

VeriColor®

Identification System

(covers ver. B Hub and ver. 2.0 Software)



Setup and Operation



CE Declaration

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Model Name: VeriColor Identification System
Model No.: VC100B (Hub)
VC25 (Small Spot Sensor)
VC50 (Medium Spot Sensor)

Directive(s) Conformance: EMC 89/336/EEC LVD 73/23/EEC

Note:

This is a class A product. In a domestic environment this product may cause interference in which case the user may be required to take adequate measures.

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AVVERTIMENTO - NON usare questo apparecchio in ambienti esplosivi.

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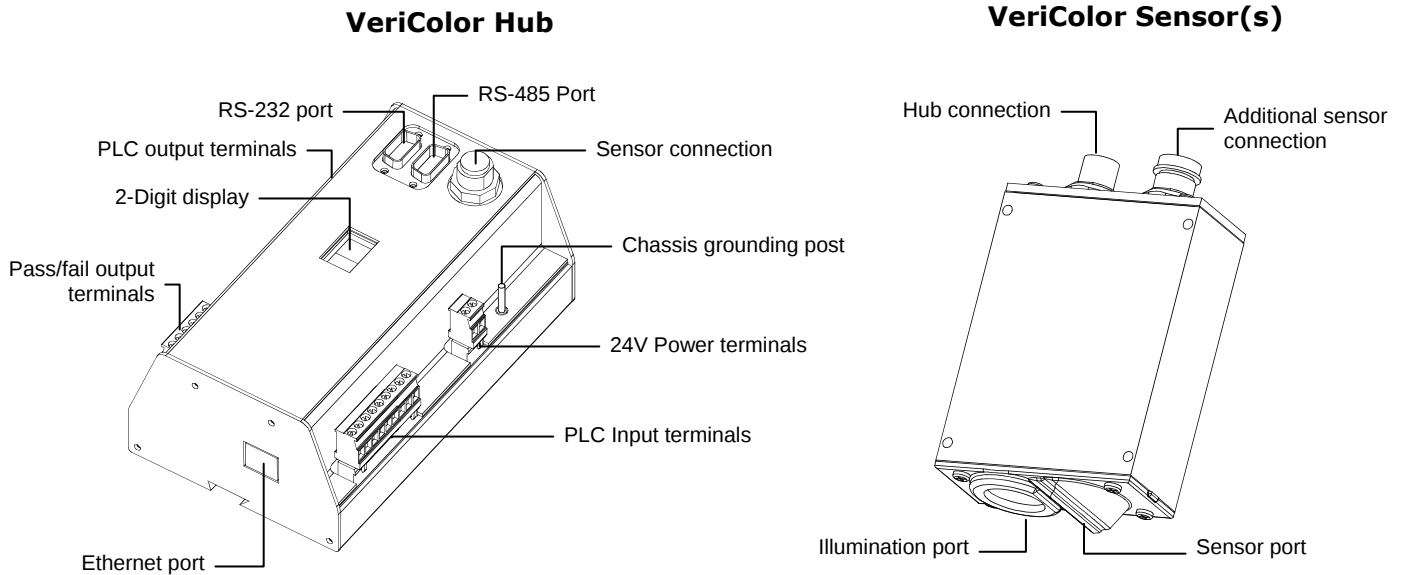
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Overview and Setup

Instrument Description

The VeriColor® 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 VeriColor system is composed of three main components: the VeriColor sensor(s) which captures sample color; the VeriColor hub which provides interface to the sensor(s); 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 Hub | P/N VC100B-00-01 |
| • Sensor | P/N VC50-00-01 (medium spot) or
P/N VC25-00-01 (small spot) |
| • Interconnect Cable (3 meter) | P/N SE108-EUR8-03 |
| • Alignment Tool | P/N VC50-803 |
| • Calibration Tool | P/N VC100-162 |
| • Targeting Stickers (4) | P/N VC50-32 (medium spot) or
P/N VC25-32 (small spot) |
| • DIN Rail Mounting Bracket | P/N VC100-25 |
| • Flange Mounting Brackets | P/N VC100-35 |
| • VeriColor Application Software CD | P/N VC150-500-CD |
| • Setup and Operation Manual | P/N VC150B-500 |
| • Registration Material | P/N SD01-99 |

Setting Up the System

The setup consists of mounting the sensor(s) and hub, connecting the interface cabling, powering up the system, and installing the software.

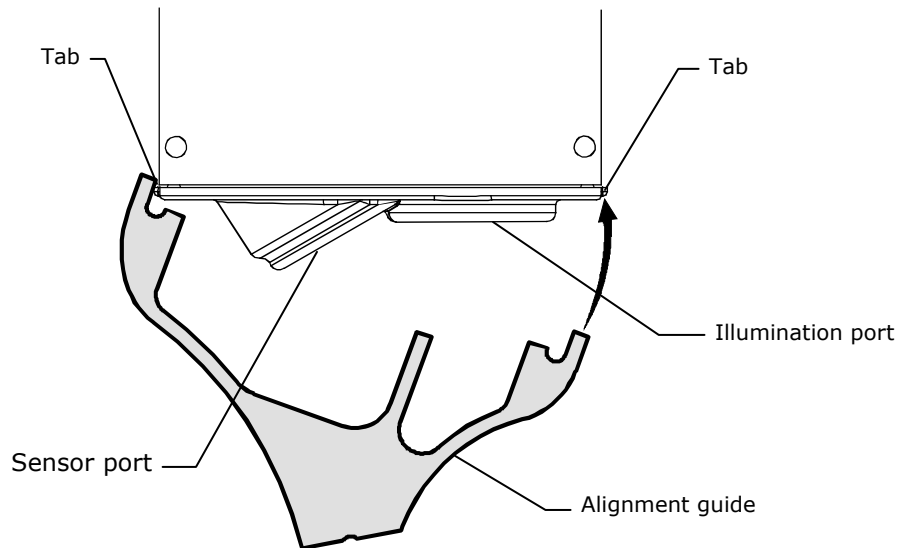
Sensor Installation

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

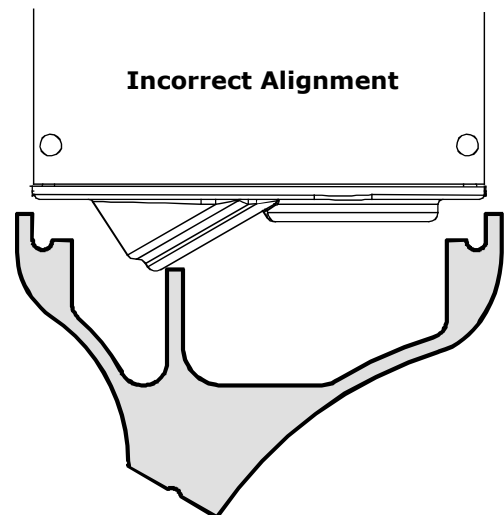
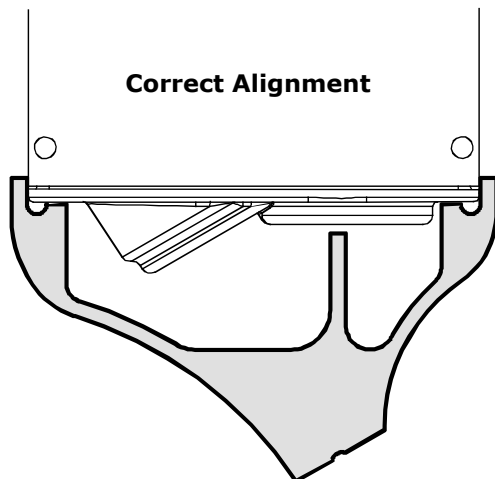
CAUTION: Keep the sensor port lens and illumination port lens free from dust, smudge marks, and finger prints.

Attaching the Alignment Tool to the Sensor

1. Position the end of the alignment tool shown over the tab on the sensor port side of the sensor. 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 sensor.

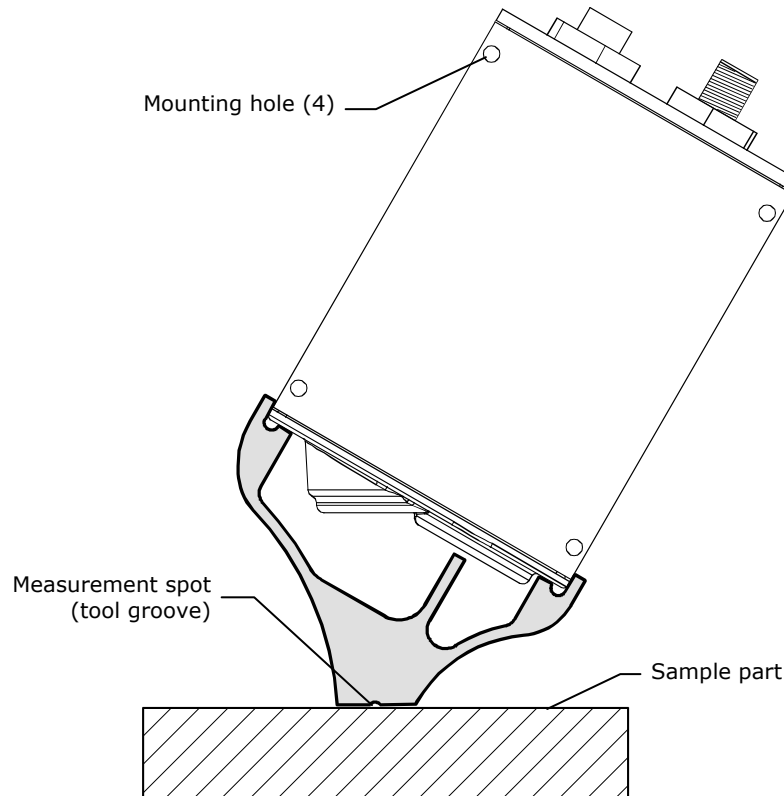


NOTE: The alignment tool will only install in one direction.

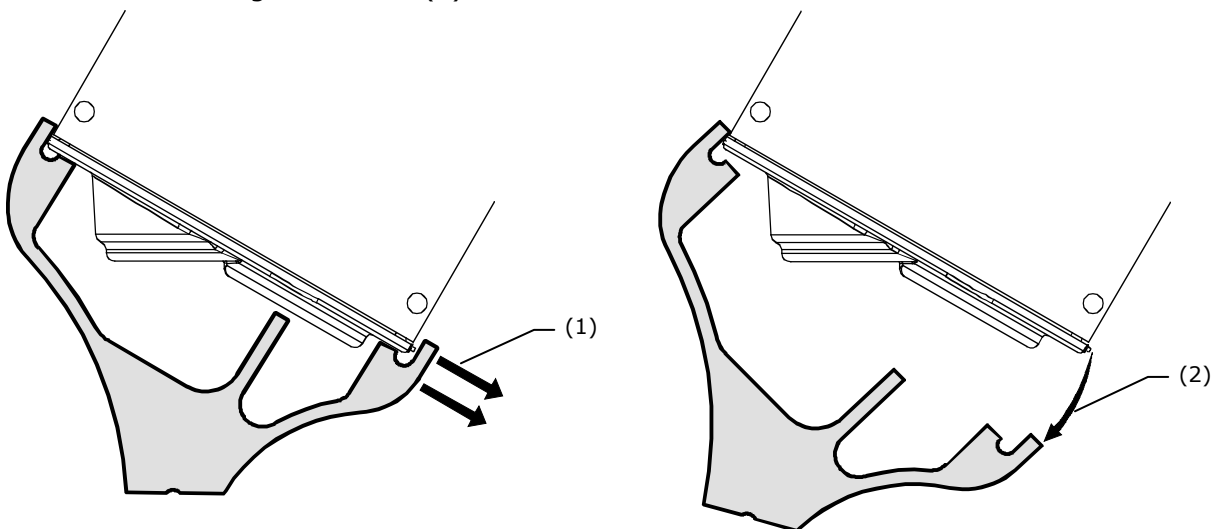


Positioning the Sensor with Alignment Tool

1. Locate the sensor 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 sensor to the desired measurement spot. The groove is the location where the measurement will take place.
2. When the sensor is properly located, secure it to the fixture using the four mounting holes. Remove the part from the fixture.

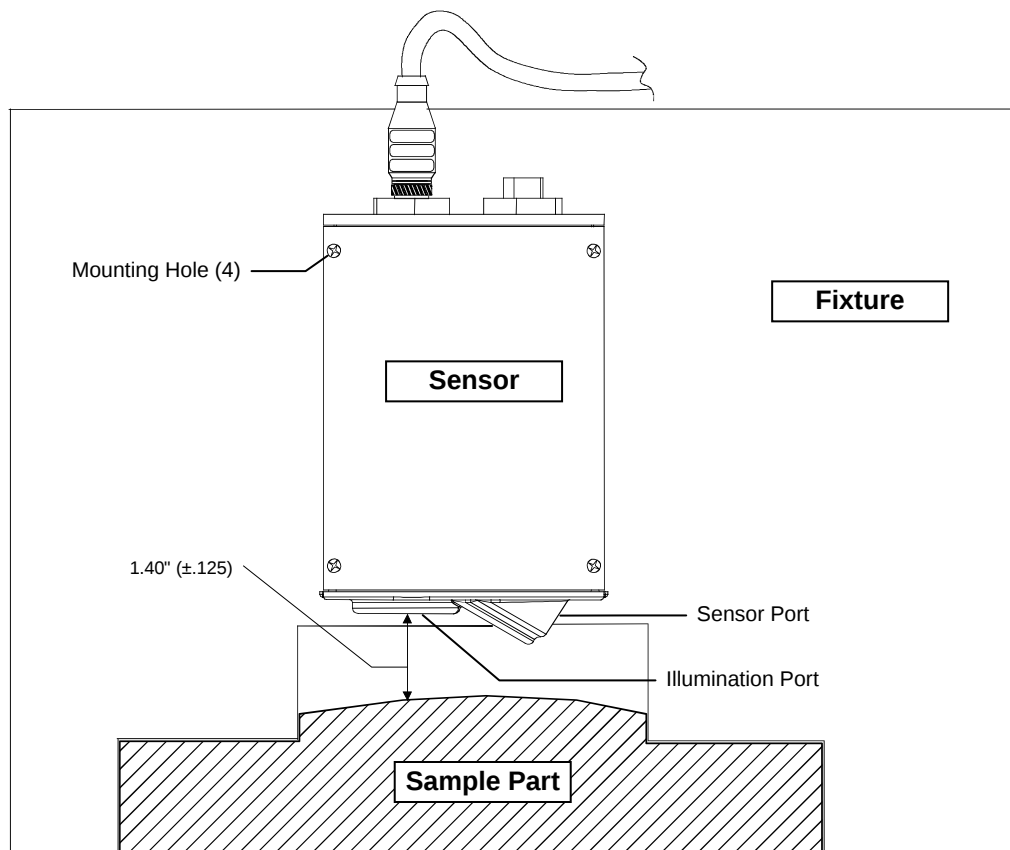


3. Remove the alignment tool by pulling outward (1) on the sensor port side of the tool and rotating downward (2).

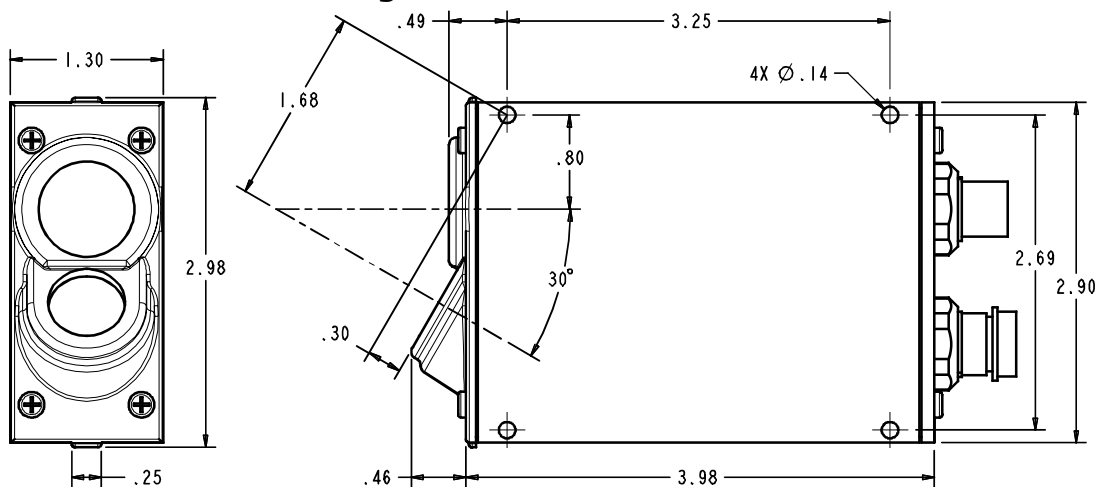


Sensor Vertical Mounting

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



Sensor Dimension Drawing



Mounting the Hub

The hub should be mounted in an area where it can be easily viewed and accessed.

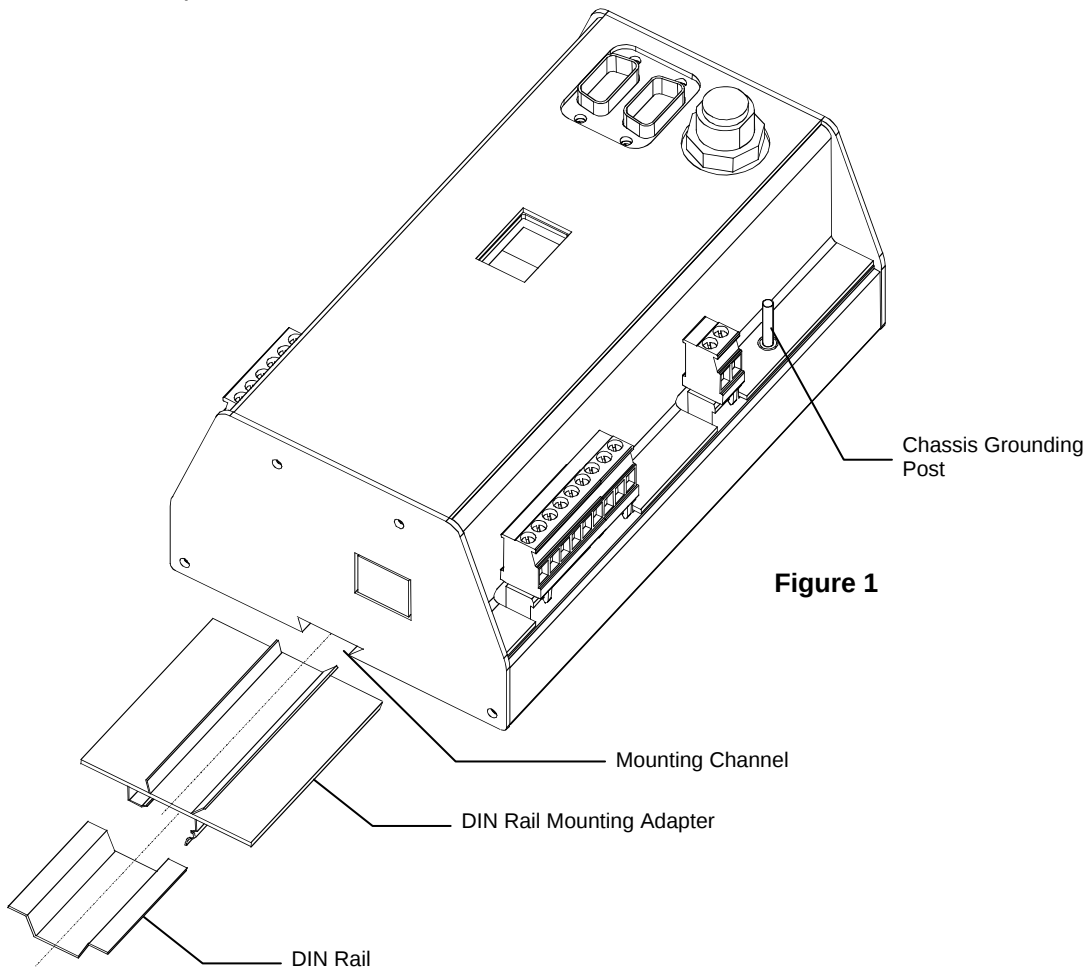
The hub is mounted to the DIN rail by means of a channel located at the bottom of the hub. A DIN rail mounting bracket (included) is required to mount the hub to the DIN rail (see figure 1). The hub can also be mounted using the flange mounting angle brackets provided. The brackets are mounted to the side plates of the hub (see figure 2).

The hub must be grounded using the chassis grounding post.



System grounds should be tied to a common grounding bus bar in the enclosure, and to the Hub enclosure chassis grounding post (figure 1 and figure 2) using low impedance ground straps. Silver tinned flat copper braid at least 0.25 inches (6 mm) wide is ideal for this purpose. Use of braid rather than conventional wire is more important on switching power supplies than linear supplies. Braids are also excellent for EMC purposes, which can better attenuate RF events. Ideally, such grounding straps should be less than 4 inches (100 mm) long. The ground strap should be used in addition to any safety ground wires required by applicable electrical codes. If you use conventional wire be sure that it is multi-strand wire at least 14 AWG for best results.

Note: If not using a common grounding bus bar system and grounding is accomplished directly through the enclosure, be sure that the connection between the chassis grounding post and the enclosure is unimpeded with paint or any other insulated surface. Use of a star washer is helpful.



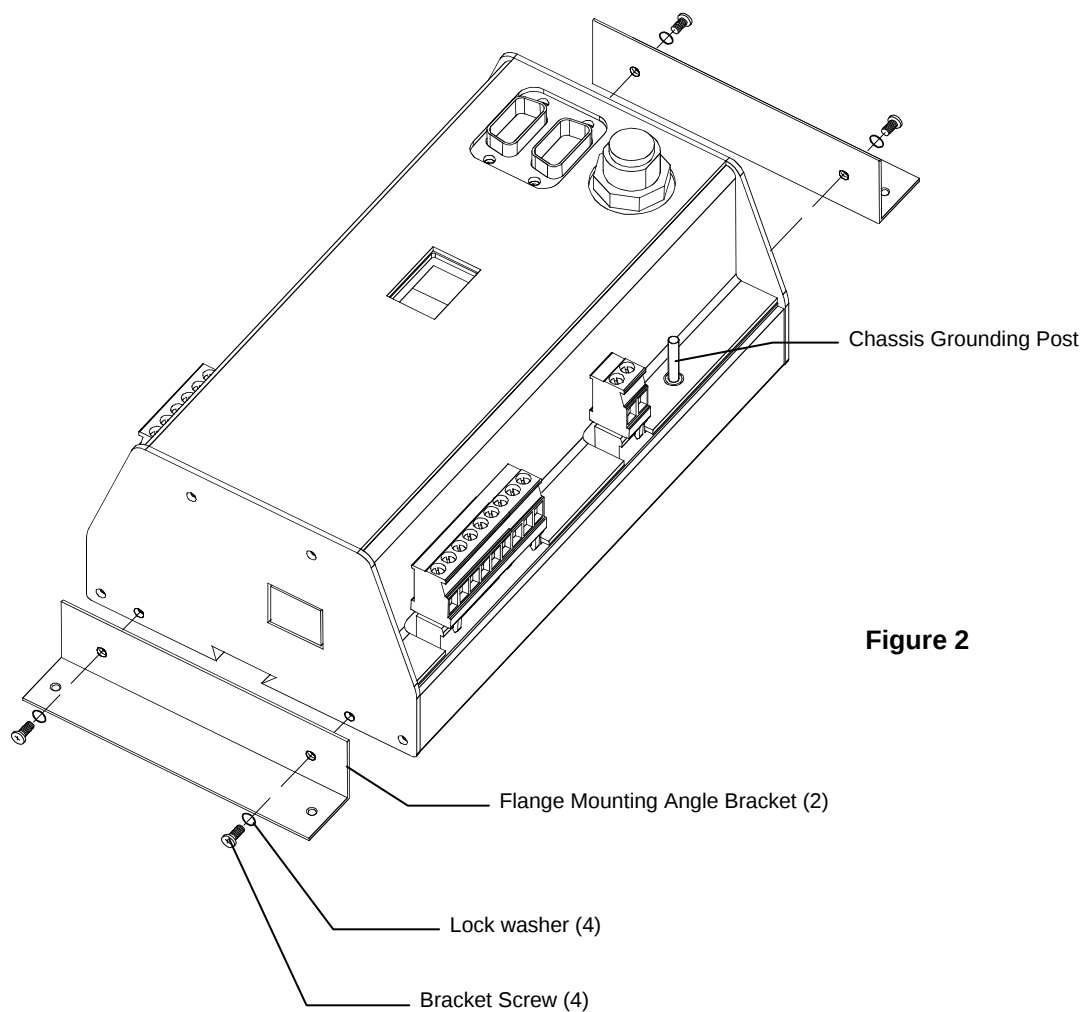
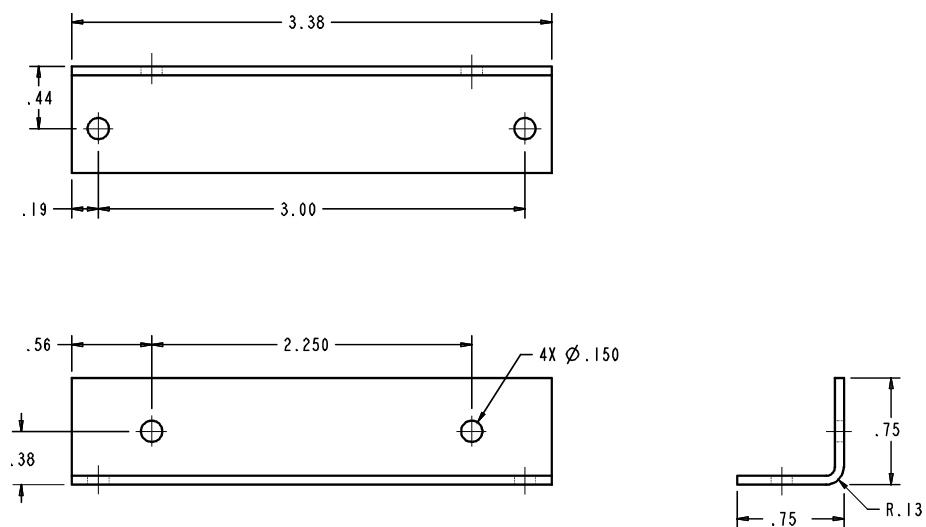


Figure 2

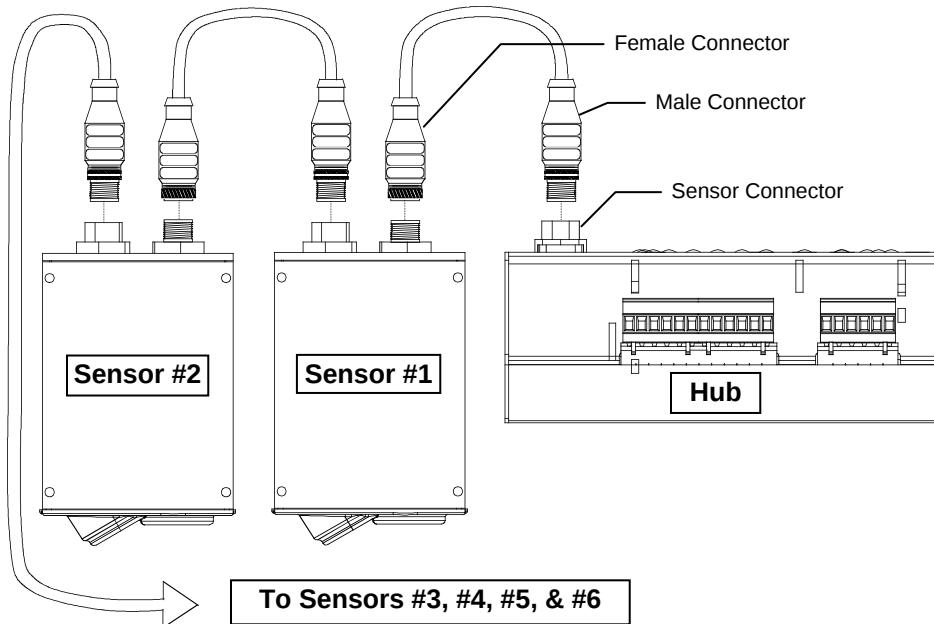
Angle Bracket Dimension Drawing



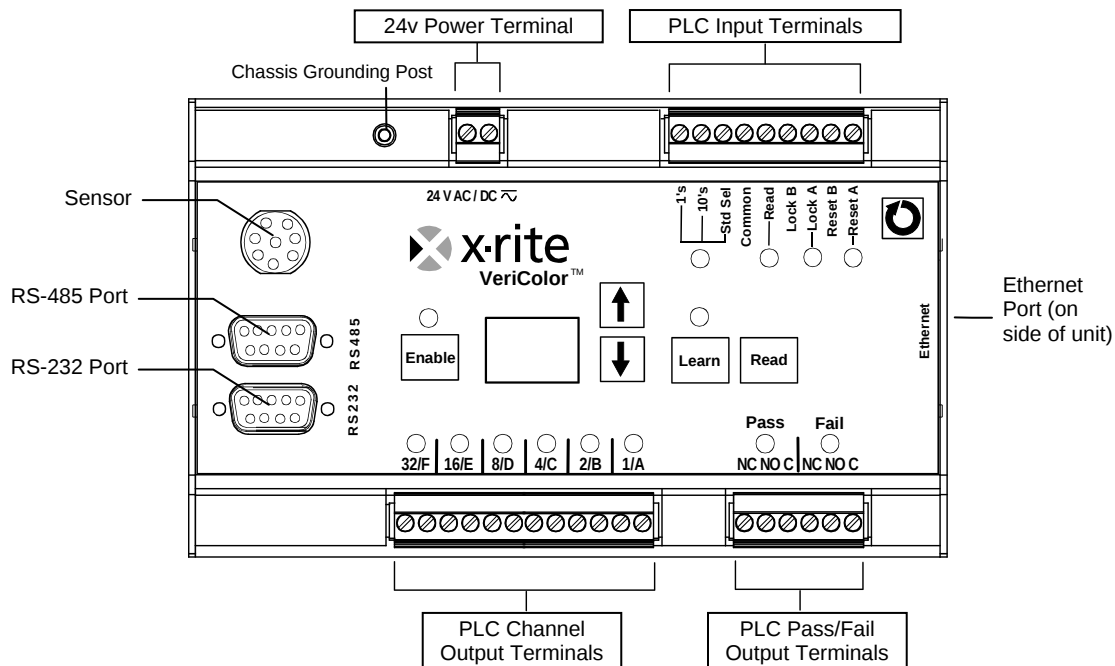
Connecting the Cabling

Connect the first cable between the hub and the first sensor. If more than one sensor is used, connect a cable from the first sensor to the second sensor. Continue the daisy chain connection method for additional sensors, up to six maximum.

The VeriColor system includes a three meter cable (P/N SE108-EUR8-3). Each additional sensor includes a one meter cable (P/N SE108-EUR8-1). A 10 meter cable (P/N SE108-EUR8-10) and a three meter "right-angle" cable (P/N SE108-EUR8-3RA) are also available. Cables may be daisy chained together to obtain additional lengths.



Connect the control lines to the terminal screws and/or communication cables to the I/O ports. Connect the 24 volt power source to the power terminal screws.



Hub Definitions

The hub communicates externally via PLC, computer communications (serial and Ethernet) and an LED indicator. A basic description of the hub's connections and controls follows. For a detailed description of the hub's electrical specifications, refer to the Electrical Interface Details in the Appendices.

Power Supply Terminals

The main power input is 24 ± 2 volt @ 50/60 Hz. AC or DC. The AC is converted to DC internally. There is no polarity connection required. This is a 2-position plug located on the top left side of the unit and is the main power input: 24 Volts @ 50/60Hz. AC or DC as described previously. There is an associated LED status indicator contained within the X-Rite logo (orange triangle). LED indication (Pwr ON) illuminates when power is applied

Local PLC Interface

Local external control between the operator (machine-level) and the hub is through a set of front panel screw terminals (both input and output signals). These screw terminals are contained within a 2-part, quick inter-connect system. The 2-piece system consists of a removable plug that contains the screw terminals and the mating header that's mounted on the hub. Several inputs and outputs with their respective status indicators (LEDs) are available. Refer to figure-1 for front panel layout details and the Appendices for electrical details.

PLC Input Terminals

There is a 9-position plug (screw terminals) located on the top, right side of the hub. These are intended as low-voltage discrete control line inputs having bi-directional (isolated) capabilities. The bi-directionality allows electrical configuration of either pull-up or pull-down operation.

If the configuration is "pull-up", you must externally energize the control signal between +12 and +24-voltage 'dc' and when activation is requested, electrically ground that signal line to zero volts 'dc'. The other screw terminal input is continuously energized.

If the hub configuration is "pull-down", you must externally de-energize the control signal to zero volts 'dc' and when activation is requested, electrically energize the control signal between +12 and +24-voltage 'dc'. The other screw terminal input is continuously grounded.

The Lock (lockout) and Reset features have "paired" inputs, while the Discrete Select, 10s, 1s, and Read input control lines utilize a "common" terminal. The "common" terminal will have the continuously applied level, either energized or grounded. Lock and Reset do not use the common terminal.

Reset "A" and "B" Input

This input is a hardwired line for local PLC control. Activation is dependent on your configuration as noted above and uses 2 terminals 'A' and 'B'. Reset is a momentarily applied condition. Executing a 1 second pulse commands the HUB to process a "software-reset" operation. There is an associated red LED status indicator that displays operational information. LED off indicates no action or unit is okay and "red" (LED on) indicates a "RESET" is occurring.

Lock "A" and "B" (Lockout) Input

This input is a hardwired line for local PLC control. Activation is dependent on your configuration as noted above and uses 2 terminals "A" and "B". Lockout MUST be continuously applied for this function to exist. This action disables all front panel manual controls, except RESET. There is an associated green LED status indicator. LED off indicates no action and "green" (LED on) indicates "LockOut" mode active.

Read Input (Measure)

This input is a hardwire line for local PLC control. Activation is dependent on your configuration as noted above, but uses a "common terminal set-up". Read is a momentarily applied condition. Executing a 1 second pulse commands the HUB to process a "measurement" operation. There is an associated green LED status indicator. LED off indicates no action and "green" (LED on) indicates "Measure" is occurring.

Std Sel (Standard Select), 10's and 1's Inputs

This group of 3 hardwired line inputs is for local PLC control. Activation is dependent on your configuration as noted above using the "common terminal set-up". There is an associated green LED status indicator for this group. LED off indicates "discrete standard select" mode is inactive, LED on (illuminated) indicates active and standards can be selected.

Std Sel (standard select) must be continuously applied for this function to exist. During this "on" period the '10' and '1' inputs can be pulsed to choose a standard from the ones stored. Up to 50 standards can be stored.

The '10' input is a momentarily applied condition that will select standards only while std sel is active. Executing from 1 to 5 pulses will command the HUB to process a "tens digit" operation. Each pulse has to be 'on' between 100 and 200 milli-seconds, then 'off' between 100 and 200 milli-seconds. If no pulses happen during the std sel activation, then no "tens digit" operation occurs.

The '1' input is a momentarily applied condition that will select standards only while std sel is active. Executing from 1 to 9 pulses will command the HUB to process a "ones digit" operation. Each pulse has to be 'on' between 100 and 200 milli-seconds, then 'off' between 100 and 200 milli-seconds. If no pulses happen during the std sel activation, then no "ones digit" operation occurs.

PLC Output Terminals

There are two multi-position plugs located along the bottom edge of the unit. These plugs are the hub's isolated outputs that can control external devices through several screw terminals. These are low current, relay style outputs. "LockOut" does not affect these controls.

Fail Output (3 connections)

This output group is activated to indicate that a "fail" resulted after processing a measure command, with the resulting reading being out of tolerance. The output group has a normally closed and open set of relay contacts, with a common input line. The default state during power-up and reset is the normally closed contact. There is an associated red LED status indicator. LED off indicates no action and "red" (LED on) indicates "FAIL" active.

Pass Output (3 connections)

This output group is activated to indicate that a "pass" resulted after processing a measure command with the resulting reading being in tolerance. The output group has a normally closed and open set of relay contacts, with a common input line. The default state during power-up and reset is the normally closed contact. There is an associated green LED status indicator. LED off indicates no action and "green" (LED on) indicates "PASS" active.

Channel Outputs (12 connections)

This output group can be activated after processing a hub command or during set-up. The output activation can control an external device indicating that an action is required. The "action" will be on or off. There are 6 outputs that can be used individually, in a base-2 feature (binary coding), or in a "paired" combination (user defined). These outputs are the closure of the normally open contacts of a relay. The default state during power-up and

reset is "open." Each channel (output) has an individual common signal return for industrial isolation.

The status indicators are bi-color LEDs that display resulting information in the form of color states to the user. Color not displayed (LED off) indicates no result or unit is not active. A color "on" indicates the feature is active. Red indicates "state = 0", Green indicates "state = 1", relay "on." Amber indicates channel programmed (relay is not active).

Computer Interfaces

Computer (PC) communication between the user and the hub can occur by one of two methods: standard RS-232 or a 10 MB Ethernet connection. The RS-485 port is an optional input, intended for PLC use.

RS-232 Interface

The computer interface is through a standard computer RS-232 port using a DB-9 connector (also see the Appendices). The communications protocol is serial using X-Rite's RCI command set, which is in a separate document.

Ethernet Interface

An additional computer interface can be through a 10 MB Ethernet connection port (RJ45).

RS-485 Interface (programmable logic controller)

An industrial computer interface (for PLC control) can be through the RS-485 port (DB-9 connector); also see Appendix-B. This interface can externally control the hub through serial communications, but must be configured by the user using the standard X-Rite RCI protocol.

Front Panel Interface

Manual hub operation can be established through the front panel to allow control and/or set-up of the system. Several switches with their respective status indicators (LEDs) are available. Refer to Connecting the Cabling section for front panel layout/button location details, and Manual Hub Operation section for operational mode details.

Reset Button

This is a momentary push-button. Activation generates a signal that commands the hub to process a "RESET" operation. It momentarily re-cycles the internal power supply. "Lockout" does not affect this control. There is an associated red LED that illuminates to indicate when in a reset condition.

Enable Button

This is a momentary push-button. Activation generates a signal that commands the hub to process an "enable" operation. Note that when "Lockout" is active, it prevents this front panel control from operating. There is an associated green LED status indicator that displays operational information. LED off indicates no action and "green" (LED on) indicates "ENABLED."

Select Up Button and Down Button

These are momentary push-buttons. Activation of either generates a signal that commands the hub to process either a "select-up" or "select-down" operation. Note that when "Lockout" is active, it prevents these front panel controls from operating. There is an

associated 2-digit display that indicates operational information, and as button activation occurs, changes to the display indicate "Select-up or Select-down" respectively.

Learn

Learn Switch

This is a momentary, push-button switch. Activation generates a signal that commands the hub to process a learn operation. Note that when "Lockout" is active, it prevents this front panel control from operating. There is an associated red LED status indicator that displays operational information. LED off indicates no action and "red" (LED on) indicates "LEARN" mode.

Read

Read (Measure) Switch

This is a momentary, push-button switch. Activation generates a signal that commands the hub to process a measure operation. Note that when "Lockout" is active, it prevents this front panel control from operating. There is an associated green LED status indicator that displays operational information. LED off indicates no action and "green" (LED on) indicates a "MEASURE" function is occurring.

Display (2-digit)

The display module indicates numbers 0 to 99. The display is typically used to indicate the current standard number of 1 through 50. In targeting mode, it displays a two digit Δ LED value. Δ LED values from 0.0 to 9.9 can be displayed.

Δ LED is an algorithm developed by X-Rite to describe color difference without factoring in illumination or eye response. As with Delta E CIELab, it attempts to describe a minimum noticeable difference as a value of 1.0.

Remote Sensor Interface

The remote sensors use daisy-chain communications and control signals (serial) that are presented through one I/O port on the hub. The connector is a non-standard (mini-circular, 6-pin DIN), employing the RS-422 standard. The hub automatically assigns sensor identification in the order they are located in the communications chain. Refer to the Appendices for electrical details.

Chassis Grounding Post

The "chassis" grounding post located near this power input is used for grounding the hub. The chassis grounding post must be used to ground the hub. Without this connection, remote sensor measurements may be sensitive to nearby noise sources.

Refer to Mounting the Hub described earlier in this manual for additional information on grounding.

VeriColor Hub Software Application

The VeriColor system includes a software application that provides an interface for the VeriColor Hub. The application is used to configure the hub, store projects which consist of standard colors, and provide visual feedback of sample measurements.

Before installing the software, make sure the sensor(s) and hub are set up as explained earlier and the hub is connected to serial port or Ethernet on the computer.

Basic System Requirements

- Windows OS (2000 or greater)
- Minimum screen resolution (1024x768)

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" short-cut on your desktop or from within the Programs> X-Rite 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 on using the application with the VeriColor system.

Application Modes

The X-Rite VeriColor Hub 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 Hub
- **Monitor** – used to monitor 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 establish either serial or Ethernet communications with the hub. Offline browsing can also be used at this screen.



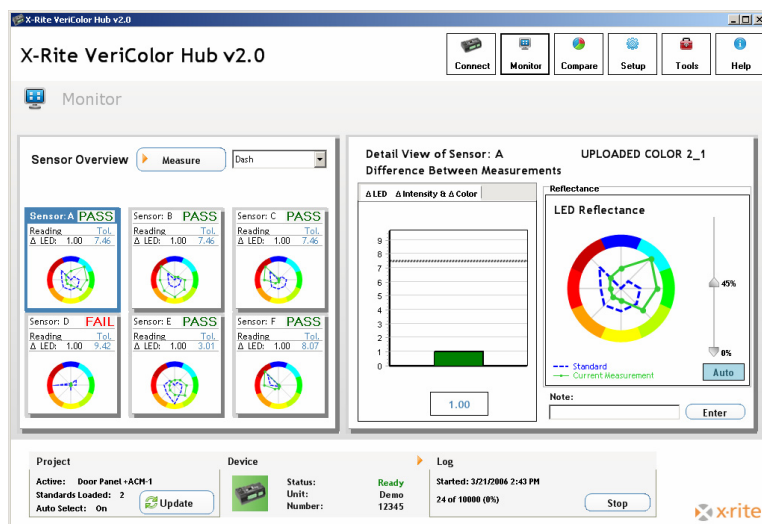
Communication between the hub and computer is established in one of two ways.

- 1) Selecting the known COM port using the **Serial Port** control or clicking **Auto Connect**
- 2) Selecting a previous IP address from the **Ethernet** control or typing in an IP address. With either case, the **Connect** button is clicked to establish the connection. Refer Ethernet Notes in the Appendices for additional information on Ethernet setup.

The **Off-line Browsing** control lists all the hubs that have locally stored projects. When a hub is selected, the program switches to the Setup screen where the projects can be viewed and edited.

Monitor Mode

The Monitor screen is the “main” mode of the application. The Monitor mode is used to view measurement results once the projects, colors and standards 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 Hub.

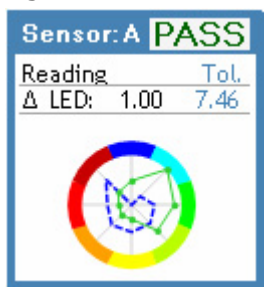
Standard Selection

The current standard used by the Hub is displayed at the Sensor Overview window of the screen. The same control can be used to select a different standard if more than one exists in the current project.

Sensor Overview

The Sensor Overview area displays a color wheel window for each sensor, or a color wheel window for a collection of sensors known as a VLA (Virtual Large Aperture). Each color wheel window shows the sensor, pass/fail status, tolerance, and Δ LED or Δ Intensity and Δ Color values.

When a color wheel window is clicked on in the Sensor Overview area, the zoomed view of the color wheel window selected is displayed in the Detail View of Sensor window on the right side of the screen.



Detail View of Sensor

The Detail View window contains a color wheel and bar graphs that displays the Δ LED or Δ Color and Δ Intensity values.

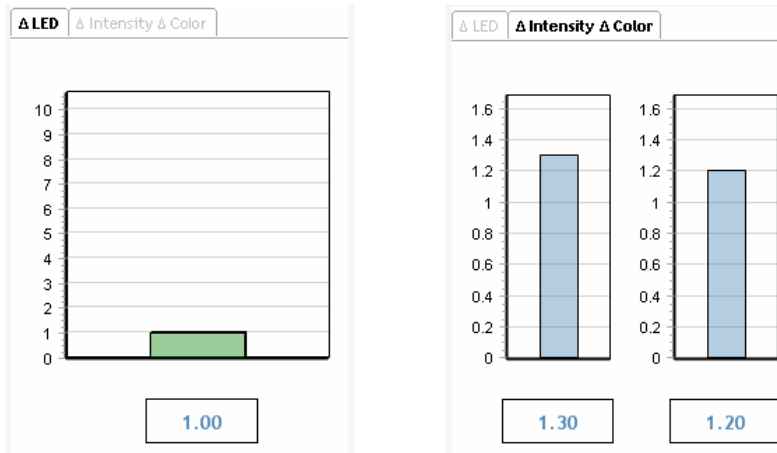
The bar graphs display Δ LED or Δ Intensity and Δ Color values between the current sample and standard color. The graph displayed is dependent on the current color's active tolerance. You can switch between graph modes by clicking on either tab at the top of the graph.

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

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

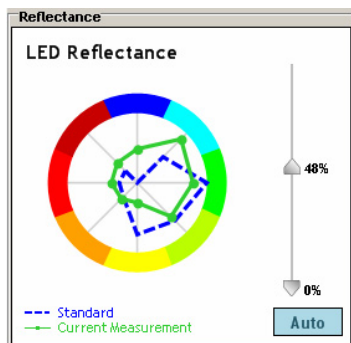
Each graph contains a colored bar with a dotted tolerance line. The bar is the value and the dotted line represents the current tolerance value. The bar's color can be green (Pass), red (Fail) or blue (no tolerance).

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 few exceptions to this rule but they will be described in each mode.



The color wheel allows direct comparison between the standard color and sample measurements. The color wheel utilizes automatic and manual controls for adjusting the scaling of the standard color 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).



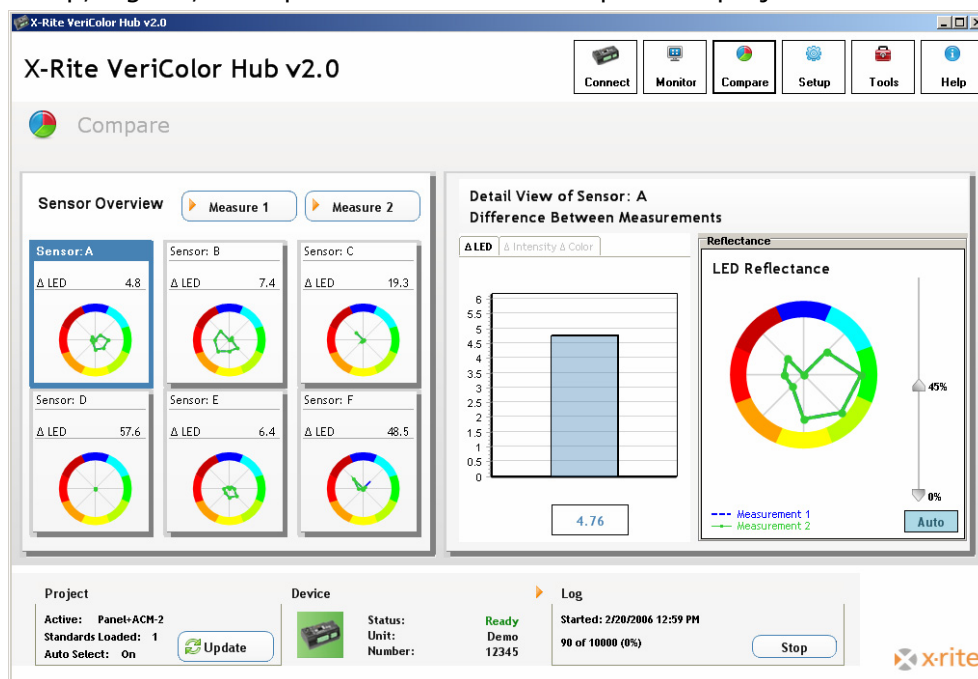
Notes

The Note box at the bottom-right of the screen is used to enter information for the current measurement displayed. The information is added to a column in the log file.

Enter the information in the field and click Enter to include a note.

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 hub to be setup with a project.



Measure 1 and Measure 2

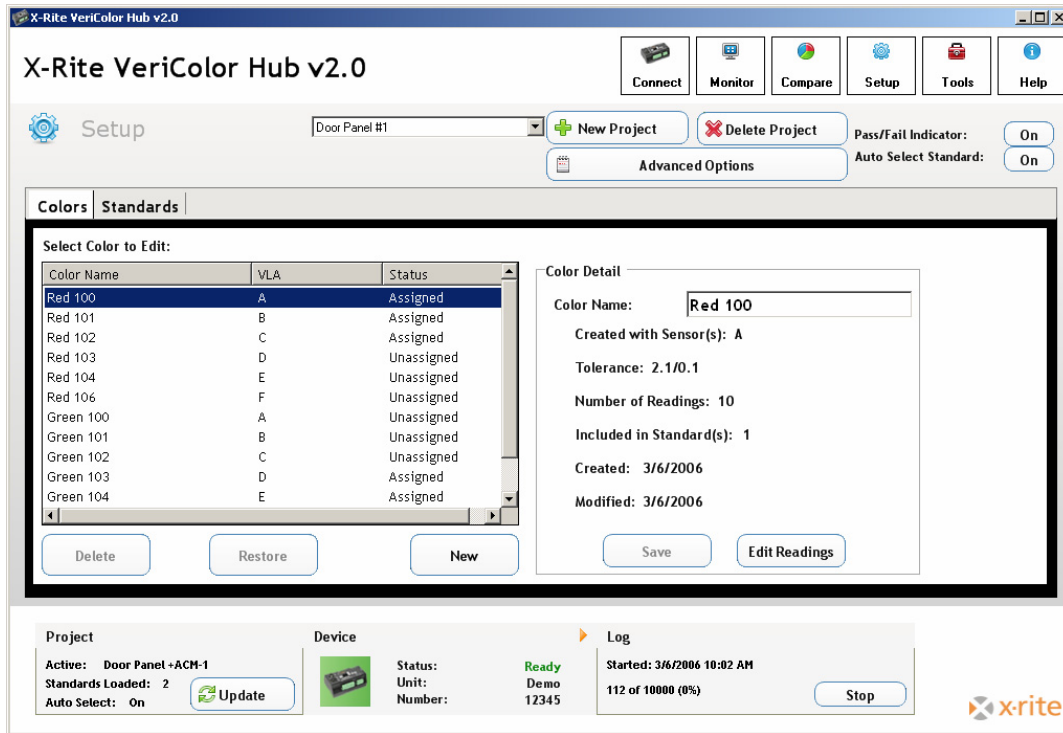
A measurement taken using the Measure 1 button is displayed as Measure 1 data, and a measurement taken using the Measure 2 button is displayed as Measure 2 data. The results displayed are the differences between Measure 1 and Measure 2. The last measurement taken using either button remains current until the application is restarted.

Sensor Overview and Detail View Windows

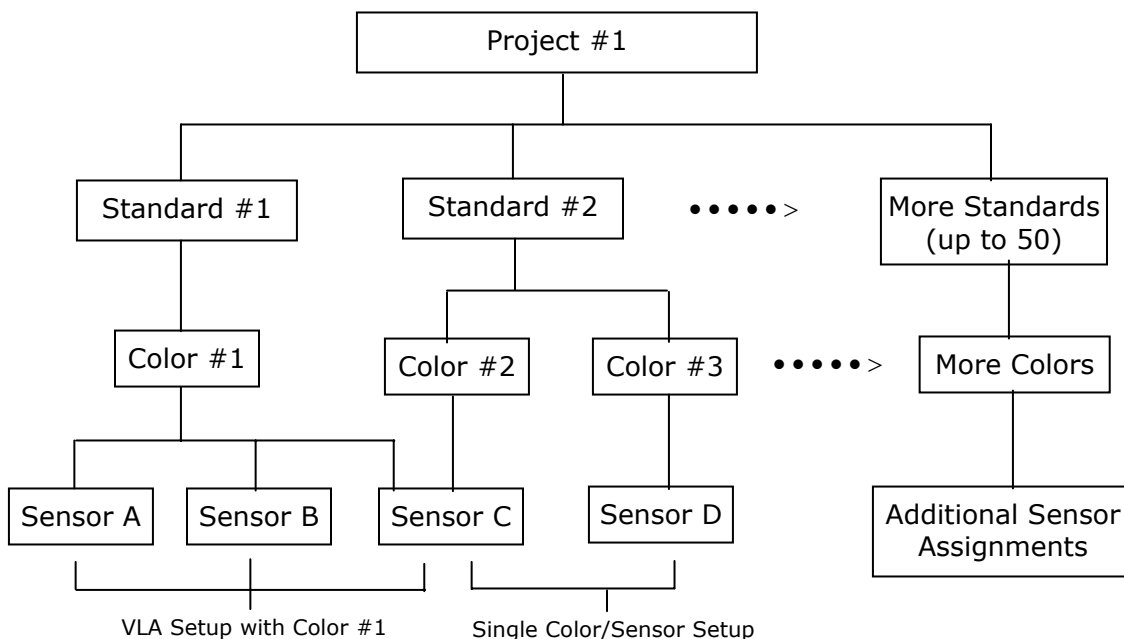
The bar graphs and color wheels display the same as in the Monitor mode without tolerancing. The color wheel controls are the same as on the Monitor screen.

Setup Mode

The Setup mode is used to create projects, standards and their colors. A single project can consist of up to 50 standards and configuration settings. Once created, a project is downloaded and stored in the hub. Once the hub is programmed with a project, it can be executed independent of the software application. See Manual Hub Operation later in this manual for an explanation.



The following is an example of a project setup. Standard #1 consists of color #1 with sensors A, B and C assigned as a VLA (virtual large aperture.) Standard #2 consists of two colors with individual sensors (C and D) assigned to each color.



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.

Pass/Fail Indicator

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

Auto Select Standard

The Auto Select Standard option allows the hub to select the closest standard from the list of standards in the project during sample measurements. Selecting On activates this option and selecting Off requires you to manually select the standard before a sample measurement.

Advanced Options

The Advanced Options screen contains several project options that you typically do not have to change. The options are contained in three tab pages that are selected at the top of the screen. After the options are set, the Done button is clicked to return you back to the main Project Setup screen.

Input Operations Tab

Advanced Options

Input Operations | Output Operations | Search Method

Averaging (Sampling)

Number of Measurements: 1 (range 1 to 10)

Delay Time Between Measurements: Manual (range Manual to 9.9)

Measure Trigger Delay (PLC Input)

Seconds of delay: 0 sec (range 0 to 2.0)

Sensor Measure

Simultaneous (selected) (range Simultaneous to Sequentially)

Digital Filtering

Filter Weight: Off (range Off to 21)

Done

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 (set to one), 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 hub will pause between measurements.

Measure Trigger Delay (PLC input)

Determines the amount of time the hub will “pause” after receiving a measure command from the PLC. The control can be adjusted from 0 to 2.0 seconds.

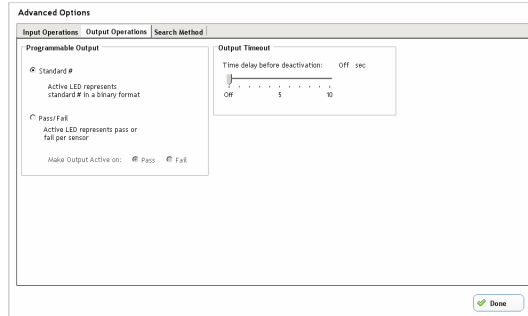
Digital Filtering

The Digital Filtering option is an alternative to simply averaging a set of readings. This method applies a weighting factor across multiple readings. The option can be set to off, or from a range of 2 to 21.

Sensor Measure

Determines how the measurements are taken when more than one sensor is used. Measurements can be taken simultaneously (all sensors at the same time) or sequentially (one after the other), starting with the first sensor.

Output Operations Tab



Programmable Output

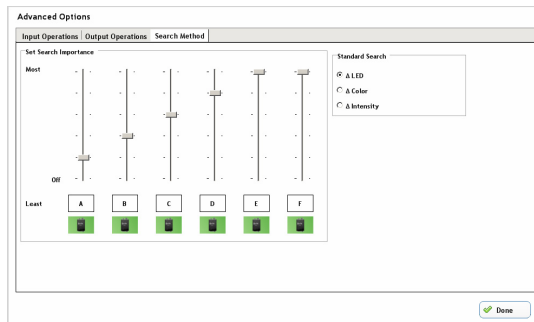
This option configures the hub such that the LED for each sensor either represents the Standard number (in binary) or the Pass/Fail status of each sensor. If set to Pass/Fail status, the Make Output Active option become available.

The Make Output Active on toggles between normally closed and normally opened for the pass and fail output options.

Output Timeout

Determines how long the instrument holds its outputs active after a measurement occurs. This setting can range from Off to 10 seconds at a one-second increment.

Search Method Tab



Set Search Importance

The Set Search Importance group box contains a series of vertical sliders that represent the search priority for each sensor in the project. Each slider is labeled with the name of the sensor and a pictorial representation. The highest priority is at the top of the scale with the least being at the bottom. The search priority can be set the same for more than one sensor. Search importance can also be set to Off for individual sensors. However, one sensor must always be set with a priority.

Standard Search

Determines which math formula is used by the software and the hub to find the next closest color in the project. The method can be set to Δ LED, Δ Color or Δ Intensity. The hub 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).

Colors Tab

The Colors Tab is used to create, edit and delete colors for the selected project. A color is assigned to a specific sensor before it is learned. Clicking on an existing color in the list displays its sensor, tolerance, readings, and standard assignment in the Color Detail list on the right side of the screen.

The screenshot shows the 'Colors' tab selected. On the left, a table lists colors with their VLA and Status. On the right, the 'Color Detail' panel shows information for 'Green 101'.

Color Name	VLA	Status
Green 101	A	Assigned
Green 102	B	Assigned
Green 103	C	Assigned
Green 104	D/E	Assigned
Red 101	A	Unassigned
Blue 101	A	Unassigned

Buttons at the bottom: Delete, Restore, New.

Color Detail

Color Name:

Created with Sensor(s): A

Tolerance: 8.3

Number of Readings: 8

Included in Standard(s): 1

Created: 2/15/2006

Modified: 2/15/2006

Buttons at the bottom: Save, Edit Readings

Delete

The Delete button is used to delete the selected color from the list. A color that exists in a current standard cannot be deleted until it is removed from the standard.

Restore

The Restore button is used to restore (undelete) the deleted color to the list.

New

The New button is used to create a new color for the selected project. Once New is selected, the Color Detail group changes to allow for sensor assignment. One or more sensors can be assigned to the color. Sensors not available are dimmed (grayed).

The 'Color Detail' panel for creating a new color. It includes a text field for the color name, a checkbox for VLA, and six sensor icons (A-F) for assignment.

Color Name:

Select Icon to Assign Sensor to New Color:

☐ VLA

Sensor A, Sensor B, Sensor C, Sensor D, Sensor E, Sensor F

Buttons at the bottom: Save, Edit Readings

Color Name

A name is entered in the Color Name field and then a sensor is assigned to the color by clicking on the sensor icon. If you are assigning more than one sensor to a color, you must first check the VLA (Virtual Large Aperture) box.

Edit Readings

Clicking the Edit Readings button opens a screen where the color is learned. (see New Color Learn). This procedure is repeated for each new color created. The Edit Reading button is also used to open the learn screen when an existing color is selected. From here, measurements can be taken for the existing color.

Save

The Save button is used to save the created color to the color list.

New Color Learn (this screen appears when the Edit Readings button is clicked)

The learn screen allows you to create new colors or edit existing colors from a project. The purpose of this screen is to take several measurements that are averaged together to represent a standard color. You can work from a history of measurements and determine which ones are used to average into the color. This screen assists you in selecting the best tolerance values for reliable performance and color identification. You can view the measurement data as Δ LED or Δ Intensity and Δ Color by selecting the tabs at the top of the screen.

**Measure**

The Measure button is used to activate a measurement by the hub on the color. 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.

Import

The Import button is used to import a sample from a stored log file for use as a color. The log file can be opened in Excel first to obtain the desired line number.

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.

Done

After the color is set, the Done button is clicked to return you back to the Colors page of the Setup screen where the color can be saved.

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. Use this when trying to identify colors.

Auto Min

This tolerance is determined by a certain margin over the worst deviating measurement vs. the standard color. 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 dragging the tolerance bar up and down, or by clicking on the field next to the Manual option and entering a value.

Standards Tab

The Standards Tab is used to create, edit and delete standards for the selected project after colors are created. Up to 50 standards can exist in a project. Standards can be dragged to new locations in the list. Clicking on an existing standard in the list displays its sensor and color assignments in the Standards Detail list on the right side of the screen.

The screenshot shows the 'Standards' tab in the software. At the top, there are two tabs: 'Colors' and 'Standards', with 'Standards' being the active tab. Below the tabs is a section titled 'Select a Position to Create/Edit a Standard'. It contains a list of 50 positions, numbered 1 through 50. Positions 1 and 2 are filled with 'Door Trim' and 'Dash' respectively. The other positions are empty. Below this list are two buttons: 'Delete Standard' and 'Restore Standard'. To the right of the list is a 'Standard Detail' panel. It contains the following information: 'Standard Name: Door Trim', 'Created: 3/6/2006', 'Modified: 3/6/2006', and 'Click Sensor to Change Assignment:'. Below this information are six buttons arranged in a 2x3 grid: 'Sensor A Red 100', 'Sensor B Red 101', 'Sensor C Red 102', 'Sensor D Green 103', 'Sensor E Green 104', and 'Sensor F Green 105'. At the bottom of the detail panel are two buttons: 'Save' and 'Reset'.

Delete Standard

The Delete Standard button is used to delete the selected standard from the list. The other standards in the list are unaffected when a standard is deleted and retain their positions.

Restore Standard

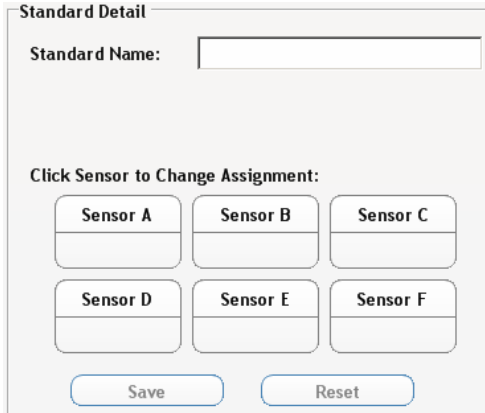
The Restore button is used to restore (undelete) the deleted standard to the list.

Creating a New Standard

Click in a blank standard position in the list to create a new standard. Once a blank position is selected, the Standard Detail group clears to allow you to assign a color/sensor to the new standard.

Standard Name

A name is entered in the Standard Name field and then a color is assigned to the sensor(s) by clicking on the Sensor icon. Sensors not available are dimmed (grayed).



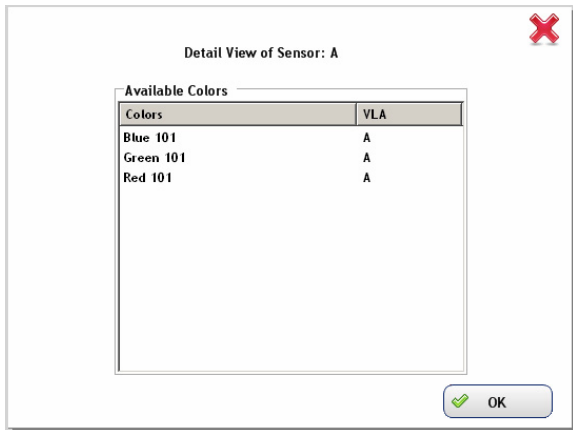
Standard Detail

Standard Name:

Click Sensor to Change Assignment:

Sensor A	Sensor B	Sensor C
Sensor D	Sensor E	Sensor F

When the Sensor icon is clicked, a list of available colors that were created using the selected sensor displays. Select the color from the list that will be assigned to the standard and click OK.



Detail View of Sensor: A

Available Colors

Colors	VLA
Blue 101	A
Green 101	A
Red 101	A

Continue with additional color/sensor assignments as needed.

Save

When finished assigning colors to sensors, click the Save button to save the new standard. The new standard saved will be placed in the Standard list on the left side of the screen.

Reset

The Reset button is used to return the colors assigned to each sensor back to their original settings. If this is a new standard, then the sensors are set to no assigned colors.

Tools Mode

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

Device Tab

The device tab provides the status for the hub and each sensor, and a list of errors. Factory setting can also be restored on this tab page.

Device | Communications | Targeting | Calibration | Log File

Name

Device Name:

Demo

Apply Revert

Errors

Clear Errors Print

Lock Device Buttons

Device Lock Status: Off

Software Command

Off

PLC Input: Off

Factory Settings

To restore the default settings to the current device, click the button below. Performing this action will cause you to lose all of your current preferences.

Restore Factory Settings

Name Group

The device group provides the ability to edit the instrument's name. Enter a name in the device name field and click Apply.

The Revert button is used to change the device name back to the name it was before it was changed.

Errors Group

The Clear Errors button will clear the errors shown in the Error list and remove the errors stored in the hub.

The Print Report button will print all error shown in the list to the default printer.

Factory Settings Group

Clicking the Restore Factory Settings button will restore the hub to its default configuration.

Lock Device Buttons Group

The Lock Device Buttons group is used to lock the PLC Input and Software Command. The option button toggles between On and Off. When the button is On the option is disabled, and when the button is Off the option is enabled.

Communications Tab

This communications tab is used to configure the Ethernet connection. Consult your IT department for specific setting requirements.

Device	Communications	Targeting	Calibration	Log File
Ethernet Settings Fixture Name: Demo Hub Serial Number: 12345 Ethernet Support: Off DHCP: Off Network Name: Hub Name IP Address: 0.0.0.0 Subnet Mask: 0.0.0.0 Default Gateway: 0.0.0.0 DNS Server: 0.0.0.0 Save Settings				

Targeting Tab

The targeting tab provides a “wizard” format that takes you through a number of steps required to verify sensor(s) positioning on a part.

Targeting the sensor(s) in conjunction with the software application will be covered in greater detail in the Operation section later in this document.

Device	Communications	Targeting	Calibration	Log File
Step One Select which sensor you would like to target. Then click Next. A B C D E F Step 1 of 5 Next >				

Calibration Tab

The calibration tab provides a “wizard” format that is used to verify sensor(s) performance and calibrate the sensor(s) if needed.

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

The screenshot shows the 'Calibration' tab selected in the top navigation bar. The main content area is titled 'Sensor A: Step One'. It contains instructions: 'Select which sensor you would like to Calibrate. View last Verification and Calibration, then click Verify to initiate verification process.' Below this are six buttons labeled A, B, C, D, E, and F, each with a sensor icon. Button A is highlighted with a black border. Below the buttons, it shows 'Sensor: A Last Verification: 3/21/2006 3:43:30 PM' and 'Sensor: A Last Calibration: 3/21/2006 3:43:30 PM'. At the bottom right, it says 'Step 1 of 4' and a 'Verify' button.

Log File Tab

The log file tab displays details on the log file. You can view, archive, and clear the current log, as well as past log files.

The screenshot shows the 'Log File' tab selected in the top navigation bar. The interface is divided into two main sections: 'Current Log' and 'Past Logs'.
 The 'Current Log' section displays:
 - Log Name: Door Panel #1.VeriColorLog
 - Log Started: 3/6/2006 10:02 AM
 - Entries: 128
 There are 'View Log' and 'Clear Log' buttons. Below this, it says 'Archive Based On: ☒ Time ☐ Size'. There are two sliders: the first for frequency with options 'Daily', 'Weekly', and 'Monthly'; the second for size with options 'Small', 'Medium', and 'Large'. An 'Archive' button is at the bottom.
 The 'Past Logs' section has a dropdown menu for selecting a log file. Below it, it shows fields for 'Log Name:', 'Log Started:', 'Log Completed:', and 'Entries:'. At the bottom are 'Delete Archive' and 'View Archive' buttons.

Current Log Group

The Current Log group displayed is the log file in use by the current project in the hub.

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

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

The 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 hub's serial number. You can archive based on Time (weekly, bi-weekly or monthly) or Size (small, medium or large).

The Archive 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.

Past Logs Group

The Past log control allow you to selected previously stored log files.

The View Archive button is used to view the selected log file.

The Delete Archive button is used to delete the selected log file. Deleted log files cannot be restored.

Device/Logging Controls (bottom screen)

The bottom of the screen contains the Project, Device, and Log controls.

Project	Device	Log
Active: Door Panel +-ACM-1 Standards Loaded: 2 Auto Select: On 	 Status: Ready Unit: Demo Number: 12345	Started: 3/21/2006 2:43 PM 84 of 10000 (0%) 

Sensor(s) appear when the orange arrow is clicked.

Project	Device																			
Active: Door Panel +-ACM-1 Standards Loaded: 2 Auto Select: On 	 Status: Ready Unit: Demo Number: 12345	<table border="1"><thead><tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr></thead><tbody><tr><td>12345</td><td>12345</td><td>12345</td><td>12345</td><td>12345</td><td>12345</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>	A	B	C	D	E	F	12345	12345	12345	12345	12345	12345						
A	B	C	D	E	F															
12345	12345	12345	12345	12345	12345															
																				

Project Fields

Contains the following fields:

- **Active:** Name of the current project loaded in the hub.
- **Standards Loaded:** Current standards loaded in the hub.
- **Auto Select:** Displays the status of the auto select feature for the current project.
- **Update Button:** Click to download the selected project to the hub.

Device Status Graphic

The status of hub and each sensor is displayed at the bottom of screen. The background color reflects the current condition of each device. If red appears, the device can be clicked on to view the error condition information.

- **Green:** Device is ready and operating.
- **Yellow:** Device is warming up.
- **Red:** Device has a system error.

Device (Hub) Fields

Contains the following fields:

- **Status:** The status of the hub (Ready, Warming up, or Error).
- **Unit:** The name of the hub.
- **Number:** The serial number of the hub.
- **Orange Arrow:** Click this icon to display the sensor graphics. Clicking a second time closes the sensor graphics.

Sensor Fields

Contains the following fields:

- **A-F:** Indicates the letter of the sensor(s) in use.
- **Number:** The serial number of the sensor.

Log File Info

Contains the following fields:

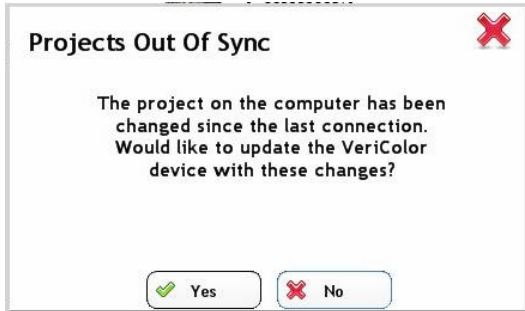
- **Log Started:** The year-month-day-time that the log file was started.
- **Entries:** The number of lines in the log file (out of a maximum number of 10,000).
- **File Name:** The name of the log file as it is saved on the computer.
- **Log Start/Stop button:** Click the Start button to turn automatic measurement logging on. When this mode is on, the button changes to "Stop" and each measurement is recorded in a log file. Click the Stop button to turn logging off.

Project Out Of Sync Message

A project out of sync message appears when the project on the computer and hub do not match one another. The message that displays depends on which device's (computer or hub) project has changed since the last connection.

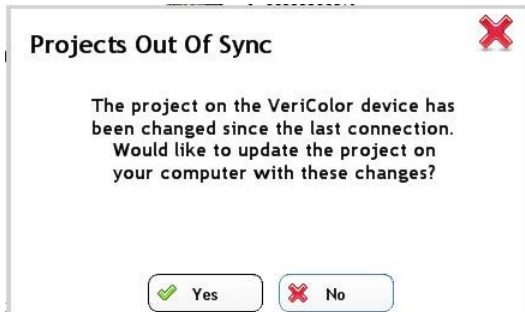
Computer Project Change

This screen appears when the project in the computer has changed. Clicking the Yes button causes the changed computer project to overwrite the project in the hub.



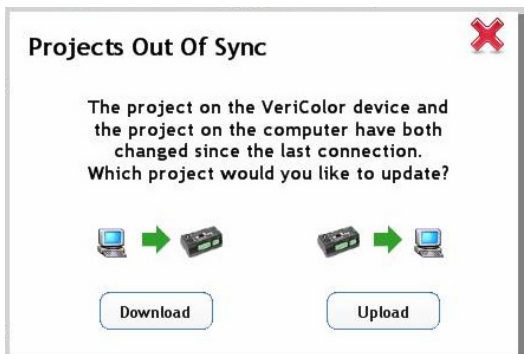
Hub Project Change

This screen appears when the project in the hub has changed since the last connection. Clicking the Yes button causes the changed project in the hub to overwrite the same project in the computer. A backup copy of the existing project in the computer is automatically created and stored in the VeriColor projects folder (i.e. "C:\Program Files\VeriColor Hub System v2.0\Projects") when Yes is selected.



Computer Project and Hub Project Changed

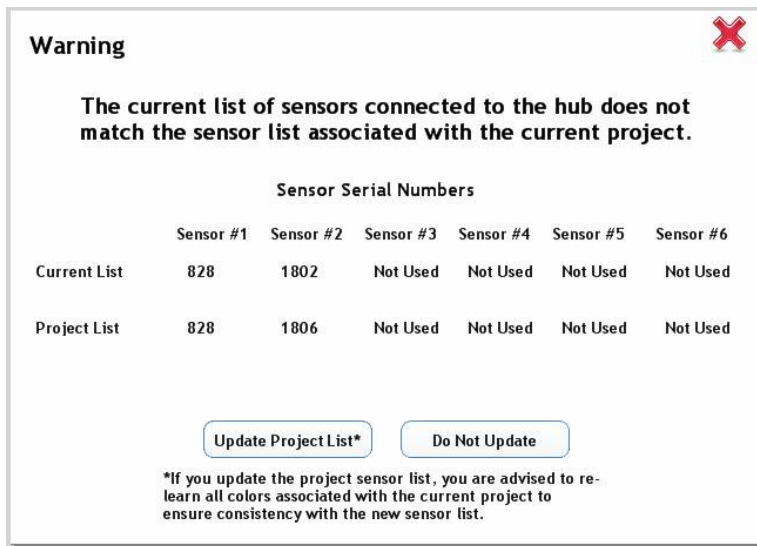
This screen appears when both the project in the computer and the project in the hub have changed. Clicking the Download button causes the project in the computer to overwrite the project in the hub. Clicking the Upload button causes the project in the hub to overwrite the project in the computer. In the case of an upload, a backup of the current computer project is created as explained earlier.



Sensor List Warning Message

The hub keeps track of the sensors that were used on the selected project via their serial numbers. If a sensor is changed for example, the serial number of the changed sensor no longer matches the serial number in the project so a warning message appears. This is also true if a sensor is added or removed. This check for the current sensor list is made when the hub is connected to the computer or an attempt is made to download a project from Setups to the hub.

X-Rite recommends that if sensors are changed the colors should be relearned for the current project to ensure consistency.



Example of a warning screen.

Do Not Update Button

Clicking this button will continue with the download and no changes will occur. However, this message will appear every time you connect to the computer or attempt to download this project to the hub. Or until the original sensors that match the project are returned to the hub.

Update Project List Button

Clicking this button will cause the hub to update the sensor list in the current project; keeping this message from reappearing.

VeriColor Hub Software Operation

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

For information on operating the hub manually, refer to Manual Hub Operation later in this document.

Learning Standard Colors

Learning is the method of measuring a color that will be used as a standard color for sample comparison. Colors are then assigned to standards and downloaded to the hub.

NOTE: When operating in environments above 40°C, the sensor(s) should be calibrated and standard colors 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 sensor 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. Make sure the Colors tab is selected and click **New** button.
4. Enter a color name in the Color Name field, assign a sensor(s), and click **Edit Readings**.
5. Position the part in the fixture (under the assigned sensor) that is to be used for a standard color.
6. Click the **Measure** button to take the measurement.
7. Reposition the part (or position a different part) and take additional measurements.
8. Select the desired tolerancing method and accept or decline measurement as needed.
9. When you have finished measuring the standard color to achieve an average, click the **Done** button to return to the main project setup screen (Color tab).
10. Click **Save** to save the color to the color list.
11. Repeat step 3 through 10 to continue with the additional standard colors.

Monitoring Sample Measurements

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 hub.
3. If auto color is not used, select the standard 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 the bar graph and color wheel(s).
6. Select a sensor color wheel graphic in the Sensor Overview group to view individual sensor results.
7. Remove the sample and continue with additional sample parts.

Targeting Mode

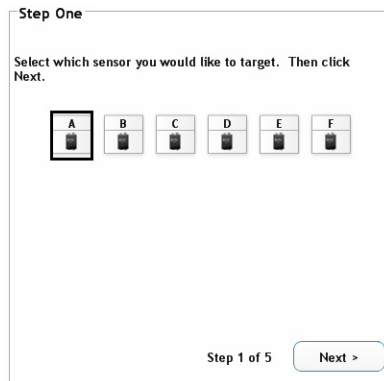
Because the sensor(s) over illuminates, it is sometime difficult to tell exactly where the sensor is viewing to determine color. This is particularly true for small part measurements. Targeting a part is the method of adjusting the sensor(s) on the fixture to the required position for part measurements. 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.

Important Targeting Mode Notes:

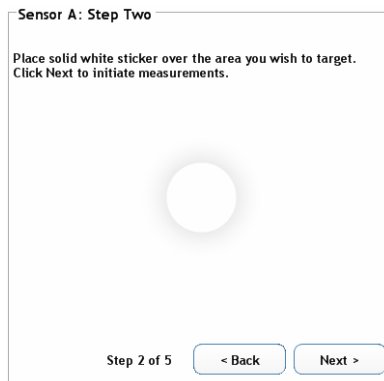
Before leaving target mode, test the fixture's alignment and repeatability by removing and installing the sample several times as done in a production environment. If the Δ LED's value differs significantly when the part is placed in and out, then the fixture needs to become more precise. Otherwise,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

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

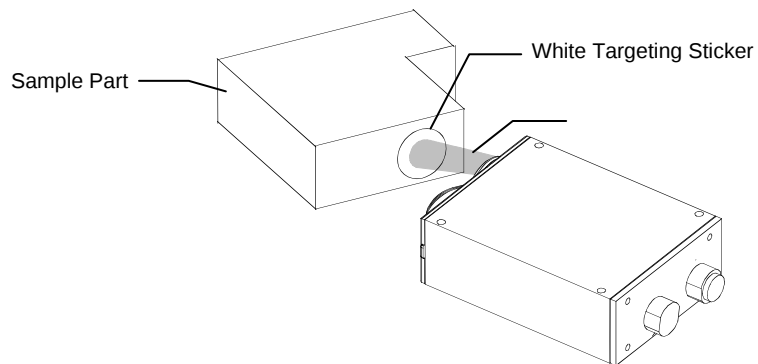
1. Start the application; select the **Tools** screen and then the **Targeting** tab.
2. Place the white sticker over the target area of the part you intend on measuring.
3. Place the part in the fixture to begin targeting.
4. Click the icon of the Sensor (A-F) you are targeting and then click **Next**.



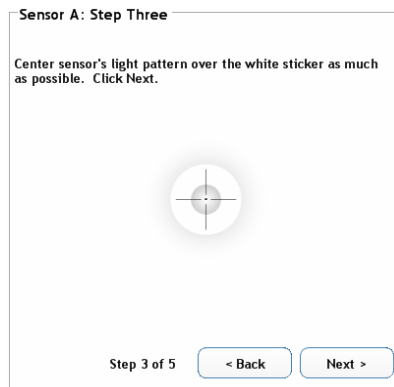
5. Click **Next** on Step 2 window to start the continuous measurement sequence.



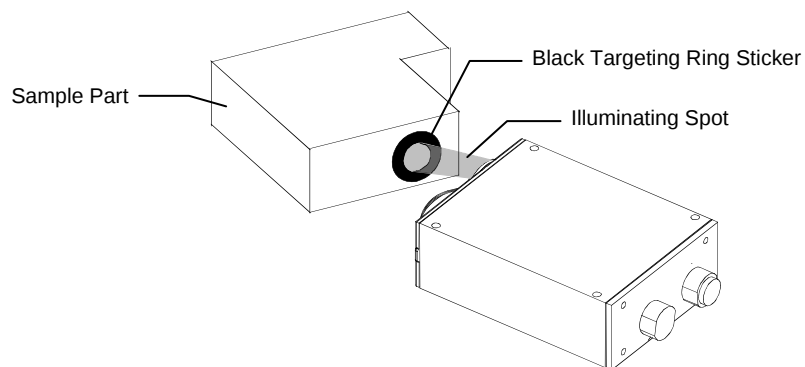
6. Without disturbing the pre-aligned height and angle position of the sensor, carefully adjust the sensor (x and y coordinates) so the flashing spot is centered in the middle of the white sticker.



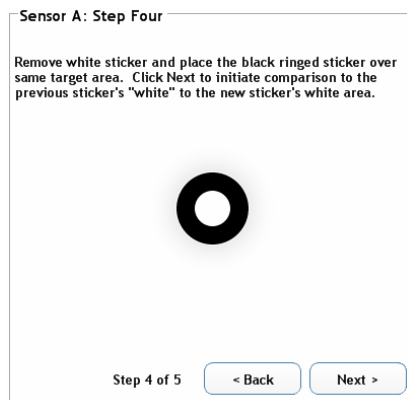
7. After the desired positioning is achieved, click **Next** on Step 3 window. This takes the last measurement and saves it as the target value for the sensor.



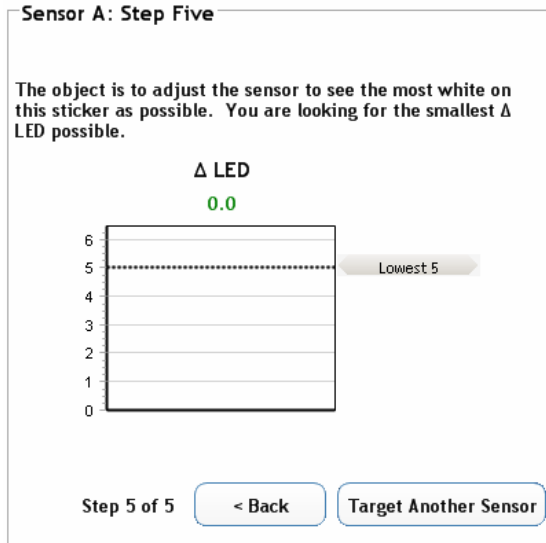
8. Remove the part from the fixture and remove the white sticker. Place the black ring sticker in the same location. The black ring is used to help "fine tune" the alignment.



9. Place the part back in the fixture and click **Next** on the Step 4 window.



10. View the bar graph on the Step 5 window. If the Δ LED value has increased, you will need to fine tune the sensor. This is due to the fact that the flashing spot from the sensor may be measuring part of the black outer ring. If this occurs, fine tune the sensor to get the smallest Δ LED value possible. Be careful not to change the sensor's height and angle adjustment. A Δ LED value of 1.0 or under should be achievable.



11. After the sensor is targeted, click **Target Another Sensor** to return to the Step 1 targeting window. From here you can target another sensor or exit the targeting mode.

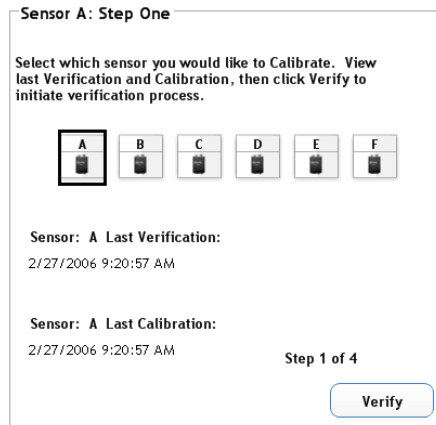
Calibration/Verification Mode

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

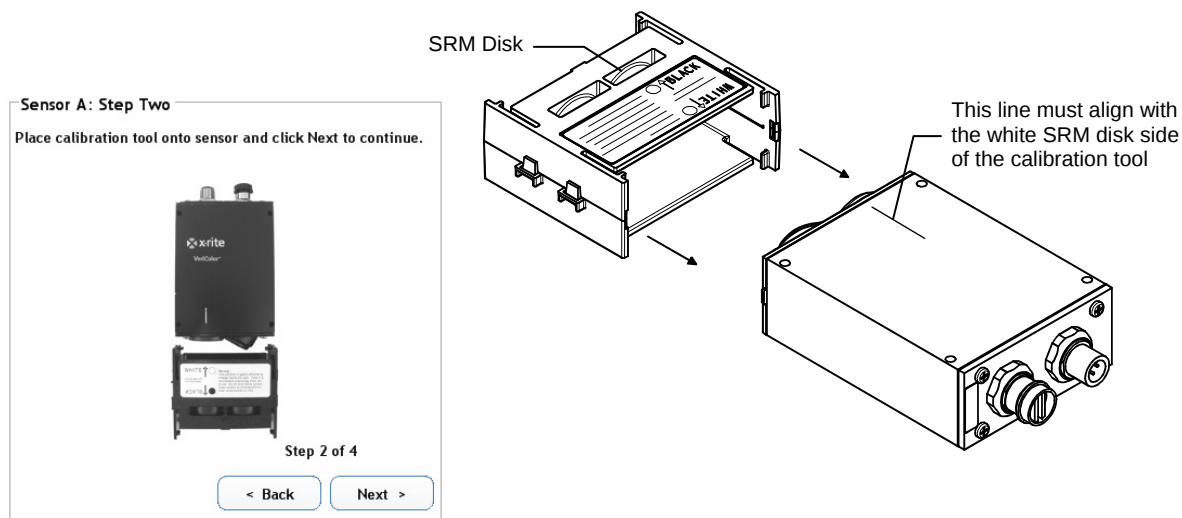
NOTE: When operating in environments above 40°C, the sensor(s) should be calibrated and standards should be learned at the operating temperature to maintain best performance and color resolution.

IMPORTANT: Do not touch the white SRM (Standard Reflection Material) 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.

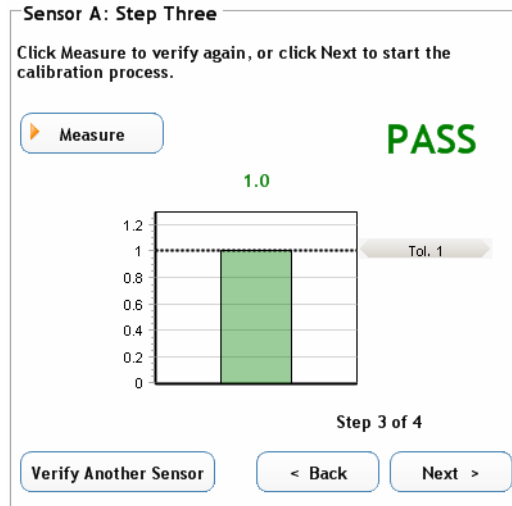
1. Start the application; select the **Tools** screen and then the **Calibration** tab.
2. The first screen lists information on when the last verification and calibration were performed on the selected sensor. Click the icon of the sensor (A-F) and then click **Verify** to begin the verification process.



3. Snap the "white" end of the calibration tool onto the optics end of the sensor. 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 sensor. After the tool is properly positioned, click **Next** on Step 2 window.



- Click **Measure** on the Step 3 window. The Δ LED bar graph appears and a PASS or FAIL status is indicated. The tolerancing can be changed by clicking on tolerance arrow and dragging 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 click **Verify Another Sensor** to return to the first verify window. From here you can verify another sensor or exit the calibration mode.

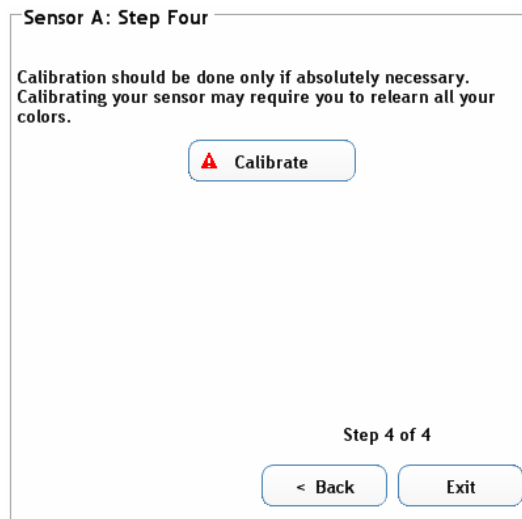
If a failure occurred, make sure the calibration tool is on correctly and that the SRM disk inside the tool is clean. You may also want to clean the illumination port and sensor port on the sensor. Refer to the General Maintenance section for cleaning procedures.

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** button on the Step 3 window to advance to the Step 4 window where calibration is performed.

IMPORTANT: Calibration should only be performed if absolutely necessary. Calibrating the sensor may require stored standard colors for that particular sensor to be relearned.

- Click **Calibrate** on the Step 4 window to calibrated the sensor.



Manual Hub Operation

In manual mode, inputs from the front panel buttons of the hub or local PLC control the hub. The hub has limited configuration capabilities along with local control. In local PLC mode, the hub only runs a predefined sequence program with results displayed locally, while providing external control signals via relay outputs.

Manual hub operation requires no computer interface. Operation is performed utilizing the buttons, 2 digit display, and LEDs located on the hub.

Operation of the system consists of three main modes, targeting, learning, and sample measurements.

For information on operating the hub utilizing the VeriColor hub software, refer to VeriColor Hub Software Operation earlier in this document.

NOTE: The LOCK (Lockout) input terminal must be disabled for the hub's panel buttons to function. Deactivation depends on your choice of pull-up or pull-down configuration. For status, you can visually reference the 'lock' LED to verify the functional state (green illumination indicates 'lockout' is active). Remember, lockout can also be activated through software or remote commands so they must also be deactivated.

Manual Standard Learning Mode

Learning is the method of measuring a color that will be used as a standard color for sample comparison. The manual learn mode allows you to measure standard colors and store them in the hub without using the VeriColor software application. For more advanced setups and greater control, it is suggested that you use the VeriColor software application when learning standard colors.

NOTE: When operating in environments above 40°C, the sensor(s) should be calibrated and standard colors 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 sensor 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. Position the part in the fixture that is to be used for a standard color.
2. Press the **Select Up** arrow button or the **Select Down** arrow button to choose a location (1-50) to store the standard data.

NOTE: Care should be taken when selecting a standard location. Pre-existing standards can be easily overwritten in manual learn mode.

The Enable LED indicates whether the selected standard is enabled or disabled. An illuminating Enable LED indicates the standard is enabled (refer to Enable/Disabling Standard later in this section for more information). Also, the output LEDs (A-F) illuminate amber if data is stored for the selected standard. For example, if standard

#3 is selected on a two sensor system, LEDs "A" and "B" will light if data is stored in the location.

3. Press the **Learn** button once to activate the learn mode. The LED next to the button illuminates red when learn mode is activated.
4. Press the **Read** button to take one measurement with all attached sensors. The standard that is saved in the hub is a collection of measurements (VLA) from all attached sensors.
5. Additional measurements can be taken on the part to achieve average values by pressing the **Read** button as many times as desired.

NOTE: In the standalone learn mode, averaging only occurs within individual sensors, not across all attached sensors.

A tolerance value of 1.00 is the starting default value and will auto compensate based on how far any additional measurements deviate from the current average. The tolerance will never auto adjust below a value 1.00. The VeriColor software must be used to allow smaller tolerancing.

If a measurement error occurs and you want to restart the measurement sequence for the standard, simply toggle the selected standard number up or down and then back.
6. Continue with the next standard by placing the part in the fixture and using the **Select Up** or **Select Down** button to select the standard location.
7. When all required standards have been measured, press the **Learn** button to permanently save the standards and exit out of the learn mode. The LED next to the learn button will go out.

Enabling/Disabling Standard in Manual Mode

Stored standards can be enabled or disabled for a particular project. This is accomplished by using the **Enable** button next to the 2-digit display. Use the **Select-Up** or **Select-Down** arrow buttons to choose the standard location. The LED next to the Enabled button illuminates green when the selected standard is enabled. Pressing the Enable button again will disable the standard (LED not illuminating). When the LED is off, the standard is disabled and will not be evaluated during a standard search. The standard can be reselected by pressing the **Enable** button again. If no standard is stored in the selected location, the LED will not illuminate when the **Enable** button is pressed.

Measuring Sample in Manual Mode

This is the mode the hub operates in most of the time. The hub will operate in its default configuration. Any changes to configuration require the VeriColor software.

After each sample measurement, the closest passing standard (smallest Δ LED) to the sample becomes the current standard.

If the sample was within tolerance per sensor, then the Pass output LED illuminates. If one sensor fails its tolerance in a multi sensor fixture, then the Fail Output LED illuminates.

When a measurement passes, the LED Array Output will illuminate with green lights (activating the output relays) as the binary representation of the Standard number.

If a measurement fails, the LED Array Outputs will all turn off (if they aren't already). Outputs LEDs illuminate for 15 seconds (default setting) after a measurement or until a new measurement is taken.

1. Determine what standards are to be used for sample comparison if required (see Enabling/Disabling Standards).
2. Position the sample in the fixture.
3. Press the **Read** button to activate the sensor(s) measurement. The hub automatically selects the closest standard and displays the select standard number on the 2-digit display and binary LEDs.
4. Repeat above steps to measure additional samples.

Manual Targeting Mode

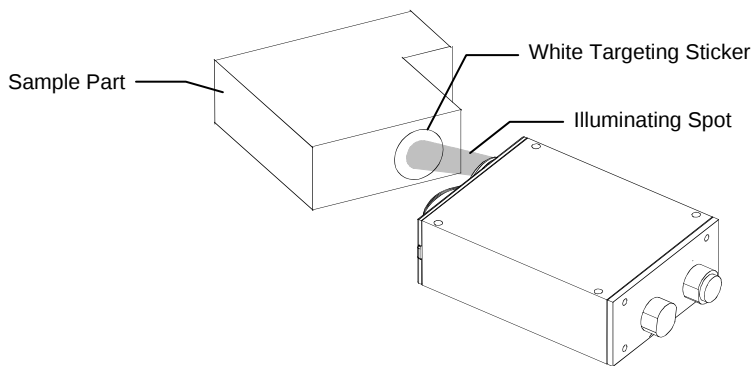
Because the sensor(s) over illuminates, it is sometime difficult to tell exactly where the sensor is viewing to determine color. This is particularly true for small part measurements. Targeting a part is the method of adjusting the sensor(s) on the fixture to the required position for part measurements. 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.

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 Δ 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.

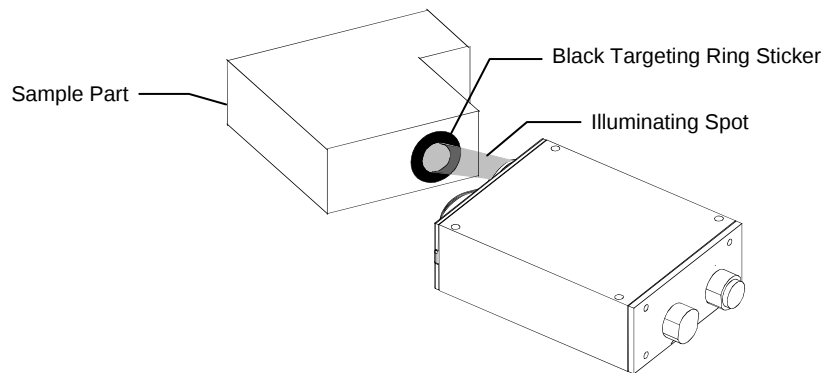
Each time targeting mode is started, the sensor will need to relearn the (white sticker only) target.

1. Place the white sticker over the target area of the part you intend on measuring.
2. Place the part in the fixture of the first sensor to begin targeting.
3. Simultaneously press and hold the **Read** button and the **Learn** button on the hub until targeting mode is entered. Targeting mode is indicated by:
 - Learn LED illuminating red
 - Output LED "A" illuminating amber
 - 2-digit display fluctuating values (example, 8.9, 9.9, etc.)
 - First sensor taking rapid measurements (2 per second)
4. Without disturbing the pre-aligned height and angle position of the first sensor, carefully adjust the sensor (x and y coordinates) so the flashing spot is centered in the middle of the white sticker.



5. After the desired positioning is achieved, press the **Learn** button. This takes the last measurement and saves it as the target value for the sensor. The 2-digit display should indicate 0.0 as long as the fixture is stable.

6. If additional sensors require targeting, press the **Select Up** or the **Select Down** arrow buttons to advance to the next sensor and repeat steps 4 and 5.
7. 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.
8. Place the part back in the fixture and select the first sensor using the **Select Up** or the **Select Down** arrow buttons.
9. The value indicated on the 2-digit display will more than likely increase. This is due to the fact that the flashing spot from the sensor may be measuring part of the black outer ring. If this occurs, fine tune the sensor to get the smallest Δ LED value possible. Be careful not to change the sensor’s height and angle adjustment. A Δ LED value of 2.0 or under is considered acceptable.



10. Press the **Select Up** or the **Select Down** arrow buttons to advance to the next sensor and repeat step 9.
11. After all sensors are targeted, simultaneously press the **Learn** button and **Measure** button to exit targeting mode.

Restoring Factory Presets in Manual Mode

Factory Presets are restored by pressing and holding (approx. 2 seconds) the **Up** arrow, **Down** arrow, and **Enable** buttons simultaneously. The output LED array illuminates amber and then red. At this point, the Factory Settings are restored. The reset process can be aborted by releasing the buttons before the LED's illuminate red. Restoring Factory Presets clears following data:

- Master Sensor List
- All Standards, Projects, and Fixture data
- Configuration settings
- Communication settings (Ethernet defaults to Off and must be setup again from software, and RS-485 Serial port's Baud rate defaults back to 19200)
- Customer calibration data

Performing a factory preset does **not** clear the hub and sensor serial numbers. Reset the hub after performing a factory preset. Refer to Front Panel Interface section for procedure.

General Maintenance

Repair Information

The VeriColor 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: 1-888-826-3042 or fax: 1-616-534-0067).

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 Hub

Normally, use low-pressure air to blow away any dust or debris between the connectors and top surface.

Cleaning the Sensor(s)

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.

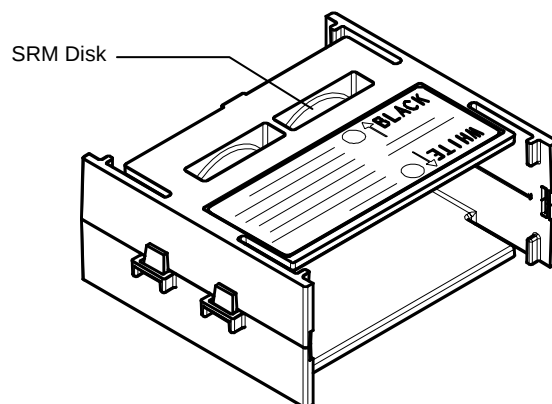
For a more thorough cleaning, photographic lens tissue and photographic-type lens cleaning fluid or isopropyl alcohol may be used. Always apply the fluid to the cleaning cloth – never directly on the lens.

Cleaning the Calibration Tool

Caution should be used not to touch the SRM (Standard Reflection Material) 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.



Appendices

Specifications

General

Instrument Type: Hi-Res Reflective Color
Geometry: 0°/30°
Measurement Area: 12 mm (.5 in.) or 6 mm (.25 in.) spot sizes
Color Difference Resolution: 0.25 Δ LED, typical (Δ LED is a proprietary color difference calculation which is based on VeriColor LED color response and is scaled similar to CIE ΔE^* for small color differences.)
Operating Temp: 0° - 50°C (32° - 122°F)¹
Operational Humidity: 0 - 95% non condensing
Hub Size: L: 6.9" (17.5 cm), W: 4.2" (10.7 cm),
H: 3.2" (8.1 cm)
Hub Weight: 20 oz (670 g)
Sensor Size: L: 5.1" (13 cm), W: 2.9" (7.4 cm),
H: 1.3" (3.3 cm)
Sensor Weight: 12 oz (338 g)
Power Source: 24V @ 50/60 Hz., AC or DC, 2.5 Amps Max.

Performance

Black Repeatability: 0.3 Δ LED (1% reflectance black)
0 - 40°C (32 - 104°F)¹
White Repeatability: 0.05 Δ LED (99% reflectance white)
0 - 40°C (32 - 104°F)¹
Measurement Distance: 35 mm $\pm$ 5 mm (1.4 in. $\pm$.2 in.)
Measurement Time: 250 ms
Cycle Time: 1 sec. (time interval between measurements)
LED Illuminator Life: Life of the unit

Environmental

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

Enclosure

Sensor: Designed to meet NEMA 4 / IP56
Hub: Designed to meet NEMA 12 / IP52
Vibration: 5 - 10 Hz 0.200 inch displacement pk - pk
10 - 500 Hz at 1G
Shock: Operational at 15 g amplitude 18 ms duration
Non-Operational at 30 g amplitude 11 ms duration
Package Drop: NSTC Project 1A

Safety Compliance

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

¹When 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 1-888-826-3042 or by visiting our website at: www.xrite.com.

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
Small Spot (.25") Targeting Sticker Kit	P/N VC25-32

Hub Electrical Interface Details

These are the 2-part screw terminal blocks used for power input and local PLC interfacing. The hub interface has the following screw terminal Inputs and Outputs:

(Looking **left** to right from top view)

Item	Location	Name	Description	Active State	Comments
--	Top (left)	Power +	24 Volts AC or +24 Vdc . Related LED status indicator.	Power supply	2.1-amps max.
--	Top	Power -	24 Volts AC or DC Ground	Power supply	
15=Input 6	Top	PLC-1 // "1's"	PLC screw terminal	Either (+24 Vdc) <normal high/pull low> <normal low/pull high>	15 –ma. Max.
14=Input 5	Top	PLC-2 // "10's"	PLC screw terminal	Either (+24 Vdc) <normal high/pull low> <normal low/pull high>	15 –ma. Max.
I3=Input 4	Top	PLC-3 // "Discrete Select"	PLC screw terminal	Either (+24 Vdc) <normal high/pull low> <normal low/pull high>	15 –ma. Max.
--**	Top	Signal Common	Common (PLC screw terminal)	<u>COMMON</u> <u>Signal return</u> // 12 - 15	
I2=Input 3	Top	READ / Measure	PLC screw terminal or Manual command push button	Either (+24 Vdc) <normal high/pull low> <normal low/pull high>	15 -ma. max.
** 12 – 15			**Uses a common return path		
--	Top	Lockout-B	PLC screw terminal	<u>Signal return</u> // isolated pair	
I1=Input 2	Top	Lockout-A	PLC screw terminal	LOW (+12V base) <normal high/pull low>	15 -ma. max.
--	Top	Reset-B	PLC screw terminal	<u>Signal return</u> // isolated pair	
I0=Input 1	Top	Reset-A	PLC screw terminal or Manual command push button. Related LED status indicator.	LOW (+12V base) <normal high/pull low>	15 -ma. max.

(Looking **right** to left from top view)

Item	Location	Name	Description	Active State	Comments
--	Bottom (right)	Fail -C (common)	PLC screw terminal: Common contact (isolated)	Signal common	Return line
O0 = Output 1	Bottom	Fail -NO	PLC screw terminal with LED status indicator for "Fail" section. Normal Open contact (isolated)	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
O1 = Output 2	Bottom	Fail -NC	PLC screw terminal: Normal Closed contact (isolated)	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	Pass -C (common)	PLC screw terminal: Common contact (isolated)	Signal common	Return line
O2 = Output 3	Bottom	Pass -NO	PLC screw terminal with LED status indicator for "Pass" section. Normal Open contact (isolated)	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
O3 = Output 4	Bottom	Pass -NC	PLC screw terminal: Normal Closed contact (isolated)	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
O4 = Output 5	Bottom	ChnA -NO	PLC screw terminal. Normal Open contacts. Related LED status indicator for Channel-A.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	ChnA -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	
O5 = Output 6	Bottom	ChnB -NO	PLC screw terminal. Normal Open contacts. Related LED status indicator for Channel-B.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	ChnB -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	
O6 = Output 7	Bottom	ChnC -NO	PLC screw terminal. Normal Open contacts. Related LED status indicator for Channel-C.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	ChnC -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	
O7 = Output 8	Bottom	ChnD -NO	PLC screw terminal. Normal Open contacts. Related LED status indicator for Channel-D.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	ChnD -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	
O8 = Output 9	Bottom	ChnE -NO	PLC screw terminal. Normal Open contacts. Related LED status indicator for Channel-E.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	ChnE -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	
O9 = Output 10	Bottom	ChnF -NO	PLC screw terminal. Normal Open contacts. Related LED status indicator for Channel-F.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5-amps max @120Vac
--	Bottom	ChnF -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	

RS-232 and RS-485 Electrical Interface Details

These are the two DB-9 connectors used for RS-232 and RS-485 interfacing.

RS-232 - only pins 2, 3, and 5 are used the rest are not connected.

Item	Pin	Name	Description	Active State	Comments
RS232	2	TX	Serial communications	Float (+5V base)	
RS232	3	RX	Serial communications	Float (+5V base)	
RS232	5	GND	DC Ground		
RS232	shell	C-GND	Chassis Ground --		

RS-232 - only pins 2, 3, and 5 are used the rest are not connected.

Item	Pin	Name	Description	Active State	Comments
RS485	3	"B"	Serial communications pair...	Float (+5V base)	"differential"
RS485	6	GND	DC Ground		
RS485	8	"A"	Serial communications pair...	Float (+5V base)	"differential"
RS485	shell	C-GND	Chassis Ground --		

Hub to Sensor Electrical Interface Details

Remote Sensor Interface – RS-422.

Item	Location	Name	Description	Active State	Comments
1 -Output	a	Power +	24 Volts DC	Power supply	1.0 -amps max.
2 -Output	b	Power -	DC Ground	Power supply	
3 -Output	c	HTX-a	Serial communications pair... RS422: Transmit line "a"	Float (+5V base)	"differential"
4 -Output	d	HTX-b	Serial communications pair... RS422: Transmit line "b"	Float (+5V base)	
5 -Input	f	HRX-a	Serial communications pair... RS422: Receive line "a"	Float (+5V base)	"differential"
6 -Input	g	HRX-b	Serial communications pair... RS422: Receive line "b"	Float (+5V base)	
7 – shell	shell	C-GND	Chassis Ground --		

Hub 2-Digit LED Display Codes

VeriColor was designed to be robust and reliable. Below is a list of display codes and their meaning. Many error situations are recoverable. Error codes are indicated any time the 2-digit display is flashing on/off. You can also visit our website at **www.xrite.com** for the latest update information

Problem	Topic	Explanation/Solution
Non-Flashing "01"	Hub Ready Mode, Learn LED Off, LED Array all off	After System Test Mode completes, the hub always selects the first standard as indicated by the "01" and is ready to measure samples.
Flashing "01" – System Test Mode	Each time VeriColor powers up, it will enter Test Mode.	This is normal operation. VeriColor will remain in this state until all sensors confirm they have warmed up to operating temperature and are ready to measure. While sensors are warming up, Output LEDs on the hub will indicate which sensors are warming or ready. Sensors still warming up are indicated by a red light, while ones that are ready will be amber. Once all sensors are ready all LED's will turn off and the system is ready for measurements, also the "01" will cease to flash. Typical warm-up time for a system at room temperature (22°C) should be 20-40 seconds. The colder the sensor is, the longer it will take to warm up.
	VeriColor remains in test mode for longer than three minutes.	Reset the hub and see if problem repeats itself after three minutes.
		For each sensor that still indicates a red "warming up" status, it is likely they are defective and should be replaced. The sensor may otherwise work fine but will not be thermally color stable for the specified temperature operating range.
Flashing "02" – Master Sensor List Error.	After power-up the hub has detected a difference between the Master Sensor List and the system's current configuration. If any of the following changes were made to the system - Sensor(s) added Sensor(s) removed Sensors changed order in the daisy chain	If the changes made to the system are intentional, refer to FAQ section on resetting the Master Sensor List.
	A hardware failure has occurred giving the appearance that sensors have been removed from the system.	Refer to the Hardware area for Troubleshooting under the topic of Sensors that won't communicate.

Problem	Topic	Explanation/Solution
Flashing "03" – Sensor Timeout Error	The hub has tried to communicate to a specific sensor and failed.	Refer to the Hardware area for Troubleshooting under the topic of "Sensors that won't communicate".
Flashing "04" – Measurement Failed Error	During a measurement, one or more sensors had communication problems.	Take note of which "Output" LEDs are amber. This will identify the problem sensor(s). Reset the hub. If the "02" error mode occurs, then refer to Hardware area for Troubleshooting under the topic of "Sensors that won't communicate".
		If the "02" did not occur after reset, then try a few measurements to see if the "04" error mode returns. If not, a likely cause is a sensor may have been disconnected and reconnected by accident or by a loose connection. Check all cables for damage and verify they are firmly connected. Any time a sensor gets disconnected from the system, it will not be able to communicate to the hub even after it is reconnected until the hub is reset.
		The "04" returns and all sensors can be observed to measure (look for the flashing colored light from each sensor). In this case, the sensor indicated by amber is returning bad measurements. This should be very rare but would mean that particular sensor needs replacing.
		If the "04" error occurs in different sensors, then the problem is likely environmental electronic noise that overwhelms the communications during a measure. This should be a rare occurrence but, additional shielding may be required.
Flashing "05" – Sensor Hardware Failure	During system test, a sensor has returned an error code to the hub indicating a problem	Use the amber LEDs to find the problem sensor, it must be replaced.
Flashing "06" – Data Storage Error	During power up, the hub experienced a one-time glitch was not able to properly load storage data.	Reset hub and see if the "06" error mode returns. If so see next cause.

Problem	Topic	Explanation/Solution
Flashing “06” – Data Storage Error – cont.	User settings are corrupt.	Two causes for this error are erroneous values being sent to the hub from a software application, or a new version of hub firmware has a different data storage structure than the previous. Clear out user settings with the “Factory Presets Procedure”; see FAQ or user manual for details. Reset hub and see if “06” returns. If not normal operation can resume.
	“06” returns even after performing “Factory” Presets Procedure”.	Either factory settings are corrupt or there is a hardware problem with the hub. In either case the hub must be replaced and serviced.

Error Log in VeriColor Hub Software

When using this table, some errors numbers that appear in the VeriColor software may be 3 digits. In those cases, the first digit always identifies in which sensor the error occurred. For example, an error of "220" means a Master Sensor List error occurred in sensor #2. Errors that are possibly 3 digits can be found in the table below with an "x" before the number.

Problem	Topic	Explanation/Solution
01 – Bad Command	An invalid command has been sent to the hub.	This type of error can for the most part be ignored.
02 - Command Timeout	The hub was expecting further input to a command but did not receive it in time.	Check communication cable to see if it's loose or disconnected. Clear errors and continue.
		Improperly entered command by a user or some Software application. Clear errors and continue.
		If cable is fine, this error may have been caused by temporary interference. Clear errors and continue.
x02 – Sensor Timeout	A particular sensor has not responded to a command sent by the hub.	One or more sensors have been removed from the system. Even if they were reconnected, the hub has not been reset. Reset the hub, and observe hub while it powers up to see if it finds any missing sensors ("02" flashing number). If the "02" error mode occurs, then refer to Hardware area for Troubleshooting under the topic of Sensors that won't communicate.
		Intermittent noise has temporarily impeded communications between the hub and sensor. Reset the hub, and observe hub while it powers up to see if finds any missing sensors ("02" flashing number). If the "02" error mode occurs, then refer to Hardware area for Troubleshooting under the topic of Sensors that won't communicate.
		If this problem keeps occurring intermittently, but no problems are found during power up, then the likely problem is a faulty cable or loose connection. Check and/or replace any cables between the hub and sensors. Any cables that exist between the problem sensor and hub should be suspect.

Problem	Topic	Explanation/Solution
x02 – Sensor Timeout – cont.	A particular sensor has not responded to a command sent by the hub. – cont.	If the error seems to occur frequently after a certain time period after power-up and all suspect cables have been replaced, then the sensor that has the problem probably has incurred some damage to its communications and will need replacement. Although having a hub's communications damaged is very unlikely, it is much easier to replace a hub than a sensor. Some customers may prefer to do this before replacing sensors.
03 – Invalid Sensor	A command sent to the hub has instructed it to use a sensor it doesn't believe exists. This is more likely to occur in 3 rd party Software Applications or direct user commands.	If the sensor being accessed is connected to the system, perhaps it was added without resetting the hub afterwards. Reset the hub so it initializes the new sensor(s).
		Improper command sent to hub. Check command format and check for typos.
"Error: Reported Sensor List does not match the Master Sensor List associated with this fixture"	This screen can only happen when a user attempts to Connect in VeriColor Software. If a difference between the hub's current setup and what Software remembers a warning screen will appear giving the user three options. Descriptions and when to use these options appear to the right.	"Continue – Temporarily ignore data from missing sensors." This option will allow the user to attempt to use the system "as is". This is not recommended for normal use as the system will do its best to operate, but operation will be different depending on the situation. This option should only be used for very temporary situations where the system is required to limp along or for diagnostics. This error screen will come up every time the user connects if "Continue" is chosen the previous time.

Problem	Topic	Explanation/Solution
"Error: Reported Sensor List does not match the Master Sensor List associated with this fixture" – cont.	This screen can only happen when a user attempts to Connect in VeriColor Software. If a difference between the hub's current setup and what Software remembers a warning screen will appear giving the user three options. Descriptions and when to use these options appear to the right. – cont.	"Update Master Sensor List – DON'T Re-learn Standards" This option gets chosen when the configuration for the "Reported Sensor List" column is to become the new setup for the current Fixture. Using this option will save the "Reported" setup as the new Master Sensor List. This option also does not force all standards in the fixture to be relearned before downloading. This feature should be only used if the new "Master Sensor List" does not affect the fixture's standards. Sense sensors are not currently interchangeable and cannot be expected to read samples in exactly the same way. If all fixture standards' have large color differences (3.00 ΔLED or more apart) then a different sensor probably won't matter.
		"Update Master Sensor List – Re-learn ALL Standards" This option works much the same as described above, except all standards for the current Fixture will be marked with a <Re-Learn> label. A project cannot be downloaded to the Hub if it contains a standard that is still labeled <Re-Learn>. Each standard must be edited and relearned. This assures all standards are compliant with the current setup for system reliability and performance.
x20 – Master Sensor List Error	The hub has reported a difference between its current setup and what it was setup as. Take note of which Sensor(s) are out of place. "Error: Reported Sensor List does not match the Master Sensor List associated with this fixture"	The best way to diagnose this problem is to click on the "Clear Errors" button, the hub will be reset and the user is brought back to the first screen. When the user clicks "Connect" and the problem still exists, the Sensor List Error screen will come up. This screen is more useful to seeing exactly what the problem is. See above section "Error: Reported Sensor List does not match the Master Sensor List associated with this fixture" if the current setup is acceptable. Otherwise if you have sensors that are "missing", please refer to Hardware area for Troubleshooting under the topic of "Sensors that won't communicate".

Problem	Topic	Explanation/Solution
x30 – Failed Measurement	The last measurement returned an error code that indicated one or more sensors as failing. Take note to see which sensor(s) are indicated.	Clear errors and resume normal operation. If the same sensor fails again it has either been damaged or defective and requires replacement.
50 – Hub Load Storage Failure	While powering up, data was not able to be loaded properly.	May be a one-time glitch, reset hub. If this problem happens more than once, replace the hub.
51 – Hub Save Storage Failure	An attempt to store data in the hub permanently has failed.	If this ever does happen (not likely) then the hub's memory is damaged and needs to be serviced/replaced.
x51 – Sensor Save Storage Failure	An attempt to store data in a sensor permanently has failed.	The only times something gets stored in the sensor is when the user calibrates or wants to update the cal. verify date. This failure should be extremely rare but if seen the sensor should be replaced. Sensor may work just fine otherwise except for not being able to change the current Calibration or verify date.
52 – Invalid Factory Settings	When the hub powered up, it noticed its Factory Settings were corrupt.	Any data stored in the hub is likely corrupt, so it needs replacing.
53 – Invalid User Settings	User settings somehow got set to an invalid value.	Perform "Factory Presets" on hub, then reset hub. Current hub configuration will have to be set again in the Setup/Diagnostics screen. The current project should be downloaded again. It's hard to say what caused the problem, perhaps 3 rd Party Software loading in values that got past the initial check.
	Might be common if switching between different versions of firmware.	If one release has a different data structure than the previous, this error will likely happen. Follow instructions above to reset the user memory.
## - Unknown Error Code	An error that has occurred that has not yet been documented.	Please contact customer support as this document will be updated time to time.

Hardware Troubleshooting

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

Problem	Topic	Explanation/Solution
"Hub is initializing" Is the hub locked up?	This message remains until the hub has sent the OK to software indicating all of its sensors have arrived at operating temperature.	No problem, just wait until all sensors have warmed up.
Hub won't power up, hub loses power, or keeps cycling on and off.	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 or 26V AC). Re-settable fuse opens.	Voltage spec is 24V +/- 2V. Correct voltage supplied to hub and then re-apply power.
"Read" input does not work, system does not measure.	Power supply does not provide enough current at power-up.	Make sure power supply can provide at least 2.5A at start up.
	"Read" LED indicator lights up properly when both "Read" button and "Read" Input are used.	Hub has not been reset after sensors have been connected/disconnected. Reset hub and try again.
	"Read" LED Indicator light does not work with input.	Hub may have just powered up and is still trying to initialize. (see flashing "01" state under hub operation. Wait until the hub indicates a solid "01" before attempting to measure.

Problem	Topic	Explanation/Solution
"Read" input does not work, system does not measure. – cont.	"Read" LED indicator lights up properly when both "Read" button and "Read" Input are used. – cont. "Read" LED Indicator light does not work with input. – cont.	All sensors may be disabled in the current project or an errant command sent to the hub. Edit the current project in VeriColor Software and re-download the project making sure all the required sensors are enabled.
		If the LED light does not work when the button on the hub is pressed, then the hub is defective and needs service.
		If the LED lights for the button but not the input, it's a wiring problem. See next section for getting discrete inputs to work.
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.
		Terminal not plugged in properly
		Loose or broken wires
		Contamination has entered the terminal and is preventing a reliable connection
		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 voltage (24V or more) or AC can cause damage to the circuitry. Hub will need servicing.
		Inputs need to be held low for at least 100ms. If the hub 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.

Problem	Topic	Explanation/Solution
Hub button doesn't seem to be doing anything.	Check PLC "Lockout" status.	If the "Lockout" LED is light, all buttons on the hub will be inoperative even though their input LED illuminates ("Read" LED). Remove "Lockout" input to use hub buttons.
	Current Project or software setting has activated the software key lockout.	There is a setting that also allows keys to be disabled. This does not illuminate the "Lockout" Input. One way to tell is when the "Read" button on the hub still prompts measurements but none of the other buttons do anything (except Reset). Go into VeriColor software and under "Project" settings, "Disable buttons on hub after download" is selected. Unselect this if you wish to have the hub buttons remain active.
Problems with discrete Outputs.	Wiring/Electrical problems.	Terminal screws are not tightened firmly on wires.
		Terminal is not plugged in properly
		Loose or broken wires.
		Contamination has entered the terminal and is preventing a reliable connection
		Too much current (greater than 1Amp) or voltage 200V (AC or DC) will cause damage requiring hub repairs.
Sensors that won't communicate or are missing.	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 between the hub and sensors, even if the cable exists downstream.
		A cable that is loose might cause intermittent communications and constant resetting of sensors. Ensure a proper connection and reset the hub.

Problem	Topic	Explanation/Solution
Sensors that won't communicate or are missing. – cont.	Check cables first. It might be a quick fix and are the cheapest parts to replace. – cont.	A cable that has shorted out has the potential to cause damage to multiple sensors!
		A good test of the cables in multiple sensor systems is to temporarily disconnect cables so that only the first sensor is connected to the hub. If all is well after a hub reset the first sensor should not be indicated as a problem on the LEDs or VeriColor Software when connecting.
		Now add on one sensor at a time, giving the hub a reset each time. Check back with the hub's LEDs or consult software.
	Check Hub's communications. This is not very likely to have gone bad but it's much easier to replace a hub than any sensor.	Eventually one connection will still reveal a sensor to be missing or cause other previously working sensor s to missing too. This is the cable to be replaced.
		If replacing cables do not fix the problem, go to the next section.
		If you have a spare hub, connect the sensor s to it and apply power. If you are able to measure with all sensors then your original hub was the problem.
		If you have a spare known good hub and cable, connect them up to the original hub and use software to determine if it found the right Sensor Serial # for "Reported Sensor List". Remember to reset the hub after connecting the spare sensor.
		If the original hub works with the spare sensor, the problem exists in one or more of the original sensors.

Problem	Topic	Explanation/Solution
Sensors that won't communicate or are missing. – cont.	Dealing with a bad “missing” sensor	One bad sensor can disrupt all communications with sensors further downstream. Always start with the first sensor that is identified as missing. Replace the first faulty sensor with a spare unit. That position will still indicate an error in the LEDs but the software should indicate ***MISMATCH*** instead of MISSING. Once one bad sensor is replaced, others behind it may suddenly be functional again. Possibly only one sensor is defective/damaged. Use VeriColor Software through this process each time a change is made to the system. The best way to troubleshoot this problem is to remain in the “Connect” screen, reset the hub, and then click on “Connect”. If a problem still exists the “Master Sensor List” error page will come up indicating the current state of what the Hub currently sees vs. what it was setup with.

Ethernet Notes

Make sure the instrument is connected to an Ethernet port (either part of an existing network or a direct connection to a PC with a 10Base-T Ethernet card installed). For an existing connection, an RJ-45 *straight through* cable is required. For a direct connection, an RJ-45 *crossover* cable is required.

Before Ethernet communications can work, it is necessary to configure the hub using the VeriColor software. By default, the Ethernet ability is disabled in the hub and must be enabled. If the hub does not have an assigned IP address and a DHCP (Dynamic Host Configuration Protocol) server is available on the network, enable the *use DHCP* option. Using DHCP automatically sets up critical Ethernet parameters using the hub name. The default hub name is the letters "VC" followed by the instrument serial number. The VeriColor software allows the hub name to be changed if necessary. (NOTE: Valid names for Ethernet follow strict rules. Generally, alphanumeric names work best with no special characters). If your network administrator has assigned a static IP address to the instrument, DHCP may be left unchecked, but then the *IP address* and *Netmask* are required to be entered. The DHCP method is recommended for a quick and temporary connection. For more permanent installations it is recommended that a permanent IP address be reserved for the hub and the hub should operate in the static mode (DHCP disabled).

If there is a failure to communicate, check the cables and the communication configuration to make sure they are correct. If the Ethernet has worked previously, but fails to connect, go to the *start/run* entry box provided by Windows. Type and run the line: `nbtstat -R`

Make sure the `-R` is the capital letter. This utility clears a table that matches names with IP addresses maintained by Windows. If there are redundant DHCP servers on the network, it is possible for the wrong IP address to be assigned to the hub name. Clearing the table corrects this problem. Typically, the table updates itself after about 15 minutes, but `nbtstat -R` clears the table causing an immediate update when necessary.

Remote Control Interface

If you would like to control VeriColor hub from a 3rd party software, refer to the RCI Interface manual provided on the CD-ROM. The commands work the same on RS-232, RS-485, and Ethernet.

General FAQs

Q - When power is applied to the hub, it keeps making clicking noises and never fully powers up.

A - Not enough current is being supplied. Make sure the supply is capable of supplying 2.2A peak load.

Q - When powering up the hub, the Standard # displays "00" for a long time and does not respond to buttons or RCI commands.

A1 - The most likely cause of this the Ethernet Port has been enabled but the network is down or not connected. If the hub starts working normally within 7 or so seconds, see options below for possible solutions.

If the Ethernet connection is not going to be used, turn it off using VeriColor software over the RS-232 port. Reset hub to verify fix.

Network might be down. See IT dept.

Ethernet settings might have changed, review them and reset the hub.

A2 - If "00" persists for 10 seconds or more, then the hub is locked up and it's possible something got corrupted in its current configuration. To clear it out, hold down buttons to restore factory presets while cycling power on the hub (make sure the PLC input for Lockout is not active). If this does not work, then the hub is defective and needs replacement.

Q - How do I know which standards are real/exist?

A1 - Use the Select Up and Down buttons to scroll through. The output LEDs (A-F) illuminate amber if data is stored for the selected standard. For example, if standard #3 is selected on a two sensor system, LEDs "A" and "B" will light if data is stored in the location.

Q - How do I update my hub's firmware?

A - In the unlikely event the hub's firmware needs updating, look on the VeriColor CD provided and install the Firmware Update Utility. New firmware is available on the X-Rite website.

Q - When I push buttons on the hub I get no response, but otherwise the system is working.

A1 - Check the Lockout indicator on the hub. If it is illuminating, the buttons are disabled. Remove the PLC lockout input, or pull the input high to enable the buttons on the hub.

A2 - If the Lockout indicator is not illuminating, the keys may be disabled because of a configuration command sent by the software. Edit the desired project to enable the button on the hub and then download.

Q - Why do I keep getting NA for Pass/Fail response in VeriColor Software?

A1 - Pass/Fail option has been disabled either in the current project or by a command sent to the hub. Edit the current Project in software and make sure the "Check for Pass/Fail after each measurement" box is checked.

A2 - The current standard selected on the hub is empty or doesn't have a tolerance. One option is to change to a standard that has a valid tolerance with the Select Keys or serial command. The likely cause is "Select the closest standard after each measurement" box is not checked in the current project, which causes the NA if the current standard selected on the hub is invalid.



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