RM400
RM425

Spectrophotometer
User Guide

x-rite

CE Declaration

Hereby, X-Rite, Incorporated, declares that this RM400/RM425 Series is in compliance with the essential requirements and other relevant provisions of Directive(s) EMC 2004/108/EC, LVD 2006/95/EC, and RoHS 2011/65/EU (Category 9).

Federal Communications Commission Notice

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 Compliance 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.

Equipment Information

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.

Instructions for disposal: Please dispose of Waste Electrical and Electronic Equipment (WEEE) at designated collection points for the recycling of such equipment

Proprietary Notice

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This product may be covered by one or more patents. Refer to the instrument for actual patent numbers.

Warranty Information

X-Rite, Incorporated ("X-Rite") warrants each instrument manufactured to be free of defects in material and workmanship for a period of 12 months*. This warranty shall be fulfilled by the repair or replacement, at the option of X-Rite, of any part or parts, free of charge including labor, F.O.B. its factory or authorized service center.

X-Rite warrants this Product against defects in material and workmanship for a period of twelve (12) months from the date of shipment from X-Rite's facility, unless mandatory law provides for longer periods. During such time, X-Rite will either replace or repair at its discretion defective parts free of charge.

X-Rite's warranties herein do not cover failure of warranted goods resulting from: (i) damage after shipment, accident, abuse, misuse, neglect, alteration or any other use not in accordance with X-Rite's recommendations, accompanying documentation, published specifications, and standard industry practice; (ii) using the device in an operating environment outside the recommended specifications or failure to follow the maintenance procedures in X-Rite's accompanying documentation or published specifications; (iii) repair or service by anyone other than X-Rite or its authorized representatives; (iv) the failure of the warranted goods caused by use of any parts or consumables not manufactured, distributed, or

approved by X-Rite; (v) any attachments or modifications to the warranted goods that are not manufactured, distributed or approved by X-Rite. Consumable parts and Product cleaning are also not covered by the warranty.

X-Rite‘s sole and exclusive obligation for breach of the above warranties shall be the repair or replacement of any part, without charge, which within the warranty period is proven to X-Rite‘s reasonable satisfaction to have been defective. Repairs or replacement by X-Rite shall not revive an otherwise expired warranty, nor shall the same extend the duration of a warranty.

Customer shall be responsible for packaging and shipping the defective product to the service center designated by X-Rite. X-Rite shall pay for the return of the product to Customer if the shipment is to a location within the region in which the X-Rite service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations. Proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the unit is within the Warranty period must be presented to obtain warranty service. Do not try to dismantle the Product. Unauthorized dismantling of the equipment will void all warranty claims. Contact the X-Rite Support or the nearest X-Rite Service Center, if you believe that the unit does not work anymore or does not work correctly.

THESE WARRANTIES ARE GIVEN SOLELY TO BUYER AND ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR APPLICATION, AND NON-INFRINGEMENT. NO EMPLOYEE OR AGENT OF X-RITE, OTHER THAN AN OFFICER OF X-RITE, IS AUTHORIZED TO MAKE ANY WARRANTY IN ADDITION TO THE FOREGOING.

IN NO EVENT WILL X-RITE BE LIABLE FOR ANY OF BUYER’S MANUFACTURING COSTS, OVERHEAD, LOST PROFITS, GOODWILL, OTHER EXPENSES OR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES BASED UPON BREACH OF ANY WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT TORT, OR ANY OTHER LEGAL THEORY. IN ANY EVENT OF LIABILITY, X-RITE’S MAXIMUM LIABILITY HEREUNDER WILL NOT EXCEED THE PRICE OF THE GOODS OR SERVICES FURNISHED BY X-RITE GIVING RISE TO THE CLAIM.

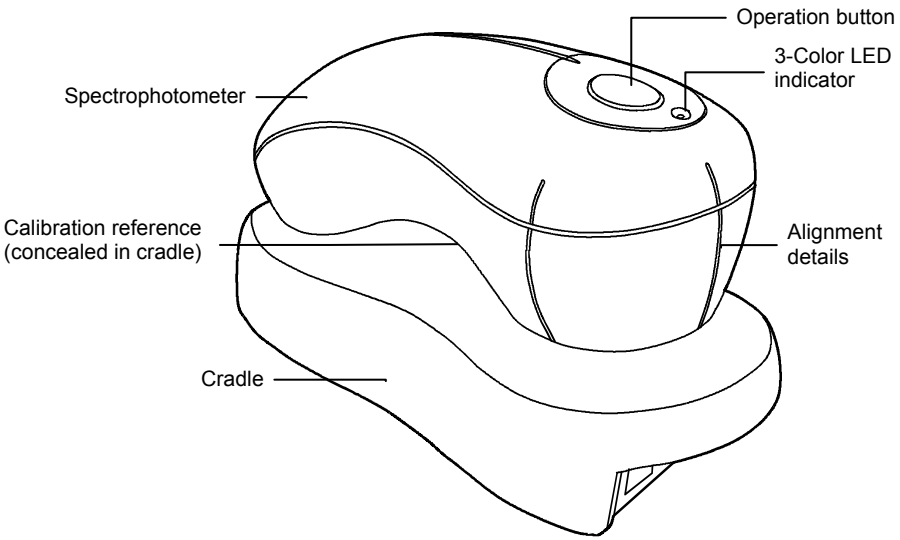
Table of Contents

Section 1 - Overview and Setup

Introduction

The spectrophotometer is a compact, rugged and reliable color measurement instrument that reports spectral data to a PC. Depending on the model, the instrument can take measurements in a "tethered mode" to a PC or a remote cradle-driven configuration.

This manual covers the installation, basic operation and maintenance of the instrument. Specific instructions for using the instrument with your software application can be found in the software documentation.



Features

Operation button: activates the instrument when taking a measurement

3-color LED: indicates the instrument operation condition

Cradle: provides a storage location for the instrument and battery charging for the RM425 model

Calibration reference: integrated into the cradle

Alignment details: assists with alignment of the instrument on the sample

Packaging Content

Your instrument packaging should contain all the items listed below. If any of these items are missing, contact your Authorized Representative.

- RM400 or RM425 instrument with interface cabling
- Cradle with integrated calibration reference
- Switching power supply with line cord
- Documentation and registration material

Connecting the Cabling

The connection procedure varies depending on the instrument you purchased.

Serial Interface (see fig. 1 or fig. 2)

1. Close any open software applications and shut down your computer.
2. Attach the DB9 connector from the interface cable to an I/O port on the computer. Secure it with the thumb screws.
   For Remote Instrument Configuration:
   Attach the other DB9 connector from the interface cable to the port on back of the cradle. Secure it with the thumb screws.
3. *For Tethered Instrument Configuration*:
   Plug the small connector from the power supply into the power input connector on the interface cable.
   For Remote Instrument Configuration:
   Plug the small connector from the power supply into the power input on the back of the cradle.
4. Plug the detachable line cord into the power supply and then plug the line cord into the AC wall receptacle.
5. *For Remote Instrument Configuration*:
   Make sure the instrument is properly positioned in the cradle and allow it to charge for 3 hours before use.

The remote instrument automatically goes into a “charge mode” when it is placed on the cradle.

6. Turn on the computer, run the application and select the I/O port the instrument is attached to, if applicable.

USB Interface (see fig. 1 or fig. 2)

IMPORTANT: You must install the software before connecting the instrument to your computer.

1. *For Tethered Instrument Configuration:*
   Plug the input connector from the power supply into the connector on the interface cable.
   For Remote Instrument Configuration:
   Plug the small connector from the power supply into the power input on the back of the cradle.
2. Plug the detachable line cord into the power supply and then plug the line cord into the AC wall receptacle.
3. *For Remote Instrument Configuration*:
   Make sure the instrument is properly positioned in the cradle and allow it to charge for 3 hours before use.

The remote instrument automatically goes into a "charge mode" when it is placed on the cradle.

4. Plug the USB cable into an available port on your computer. The computer should confirm that the USB connector is plugged in and automatically install the device driver for the instrument.

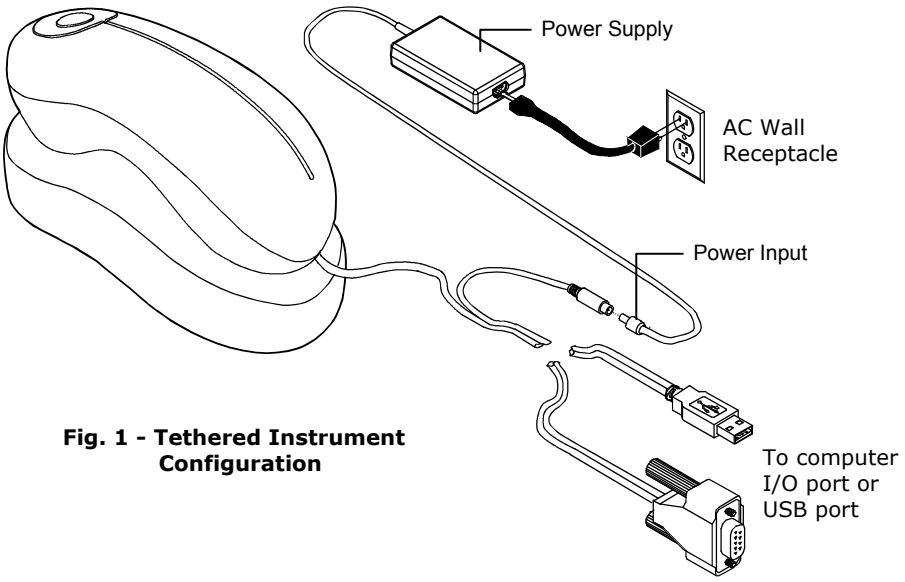


Fig. 1 - Tethered Instrument Configuration

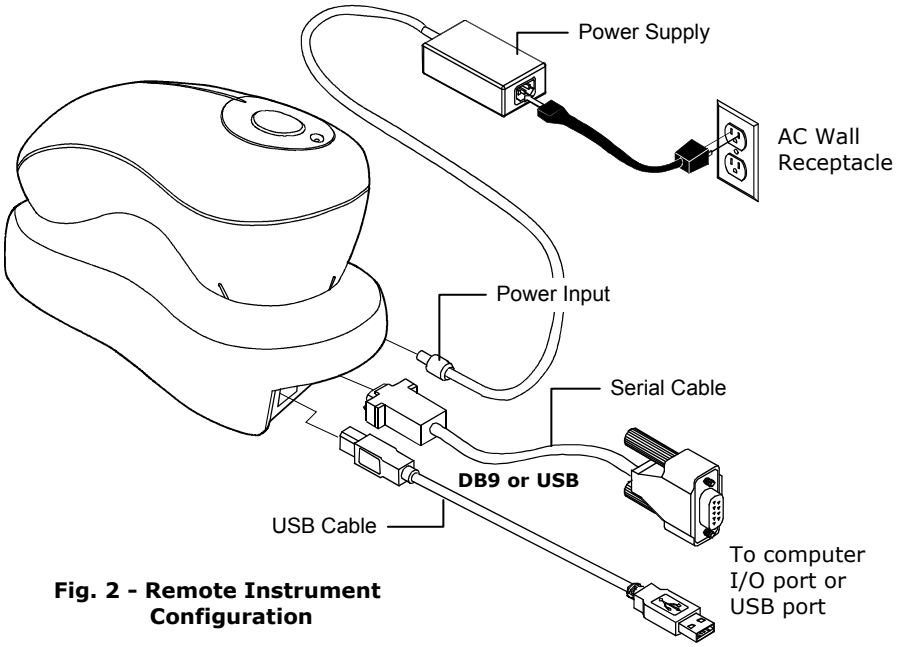
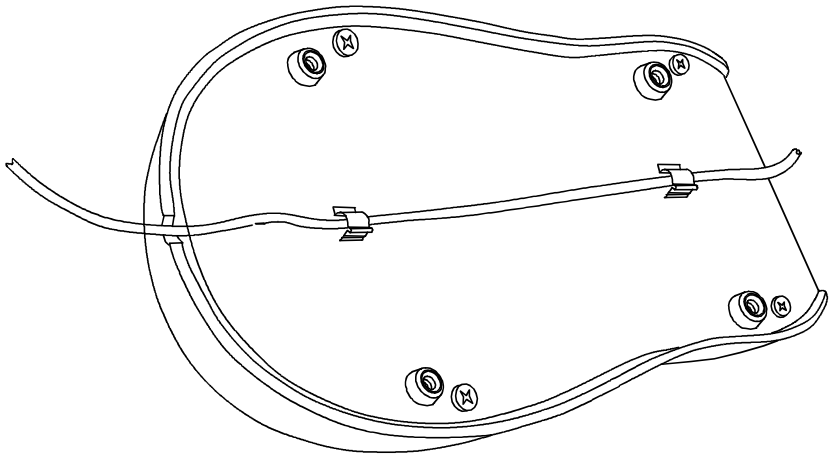


Fig. 2 - Remote Instrument Configuration

Tethered Instruments

The interface cable can be secured to the bottom of the cradle with the clips provided.



Instrument LED Indicator

The LED indicates a variety of instrument conditions, such as calibration mode and operation. Below is a complete list of conditions reported by the LED.

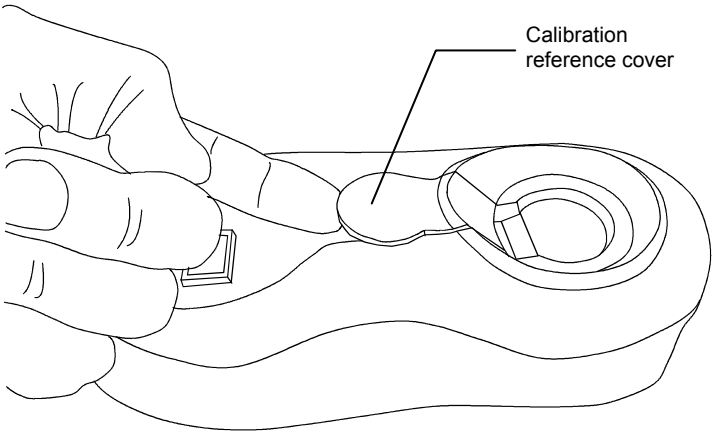
- *Solid Green*—standby, connected to AC adapter (RM400) or charger through the cradle (RM425).
- *Solid Amber*—standby, running on battery power (RM425).
- *Solid Red*—reading in progress.
- *Flashing Green*—waiting to calibrate, connected to AC adapter (RM400) or charger through the cradle (RM425).
- *Flashing Amber*—waiting to calibrate, running on battery power (RM425).
- *Flashing Red*—measurement failure, please remeasure.
- *LED Off*—shutdown mode (RM425), running on battery power. Press the operation button to wakeup instrument.

Section 2 - Calibration

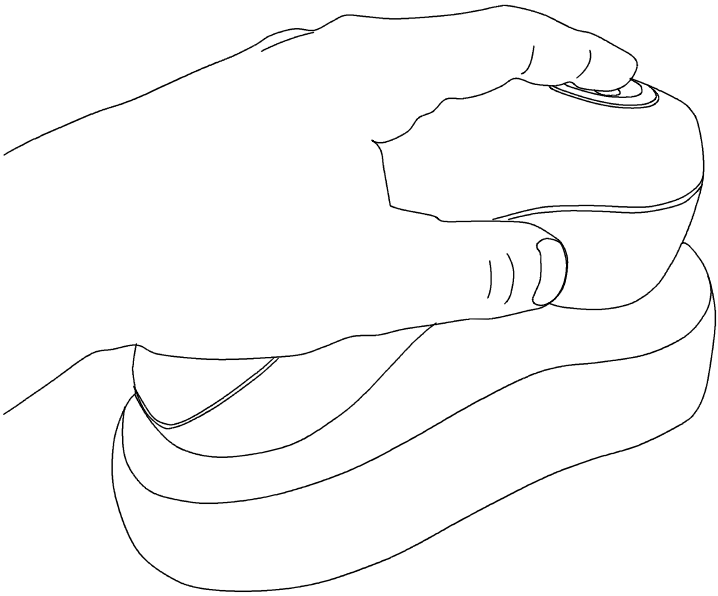
Typically, the software application prompts for an instrument calibration when required. The frequency at which this occurs depends on the application. Refer below for procedure.

The calibration reference is concealed behind a cover in the top of the cradle.

1. When a calibration is called for by the application, select the appropriate option to initiate the calibration. The instrument LED should be flashing amber or green (depending on model) at this time.
2. Remove the instrument from the cradle and set aside.
3. Using your finger, lift up on the front of the calibration reference cover and rotate it 180°, allowing the white calibration reference to face upwards.
4. Make sure, the calibration reference is clean. Please see General Maintenance in the Appendix for cleaning procedures.



5. Position the instrument back in the cradle with the measurement optics over the calibration reference.
6. Press the Operation button.



7. The LED indicator turns red during the calibration. The LED indicator then turns solid green or yellow (depending on model) after a successful calibration.
8. Remove the instrument from the cradle and close the reference back into its storage location.

Section 3 - Taking Measurement

You should refer to the documentation for the software program that you are using with your instrument. All applications that use the tethered instrument (RM400) must be running during measurements. The remote instrument stores the measurement before downloading it to the application through the cradle.

Sample Criteria

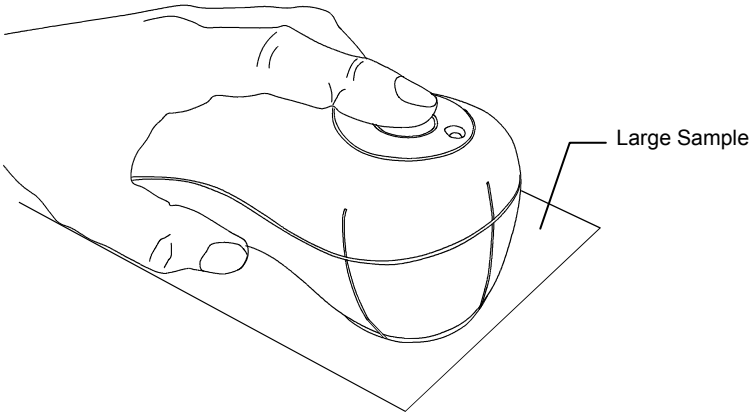
The instrument measures color data from just about any clean, dry surface that is reasonably flat and smooth. The target eye should be able to rest flat and steady on the sample area. (Because the opening is just 6 millimeters in diameter, it can rest sufficiently flat on many curved surfaces.) Generally, surfaces with bulky, rough, or loose-weave textures will not provide good results.

NOTE: Never measure wet paint. Wet paint will contaminate the instrument.

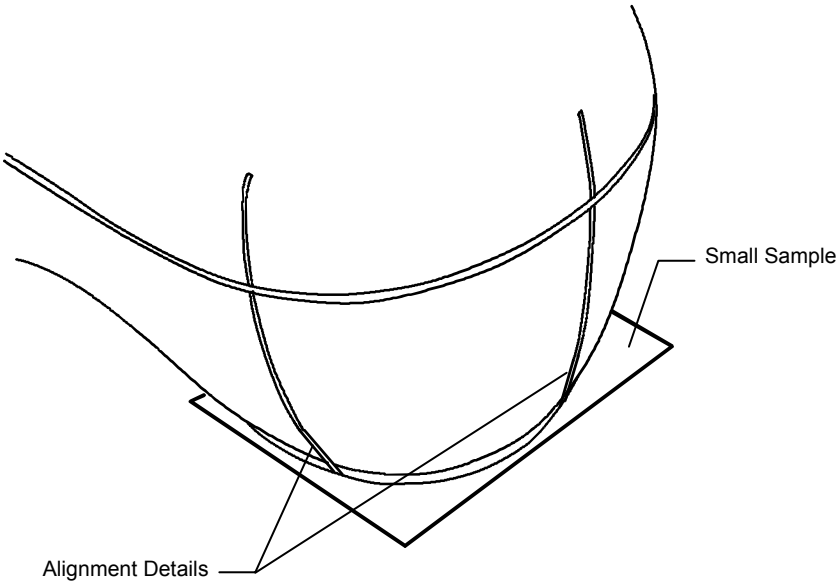
Measurement Techniques

The following information is provided to familiarize you with "mechanical" aspects of taking a measurement.

1. Clear the color sample surface of any dirt, dust, or moisture.
2. If possible, place the entire instrument on the sample to be measured.



If this is not possible, place the measurement aperture directly on the sample surface. Make sure the aperture is flat against the sample so that all ambient light is blocked during the measurement. You can use the alignment details on the front and sides of the instrument for positioning.



3. While holding the instrument still, momentarily press the Operation button. Any movement will affect the reading accuracy.
4. The LED indicator turns red during the measurement.

Appendices

Troubleshooting

Prior to contacting X-Rite Customer Service for instrument problems, try the applicable solution(s) described below. If the condition persists, contact a Customer Service Representative by phone at: 800-572-4626; or by fax at: 1-616-803-2705. You can also contact X-Rite's support staff through our Support page at www.xrite.com.

LED indicator not lit:

- Instrument in power down mode (RM425), press the operation button.
- Ensure that the power supply is plugged in and connected to the interface cable. For remote instruments, make sure the batteries are charged.
- Reset the instrument (see Instrument Reset).

Flashing red LED:

- Measurement failure, please remeasure. If the error persists, please contact Technical Support (see Service Information).

Solid red LED (except when reading):

- Remove power from the instrument, reapply power and see if the condition is corrected.
- Reset the instrument (see Instrument Reset) and calibrate.
- This could indicate that the unit may not be programmed properly, which could happen if power was removed during reprogramming. Try reprogramming the instrument again (refer to the programming instructions that came with your update).

Instrument and software not communicating:

- Check the computer interface connections.
- Close and restart the software application. If this does not work, reboot the computer.
- Remove power from the instrument, reapply power and see if the condition is corrected.

- Check for proper configuration setting from the software provider.
- Reset the instrument (see Instrument Reset) and calibrate.

Repeated sample measurement failures:

- Ensure that the sample is being read in accordance with your software's documentation.
- Close and restart the software application.
- Perform a calibration on the instrument (see Calibration section).
- Reset the instrument (see Instrument Reset).

Repeated calibration failures:

- Clean instrument and calibration reference (see General Maintenance).
- Reset the instrument (see Instrument Reset) and calibrate.

Service Information

The instrument is covered by a one-year limited warranty and should be referred to an authorized service center for repairs within the warranty period.

X-Rite provides repair service to their customers. Because of the complexity of the circuitry, all repairs should be referred to an authorized service center.

X-Rite will repair any instrument past warranty. The customer shall pay shipping and repair cost to the authorized service center, and the instrument shall be submitted in the original carton, as a complete unaltered unit, along with all the supplied accessories.

Technical Support contact numbers:

Tel: 800-572-4626

Fax: 616-803-2705

General Maintenance

Your instrument requires very little maintenance to achieve years of reliable operation. However, to protect your investment and maintain reading accuracy, a few simple-cleaning procedures should be performed from time to time.

General Cleaning

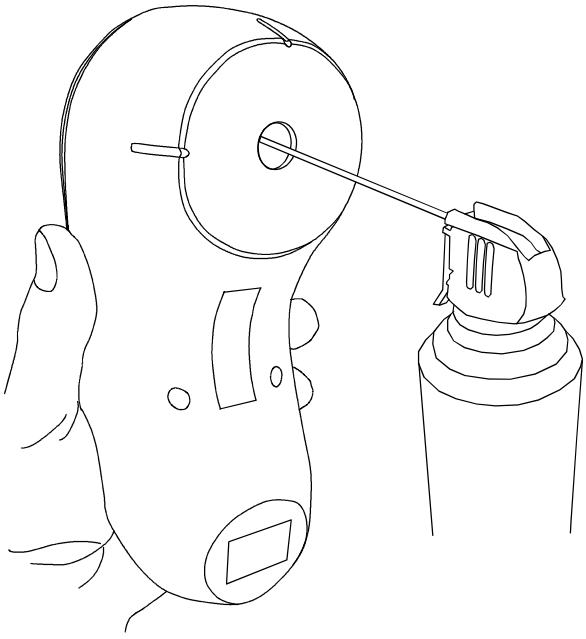
The exterior of the instrument and cradle may be wiped clean with a cloth dampened in water or mild cleaner.

NOTE: DO NOT use any solvents to the clean the instrument, this will cause damage to the cover.

Cleaning the Optics

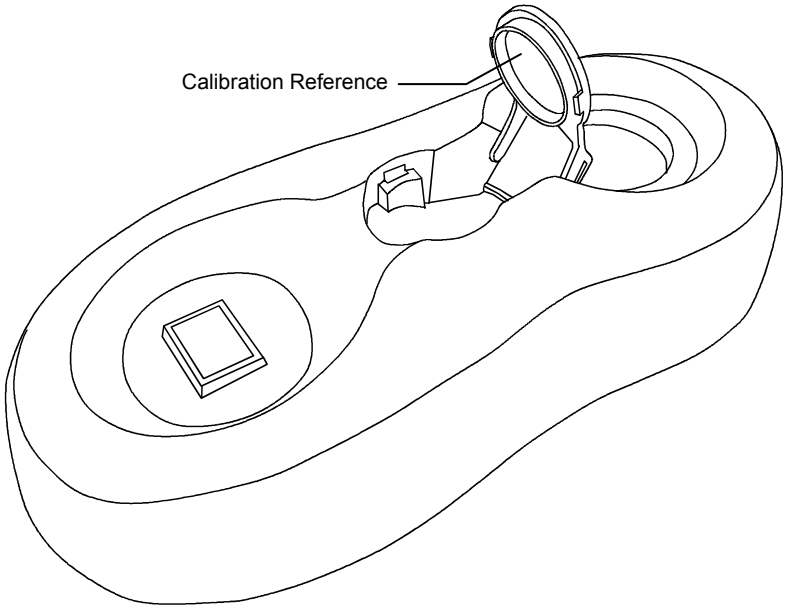
1. Remove the instrument from the cradle.
2. Carefully blow short burst of clean, dry air into the measurement aperture. This should remove any accumulated dust in the optics area.

CAUTION: *DO NOT* invert cans that use compressed gas as a propellant, doing so could cause damage to the optics assembly.



Cleaning the Calibration Reference

1. Remove the instrument and set aside.
2. Using your finger, lift up on the front of the calibration reference cover and rotate it to a 90° angle from the cradle.



3. Clean the calibration reference using a cotton swab or lint-free cloth.
4. Position the reference back into its storage location.

Instrument Reset

Note: When performing an Instrument Reset, which restores the X-Rite Factory Defaults, you will have to ensure the correct configuration for your software is then restored.

To set the factory defaults, press and hold the Operation button on top of the instrument until the LED indicator changes to solid green (approx. 8 seconds).

Instrument Specifications

Measurement Functions:	Spectral reflection 400-700nm, 10nm intervals. XYZ, Yxy, L*a*b*, L*u*v*, and L*C*h°.
Illumination/Observer:	A, C, D50, D55, D65, D75, F2, F7, F11, & F12. 2° or 10°
Spectral Sensor:	DRS spectral engine. 16 band, 400-700 nm spectral range, 20 nanometer interval, 45°/0° geometry meeting ISO & ANSI standards. 8mm diameter measuring area.
Performance:	0 to 200% reflectance. 20nm intervals, 400nm to 700nm range. 0.30 ΔE_{ab} avg. BCRA Series II Tile Set. 0.10 max ΔE_{ab} white ceramic, 20 measurements. Pulsated gas filled tungsten, no warm-up.
I/O Connection	DB9 for PC compatible serial port. USB for universal serial bus.
AC Adapter Requirements:	12v DC (1.25A) AC power supply, universal 100-240VAC.
Software:	Interface to Mix2Win.
Dimension:	L: 7.5" (19.1 mm), W: 3.2" (8.1 mm), H: 3.3" (8.4 mm)
Weight:	RM400 9.9 oz. (280 g) + base RM425 16.2 oz. (460 g) + base

Environmental

Operating Temp:	10° (50°F) to 40°C (104°F)
Humidity Range:	85% RH non condensing
Usage:	Indoor Only
Altitude:	2000m
Pollution Degree:	2
Transient Overvoltage:	Category II

Safety Compliance

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

Design and specifications subject to change without notice.

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Please visit www.xrite.com for a local office near you.

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