measurements made of the same sample by different instruments. The variation in sample measurements is expressed in terms of DE. Manufacturers of spectrophotometers for commercial use include a value for inter-instrument agreement in the instrument specification. This value is only valid for comparisons made using instruments of the same model.

Resin

One or a group of organic materials, either natural or synthetic, that serves as a vehicle for the colorant. Resins can impart gloss, adhesion, heat resistance, odor retention, resistance to chemicals, hardness, film-forming abilities, and other properties to the finished product.

Alternate names include vehicle, clear, and extender.

Sample

A colored object that may be measured, evaluated, matched, or corrected. When you are working on a job, a sample may be a target (standard), or trial (batch). The spectral and or colorimetric description of a sample can be stored in a folder, at any time, for future use.

Sample type

Depending on your application, you may have to measure more than one sample in order to collect all of the information required to evaluate, match or correct a color. The program needs to know how many samples you will be measuring, and what type of samples they are. From this information, the program can select the correct calculation to apply to the measurement data, and prompt you for the correct samples. This information is referred to as "sample type".

The sample type is also important information in the creation of a colorant set. Typically, the colorant data used to calculate matches and corrections are generated from the same sample type used for the target and/or trial data.

Five sample types are available, and appear in the list below:

- ☒ Single Measurement
- ☐ Over Light and Dark (ROL/ROD)
- ☐ Reflectance and Transmission (R/T)
- ☐ Over Light and Black Trap or Open Port (ROL/RO)
- ☐ Opaque and Over Dark (ROO/ROD)

See also *Applications Technology, Sample Types* for a detailed discussion.

Saturation

The attribute of color perception that expresses the degree of departure from a gray of the same lightness. All neutrals (white/black/gray) have zero saturation. The term saturation is often associated with the intensity or brightness of a sample. When working with the 1976 CIEL*a*b* or CMC color difference equations, the dimension of chroma(C^* and DC^*) approximately relates to the saturation of the sample.

Saunderson Correction

Equation for calculating a correction for the Fresnel reflectances at the surface of a dielectric material for both the incident light and the exiting light.

Scattering Coefficient (S)

An optical constant that quantifies the ability of a colorant to scatter light. Based on reflectance data for a sample, it is one of the values calculated during colorant set calibration, using the Kubelka-Munk equation. It is part of the data used to calculate color matches and corrections.

Standard Observer

A numeric description of the way the human eye responds to color. The spectral response characteristics of the average observer are officially defined by the CIE. Two such sets of data are defined, the 1931 data for the 2° visual field (distance viewing) and the 1964 data for the annular 10° visual field (approximately arm's length viewing). NOTE: All of the expressions of colorimetric data (screen displays and hard copy) explicitly state the illuminant/observer condition used to determine the values.

Scattering

Diffusion or redirection of radiant energy when light encounters particles having different refractive indices. Scattering occurs at boundaries between different mediums regardless of whether they are external to the sample (i.e., air/resin interface) or internal to the sample (i.e., resin/pigment particle interface).

Secondary

The formula grid can display more than one expression of the formula. 'Secondary' fields are simply conversions of the primary formula. The secondary formula(s) are equivalents of the primary formula.

Scattering resin

A resin that is not completely transparent. The resin can contain particles that absorb light, scatter light, or both. The result is that the background is obscured. This causes the material to appear cloudy, or translucent.

Single constant/one constant

Two sets of equations, the Kubelka Munk equations, are used to describe color mixing properties of colorants. Two equations were used to cover the transparency of the colorants and the type of colorants used. A single constant approach assumes that colorants selectively absorb light, and that the light scattering properties of the colorants are constant.

The theory assumes that the absorption (K) is done by the colorant, and the scattering (S) by the substrate. Separate K and S values are not calculated for the colorant. A "single constant" approach is used to match transparent samples using dyes, and transparent or translucent samples that are made from a selection of pigments that does not include a white pigment. If white is used, it is used in a fixed amount regardless of the colorant.

Solvent

Another term for thinner. It is a component ingredient, usually a solvent or diluent, added to a formula for viscosity adjustment.

Spectral/spectral curve

A graphic representation of the spectral data for a sample. The relative reflectance or transmittance (or absorption) of the sample is plotted on the ordinate, and the wavelength or frequency as the abscissa. The most common curves in the visible region use wavelength units of nanometers, with the short wavelength units at the left of the scale.

Spectrophotometric curve

A graphic representation of the spectral measurement for a sample. The relative reflectance or transmittance (or absorption) of the sample is plotted on the vertical axis, and the wavelength or frequency on the horizontal axis. The most common curves in the visible region use wavelength units of nanometers, with the short wavelength units at the left of the scale.

Spectrum, visible

A band of the electromagnetic spectrum that is detected by the human eye as light. It typically includes wavelengths from 380 –770nm.

Specular

The smooth, mirror-like reflection coming from a sample. When the light travels through air and encounters the sample, some the light is reflected at the sample surface and never penetrates the sample. We refer to this portion of the reflected light as the specular component.

For the calculation of optical constants, matching and correction predictions, all spectral measurements must be corrected to account for the loss of energy due to this specular effect.

Specular Component Included (SCI)

A type of measurement geometry. Measurement of reflectance made in such a way that the regular surface reflection is included in the measurement.

Specular Component Excluded (SCE)

A type of measurement geometry. Measurement of reflectance made in such a way that the regular surface reflection is not part of the measurement. This can be accomplished through the following techniques:

- Using 0°(perpendicular) incident light on the samples, thereby reflecting the specular component of the reflectance back into the instrument.
- Using black absorbers or light traps at the specular angle when the incident angle is not perpendicular.
- Measuring at an angle different from the specular angle in directional measurements.
- For a sphere instrument, opening a hole in the sphere opposite the measuring optics.

Standard

A sample that serves as a reference for comparison. In some cases, it is an official standard whose attributes are formally recorded and agreed upon by all who use it; i.e., reference samples produced by institutions such as the NBS, samples formally designated as references for SPC evaluations, etc.

In other cases a standard may be informally designated for the purposes of defining a target or objective to be achieved. Color differences are expressed relative to a standard, and designation of the standard is required to interpret these differences.

In Formula Central, the standard sample is referred to as the 'target'.

Strength

The relative ability of a unit quantity of colorant to alter the color of another colorant to which it is added. In popular usage, tinting strength is an index of the effectiveness with which a chromatic colorant imparts color to a standard white pigment. In a mixture of pigments, the absorption strength or the scattering strength, or both, may affect its apparent strength. In any case, tinting strength comparisons of materials of different chemical type may vary with the concentrations of colorants used, so care must be exercised in selecting relative concentrations or concentration ranges. -OR-

Relative change in the absorption of a standard white pigment when a specified amount of absorbing pigment, black or chromatic, is added. This is basically the common definition of tinting strength.

Substrate

The substrate is the background over which a colored material is applied. When a colored material does not totally hide the background, the background has an influence on the color difference of the match. If you are working with a transparent or translucent material, using a different substrate will change the color of the material.

Sub-menu

Windows menus frequently include submenus. The submenu contains an additional set of choices related to a particular menu selection. An ? next to a menu option indicates that you must move to a submenu to view the choices. Place the cursor over the arrow to display the submenu.

Target

In Formula Central, this is the sample color you are trying to match. It is also referred to as the **standard**.

Thinner

A specific ingredient type that identifies a collection of ingredients sometimes worked with as a group usually for purposes of formula scaling. It is a component ingredient, usually a solvent or diluent, added to a formula for viscosity adjustment. A thinner cannot be a colorant, and does not have a strength factor.

Tolerance

A number or series of numbers that define a range of acceptability around a numerical standard. Tolerances are used to evaluate the acceptability of both incoming raw materials, and outgoing finished products. Tolerance specifications typically include a sample, and a choice of color space/color difference equation you use. If you are using colorimetric values for tolerances, the tolerance must also specify the selection of an Illuminant/Observer combination. A tolerance can also include limits on film thickness, opacity, etc.

Total batch

This is the grand total of the formula. This row in the formula grid displays the resulting batch size when you scale on a fixed amount of colorant, resin, solvent or additive.

Translucent

A term used to describe a sample that is not completely transparent, nor opaque. Light is partially absorbed and scattered by the materials in the sample, and by the background of the sample. Samples that are translucent are also said to exhibit 'incomplete hide'.

Transmittance

Ratio of transmitted light to incident light. It is that fraction of the emitted light of a given wavelength that is not reflected or absorbed, but passes through a substance.

Transparent

Adjective to describe a material that transmits light without diffusion or scattering.

Transparent resin

A resin that does not scatter or absorb any light.

Trial

In Formula Central, this is the sample that is compared to the target. It represents the color that you want to correct. It is also referred to as the batch sample.

Tristimulus values, CIE

Amounts (in percent) of the three components necessary for matching a color; in the CIE System. This is a three-color additive mixture and the components are designated as X, Y, Z. Tristimulus values are not absolute values characteristic of a sample, but relative values dependent on the method used to obtain them.

The Illuminant and Standard Observer color matching functions used must be designated. Originally they were defined by the CIE as the 1931 (2° field) and Illuminant C. However, weighting tables exist that integrate the illuminant/observer values for a variety of illuminant and observer combinations (e.g. D65/10°, etc.)

Approximations of CIE tristimulus values may be obtained from measurements made on a tristimulus colorimeter, giving measurements generally normalized to 100, which must then be normalized to equivalent CIE values.

Two constant (Kubelka Munk)

Two sets of equations, the Kubelka Munk equations, are used to describe color mixing properties of colorants. Two equations were used to cover the transparency of the colorants and the type of colorants used. A two-constant approach assumes that the colorants being used both selectively absorb and scatter light, and separate K and S values are calculated for the colorant. A 'two constant' approach is used to match opaque and translucent samples using a colorant selection that includes white.

User-supplied resin

The portion of the resin in the formula that is left out of the concentrate. This is the resin to which the end user adds the concentrate. Often it is not the same resin as that used to make the concentrate, and is supplied by the end-user.

It is specified at run-time in Formula Central. (Only available when concentrate scaling is enabled.)

Viewing geometry

A configuration of light source, object and detector. Most commercial spectrophotometers offer the following geometries:

- **d/8°.** Sample is diffusely illuminated; detector is positioned at an angle of 8° from the sample surface.
- **0°/45°.** Sample is illuminated at 0°; detector is positioned at a 45° angle from the sample surface.
- **45°/0°.** Sample is illuminated at 45°; detector is positioned at a 0° angle from the sample surface.

Viscosity

Viscosity is a physical property that refers to the rate of flow of the material. For some products, small variations in the viscosity of the material have a significant impact on the color.

When preparing a job formula, you must match the viscosity displayed with the formula in order to achieve the other specifications in the formula display such as the hiding, film thickness, color difference or other requirements.

To the right of the fields for the viscosity range are fields that define the type of equipment used for the specification. Be sure that you are using the equipment indicated or the viscosity units will not be valid for the formula.

Wavelength

It is the measuring unit used to identify the components of the visible spectrum, designated as λ in spectrophotometry. Distance between two successive points of a periodic wave in the direction of propagation in which the oscillation has the same phase.

White

A white is a neutral or near-neutral color that typically has high reflectance values, and powerful light scattering properties.

In Datacolor MATCH^{PIGMENT}, it is a specific ingredient type that identifies a collection of ingredients sometimes worked with as a group, usually for purposes of formula scaling. It can be a colorant, and has a strength factor.

- **Master White.** In many opaque and translucent applications, the sample set contains a mixture of the white color with every color in the colorant set. From these samples the optical values are calculated for every colorant. If your colorant set includes more than one white, the master white is the white colorant in the colorant set mixtures. The data for the master white is used to calculate the data for all other colorants in the set.
- **Alternate White.** An "alternate white" is any white that is not the master white. - In opaque sets, the alternate white must be calibrated using a mixture with black. -In translucent sets, an alternate white can be calibrated using a "masstone", "mixture with black", or "mixture with black and resin".

Whiteness index

Any of several numerical indices used to indicate the degree of whiteness.

Yellowness index

Any of several numerical indices of the degree of departure from a preferred white reflecting material or colorless transparent material towards yellow.

Yield factor

A factor applied to the ingredient strength of all ingredients in a formula:

Yield = 100%

Red
10

Yellow
10

Blue
10

Clear
70

Total
100

Yield = 200%

Red
5

Yellow
5

Blue
5

Clear
85

Total
100

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