
Datacolor 650™

Datacolor 600™

Datacolor 400™

User's Guide



Because Color Matters

Datacolor 650/600/400 User's Guide

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Datacolor Spectrophotometers

About Datacolor Spectrophotometers

The Datacolor high performance benchtop spectrophotometers (Datacolor 650™, Datacolor 600™, Datacolor 400™) are the newest generation of bench top color measuring instruments, incorporating state-of-the-art CMOS integrated circuit technology in the instrument design. All are intended for use as a device for measuring, specifying and evaluating color in both laboratory and production settings.



Datacolor 600

Below is a summary of the standard and optional features included with instruments.

Standard features include the following:

- Pulsed xenon light source
- Multiple aperture sizes to accommodate samples of different sizes
- Automated specular port

Optional features including the following:

- Automated aperture detection
- Automated zoom lens
- Automated, adjustable ultra-violet filters for measuring fluorescent samples

Please refer to Appendix, Features by Model to determine the standard and optional features available for a specific model.

Adjustable UV Filter Option

This option offers the ability to control the amount of UV light emitted from the light source. This is used for applications that need to identify the presence of optical brightening agents, or other types of fluorescent materials in the samples being evaluated.

The configuration of the adjustable UV filter is handled through the software. See also Datacolor TOOLS user Guide for detailed instructions to configure the option and calibrate the instrument.

Transmission Option (Datacolor 650/650V)

The Datacolor 650 includes an option to measure the transmission properties of transparent and translucent samples. It can measure the “regular” transmittance of transparent solid and liquid samples, as well as the “total” and “diffuse” transmittance of translucent samples. The transmission option is also available with the Datacolor 650V vertical mount model.

Vertical Mount Option (Datacolor 650V/600V/400V)

This is a modification to the instrument that provides the ability to mount the unit vertically. The vertical mount unit is fitted with a viewing port to verify that the sample completely covers the aperture.



Datacolor 650V

- The Datacolor 600V and 400V are typically used by the paper industry.
- The Datacolor 650V offers the option to make transmission measurements in a vertical configuration.

Electrical/Environmental Requirements

Power	85 to 264 VAC, 47 to 63 Hz, 80 VA peak, 35 VA typical
Absolute Operating Environment	5° to 40° C, 20-85% RH, non-condensing
Interfaces	Serial: RS232 9600/115200 baud (shipped at 19200 baud) USB: 1.1 or higher

Safety Features

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

 **CAUTION**

There are no user-serviceable parts for this equipment.

Light Source

Do not stare directly into the open port located in the front door panel when the measurement is in progress. **Staring directly into the light source can result in eye discomfort similar to that of staring at a camera flash.**

Power

 **CAUTION**

Disconnect power before servicing.

The power cord supplied with the unit *must* be used.

Feature Summary

These instruments employ state-of-the-art features including the spectrometer, integrating sphere, light source, and optics. Below is a summary of those features:

FEATURE	DESCRIPTION	PURPOSE/BENEFIT
Integrating sphere	Barium coated sphere.	Industry standard.
Measurement Geometry	D/8° geometry, Specular Component Included (SCI) or Excluded (SCE).	Provides for more uniform measurement of samples with irregular surfaces.
SP2000 Spectral Analyzer	Proprietary dual-channel holographic grating. 256-photodiode linear arrays used for both the reference and sample channels.	Dual channel design provides continuous monitoring of sample illumination and compensates for changes. 256-photodiode array enhances the precision of the measurement.
Light source	Pulsed xenon flash lamp	Filtered to provide D65 illumination including UV component.
Effective Bandwidth	5nm or 10nm	Based on reporting interval.

Accessories

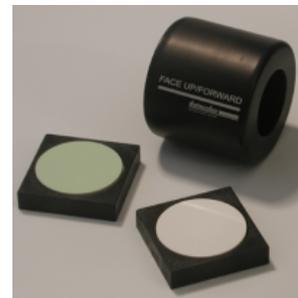
All models come with the following standard accessories:

- Six foot power cable
- Serial cable with connectors on either end
- Black Trap
- White Tile
- Green Tile
- USB Cable

Calibration Tiles

A black trap, white tile and green tile are provided with all instruments:

- The black trap and white tile are used each time the instrument is calibrated.
- The green tile is used to perform an optional diagnostic test.
- A CD and diskette containing the calibration values for the white tile are also provided.



Aperture Plates

Multiple aperture plates with openings of different sizes are included as standard accessories with all models. The identification is engraved on each plate.

Please refer to *Appendix, Features by Model* to determine the standard and optional aperture plates available for a specific model.



Standard Aperture Plates

The apertures listed below are provided with every model:

- Large Area View (LAV)
- Ultra-Small Area View (USAV)

Optional Aperture Plates

- Medium Area View (MAV)
- Small Area View (SAV)
- Extra Ultra Small Area View (XUSAV)
- Medium Area View (MAV), barium coated (standard with the Datacolor 650)



NOTE

Some of these apertures are standard accessories, depending on instrument model.

Below are aperture plate specifications:

Aperture Identification	Sample Area Measured	Sample Area Illuminated
LAV	26mm	30mm
MAV	16mm	20mm
SAV	5mm	9mm
USAV	2.5mm	6.5mm
XUSAV	2.5mm	3.0mm



NOTE

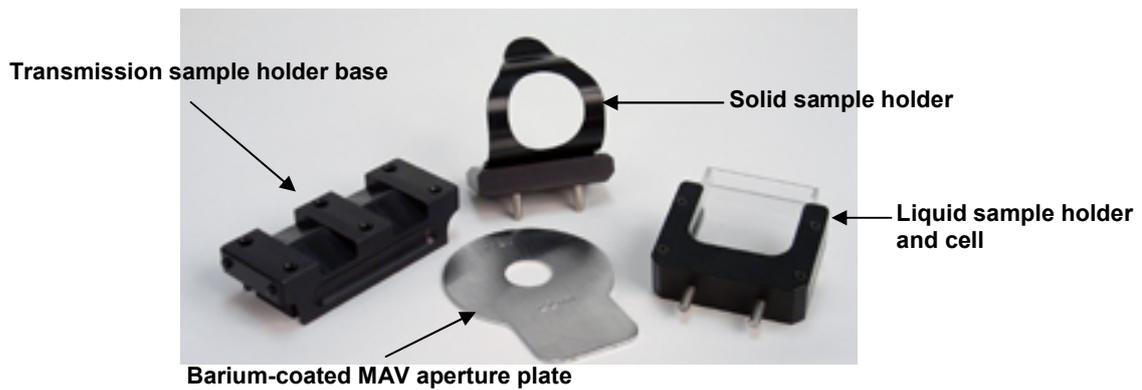
The area illuminated is always 4mm greater than the diameter measured to reduce translucency errors. The exception to this is the XUSAV plate.

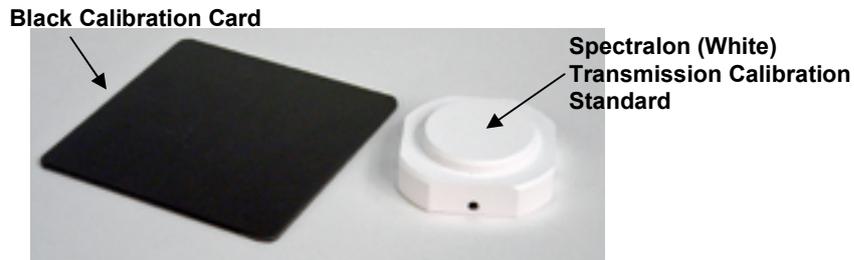
Tips for Aperture Selection

- Always use the largest possible aperture size.
- The Large Area View (LAV) plate is recommended for averaging samples with irregular surfaces and textured samples.
- Small (SAV) and ultra-small (USAV) plates should only be used for measurements of samples that do not completely cover the opening of the larger aperture plates.
- Medium (MAV) with barium coating must be used for transmission measurements.

Optional Accessories

If you have purchased a Datacolor 650 or Datacolor 650V, you will receive the following accessories to make transmission measurements:





- **Transmission Sample Holder Base.** Datacolor 650 users must install this holder into the transmission chamber. For Datacolor 650V (vertical mount) units, the sample holder base is installed at the factory.
- **Transmission Sample Holders.** Used to secure the transmission sample in the chamber. One is used for liquids and the other for solid samples. Each has two dowels on the bottom that fit into the holes on the transmission sample holder base.
- **Transmission Cell.** Used as a container for liquid materials. It is placed into the liquid sample holder.
- **Medium Area View, Barium Coated Aperture Plate.** The inside of this plate has a barium coating around the opening. This aperture plate must be used for all transmission measurements.
- **Black Calibration Card.** This is used instead of the black trap for the zero calibration.
- **Spectralon® (White) Plaque.** This white standard must be used for transmission calibration. In addition, it is placed at the port for most transmission measurements. Consult the standard procedure (ASTM, ISO, etc.) you are following to determine if this sample should be placed at the port.

Cable Installation

Overview

You must install a power cable, and either a USB cable **or** a serial cable to connect the instrument to a computer.



NOTE

Do not connect both cables to the unit. You have a choice of using **either** a serial cable **or** a USB cable, and both are provided with the instrument.

The connections for the cables are found on the back of the instrument.



WARNING

Read the "Electrical and Environmental Requirements" section **BEFORE** connecting your instrument.

Power Cable

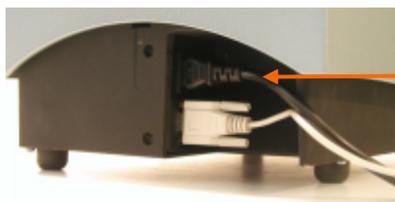
A six-foot power cable is provided with the instrument.



NOTE

The power cord supplied with the unit **must** be used.

Power is supplied to the back of the unit via a 3-prong male connector.



Power cable

Plug the female end of the power cord into the power receptacle on the rear panel of the instrument. Insert the plug into a standard AC outlet.

Serial Cable Installation

You can connect the instrument to the computer using either a serial cable or a USB cable. Select one of them. This section provides instructions for using the serial cable.

 **NOTE**

Do not connect both cables to the unit.

The serial cable is shown below:



1. Connect the 9-pin male connector on the serial cable to the RS-232C female connector on the rear panel of the instrument.
2. Connect the female connector on the serial cable to a serial communications port on the back of the computer.



3. If there is more than one serial port on the computer, make a note of the port being used. You may need to enter this information into the program.
4. Tighten each connection securely to ensure proper signal.

See the Appendix for a description of the RS-232C connector pin assignments.

USB Cable Installation

Instruments manufactured by Datacolor can now be connected to a USB port on a desktop system. See *Appendix, System Requirements for USB Cable Installation* before you attempt to connect to a USB port.

You can connect the instrument to the computer using **either** a serial cable **or** a USB cable. Select one of them. This section provides instructions for using the USB cable.

NOTES

Do not connect both cables to the unit.

If you use the USB cable, you must install additional software to activate the USB port. See also *Driver Installation* below for instructions to add this software.

Before You Begin

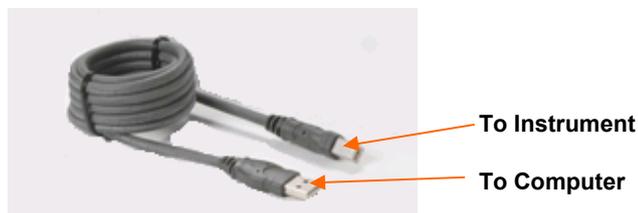
- Close all programs currently running on the system.
- You will need the accessories listed below to complete the installation:
 - USB cable (provided by Datacolor).
 - Datacolor CD ROM disk labeled, “*USB Drivers and Documentation*” (Datacolor Part No. 2052-0330).
 - Calibration diskette or CD included with the instrument (this is required only when installing new instruments)

Three steps must be completed to enable the USB port for use with the instrument:

- Install the USB Driver.
- Identify the system assignment for the USB port. This is accessed through the **Control Panel** included with the Windows operating system.
- Change the com port assignment in the Datacolor applications software.

Cable Installation

The USB cable provided with the system is shown below:



One end of the cable connects to a USB port on the instrument. The other connects to a USB port on the computer.

- Connect the USB cable to the instrument and to the USB port on the back of the computer.

Driver Installation

To prepare your computer and the Datacolor programs to communicate with your instrument using a USB port, you must install software files onto the computer. This is done by following a Wizard that will appear on your computer screen when you connect the USB cable to the instrument, and to the USB port on the back of the computer.

1. Place the **USB Drivers and Documentation CD** into the CD-Rom drive.
2. Connect the USB cable to both the instrument and the computer. The window below will automatically display:



The **New Hardware Wizard** window displays.



3. Click on the **Next** button at the bottom of the window. The wizard will step you through the installation of the USB software files. For most installations, you can accept the defaults selected by the Wizard.

- Continue to click the **Finish** button at the bottom of each window in the Wizard. The program will notify you that the procedure is completed.



⚠ CAUTION

Do not remove the USB Driver CD from the drive. The Wizard will close and then immediately reopen and then you will have to repeat the procedure a second time to successfully copy the file.

- When you once again see the “Welcome” screen, click the **Next** button.
- Repeat the steps mentioned above as you move through the Wizard again. When you again the last wizard screen, click **Finish**. At this time, the Wizard closes and the installation is complete.

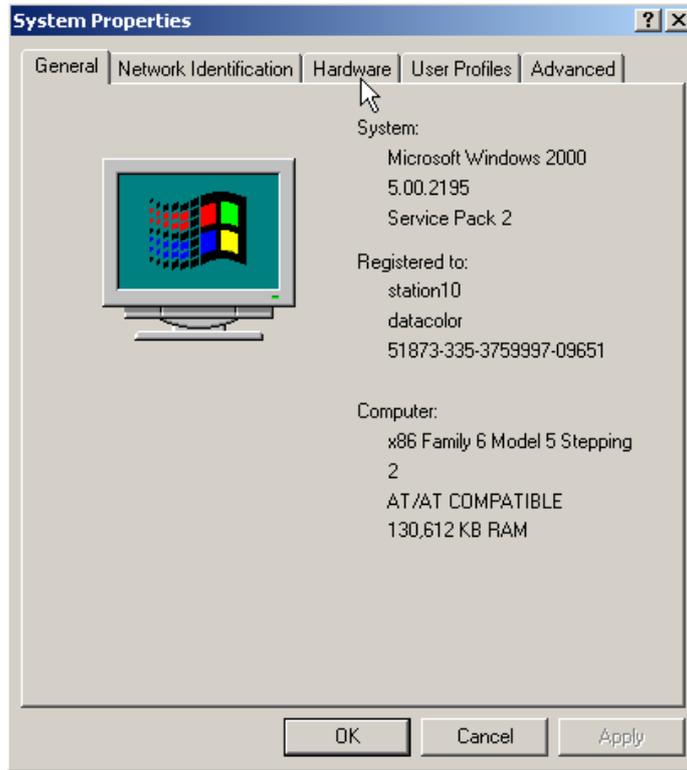
Viewing/Changing System Port Assignment

As part of the USB driver installation, a port number is assigned to the USB port. The default selection is the next available com port. Depending on the application you are running, you may need to know this port assignment to configure the Datacolor applications program(s) to recognize the USB port.

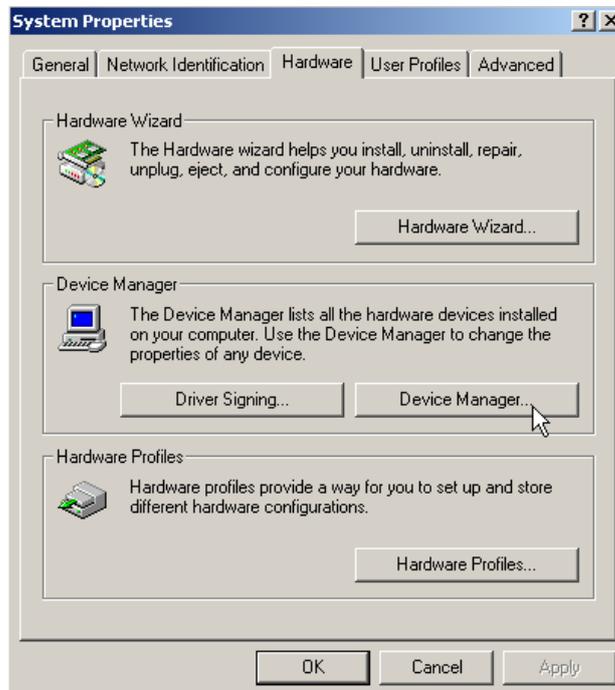
📄 NOTES

Some Datacolor programs automatically configure the USB port assignment. Others require that you manually assign the port number. Refer to the program User’s Guide for information to assign/edit the instrument port number.

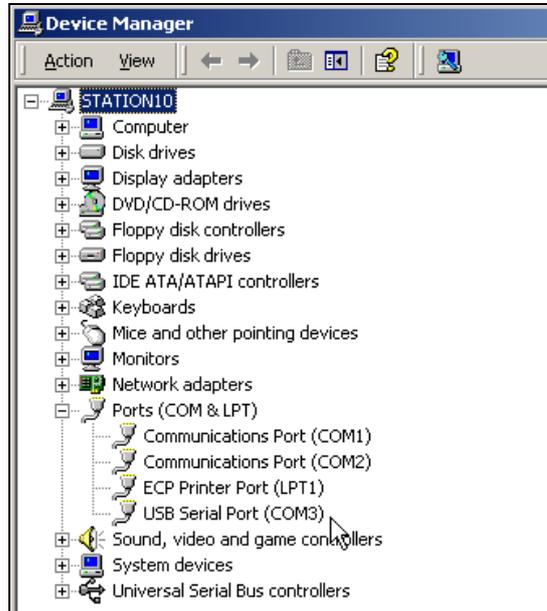
If the computer has more than one USB port, the program will default to the first one available. If you want to connect the instrument to a different USB port, you must assign the port manually in the applications software.



4. Click the **Hardware Tab**. The dialog box below displays:



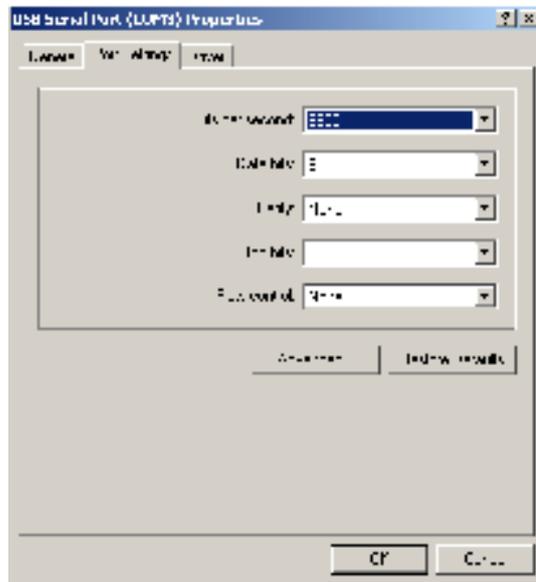
5. Click the **Device Manager** button. The Device Manager window displays.



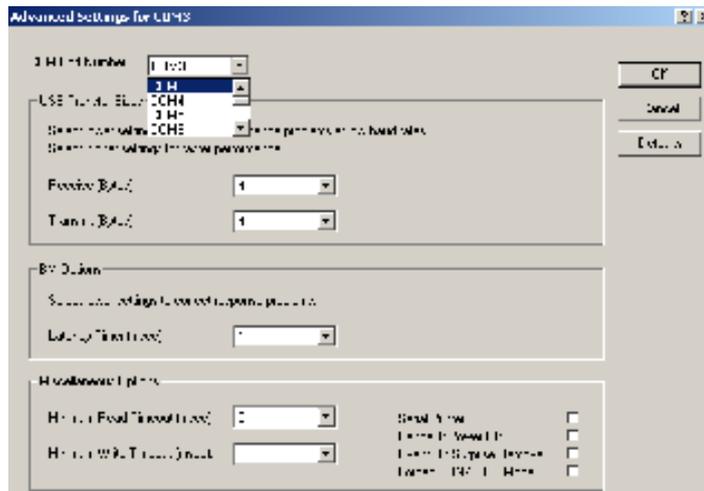
6. Go to the **Ports** heading. Click on the plus (+) to display the port selections.
7. Click **USB Serial Port**. The USB Serial Port (COM3) Properties dialog box displays.



- Click **Port Settings**. The dialog box below displays:



- Click the **Advanced** button. The Advanced Settings for COM3 dialog box displays.



The field labeled *COM Port Number* displays the current assignment for the USB port. To change the port setting, click the drop-down list arrow. The list of COM ports is displayed.

- Click on the port assignment to be used for the USB port.
- When you have completed the changes, click **OK**.

Changing the COM Port Assignment in Datacolor Programs

To enable the USB port for color measurements, you may need to change the COM port assignment in the applications program. *Refer to the program documentation for the specific Datacolor applications program you are running for instructions on configuring the instrument.*

NOTES

Controls and Indicators

Controls and Indicators Panel

On all benchtop models, a status panel is located on the top of the instrument. It identifies the current instrument settings being used. The indicators on the status panel vary, depending on the model of you are operating.



Datacolor 600/650

The status panel is the same for the Datacolor 650 and 600. It is shown below:

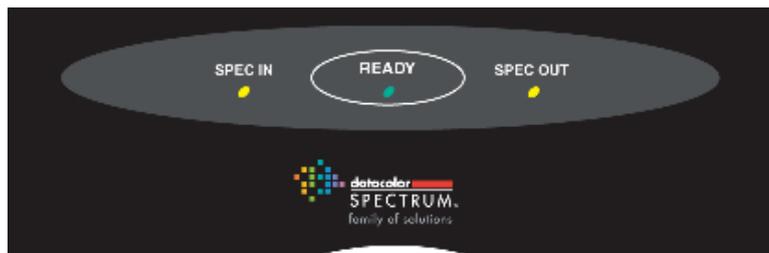


OPTION	DESCRIPTION
420	The 420nm UV cutoff filter is selected. All wavelengths below 420nm are excluded from the light source in the instrument.
460	The 460nm UV cutoff filter is selected. All wavelengths below 460nm are excluded from the light source in the instrument.
UV Cal	The UV filter option has been properly/successfully calibrated.

OPTION	DESCRIPTION
UV Inc.	No UV filter is selected. All UV wavelengths from the light source are included.
UV Exc.	The UV Excluded filter is selected. No UV wavelengths from the light source are included.
Ready	Instrument is ready for use.
Spec Exc.	The specular port is open and all measurements exclude the specular reflection from the sample.
Spec Inc.	The specular port is closed, and all measurements include the specular reflection from the sample.
USAV	Ultra Small Area View lens position is selected.
SAV	Small Area View lens position is selected.
MAV	Medium Area View lens position is selected.
LAV	Large Area View lens position is selected.

Datacolor 400

Below is the status panel for a 400:



OPTION	DESCRIPTION
Spec Inc.	The specular port is closed, and all measurements include the specular reflection from the sample.
Ready	Instrument is ready for use.
Spec Exc	The specular port is open and all measurements exclude the specular reflection from the sample.

Powering Up

NOTE

The power cord supplied with the unit *must* be used.

Use this simple procedure to start using your instrument:

1. Verify all cable connections. The AC power cord should be plugged into an outlet. The communications cable (serial or USB) should be attached to the instrument and host computer.
2. Turn on the computer.

3. Turn on the instrument power switch. This is located on the lower right side of your instrument toward the front.



- When power is applied, all mechanisms are automatically reset.
- The red lights on the status panel will flash briefly.



NOTE

If the instrument power is not turned on before a Datacolor program is launched, you may receive an error message.

4. Depending on the model you are using, the LED lights on the status panel may include the status of the following mechanisms:
 - Aperture plate/zoom lens position
 - UV filter status
 - Specular port statusWhen the **Ready** light remains on, your instrument is ready to use.
5. Launch a Datacolor program.
6. Prepare to calibrate the instrument. You will need the black trap, the white calibration tile and the green diagnostic tile.

NOTES

Instrument Calibration

Overview

The instrument must be calibrated regularly to ensure that the measurements are accurate. This section provides instructions for performing both reflectance and transmittance calibrations.

NOTE

We recommend that you calibrate the instrument every 8 hours. *Please refer to your software documentation for specific calibration instructions.*

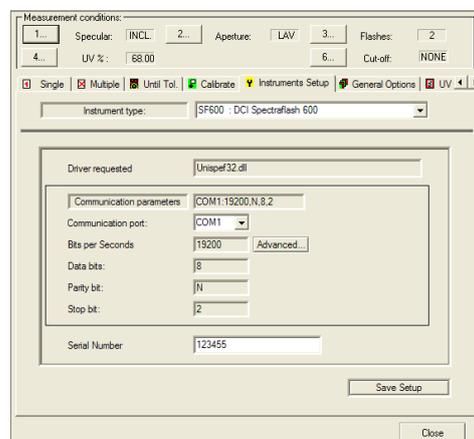
Installing Calibration Data

If this is a new instrument, you will need to install the calibration data. The calibration data can be found on a diskette or CD included with the calibration tiles. The data is installed as part of the instrument configuration, using software options controlled by the Datacolor program you are running. Below is an example of the installation procedure.

NOTE

Depending on the program you are running, the screens shown below may not match those in your program. *See also the User's Guide for the program you are running to obtain detailed information on the instrument configuration options you will use to set up the instrument.*

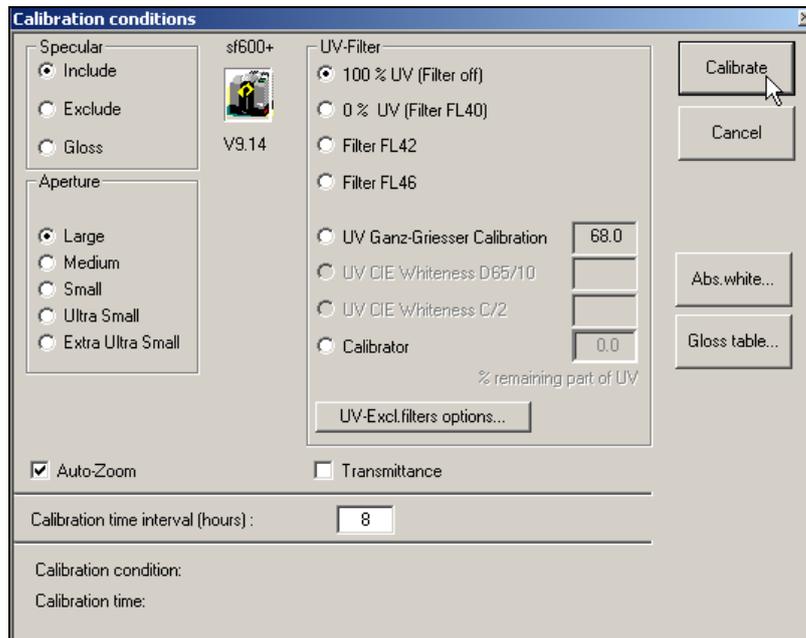
1. You must access the instrument setup. This is typically done from an Instrument Setup option on a menu. You will see a screen similar to the one below:



- When you complete the instrument configuration and select **Save Setup**, the program prompts you to place the diskette or CD containing the calibration data in the appropriate drive. When you do this, a screen similar to the one below will appear:



- Two files should be displayed. If they are not, browse to the correct drive/folder location.
- You must load **both** files. Highlight both file names, and click **Open**. The files will be transferred to the system. When the transfer is completed, the program will prompt you to calibrate the instrument. A calibration screen similar to the one below will appear:



- Click **Calibrate** to start the instrument calibration or **Cancel** to close the window.

NOTE

Instrument calibration can also be accessed through a separate menu option or function button in the program window. The User's Guide for the program you are running contains detailed instructions to access the calibration options.

Reflectance Calibration

The instrument should be calibrated every 8 hours to compensate for changes in the environment. A black trap, white tile and green tile are provided with all instruments to complete the calibration:



The black trap and white tile are used each time the instrument is calibrated. The green tile is used to perform an optional diagnostic test.

Reflectance Calibration Procedure

The software prompts for calibration vary from one program to another. All of the procedures include two measurements:

- The black trap
- The white tile

Before you begin, verify that the aperture plate at the port matches the aperture selection in the program you are running.

1. Access the calibration procedure in the program you are running.
2. When you are prompted by the program, place the black trap at the instrument port.
3. When you are prompted by the program, place the white tile at the instrument port.
4. The program may prompt you for a diagnostic tile. If prompted, place the green tile at the instrument port, and start the measurement.
5. After these measurements are completed, the program will display a message that the calibration is successful. You can now start measuring samples.

The Datacolor Users Guide for the program you are running (e.g., Datacolor Tools, etc.) provides step-by-step instructions regarding the (instrument) software setup and calibration procedure.

NOTES

If sequential total *transmittance* and *reflectance* measurements are going to be made using the 650, the instrument should be calibrated *for both transmittance and reflectance conditions*, and measurements are made using the barium-coated MAV aperture plate.

UV Filter Calibration

The procedure for calibrating the adjustable UV filter is performed in reflectance mode, and requires the use of a fluorescent white tile, provided with the instrument. This procedure requires the selection of specific software options. *See also the Datacolor Tools User's Guide contains step-by-step instructions to calibrate the adjustable UV filter.*



NOTES

This calibration procedure is critical to the accurate measurement, either reflectance or transmittance, of fluorescent samples.

If you are sharing either reflectance or transmittance data for fluorescent samples, the adjustable UV filter in each of the instruments must be calibrated regularly.

Datacolor 650 Transmittance Options

The Datacolor 650 includes an option to measure the transmission properties of transparent and translucent samples. The 650 can measure the “regular” transmittance of transparent solid and liquid samples, as well as the “total” and “diffuse” transmittance of translucent samples. The Datacolor 650 can also be used to perform the following evaluations:

- Haze evaluations, in compliance with ASTM D1003 Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics, for materials that exhibit slight light scattering.
- APHA evaluation, which measure the yellowness of liquids.

The transmission compartment of the Datacolor 650 is large enough to allow the colorist to easily insert and remove samples. It has been fitted with a removable spill tray in the event of minor spillage of liquid samples.



NOTES

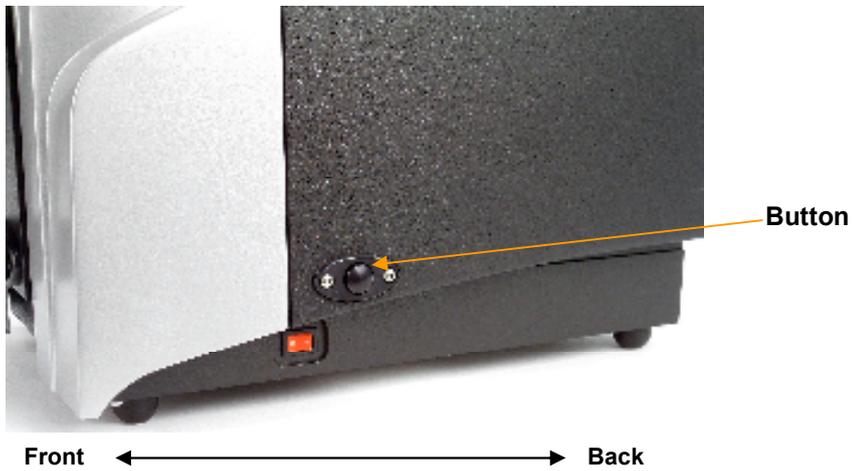
The transmission option is available on both the Datacolor 650 and Datacolor 650V. See also Datacolor 650 Vertical Mount Options in this guide for instructions to use the transmission option in the vertical mount unit (Datacolor 650V).

To calibrate the instrument for transmittance and to make transmittance measurements, the sample holder base and transmission sample holder base must be installed.

The transmission sample holder base is installed at the factory for Datacolor 650V units.

Accessing the Transmission Compartment

There are side-latch buttons on each side of the Datacolor 650 case that are used to open the transmission case:

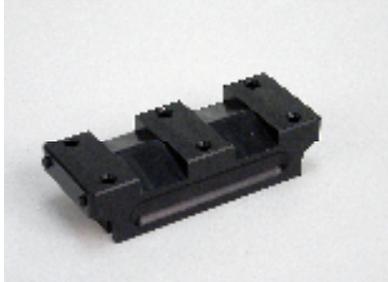


Depress these buttons, and slide the case toward the back of the instrument, to open the transmission compartment. The case will lock in the *Open* position:



Transmission Accessories

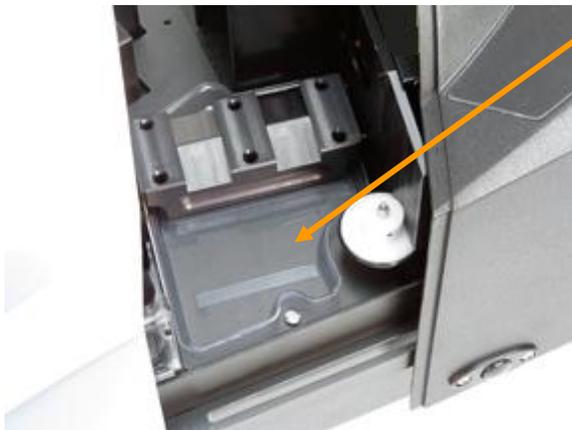
The following accessories must be installed in order to perform transmission measurements:



Transmission Sample Holder Base. Installed by user.



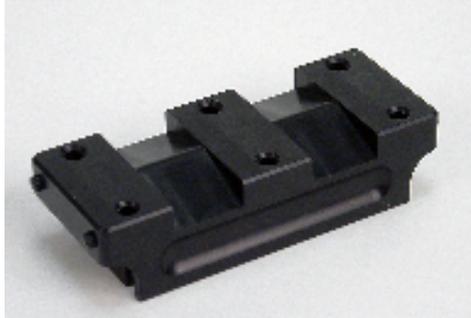
Transmission Sample Holders. Installed by user.



Spill Tray. Installed at factory.

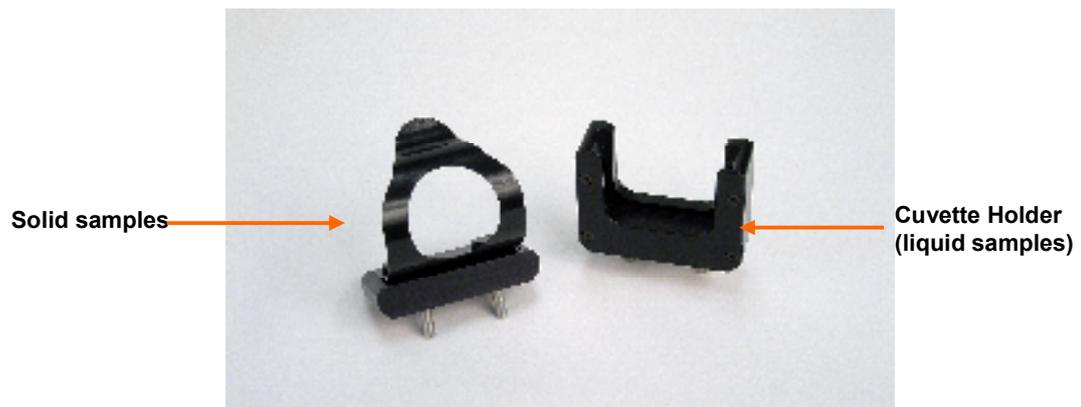
Transmission Sample Holder Base

This base is installed by the user. It is used to mount the sample holder correctly in the chamber.



Transmission Sample Holders

Two sample holders are provided for transmission measurements. One is designed to hold a cuvette used for measuring liquids. The other is used for solid, transparent samples such as plastic plaques.

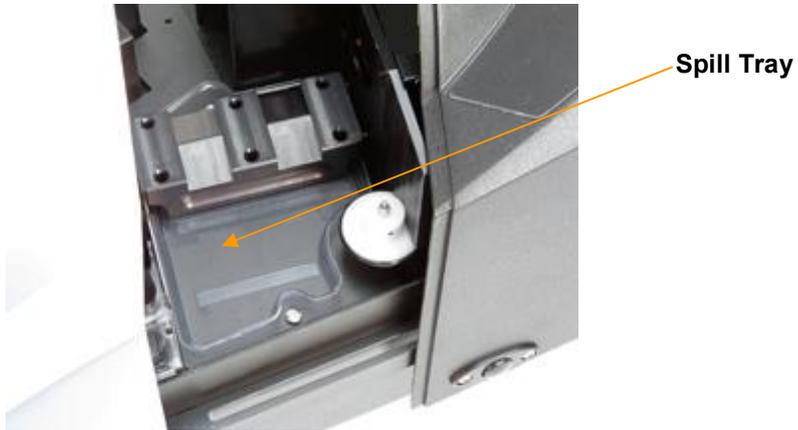


 **NOTE**

The cuvette holder is designed to hold a cuvette 50mm X 10mm (Datacolor Part No. 2950-0004).

Spill Tray

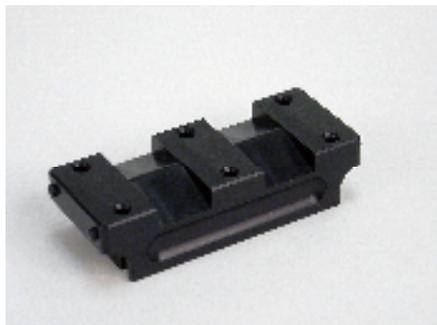
This tray is installed at the bottom of the transmission compartment, and is used to capture any overflow of liquid materials.



Installing the Transmission Accessories

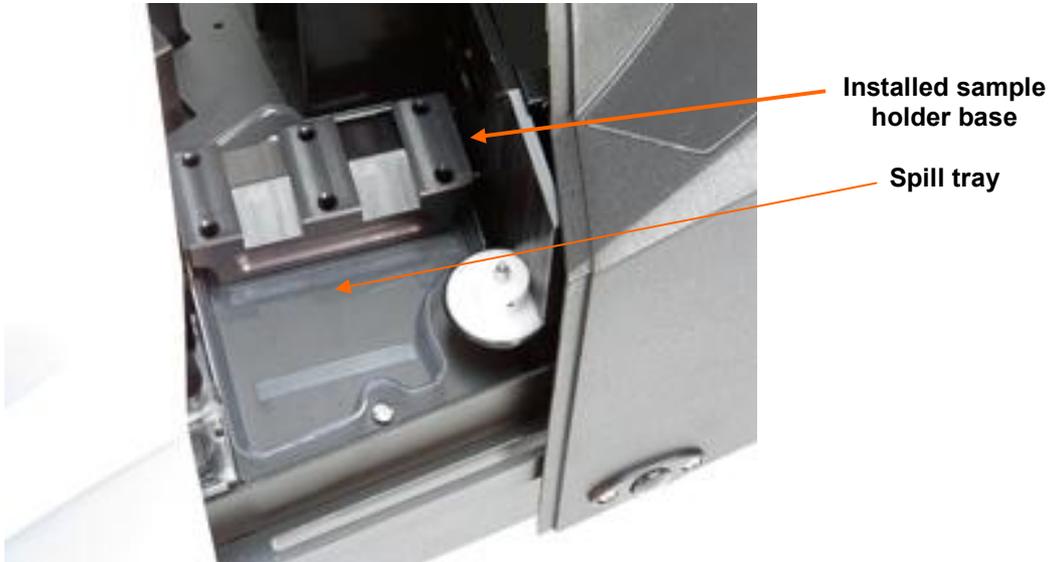
Transmission Sample Holder Base

The transmission sample holders are mounted on this base:



The base attaches to a metal bar at the bottom of the transmission compartment. It is placed directly over the spill tray, and is secured through magnets.

Below is an example of the correct installation of the spill tray and sample holder base:



 **NOTES**

Exercise care when installing the base into the transmission compartment. The design is very tight.

The spill tray is installed at the factory.

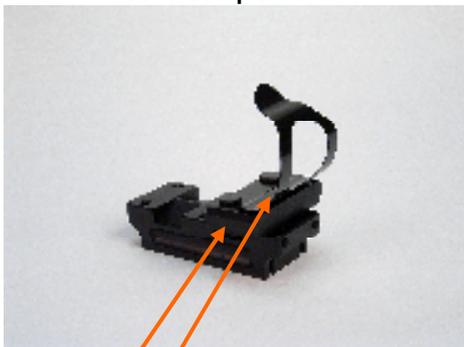
Install the base in the transmission compartment before attaching either of the sample holders. No special tool is required for installation.

The base must be removed to make closed-case reflectance measurements.

Transmission Sample Holders

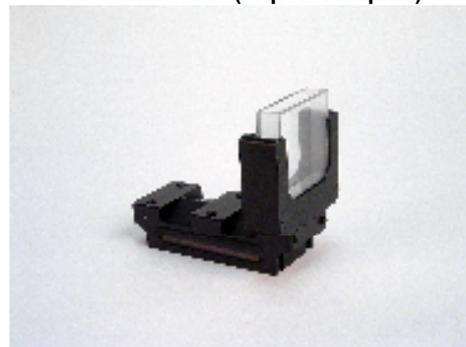
Two sample holders are provided to accommodate various types of transparent samples.

Solid Sample Holder



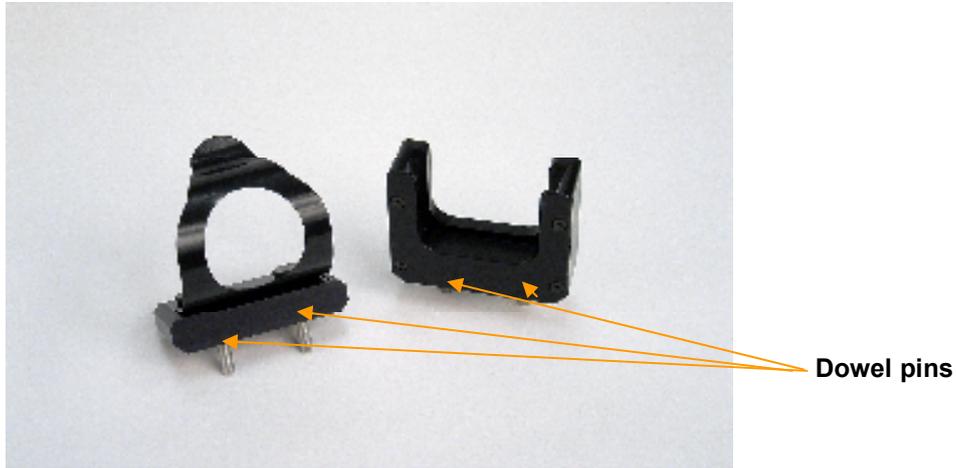
Two thumb screws provide the ability to adapt the holder to samples of varying thicknesses. This holder is used for transmission measurements using the 650V.

Cuvette Holder (Liquid Samples)

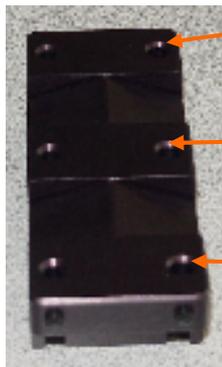


This holder is designed for use with a 50mm X 10mm cuvette.

These sample holders are mounted onto the transmission sample holder base via two dowels protruding from the bottom of the holder.



The base includes three positions to locate the sample between the sphere and the lens. The location of the sample holder along the base depends on the type of material being measured.



Position 3. Places the sample close to the lens. It is used to measure regular transmission of transparent materials.

Position 2. This is provided for ease of handling when measuring regular transmission. Can only be used with the cuvette holder.

Position 1. Places the sample close to the sphere. Used to measure translucent samples and to make haze measurements.

NOTES

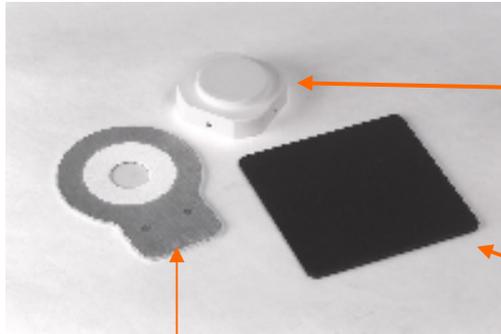
Loosen the thumbscrews on the solid sample holder to aid in the installation of the sample holder.

Make sure the sphere opening/lens opening is completely covered by the sample you are going to measure.

No special tools are required to install the sample holders.

Transmittance Calibration

The following accessories are used to calibrate the instrument for transmittance:



Barium-coated MAV Aperture Plate

White Spectralon® Plaque.
Typically placed at the sample port for calibration and measurement.

Black Card. Used to “block” the lens during calibration.

Calibration Procedure

Before you begin, you should verify the current aperture selection. The setting must be Medium Area View (MAV) and the barium-coated MAV plate should be placed at the instrument port.

 **NOTE**

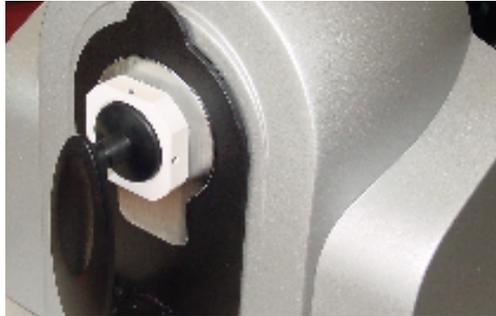
Transmission calibration and measurements ***must*** be made using the barium-coated Medium Area View (MAV) aperture plate.

To calibrate the instrument for transmittance measurements, do the following:

1. Place the barium-coated MAV aperture plate at the port.
2. Open the transmission compartment and make sure the optical path between the sphere and the lens is clear.
3. Access the calibration procedure in the program you are running. You may need to change the selections for the aperture plate, and measurement mode (transmission). *See also the User's Guide for the program you are running for detailed instructions to access the instrument setup and calibration options.*
4. When you are prompted by the program, block the lens using the black card:



5. When the measurement is completed, remove the black card from the transmission compartment.
6. Place the white Spectralon® plaque at the sample port, and make the next measurement.

**NOTES**

The white plaque remains at the port for “Total” Transmittance measurements, and is replaced with the black trap for “Diffuse” Transmittance measurements. *See also Sample Presentation and Measurement, Transmittance Measurements.*

Sample Presentation and Measurement

Sample Presentation and Measurement Overview

You must pay close attention to the positioning of the sample to insure an accurate measurement. When positioned correctly, the sample rests between the sample holder and the front panel door. The sample must completely cover the aperture opening.

Reflectance Measurements

1. Grasp the sample holder and pull forward.
2. Position the sample, then carefully bring arm back up to normal operating position.



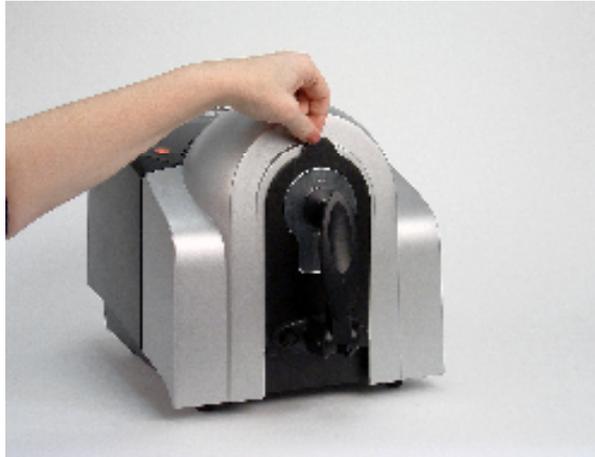
⚠ WARNING

Do not allow sample arm to spring back. For the Datacolor 600V (vertical mount), the cylindrical, spring-loaded sample holder can be depressed to position your sample. You can return the cylinder to its normal position with a quarter turn of the cylinder.

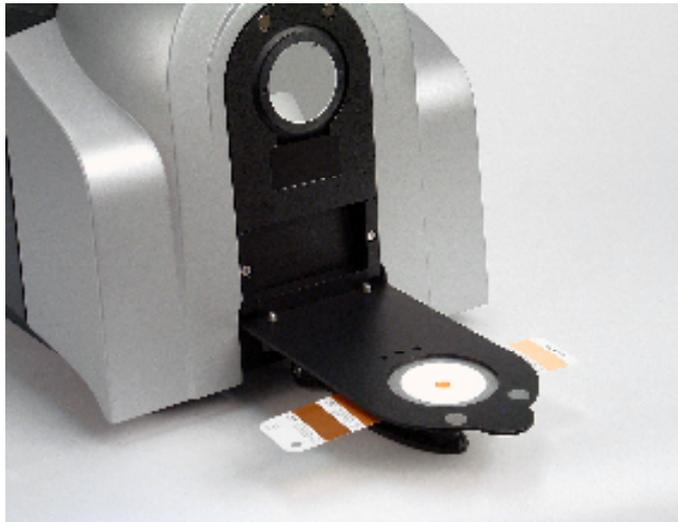
Sample Viewing Port

When measuring small samples, you may need to check that the sample is properly positioned at the port. To verify that the correct area of the sample is being measured:

1. Place the sample at the port. Grasp the black tab above the aperture plate.

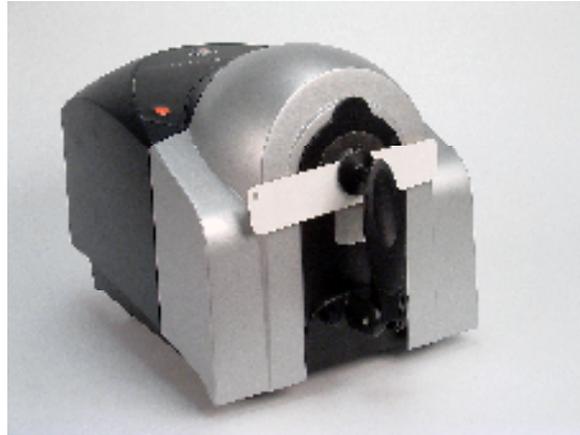


2. Pull top of door down to its full horizontal position.



3. The backside of this door reveals the area of the sample covering the port opening. If necessary, adjust the placement of the sample to target the portion of the sample to be measured.

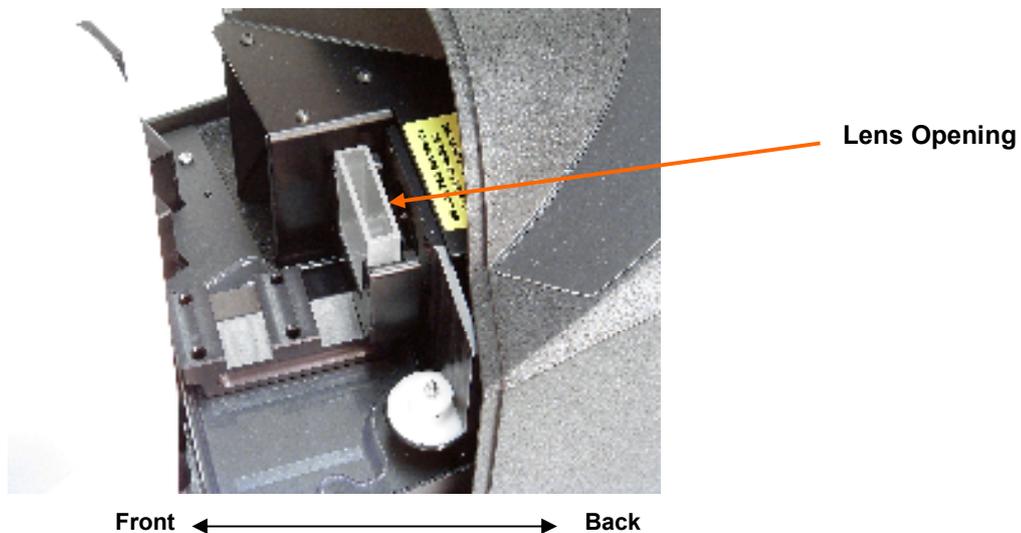
4. Push the door back to its normal position.



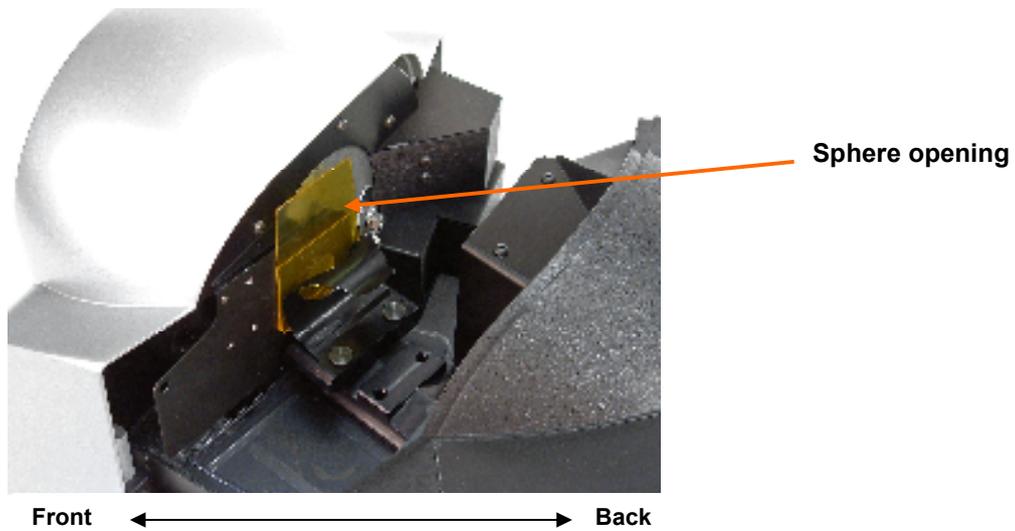
Transmittance Measurements

Three techniques are used to measure the transmittance of samples: “regular” transmittance, “total” transmittance and “diffuse” transmittance.

When working with samples that are completely transparent (such as dyes in solution or transparent plastics) you are measuring “regular” transmittance. These samples need to be positioned close to the lens opening at the back of the transmission compartment:

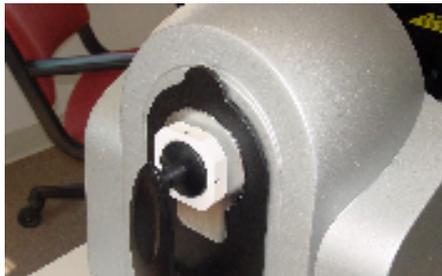


Measuring the transmittance of translucent samples that contain particles, such as engineered resins or opal glass, you are measuring either “total” or “diffuse” transmittance. The samples should be positioned at the front of the transmission compartment, close to the sphere opening.



“Total” transmittance measurements are made with the white Spectralon® plaque in place. “Diffuse” transmittance measurements are made by replacing the Spectralon® plaque at the port with a light trap.

Total Transmittance



Diffuse Transmittance



Consult with your Applications Specialist regarding the measurement technique you should use for specific evaluations.

Remote Measure Button

The red button at the top of the instrument is used to start a measurement from the instrument, rather than from the program.



NOTE

The remote measure button is not available on all models. For those models equipped with it, it is active only when the software supports remote measurement.

NOTES

Maintenance

About Instrument Maintenance

The sections that follow provide detailed instructions for maintaining the instrument and calibration tiles. These instructions and tips will help to insure that the instrument continues to perform properly over its life.

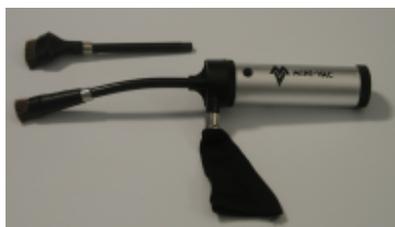
CAUTION

There are no user-serviceable parts for this equipment.

Sphere Cleaning

The sphere should be examined visually for the presence of dust, sample particles, fibers, and excessive yellowing due to environmental influences. *This inspection should be performed frequently, especially if you measure loose materials.*

If you discover loose materials in the sphere, they should be removed. An optional accessory, the Minivac portable cleaning system is a useful tool for cleaning the sphere.



Operating the Minivac Portable Cleaning System

1. Configure the instrument so that the specular port is closed (**Specular Component Included**).
2. Remove the aperture plate from the front of the unit.



3. Look inside the sphere.

- Using the Minivac portable cleaning system, carefully vacuum away any loose materials in the sphere.



WARNING

Do not touch the inside of the sphere. The coating is very fragile.

- When finished, replace the aperture plate.

Tile Handling/Cleaning

Handling Tiles

- Handle calibration tiles with **extreme care**. Do not drop them, or scratch the glazed surface.
- Always grasp the tile using its edges.

Cleaning Tiles

- The calibration tiles should be cleaned before each use. Wiping it clean with a soft, lint-free cloth can do this.



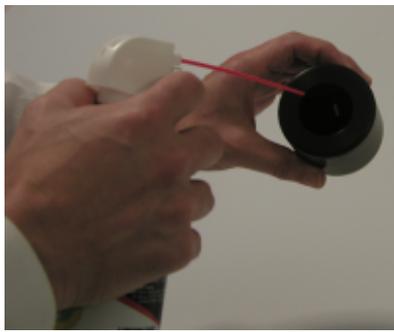
- A detergent, free of optical brighteners, fluorescent materials or photoactive dyes should be used as needed to clear any oils, fingerprints, or other deposits. Liquid dish detergent is a suitable detergent. The detergent/water solution should be prepared as follows: **1 part detergent : 250 parts water**. Use a few drops of the detergent solution to moisten a soft, lint-free cloth, and gently wipe the tile surface. Rinse the detergent from the tile by wiping it with a cloth, moistened with clean water.
- NEVER** use abrasive cleansers, razor blades, or other metal objects to remove dirt or foreign substances from the calibration tiles. This will damage the tile surface.
- NEVER** immerse the tiles in water.
- Tiles that have scratches, chips, abrasions or cracks must be replaced. Signs of wear on the tile surface will affect the accuracy of the calibration.

Storage

- Large temperature variations will affect the accuracy of your calibration, requiring more frequent calibration. The calibration tiles should be stored in an environment that simulates the temperature of the samples to be measured.
- Prolonged exposure to sunlight or other sources of ultra-violet radiation will cause the color of the tiles to change. The tiles should always be stored in a protective case or container away from direct sunlight and environmental contaminants.

Cleaning the Black Trap

The black trap should be kept dust-free. Dust accumulating in the black trap should be blown out with compressed air.



Cleaning the Spectralon® Plaque

This is the white plaque used for transmission calibration and measurement. It is an optical standard and should be handled in the same way as other optical standards. All efforts should be made to prevent contaminants from contacting the surface of the plaque. We recommend that you wear gloves when handling this plaque.

WARNING

Do NOT use Freon to air brush this plaque.

Cleaning Instructions

If the tile is lightly soiled, it may be air brushed with a jet of clean dry air or nitrogen. For heavier soil, the material can be cleaned using the following procedure:

1. Sand the surface under running water¹ with a 220 – 240 grit waterproof emery cloth, until the surface is totally hydrophobic (water beads and runs off immediately).
2. Blow dry with clean air or nitrogen, or allow the material to air dry.

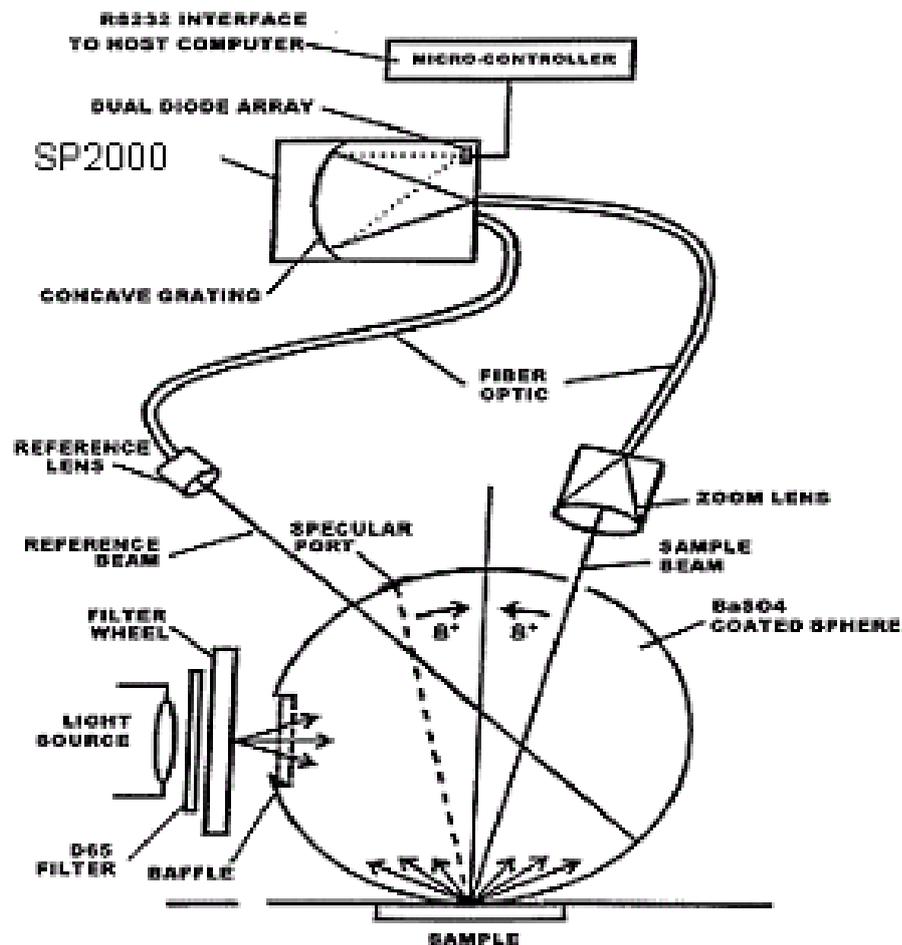
¹ Low reflectance Spectralon (<10% reflectance) should be dry sanded.

NOTES

Appendix

Optical Block Diagram

The same optical configuration is used for the Datacolor 650, 600 and 400:



Datacolor 650/600/400 Instrument Specifications

Specifications are subject to change without notice.

ITEM	DESCRIPTION	
Instrument Type	Dual beam integrating sphere with xenon flash lamp.	
Measuring Geometry	Diffuse illumination, 8° viewing in conformance with CIE publication No. 15.2 Colorimetry.	
Illumination Source	Pulsed xenon, filtered to approximate D65.	
Sphere Diameter	152 mm / 6.0 inches	
Specular Port	Automated specular included or specular excluded	
Spectral Analyzer	Proprietary SP 2000 analyzer with dual 256-diode array and high-resolution holographic grating.	
Wavelength Range	360 – 700nm	
Photometric Range	0 to 200%	
Black Trap	High performance	
Aperture Configuration	Large Area View. 30mm illuminated/ 26mm viewed Medium Area View. 20mm illuminated/ 16mm viewed Small Area View. 9mm illuminated/ 5mm viewed Ultra-Small Area View. 6.5mm illuminated/ 2.5mm viewed X-Ultra Small Area View*. 3mm illuminated/ 2.5mm viewed	
Power	85 to 264 VAC, 47 to 63 Hz, 80 VA peak, 35 VA typical	
Absolute Operating Environment	5° to 40° C, 5% to-85% RH, non-condensing	
Interface	Serial: RS232, 9600/115200 baud (shipped as 19200) USB: 1.1 or higher	
Dimensions**		
	English	Metric
<i>Height</i>	12-13/16 inches	325 mm
<i>Width</i>	12-5/16 inches	312 mm
<i>Depth</i>	18-5/8 inches	471 mm
<i>Weight</i>	33 lbs.	14.97 kg

* Sample translucency may affect inter-lens agreement

** Dimensions shown are for horizontal mount instruments. The dimensions for the Datacolor 600V and Datacolor 44V (vertical mounts) can be found in Appendix, Dimension Comparison Vertical vs. Horizontal Mount.

Features by Model

FEATURE	650	600	400
Reporting Interval	5 or 10nm**	5 or 10nm**	10nm
Effective Bandwidth	5 or 10nm**	5 or 10nm**	10nm
20 Read Repeatability on White Tile Using Dual Flash (CIELAB)	0.015 (max)	0.015 (max)	0.035 (max)
Inter-instrument Agreement—Reflectance Measurements* (CIEL*a*b*)	0.15 (max) 0.08 (avg)	0.15 (max) 0.08 (avg)	0.30 (max) 0.15 (avg)
Transmittance Measurements	Yes***	No	No
Inter-instrument Agreement for Regular Transmittance (550 nm)*	±0.20% at 85%T ±0.10% at 32% T	Not Available	Not Available
Inter-instrument Agreement for Diffuse Transmittance (550 nm)*	±.40% at 42% T	Not Available	Not Available
Inter-instrument Agreement for Transmission Haze Measurements*	±0.15% at 10% TH	Not Available	Not Available
Lens	4 position auto-zoom	4 position auto-zoom	3 position auto- zoom
Aperture Plates	4 standard LAV SAV USAV MAV barium coated 2 optional MAV XUSAV	3 standard LAV SAV USAV 2 optional MAV XUSAV	3 standard LAV SAV USAV 1 optional XUSAV
Aperture Detection	Yes	Yes	Not Available
Automated, adjustable UV Calibration	Yes	Yes	Optional
UV Cutoff Filters	400 nm 420 nm 460nm	400 nm 420 nm 460nm	Optional 400 nm 420 nm 460nm
Remote Measurement Button	Yes	Yes	Not Available
Vertical Mount****	No	Optional	Optional

* Measurements made at 23° C +/- 1° C.

** Software must be capable of 5nm reporting

*** Capable of measuring regular, total and diffuse transmission

**** Includes sample viewer assembly

Dimension Comparison - Horizontal vs. Vertical Mount

The Datacolor 600 V and Datacolor 400 V are vertically mounted, with the sample port facing down. This provides the option to present the sample to the instrument vertically. These models conform to all specifications for the Datacolor 600™ and Datacolor 400™, with the exception of the dimensions.

Below is a comparison of the dimension specifications for the horizontal and vertical mount instruments:

Datacolor 600™



Datacolor 600 V



	English	Metric		English	Metric
Height	13 in.	325 mm	Height	25 3/8 in.	644 mm
Width	12 5/16 in.	312 mm	Width	12 5/16 in.	312 mm
Depth	18 1/8 in.	471 mm	Depth	14 3/8 in.	371 mm
Weight	31 lbs.	14.85 kg	Weight	41 lbs.	18.45 kg

Optional Accessories

Compatible Models	Datacolor Part No.	Accessory
Datacolor 600, 650	3775-0260	MAV Aperture Plate
Datacolor 400, 600, 650	3775-0259	XUSAV Aperture Plate
Datacolor 400, 600, 650	1035-0004	Textile Skein Holder
Datacolor 400	1035-0186	Glass Aperture Plate - LAV
Datacolor 400	1035-0189	Textile Sample Holder - SAV
Datacolor 400	1035-0190	Textile Sample Holder - USAV
Datacolor 400	1035-0185	Carpet Tube Holder - LAV
Datacolor 400	1035-0188	Textile Sample Holder - LAV
Datacolor 400	1035-0191	Compression Sample Holder
Datacolor 650	2950-0004	10mm Transmission Cell
Datacolor 650, 600, 400	5400-0036	Minivac Portable Cleaning System

Miscellaneous Technical Information

System Requirements for USB Connection

Below are the software and firmware versions required to successfully connect a Datacolor instrument to a USB port.

Operating Systems	Windows 2000, Windows XP Pro
USB Firmware	1.1 or higher

RS-232C Connector Pin Assignments

Pin #	Purpose	Direction
2	Transmit data	Out (to host)
3	Receive data	In (from host)
7	Signal ground	

CAUTION

- (1) *DO NOT WIRE* to pins other than 2, 3, and 7.
(2) For all unused inputs, the default is active high.
-

Compliance Statements

FCC Compliance Statement

WARNING

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this User's manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian Compliance Statement

English

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Francais

El present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

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