

# VeriColor®

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## Solo Identification System



## Setup and Operator Manual





## CE Declaration

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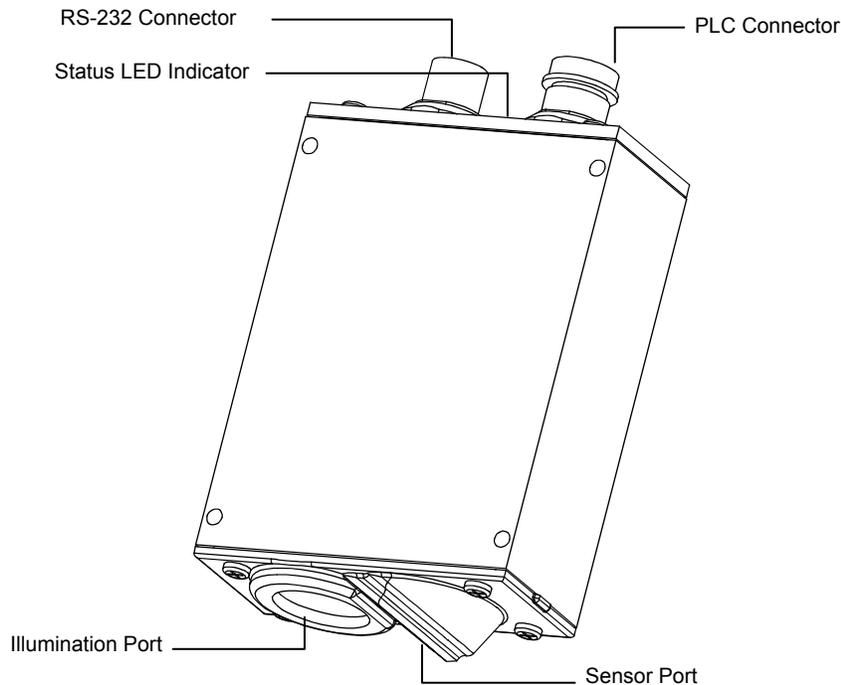
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# Overview and Setup

## Instrument Description

The *VeriColor® Solo Identification System* is used to evaluate and identify colors in an industrial type application. It provides the means necessary to learn (measure) standard colors and measure samples for comparison. The system uses these comparisons to determine the closest standard or pass/fail a sample based on a tolerance.

The Solo system is composed of two main components: the VeriColor Solo sensor head which stores standard colors and captures sample color, and the software application.



## Unpacking and Inspection

After removing the instrument from the shipping carton, inspect it for damage. If any damage has occurred during shipping, immediately contact the transportation company. Do not proceed with installation until the carrier's agent has inspected the damage.

Your instrument was packaged in a specially designed carton to assure against damage. If shipment is necessary, the instrument should be packaged in the original carton along with all the accessories. If the original carton is not available, contact X-Rite to have a replacement shipped to you.

### Packaging Contents:

- |   |                    |
|---|--------------------|
| • VeriColor Solo Instrument                     | P/N VCS50-00-01    |
| • 5 Meter Male 8-Circuit Open Ended Cable       | P/N SE108-EUR8-5M  |
| • 5 Meter Female 8-Circuit Open Ended/DB9 Cable | P/N VCS50-EUR8-5DB |
| • Alignment Tool                                | P/N VC50-803       |
| • Calibration Tool                              | P/N VC100-162      |
| • Targeting Stickers (4) Medium Spot            | P/N VC50-32        |
| • VeriColor Solo Application Software CD        | P/N VCS50-500-CD   |
| • Setup and Operation Manual                    | P/N VCS50-500      |
| • Registration Fax (multi-language)             | P/N SD01-99        |

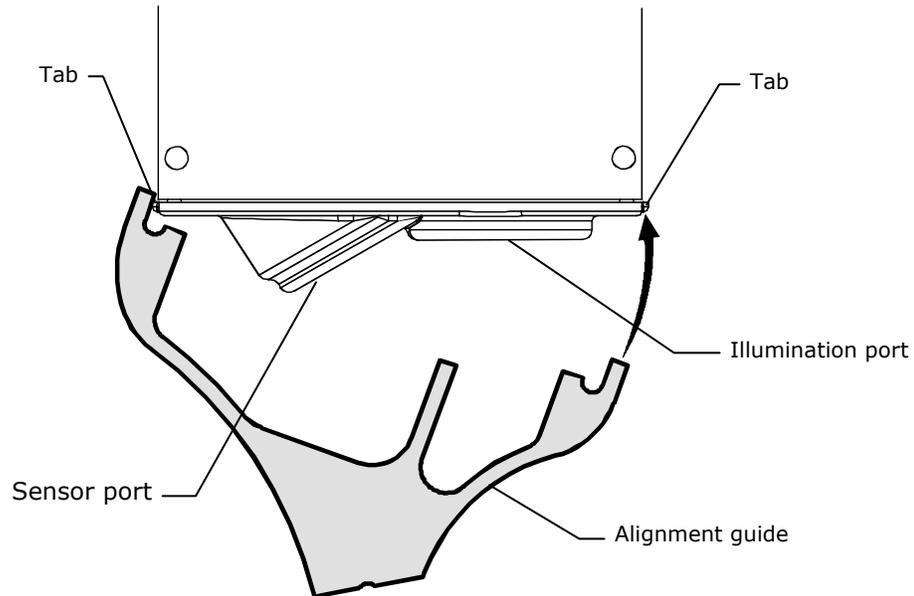
## Solo Installation

An alignment tool is provided with the Solo instrument to aid in the installation. The tool simply snaps into position, providing the required angle (30°) and height (1.40") needed for proper mounting.

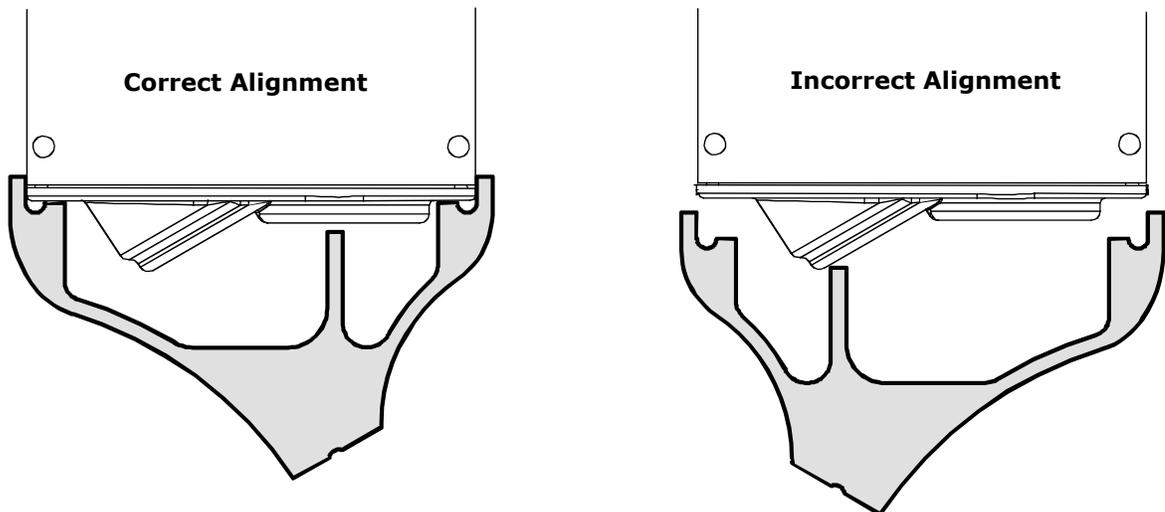
**CAUTION: Keep the sensor port lens and illumination port lens free from dust, smudge marks, and finger prints.**

### Attaching the Alignment Tool to the Solo Instrument

1. Position the end of the alignment tool shown over the tab on the sensor port side of the Solo instrument. The tab should insert into a slotted opening in the tool.
2. Rotate the other end of the tool upward until it snaps into place over the tab on the illumination port of the Solo instrument.

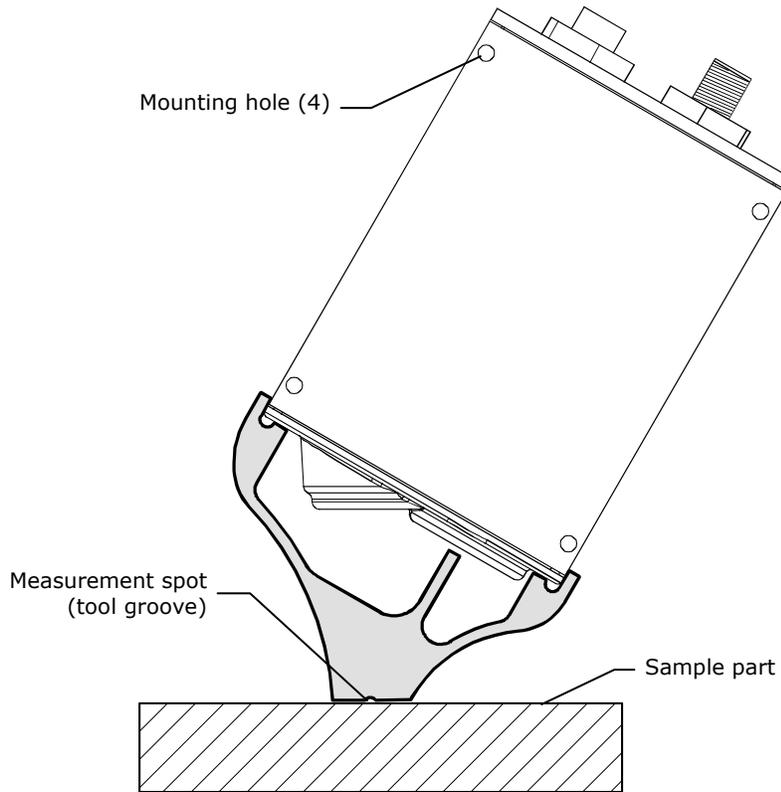


**NOTE:** The alignment tool will only install in one direction.

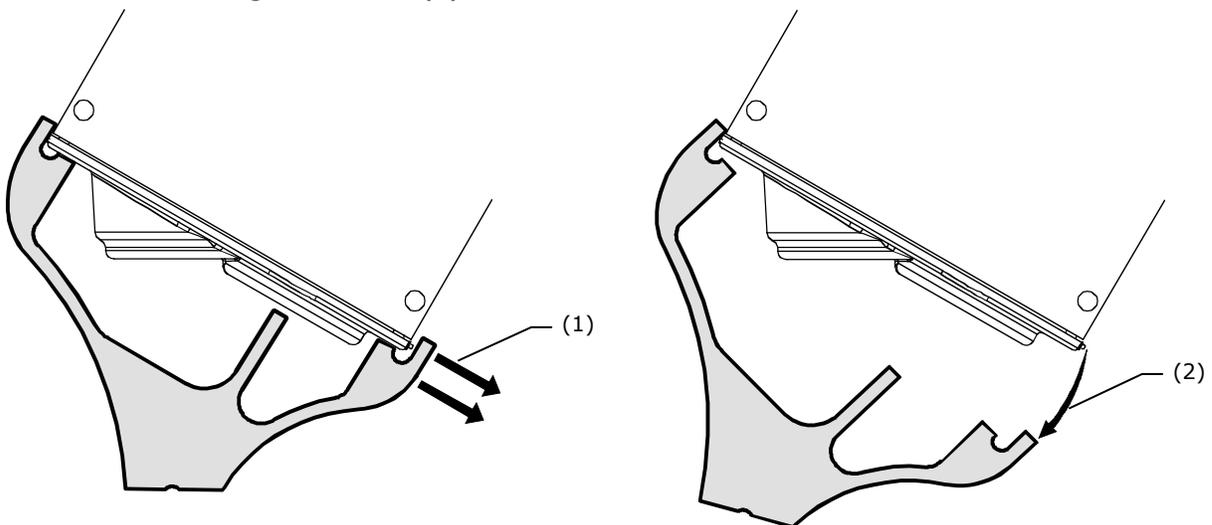


### Positioning the Solo Instrument with Alignment Tool

1. Locate the Solo instrument in the fixture with the flat surface of the alignment tool on the part to measure. Using the groove that runs along the bottom of the flat surface as a guide, position the solo instrument to the desired measurement spot. The groove is the location where the measurement will take place.
2. When the Solo instrument is properly located, secure it to the fixture using the four mounting holes. Remove the part from the fixture.

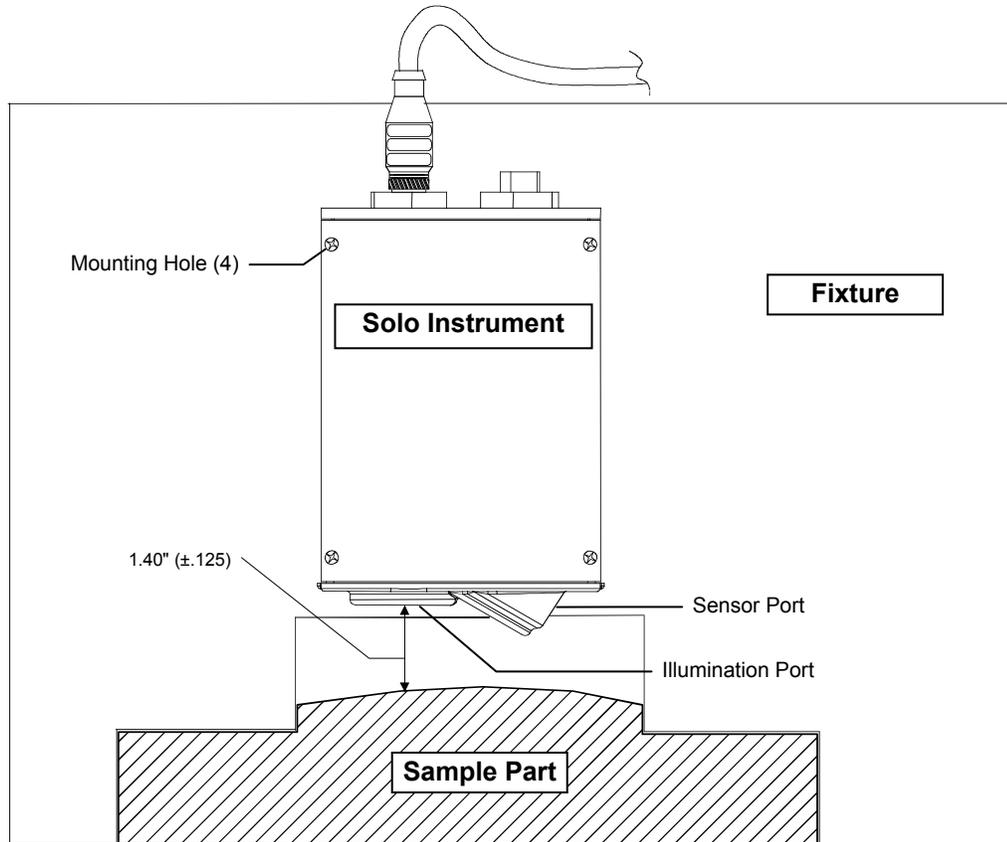


3. Remove the alignment tool by pulling outward (1) on the sensor port side of the tool and rotating downward (2).



## Vertical Mounting

As an alternative to tilted mounting, you can mount the Solo instrument in a vertical position. However, X-Rite recommends mounting the sensor head at a 30° angle utilizing the alignment tool.



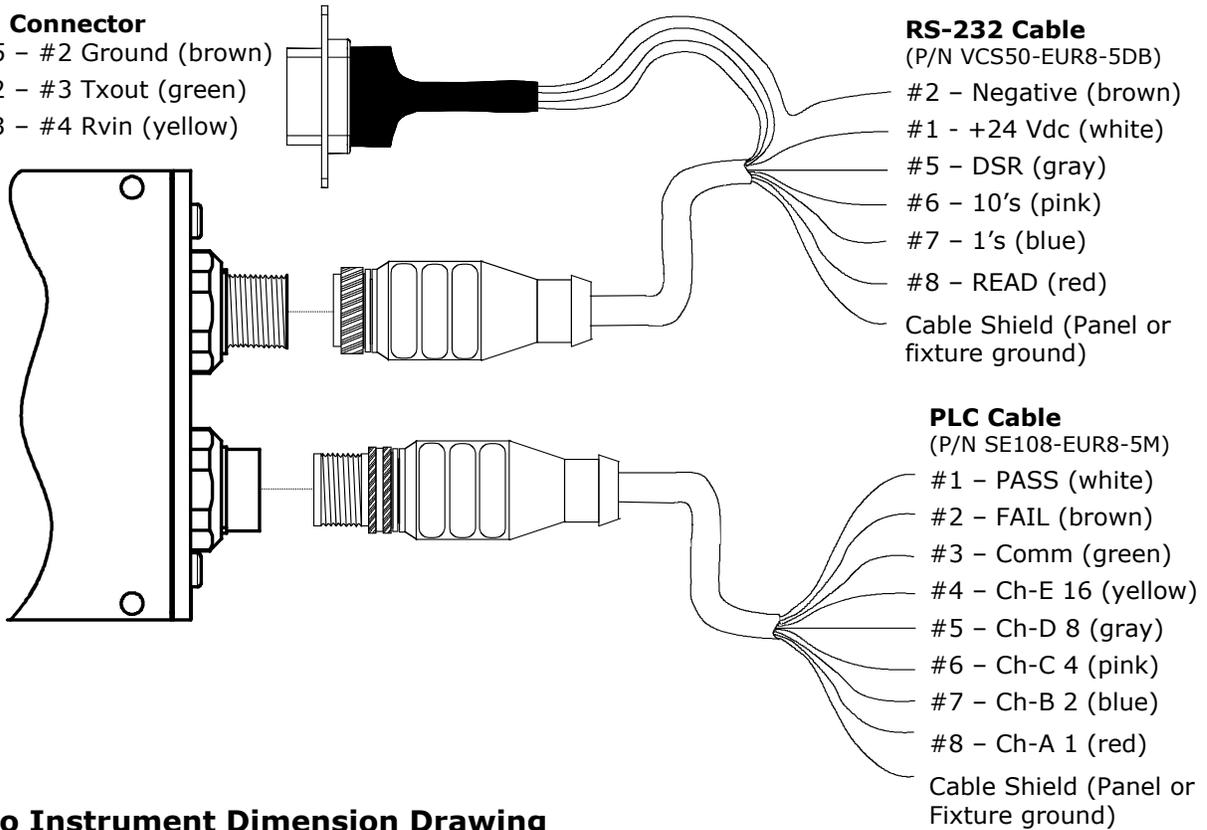
### Cable Connection and Wiring

1. Connect the female connector (P/N VCS50-EUR8-5DB) from the RS-232 interface cable to the Solo instrument and tighten.
2. Connect the male connector (P/N SE108-EUR8-5M) from the PLC interface cable to the Solo instrument and tighten.
3. Attach the individual wires to the terminals on the PLC and RS-232 connector (DB-9) as required. Refer to the wiring diagram below for details.

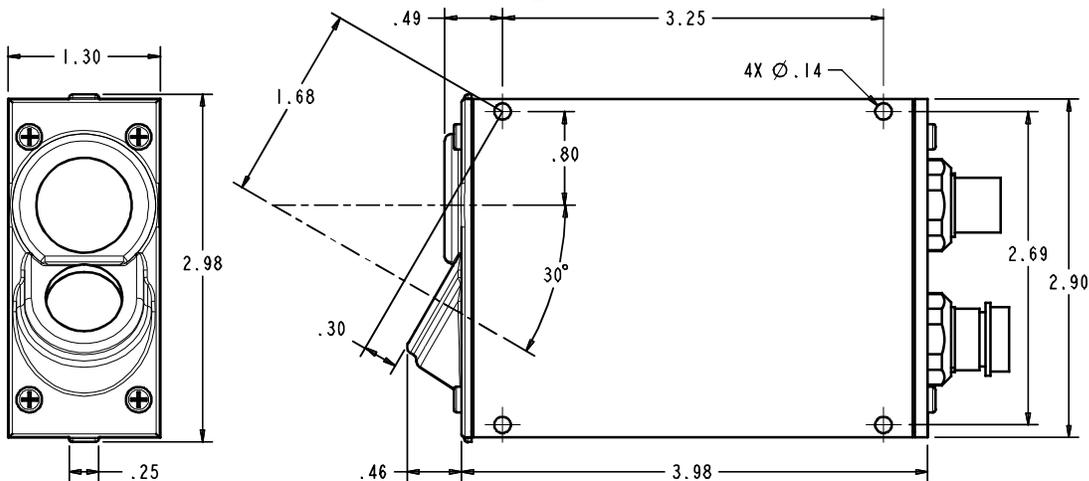
**See the Appendices (page 32) for a detailed electrical interface description.**

#### DB9 Connector

- Pin 5 - #2 Ground (brown)
- Pin 2 - #3 Txout (green)
- Pin 3 - #4 Rvin (yellow)



### Solo Instrument Dimension Drawing



## Hardware Interface Definitions

The Solo instrument communicates externally via PLC, serial communications, and an LED indicator. The following lists the available inputs and outputs.

### Inputs

#### Measurement Trigger

This input is used to prompt the Solo instrument to begin the measurement sequence immediately (or a specified pause). The type of measurement depends on the operation mode (during some instances this input will be ignored). Measurements can also be triggered by serial command.

#### Color Select

This input allows you to select the color ahead of time, before a measurement is taken. The process to use color select, is to activate it first, then toggle the 1's and/or 10's select inputs to arrive at the desired color number.

Each time the color select input is activated, new measurements are locked out and the color number starts at 0. If the color select input is released without changing the number, it will go back to the color number selected before the process was started.

#### 1's Select

This input can only be used while the color select input is being held active. During that time, each time this input is activated and released the color number will increment by 1. Example, if the color number is currently 4, after two toggles the color number will be 6. If the number is 19 then it would become 21 after two toggles. Since the Solo instrument stores a maximum of 30 colors, no number higher than 30 can be selected, even if additional increments to the input are made.

#### 10's Select

This operates much the same as the 1's input except it provides a way to select higher numbers quicker than the 1's input alone. For example, if you want to select color number 29, you would toggle the 10's input twice and the 1's input 9 times.

### Outputs

#### Pass

This output indicates that the last sample measurement(s) was determined to be within the active tolerance for the selected color.

This output defaults to NO (normally open) operation, but can be switched to NC (normally closed) operation with a configuration setting. This setting affects all output operation as follows.

#### Fail

This output indicates that the last sample measurement(s) had a greater color difference than the active tolerance for the selected Color allowed.

Like Pass, this output defaults to NO (normally open) operation but can be switched to NC.

#### Programmable Output Ports (5 bits)

This output is solely used to portray the color number in binary format.

Like Pass and Fail outputs, the operation of these outputs default to NO operation and can be configured to NC.

## Status LED Indicator

On the back plate of the Solo instrument is an LED indicator capable of displaying three colors, Green, Amber and Red. In some cases the LED will flash, but most of the time it will remain on. This LED is simply an indicator to give you "at a glance" the overall status of the instrument. A description of each color status is listed below.

**Off** – This generally means the Solo instrument has no or insufficient power.

**Flashing Amber** – When the instrument is first powered up, it will slowly flash while undergoing system test, and waiting for the illumination LED pack to warm up to temperature.

**Solid Green** – indicates the instrument is ready and waiting for further input (discrete input or serial port).

**Solid Amber** – indicates the instrument is busy and performing a requested task. Whenever a PLC input or serial command is being processed, the status light should remain amber until it is ready for the next request.

**Solid Red** – indicates system error/failure. If this occurs then the instrument is not functioning and cannot be used until the problem is resolved.

## VeriColor Solo Software Application

The VeriColor Solo system includes an application utility that provides an interface for the Solo instrument. The application (VeriColor Solo) is used to configure the instrument, store projects which consist of standard colors, and provide visual feedback of sample measurements.

Before installing the software, make sure the Solo Instrument is set up as explained earlier and the cable is connected to an RS-232 port on the computer.

### Basic System Requirements

- PC Windows Application (2000 or greater)
- Minimum Screen resolution (800x600)

### Installing the Software

The software uses a standard Windows installation procedure.

1. Insert the software CD into your computer's CD-ROM drive. The setup should start automatically. If it does not start automatically, double-click the **setup.exe** file on the CD.
2. The setup program guides you through the rest of the installation process. Follow the instructions on each setup screen to complete the installation.

### Starting the Application

The software application can be launched using the "VeriColor Solo" short-cut on your desktop or from within the Programs> VeriColor Solo application group.



(First screen that appears when the application is started)

The following pages provide you with a detailed overview of the software application. You can also refer to the on-line help system within the application for operation instruction. The help system can be accessed at any point in the application by clicking the Help button at the top of the screen.

Refer to the Operation section for information using the application with the VeriColor Solo instrument.

## Application Modes

The VeriColor Solo application is divided into six main modes, which are navigated by using the six buttons located at the top of the screen.

- **Connect** – used to establish connection to the VeriColor Solo instrument
- **Monitor** – used to monitor the sample measurements after the system is set up
- **Compare** – used to compare sample measurements without storing sample data
- **Setup** – used to create projects and color standards
- **Tools** – used to access the device Name, targeting, calibration, log file, etc.
- **Help** – used to access online help for the displayed dialog

## Connect Mode

The Connect screen is used to select the communication port where the VeriColor Solo instrument is connected, and to perform off-line browsing.

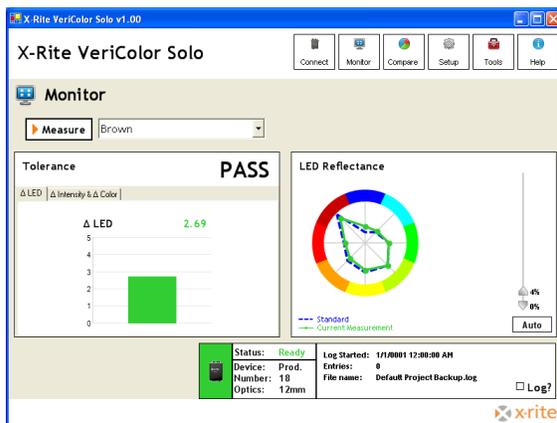


Communication is established by selecting the known COM port using the **Serial Port** control and baud rate using the **Baud Rate** control. After selecting **OK**, the Monitor screen opens.

The Off-line Browsing control is used to select a device and project for viewing.

## Monitor Mode

The Monitor screen is the “main” mode of the application. The Monitor mode is used to view measurement performance once the standard colors are setup. Sample results from measurements activated remotely also appear on this screen.



**Measure**

The Measure button is used to activate a measurement by the Solo instrument.

**Standard Selection**

The current standard used by the Solo instrument is displayed at the top-left portion of the screen. The same control can be used to select a different standard if more than one exists in the current project.

**ΔLED, ΔIntensity, and ΔColor Bar Graphs**

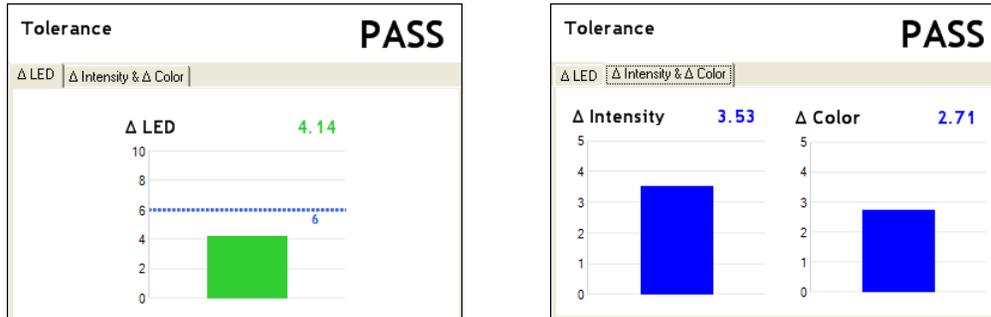
The bar graphs display ΔLED or ΔIntensity and ΔColor values between the current sample and standard. The graph defaults to ΔLED or ΔColor & ΔIntensity. This is dependent on the current standard’s active tolerance. You can switch between graph modes by clicking on either tab at the top of the graph.

- **LED** represents the total color difference from a learned standard (similar to LAB ΔE)
- **Intensity** represents the difference in light/dark, black/white, or changes in gloss and/or appearance
- **Color** represents the difference from a learned standard moving in any direction to red/green or blue/yellow (change in color hue)

Intensity and Color mode would be used when measuring parts that have the most variable intensity changes, such as textiles.

Each graph contains a colored bar with a dotted tolerance line. The bar is the value and the dotted line represents the current tolerance value. The bar’s color can be green (Pass), red (Fail) or blue (no tolerance).

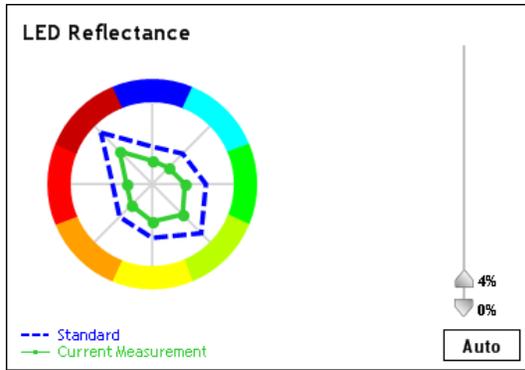
These graphs are automatically scaled depending on the circumstance. For most cases, the graph is scaled to the tolerance or value, whichever is greater. There are a couple exceptions to this rule but they will be described in each mode.



**Color Wheel**

The color wheel allows direct comparison between the standard and sample measurements. The color wheel utilizes automatic and manual controls for adjusting the scaling of the standard and sample. In auto mode each new measurement adjusts the scale automatically. If one of the scaling arrows is scrolled, the graph updates as the bar is moved. This causes the auto button to turn off.

The center point of the circle represents the origin or the bottom range of the scale, while the color bars at the edges represent the top range. The greatest benefit of graphing two colors at once is that it gives you the ability to discern color differences (bluer, darker, greener, etc).



### Status

The status of the Solo instrument is displayed in a box at the bottom of screen. The background color reflects the state of the instrument.

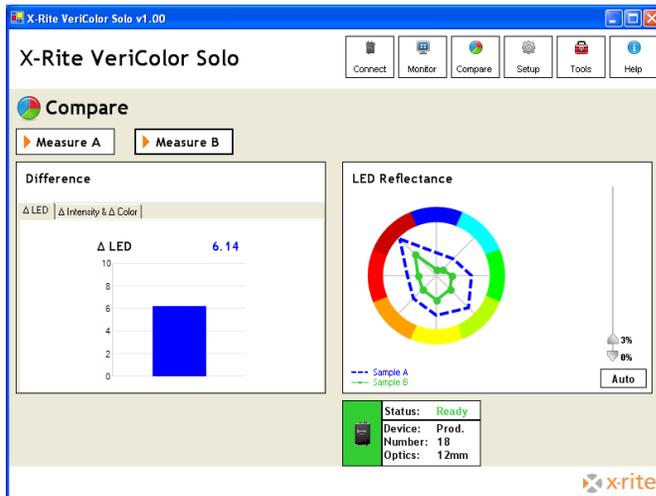
- **Green** = ready
- **Yellow** = warming up
- **Red** = system error

### Log

Current log information is displayed in a box at the bottom of the screen. Check the Log box to turn logging on.

### Compare Mode

The Compare mode is useful for quickly determining the color difference between two separate measurements. Measurements taken on this screen do not affect the current setup, log file, or require the Solo instrument to be setup with a project.



### Measure A and Measure B

A measurement taken using the Measure A button is displayed as Sample A data, and a measurement taken using the Measure B button is displayed as Sample B data. The results displayed is the difference between Sample A and Sample B. The last measurement taken using either button remains current until the application is restarted.

### Bar Graphs and Color Wheel

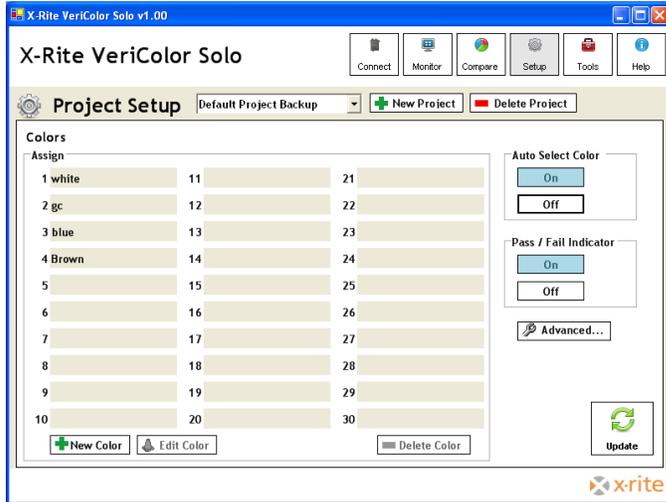
The bar graphs display the same as in the Monitor mode without tolerancing. The color wheel controls are the same as on the Monitor screen.

## Status

The status box displays works the same as on the Monitor screen.

## Setup Mode

The Setup mode is used to create, edit and delete projects. A single project can consist of up to 30 standard colors and configuration settings. Once created, a project is downloaded and stored in the Solo instrument. Once the Solo Instrument is programmed with a project, it can execute independent of the software application.



## Project Selection

The current project name is displayed at the top portion of the screen. The same control can be used to select a different project if more than one exists.

## New Project

The New Project button is used to create a new project. Once clicked, you are prompted to enter a new project name.

## Delete Project

The Delete Project button is used to delete the currently selected project. Deleted projects cannot be restored.

## Assign Color Fields

The Assign fields display the standard color names for the project. Each project may contain up to 30 standards.

## New Color

The New Color button opens the Project Setup screen where the standard is learned (see New Color Learn). This procedure is repeated for each new standard created.

## Edit Color

The Edit Color button is used to open the learn screen for the selected standard. From here, measurement can be taken for the existing standard.

## Delete Color

The Delete Color button is used to delete the selected standard color. Deleted colors cannot be restored.

## Auto Select Color

The Auto Select Color option allows the Solo instrument to select the closest standard color from the list of standards during sample measurements. Selecting On activates this option and selecting Off requires you to manually select the standard before a sample measurement.

**NOTE: The software uses the LED method when searching for the closest color from the saved standards.**

### Pass/Fail Indicator

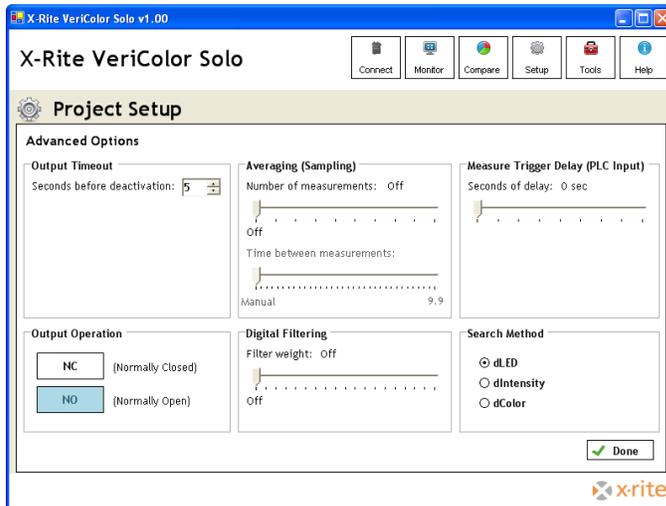
The Pass/Fail Indicator option is used to assign a pass or fail status to each sample measurement, based on the tolerancing. Selecting On activates this option and selecting Off disables this option.

### Update

The Update button downloads the selected project to the Solo instrument.

### Advanced Options

The Advanced button opens the Advanced Options screen where additional options for the selected project can be set. After the options are set, the Done button is clicked to return you back to the main project screen.



### Output Timeout

Determines how long the instrument holds its outputs active after a measurement occurs. The control can be adjusted from 0 to 99 seconds.

### Averaging (Sampling)

Determines the amount of measurement taken to obtain an average, and how much time elapses between measurements. The averaging control can be turned off, or adjusted from 2 to 10 measurements to average. Time delayed between measurements can be set from Manual to 9.9 seconds. When the control is set to Manual, the Measure button must be clicked to take the measurement. When set to a time increment, the Solo instrument will pause between measurements.

### Measure Trigger Delay (PLC input)

Determines the amount of time the Solo instrument will "pause" after seeing the measurement input go activate (discrete input only). This occurs before an actual measurement is taken. The control can be adjusted from 0 to 2.0 seconds.

### Output Operation

Determines the normal operation state of the instrument outputs. Setting can be toggled between normally closed and normally open.

### Digital Filtering

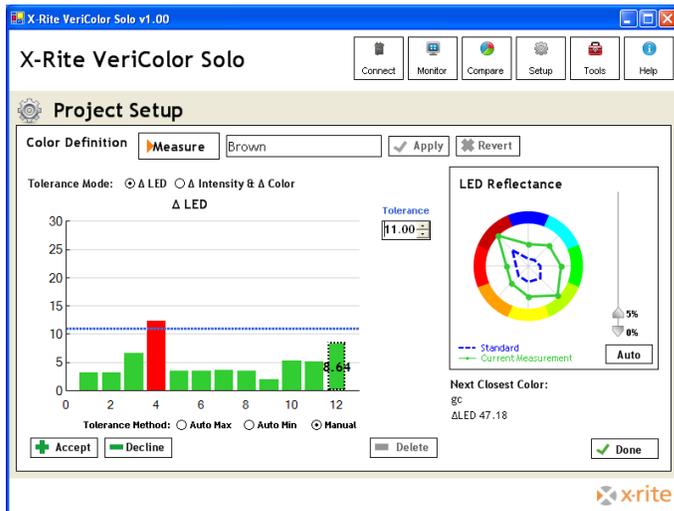
The Digital Filtering option is an alternative to simply averaging a set of readings. This method applies a weighting factor across multiple readings. It ranges from 3 to 20 and, when active in the application, is indicated within the sensor status panel.

## Search Method

Determines which math formula is used by the software and the Solo instrument to find the next closest color. The instrument uses it for determining the closest color after a measurement, and the software uses this setting during the Learn mode (to help with Auto Max tolerancing).

## New Color Learn

This screen appears when the New Color button is clicked. This screen allows you to take several measurements that are averaged together to represent a standard color. You can work with a history of up to 30 measurements and determine which ones are used to average into the standard. The standard name and tolerancing parameters are also assigned on this screen. After the standard is set, the Done button is clicked to return you back to the main project screen.



## Measure

The Measure button is used to activate a measurement by the Solo instrument on the standard. Each time the button is clicked, a measurement is taken and results are appended to the end of the bar graph and automatically accepted. The new measurement becomes the selected measurement and all graphs are updated.

## New Color

This field is used to enter a name for the standard color that is to be measured. Once completed, this name appears in the Assign list of the main Project screen.

## Accept/Decline

The Accept and Decline buttons are used to characterize each measurement as counting towards the standard color or not. Accepted readings are displayed in green or red (if they exceed the tolerance value) on the bar graph, while declined measurements are displayed as gray bars. Simply click the measurement in the graph and select either button. Once a measurement is selected in the graph, the color wheel graph updates to show the selected reading versus the calculated standard color.

## Delete

The Delete button is used to remove the selected measurement from the bar graph.

## Tolerancing

The tolerance bar and dotted line on the graph represent the tolerance value. There are three tolerancing methods that you can choose from for the standard.

### Auto Max

This tolerance is determined by setting a mid point to the next closest Color existing in the project. The area below the color wheel graph contains information on how far or

close the next closest color is. This is the default method, and allows the most buffer space between colors in a project and is suggested for beginning users simply trying to identify colors.

**Auto Min**

This tolerance is determined by a certain margin over the worst deviating measurement vs. the standard. This would be used if you have a certain acceptable production color variation but want to catch parts that were off color.

**Manual**

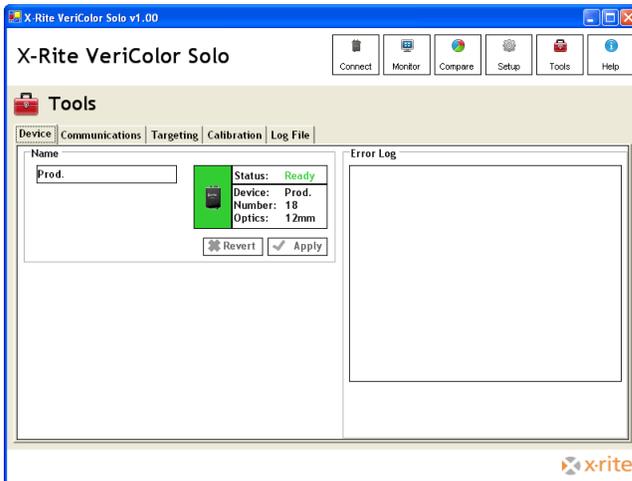
This setting allows you to manually set the tolerance by clicking in the field and entering a value.

**Tools Mode**

The Tools mode is used to access instrument information, communication setup, targeting procedure, calibration procedure, and the log file.

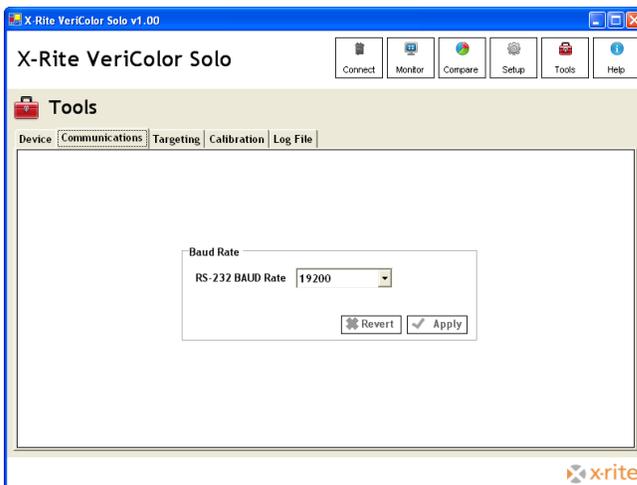
**Device Screen**

The device screen provides the system status and the ability to edit the instrument’s name. Enter a name in the name field and click Apply. It also provides you with a method to revert instrument’s name back after it’s changed.



**Communication Screen**

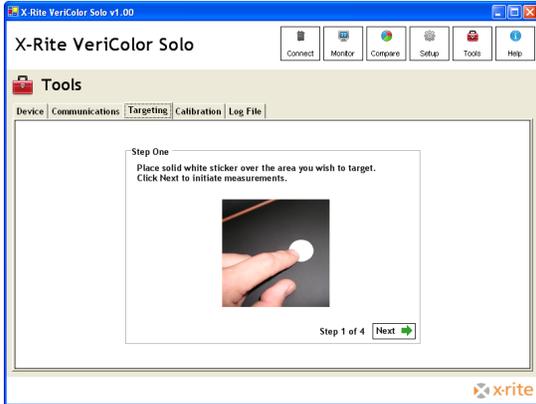
This communication screen is used to change the current BAUD rate. Select the rate from the RS-232 BAUD Rate control and click Apply.



### Targeting Screen

The targeting screen is basically a “wizard” format that takes you through a number of steps required to verify sensor positioning on a part.

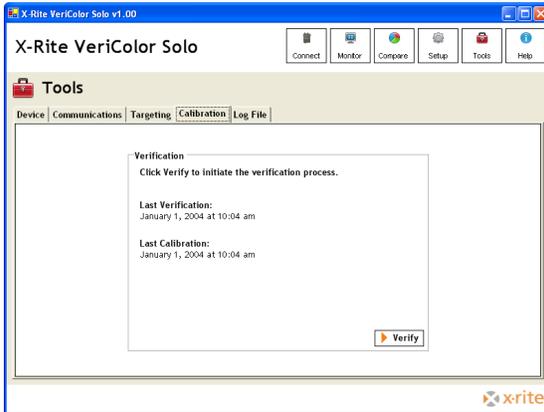
Targeting the Solo instrument in conjunction with the software application will be covered in greater detail in the Operation section of this document.



### Calibration Screen

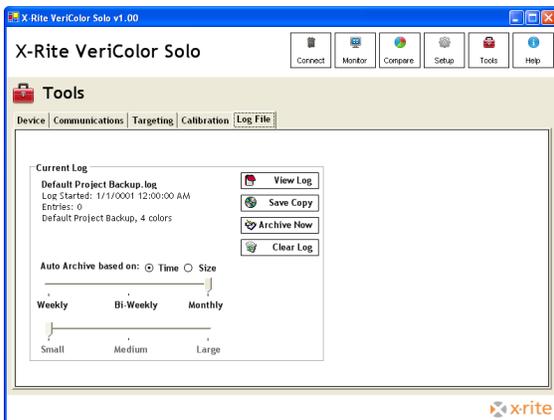
The calibration screen is used to verify instrument performance and calibrate the Solo instrument if needed.

Verifying instrument performance and calibration will be covered in greater detail in the Operation section of this document.



### Log File Screen

The log file screen displays details on the log file. You can view, archive, and delete the current log as well as preexisting files.



### **Current Log Information**

The Current Log area of the screen defaults to the log file in use by the current project in the Solo instrument.

### **View Log**

The View Log button launches an Excel viewer of the current log file.

### **Clear Log**

The Clear Log button empties the current log information. Deleted log files cannot be restored.

### **Auto Archive Control**

The Auto Archive control allows you to determine how frequently log files are automatically archived to the hard drive and a new one started. Log file names are based on the project name and current date. The directory name is based on the Solo instrument serial number. You can archive based on time (weekly, bi-weekly or monthly) or size (small, medium or large).

### **Archive Now**

The Archive Now button allows you to manually archive the current log file at anytime. You can rename the file if desired and determine where it should be saved.

### **Save Copy**

The Save Copy button allows you to save a copy of the current log file.

## Operation

This section will guide you through the requirements for learning standards, monitoring samples, targeting, and verifying calibration. As mentioned earlier, you can also access specific information on the application utilizing the online help system.

### Learning Standard Colors

Learning is the method of measuring a part that is used as standard color for sample comparison. Up to 30 standard colors can be learned and saved in a project for downloading to the Solo instrument.

**NOTE:** When operating in environments above 40°C, the instrument should be calibrated and standards should be learned at the operating temperature to maintain best performance and color resolution.

#### Important Learn Mode Notes

As long as the fixture is repeatable (parts placed in the fixture are held in the same position consistently) one measurement per part should be adequate. Repeated measurements of the same part without moving/replacing is unnecessary.

Ideally, the part should be taken in and out of the fixture several times and measured to take into account any positional variations. This does not mean that the part should move freely under the head while measuring various spots. The area measured should be held consistently.

Identical parts from different lots should also be measured in case their colors vary slightly between production runs.

1. Start the application and select the **Setup** screen.
2. Setup new project and configure options. See previous section for information on performing these tasks.
3. Click **New Color** and enter standard color name.
4. Position the part in the fixture that is to be used for a standard.
5. Click the **Measure** button to take the measurement.
6. Reposition the part (or position a different part) and take additional measurements.
7. Select the desired tolerancing method and accept or decline measurement as needed.
8. When you have finished measuring the standard to achieve an average, click Done to return to the main project setup screen.
9. Continue with the next standard by placing the part in the fixture and entering a name.

## Monitoring Sample Colors

Use the Monitor screen to measure sample parts and monitor the Pass/fail status.

1. Start the application and select the **Monitor** screen.
2. Verify the correct project is selected. If not, select the desired project from the Setup screen and click the **Update** button to upload the project to the instrument.
3. If auto color is not used, select the standard color that will be used for sample comparison.
4. Position the sample in the fixture.
5. Click the **Measure** button to measure the sample. The software will automatically select the closest standard from the project (if auto color is activated), and display the result in bar graph and color wheel.
6. Remove the sample and continue with additional sample parts.

## Targeting Mode

Because the Solo instrument over illuminates, it is sometime difficult to tell exactly where the instrument is viewing to determine color. This is particular true for small part measurements.

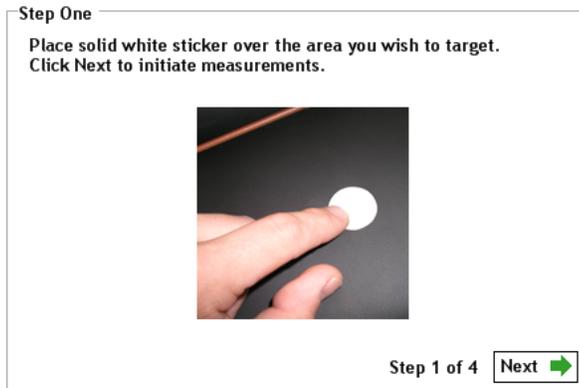
Targeting a part is the method of adjusting the sensor head on the fixture to the required position for part measurements. Performing the targeting procedure is only needed if the location of the part to be measured is critical. For example, the measurement area is small or very close to the spot size of the sensor head.

### Important Targeting Mode Notes:

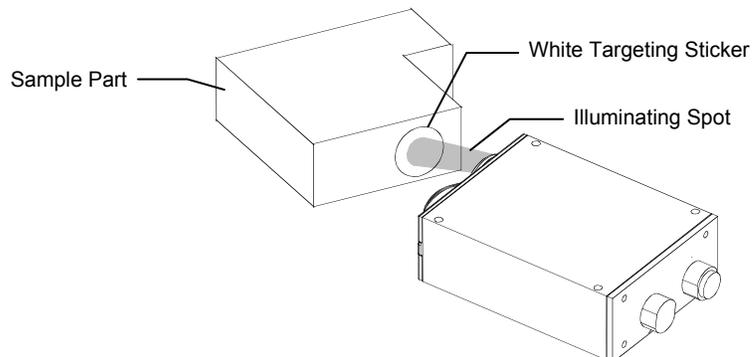
Before leaving target mode, test the fixture's alignment and repeatability by removing and installing the sample several times as done in a production environment. If the  $\Delta$ LED's value differs significantly when the part is placed in and out, then the fixture needs to become more precise. Otherwise, the results will be unsatisfactory.

Each time targeting mode is started, the instrument will need to relearn the (white sticker only) target.

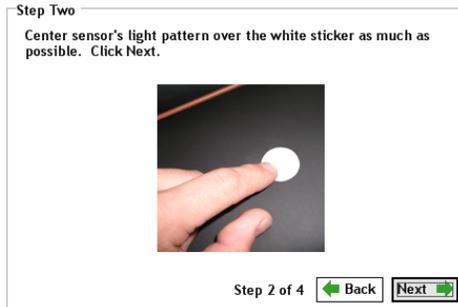
1. Start the application; select the **Tools** screen and then the **Targeting** screen.
2. Place the white sticker over the target area of the part you intend on measuring.
3. Place the part in the fixture to begin targeting.
4. Click **Next** on Step One screen to start the continuous measurement sequence.



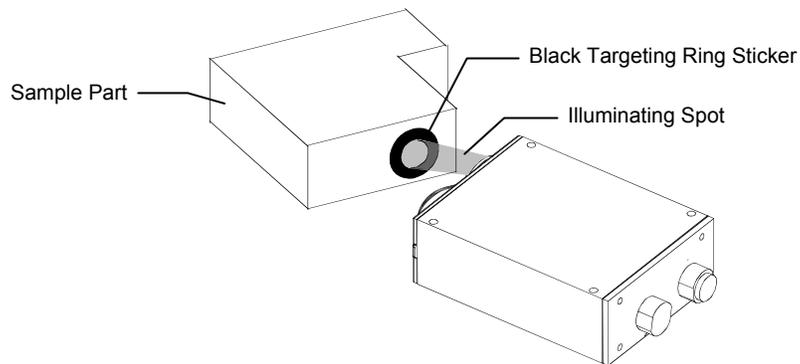
5. Without disturbing the pre-aligned height and angle position of the Solo instrument, carefully adjust the sensor head (x and y coordinates) so the flashing spot is centered in the middle of the white sticker.



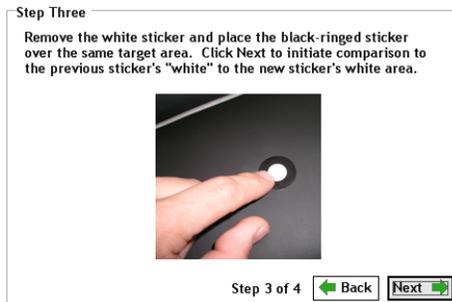
- After the desired positioning is achieved, click **Next** on Step Two screen. This takes the last measurement and saves it as the target value for the Solo instrument.



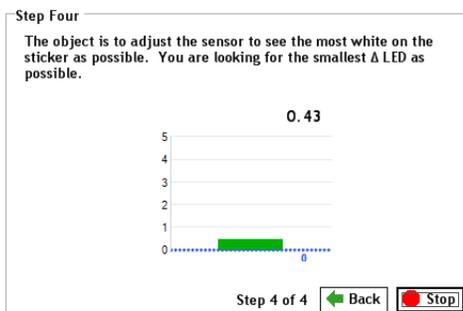
- Remove the part from the fixture and remove the white sticker. Place the black ring sticker in the same location. The black ring is used to help "fine tune" the alignment.



- Place the part back in the fixture and click **Next** on the Step Three screen.



- View the bar graph on the Step Four screen. If the  $\Delta$ LED value has increased, you will need to fine tune the Solo instrument. This is due to the fact that the flashing spot from the Solo instrument may be measuring part of the black outer ring. If this occurs, fine tune the sensor head to get the smallest  $\Delta$ LED value possible. Be careful not to change the sensor head's height and angle adjustment. A  $\Delta$ LED value of 1.0 or under should be achievable.



- After the Solo instrument is targeted, click **Stop** to exit targeting mode.

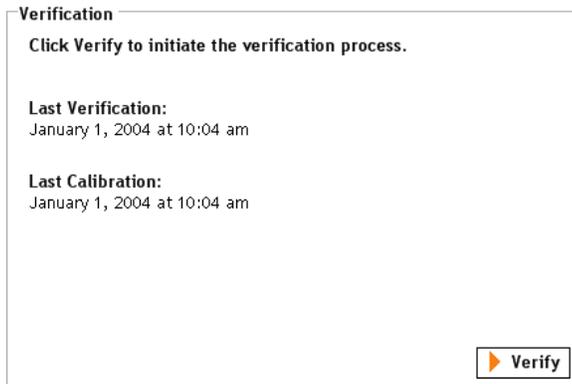
## Calibration/Verification Mode

The Solo instrument comes with a calibration tool that is used to verify measurement performance and for calibrating the device if needed. Calibration should be verified anytime measurement performance is in question. Poor measurement performance can be caused by dust or dirt on the sensor port. Refer to the Cleaning section later in this document for procedure on cleaning the Solo instrument.

**NOTE:** When operating in environments above 40°C, the instrument should be calibrated and standards should be learned at the operating temperature to maintain best performance and color resolution.

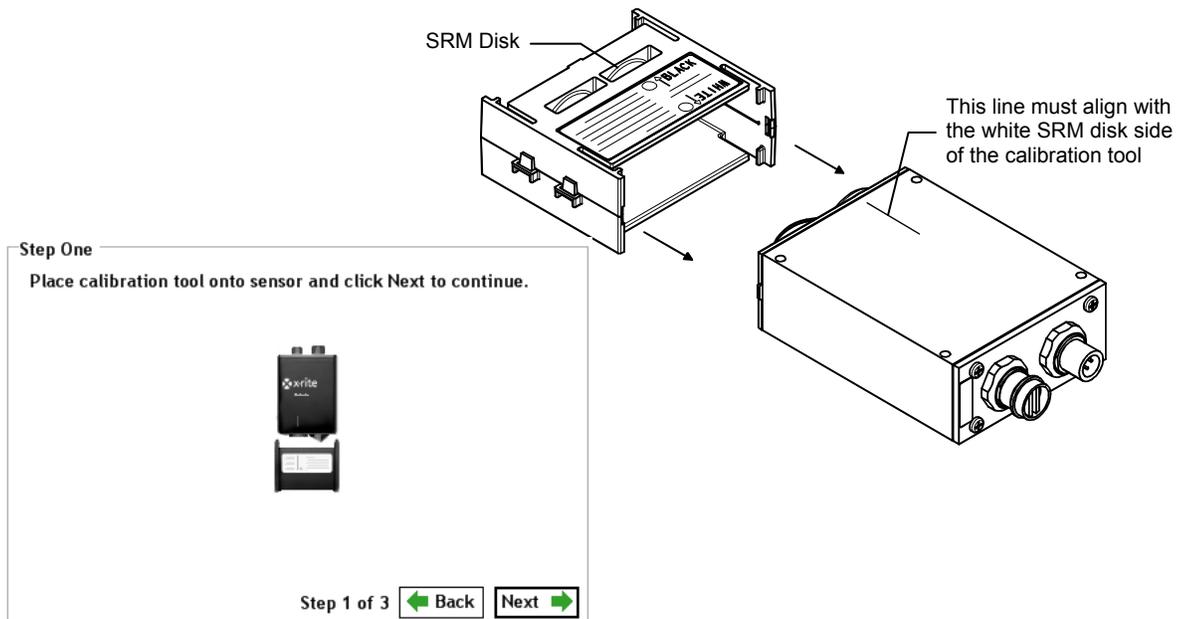
**IMPORTANT:** Do not touch the white SRM disk inside the calibration tool. It must be kept clean to ensure accurate measurements. Always store the calibration tool in its bag when not in use.

1. Start the application; select the **Tools** screen and then the Calibration screen.
2. The first screen lists information on when the last verification and calibration were performed by the Solo instrument. Click **Verify** to begin the verification process.

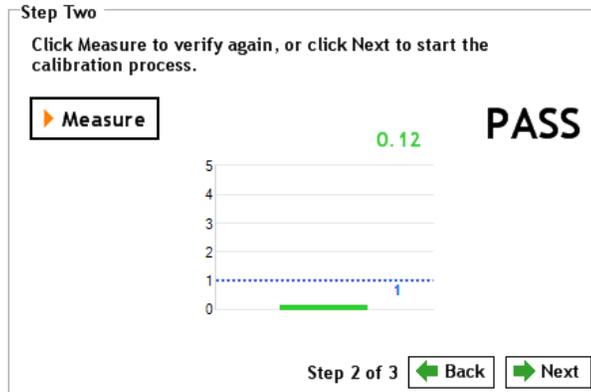


3. Snap the “white” end of the calibration tool onto the optics end of the Solo instrument. Make sure that the white disk is located directly below the illumination port. The illumination port can be identified by the line that runs along the side of the Solo instrument.

After the tool is properly positioned, click **Next** on Step One screen.



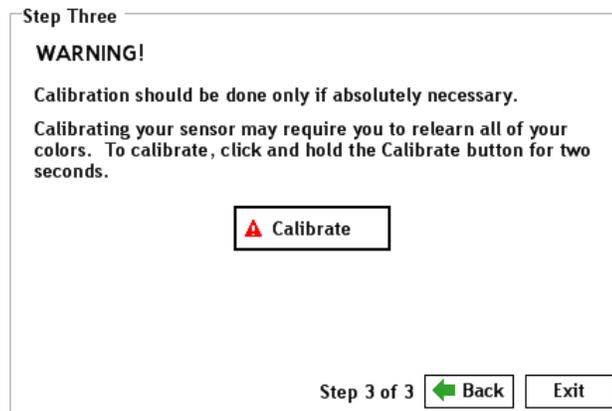
- Click **Measure** on the Step Two screen. The  $\Delta$ LED bar graph appears and a PASS or FAIL status is indicated. The tolerancing can be changed by clicking on tolerance arrow and entering a value. You can also click the tolerance arrow and drag it up and down to the desired level. Each time the Measure button is clicked, a new verification test is performed.



- If the verification passed, remove the calibration tool and exit out of the verification procedure.  
If a failure occurred, make sure the calibration tool is on correctly and that the SRM disk inside the tool is clean. You may also want to clean the illumination port and sensor port on the Solo instrument. Refer to the General Maintenance section for cleaning procedures.  
After checking the tool and cleaning the instrument, click **Measure** again to verify calibration. If a failure still occurs, a calibration will be required. Advance to Step 6.
- Click the Next on the Step Two screen to advance to the Step Three screen where calibration is performed.

**IMPORTANT: Calibration should only be performed if absolutely necessary. Calibrating the Solo instrument may require stored standard colors to be relearned.**

- Click and hold **Calibrate** on the Step Three screen for at least 2 seconds.



- Release the Calibrate button after Calibration is completed appears on the screen. The display returns to the first screen of the calibration.

## **General Maintenance**

### **Repair Information**

The VeriColor Solo Identification system is covered by a one-year limited warranty and should be referred to the factory or an authorized service center for repairs within the warranty period. Attempts to make repairs within this time frame may void the warranty.

X-Rite provides a factory repair service to their customers. Because of the complexity of the circuitry, all repairs should be referred to the factory or an authorized service center (call: 1 800 248 9748).

X-Rite will repair any instrument past warranty. Shipping cost to the factory or authorized service center shall be paid by the customer.

### **Cleaning the Solo Instrument Lenses**

Normally, use low-pressure air to blow away any dust or debris on the lenses (or use a soft lens brush).

To remove dirt or finger prints, clean with a soft cotton cloth rubbing in a circular motion. Use of a coarse cloth or unnecessary rubbing may scratch the lens surface and eventually cause permanent damage.

For a more thorough cleaning, photographic lens tissue and photographic-type lens cleaning fluid or isopropyl alcohol may be used. Always apply the fluid to the cleaning cloth – never directly on the lens.

### **Cleaning the Calibration Tool**

Caution should be used not to touch the SRM disk.

ONLY use clean, dry compressed air to remove any contaminants from the SRM disk in the calibration tool.

Store the calibration tool in the bag provided when not in use.

## Hardware Troubleshooting

This section deals primarily with troubleshooting problems with the PLC discrete inputs.

Problem	Topic	Explanation/Solution
Solo will not power up.	Improper power connection.	Terminal screws not tightened firmly on wires.
		Terminal not plugged in properly.
		Loose or broken power wires.
		Contamination has entered the terminal and is preventing a reliable connection.
	Over-current situation caused by a short or overload. Re-settable fuse opens.	Fix the short or overload problem, wait a little bit and re-apply power.
Over-voltage situation (exceeds 30VDC). Re-settable fuse opens.	Voltage spec is 24V +/- 10%. Correct voltage supplied to Solo and then re-apply power.	
Power supply does not provide enough current at power-up.	Make sure power supply can provide at least 250mA at start up.	
"Read" input does not work, system does not measure.	LED indicator light does not work (solid amber) with input.	Instrument may have just powered up and is still trying to initialize (flashing amber). Wait until the Solo instrument indicates a solid "green" before attempting to measure.
Problems getting discrete inputs to work.	Most often the problem would be wiring/electrical problems. Each input has a corresponding LED that will light when the input is active.	Terminal screws not tightened firmly on wires, or loose or broken wires.
		Providing voltage DC or otherwise to the input is not correct. Activating an input entails pulling it low, usually with a ground connection in the input terminal block.
		Supplying too much DC voltage or AC can cause damage to the circuitry. Instrument will need service.
		Inputs need to be held low for at least 100ms. If the instrument is already busy with a previous command, the input pulse may be missed, as inputs are not buffered. It's OK to hold down an input until an action is observed. Another action won't be executed until that input has been released.

<b>Problem</b>	<b>Topic</b>	<b>Explanation/Solution</b>
Problems with discrete Outputs.	Wiring/Electrical problems.  See page 8 for electrical wiring diagram.	Terminal screws not tightened firmly on wires.
		Terminal not plugged in properly.
		Loose or broken power wires.
		Contamination has entered the terminal and is preventing a reliable connection.
Instrument will not communicate.	Check cables first. It might be a quick fix and are the cheapest parts to replace.	Go over the entire system looking for loose or obviously damaged cables.
		A cable that is shorted out can cease all communications.
		A cable that is loose might cause intermittent communications and constant resetting of head.

# Appendices

## Specifications

### General

Instrument Type: .....	Hi-Res Reflective Color
Geometry: .....	0°/30° or 30°/0° (results below based on 30°/0°)
Measurement Area: .....	12 mm (.5 in.)
Color Difference Resolution .....	0.25 $\Delta$ LED, typical ( $\Delta$ LED is a proprietary color difference calculation which is based on VeriColor LED color response and is scaled similar to CIE $\Delta E^*$ for small color differences.)
Operating Temp:.....	0° - 50°C (32° - 122°F) <sup>1</sup>
Operational Humidity:.....	10 - 90% non condensing
Enclosure Spec: .....	Designed to meet NEMA 4 / IP56
Size .....	L: 5.1" (13 cm), W: 2.9" (7.4 cm), H: 1.3" (3.3 cm)
Weight .....	12.2 oz (347 g)
Power Source .....	24VDC $\pm$ 10% @ 250mA Max.

### Performance

Black Repeatability: .....	0.3 $\Delta$ LED 0 - 40°C (32 - 104°F) <sup>1</sup> (10 measurements at 3 sec. intervals on a 1% reflectance black)
White Repeatability: .....	0.1 $\Delta$ LED 0 - 40°C (32 - 104°F) <sup>1</sup> (10 measurements at 3 sec. intervals on a 99% reflectance white)
Measurement Distance.....	35 mm $\pm$ 5mm (1.4 in. $\pm$ .2 in.)
Measurement Time:.....	250 ms
Cycle Time:.....	1 sec. (time interval between measurements)
Warm up Time:.....	30 sec. typical @ 23°C
Calibration Interval: .....	Validation recommended - 90 days/.5 million reads (whichever comes first) NOTE: More frequent verifications may be required if cleanliness of the system is not maintained.
LED Illuminator Life:.....	Life of the unit
Product Life:.....	5 years minimum
Vibration:.....	5 - 10 Hz 0.200 inch displacement pk - pk 10 - 100 Hz at 1G
Shock:.....	Operational at 15 g amplitude 18 ms duration Non-Operational at 30 g amplitude 11 ms duration

### Environmental

Usage: .....	Indoor Only
Altitude: .....	2000m
Pollution Degree: .....	2
Overvoltage: .....	Category II

**Safety Compliance**

Underwriters Laboratories: ..... UL 61010-1  
Canadian Standards Assoc: ..... CSA 22.2 No. 1010.1-92  
International Electrotechnical  
Committee ..... IEC (EN) 61010-1

<sup>1</sup>When operating in environments above 40°C, the instrument should be calibrated and standards should be learned at the operating temperature to maintain best performance and color resolution.

Design and specifications subject to change without notice.

**Accessories**

The following accessory items can be purchased from X-Rite by calling 1 800 248 9748 or by visiting our website at: [www.xrite.com](http://www.xrite.com).

5 Meter Female – Open Ended Cable (8 circuit)/DB9	P/N VCS50-EUR8-5DB
5 Meter Male – Open Ended Cable (8 circuit)	P/N SE108-EUR8-5M
1 Meter – Interconnect Cable (8 circuit)	P/N SE108-EUR8-1
3 Meter – Interconnect Cable (8 circuit)	P/N SE108-EUR8-3
10 Meter – Interconnect Cable (8 circuit)	P/N SE108-EUR8-10
1 Meter – Right-angle Interconnect Cable (8 circuit)	P/N SE108-EUR8-1RA
Medium Spot (.50”) Targeting Sticker Kit	P/N VC50-32
Medium Spot Solo Instrument	P/N VCS50

## Electrical Interface Details

Power – Communications Cable					
Item	Pin	Name	Description	Active State	Comments
1	J1 -1	Power	+24 Vdc	-	0.25 Amp max. 0.14 Amp Typ.
2	J1 -2	Negative	Power Return	-	Negative side of 24Vdc power supply
3	J1 -3	Tx out	RS232 Transmit Out	-	RS232
4	J1 -4	RV in	RS232 Receive In	-	RS232
5	J1 -5	DSR	Discrete Select Request	High (continuous)	Input +24V max, +12V min rating, 200mA max.
6	J1 -6	10's	Ten's Digit	High (50 msec pulse)	DSR must be active to work Input +24V max, +12V min rating, 200mA max.
7	J1 -7	1's	One's Digit	High (50 msec pulse)	DSR must be active to work Input +24V max, +12V min rating, 200mA max.
8	J1 -8	Read	Take a Measurement	High (50 msec pulse)	Toggle to cause a measure Input +24V max, +12V min rating, 200mA max.
Cable Shield	-	Shield	-	-	Connect to the panel or fixture ground

PLC Cable					
Item	Pin	Name	Description	Active State	Comments
1	J2 -1	Pass	Pass output	*	100mA max
2	J2 -2	Fail	Fail output	*	100mA max
3	J2 -3	Comm	Common	**	-
4	J2 -4	ChE+16	Output – E	*	100mA max
5	J2 -5	ChD+8	Output – D	*	100mA max
6	J2 -6	ChC+4	Output – C	*	100mA max
7	J2 -7	ChB+2	Output – B	*	100mA max
8	J2 -8	ChA+1	Output – A	*	100mA max
Cable Shield	-	Shield	-	-	Connect to the panel or fixture ground

Note: The 4 inputs use ground as a common return.

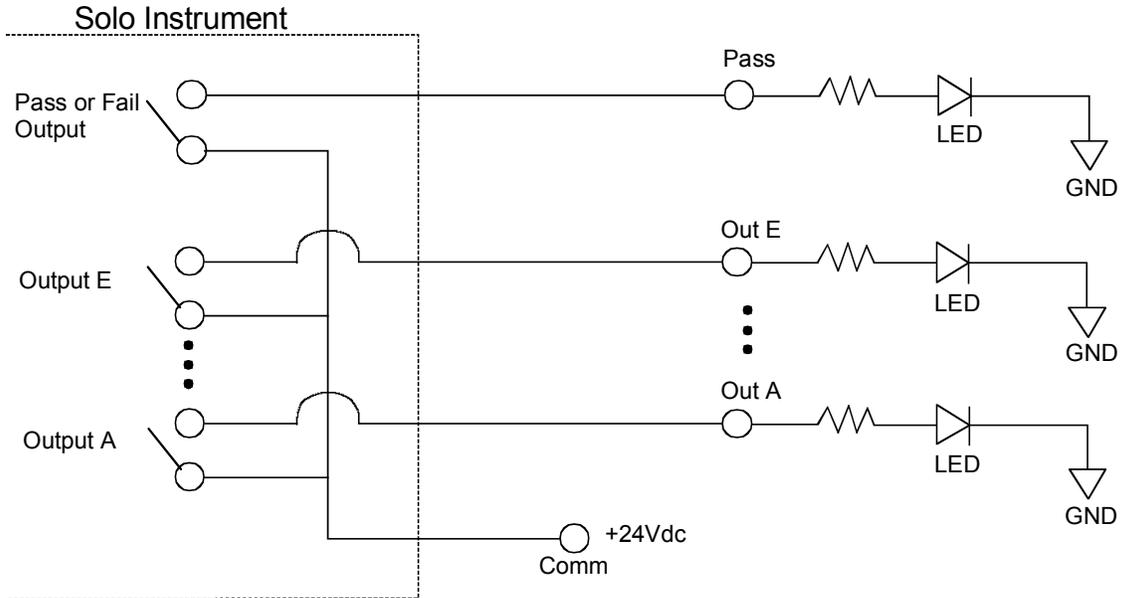
Note: ChA+1 through ChE+16 outputs are user configurable for either individual, grouped, or even "binary" operation.

\*See sample application diagram on next page for operation.

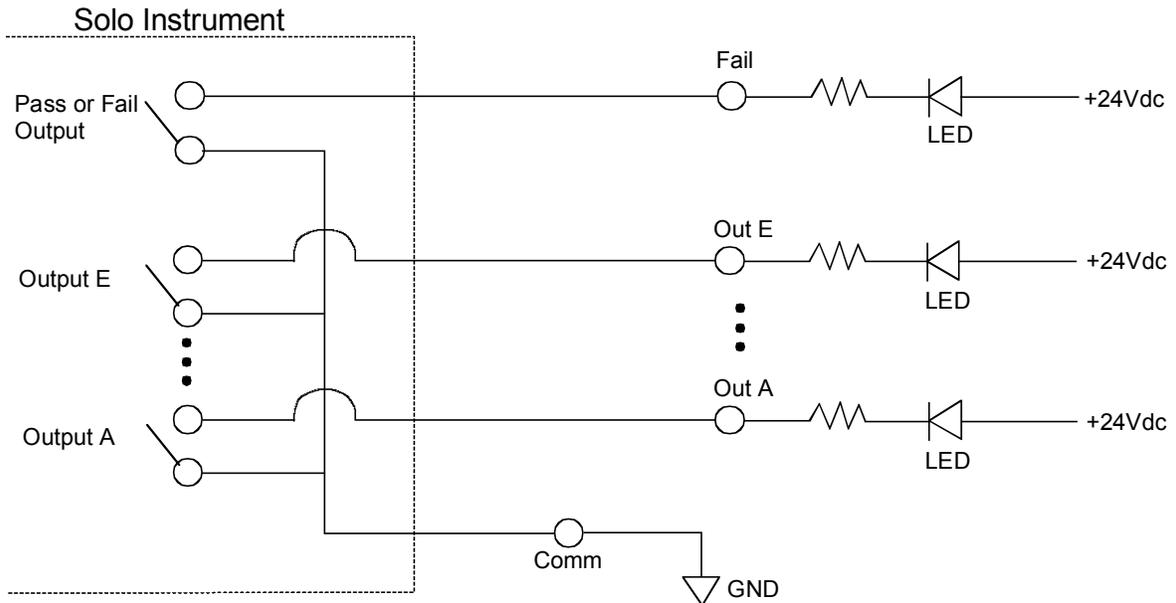
\*\* See sample application diagram on next page for operation.

## External Connection – Sample Application

### Option A (High Side Common)



### Option B (Low Side Common)













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