METEOROLOGICAL INSTRUMENTS

INSTRUCTIONS

Snow Depth Sensor

MODEL 54000

SNOdar

CE

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PN: 54000-90
REV: A012925

MODEL 54000
SNOdar SNOW DEPTH SENSOR

SPECIFICATIONS

Durability

Input Voltage:	6-24 Volts
Operating Temperature:	-40 to 60°C
Storage Temperature:	-40 to -85°C
Mechanical Vibration:	20g MIL-STD-883D
Mechanical Shock:	500g MIL-STD-883D
Ingress Protection:	IP67
Corrosion Resistance:	Type II: MIL-A-8625

Measurements

Accuracy:	±1 to ±2 cm
Resolution:	0.3 to 1 cm
Range:	0.09 to 9 m
Measuring Interval:	1 to 60 min

Power Usage

Current Consumption:	0.04 to 0.26 amps
Power Consumption:	0.42 to 3.24 watts
Avg Power Consumption:	0.5 watts

Dimensions

Weight with bracket:	375 grams
Weight w/o bracket:	265 grams
Size:	6.3 x 6.3 x 9.5 cm

ESD Ratings

Human-Body Model:	±2500V
Charged-Device Model:	±1000V

FEATURES

- Real-time, accurate data during storms
- User-friendly app for setup and live data
- Bluetooth Low Energy (BLE) enabled
- Seasonal internal data logger
- Snow depth (compaction)
- New snowfall
- Seasonal snowfall
- Optional estimated SWE (Snow Water Equivalent)
- SDI-12 data logger & RS-232 output
- Sensor orientation monitoring
- Oblique or normal angle mounting on tower

INTRODUCTION

The SNOdar is a highly accurate, reliable snow depth sensor designed to deliver real-time data—even in the middle of a snowstorm. Its mobile app makes setup effortless while providing instant access to live snow depth measurements from anywhere in the world.

SNOdar is one of the only snow depth sensors that utilizes LIDAR (Light Detection and Ranging) technology to provide accurate snow depth measurements. This high-precision method allows the SNOdar to create detailed, real-time snow depth data, ensuring reliable and efficient snow monitoring for a variety of applications.

The SNOdar can output data via RS-232 or SDI-12 to a range of commercially available data loggers. It also features an internal, non-volatile data logger capable of storing an entire season's worth of data, eliminating the need for separate data loggers for each sensor—resulting in significant cost savings during deployment. Its compact, lightweight design is built to withstand frigid temperatures while consuming very little energy.

APPLICATIONS

- SNOTEL Snow Monitoring
- Stormboard Snow Measurement
- Avalanche Monitoring & Forecasting
- DOT Road Conditions
- Ski Resort Snow Monitoring
- Scientific Snow Monitoring
- Snow Management

OVERVIEW

Welcome to the SNOdar User Manual, your comprehensive guide to setting up, installing, and using your SNOdar snow depth sensor. This manual will walk you through every step, from mounting the sensor in an optimal location to configuring the app for seamless data collection. Whether you're a first-time user or an experienced weather enthusiast, this guide ensures you get the most accurate and reliable measurements from your SNOdar system.

You'll start with installation and mounting, including best practices for securing the sensor in an unobstructed area to maximize performance. Next, you'll learn how to connect and configure the SNOdar app, enabling real-time monitoring and alerts. Once your system is up and running, the manual will guide you through reviewing and interpreting data logs, helping you track snow accumulation trends over time. Finally, you'll find troubleshooting steps for common sensor errors, ensuring smooth operation even in challenging weather conditions. With this manual, you'll have everything you need to confidently set up, use, and maintain your SNOdar sensor.

54000-90(A)

POWER AND BOOT SENSOR

Unbox the device and locate the 6-pin power cable. Apply the supplied grease to the connector on the device prior to connecting the cable. Ensure proper alignment with the directional key, and secure the connection by engaging the bayonet locking mechanism. Next, supply a power input of 6–24 VDC (with a minimum of 3.5 watts) to the cable leads, following the pinout diagram provided below. Either GND connection may be used.

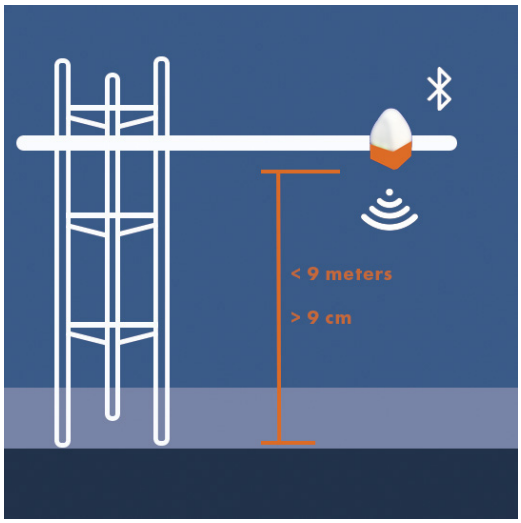
SNOdar Pin Name	SNOdar Pin No.	Cable Pin No.	Wire Color
GND	1	1	BLACK
PWR + 12V	2	2	WHITE
GND	3	3	GREEN
SDI-12	4	4	RED
TX: RS-232	5	5	BLUE
RX: RS-232	6	6	VIOLET

Once the device is powered on, the green LED will flash 20 times at a rate of 5 flashes per second (5 Hz), indicating that the device is functioning properly and actively broadcasting a Bluetooth Low Energy (BLE) signal. If in the field, go to Installation and Mounting directly below; otherwise, set sensor aside and set up the SNOdar app on your mobile device.

INSTALLATION AND MOUNTING

MOUNTING HEIGHT

Mount the sensor less than 9 meters from the ground and more than 9 cm from the ground or Stormboard fixture.



OBLIQUENESS

For best performance, when mounting the sensor, rotate it so that it is normal to the ground, i.e. measuring perpendicular to the ground surface; however, it does have the ability to be mounted at angles or on hillsides, up to 30 degrees from normal.

IMU DIRECTIONALITY

Roll: Rotation about the axis running through the clamp mount (this is the rotation monitored in Stormboard mode, 20 degrees is ideal)
Pitch: Rotation about the axis running through the connector
Yaw: Rotation about the axis running through the top dome peak

Roll

Pitch

Yaw

GROUND PREPARATION

Before setup and calibration, ensure the area beneath the sensor is free of any debris, such as sticks, rocks, or uneven ground clumps. Additionally, remove any large foliage or tall grass surrounding the sensor. For optimal accuracy in seasonal measurements, it is recommended to prepare a level dirt pad beneath the sensor.

DOWNLOAD THE APP

Depending on your mobile device of choice:

Download on the App Store

https://apps.apple.com/us/app/snodar/id1584974884

GET IT ON Google Play

https://play.google.com/store/apps/details?id=com

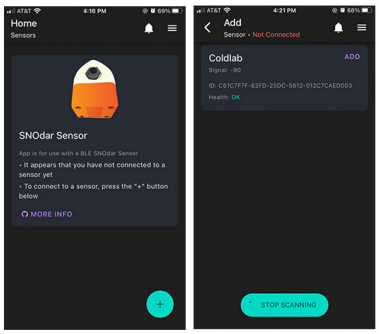
RUN THE APP

PERMISSIONS

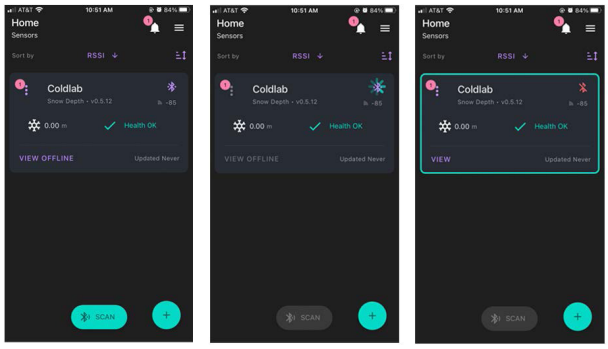
To run the fully featured App, Bluetooth and Location services (i.e. GPS) *MUST* be enabled.

CONNECT

1. To connect to a sensor, tap the + sign in the lower right corner of the screen.
2. From the **Add Sensor** screen, connect to the desired sensor by tapping on the **Connect** button by the sensor's name.
3. When prompted, enter the default passkey `123456` and tap the pair button.



4. Devices that have already been added will be listed on the home screen and can be connected to by tapping the **Bluetooth** button to the right of the device's name.



PAIRING AND BONDING SECURITY

The mobile device will now have to pair and bond to the SNOdar device. This is an encryption-based security feature to protect the device and its data from nefarious and/or unintentional actions. Therefore, it is highly important to **change the default passkey** and note, somewhere safe, where it can be recalled if forgotten.

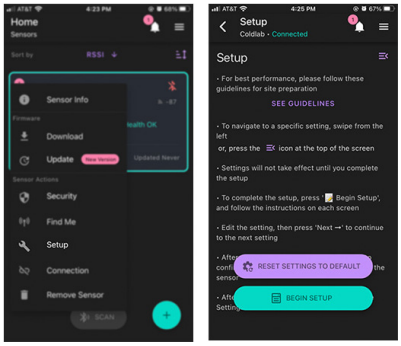
CHANGE PASSKEY

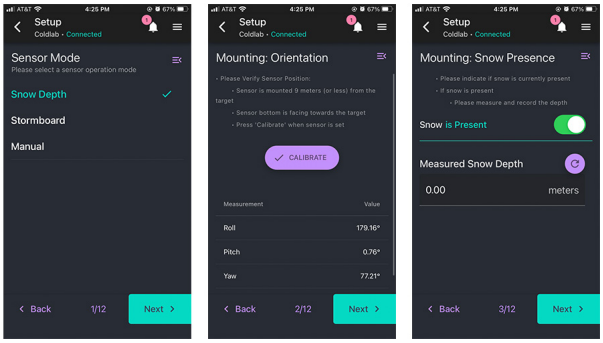
1. From the home screen, tap on the Kebab Menu beside the name of the desired sensor.
2. Select Security from the menu items.
3. Tap the edit button and change the default passkey to a six digit, numeric passkey of your choice.
4. Tap the Save button to update the passkey.

NOTE: Updating the passkey will restart the device.

SENSOR SETUP

Upon SNOdar sensor field installation, it is imperative to run the Sensor Setup located in the Kebab Menu on the home screen.





SENSOR MODE

The Sensor Mode Page allows for different sensor operation modes to be selected.

- The **Snow Depth** sensor mode is standard automated snow depth measurement. The unit needs to be calibrated at the beginning of each season (preferably when NO snow is present) for accurate, settled snow depth measurements.
- The **Stormboard** sensor mode is a manual calibration mode for storm snowfall measurements. This mode will calibrate to 'zero' accumulation after the user wipes the stormboard clean of snow. A manual calibrate after each clear will help the accuracy remain high.
- The **Distance** sensor mode is used for basic distance measurements. This will be the default mode when NO Bluetooth setup can be done. The sensor will measure distance to the snow every 5 minutes and send data out the SDI-12.
- The **Manual** sensor mode has no automated operation only user interactions. This mode is used exclusively for testing and in lab scenarios.

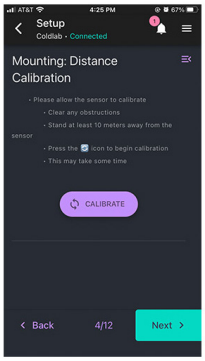
MOUNTING: ORIENTATION

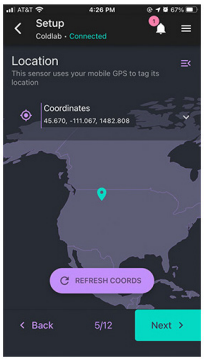
The Mounting Orientation page verifies that the sensor is mounted in the proper orientation—less than 9 meters above ground and with the sensor bottom facing towards the ground.

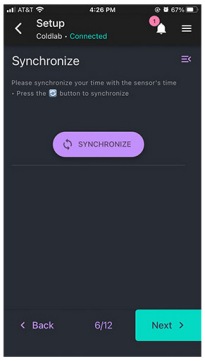
Once the sensor has been mounted, press the **Calibrate** button in the bottom middle of the screen. If the sensor is properly oriented, this **Calibrate** button will turn green.

MOUNTING: SNOW PRESENCE

The Snow Presence Page records if snow is present when sensor is set up. If snow is present, the depth of the snow in meters must be entered.







MOUNTING: DISTANCE CALIBRATION

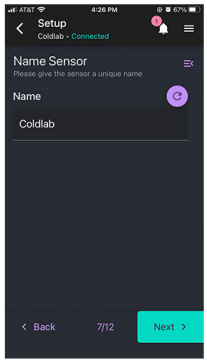
The Sensor Calibration Page allows the sensor to calibrate. To do so, clear any obstruction from below the sensor, press the Calibrate button, and stand at least 10 meters away from the sensor.

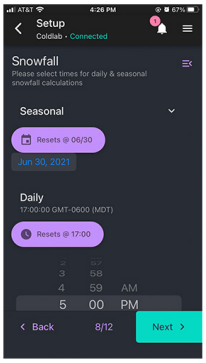
LOCATION

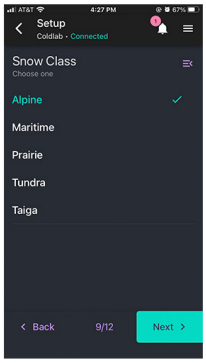
The Location Page uses your mobile device's GPS to determine the sensor's location. To update the location tap the **Refresh Coords** button.

SYNCHRONIZE

The Synchronize Page synchronizes the sensor's time with the time and time zone of your mobile device. To do so, press the Synchronize button. When the time has been synchronized, the newly set time will be displayed.







NAME SENSOR

The Name Sensor Page allows for the sensor to be given a unique name. The name can be reverted back to the original sensor name by pressing the **Refresh** icon to the right of the text input field.

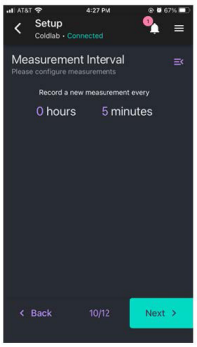
SNOWFALL

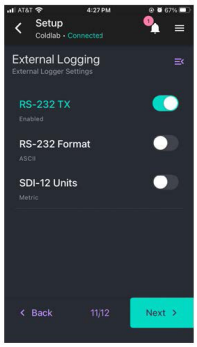
The Snowfall page allows for a time to be set at which the snowfall calculations for the day and the season will start over. To set the seasonal reset date, tap the date icon under the **Resets @** button and scroll through the year, month, and date. To set the daily reset time, scroll through the time options under the **Resets @** button. Both values are set according to the local time of the mobile device.

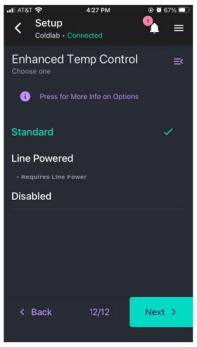
SNOW CLASS

The Snow Class Page allows for the type of snow to be specified. Choose a snow class that best describes the snow in your region:

- Alpine
- Maritime
- Prairie
- Tundra
- Taiga







MEASUREMENT INTERVAL

The Measurement Interval Page allows for the interval at which measurements are taken to be set. The minimum allowable time interval is 1 minute.

To set the interval, tap anywhere on the current hours and minutes listing. Then tap the time button that appears. To increase the time, drag the hours (left) or minutes (right) up. To decrease the time, drag the hours (left) or minutes (right) down. Tap anywhere outside of the time input to exit.

EXTERNAL LOGGING

The logging mode for data acquisition can be set to a combination of RS-232 TX, RS-232 Format, and SDI-12 Units. RS-232 TX must be enabled in order to enable SDI-12 Units.

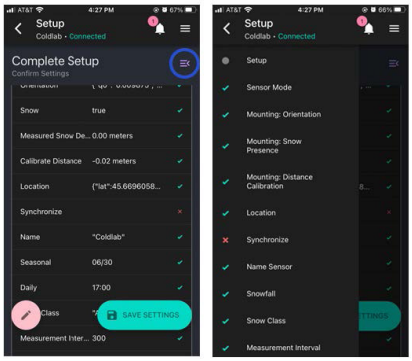
ENHANCED TEMPERATURE CONTROL

While the SNOdar has a standard temperature control, the Enhance Temperature Control page allows for the temperature control to be disabled or set to Line Powered control. Detailed information about each of these options can be found by tapping the more info button.

COMPLETE SETUP

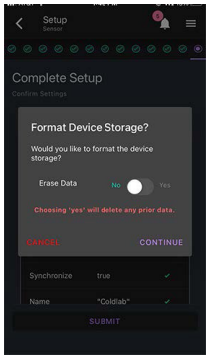
Lastly, the Complete Setup Page provides a summary of the settings. Any setup steps that were skipped or are incomplete will have a red x next to them. To go back to these steps, press the menu button in the right corner of the setup page and choose the desired setup step from the menu.

To confirm the settings and complete the sensor setup, press the Save Settings button.



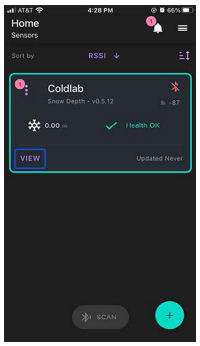
ERASE DATA FLASH

Once you press the Save Settings button, you will be asked if you would like to format the device storage. By choosing yes the device storage will be formatted and any recorded data will be deleted. By choosing no, the device storage will not be formatted and any recorded data will be preserved.



VIEW

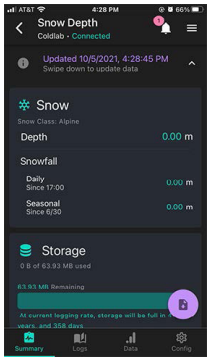
To view a sensor and its associated data, press the View button on the desired sensor's tab. You can return to the home page via the back arrow in the top left corner.



SUMMARY

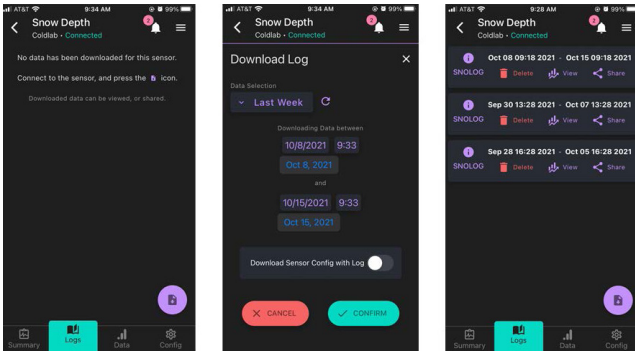
The Summary Page provides an overview of the sensor's data as well as displays any errors with the sensor. For more information on sensor error notifications see the Sensor Error Notifications section of the user guide.

The Summary Page contains information on snow depth, sensor storage, measurement information, sensor power, internal sensor temperature including potential heater failure, and sensor orientation including potential sensor drift.

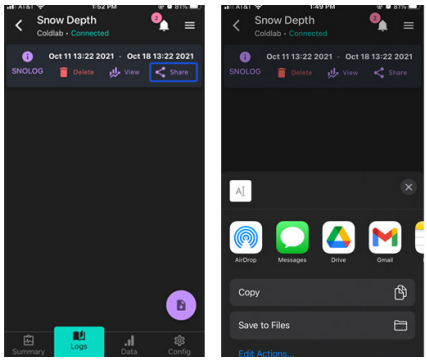


LOGS

The Logs Page displays data that has been downloaded for the sensor. To download data, press the **Download** button in the lower right hand corner of the page. Then press the **Download Log from Sensor** button. You will be prompted to choose data from either the last day, the last week, or the last month. A custom range can also be selected by tapping on the first displayed date or time and setting a unique time then doing the same for the second displayed date or time. Once downloaded, the logs page will display all logs that have been downloaded to your mobile device.

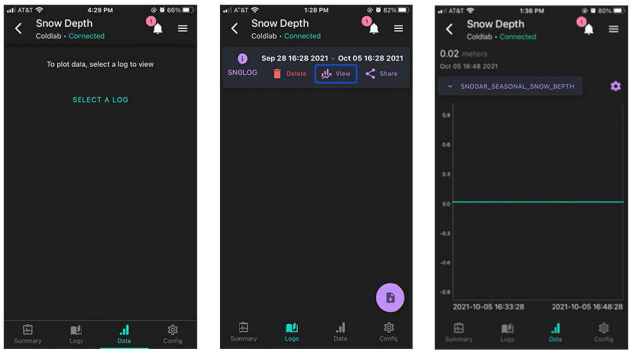


More information about each log can be found under the **SNOLOG Information** button. To view a graph of the log, tap the **View** button. Tapping the **Share** button will bring up options for sharing the log or uploading to your cloud storage of choice.



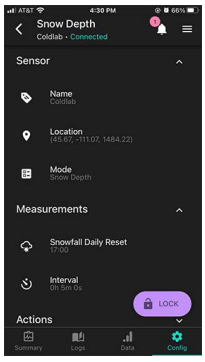
DATA

The Data Page displays an interactive depiction of the downloaded data. To plot data, select a log and press the **View** button for that log. Once the log has been plotted, different collections of data can be displayed by tapping the **Dropdown menu** above the plot. The chart settings can also be altered by tapping the **Settings** icon beside the dropdown menu.



CONFIGURATION

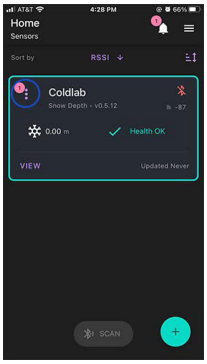
The Config Page allows for quick edits of some of the sensor's settings. These settings can only be edited after the Unlock button in the bottom corner of the screen is tapped. The Lock button should be tapped after edits are made.



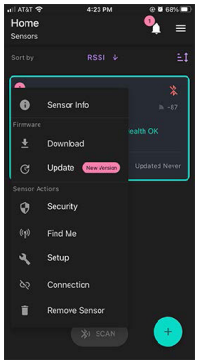
APPENDIX

DEVICE FIRMWARE UPDATE (DFU)

The App has the ability to update the sensor firmware over-the-air (OTA). Toggle the main **Kebab** menu in the upper left corner of the sensor card on the Home page. If there is an available update, a red-encircled + alert will appear by the Update action. Initiate the update and the unit LEDs will quickly flash Magenta, then hold Cyan while it is updating. **DON'T** power down the sensor or quit the App while updating. The unit will reboot and flash Green when updated and ready.



Sensor Card Kebab Menu Location



Available Firmware Update

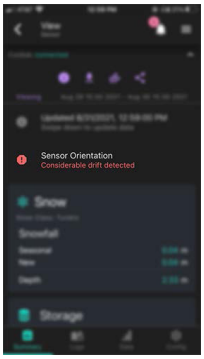
LED LEGEND

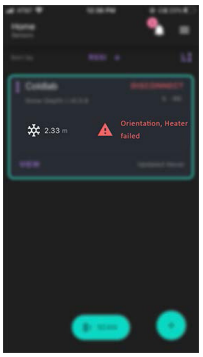
- Upon Boot
  - . 4 secs @ 5 Hz Green: Health Diagnostics Passing
  - . 4 secs @ 5 Hz Red: Health Diagnostics Failure
- Measurement
  - . Solid Yellow for length of measurement
  - . Solid White for length of calibration
- BLE Connect
  - . Fade Blue -> Cyan -> White for 2 seconds
- BLE Disconnect
  - . Fade White -> Cyan -> Blue for 2 seconds
- Device Firmware Update (DFU) via Mobile device
  - . Magenta for 2 seconds preparing update into Cyan for the length of the upload, up to 60 seconds. The unit will reboot when updating is finished.
- 'Find Me' Feature on the _Home_ Kebab menu
  - . Blue <-> White ping-pong for 4 seconds
  - . Useful to identify units when there are multiple sensors to configure

SENSOR ERROR NOTIFICATIONS

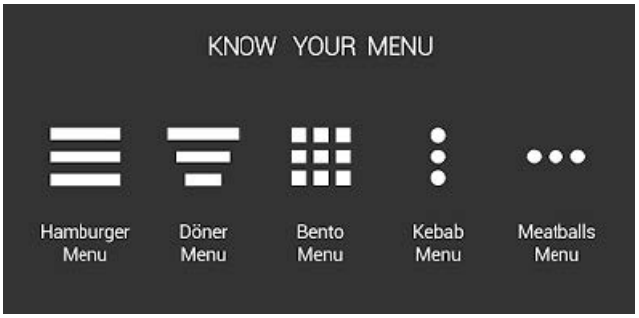
Orientation Drift: This sensor orientation notification will appear if considerable drift has been detected in the sensor's orientation. This error can be resolved by adjusting the sensor back to the correct orientation.

Heater Failure: This notification will be seen if the sensor's internal heater fails.

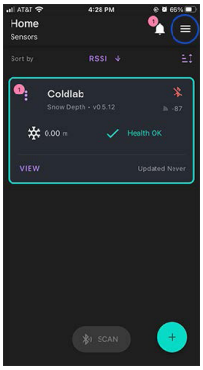


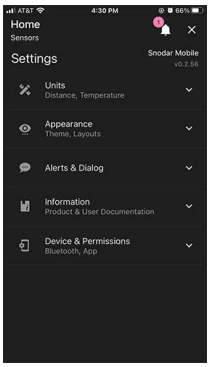


UNDERSTANDING THE MENUS



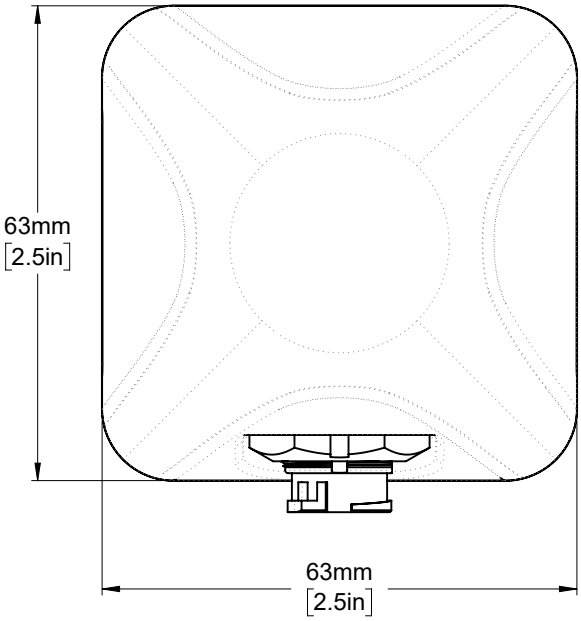
General App Info is contained in the upper right Hamburger Menu.

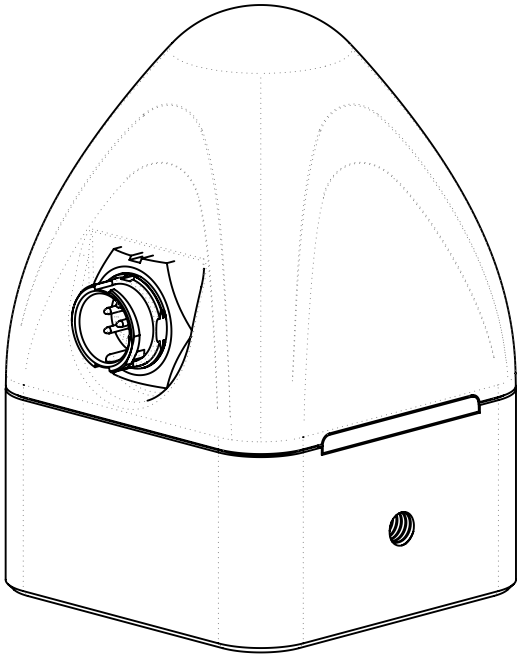


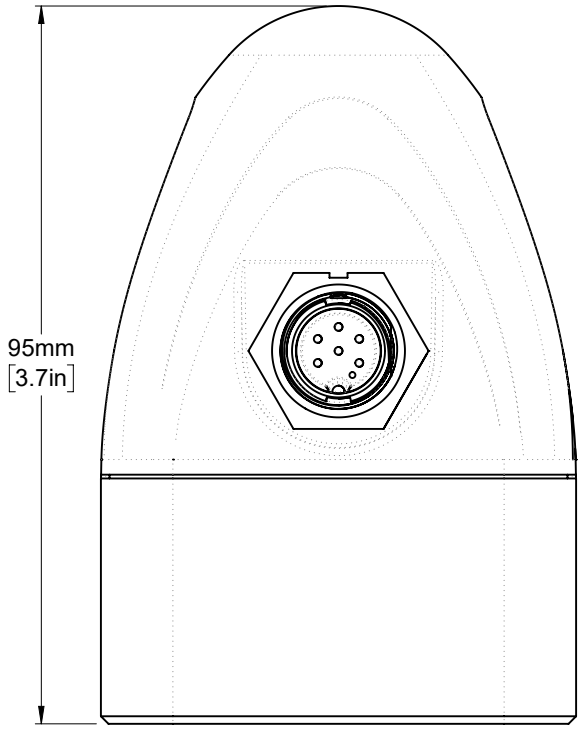


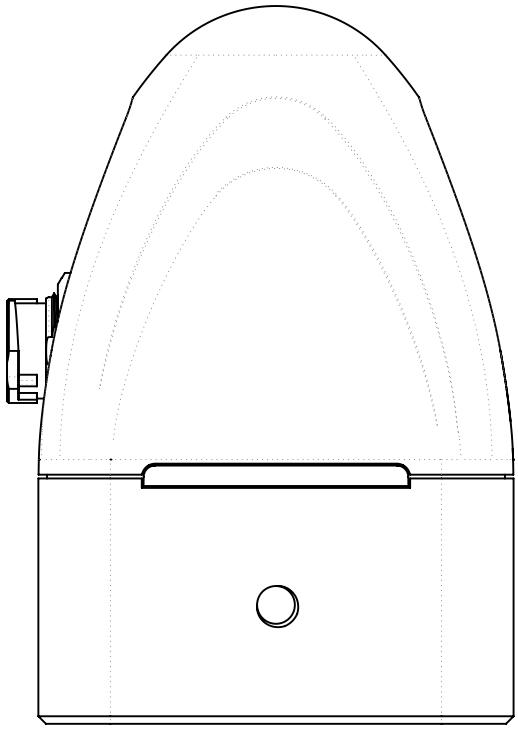
HARDWARE DIMENSIONS

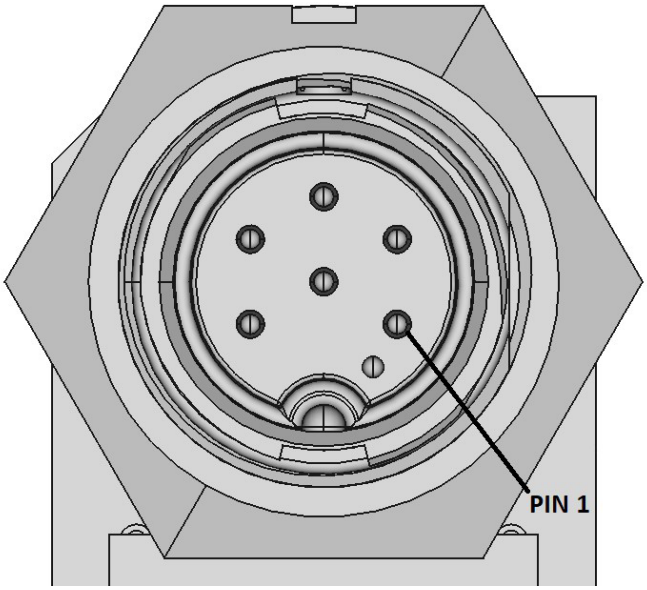
SNOdar



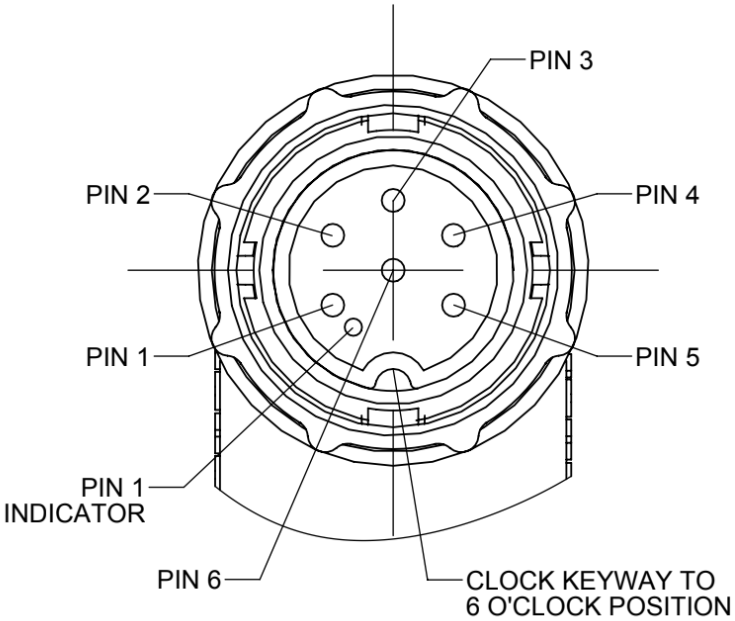








VIEW OF SENSOR SOCKET



PIN CALLOUT VIEW FROM MATING SIDE OF CONNECTOR
SCALE=3:1