

Instructions Manual

Senstream Research Ring

Senstream, Inc

Revision B

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Document History			
Revision	Changes / Release	Date	By
A	Initial release of Instructions - Updated	12/19/22	JP
B	Corrected FCC ID in Regulatory Notices	01/30/23	JP

Introduction

The Research Ring by Senstream is a revolutionary research platform that enables the capture of high-quality data from numerous physiological signals on a single, small, user-friendly device. Research-grade in a friendly consumer form factor, the Research Ring collects electrodermal activity (EDA, aka GSR) data, pulse (with an optical sensor), electrocardiogram (ECG), and temperature.

For years, researchers have hoped for a way to gather physiological and other data “in the wild,” in everyday settings and situations with their study participants. This has generally not been feasible because data acquisition hardware and software has historically required large, computer-connected signal acquisition systems, and lab-friendly (but not user-friendly) systems, cables, sensors and software. While more portable systems have evolved, the problem with many of them is that they do not capture high quality data that researchers can use for peer-reviewed studies.

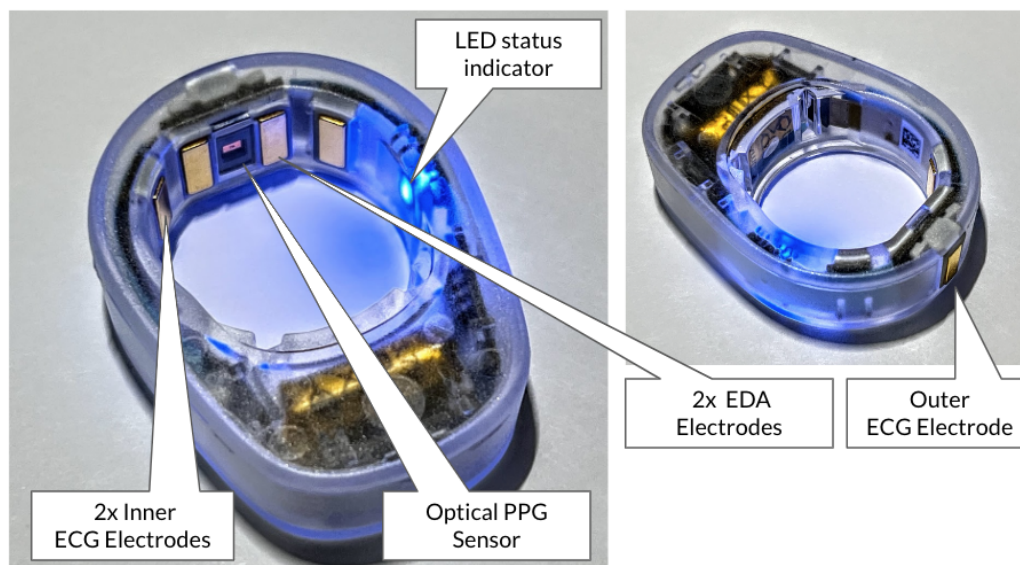
The Senstream Research Ring is a product that gives researchers new horizons. If the researcher wants to study a user's psychophysiological and other contextual data, they can give the Research Ring to a study participant along with a companion mobile application and start collecting data. This “mobile first” approach is also cloud-friendly. The data is collected on the phone and can be immediately stored on the cloud when a data collection session ends.

In addition to being a stand-alone research tool the Senstream Research Ring can also be synchronized with AcqKnowledge (BIOPAC's data acquisition and analysis tool) in real time or imported into AcqKnowledge asynchronously from the mobile application

Senstream Research Ring Overview



The Senstream Ring, USB charging cable, ring sizing shims (6-13)



Ring Sensors

Sensors	Description	Metric	Max Sampling Rate*
PPG	Photoplethysmography	Heart Rate - optical	400 Hz
EDA	Electrodermal Activity	skin conductance (μ Siemens)	25 Hz
ECG	Electrocardiogram	Heart Rate - electrical	800 Hz
Temp	Body Temperature	Celsius or Fahrenheit	5 Hz
Motion	Actigraphy	(TBD)**	5 Hz

* Not all sampling rates may be run concurrently. Consult the Senstream App for defined sessions or contact Senstream for more info.

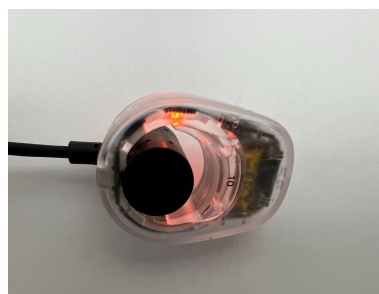
** Actigraphy using the Research Ring's IMU is under development

Charging and Power Management Basics

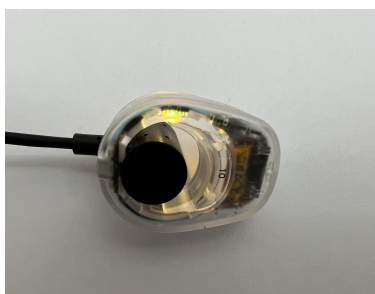
First things first! Charge your ring! It leaves the factory in a “shipping mode” which requires power to be applied to the ring to power it on. Each ring is supplied with a charging cable that magnetically couples to the innermost electrodes. It can be applied from either side of the ring and doesn't require the removal of any sizing shims

To charge your Senstream ring, connect the charging cable to a safety certified (for your region) USB charger with at least 500mA of current (this is typically the minimum of most USB chargers).

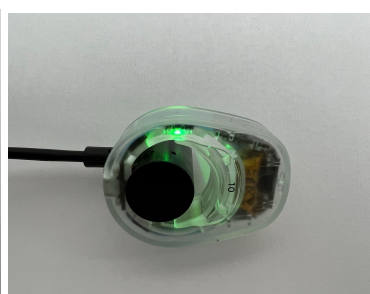
The state of charge is indicated by the color of the indicator light. Orange is low, yellow is mid range, to solid bright green which is fully charged.



Low



Medium



Charged

Connectivity

When the ring is disconnected from power it will flash “blue” signaling that it is ready to establish a BLE bluetooth low energy(™) connection with your iOS device. It will remain in this state for about 30-60 seconds until the ring goes into a low power sleep mode. If the ring isn't paired during that time it can be powered up by simply moving it or attaching and removing the charge cable with power. Please refer to the Senstream Application documentation for instructions on how to pair the ring.

Finger Detection

The ring uses the PPG sensor to detect the presence of a finger before enabling operation of the EDA electrodes and the other sensors. The ring will not stream data without the presence of a finger in close proximity to the PPG window

Run Times

The ring will record and transmit for varying lengths of time depending on the channels and sampling frequency selected by the user. The ring can be fully charged from its fully depleted state in about 2 hours.

Companion Smartphone Application

The Senstream Research Ring uses a smartphone application to manage the Research Ring's modes of operation and quality of service. You can find the applications by visiting <https://senstream.com/applications> or opening the QR code below with your smartphone.



Note: Senstream does not offer an Android compatible application at this time.

Ring Firmware Updates

Firmware updates will be installed via the iOS app. Details about your ring are also viewable within the app.

Application Basics

Please refer to the application specific documentation for the application (see previous links)

Cloud Application [charts.senstream.com]

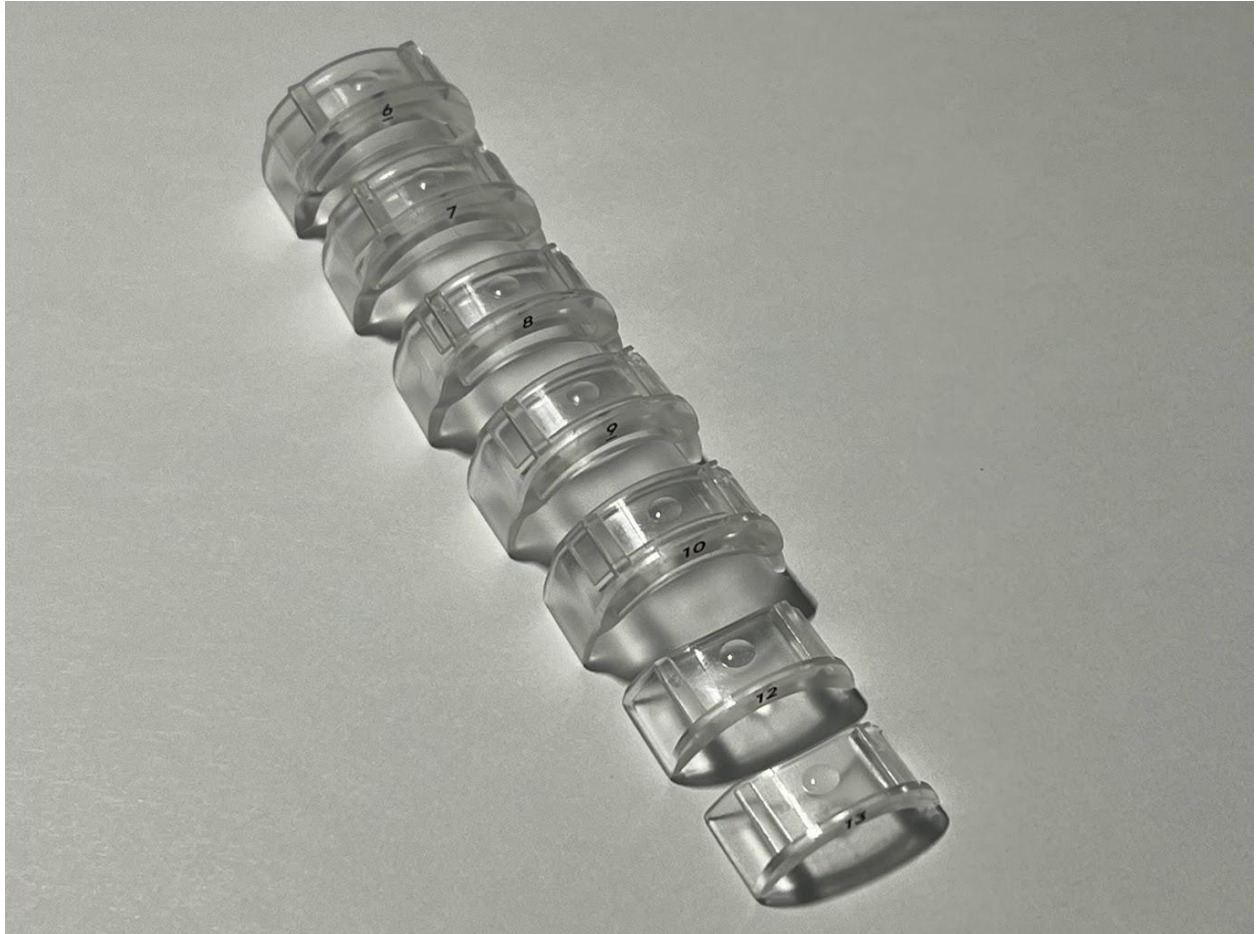
The [charts] web app provides a tool to analyze, export, and share session data you've uploaded to your Senstream account via the iOS mobile app.

Data Handling

Session signal data is stored locally on your iOS device. The user may also choose to upload session data to Senstream's secure, private cloud service where Senstream Research Ring customers are able to review, edit, and share this data. If you wish to delete a session, that deletion will also be permanently deleted from the Senstream Cloud. If you sign into more than one iOS device (or the Senstream web application), you will see all of your uploaded session data. Anonymous user behavior analytics events are collected by a Senstream-managed server to improve the software's design and service. Quality of service events are also collected directly from the ring's firmware to monitor any performance issues in the field. If you run into any issues or have questions about Senstream's data handling, contact Senstream at: help@senstream.com

Sizing the Ring

The Research Ring's performance requires that the ring fits snugly on the participant's finger. Any finger will work, but the inner finger upper proximal phalanges work best. Those are the finger pads that are closest to your palm on the index, middle, and ring finger.



Each ring is supplied with 8 sizing shims that allow the ring to be sized to US standard ring whole sizes of 6 to 13.

⚠ Warning: The size of the shims present a choking hazard for children under the age of 3. Please store and secure appropriately.



Insert the shims as shown above. Push the shim into the ring until it is flush.

Remove the shims by pushing the top of the shim in the opposite way of travel from insertion. Avoid using sharp or metallic edges.



When using the ring it's best to orient the connector opening towards the participant so the shim can slide out when removing the ring. This is especially important when the ring fit is snug. If the ring is difficult to remove, try removing the sizing shim while on the finger. You can also apply some moisture to the knuckle to reduce the friction of removal.

Cleaning and Care

The Senstream Research Ring and sizing shims are made with biocompatible engineering resin. The ring and used disassembled sizing shims should be wiped down with a 90% isopropyl alcohol and allowed to dry between each participant. It's also recommended that each participant wash their hands before and after each session. Do not submerge the ring in any cleaning fluid or water. If you do accidentally immerse the ring in fluid do not put the ring on a finger or apply the charging cable for at least 24 hours.

Support Contacts

There is an email based feedback function in the menu in the upper right of most screens or you can send email to help@senstream.com

Regulatory Notices

This Device contains wireless BLE operation; FCC ID: 2A754-AT01; IC: 29615-AT01

The Device wireless operation is safe and complies to RF Exposure requirements

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- 1) This device may not cause interference.
- 2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- 1) L'appareil ne doit pas produire de brouillage;
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Warranty Disclaimer

EXCEPT FOR THE LIMITED WARRANTY FOR THE SENSTREAM RESEARCH RING SET FORTH BELOW, THE RING AND SENSTREAM'S SERVICES ARE PROVIDED BY SENSTREAM AND ITS AFFILIATES "AS IS".

NEITHER SENSTREAM NOR ITS PARTNERS, SUPPLIERS, OR AFFILIATES MAKE ANY REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED AS TO THE OPERATION OF THE OUR SERVICES (INCLUDING THE RING) ITS CONTENTS, OR ANY INFORMATION MADE AVAILABLE BY OR THROUGH THE SESNTEAM SERVICES. IN ADDITION, SENSTREAM AND ITS PARTNERS, SUPPLIERS AND AFFILIATES DISCLAIM ALL WARRANTIES WITH RESPECT TO SENSTREAM'S SERVICES (INCLUDING THE RING), EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT, FURTHERMORE, SENSTREAM DOES NOT WARRANT THAT USE OF THE OUR SERVICES WILL BE UNINTERRUPTED, AVAILABLE AT ANY TIME OR FROM ANY PARTICULAR LOCATION, SECURE OR ERROR FREE, THAT DEFECTS WILL BE CORRECTED, OR THAT THE OUR SERVICES (INCLUDING THE RING) ARE FREE OF VIRUSES OR OTHER POTENTIALLY HARMFUL COMPONENTS.

LIMITED WARRANTY FOR THE SENSTREAM RESEARCH RING WARRANTS TO THE ORIGINAL END USER PURCHASER THAT THE RING IS FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR ONE (1) YEAR FROM THE DATE OF PURCHASE, If your local law in effect at the time of purchase requires a warranty period longer than one (1) year, this warranty shall be extended to the extent required by such law. Within

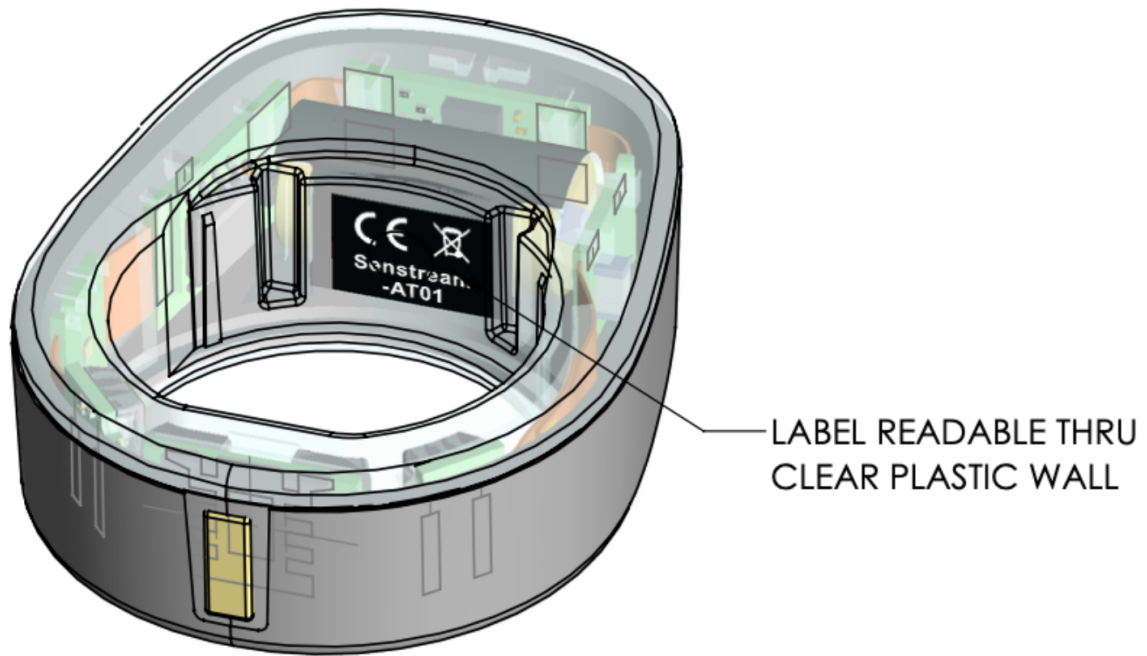
the warranty period, Senstream shall repair or replace at no charge to you any components of the ring that fail the limited warranty provided. You shall be responsible for any related transportation charges. Replacement products may be new or refurbished at our discretion. This limited warranty does not apply to (i) normal wear and tear, including scratches; (i) consumable parts included in ring, such as batteries, unless product damage has occurred due to a defect in materials or workmanship; (in) damage resulting from your failure to use the ring in accordance with the instructions accompanying the ring or available at our website; (iv) damage resulting from an accident, flood, fire, misuse, or abuse; (v) damage resulting from service performed, or damage resulting from tampering or alterations to the ring, by anyone not authorized by Senstream; or (vi) use of the ring with any other application or software than the Senstream mobile app.

Senstream retains the exclusive right to repair or replace the ring, or offer a full refund, at its sole discretion. Such remedy shall be your sole and exclusive remedy for any breach of warranty. Warranty repairs and replacements have a new warranty which is the longer of ninety (90) days or the balance of the original one-year warranty.

Limitation of Liability

IN NO EVENT WILL SENSTREAM OR ANY OF ITS AFFILIATES BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION THOSE RESULTING FROM LOST PROFITS, LOST DATA OR BUSINESS INTERRUPTION) ARISING OUT OF THE USE, INABILITY TO USE, OR THE RESULTS OF USE OF THE RESEARCH RING AND SENSTREAM'S SERVICES, WHETHER SUCH DAMAGES ARE BASED ON WARRANTY, CONTRACT, TORT OR ANY OTHER LEGAL THEORY AND WHETHER OR NOT SENSTREAM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE AGGREGATE LIABILITY OF SENSTREAM, ARISING FROM OR RELATING TO THE RESEARCH RING AND SENSTREAM'S SERVICES (REGARDLESS OF THE FORM OF ACTION OR CLAIM, E.G. CONTRACT, WARRANTY, TORT, STRICT LIABILITY, NEGLIGENCE, OR ANY OTHER LEGAL THEORY) IS LIMITED TO \$100. In some locations applicable law may not allow certain of the limitations described above, in which case such limitations will apply to the maximum extent allowed by such applicable law.

Product Marking



Firmware Release Notes

Overview of releases of the Research Ring Firmware updates

Version	Notes	Date
##	Release version of the Senstream Research Ring FW	TBD