

VeriColor™

Identification System



Setup and Operation



Equipment Information

FCC

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada Statement

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



Use of this equipment in a manner other than that specified by X-Rite, Incorporated may compromise design integrity and become unsafe.

WARNING: This instrument is not for use in explosive environments.

ADVERTENCIA - NO use este aparato en los ambientes explosivos.

AVVERTIMENTO - NON usare questo apparecchio in ambienti esplosivi.

WARNUNG: Das Gerät darf in einer explosiven Umgebung NICHT verwendet werden.

AVERTISSEMENT: Cet instrument ne doit pas être utilisé dans un environnement explosif.

CE Declaration

Manufacturer's Name:	X-Rite, Incorporated
Manufacturer's Address:	3100 44 th Street, S.W. Grandville, Michigan 49418 U.S.A.
Model Name:	VeriColor Identification System
Model No.:	VC125, VC150
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 radio interference in which case the user may be required to take adequate measures.

Table of Contents

Proprietary Notice	iv
Limited Warranty	iv
1 Overview and Setup	1
Hub Description	1
Power Supply Interface	2
Local PLC Interface	2
Power Input	2
PLC Input Controls	2
PLC Outputs	3
Computer Interfaces	4
RS-232 Interface	4
Ethernet Interface	4
RS-485 Interface (programmable logic controller)	4
Front Panel Interface	4
RESET Button	4
ENABLE Button	4
Select Up or Select Down Buttons (arrows)	4
LEARN Switch	5
READ Switch (Measure)	5
Display (2-digits)	5
Remote Sensor Head Interface	5
Chassis Grounding Post	5
Setting Up the System	6
Mounting the Sensor Head(s)	6
Mounting the Hub	8
Connecting the Cabling	10
2 Operation	11
Manual Hub Operation	11
Manual Targeting Mode	11
Manual Learn Mode	12
Measuring Sample Mode	14
Enabling/Disabling Standard	14
Factory Presets	14
Remote Control Interface	15
VeriColor Software Application	15
Installing the Software	15
Starting the Application	15
Calibration	16
Attaching the Calibration Tool	16
3 General Maintenance	17
Repair Information	17
Cleaning the Hub	17
Cleaning the Sensor Head	17
Cleaning the Calibration Tool	17
4 Appendices	19
Hub Functional Block Diagram	19
Hub Electrical Interface Details	20
RS-232 and RS-485 Electrical Interface Details	22
Hub to Head Electrical Interface Details	22
VeriColor Specifications	23
General	23
Performance	23
Environmental	23

Enclosure	23
Mechanical	24
Safety Compliance	24
Accessories	24
Hub 2-Digit Display Codes	25
VeriColor Software Chart	26

Proprietary Notice

The information contained in this manual is derived from patent and proprietary data of X-Rite, Incorporated. This manual has been prepared solely for the purpose of assisting in the use and general maintenance of this instrument.

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The product is patent pending.

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Limited Warranty

X-Rite, Incorporated warrants each unit manufactured to be free of defects in material and workmanship for a period of twelve months. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at a nominal cost. In this case, an estimate will be submitted before work is started, if requested. Always include serial number in any correspondence concerning the unit.

There are no warranties of merchantability or fitness. This warranty obligation is limited to servicing the unit returned to X-Rite, Incorporated for that purpose.

This agreement shall be interpreted in accordance with the laws of the State of Michigan and jurisdiction and venue shall lie with the courts of Michigan as selected by X-Rite, Incorporated.

X-Rite® is a registered trademark of X-Rite, Incorporated. VeriColor™ is a trademark of X-Rite, Incorporated. All other logos, product names, and trademarks mentioned are the property of their respective holders.

Overview and Setup

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.

VeriColor is composed of three main components: the sensor head(s) which captures color; the hub which provide interfaces to the user and sensor; and the software application.

Hub Description

The hub is the main module of VeriColor. It controls the remote sensor head(s) and provides an interface to the outside world (external user via PLC or front panel control, or computer communications).

A few basic features of the hub are:

- stores multiple color standards (50 maximum)
- incorporates pass/fail and error signal indication using LED output status indicators
- provides 2-way external communication and control (RS-232, PLC, and Ethernet)
- includes a flexible Windows software application for setup
- Din Rail mountable for easy installation, or optional flange mounting brackets are also available

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.

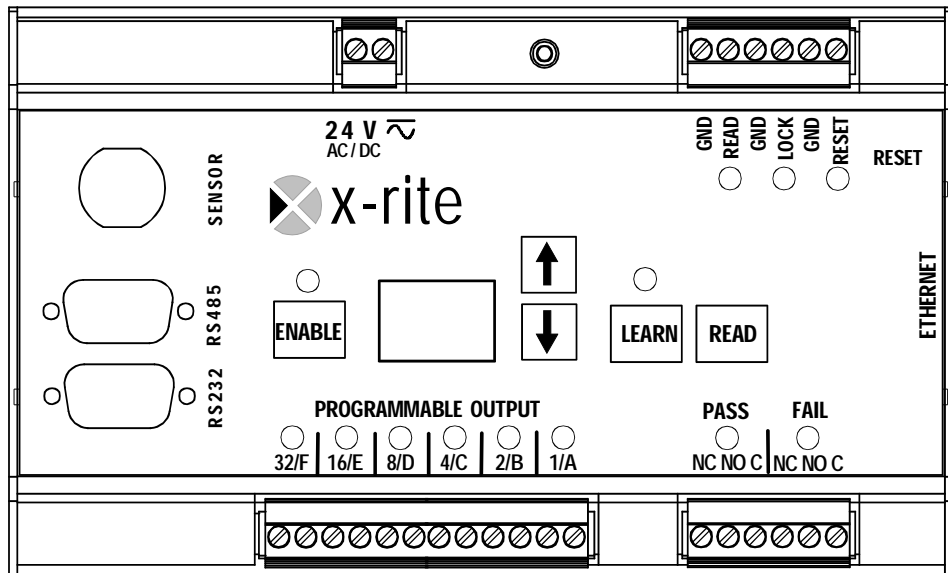


Figure 1

Power Supply Interface

The main power input is 24 ± 2 volt @ 50/60 Hz. AC or DC. The AC will be converted to DC internally. There is no polarity connection required. Refer to additional details as describe in the following section. There is a “chassis” grounding stud located near this power input to use for non-metal mounting applications.

Local PLC Interface

Local external control between the user (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. This 2-piece system consists of a removable plug that contains the screw terminals and the mating header that’s mounted on the unit. 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.

Power Input

24V @ 50/60Hz. AC/DC - Terminal connections for 24V @ 50/60Hz. AC or 24VDC. 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.

PLC Input Controls

This is a 6-position plug located on the top right side of the unit. Applying a ground level voltage (0 volts) to the screws activates these 3 inputs.

Lock (Lockout) Input

This input is activated by hardwire during local PLC control. A “low” input activation will command the hub to process a “lockout” operation and **MUST** be *continuously* applied for function to exist. This action disables front panel manual control, except for RESET. There is an associated green LED status indicator. LED off indicates no action and “green” (LED on) means, “LockOut” mode active.

Read Input (Measure)

This input is activated by hardwire during local PLC control. A momentary “low” input activation of 1-second pulse commands the hub to process a “measure” operation. Functional operation is same as switch control and its associated LED status indicator that will be explained herein.

Reset Input (Soft Reset)

This input is activated by hardwire during local PLC control. A momentary “low” input activation of 1-second pulse commands the hub to process a “software-reset” operation. There is an associated red LED status indicator that displays operational information to the user. LED off indicates no action or unit is okay and “red” (LED on) indicates a “RESET” is occurring.

Signal Ground Input

There is several signal ground inputs provided to accompany the control lines described above.

PLC Outputs

There are two multi-position plugs located along the bottom edge of the unit and they 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.

Pass/Fail – 6 position plug:

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. Note that if "fail" is active, "pass" will NOT operate.

6-Channel, 12 position plug:

Channel Outputs (12 connections)

This output group could 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 or 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.

Channel Status Indicator Outputs (6 Bi-color LEDs)

These 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" means feature active. Red indicates "state = 0" and 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 be through either of two methods: the standard RS-232 and a 10 MB Ethernet connection. The RS-485 port is an optional input, but is intended for PLC use.

RS-232 Interface

The computer interface is through a standard computer RS-232 port (DB-9 connector); also see Appendix. 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 interaction between the user and the hub 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. See figure-1 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 to the user. LED off indicates no action and "green" (LED on) indicates "ENABLED."

Select Up or Select Down Buttons (arrows)

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 to the user and as button activation happens, changes to the display indicate "Select-up or Select-down" respectively.

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 to the user. LED off indicates no action and “red” (LED on) indicates “LEARN” mode.

READ Switch (Measure)

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 to the user. LED off indicates no action and “green” (LED on) indicates a “MEASURE” function is occurring.

Display (2-digits)

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 dLED value. dLED values from 0.0 to 9.9 can be displayed.

dLED 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 Head Interface

The remote sensor heads 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 head identification in the order they are located in the communications chain. Refer to the Appendix for electrical details.

Chassis Grounding Post

The chassis grounding post (PE), located between the power terminals and PLC input terminals, must be used to ground the hub. Without this connection, sensor head measurements may be sensitive to nearby noise sources.

Setting Up the System

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

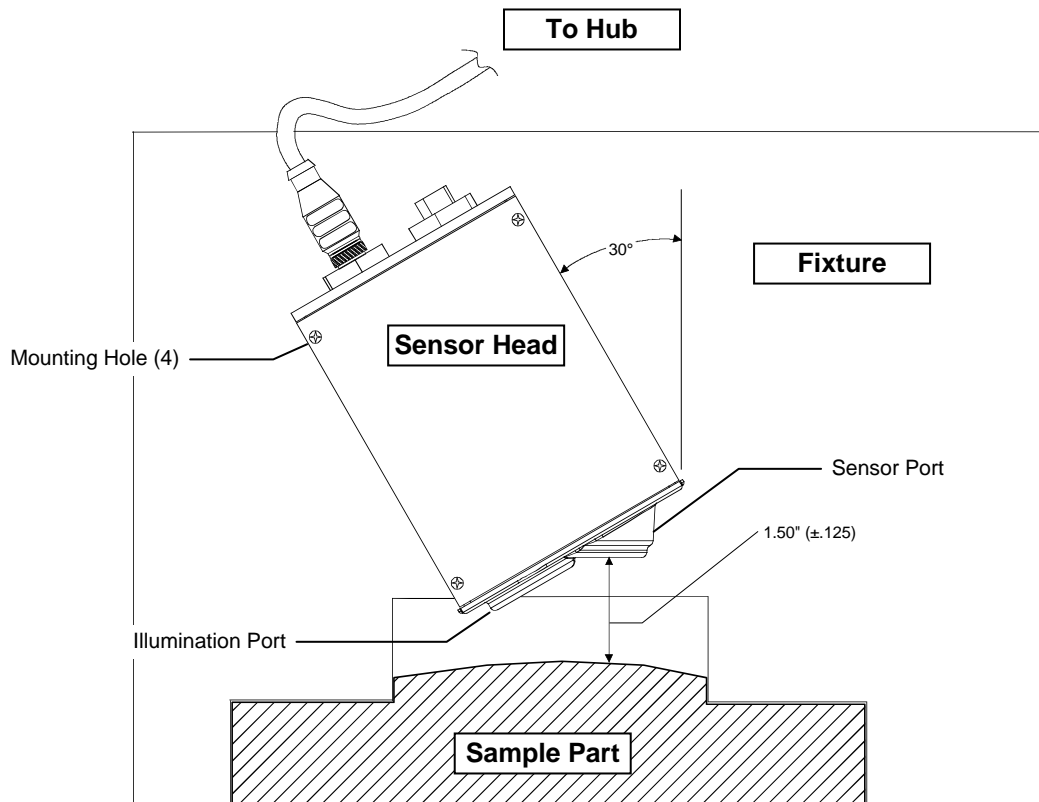
IMPORTANT: Make sure that the hub is reset after any sensor head is connected, removed, or switched position.

Mounting the Sensor Head(s)

Mount the sensor head(s) to the fixture using the holes provided at each corner. The sensor head can be mounted tilted (30°) or vertically. To receive the best measurement sensitivity, X-Rite recommends mounting the sensor heads tilted.

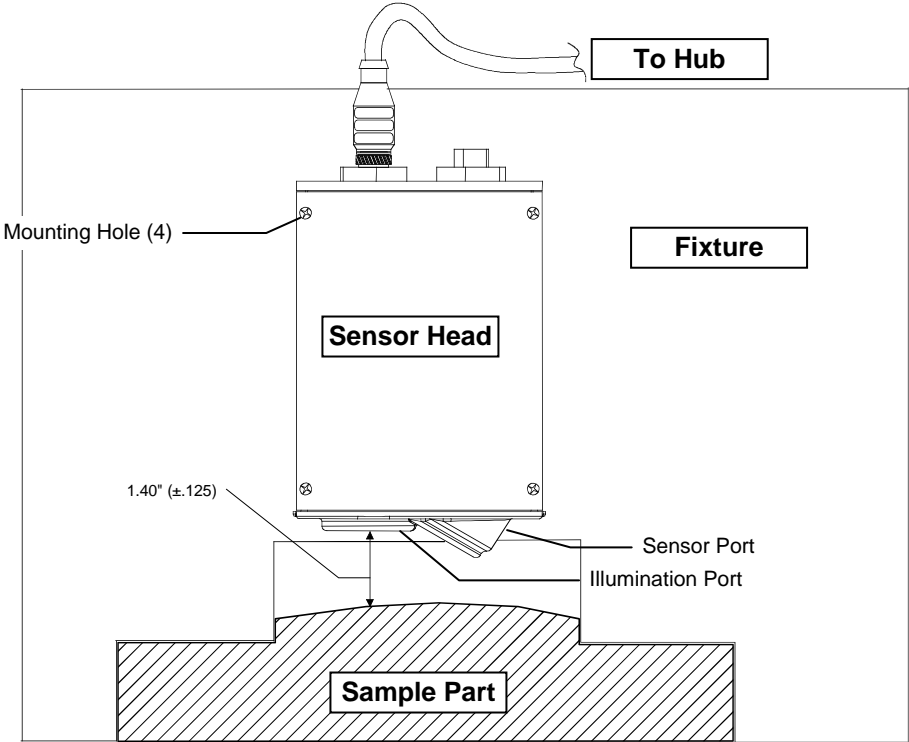
Tilted (30°)

The sensor port must be at a height of 1.50 in. ($\pm .125$ in.) from the part surface when mounting the sensor head at a 30° angle.

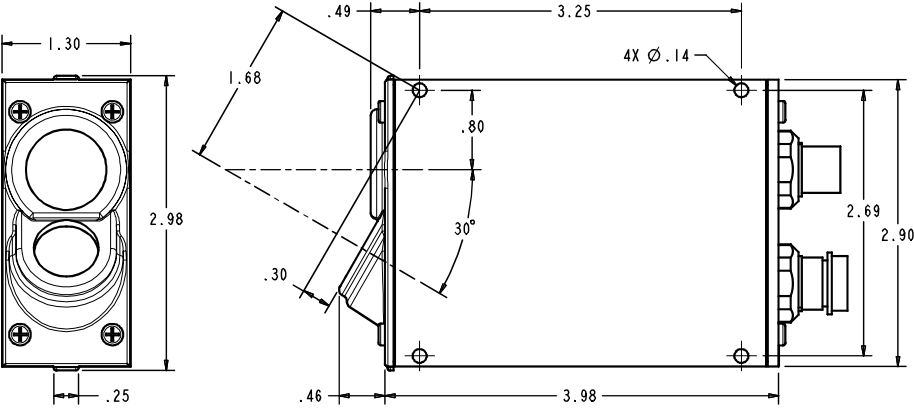


Vertical

The Illumination port must be at a height of 1.4 in. ($\pm .125$ in.) from the part surface when mounting the sensor head vertically.



Sensor Head Dimension Drawing



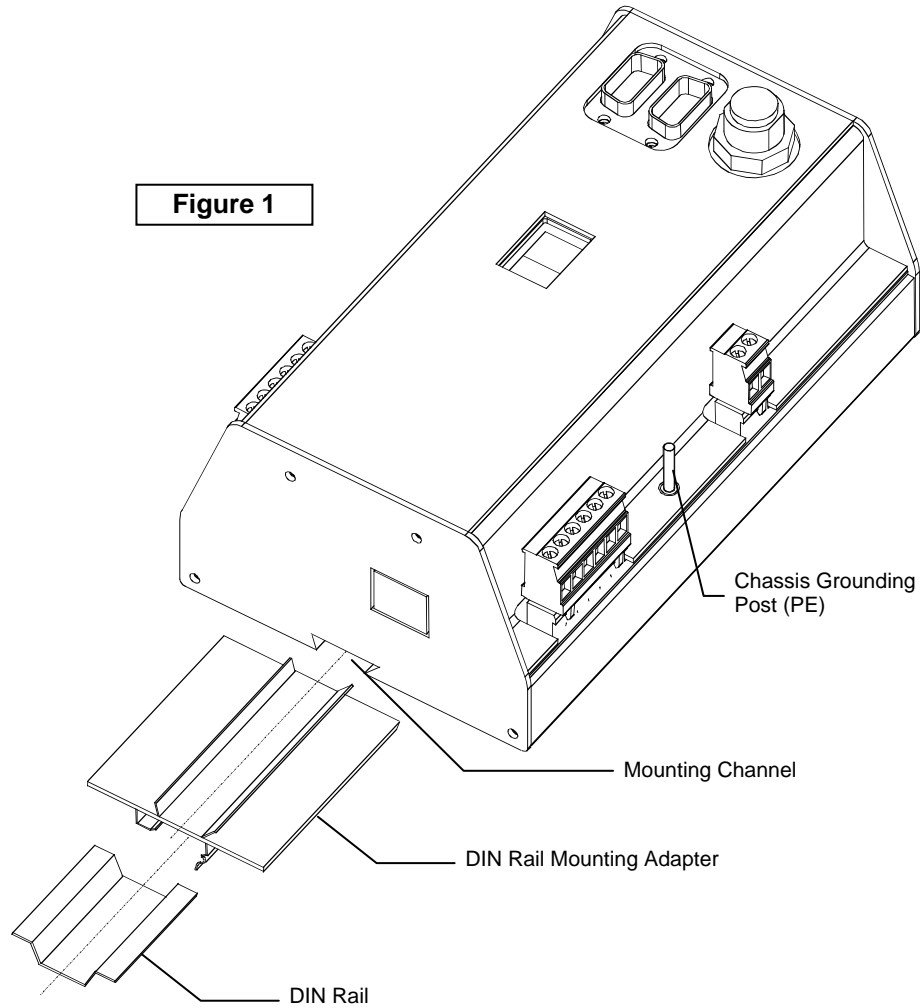
Mounting the Hub

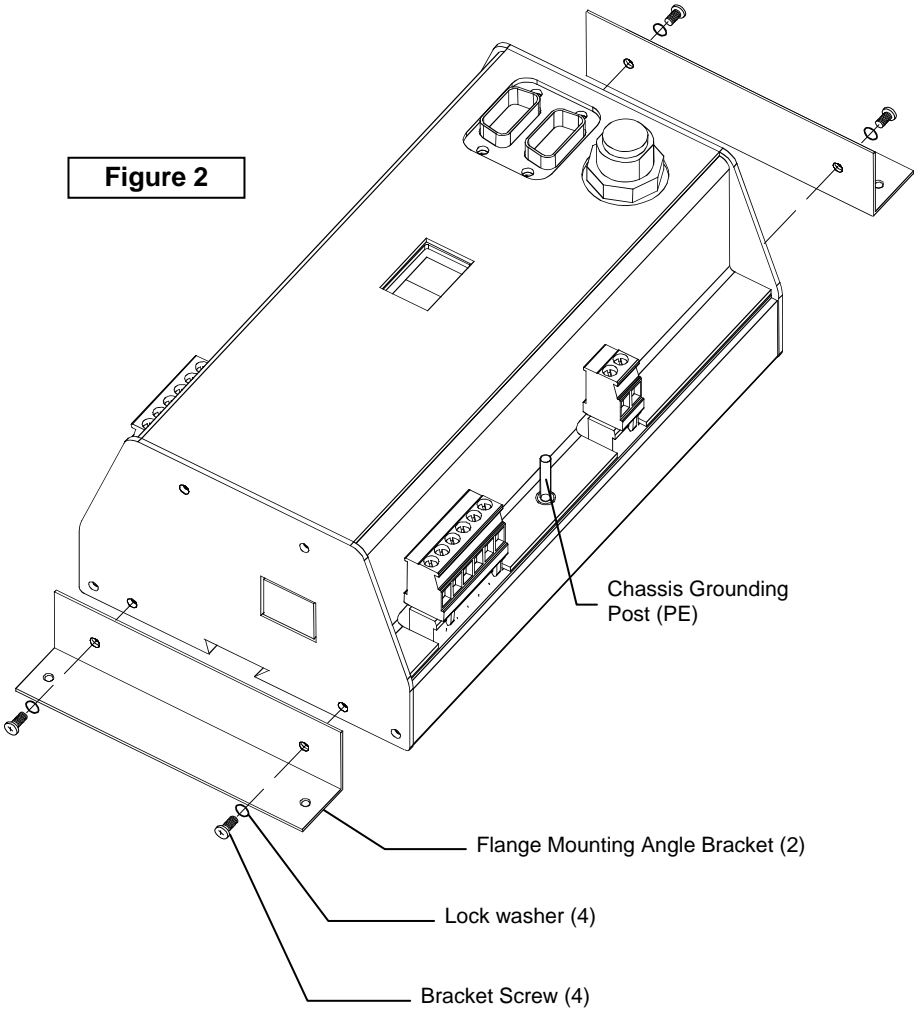
The hub is mounted to the DIN rail by means of a channel located at the bottom of the hub. A DIN rail mounting bracket (included) is required to mount the hub to the DIN rail (see figure 1).

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).

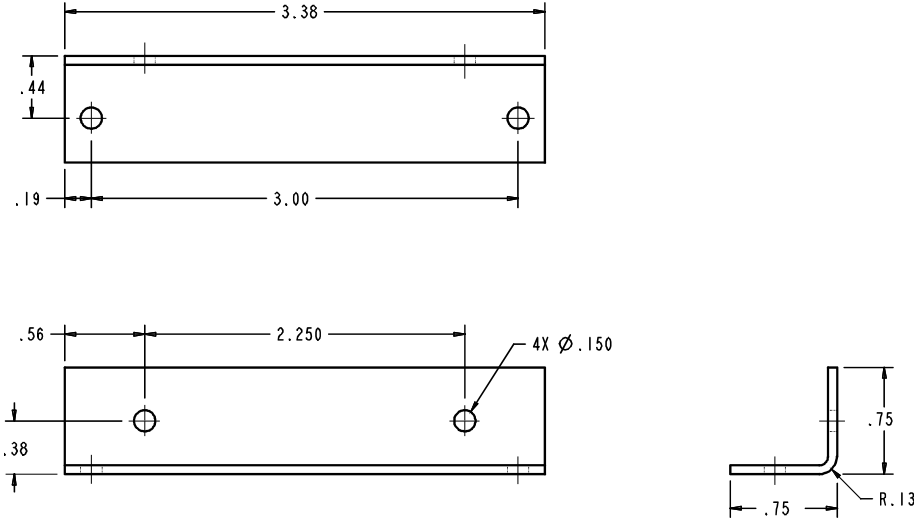
The hub must be grounded using the chassis grounding post (PE).

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





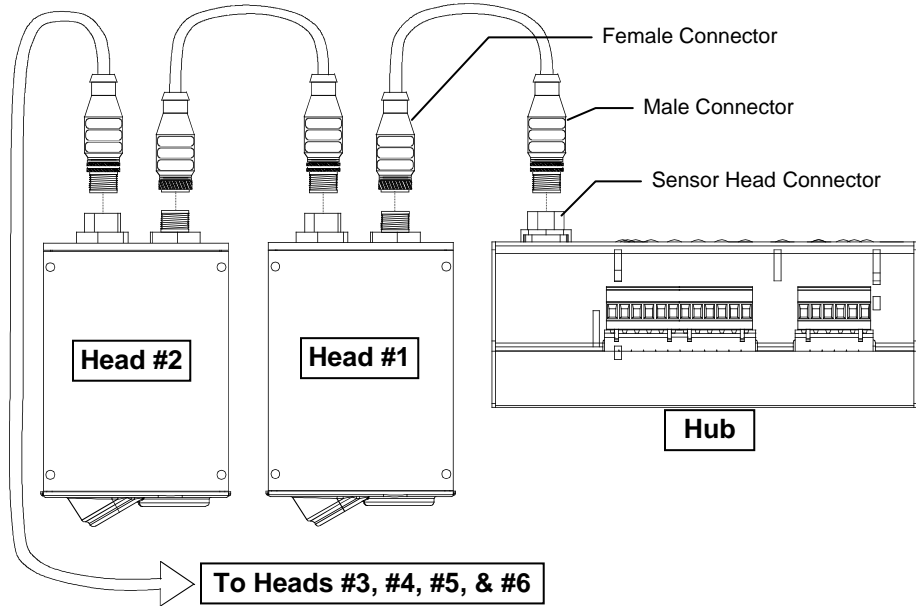
Angle Bracket Dimension Drawing



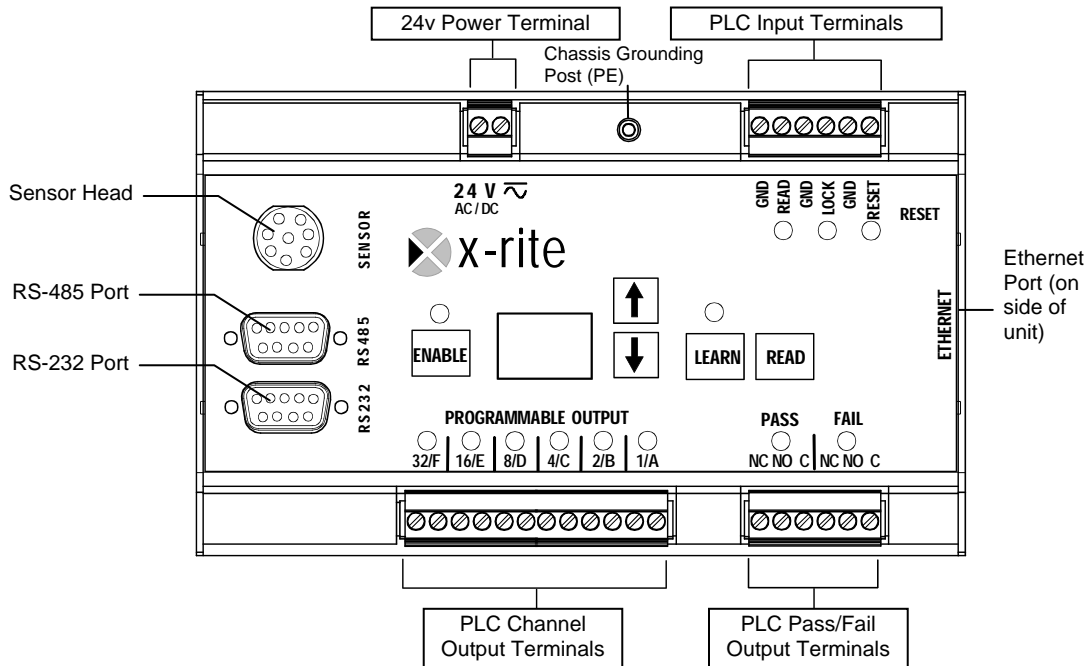
Connecting the Cabling

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

The VeriColor kit includes a three meter cable (P/N SE108-EUR6-3). Each additional sensor head includes a one meter cable (P/N SE108-EUR6-1). A 10 meter cable (P/N SE108-EUR6-10) is 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.



Operation

The hub can be operated manually (hub buttons or PLC) or by a computer.

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

For Computer, the unit is controlled by external communications, such as X-Rite's VeriColor software via RCI commands. (RCI command document is located on the VeriColor CD.) The unit can be configured, calibrated, provide local control and run a predefined program. Once a program is executed, the hub reports the results (like identified color and pass/fail status).

The VeriColor software installation is covered later in this section. VeriColor software usage is covered in the on-line help system of the software.

Manual Hub Operation

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.

NOTE: The **LOCKOUT** input terminal must be disabled, either pulled high (greater than +6Vdc) or floating (no connection) for the hub panel buttons to function. You can visually reference the Lock (Lockout) LED to verify the functional state. (illuminating green indicates "lockout" is active.

Manual Targeting Mode

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

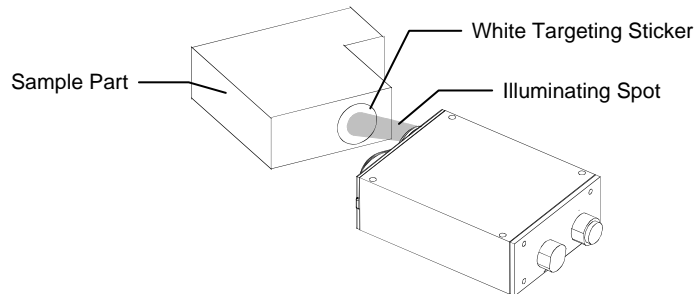
Important Targeting Mode Notes:

Before leaving target mode, test the fixture's alignment and repeatability by removing and installing the sample several times as done in a production environment. If the dLED'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.

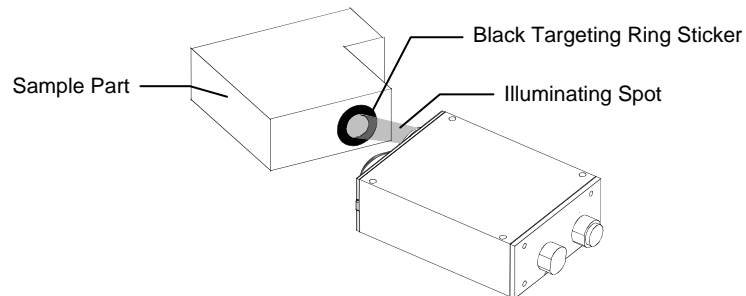
While in targeting mode, each sensor head remembers its target (when the Learn button was pressed in target mode) even after selecting different heads to target. Use this to verify the alignment is proper on all heads before leaving target mode. Each time targeting mode is started, the heads will need to relearn the (white sticker only) target.

1. Place the white sticker(s) over the target area(s) of the part you intend on measuring.
2. Place the part in the fixture 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 head taking rapid measurements (2 per second)
4. Without disturbing the pre-aligned height and angle position of the first sensor head, carefully adjust the sensor head (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 head. The 2-digit display should indicate 0.0 as long as the fixture is stable.
6. If additional sensor heads require targeting, press the **Select Up** or the **Select Down** buttons to advance to the next sensor head and repeat steps 4 and 5.
7. Remove the part from the fixture and place the black ring sticker(s) on the white sticker(s), or remove the white sticker and place the black ring sticker in the same location. The black ring(s) is used to help “fine tune” the alignment. Stacking the black ring sticker on top of the white sticker will cause the dLED value to increase.
8. Place the part back in the fixture and select the first sensor head using the **Select Up** or the **Select Down** 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 head may be measuring part of the black outer ring. If this occurs, fine tune the sensor head to get the smallest dLED value possible. Be careful not to change the sensor head’s height and angle adjustment. A dLED value of 2.0 or under is considered acceptable.



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

Additional targeting stickers are available from X-Rite by ordering P/N VC50-32 (Medium Spot .50”) or P/N VC25-32 (Small Spot .25”). Each kit contains two white stickers and two black ringed stickers.

Manual Learn Mode

Learning is the method of measuring a part that is used as a standard for sample comparison. Standards can be measured and stored in the hub quick and easy

without using the VeriColor software. For more advanced setups and greater control, it is suggested that you use the VeriColor software.

Important Learn Mode Notes:

As long as the fixture is fairly 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 it is unnecessary.

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

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.

Press the **Select Up** button or the **Select Down** button to choose the 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 head system, LEDs “A” and “B” will light if data is stored in the location.

2. Press the **Learn** button once to activate the learn mode. The LED next to the button illuminates red when learn mode is activated.
3. Press the **Read** button to take one measurement with all attached sensor heads. The standard that is saved in the hub is a collection of measurements from all attached sensor heads.
4. 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 heads, not across all attached sensor heads.

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.

5. 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.
6. Press the **Read** button to take the measurement.
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.

Measuring Sample 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 software.

After each sample measurement the closest passing standard (smallest dLED) to the sample becomes the current standard.

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

If a measurement fails, the LED Array Outputs will all turn off (if they aren't already). Outputs LEDs illuminate for 15 seconds 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 head(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.

Enabling/Disabling Standard

Stored standards can be enabled or disabled for a particular job. This is accomplished by using the Enable button next to the 2-digit display. Use the Select-Up or Select-Down buttons to choose the standard location. The LED next the Enabled button illuminates green when the selected standard is enabled. Pressing the 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.

Factory Presets

Factory Presets are restored by pressing and holding (approx. 2 seconds) the **Up**, **Down**, 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 Head 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 head serial numbers. Reset the hub after performing a factory preset.

Remote Control Interface

If you would like to control VeriColor from a 3rd party software, refer to the RCI Interface manual provided on the CD-ROM.

VeriColor Software Application

The X-Rite VeriColor system includes an application utility that provides an interface for the hub. The application is used to configure the hub and provide visual feedback of sample measurements. Refer the VeriColor Software Chart in the Appendix for general operation instructions.

Before installing the software, make sure the hub and sensor head(s) are set up as explained earlier. Connect the RS-232 port from the hub to an RS-232 port on the computer. Even if the Ethernet port is to be used, the RS-232 connection is needed to configure the Ethernet settings.

Installing the Software

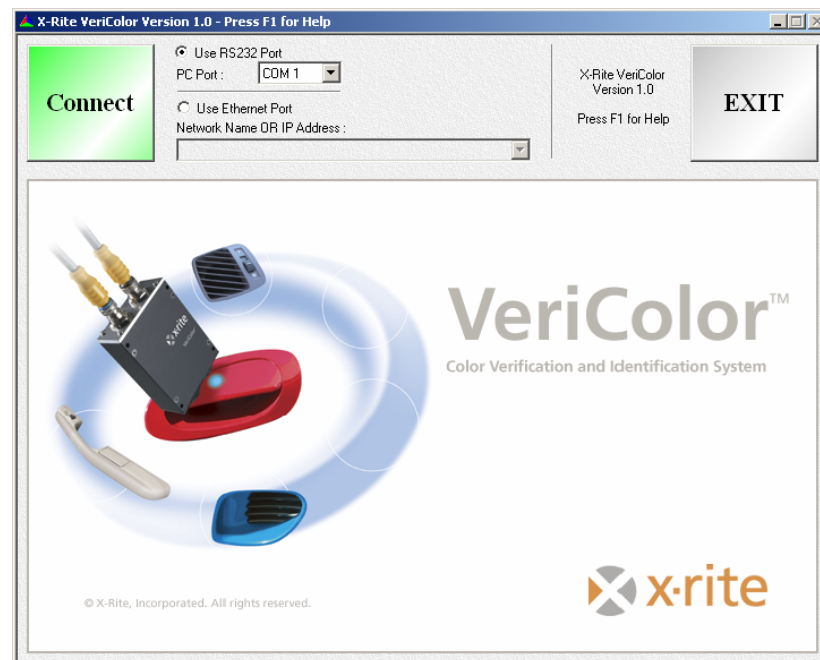
The Interface software uses a standard Windows installation procedure.

1. Insert the software CD into your computer's CD-ROM drive. Browse to the "VeriColor" folder and double-click the **Setup.exe** file.
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 interface application can be launched using the "VeriColor" short-cut on your desktop or from within the X-Rite VeriColor application group.

Refer to the on-line help system within the application for complete operation instruction. The help system can be accessed at any point in the application by pressing the F1 key on your keyboard.



Calibration

All scan heads are factory calibrated and normally do not require recalibration. Your system includes one calibration tool with each hub that can be used to verify calibration from time to time. The calibration tool is used for each sensor head attached to a particular hub.

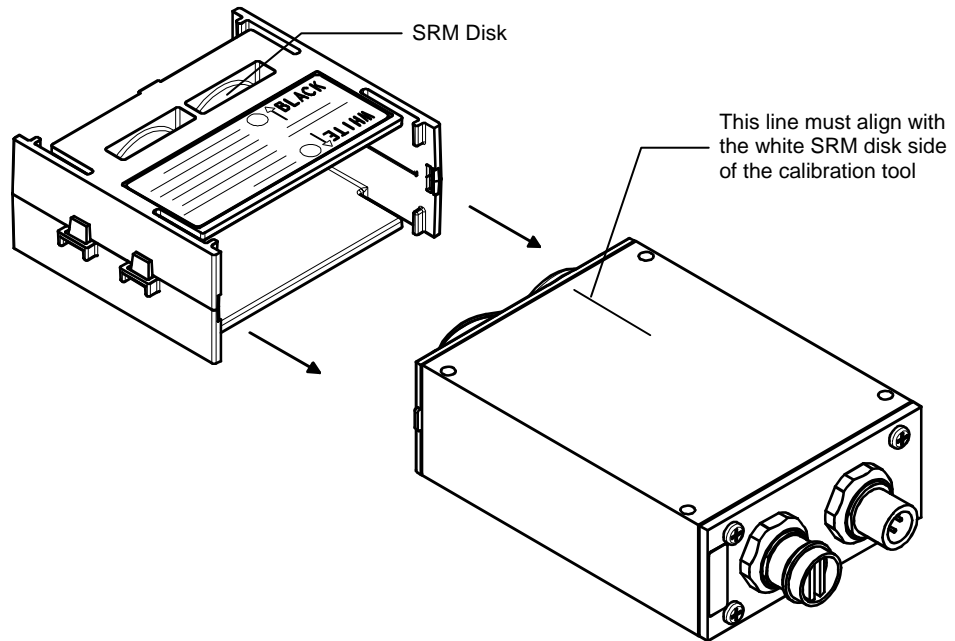
The information below illustrates the positioning requirements of the calibration tool on the sensor head. The calibration verification procedure is preformed using the VeriColor software. Please refer to the VeriColor on-line help for calibration steps.

Attaching the Calibration Tool

The calibration tool contains a SRM (Standard Reflectance Material) disk that is measured during the calibration procedure.

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

1. Snap the “white” end of the calibration tool onto the optics end of the sensor head. 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 head (see below).



General Maintenance

Repair Information

The VeriColor 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: 1-888-826-3044).

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, low-pressure air can be used to clean off any dust and dirt between connectors and the top surface.

You can also use a clean cloth dampened with water and a mild detergent, or isopropyl alcohol to clean off any contaminants.

Cleaning the Sensor Head

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

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

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

Cleaning the Calibration Tool

Caution should be used not to touch the SRM disk.

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

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

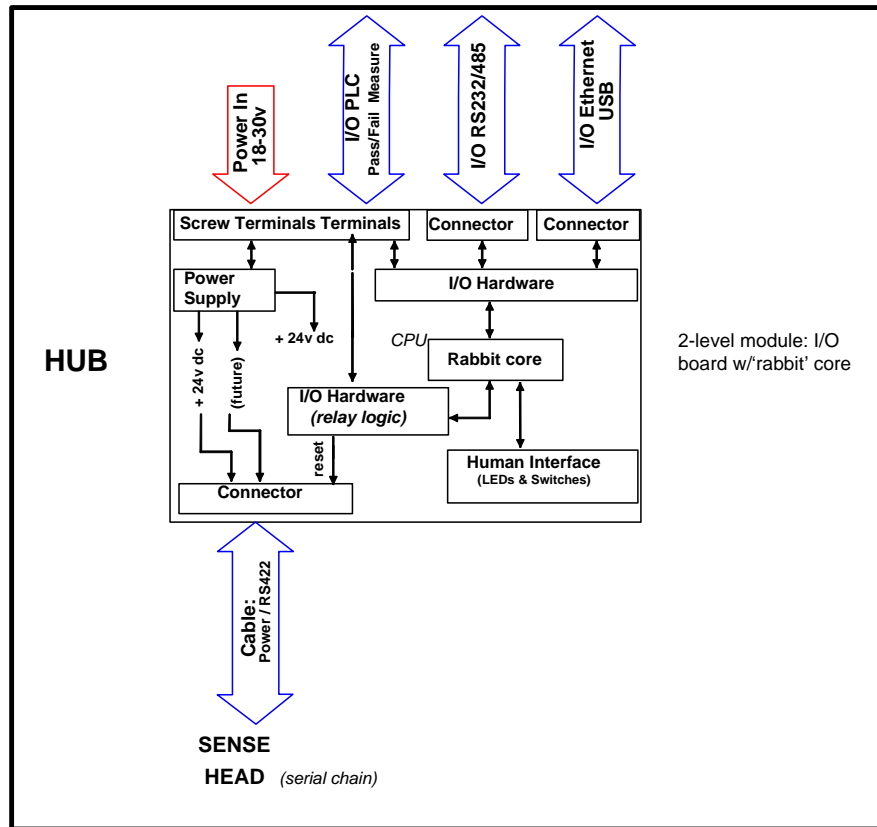
SECTION THREE

Appendices

Hub Functional Block Diagram

A basic system block diagram is provided below. The hub handles communication with the outside world and symbiont remote sensor(s), allows local manual control, runs programs and process the sensed input into resultant information...that will either be communicated externally or provide control and present status locally. Also the hub provides power supply conditioning and remote sensor managerial tasks. Functions to be processed in the hub include:

- Unit set-up and calibration.
 - Calibration: calculation of 0 and 100% points from raw data.
- User defined op-program: a simple set of run instructions (select ref-x @ head#2, then measure & pass/fail)
- Calculate results from returned sensor information.
- Provide Pass / Fail results based on "data" verses standard.
 - That includes front panel status LED control.
- Storage of standards and defaults (colors & tolerances).
- The hub will have default tolerance values that can be adjusted by a PC.
- Communications with sensor head(s).



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	2.5-amps max.
--	Top	Power -	24 Volts AC or DC Ground	Power supply	
I3=Input 4	Top	Signal GND	DC Ground (PLC screw terminal)	<u>Signal</u> return	
I2=Input 3	Top	Measure	PLC screw terminal or Manual command push button	LOW (+12V base) <normal high/pull low>	15 -ma. max.
--	Top	Signal GND	DC Ground (PLC screw terminal)	<u>Signal</u> return	
I1=Input 2	Top	Lockout	PLC screw terminal	LOW (+12V base) <normal high/pull low>	15 -ma. max.
--	Top	Signal GND	DC Ground (PLC screw terminal)	<u>Signal</u> return	
I0=Input 1	Top	Reset	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 with LED status indicator for "Channel-A" active. Normal Open contact.	"ON" or active: a high output state via a <u>relay</u>	1.2-amps max @24Vdc 0.5- amps max @120Vac

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

Item	Location	Name	Description	Active State	Comments
--	Bottom	ChnA -C (common)	PLC screw terminal: Common contact (isolated).	Signal common	
O5 = Output 6	Bottom	ChnB -NO	PLC screw terminal with LED status indicator for "Channel-B" active. Normal Open contact.	"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 with LED status indicator for "Channel-C" active. Normal Open contact.	"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 with LED status indicator for "Channel-D" active. Normal Open contact.	"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 with LED status indicator for "Channel-E" active. Normal Open contact.	"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 with LED status indicator for "Channel-F" active. Normal Open contact.	"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-485 - 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 Head Electrical Interface Details

Remote Sensor Head 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 --		

VeriColor Specifications

General

Instrument Type:	Hi-Res Reflective Color
Geometry:	0°/30°
Measurement Area:.....	12 or 6 mm spot sizes
Color Resolution.....	0.25 ΔE^* , typical
Illuminant Observer	N/A. Reports color difference in dLED (scaled similar to ΔE for small differences)
Hub Size:	L: 6.9" (17.5 cm), W: 4.2" (10.7 cm), H: 3.2" (8.1 cm)
Hub Weight	24 oz (670 g)
Sensor Head Size	L: 5.1" (13 cm), W: 2.9" (7.4 cm), H: 1.3" (3.3 cm)
Sensor Head Weight	12 oz (338 g)
Power Source.....	24V @ 50/60 Hz. AC or DC, 2.5 Amps Max.

Performance

Repeatability – Black:	0.3 ΔE (1% reflectance) 0 - 40°C (32 - 104°F)
Repeatability – White:	0.05 ΔE (99% reflectance) 0 - 40°C (32 - 104°F)
Lamp Life:	Life of unit
Measurement Time:.....	250 ms
Cycle Time:	1 sec. (time interval between measurements)
Measurement Distance	40 mm from sensor lens \pm 4mm positional insensitivity

Environmental

Operating Temp:.....	0° - 50°C
Storage Temp:	-40° - 70°C
Operational Humidity:.....	0 - 95% non condensing
Usage:	Indoor Only
Altitude:.....	2000m
Pollution Degree:.....	2
Overvoltage:	Category II

Enclosure

Sensor Head:.....	NEMA 4 / IP56
Hub:	NEMA 12 / IP52

Mechanical

Vibration:.....5 – 10 Hz 0.200 inch displacement
10 – 500 Hz at 1G pk - pk
Shock – Operation:15 g amplitude 18 ms duration
30 g amplitude 11 ms duration
Package Drop:NSTC Project 1A

Safety Compliance

Underwriters Laboratories:.....UL 61010-1
Canadian Standards Association:CSA 22.2 No. 1010.1-92
CENELECIEC (EN) 61010-1

* In color science, ΔE is a color difference in L*a*b* color space where the threshold of the human perception is typically 1 ΔE .

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.

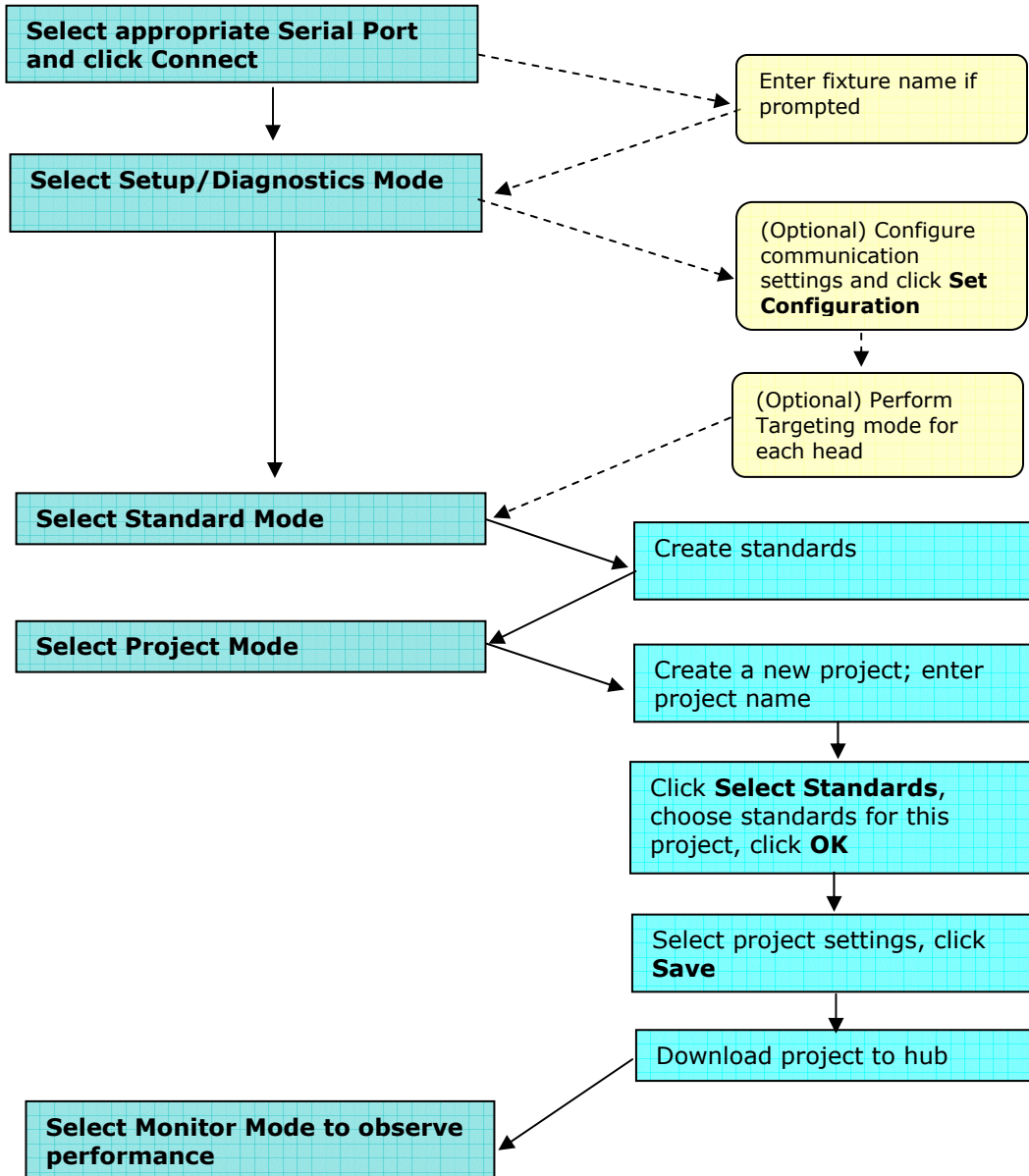
1 Meter Interconnect CableP/N SE108-EUR6-1
3 Meter Interconnect CableP/N SE108-EUR6-3
10 Meter Interconnect CableP/N SE108-EUR6-10
Medium Spot (.50") Targeting Sticker KitP/N VC50-32
Small Spot (.25") Targeting Sticker Kit.....P/N VC25-32
DIN Rail Mounting Adapter.....P/N VC100-25
Angle Bracket (2 required).....P/N VC100-35
Sensor Head.....P/N VC50
HubP/N VC100

Hub 2-Digit 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. Refer to the VeriColor Troubleshooting document located on the CD for information on handling these error conditions. You can also visit our website at www.xrite.com for the latest update information.

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 ID powers up, it will enter this test state. During this time the hub is waiting for the heads to come up to operating temperature.
Flashing “02” – Master Head List Error	After the System Test Mode, if the hub detects any difference in what heads it currently has connected versus a previous configuration, it enters “02” error state.
Flashing “03” - Head Timeout Error	The hub was attempting to communicate to a Head and it did not respond within the allocated time frame.
Flashing “04” - Head returned a Bad Measurement	A sensor head was instructed to measure and returned an error code.
Flashing “05” – Bad Head Reported	During warm-up mode, the Head responded with a Bad Hardware status.
Flashing “06” – Datastore Error	This code can appear if after updating the firmware there is a data structure change, or a serious error has occurred to the datastore values in the hub.

VeriColor Software Chart





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