MA 3
Spectrophotometer

User Guide

x·rite

Consult this documentation in all cases where the Attention symbol ⚠ appears.
This symbol is used to inform you of any potential HAZARD or actions that may require your attention.

CE Declaration

Hereby, X-Rite, Incorporated, declares that this model is in compliance with the essential requirements and other relevant provisions of Directive(s) EMC Directive 2014/30/EU, LVD 2014/35/EU and RoHS 2011/65/EU.

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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.

NOTICE:

Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment.

Industry Canada Compliance Statement

CAN ICES-3 (A) / NMB-3 (A)

Equipment Information

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

To avoid discomfort, do not look directly into the measurement optics when the instrument is on.

No user serviceable parts in this product.

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

Do not immerse the instrument in liquid.

Transportation: This product contains a lithium-ion battery. Should you need to ship this device, you may wish to consult published guidance documents by one or more of these organizations for advice on how to comply with the regulations: IATA, ICOA, IMDG & PHMSA. The battery contained in this device is 46g in weight, 3.6V, 2.15 Ah, and complies with the UN 38.3 tests in effect the year it was originally shipped.

The instrument is a sensitive measurement instrument. If the instrument experiences a drop, a calibration should be performed followed by a selftest before any measurements are taken to ensure the instrument is working properly. Refer to the Calibration section for information on performing a Calibration.

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INTRODUCTION AND SETUP

The multi-angle spectrophotometer is designed for consistent, precise color measurement of metallic, pearlescent, and other complex special effect finishes.

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

Key features of the instrument are:

- Color display with touch screen operation
- Measure button
- Three contact sensors located on the bottom of the instrument to aid in proper positioning

Packaging

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

- MA 3 instrument
- USB interface cabling
- Calibration reference
- Safety strap
- Screen protector
- Spare light seal
- Soft carrying case

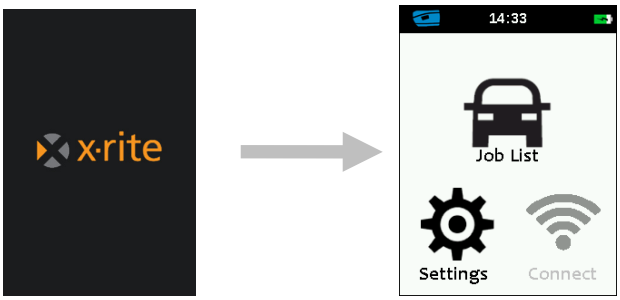
Powering On

The power/measure button is used to initiate the instrument from a power off state. Simply press the button (1) for about one second to turn on the instrument. If the instrument does not power up after pressing the power button, the battery may require charging. Refer to Charging the Battery section. The instrument is also powered on by plugging the USB cable into your computer's USB port.

Powering Off

The instrument turns off automatically after two hours of nonuse. It is not required to turn off the instrument manually.

When first powered up, the instrument goes through a startup procedure and displays a splash screen before the main screen appears.



Splash Screen **Home Screen**

Charging the Battery

General

The battery for your new instrument comes in a low to medium charge state and should be charged before use.

Connect the USB cable to the instrument and your computer's USB port.

Make sure that the USB cable is connected directly to the computer. A connection to a USB port of a keyboard or PC monitor or a bus-powered USB hub is not recommended. PC monitor or keyboard USB ports are low power USB ports.

During charging, the instrument switches on and indicates charging with a "lightning bolt" in the battery icon. The instrument will not power off while plugged into the computer USB port, however, it will go into standby mode. This is indicated by a blue pulsing LED.

A full charge from empty will take 6 hours connected to a computer USB port. Alternatively a standard USB charger can be used.

The charging time will not be reduced with a standard USB charger.

A USB charger with at least 500 mA is required. A standard charger with 1 A will not charge any faster.

Battery Icon Information

This icon at the top of the screen would indicate the battery is fully charged.

This icon at the top of the screen would indicate the battery has a sufficient charge for a substantial number of measurements.

This icon at the top of the screen would indicate the battery pack is low, but measurements are still possible. Battery should be charged soon.

The "lightning bolt" in the center of the icon at the top of the screen indicates the battery is charging.

Battery status is also reported in the Device Information menu item of the Settings window.

USER INTERFACE

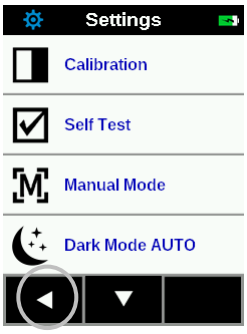
Navigating the Screen

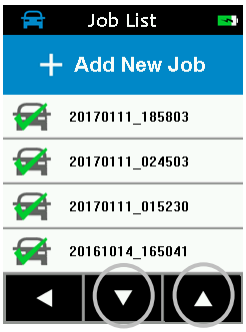
The instrument features a graphical touch screen display. All functionality is accessed directly through the screen.

Scrolling through Settings and Jobs

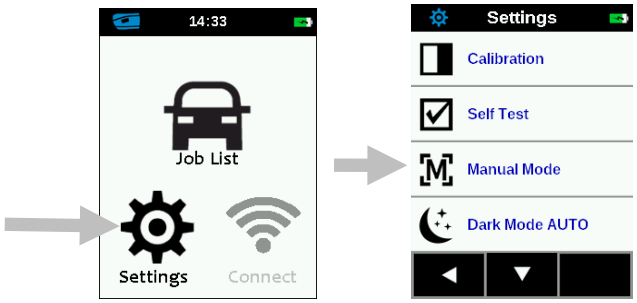
The Up (▲) and Down (▼) arrows appears on screens when some settings or jobs cannot be accessed from the main view. You can also swipe the screen up or down to view the additional settings and jobs.

The Left (◀) arrow at the bottom of the screen is used to return the screen to the previous view.





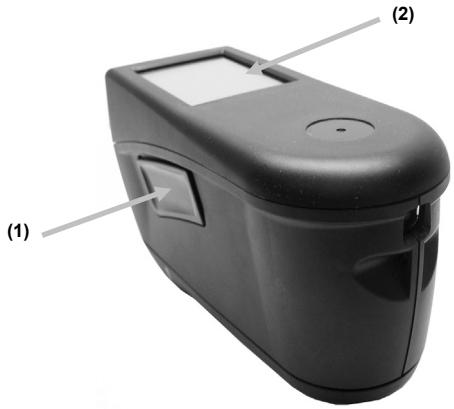
Settings and jobs are accessed by tapping the corresponding icon on the Home screen. For this example, the Settings icon was tapped to open the Settings screen.



Measure Button

The measure button (1) is located on the side of the instrument. This is the same button that is used to power on and off the instrument. You can also tap the center of the screen (2) to initiate a measurement.

NOTE: In case of a firmware crash, this button acts as a RESET button. Remove the USB cable, press and hold the button for 10 seconds and then release. The instrument will turn off. Refer to the Troubleshooting section for additional information

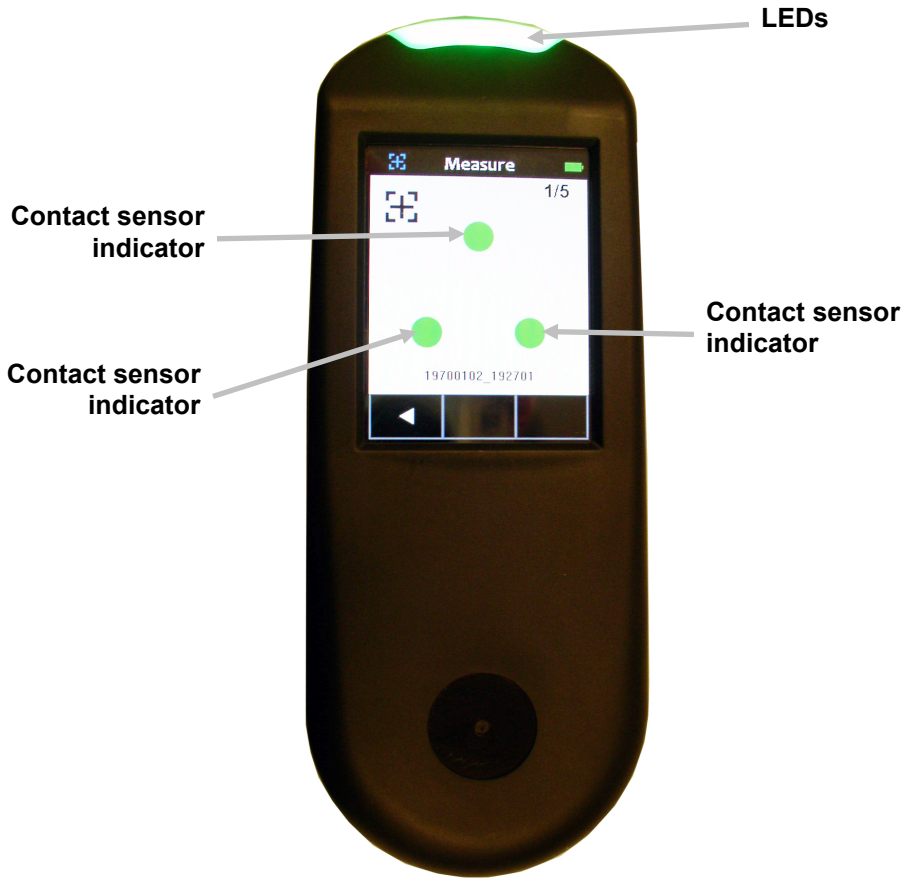


Contact Sensors, Indicators and LEDs

To aid in proper positioning and ensure repeatability of sample measurements, the instrument incorporates three contact sensors that are arranged around the measurement port. These sensors require an even amount of contact to be applied across all three sensors before a measurement is triggered.

Three contact sensor indicators that appear in the screen as well as the indicator LEDs on the top of the instrument provide positioning feedback. The indicators in the screen are arranged in the same pattern (top, and back) as the contact sensors located around the measurement port.

- **Green Indicator:** ideal contact is being applied to the corresponding sensor. A measurement can be taken when all three indicators illuminate green. If the required contact is not maintained for the duration of the measurement, an error message will appear on the display and the measurement must be retaken.
- **Red Indicator:** the required contact is not being applied to the corresponding sensor. Correct contact must be applied to achieve a green indicator condition.



The multi-color LED located on the front of instrument provides visual feedback on the status of a measurement and contact sensor.

- **Green LED**: Indicates all three contact sensors are activated properly and a measurement can now be triggered.
- **Red LED**: Indicates one or more of the contact sensors is not properly activated or an error has occurred during a measurement.
- **Blue Pulsing LED**: Indicates the instrument is in standby mode with the USB cable plugged into the computer and charging.
- **Off**: Indicates the instrument is off and not ready to measure.

Home Screen

When the instrument is powered-up, the home (top level) screen appears after the startup procedure is complete. Select the modes by tapping the icons located on the display screen.

Job List Mode

This mode is the main mode of operation. Jobs are added, selected, deleted, and measurements are taken in this mode. Refer to the Operation section for information.

Settings Mode

The settings mode is used to set and edit the instruments configuration options, and to enter the calibration mode. The settings options should be reviewed before you use your instrument for the first time. Refer to the Settings Mode section for information.

Connect/Disconnect Icon

This icon is used to connect to WiFi or disconnect from WiFi (not supported at this time).

Header Bar

Displays the current mode, WiFi connection (where applicable), and battery life status.

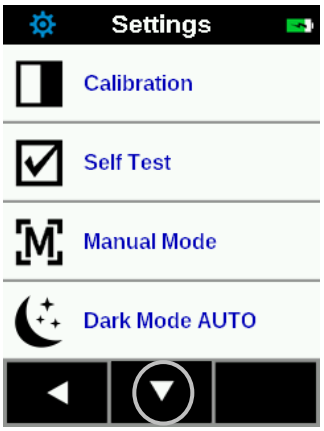
SETTINGS MODE

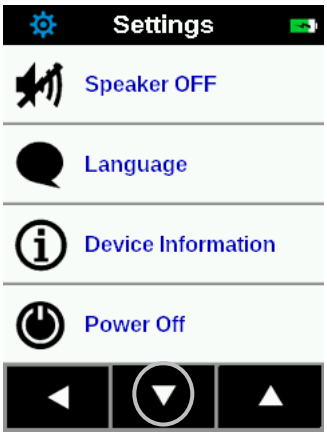
Settings mode is used to adjust and view the instrument's settings. You should review the current settings before using the instrument for the first time. However, you can go back and change these settings at any time.

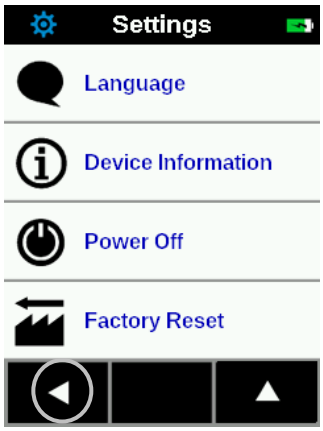
Entering Settings Mode

1. From the Main screen, tap the **Settings** icon to access the Setting screen.

2. Tap the Settings option you want to edit or activate. Down (▼) and Up (▲) arrow icons appear on the screen when some settings cannot be accessed from the main view. Tap the arrow icons to view the additional settings.







3. Tap the option required.
4. When finished with the options, tap the Left (◀) arrow at the bottom to return the screen to the Home view.
5. Refer below for information on configuring each Settings option.

Calibration

This option is used to activate the calibration procedure.

To access, tap **Calibration.** Refer to the Calibration mode section later in this manual for detailed information on performing a calibration.

Self Test

This option is used to run a self test of the instrument.

1. To activate, tap **Self Test** and then place the instrument on the white calibration tile.
2. Tap the **Start** icon in the display. The self test goes through 10 steps.

Measurement Option

This option is used to set auto measure mode.

Manual Measure: When set to Manual, you must press the Measure button or tap the screen once all three contact sensor indicators turn green in the display to take a measurement.

Automatic Measure: When set to Automatic, this option allows the instrument to automatically take a measurement once all three contact sensor indicators turn green in the display. No measurement switch press or screen tap is required. Once a measurement is taken, the instrument must be repositioned in order for another measurement to occur.

Dark Mode Option

This option is used to help reduce measurement noise on very dark sample measurements.

Off: When set to off, the option is not utilized.

Manual: When set to Manual, the instrument will display a message after the first measurement asking if you would like to turn on dark mode when a dark sample is detected. Select Yes to turn on Dark Mode or select No to continue without the option being used.

Automatic: When set to Automatic (default setting), the instrument automatically switches to dark mode after a dark sample is detected.

Speaker Option

This option is used to turn the instrument speaker on or off. The instrument beeps when the screen is tapped, after a measurement, and after a calibration.

Language

This option is used to set the language that is displayed on the instrument during operation.

To set the language, tap **Language** and then tap the desired language.

Device Information

This option is used to view important instrument information such as hardware version, calibration reference serial number, battery data, etc.

Power Off

This option is used to power off the instrument.

To access, tap **Power Off** and then tap **Power down** to confirm.

Factory Reset Option

This option is used reset the instrument to its factory default settings. All stored sample will also be deleted when activated. Select Yes to reset to the factory default settings or select No exit the setting without resetting.

CALIBRATION MODE

The instrument must be calibrated on the white tile every 14 days. Measurements with expired calibration are still possible, but with a warning at the beginning of each job.

Refer to the Cleaning section in the Appendices for information on cleaning the calibration reference.

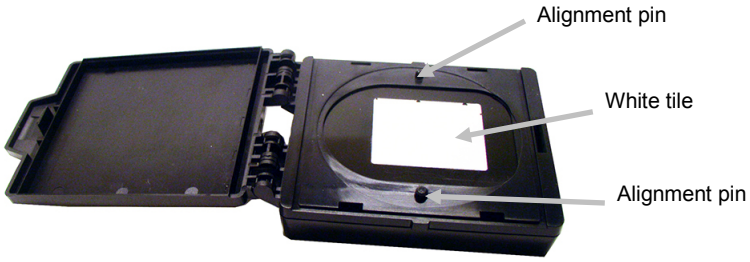
NOTE: Make sure to use the calibration reference supplied with the instrument for calibrating. Do not substitute this reference with a reference from another instrument. The serial number on the reference should match the reference serial number displayed on the instrument calibration screen.

Calibration Notes

- Calibration should be performed at room temperature (23°+/-1°C and 40-60% relative humidity).
- The **white tile in the calibration reference is severely affected by smudge marks, dust, and finger prints**. Refer to Appendices for calibration reference cleaning procedures.
- **Do not move instrument while taking a calibration measurement**. If motion is detected by the contact sensors, an error message will be displayed and calibration aborted.
- Make sure the USB cable is unplugged from the instrument before performing a calibration.

Calibration Reference

The calibration reference is designed to keep the white tile free of dust and debris.



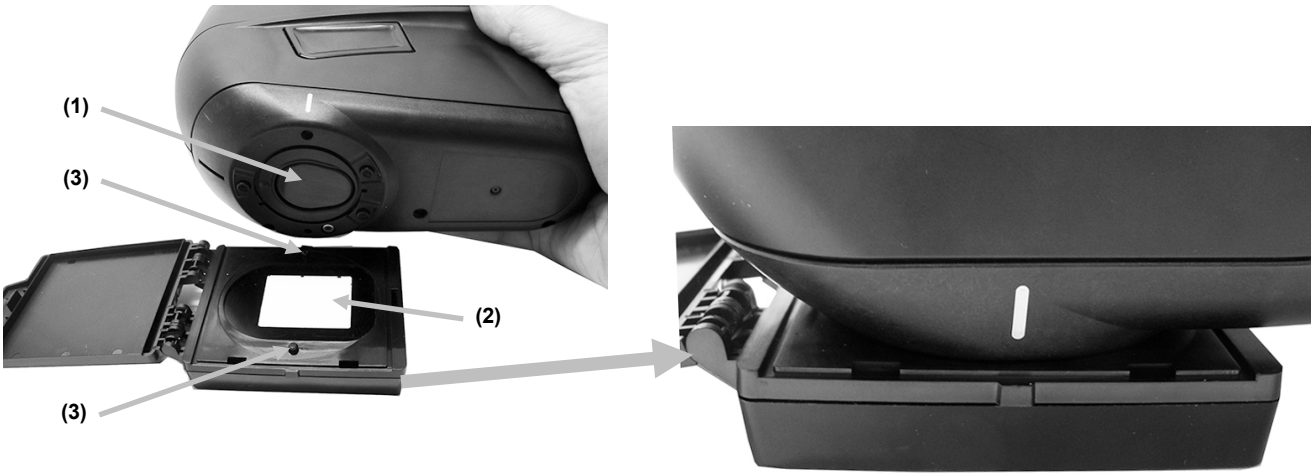
Calibrating the Instrument

1. Select the **Calibration** option from the Settings menu as previously explained (see Entering Settings Mode).

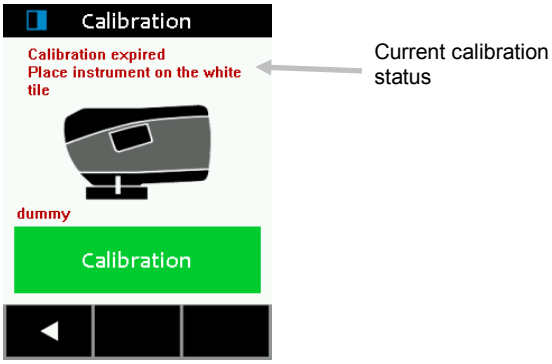
   The message “Calibration expired” appears if the instrument needs to be calibrated. If calibration is not currently needed, the time remaining before the next calibration appears. To exit the calibration mode without calibrating, tap the Left (◄) arrow at the bottom of the screen.

2. Open the calibration reference and lay it flat. Position the instrument measurement port (1) over the white tile (2) by locating the two pins (3) in the calibration reference into the holes in the measurement base.

   NOTE: The pins are keyed and will only insert in one direction.



3. When ready, tap **Calibration** and then tap **Yes** to start calibration. Do not touch the instrument throughout the measurement sequence.



NOTE: If an error message appears after white calibration, try measuring the white tile again. If an error still occurs, clean the white calibration tile as explained in the Appendices.

4. After calibration is completed, remove the instrument from the calibration reference and close the reference case.

NOTE: It is recommended to perform a Self-Test after the Calibration Refer to the Settings screen.

JOB LIST MODE

The Job List mode is used to measure and delete sample data. The instrument stores measurements as jobs (multiple measurements per job). Each job must complete all required measurements before the next job can be selected. The measurement sequence is displayed at the top of the screen to help you track your progress for a job.

The following procedures explain the steps for measuring and deleting jobs. Refer to your software documentation for information on job uploading and downloading.

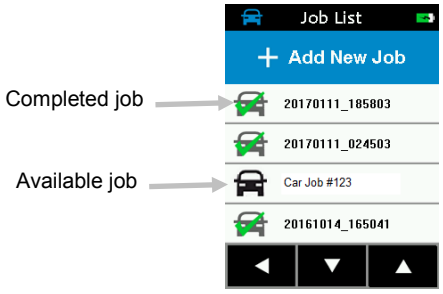
Measuring

In order for the instrument to obtain accurate and repeatable measurements, the bottom of the measurement port must be flat with the sample surface to be measured. Any movement of the instrument can cause the measurement angles to vary, greatly affecting measurements on metallic and pearlescent paint finishes. The contact sensors ensure the integrity of the measurement data.

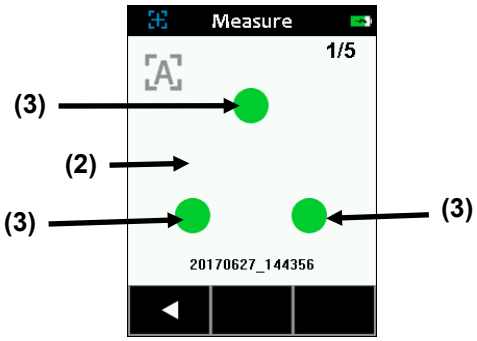
IMPORTANT:

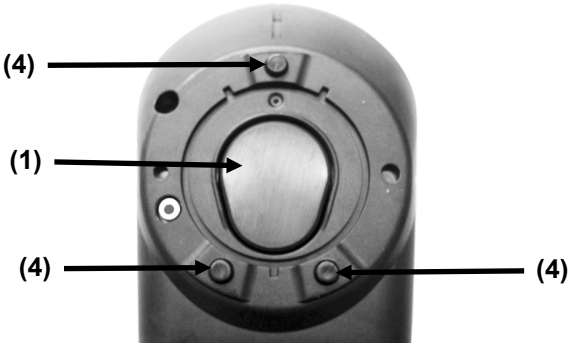
- To avoid discomfort, do not look directly into the measurement optics when the instrument is on and measuring.
- Do not move instrument while taking a sample measurement. If motion is detected by the contact sensors, an error message will be displayed and the measurement aborted.
- Measurement performance may decline under certain condensing conditions.
- Do not move the instrument on the sample surface with pressure. This may cause scratches to the sample surface.

1. From the **Home** screen, tap the Job List icon.
2. Select a downloaded job from the list or tap the **Add New Job** icon at the top of the screen to start a new job. After selection, the instrument goes into measure mode.
   NOTE: Downloaded jobs available for measurement do not have a green checkmark. Downloaded jobs that have a green checkmark have already been completed.



3. Locate the measurement port (1) in the bottom of the instrument over the first measurement area while viewing the screen (2).
4. Gently rock the instrument until all three positioning indicators (3) in the screen turn green. This indicates that all three contact sensors (4) are activated.

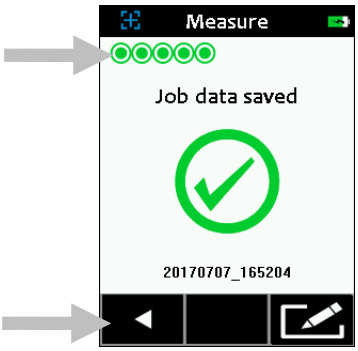




5. Hold the instrument steady and press the Measure button or tap the screen to initiate a measurement in case the instrument is configured in Manual Mode. If the instrument is configured in Automatic Mode, the measurement will be triggered as soon as (with a one-second delay) the instrument is correctly positioned on the check zone and all pins are in contact (green indicators on UI). Continue to hold the instrument steady until the progress bar in the screen reaches 100%.

NOTE: If an error occurs after the measurement, tap **OK** on the screen and try measuring again.

6. Continue with the remaining area measurements to complete the job.
7. After the last measurement is completed, the quality of the measurement is indicated with a 5 point system. Five points indicates excellent measurement without variation between the readings, 3-4 points indicates good measurement and 1-2 points indicates an acceptable measurement. Tap the Left (◀) arrow on the Job data saved screen to return to the Job List screen.

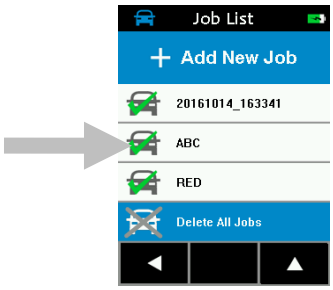


8. If the job was created on the instrument using the Add New Job feature, you can edit the name if desired. Click on the Edit icon at the button of the screen and enter a job name using the virtual keyboard. Click the Checkmark icon to save the job name.

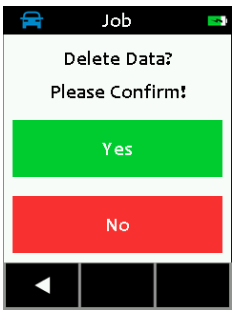
Deleting Jobs

Single Job

1. To delete a single job or job data, tap the job from the Job list. You will need to need to tap the Down (▼) or Up (▲) arrow icons if the job you want to delete is not showing up in the list.



2. Tap **Delete Data** or **Delete Job** in the screen to continue. If Delete Data is selected, only the data will be deleted and not the job.
3. A message appears asking you to confirm that you want to delete the data or job. Tap **Yes** to confirm or **No** to return to the Job List screen.



All Jobs

1. To delete all jobs, tap **Delete All Jobs** in the Job list. This option is located at the end of the job list.

2. A message appears asking you to confirm that you want to delete the job. Tap **Yes** to confirm or **No** to return to the Job List screen.

APPENDICES

Service Information

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

X-Rite, Incorporated has offices around the world. You can contact us using one of the following methods:

- To identify the X-Rite service center nearest you, please visit our web site at www.xrite.com.
- For online help, visit our web site and click the **Support** link.
- Send an e-mail to Technical Support (casupport@xrite.com) detailing your problem and listing your contact information.

Cleaning the Instrument

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

Important Notes:

- DO NOT use any solvents to the clean the instrument, this will cause damage to the cover and internal electronic components.
- Compressed air should not be used to clean the instrument. Cleaning the instrument with blown air can cause dirt on the outside of the instrument to enter into the device, and contaminate optical components.

Cleaning the Calibration Reference

The white tile in the calibration reference should be cleaned using a mild soap and warm water solution, thoroughly rinsed with warm water, and wiped dry with a clean, lint-free cloth. You must let the reference dry completely before taking a calibration measurement.

Replacing the Battery Pack

Use on Li-ion battery pack provided by X-Rite (P/N TPZ-27313); other types may burst causing personal injury.

NOTE: Time and date are lost when the battery is disconnected. It is not possible to set the clock in the Setting menu.

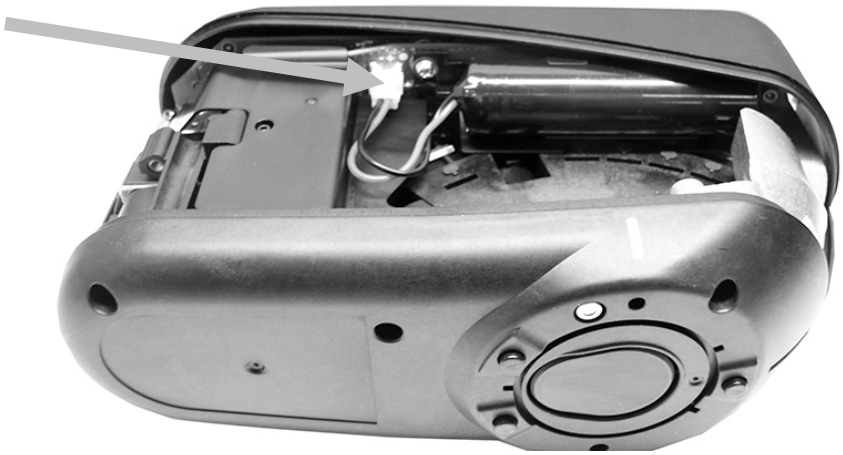
Connect the instrument to the PC and use the utility software or the application software to set time and date.

This information is used for identification of the measurements.

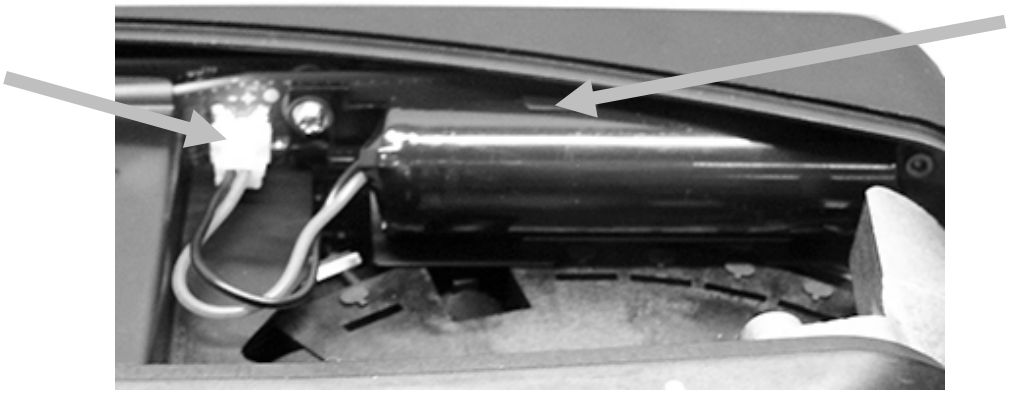
1. Carefully position the instrument on the left side and remove the 2 screws in the base plate using a 2 mm allen key). Compress the cover slightly if the screws do not fall out.

2. Lift up on the right side panel and remove.

3. Unplug the battery connector and remove the old battery pack.



4. Plug in the battery connector and insert the new battery pack into the clip.



5. Reattach the side panel, insert and carefully tighten the 2 screws in the base plate with not too much torque.

Troubleshooting

Prior to contacting X-Rite support department for instrument problems, try the applicable solution(s) described below. If the condition persists, contact us using one of the methods listed in the Service Information section.

Problem	Cause	Solution
Instrument screen remains dark.	Instrument is turned off.	Turn instrument on by pressing the power/measure button.
	Instrument is in power down mode.	Touch the screen.
	Battery is very low.	Charge the battery min. 1 hour. After max. 5 minutes the screen will turn on.
	Battery is defective.	Charge the battery. If the screen does not turn on after max. 5 minutes check if the USB cable is correctly connected to the computer or power supply (USB ports on computer monitors and keyboards do not deliver enough power). If it still does not work the battery needs to be replaced.
Screen is instable (turns on and off periodically) when the instrument is connected to a computer or power supply.	Battery is defective.	Battery needs to be replaced.
Screen is frozen.	Firmware is locked up.	Disconnect USB cable. Press and hold the power/measure button for 10 seconds and then release. Instrument turns off. Instrument can be started normally.
Measurement error or results appear inaccurate.	Material being measured is damaged (e.g. scratched).	Repeat measurement.
	Calibration was performed on a dirty calibration reference.	Clean the calibration reference and repeat the calibration per procedure in the Calibration section.
	Instrument requires calibration.	Perform calibration on calibration reference followed by a self test. If calibration and self test fails, the instrument is defective. Contact technical support.
	Instrument is defective.	Perform a self test in the Settings menu. If the self test fails the instrument is defective. Contact technical support.
Calibration procedure fails.	Instrument defective.	Contact technical support.
Instrument and software not communicating (USB connection).	USB cable not connected.	Connect the USB cable between the computer and the instrument.
	USB cable is defective.	Exchange USB cable.
	Communication crashed between application software and the instrument.	Unplug the USB cable, wait 1 second and connect the cable again. If the communication still does not work, close and restart the software application. Restart the instrument. If the communication still does not work, reboot the computer.
Instrument will not measure or calibrate.	Contact sensor(s) do not properly contact the sample surface.	Lift the instrument and place it properly on the sample. Make sure that all 3 sensor indicators on the screen turn green.

	Contact sensor(s) are not working correctly. Sensors may be stuck due to dirt or paint; or they are defective.	Open a new job to show the 3 sensor indicators on the screen and place the instrument on a flat surface and then lift it. If one or more of the sensor indicators in the screen do not change color when lifted, there may be a problem with the contact sensor(s). Contact technical support.
Shutter error.	Instrument defective.	Contact technical support.
Multiple error messages.	Instrument encountered a cascade of errors.	Press OK button in error message for 2 seconds.
Date and time wrong.	Incorrect setting.	Refer to instruction in manual.
Instrument will not measure or calibrate.	Sensor indicators in the display do not change color.	Contact sensors are not working correctly. Put the instrument into measure mode and place the instrument on a flat surface and then lift. If one or more of the sensor indicators in the display do not change color when lifted, there may be a problem with the contact sensor. Contact technical support.
Shutter error.	Instrument defective.	Contact technical support.
Multiple error messages.	Instrument encountered a cascade of errors.	Press OK button in error message for 2 seconds.
Date and time wrong.	Incorrect setting.	Refer to instruction in manual.

Instrument Specifications

Environmental

Operating Temp:	50°F to 95°F (10°C to 35°C)
Humidity Max:	85% RH max (non condensing)
Storage Temp:	-4°F to 122°F (-20°C to 50°C)

Battery

Type:	Lithium Ion Battery
Cell Size:	18650
Nominal Voltage:	3.6V
Capacity:	2.15 Ah
Max. discharge current:	4A
Max. charge current:	2.15A
Inner resistance:	<= 120 mΩ
Compliance:	UN38.3, IEC62133B, CE
Protection:	over current, over charge, over discharge

Corporate Headquarters
X-Rite, Incorporated
4300 44th Street SE
Grand Rapids, Michigan 49512
Phone 1 800 248 9748 or 1 616 803 2100
Fax 1 800 292 4437 or 1 616 803 2705

European Headquarters
X-Rite Europe GmbH
Althardstrasse 70
8105 Regensdorf
Switzerland
Phone (+41) 44 842 24 00
Fax (+41) 44 842 22 22

Asia Pacific Headquarters
X-Rite Asia Pacific Limited
Suite 2801, 28th Floor, AXA Tower
Landmark East, 100 How Ming Street
Kwun Tong, Kowloon, Hong Kong
Phone (852)2568-6283
Fax (852)2885 8610

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

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