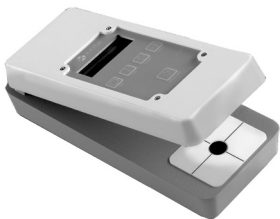


x-rite 331C

Battery Operated B/W Transmission Densitometer



Operation Manual

FCC

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.

Canada

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.



CAUTION: Operational hazard exists if battery charger other than X-Rite SE30-177 is used.

VORSICHT: Betriebsgefahr! Bitte verwenden Sie ausschließlich das Ladegerät X-Rite SE30-177.

ADVERTENCIA: No use otro cargador de las pilas que no sea la pieza X-Rite SE30-177, por el riesgo de mal funcionamiento del equipo.

ATTENTION: Ne pas utiliser d'adaptateur autre que SE30-177 de X-Rite au risque de mauvais fonctionnement de l'appareil.

AVVERTENZA: Non usare un altro caricabatteria che non è del pezzo X-Rite SE30-177, per il rischio di malfunzionamento dell'apparecchio.

CE DECLARATION

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Authorized Representative	X-Rite, Incorporated Siemensstraße 12b 63263 Neu-Isenburg Germany T: +49 (0) 61 02-79 57-0 F: +49 (0) 61 02-79 57-57
Model Name:	Densitometer
Model No.	331C
Directive(s) Conformance	EMC 2004/108/EC LVD 2006/95/EC



Warning:

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.

RoHS/WEEE

X-Rite products meet the **R**estriction of **H**azardous **S**ubstances (RoHS) Directive 2002/95/EC and European Union – **W**aste **E**lectrical and **E**lectronic **E**quipment (WEEE) Directive 2002/96/EC. Please refer to www.xrite.com for more information on X-Rite's compliance with the RoHS/WEEE directives.



Limited Warranty

X-Rite, Incorporated ("X-Rite") warrants each instrument manufactured to be free of defects in material and workmanship (excluding lamp and battery pack) for a period of 12 months, unless different local regulations apply. 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.

This warranty shall be voided by any repair, alteration, or modification, by persons other than employees of X-Rite, or those expressly authorized by X-Rite to perform repairs, and by any abuse, misuse, or neglect of the product, or by use not in accordance with X-Rite's published instructions.

X-Rite reserves the right to make changes in design and /or improvements to its products without any obligation to include these changes in any products previously manufactured. Correction of defects by repair or replacement shall constitute fulfillment of all warranty obligations on the part of X-Rite.

THIS WARRANTY IS EXPLICITLY IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. THIS WARRANTY OBLIGATION IS LIMITED TO REPAIR OR REPLACEMENT OF THE UNIT RETURNED TO X-RITE OR AN AUTHORIZED SERVICE CENTER 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.

Proprietary Notice

The information that is contained in this manual is derived from patent and proprietary data from X-Rite, Incorporated. This manual has been prepared solely for the purpose of assisting operation and maintenance personnel in their use of the X-Rite 331C.

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1. General Information

Description

The 331C instrument is a battery operated hand-held B/W Transmission Densitometer that has achieved the accuracy and stability of our A.C. powered versions. The unique size and shape makes it an ideal portable instrument for use in the plant, the lab, or on the road.

The instrument has its own light source and illumination area. Push-button control of display power, lamp, and zero make the instrument easy to use.

The 331C measures Density and Density Difference.

Specifications

Conforms to ANSI PH 2.19

331C Color Response	ANSI Visual
331C OR Color Response	Ortho
Measuring Length (Throat)	5.5 inch (14 cm)
Measuring Area	1.0mm and 2.0mm Dia.
331 Measuring Range	0 – 3.5D (1mm) 0 – 4.0D (2mm)
331OR Measuring Range	0 – 3.2D (1mm)
Accuracy	< $\pm 0.02D$
Repeatability	< $\pm 0.01D$
Zero Stability	$\pm 0.03D$ per 8 hours max
Scale Factor (Slope) Stability	$\pm 1\%$ per 6 months max
Warm-up Time	None
Battery Pack	SE15-43
AC Adapter	SE30-177
Instrument Rating	12VDC @ 1.2 Amp
Measurements per Charge	> 2000
Operating Temp Range	+10° C to 40° C
Storage Temp. Range	-20° C to 50° C
Usage	Indoor Only
Altitude	2000m
Pollution Degree	2
Transient Overvoltage	Category II
Dimensions	
Height	2.0 in. (5.08cm)
Width	2.95 in. (7.46cm)
Depth	7.0 in (17.78cm)
Weight	1.52 lbs (688gm)

Specifications and appearance design subject to change for reasons of product improvement, reliability, and/or manufacturability without notice.

Unpacking Information

Remove the instrument from the shipping carton. Inspect for possible damage. If any damage is noted, contact the transportation company immediately. Do nothing more until the carrier's agent has inspected the damage.

If damage is not evident, check to make sure that the following items are included:

- Operation Manual
- Registration Card (complete and mail)
- 331C B/W Transmission Densitometer
- Calibration Step Tablet
- Soft Vinyl Carrying Case
- 1mm & 2mm Apertures
- AC Adapter
- Calibration Screwdriver

Your X-Rite 331C was packaged and shipped in a specially designed carton to assure against damage. If reshipment is necessary, the instrument should be repackaged in the original carton. If the original carton is not available, a new one can be obtained from X-Rite.

2. Operating Instructions

Should your instrument become inoperative, refer to troubleshooting chart at the back of this manual. If the problem cannot be rectified, refer the instrument to X-Rite or an authorized service center for proper servicing.

Applying Power

Your densitometer is designed to operate from the internal battery pack or from the AC adapter. As an added feature, the instrument will operate on the AC adapter with the battery pack removed.

AC Adapter Operation

Before using: Make sure the voltage indicated on the AC adapter complies with the AC line voltage in your area. If not contact your dealer.

The instrument automatically turns on when the AC adapter is plugged in. You can turn the instrument off at any time by pressing the OFF button.

Battery Operation


THE INSTRUMENT SHOULD BE FULLY CHARGED BEFORE USING FOR THE FIRST TIME. SEE BATTERY CHARGING FOR DETAILS.

To apply battery power, press the ON button. The instrument automatically turns off after 2 minutes of inactivity to conserve battery life. To manually turn the instrument off, press the OFF button.

CAUTION: When the batteries are nearly discharged, a small arrow in the upper left-hand corner of the display appears as an indication that the batteries are in need of recharging. When the arrow appears on the display, the read lamp is disabled. If the arrow displays during a measurement, the data for that measurement will be incorrect. **The batteries must be immediately recharged once the arrow indicator is displayed.** The densitometer will not operate at all if the batteries have completely lost their charge, until the AC adapter is plugged in.

Battery Charging

The unit should be charged before using for the first time. The unit can be operated while the batteries are being charged. The batteries take approximately one hour to reach a full charge from a discharged state.

 **NOTE:** After batteries are fully charged (indicated by Green LED off), remove the AC adapter and operate the instrument from battery power until the display indicates that charging is required. Following this charging method will help prolong the life of the batteries.

Before using: Make sure the voltage indicated on the battery charger complies with the AC line voltage in your area. If not contact your dealer.

1. Plug small connector end of the AC adapter into side of unit.
2. Plug detachable line cord in the AC adapter and plug the line cord into the wall receptacle.

A fully charged set of batteries provides approximately 2000 measurements typically.

LED Indicator

The LED indicator located next to the power input receptacle has three modes to provide feedback of the battery status. The three modes are explained below:

Solid Green LED – Indicates that the batteries are being charged.

Continuous Blinking Green LED – This occurs when the charging requirements for the batteries are being evaluated (or when no battery pack is present). After a short period of time, the LED will turn on solid indicating charging is taking place.

Green LED Off – Indicates that the batteries are fully charged. You should remove the AC adapter at this point and operate the instrument from battery power until the display indicates that charging is required.

Occasional Blinking Green LED – This occurs when the instrument attempts to evaluate batteries for a brief time.

Nulling (zeroing) Procedure

Null must be established each time instrument power has been removed for more than one second. This is because the electronic memory is lost with power removal. Null remains very stable ($\pm 0.02D$) as long as the power remains on. Null the instrument as follows:

1. Remove film from reading area.
2. Lower the reading arm. Press the “NULL” button and hold while pressing the “MEASURE” button.
3. Hold both buttons down until the reading on the display has stabilized.

Absolute Den Measurement

Measure Absolute Density as follows:

1. Null the instrument as described above in Nulling Procedure.
2. Center the film area in question directly over the aperture under the reading arm.

If you are reading a sensitometric step, the center of the step should be measured.

3. Lower the reading arm. Press the “MEASURE” button and hold for a few seconds until the lamp goes out.
4. Remove pressure on the read button so that the reading arm rises.

The density measured will be displayed until the button is pushed again.

NOTE: When measuring density values above 2.50D, care should be taken that the reading head light seal is completely on the surface of the film being measured. Always measure density with the film emulsion side up.

Den Comparison Measurement

Compare Density readings as follows:

1. Place reference film over aperture. Null the instrument per instructions give in Nulling Procedure.
2. Place the film to be compared over the aperture and measure the density. This measurement is the difference between the reference film density and the compared film density. A minus (-) display indicates the compared film is a lower density.

NOTE: The unit can zero on densities up to 1.00D.

Light Table Illumination

Illuminate the light table without making a measurement by pressing the "Lamp" button. Use this feature in locating film spots to be measured.

3. Calibration

Frequency of Calibration Test

Under normal operating conditions, the instrument calibration test should be performed once a week. See instructions on the next page.

Calibration Test

Calibration of this instrument should remain stable over a long period of time and over an extended range of voltage and temperature. However, if calibration is questioned, a calibrated step tablet is provided to check against. Handle this tablet with care so that no dirt or fingerprints are deposited on the film surface.

Check calibration in the center of the step tablet area marked "CAL". This measurement should be within $+0.02D$ of the value marked on the step tablet.

Always return the step tablet to its protective cover.

Cal procedure

If calibration needs to be changed, proceed as follows:

1. Insert a small screwdriver into the hole on the right side of the instrument, engaging the potentiometer slot inside.
2. Measure the calibrated step tablet in the center of the area marked "CAL".
3. If the reading in the display does not equal that of the calibrated step tablet, adjust the potentiometer until it does.

To increase scale factor, rotate the screwdriver counterclockwise.

4. Check the units null (zero) and renull if necessary.
5. Repeat steps 3 and 4 until the calibration and null settings are exact.

NOTE: The instrument measures for only a few seconds after the "MEASURE" button is pushed and held. Potentiometer changes after the bulb turns off and will not be noted until a new measurement is made.

4. Maintenance

General

The densitometer is covered by a one-year limited warranty (excluding lamps and batteries) and should be referred to the factory for repair within this warranty period. Attempts to make repairs within this time frame may void the warranty.

Always verify instrument calibration to assure proper instrument operation. Make sure all connections are properly made.

Cleaning

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

Factory Repair

X-Rite recognizes the need to provide complete technical repair service to their customers. Because of the complexity of the circuitry, all circuitry repairs should be referred to the factory or an authorized service center.

The manufacturer will repair any densitometer submitted past warranty. Shipping costs to the factory shall be paid by the customer and the instrument shall be submitted in its original carton as a complete unaltered unit.

Lamp Replacement

A spare Lamp Assembly (P/N 331C-129) can be obtained from X-Rite should your lamp fail. Replace as follows:

NOTE: Refer to the illustration on page 13.

1. Unplug the AC adapter from the instrument.
2. Remove the bottom cover from the instrument by removing the four screws.
3. Unplug the lamp connector from the P.C.B. assembly.
4. Remove the screws holding the lamp assembly. Remove the lamp assembly.

CAUTION: Make sure the new lamp surface is clean. Remove smudge marks with alcohol on a lint-free cloth.

5. Install the new lamp into the lamp chamber assembly with the screws removed in step 4.
6. Attach the lamp connector to the lamp plug on the P.C.B. assembly.
7. Secure the bottom cover to the instrument with the four screws removed in step 2.

Battery Replacement

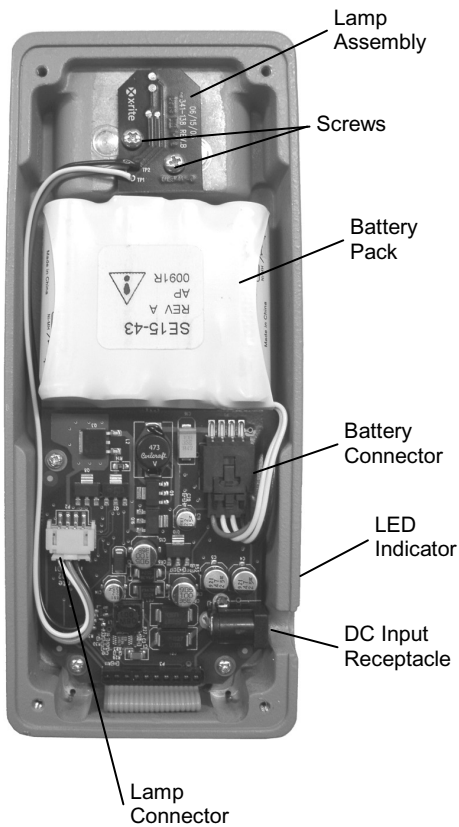


If it becomes necessary to replace the battery pack, use only part number SE15-43 supplied by X-Rite. To replace the batteries, use the following procedure.

NOTE: Refer to the illustration on page 13.

Replace as follows:

1. Unplug the AC adapter from the instrument.
2. Remove the bottom cover from the instrument by removing the four screws.
3. Unplug the battery connector from the P.C.B. assembly and remove the old battery pack.
4. Install the new battery pack into the instrument.
5. Attach the battery connector to the battery plug on the P.C.B. assembly.
6. Secure the bottom cover to the instrument with the four screws removed in Step 2.



Troubleshooting Chart

The following chart is included to aid in troubleshooting your instrument. While troubleshooting, use caution to avoid danger of electrical shock. While replacing parts, always turn off the power.

TROUBLE	CAUSE	REMEDY
Displays will not light (no decimal point).	Discharged or bad batteries. Internal component failure.	Recharge or replace. Return to factory or authorized service center.
Displays do not light (decimal point lit).	Power is just turned on. Internal component failure.	Push measure button. Return to factory or authorized service center.
Light source will not light.	Failed light source. Discharged or bad batteries Internal component failure.	Replace light source. Recharge or replace. Return to factory or authorized service center.
Reading will not change	Internal component failure.	Return to factory or authorized service center.
Reading will not hold.	Internal component failure.	Return to factory or authorized service center.
Displays turn off when measure button is pushed.	Weak batteries	Recharge batteries.



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