

# MightySat™ Rx Fingertip Pulse Oximeter

Operator's Manual





## For Sale in the USA

These operating instructions provide the necessary information for proper operation of all models of the MightySat™ Rx Fingertip Pulse Oximeter. There may be information provided in this manual that is not relevant for your system. General knowledge of pulse oximetry and an understanding of the features and functions of MightySat Rx are prerequisites for its proper use. Do not operate MightySat Rx without completely reading and understanding these instructions.

**Notice:** Purchase or possession of this device does not carry any express or implied license to use with replacement parts which would, alone or in combination with this device, fall within the scope of one of the relating patents.

**CAUTION:** Federal (USA) law restricts this device to sale by or on the order of a physician.

**Note:** Cleared Use Only: The device and related accessories are cleared by the Food and Drug Administration (FDA) for noninvasive patient monitoring and may not be used for any processes, procedures, experiments or any other use for which the device is not intended or cleared by the applicable regulatory authorities, or in any manner inconsistent with the directions for use or labeling.

**For professional use. See directions for use for full prescribing information, including indications, contraindications, warnings, precautions, and adverse events.**

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### MEDICAL ELECTRICAL EQUIPMENT


WITH RESPECT TO ELECTRIC SHOCK, FIRE AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH

3148433

ANSI/AAMI ES 60601-1:2005, CAN/CSA C22.2 No. 60601-1:2008, and applicable Particular, (ISO 80601-2-61:2011) and related Collateral (IEC 60601-1-11:2010) Standards for which the product has been found to comply by Intertek.

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Patents: [www.masimo.com/patents.htm](http://www.masimo.com/patents.htm)

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# About this Manual

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Do not operate the MightySat™ Rx Fingertip Pulse Oximeter without completely reading and understanding the instructions.

Always use the MightySat Rx precisely in accordance with the directions in this manual, including site selection and sensor placement. Failure to follow all of the directions in this manual could lead to inaccurate measurements.

Read and follow any warnings, cautions, and notes presented throughout this manual. The following are explanations of warnings, cautions, and notes.

A *warning* is given when actions may result in a serious outcome to the patient or user (for example, injury, serious adverse effect, or death).

**WARNING:** This is an example of a warning statement.

A *caution* is given when any special care is to be exercised by the patient or user to avoid injury to the patient, damage to this instrument, or damage to other property.

**CAUTION:** This is an example of a caution statement.

A *note* is given when additional general information is applicable.

**Note:** This is an example of a note.





# Product Description and Indications

## Product Description

The MightySat™ Rx Fingertip Pulse Oximeter is intended as a noninvasive device that measures and displays arterial oxygen saturation (SpO<sub>2</sub>), Pulse Rate (PR), Perfusion Index (PI), and optional Pleth Variability Index (PVI®).

The following key features are available for the MightySat Rx:

- Masimo SET® technology for SpO<sub>2</sub> and pulse rate monitoring in motion and low perfusion environments.
- Optional Bluetooth® LE wireless technology for the wireless transfer of patient data to smart devices.

The MightySat™ Rx Fingertip Pulse Oximeter is available in the following versions:

Product Versions	Features
MightySat Rx	Intended to measure and display arterial oxygen saturation (SpO <sub>2</sub> ), Pulse Rate (PR), and Perfusion Index (PI).
MightySat Rx, Bluetooth LE	Intended to measure and display arterial oxygen saturation (SpO <sub>2</sub> ), Pulse Rate (PR), and Perfusion Index (PI). Optional Bluetooth LE radio is intended to transfer of parameter data to a compatible smart device.
MightySat Rx, Bluetooth LE and PVI	Intended to measure and display arterial oxygen saturation (SpO <sub>2</sub> ), Pulse Rate (PR), Perfusion Index (PI), and optional Pleth Variability Index (PVI). Optional Bluetooth LE radio is intended for transfer of parameter data to a compatible smart device.

## Indications for Use

The MightySat™ Rx Fingertip Pulse Oximeter is indicated for the noninvasive spot checking of functional oxygen saturation of arterial hemoglobin (SpO<sub>2</sub>) and pulse rate (PR). The Masimo MightySat™ Rx Fingertip Pulse Oximeter is indicated for use with adult and pediatric patients during both no motion and motion conditions, and for patients who are well or poorly perfused in hospitals, hospital-type facilities, and mobile environments.



# Safety Information, Warnings, and Cautions

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## Safety Warnings and Cautions

- **WARNING:** Do not use MightySat Rx during magnetic resonance imaging (MRI) or in an MRI environment.
- **WARNING:** Do not place MightySat Rx or accessories in any position that might cause it to fall on the patient.
- **WARNING:** Do not use MightySat Rx during defibrillation.
- **WARNING:** Do not use MightySat Rx during electrosurgery.
- **WARNING:** Do not use MightySat Rx in the presence of flammable anesthetics or other flammable substances, oxygen-enriched environments, or nitrous oxide to avoid the risk of explosion.
- **WARNING:** Only use the MightySat Rx to secure it to the finger. Excessive pressure to a finger can cause skin damage.
- **WARNING:** Check the sensor site every hour to ensure adequate circulation, skin integrity, and sensor alignment. Skin damage, pressure necrosis, or inaccurate readings may result.
- **WARNING:** Do not leave the MightySat Rx unattended around children. Small items such as the battery door, battery, and lanyard may become choking hazards.
- **WARNING:** Do not use the lanyard during activities where it may become wrapped around the neck. Strangulation may occur.
- **CAUTION:** Do not use the MightySat Rx near devices that are sensitive to magnets. The magnet provided with the MightySat Rx could interfere with the proper operation of the device.
- **Note:** The maximum skin surface temperature is measured to be less than 41°C (106°F) in a 35°C (95°F) environment. This was verified by measuring the skin interface temperature with MightySat Rx operating under reasonable worst-case conditions.

## Performance Warnings and Cautions

- **WARNING:** MightySat Rx is not an apnea monitor and should not be used for arrhythmia analysis.
- **WARNING:** MightySat Rx should not be used as the sole basis for medical decisions. It must be used in conjunction with clinical signs and symptoms.
- **WARNING:** Do not use MightySat Rx for continuous monitoring. It is intended for spot-check use only. No alarms are provided to support continuous monitoring.
- **WARNING:** Do not use MightySat Rx if it appears or is suspected to be damaged. Damage to internal parts can result in no or inaccurate readings.
- **WARNING:** Do not repair, open, or modify MightySat Rx. Damage to internal parts can result in no or inaccurate readings.
- **WARNING:** Do not use the MightySat Rx if the internal parts have been exposed to liquids. Damage to the internal parts may result in no or inaccurate readings.
- **WARNING:** SpO<sub>2</sub> is empirically calibrated in healthy adult volunteers with normal levels of carboxyhemoglobin (COHb) and methemoglobin (MetHb).
- **WARNING:** Avoid the following conditions to minimize the risk of inaccurate SpO<sub>2</sub> readings:
  - Improper MightySat Rx placement or alignment
  - Elevated levels of COHb and MetHb: High levels of COHb or MetHb may occur with a seemingly normal SpO<sub>2</sub>. When elevated levels of COHb or MetHb are suspected, laboratory analysis (CO-Oximetry) of a blood sample should be performed.
  - Intravascular dyes such as indocyanine green or methylene blue
  - Externally applied coloring and texture such as nail polish, acrylic nails, glitter, etc.
  - Patients attached to a high pressure cuff
  - Avoid placing the MightySat Rx sensor on any extremity with an arterial catheter or blood pressure cuff
  - Elevated levels of bilirubin
  - Severe anemia
  - Venous congestion
  - Venous pulsation
  - Low arterial perfusion
  - Excessive motion
- **CAUTION:** Properly apply and avoid using the MightySat Rx under high ambient light sources, fluorescent lights, infrared heating lamps and direct sunlight to minimize interference that may result in no or inaccurate readings.
- **CAUTION:** Keep the MightySat Rx away from electrical equipment that emits radio frequencies to minimize radio interference. Radio interference may result in no or inaccurate readings.

- **CAUTION:** When using MightySat Rx (optional Bluetooth version) with a smart device, keep both devices within the recommended range of each other (see Specifications for details); moving outside of this range may cause a loss in connection with the smart device.
- **CAUTION:** When using MightySat Rx (optional Bluetooth version) with a smart device, relocate the devices away from sources that may interfere with the Bluetooth connection. The presence of other devices that may create radio frequency interference (RFI) may result in loss of Quality of Service (see **Specifications** on page 31 for details) of the Bluetooth connection. Devices that may cause RFI include but are not limited to the following: electrocautery equipment, diathermy equipment, other cellular telephones, wireless PC and tablets, pagers, RFID devices, MRI, and electromagnetic security systems.
- **CAUTION:** Do not attempt to remanufacture, recondition, or recycle MightySat Rx as these processes may damage the internal parts. Damage to internal parts can result in no or inaccurate readings.
- **Note:** The MightySat Rx display may be difficult to view when exposed to direct sunlight or bright lights.
- **Note:** Do not assess the accuracy of the MightySat Rx using a functional tester. A functional tester should only be used to check if a unit is working properly.
- **Note:** The MightySat Rx display will shut off automatically if there are no readings.

## Cleaning, Disinfecting, Service Warnings and Cautions

- **WARNING:** Properly use and dispose of Alkaline batteries or they may leak or explode.
- **WARNING:** Remove alkaline batteries when the MightySat Rx will not be in use for more than 30 days to avoid damage to the device due to batteries that may leak.
- **WARNING:** Replace both batteries at the same time to avoid mixing fully and partially charged batteries. These actions may cause the batteries to leak; resulting in possible damage to the device.
- **CAUTION:** Use only AAA alkaline batteries. Use of non-alkaline batteries may affect the accuracy of the battery status indicator.
- **CAUTION:** Only perform maintenance procedures specifically described in the manual; otherwise, return MightySat Rx for servicing. Improper maintenance may result in damage to the internal parts. Damage to internal parts may result in no or inaccurate readings.
- **CAUTION:** Thoroughly clean and low level disinfect the MightySat Rx before applying it to on a new patient.
- **CAUTION:** Do not clean MightySat Rx with any chemical other than those specified in **Cleaning, Disinfecting, and Service** on page 25. These substances may affect the device's materials and damage internal parts.
- **CAUTION:** Do not submerge MightySat Rx in any cleaning solution or attempt to sterilize by autoclave, irradiation, steam, gas, ethylene oxide or any other method. This will seriously damage the device.
- **CAUTION:** Do not use undiluted bleach (5% - 5.25% sodium hypochlorite) or any cleaning solution other than those recommended in **Cleaning, Disinfecting, and Service** on page 25 of this manual. Permanent damage to MightySat Rx may occur if other unspecified solutions are used.
- **CAUTION:** Never submerge MightySat Rx in water or any other liquid solution this may cause permanent damage to the MightySat Rx.

## Compliance Warnings and Cautions

- **WARNING:** Any changes or modifications not expressly approved by Masimo shall void the warranty for this equipment and could void the user's authority to operate the equipment.
- **CAUTION:** Comply with local laws in the disposal of the instrument and/or its accessories, including batteries.
- **CAUTION:** This device is not intended to be operated in the home environment.
- **CAUTION:** This device has not been evaluated for use in aircrafts.
- **Note:** When using MightySat Rx with a device with wireless features, consideration should be taken to local government frequency allocations and technical parameters to minimize the possibility of interference to/from other wireless devices.
- **Note:** In accordance with international telecommunication requirements, the frequency band of 2.4 GHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems.
- **Note:** This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- **Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Consult the dealer or an experienced radio/TV technician for help.
- **Note:** This equipment has been tested and found to comply with the Class B limits for medical devices according to the EN 60601-1-2: 2007, Medical Device Directive 93/42/EEC. These limits are designed to provide reasonable protection against harmful interference in all establishments, including domestic establishments.
- **Note:** This Class B digital apparatus complies with Canadian ICES-003.





# Technology Overview

The following chapter contains general descriptions about parameters, measurements, and the technology used by Masimo products.

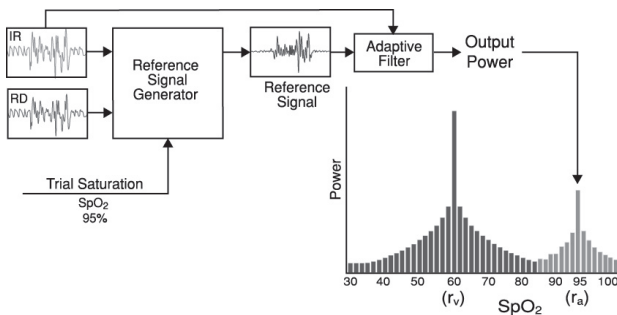
## Signal Extraction Technology® (SET®)

Masimo Signal Extraction Technology's signal processing differs from that of conventional pulse oximeters. Conventional pulse oximeters assume that arterial blood is the only blood moving (pulsating) in the measurement site. During patient motion, however, the venous blood also moves, causing conventional pulse oximeters to read low values, because they cannot distinguish between the arterial and venous blood movement (sometimes referred to as noise).

Masimo SET® pulse oximetry utilizes parallel engines and adaptive filtering. Adaptive filters are powerful because they are able to adapt to the varying physiologic signals and/or noise and separate them by looking at the whole signal and breaking it down to its fundamental components. The Masimo SET® signal processing algorithm, Discrete Saturation Transform® (DST®), in parallel with Fast Saturation Transform (FST®), reliably identifies the noise, isolates it and, using adaptive filters, cancels it. It then reports the true arterial oxygen saturation for display on the monitor.

## Masimo SET® DST

This figure is for conceptual purposes only.



## General Description for Oxygen Saturation (SpO<sub>2</sub>)

Pulse oximetry is governed by the following principles:

- Oxyhemoglobin (oxygenated blood) and deoxyhemoglobin (non-oxygenated blood) differ in their absorption of red and infrared light (spectrophotometry).
- The amount of arterial blood in tissue changes with your pulse (photoplethysmography). Therefore, the amount of light absorbed by the varying quantities of arterial blood changes as well.

## Successful Monitoring for SpO<sub>2</sub>, PR and PI

Stability of the SpO<sub>2</sub> readings may be a good indicator of signal validity. Although stability is a relative term, experience will provide a good feeling for changes that are artifactual or physiological and the speed, timing, and behavior of each.

The stability of the readings over time is affected by the averaging time being used. The longer the averaging time, the more stable the readings tend to become. This is due to a dampened response as the signal is averaged over a longer period of time than during shorter averaging times. However, longer averaging times delay the response of the oximeter and reduce the measured variations of SpO<sub>2</sub> and pulse rate.

## Functional Oxygen Saturation (SpO<sub>2</sub>)

The MightySat Rx is calibrated to measure and display functional oxygen saturation (SpO<sub>2</sub>): the amount of oxyhemoglobin expressed as a percentage of the hemoglobin that is available to transport oxygen.

Note that dyshemoglobins are not capable of transporting oxygen, but are recognized as oxygenated hemoglobins by conventional pulse oximetry.

## General Description for Perfusion Index (PI)

The Perfusion Index (PI) is the ratio of the pulsatile blood flow to the non-pulsatile or static blood in peripheral tissue. PI thus represents a noninvasive measure of peripheral perfusion that can be and noninvasively obtained from a pulse oximeter.

## General Description for Pulse Rate (PR)

Pulse rate (PR), measured in beats per minute (BPM) is based on the optical detection of peripheral flow pulse.

## General Description for Pleth Variability Index (PVI)

The Pleth Variability Index (PVI) is a measure of the dynamic changes in the perfusion index (PI) that occur during the respiratory cycle. The calculation is accomplished by measuring changes in PI over a time interval where one or more complete respiratory cycles have occurred. PVI is displayed as a percentage (0-100%).

Pleth Variability Index (PVI) may show changes that reflect physiologic factors such as vascular tone, circulating blood volume, and intrathoracic pressure excursions.

The utility of PVI has been evaluated in clinical studies [1-11]. Technical and clinical factors that may affect PVI include probe malposition, probe site, patient motion, skin incision, spontaneous breathing activity, lung compliance, open pericardium, use of vasopressors or vasodilators, low perfusion index, subject age, arrhythmias, left or right heart failure, and tidal volume [12-14].

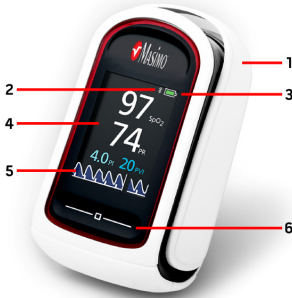
## Citations for Pleth Variability Index (PVI)

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3. Zimmermann M., Feibicke T., Keyl C., Prasser C., Moritz S., Graf B.M., Wiesenack C. Accuracy of Stroke Volume Variation Compared with Pleth Variability Index to Predict Fluid Responsiveness in Mechanically Ventilated Patients Undergoing Major Surgery. *Eur J Anaesthesiol*. 2010 Jun; 27(6):555-61.
4. Desebbe O, Boucau C, Farhat F, Bastien O, Lehot JJ, Cannesson M. Anesth Analg. The Ability of Pleth Variability Index to Predict the Hemodynamic Effects of Positive End-Expiratory Pressure in Mechanically Ventilated Patients under General Anesthesia. 2010 Mar 1; 110(3):792-8.
5. Tsuchiya M., Yamada T., Asada A. Pleth Variability Index Predicts Hypotension During Anesthesia Induction. *Acta Anesthesiol Scand*. 2010 May; 54(5):596-602.
6. Loupec T., Nanadoumgar H., Frasca D., Petitpas F., Laksiri L., Baudouin D., Debaene B., Dahyot-Fizelier C., Mimoz O. Pleth Variability Index Predicts Fluid Responsiveness in Critically Ill Patients. *Crit Care Med*. 2011 Feb; 39(2):294-9.
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11. Yu Y., Dong J., Xu Z., Shen H., Zheng J. Pleth Variability Index-Directed Fluid Management in Abdominal Surgery under Combined General and Epidural Anesthesia. *J Clin Monit Comput*. 2014 Feb 21.
12. Desgranges F.P., Desebbe O., Ghazouani A., Gilbert K., Keller G., Chiari P., Robin J., Bastien O., Lehot J.J., Cannesson M. *Br. J. Anaesth* 2011 Sep; 107(3):329-35.
13. Cannesson M. Arterial pressure variation and goal-directed fluid therapy. *J Cardiothorac Vasc Anesth*. 2010 Jun; 24(3):487-97.
14. Takeyama M, Matsunaga A, Kakihana Y, Masuda M, Kuniyoshi T, Kanmura Y. Impact of Skin Incision on the Pleth Variability Index. *J Clin Monit Comput* 2011 Aug; 25(4):215-21.



# Operation

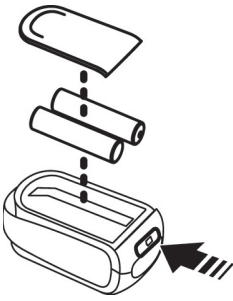
## MightySat Rx Features



ID	Description	Function
1	Enclosure Clip	Clip provided for ease of lanyard attachment.
2	Bluetooth Indicator (Optional)	Indicates when Bluetooth LE is enabled on the device.
3	Battery Status Indicator	Indicates the remaining relative life of the battery.
4	Display Screen	Display for measurements and indicators. <b>Note:</b> Numbers will dim when confidence in the value is low.
5	Waveform and SIQ or Pulse Bar	When the waveform option is turned on, the pleth waveform and the SIQ provides an indicator of the relative signal strength. When the waveform option is turned off, the pulse bar provides a blinking graphical indicator which corresponds to the pulse rate. Additionally, the relative signal strength is depicted by the height of the pulse bar.
6	Touchpad	User interface to allow for change of settings (see <b>Using the Touchpad</b> on page 22 in this manual).

## Installing the AAA Batteries

The MightySat Rx requires two alkaline AAA batteries to operate. To install batteries, follow the instructions below:



1. Place the MightySat Rx so that the display screen is facing downwards.
2. Find the battery button on the front of the sensor pad.
3. Push lightly on the battery button to release the battery cover and then remove the battery cover.
4. Insert two new AAA alkaline batteries and match the orientation labels (+ and -).
5. Once the batteries are correctly inserted, snap the battery door back onto the device.

**Note:** MightySat Rx will not work if the batteries are inserted in the incorrect orientation.

**WARNING:** Ensure that the battery door is intact before use.

**Note:** MightySat Rx will turn on automatically when the device is opened so that the sensor pads are exposed as shown in the image below.

## Using MightySat Rx

To take readings with the MightySat Rx, follow the instruction below:

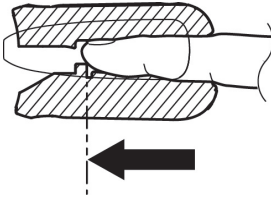
**Note:** Before use, ensure batteries are correctly installed in the MightySat Rx.



1. To open the MightySat Rx, squeeze the back portion of the device as shown in the image above.
2. Once the sensor pads are exposed, insert a finger (non-dominant, ring finger) so the sensor LED is above the fingernail.
3. Once the finger is correctly positioned, gently close the MightySat Rx by releasing the pressure on the back of the device.

**Note:** Ensure the finger is correctly positioned for accurate measurements.

4. The tip of the finger should touch the finger stop as shown in the image below.



5. Once the MightySat Rx is correctly closed on the finger, the MightySat Rx will display readings.

**Note:** If no readings are displayed, see **Troubleshooting** on page 26 in this manual.


**WARNING:** While on the finger, do not press the top of the device against any surface.

**WARNING:** Do not attempt to secure the MightySat Rx to the finger using external pressure. The internal spring provides the correct pressure; additional pressure may cause inaccurate readings.


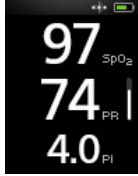
## Turning off MightySat Rx

The MightySat Rx turns off automatically after removing the finger from the device in the absence of device interaction or connection to a smart device.

## Using the Touchpad

The Touchpad  on MightySat Rx device is located below the display screen.

**Note:** The display is not a touch screen.

Action	Description	Function
Touch	Tap and release. Action will be performed once finger is released.	Select a menu item or action. Touch rotates the display clockwise. <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;">   </div>
Press and Hold	Press and hold. Release finger once action has been performed.	Enter and exit the Main Screen.
Swipe	Touch and slide (left, and right) and release.	Scroll through all selectable menu options.








## Navigating the Menu

From the Main Screen, press and hold the Touchpad to access the Main Menu.

Use the Touchpad *Swipe* gesture to scroll through the Main Menu Options. Use the *Touch* gesture to select the Main Menu Option. Use the same gestures to adjust settings.

The Menu options are:

Main Menu Options	Display Button	Description	Default	Options
Back		Return to Main Screen.	N/A	N/A
Waveform		Allows the user to choose if the waveform will be displayed on the screen.	On	On or Off
Brightness		Change the brightness of the display screen.	100%	25%, 50%, 75%, and 100%
Bluetooth (Optional)		Allows the user to connect to a smart device via Bluetooth LE.	On	On or Off
About		Hardware and software information about the device including serial number, software version, and Bluetooth LE Mac Address.	N/A	N/A

## Connecting to a Smart Device via Bluetooth (Optional)

**Note:** Bluetooth LE is an optional feature available on specific versions of MightySat Rx for use with compatible smart devices. For a full list of compatible smart devices, see [www.masimoprofessionalhealth.com](http://www.masimoprofessionalhealth.com).

### Bluetooth Connection Overview

The MightySat Rx provides a Bluetooth LE wireless option to allow connection to a compatible smart device. The Bluetooth communication is only available to smart devices using the Masimo Professional Health App. When a Bluetooth connection is established the Bluetooth connected icon will appear. MightySat Rx can only communicate to a single smart device at one time to minimize the risk of unauthorized access.

1. Turn on Bluetooth on MightySat Rx. See **Navigating the Menu** on page 23 of this manual for further instructions.
2. Ensure the Bluetooth is enabled on the smart device.
3. From your compatible smart device, do one of the following:
  - For Android™-powered devices, go to the Google Play™ store.
  - For Apple® devices, go to the App Store<sup>SM</sup>.
4. Search and download the "Masimo Professional Health" app.
5. Launch the Masimo Professional Health app to connect the MightySat Rx with a compatible smart device.

**Note:** The MightySat Rx requires the use of the Masimo Professional Health app to communicate to a compatible smart device.

6. Confirm the correct connection by viewing the appropriate "Serial" number is displayed on the smart device. The Serial number can be found on the About screen, see **Navigating the Menu** on page 23 of this manual for information on accessing the About screen.
7. Once MightySat Rx is connected to a smart device, confirm the readings on the MightySat Rx to the readings displayed on the Masimo Professional Health app are synchronized without a delay greater than 10 seconds.

**Note:** A connection icon will appear on the MightySat Rx device when a Bluetooth connection has been established.

**Note:** If the delay is greater than 10 seconds, move the MightySat Rx in closer proximity to the smart device or attempt to repeat the connection process.

**Note:** To prevent unauthorized connection to the MightySat Rx, turn off the optional Bluetooth LE feature on the MightySat Rx.

**CAUTION:** When using MightySat Rx (optional Bluetooth version) with a smart device, keep both devices within the recommended range of each other (see **Specifications** on page 31 for details); moving outside of this range may cause a loss in connection with the smart device.

**CAUTION:** When using MightySat Rx (optional Bluetooth version) with a smart device, relocate the devices away from sources that may interfere with the Bluetooth connection. Interference may result in loss of Quality of Service (see **Specifications** on page 31 for details) of the Bluetooth connection.

# Cleaning, Disinfecting, and Service

---

## Cleaning and Disinfecting MightySat Rx

**WARNING:** Before cleaning, read *Cleaning, Disinfecting, Service Warnings and Cautions* on page 12 in this manual.

**WARNING:** Before cleaning, make sure the device is off and is not applied to a finger.

**CAUTION:** Thoroughly clean and low level disinfect the MightySat Rx before applying it to on a new patient.

**Note:** Before cleaning, remove the batteries and make sure the battery cover is re-attached correctly.

To clean the MightySat Rx, follow the instructions below:

- Wipe each of the sensor pads and outer surfaces using a CaviWipes™ wipe twice or until the surfaces are free of any visible residue.  
**Note:** Pay particular attention to cracks, crevices, and hard to reach areas of the device.
- Repeat the above cleaning step using a fresh wipe.
- Allow the MightySat Rx to dry thoroughly before using again.

To conduct low level surface disinfection of the MightySat Rx, follow the instructions below:

**Note:** Follow cleaning instructions prior to disinfecting the device.

- Visibly wet the sensor pads and outer surfaces using a soft cloth dampened with a 10% (1:10) chlorine bleach to water solution.
- Allow the solution to sit for 10 minutes on the sensor pads before wiping them with a dry soft cloth.
- Allow the MightySat Rx to dry thoroughly before using again.

Alternatively, the MightySat Rx can be disinfecting using the same instructions above, except with CaviWipes with a 5 minute exposure time.

The surfaces of the MightySat Rx have been tested to be chemically resistant to following solution(s):

- 70% Isopropyl Alcohol
- Cidex Plus (3.4% glutaraldehyde)
- 10% (1:10) chlorine bleach to water solution
- Quaternary ammonium chloride solution wipe (CaviWipes™)

**CAUTION:** To avoid permanent damage to the MightySat Rx, do not use undiluted bleach (5% - 5.25% sodium hypochlorite) or any other cleaning solution not recommended.

## Service

**WARNING:** Do not attempt to repair the MightySat Rx as this may cause damage to the device and prevent it from operating properly.

If the device does not appear to be operating correctly, see **Troubleshooting** on page 26 section in this manual.

**Note:** To maintain the proper functionality of the battery compartment and avoid possible damage from alkaline batteries that may leak, remove batteries from the device when not in use for long periods of time.

## Troubleshooting

Error or Error Message	Possible Causes	Recommended Solutions
A red battery symbol displays on display screen	Low battery	Replace low batteries as soon as possible. (see <b>Installing the AAA Batteries on page 20</b> in this manual)
Device does not display readings	Incorrect finger placement Incorrect battery orientation No battery Low battery Environmental influences	Wait for measurement (Optional PVI may take up to 2 minutes before initial measurement) Reposition finger (see <b>Using MightySat Rx on page 20</b> in this manual) Re-orient batteries Replace with new batteries Relocate device Contact Masimo Technical Services
Device display does not turn on	No battery Device damaged	Replace with new batteries Contact Masimo Technical Services

Error or Error Message	Possible Causes	Recommended Solutions
Numbers appear dim	<p>Low battery</p> <p>Brightness set low</p> <p>Exposed to bright lights or sunlight</p> <p>Incorrect finger placement</p> <p>Measurement site may be poorly perfused</p>	<p>Check battery status indicator and replace batteries if necessary</p> <p>Check brightness setting in menu</p> <p>Relocate device so that it is not directly under bright lights</p> <p>Reposition finger (See <b>Using MightySat Rx</b> on page 20 section in this manual)</p> <p>Contact Masimo Technical Services</p>
Device keeps turning off while on the finger	<p>Incorrect finger placement</p> <p>Environmental influences</p> <p>Device damaged</p>	<p>Reposition finger (See <b>Using MightySat Rx</b> on page 20 section in this manual)</p> <p>Relocate device</p> <p>Replace with new batteries</p> <p>Contact Masimo Technical Services</p>
Measurement does not display on the smart device using optional Bluetooth LE	<p>Bluetooth LE not connected</p> <p>Compatible app not installed on smart device</p> <p>Device damaged</p> <p>Smart device damaged</p>	<p>Confirm Bluetooth LE is on for the MightySat Rx and the smart device</p> <p>Confirm a compatible app is installed on the smart device</p> <p>Close and re-launch the compatible app on the smart device</p> <p>Check that MightySat Rx is connected to the correct smart device</p> <p>Contact Masimo Technical Services</p>

## Product Support

For additional help, contact Masimo Technical Services at (949) 297-7498. Local contact information can be found at <http://service.masimo.com>.

## Limited Warranty

Masimo warrants to the original end-user purchaser the Masimo-branded hardware product MightySat™ Rx Fingertip Pulse Oximeter and any software media contained in the original packaging against defects in material and workmanship when used in accordance with Masimo's user manuals, technical specifications, and other Masimo published guidelines for a period of 48 months from the original date the Product was obtained by the end-user purchaser.

Masimo's sole obligation under this warranty is the repair or replacement, at its option, of any defective Product or software media that is covered under the warranty.

To request a replacement under warranty, Purchaser must contact Masimo and obtain a returned goods authorization number so that Masimo can track the Product. If Masimo determines that a Product must be replaced under warranty, it will be replaced and the cost of shipment covered. All other shipping costs must be paid by purchaser.

The above described warranty is in addition to any statutory rights provided to Purchaser under applicable laws and regulations of the region in which the product was sold to the extent that those rights cannot be disclaimed and are superseded by the above described warranty to the extent permitted under applicable laws and regulations of the region in which the product was sold.

## Exclusions

The warranty does not apply to any non-Masimo branded product or any software, even if packaged with the Product, or any Product that was: (a) not new or in its original packaging when supplied to purchaser; (b) modified without Masimo's written permission; (c) supplies, devices, or systems external to the Product; (d) disassembled, reassembled, or repaired by anyone other than a person authorized by Masimo; (e) used with other products, like new sensors, reprocessed sensors, or other accessories, not intended by Masimo to be used with the Product; (f) not used or maintained as provided in the operator's manual or as otherwise provided in its labeling; (g) reprocessed, reconditioned, or recycled; and (h) damaged by accident, abuse, misuse, liquid contact, fire, earthquake or other external cause.

**No warranty applies to any Product provided to Purchaser for which Masimo, or its authorized distributor, is not paid; and these Products are provided AS-IS without warranty.**

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**Except as otherwise required by law or altered by the purchase agreement, the above warranty is the exclusive warranty that applies to the Product and software media, and Masimo does not make any other promises, conditions, or warranties regarding the Product. No other warranty applies, express or implied, including without limitation, any implied warranty of merchantability, fitness for a particular purpose, satisfactory quality, or as to the use of reasonable skill and care. In so far as the above warranties cannot be disclaimed, Masimo limits the duration and remedies of the warranties to the duration and to the remedies set forth above and as permitted by law. See the licensing terms for the terms and conditions that apply to and Software accompanying the Product.**

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# Specifications

## Performance Specifications

SpO2 Accuracy*			
Condition	Range	Population	A <sub>RMS</sub>
No Motion [1]	70% to 100%	Adults, Pediatrics	2%
Motion [2]	70% to 100%	Adults, Pediatrics	3%
Low perfusion [3]	70% to 100%	Adults, Pediatrics	2%

\*See the **SpO2 Performance Specifications** on page 32 section for additional SpO2 accuracy information.

Pulse Rate (PR)			
Condition	Range	Population	A <sub>RMS</sub>
No Motion [4]	25 bpm to 240 bpm	Adults, Pediatrics	3 bpm
Motion [4]	25 bpm to 240 bpm	Adults, Pediatrics	5 bpm
Low perfusion [4]	25 bpm to 240 bpm	Adults, Pediatrics	3 bpm

## Display Ranges

Parameter	Display Ranges
SpO2 (Oxygen Saturation)	0% to 100%
PR (Pulse Rate)	25 bpm to 240 bpm
PI (Perfusion Index)	0.02% to 20%
Pleth Variability Index (PVI)	0% to 100%

The emitted wavelengths range from 600 nm to 1000 nm and the peak optical power is less than 15 mW. Information about the wavelength range can be especially useful to clinicians.

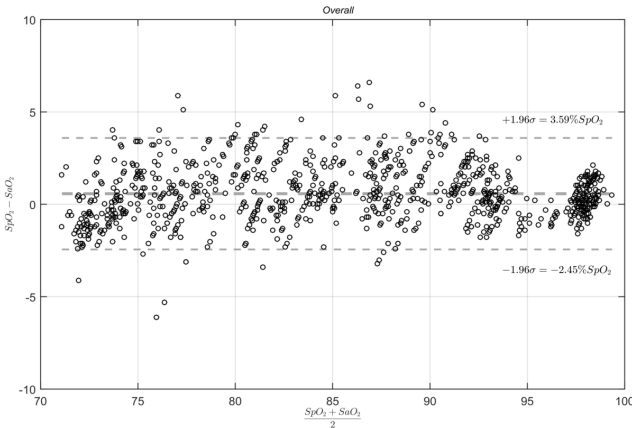
## SpO2 Performance Specifications

Table below provides Arms (Accuracy Root Mean Square) values measured using the MightySat Rx with Masimo SET® Oximetry Technology in a clinical study under no motion conditions.

The below Bland-Altman plot represents the correlation of the  $(SpO_2 + SaO_2)/2$  versus  $(SpO_2 - SaO_2)$  under no motion with an upper 95% and lower 95% limits of agreement.

Measured $A_{RMS}$ Values	
Range	$(A_{RMS})$
90% – 100%	1.08%
80% – 90%	1.95%
70% – 80%	1.79%

Overall Claimed Accuracy Value	
Range	$(A_{RMS})$
70% – 100%	2%



## Battery Life

Item	Description
Operating	1.5 Volt AAA Battery (2)
Battery Life	*Approximately 1800 spot checks

**\*Note:** Based upon 15 hours of operation with screen brightness set to 50% a spot check of 30 seconds.

## Physical Characteristics

Item	Description
Dimensions	2.9" x 1.6" x 1.2" (7.4 cm x 4.1 cm x 3.0 cm)
Weight without Battery	0.11 lbs. (51g)
Weight with Battery*	0.16 lbs. (73g)

**\*Note:** Weight is dependent on batteries used.

## Bluetooth LE Wireless Technology Information

Bluetooth LE Wireless Technology Information	
Modulation Type	GFSK
Max. Output Power	-1 dBm
Frequency Range	2402 MHz - 2480 MHz
Antenna Peak Gain	-7 dBi
Recommended Range	~10 feet (~3 meters) line-of-sight
Quality of Service (QoS)	Delay <10 seconds
Security	Proprietary binary protocol

Radio Compliance	
Radio Modes	Bluetooth LE
USA	FCC ID: VKF-MSAT01A FCC parts 15.207 and 15.247
Canada	IC-7362A-MSAT01A RSS-210
Europe	EN 300 328 EN 301 489-17

## Environment

Item	Description
Operating Temperature Range	5°C to 40°C
Operating Humidity	10% to 95% RH
Storage/Transport Temperature	-40°C to 70°C
Atmospheric pressure	540 mBar to 1060 mBar

## Compliance

Safety Compliance
ANSI/AAMI ES60601-1
CSA C22.2 No. 60601-1
IEC/EN 60601-1
IEC 60601-1-6
IEC 60601-1-11
ISO 80601-2-61

EMC Compliance
IEC 60601-1-2, Class B
ISO 80601-2-61: Clause 202, 20 V/m radiated immunity















Equipment Classifications per IEC 60601-1	
Degree of Protection against electric shock	Type BF applied part
Mode of Operation	Continuous
Degree of Protection from Liquid Ingress	IP23, Protection from ingress of particulates > than 12.5 mm and ingress from spraying water.
Environment	Not for use in the presence of flammable anesthetics

## Citations

1. *The Masimo SET® Technology used in the MightySat™ Rx Fingertip Pulse Oximeter has been validated for no motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark pigmented skin in induced hypoxia studies in the range of 70%-100% SpO2 against a laboratory co-oximeter. This variation equals plus or minus one standard deviation which encompasses 68% of the population.*
2. *The Masimo SET® Technology used in the MightySat™ Rx Fingertip Pulse Oximeter has been validated for motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark pigmented skin in induced hypoxia studies while performing rubbing and tapping motions, at 2 to 4 Hz at an amplitude of 1 to 2 cm and a non-repetitive motion between 1 to 5 Hz at an amplitude of 2 to 3 cm in induced hypoxia studies in the range of 70%-100% SpO2 against a laboratory co-oximeter. This variation equals plus or minus one standard deviation which encompasses 68% of the population.*
3. *The Masimo SET® Technology used in the MightySat™ Rx Fingertip Pulse Oximeter has been validated for low perfusion accuracy in bench top testing against a Biotek Index 2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and transmission of greater than 5% for saturations ranging from 70% to 100%. This variation equals plus or minus one standard deviation which encompasses 68% of the population.*
4. *The Masimo SET® Technology used in the MightySat™ Rx Fingertip Pulse Oximeter has been validated for pulse rate accuracy for the range of 25-240 bpm in bench top testing against a Biotek Index 2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and transmission of greater than 5% for saturations ranging from 70% to 100%. This variation equals plus or minus one standard deviation which encompasses 68% of the population. Pulse rate accuracy under motion was verified by bench top testing in the range of 55-180 bpm against a Biotek simulator using the motion preset setting.*

## Symbols

The following symbols may be found on the product or packaging.

Symbol	Definition	Symbol	Definition
	Follow Instructions for Use	IP23	Protection from ingress of particulates > than 12.5 mm and ingress from spraying water
	Consult Instructions for Use		ETL Intertek certification. Conforms to ANSI/AAMI ES 60601-1 and certified to CAN/CSA STD C22.2 No. 60601-1
	Manufacturer		Mark of Conformity to European Medical Device Directive 93/42/EEC
	Date of Manufacture		Wireless features can be used in member states with the restriction of indoor use in France
	Not for Continuous Monitoring (No Alarm for SpO <sub>2</sub> )		Not made with natural rubber latex
	Type BF Applied Part		Polypropylene
	Separate collection for electrical and electronic equipment (WEEE)		Storage/transport temperature and air pressure range
	Non-Sterile	FCC ID, IC, IC Model	Identifies unit has been registered as a radio device
	Federal Communications Commission (FCC) licensing		Instructions/Directions for Use/Manuals are available in electronic format @ <a href="http://www.Masimo.com/TechDocs">http://www.Masimo.com/TechDocs</a> <b>Note: eIFU is not available for CE mark countries.</b>


## Guidance and Manufacturer's Declaration - Electromagnetic Emissions

<b>Guidance and Manufacturer's Declarations - Electromagnetic Emissions</b>		
The ME Equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the ME Equipment should assure that it is used in such an environment.		
Emission Test	Compliance	Electromagnetic Environment - Guidance
RF Emissions CISPR 11	Group 1	ME Equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class B	This device is not intended to be operated in the home environment. This device has not been evaluated for use in aircrafts.
Harmonic emissions IEC 61000-3-2	N/A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	N/A	



## Guidance and Manufacturer's Declaration - Electromagnetic Immunity

Guidance and Manufacturer's Declaration - Electromagnetic Immunity			
The ME Equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the ME Equipment should assure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+6 kV contact +8 kV air	+6 kV contact +8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	N/A	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	N/A	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % UT (>95 % dip in UT) for 0,5 cycle 40 % UT (60 % dip in UT) for 5 cycles 70 % UT (30 % dip in UT) for 25 cycles <5 % UT (>95 % dip in UT) for 5 s	N/A	Mains power quality should be that of a typical commercial or hospital environment. If the user of the [ME EQUIPMENT or ME SYSTEM] requires continued operation during power mains interruptions, it is recommended that the [ME EQUIPMENT or ME SYSTEM] be powered from an uninterruptible power supply or a battery.
Power frequency (50/ 60 Hz) magnetic field IEC 61000-4-3	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of typical location in a typical hospital environment.

Guidance and Manufacturer's Declaration - Electromagnetic Immunity			
<p>Conducted RF IEC 61000-4-6</p> <p>Radiated RF IEC 61000-4-3</p> <p>ISO 80601-2-61, Clause 202</p>	<p>3 Vrms 150 kHz to 80 MHz</p> <p>3 V/m 150 kHz to 80MHz</p> <p>20 V/m 80 MHz to 2.5 GHz</p>	<p>N/A</p> <p>3 V/m</p> <p>20 V/m</p>	<p>Portable and mobile RF communications equipment should be used no closer to any part of the ME Equipment, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = \left[ \frac{3,5}{V_1} \right] \sqrt{P}$ <p style="text-align: right;">150 kHz to 80 MHz</p> $d = \left[ \frac{3,5}{E_1} \right] \sqrt{P}$ <p style="text-align: right;">80 MHz to 800 MHz</p> $d = \left[ \frac{7}{E_1} \right] \sqrt{P}$ <p style="text-align: right;">800 MHz to 2,5 GHz</p> <p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey<sup>a</sup>, should be less than the compliance level in each frequency range<sup>b</sup>.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> <div style="text-align: center;">  </div>
<p><b>Note 1:</b> At 80 MHz and 800 MHz, the higher frequency range applies.</p> <p><b>Note 2:</b> These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			

**Guidance and Manufacturer's Declaration - Electromagnetic Immunity**

<sup>a</sup> Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ME Equipment is used exceeds the applicable RF compliance level above, the ME Equipment should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the ME Equipment.

<sup>b</sup> Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V1] V/m.

## Recommended Separation Distances

<b>Recommended Separation Distance Between Portable and Mobile RF Communication Equipment and the ME Equipment</b>			
<p>The ME Equipment is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ME Equipment can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ME Equipment as recommended below, according to the maximum output power of the communication equipment.</p>			
Rated maximum output power of transmitter (W)	Separation Distance According to Frequency of Transmitter (m)		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5GHz
	$d = \left[ \frac{3,5}{V_1} \right] \sqrt{P}$	$d = \left[ \frac{3,5}{E_1} \right] \sqrt{P}$	$d = \left[ \frac{7}{E_1} \right] \sqrt{P}$
0.01	0.12	0.018	0.035
0.1	0.37	0.057	0.11
1	1.17	0.18	0.35
10	3.7	0.57	1.1
100	11.7	1.8	3.5
<p>For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.</p>			
<p><b>Note 1:</b> At 80 MHz and 800 MHz, the higher frequency range applies.</p> <p><b>Note 2:</b> These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			

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