

# User Manual

## neoBLUE<sup>®</sup> LED Phototherapy Radiometer



Read and be familiar with this manual before operating or servicing this device. To ensure operator, technician, and patient safety, use only as specified in this manual.



**Caution: United States Federal Law restricts this device to sale or use by or on the order of a physician (or properly licensed practitioner).**

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# Overview

 <b>CAUTION</b>	Read and be familiar with this instruction manual before installing, operating, or servicing this device.
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 <b>CAUTION</b>	If this equipment is used in a manner not specified by this manual, the protection provided by the equipment may be impaired.
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This manual provides the necessary information to maintain and service the neoBLUE® LED Phototherapy Radiometer. The operating instructions in this manual are intended for use by hospital personnel. The service instructions in this manual are intended for use by qualified technicians.

## Conventions

The following conventions are used in this manual.











**Table 1** Conventions

Convention	Description
 <b>NOTE</b>	Notes provide additional information to clarify a point in the text.
 <b>CAUTION</b>	Cautions indicate situations that, if not avoided, could result in minor to moderate injury to the patient or operator, or damage to the equipment.
 <b>WARNING</b>	Warnings indicate situations that, if not avoided, could result in serious injury or death to the patient or operator.

## Symbols

The following symbols are located on the Radiometer and its packaging.

**Table 2** Symbols

Symbol	Definition	Symbol	Definition
	Atmospheric pressure		Shipping
	Battery		Storage
	Caution, read instructions		Temperature
	Humidity, condensing		Manufacturer
	Electronic waste (see Specifications)		Authorized representative

## Intended Use

The neoBLUE LED Phototherapy Radiometer is a spectroradiometer for measuring the irradiance (radiant power) of neoBLUE light-emitting diode (LED) phototherapy devices.

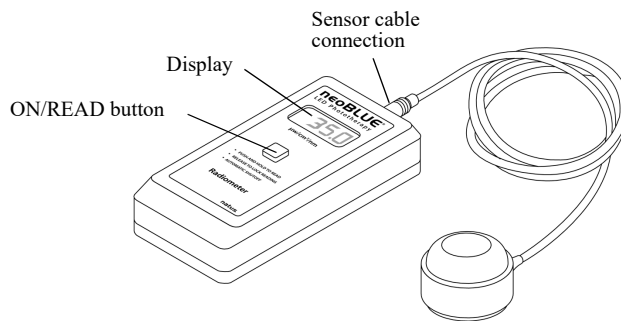


This product is suitable only for measuring with neoBLUE products. It does not accurately measure broadband sources such as halogen or fluorescent.

## Description

The Radiometer is comprised of a readout and a detachable sensor, as illustrated in Figure 1.

**Figure 1** neoBLUE LED Phototherapy Radiometer

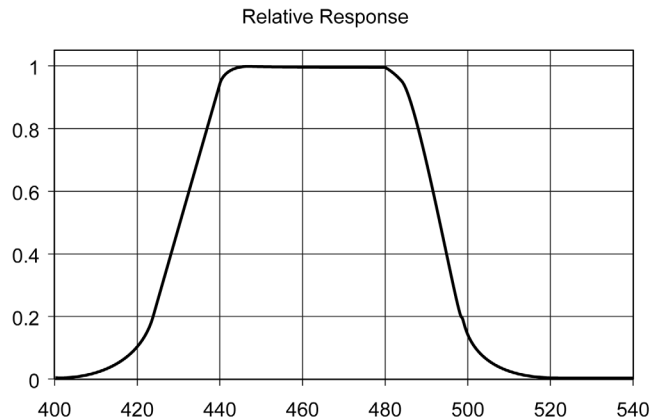


The Radiometer measures the irradiance of wavelengths from 420 to 500 nanometers (nm), the blue-green portion of the spectrum, which includes the bilirubin peak absorption wavelength. It measures intensity in units of microwatts per square centimeter per nanometer ( $\mu\text{W}/\text{cm}^2/\text{nm}$ ). A nanometer is a measure of wavelength equal to one-billionth of a centimeter. The term “per nanometer” indicates the average irradiance per nanometer across the spectral band to be measured, which is 80 nm wide. Measuring in this fashion makes it possible to compare average irradiance across spectral bands of different widths.

## Instrument Response Characteristics

Figure 2 represents the nominal response characteristics of the neoBLUE Radiometer, which corresponds to the peak absorption spectrum of bilirubin.

**Figure 2** Nominal response of the Radiometer





This instrument is calibrated at 72° F (22° C). Readings may change with temperature and increase at the rate of approximately 0.15% per °F (0.27% per °C). Readings are not affected by momentary exposure (3 minutes or less) to temperature changes of less than 20° C, such as readings taken in an incubator.

## Operation



**Explosion hazard. Do not use this device in the presence of flammables (for example, oxygen, nitrous oxide, and anesthetics).**



- Read and be familiar with this instruction manual before using this device.
- This product should only be used by technically qualified hospital personnel.
- Inspect this device before each use to ensure proper functioning.
- If meter or sensor is dropped a distance of 1 foot or more, verify proper operation and compare reading to that of a known good meter. Have unit recalibrated as necessary.

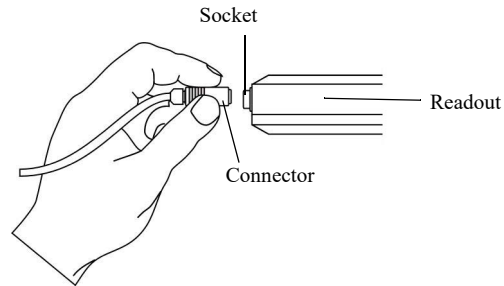


The hospital or facility is responsible for ensuring that all personnel who operate or maintain this device are trained in its operation and safe use, and for maintaining training records of attendance and evidence of understanding.

## Connecting the Sensor

The sensor connects to the socket on the readout. To connect, turn the connector until the keyed slots are aligned, and then carefully insert the connector into the socket.

**Figure 3** Connecting the sensor to the readout



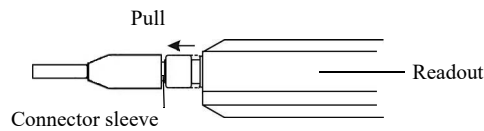
## Disconnecting the Sensor



To avoid damage, never pull on the cable to remove the connector.

To remove the sensor, pull back on the connector (toward the sensor).

**Figure 4** Disconnecting the sensor



## Verifying Proper Operation

Verify proper operation on receipt of a new Radiometer, after servicing, and before each use.

### To verify proper operation:

- 1 Confirm that calibration is current by checking the calibration date sticker both on the bottom of the sensor and on the bottom of the readout.
- 2 Confirm that the sensor is connected to the readout.
- 3 Hold the sensor near a neoBLUE phototherapy light, and press the ON/READ button. Verify that a reading appears and that it changes as the position of the sensor moves.
- 4 Release the ON/READ button, and verify that the reading continues to be displayed for 30 seconds.

## Taking Measurements

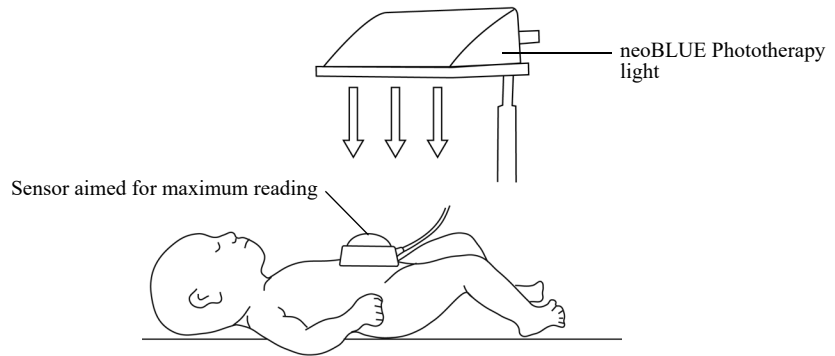
### To measure overhead lights:

- 1 Connect the sensor to the readout.
- 2 Hold the sensor against the infant's body as near to the umbilical region as possible and aim the sensor at the center of the neoBLUE phototherapy light (see Figure 5).
  - For reproducible measurements, always hold the sensor at the same place on the infant's body.
  - Changes in the distance or angle of the light to the patient will change the intensity (irradiance) reading.




Factory calibration of neoBLUE lights occurs at a distance of 12 inches (30 cm) from the infant. Use or measurement of a neoBLUE light at other distances results in different intensity readings.

**Figure 5** Measuring overhead lights



- 3 Press and hold the ON/READ button. "On" is displayed briefly, and then the intensity measurement is displayed. While pressing the button, adjust the aim of the sensor to obtain the maximum reading.
- 4 Release the ON/READ button. The intensity measurement locks on the display for 30 seconds and then automatically shuts off to preserve battery life.

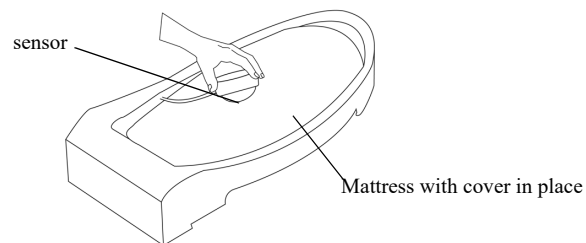
If more than one phototherapy light is used on the infant, keep all the lights on to accurately measure the intensity of light that is being delivered to the patient.


 **NOTE** See the service procedures for individual neoBLUE lights for instructions about adjusting the intensity with this radiometer.

**To measure the neoBLUE cozy light:**

- 1 Connect the sensor to the readout.
- 2 Place the sensor, with the white sensor facing down, in the middle of the lighted side of the covered mattress (see Figure 6). The disposable cover should be on the mattress.

**Figure 6** Measuring the neoBLUE cozy light



 **NOTE** Place the entire white diffuser of the sensor over the lighted area of the mattress to avoid inaccurate measurements.

- 3 Press and hold the ON/READ button. "On" is displayed briefly, and then the intensity measurement is displayed.

- 4 Release the ON/READ button. The intensity measurement locks on the display for 30 seconds and then automatically shuts off to preserve battery life.




Do not leave the radiometer under radiant warmer or in incubator for extended periods of time because inaccurate readings can occur.

## Messages

The following messages may be displayed on the readout.

Table 3 Messages

Display	Message	Description
	Low Bat	Battery power is low; replace the battery (see page 7).
<b>150.0</b>	Over Range	If <b>150.0</b> flashes on the display when the ON/READ button is pressed, the intensity is greater than 150 $\mu\text{W}/\text{cm}^2/\text{nm}$ and is out of range of the Radiometer.
- - -	Error	If dashes flash on the display when the ON/READ button is pressed, an error condition is present: <ul style="list-style-type: none"> <li>■ The sensor may not be connected. Check the sensor connection.</li> <li>■ The sensor may have failed. Try to read again. If the problem continues, contact Natus Technical Service or your local Natus representative (see page 8).</li> <li>■ The digital readout may have failed. Try to read again. If the problem continues, contact Natus Technical Service or your local Natus representative (see page 8).</li> </ul>

## Cleaning



- Regularly clean unit per hospital infection control procedures to prevent cross-contamination.
- Do not allow liquid to enter the Radiometer case because this can cause electrical damage.

### Required items:

- Soft cloth
- Mild cleaning detergent (for example, Virex™ Tb, Virustat®, Coverage® cleaners) or mild soap-and-water solution

### To clean the Radiometer:

- 1 Confirm that the Radiometer is off. If it is on, press the ON/READ button to turn it off.
- 2 Dampen the cloth with either the mild soap-and-water solution or detergent, and then wipe down all exterior surfaces of the Radiometer.

# Maintenance and Service



- Only qualified technicians should maintain or service this device.
- Read and be familiar with this instruction manual before maintaining or servicing this device.
- Do not allow liquid to enter the Radiometer case because this can cause electrical damage.
- The printed circuit boards (PCBs) contain static sensitive parts. Always use appropriate electrostatic discharge protection, such as an electrical-grounding wrist strap, when working with internal components.
- To assure accuracy, factory-calibrate the neoBLUE LED Phototherapy Radiometer to a radiometric standard annually (see *Calibrating the Radiometer*).

## Replacing the Battery

### Required items:

- 5/64-in. Allen wrench
- 9-volt alkaline, non-rechargeable battery (ANSI/NEDA type 1604A or IEC type 6LR61)

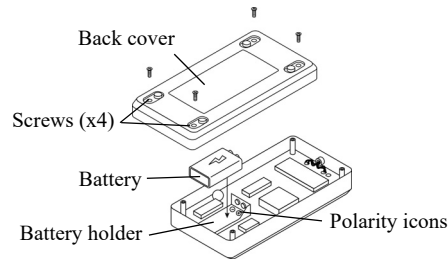
### To replace the battery:

- 1 Remove the back cover: Loosen and remove the four screws that secure the back cover of the readout (see Figure 7).



An instruction label on the inside of the back cover illustrates how to remove and insert the battery.

**Figure 7** Replacing the battery



- 2 Insert the new 9-volt battery into the battery holder.
- 3 Verify proper operation.

## Calibrating the Radiometer

The Radiometer was factory calibrated to a radiometric standard traceable to the National Institute of Standards and Technology (NIST). The calibration certificate is enclosed with this manual.

To assure continued accurate measurement of irradiance, the Radiometer should be recalibrated every 12 months to a radiometric (irradiance) standard. Because certain calibration factors are stored in its memory, the Radiometer must be recalibrated at the factory. The date of the last calibration and the date calibration is

due are labeled on the readout and sensor. Both the readout and the sensor should be returned for calibration.

## Service and Repair

The neoBLUE LED Phototherapy Radiometer has no customer serviceable parts and must be returned to the factory or an authorized service center for all repairs and parts replacement. After any service, the Radiometer must be recalibrated radiometrically to assure accurate measurement of irradiance.



Customer attempts to service the Radiometer will invalidate the warranty and may result in irreparable damage.

## Returning for Calibration or Service

The readout and the sensor must be returned together for calibration or service.

When sending equipment for service:

- Contact Natus Technical Service for a Return Merchandise Authorization (RMA) number and the location where the equipment should be sent.
- Clean the device, securely package it, and include the RMA number on the outside of the box.
- In the U.S., ship the equipment to:

Natus Incorporated  
3150 Pleasant View Road  
Middleton, WI USA 53562

## Contacting Natus Medical

To order additional Radiometers or sensors, contact:

Natus Medical Incorporated  
1501 Industrial Road  
San Carlos, CA 94070 USA  
Telephone: +1-650-802-0400  
Fax: +1-650-802-0401

Global sales & support: 1-800-303-0306

Customer Service Fax: +1-650-802-6620  
E-mail: [customer\\_service@natus.com](mailto:customer_service@natus.com)

Technical Service Fax: +1-650-802-8680  
E-mail: [technical\\_service@natus.com](mailto:technical_service@natus.com)

International Support: Please contact your local Distributor.  
Distributor locations can be found at [www.natus.com](http://www.natus.com)

# Specifications

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## Dimensions

### Digital Readout Unit

7.25 in. long x 3.4 in. wide x 1.75 in. deep

18.4 cm high x 8.6 cm wide x 4.4 cm deep

### Sensor

1.5 in. high x 2.5 in. diameter; 46 in. cable

3.8 cm high x 6.4 cm diameter; 116.8 cm cable

### Weight

■ Digital Readout Unit: 13 oz      369 g

■ Sensor:                              5.25 oz      149 g

### Measurement Range

■ Bandwidth:                        420–500 nm

■ Irradiance:                        0–150.0  $\mu\text{W}/\text{cm}^2/\text{nm}$

### Accuracy

$\pm 6\%$  of reading at 460 nm, 72° F (22° C)

$\pm 10\%$  meter to meter

### Electrical

9V alkaline battery, non-rechargeable

ANSI/NEDA type 1604A or IEC type 6LR61

### Environmental

#### Temperature

■ Operating:                        41–104°F    5–40°C

■ Shipping:                        -40–158°F   -40–70°C

■ Storage:                         -4–113°F   -20–45°C

#### Relative Humidity (RH)

■ Operating: 10–95%, non-condensing

■ Shipping/Storage: 10–100%, condensing

#### Operating Altitude

Up to 10,000 ft                      Up to 3,000 m

#### Operating/Shipping Pressure

0.6–1.0 atm                         600–1060 hPA

### Controls

ON/READ button turns on digital readout unit; the irradiance reading locks on the display when the button is released. The device automatically shuts off after 30 seconds.

## Display

Liquid-crystal display (LCD)

## Ordering Information

### Item

**REF**

neoBLUE LED Phototherapy

Radiometer . . . . . 53870

Radiometer sensor . . . . . 401671

## Regulatory, Electrical Safety, and Classifications

- FDA Class 1
- Health Canada Class 2
- UL/CSA/IEC 61010-1
- IEC 61326
- Ordinary Equipment (IPX0)
- Indoor Use Only
- Pollution Degree 2
- The Declaration of Conformity is available on request.


## Electromagnetic Compatibility

Meets the IEC 61326 standard. In some situations such as contact electrostatic discharge, abnormal operation (for example, display fluctuation) or lock-up may occur. If so, re-orient the meter and/or allow it to auto-reset and retake the reading.

## Product Disposal

Disposal does not require any special precautions. Dispose of according to your local disposal regulations.

For EU member states:

 Do not dispose of this product with your household waste. Please contact Natus Customer Service regarding the proper disposal of this equipment. Recycling this product helps conserve natural resources and prevents potential negative consequences to the environment and human health caused by inappropriate waste handling.





# Drawings and Schematics

Figure 8 neoBLUE LED Phototherapy Radiometer - Schematic, Drawing No. 700271, Rev. C

