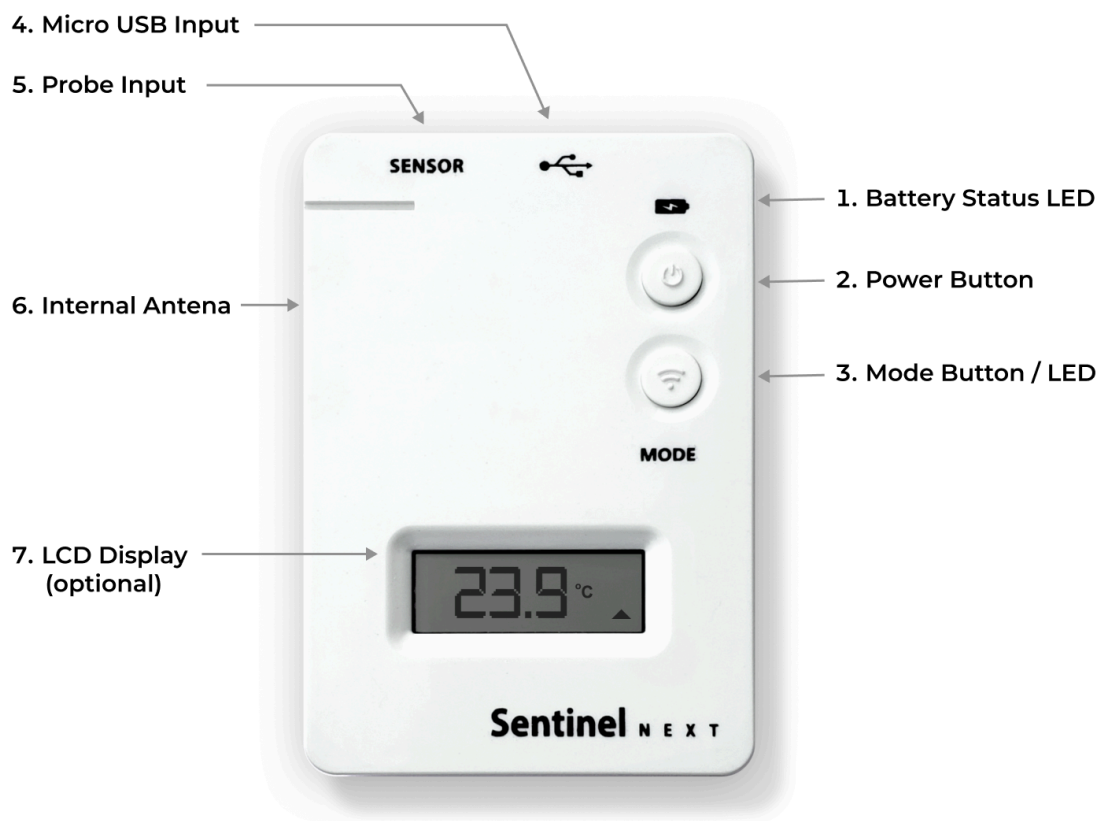


Sentinel Next Reference Guide

This guide describes the physical and functional attributes of the Sentinel Next line of sensors.

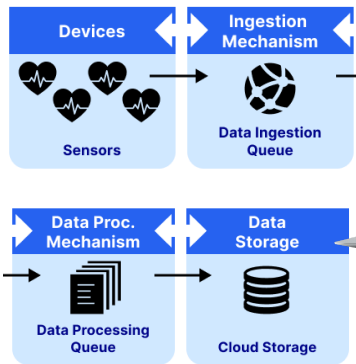
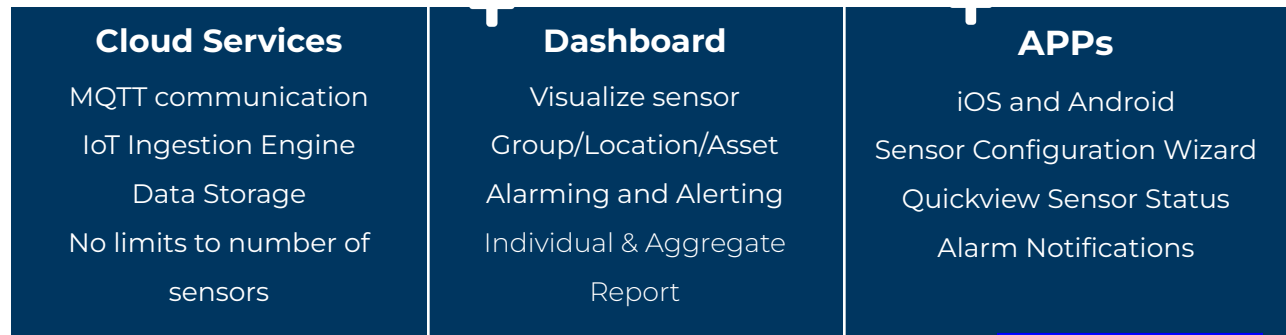


Remote Monitoring Solution

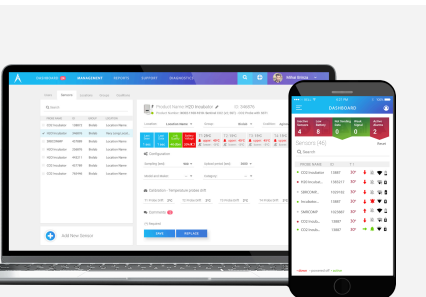
+ Software

The software **complies with 21 CFR Part 11.**

It meets GMP standards and is used by Hospitals, Clinics, Pharma and Research Institutions.



Sensors communicate to the cloud using MQTT via either using WiFi or LTE cell network. No data is lost. All sensor communications can be seen in the cloud for updating firmware, debugging and diagnostics purposes. The system can be scaled to 100,000+ sensors instantly by allocating more resources on the server. The diagram shows the data flow from the sensor to the cloud.



The dashboard sits on top of the Data storage system. It is designed to help the user set sensor parameters, visualize data through graphs and tables, aggregate reports for managers and manage alarms.

Features include:

- User management
- Sensor management
- Alarm management
- Graphs / Data (exporting)
- Sensor Diagnostics
- Admin reports
- Sensor Health
- Sensor Signing
- Manage NIST Certificates
- Alarm Statistics
- Custom Reports and Workflows



Sensor configuration Wizard is an APP to test your network to cloud connectivity, configure sensors in the field and perform advanced diagnostics in case of communication malfunction

Sentinel Next APP provides a quick view of the sensor reading, graph, health and status of the alarms. The alarms can also be acknowledged from the APP. In addition, it can be used to validate sensors in the field.

Software Specification

Cloud Provider Google

Sensor Communication WiFi Infrastructure

Protocol MQTTS (secure connection for devices and sensors) ; HTTPS (Debugging and OTAP)

IDS/IPS : Intrusion detection <https://cloud.google.com/intrusion-detection-system>

WAF: Cloud Armor <https://cloud.google.com/armor/>

Vulnerability Test: <https://cloud.google.com/security-command-center>

TLS Version: 1.2

Data: meets 21 CFR Part 11

Cloud Features Metrics and dashboards allowing visibility into the performance of your services with alerting. Health check monitoring for web applications and applications that can be accessed from the internet with uptime monitoring. Support for logs and logs routing with error reporting and alerting.

Audit logs for visibility into security-related events in your Google Cloud account.

Production debugging and profiling.

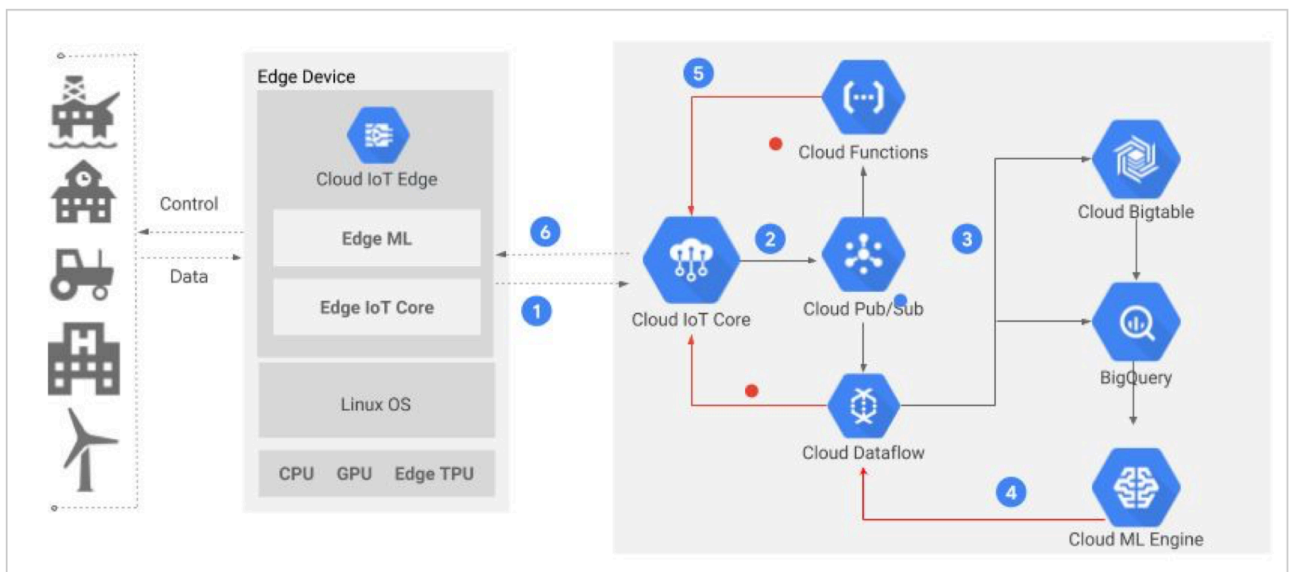
Aegis Application User Management System

Sensor Management System

Sensor Data Storage and Reporting

Sensor Health Monitoring

Aggregate Reports for Anomaly Detection



Dataflow Architecture

IT Infrastructure Specifications

1. Enable Publish and Subscribe over MQTT

Sensors connect to the MQTT Bridge using TLS transport to communicate with the Cloud IoT Core.

The following URL and ports should be enabled on the network Firewall:

mqtt.googleapis.com:443

2. Enable Clock Synchronization

Sentinel units periodically synchronize their internal clock using the NTP protocol.

0.pool.ntp.org

Please allow packets over the UDP protocol to destination port 123, for all sensors.

3. Enable OTA (Over The Air Firmware Updates)

Sensors can have their firmware updated remotely, and will need to be able to access the Google Cloud Storage with TLS security (port 443):

storage.googleapis.com:443

4. Test the Network with the Sentinel Config App (Android/iOS)

Once the changes above have been made on the network Firewall, you can download and install the Sentinel Config app from the Google Play Store or iOS App Store:

<https://play.google.com/store/apps/details?id=com.aginova.sentinelconfig>

<https://apps.apple.com/ie/app/sentinel-config/id1457672545>

After launching the app, simulate a sensor by pressing the MQTT TEST button. This will check whether the Publish & Subscribe over the MQTT Bridge of the Cloud IoT Core is successful, and it will test clock synchronization with the NTP Pool time servers.

Sensor Hardware

Sentinel NEXT 1S

Product Number: **XTEMP-3101-0000**

Specifications

Dimensions (HxWxD)	89mm x 60mm x 20mm (3.50" x 2.36" x 0.78")
Weight	102g (3.60 Oz)
Connectors	10-pin Sensor Connector; micro USB for Charging
Battery	Integrated 1000mAh Rechargeable Li-Ion Battery
Wi-Fi Protocols	IEEE 802.11b/g/n
Wi-Fi Models Supported	Wi-Fi Direct, Infrastructure, Remote
Wi-Fi Encryption	WEP, WPA/WPA2, WPA2-Enterprise Personal (PEAPv0/MSCHAPV2, EAP-TTLS)
On Board Data Storage	>2 months with a Once/Minute Sampling Rate
Operating Temperature	0°C to 40°C on Charger -20°C to 60°C on Battery only
Non-operating Temperature	-30°C to 70°C
Relative Humidity	10% to 90%
Certifications	FCC, CE
Ports Used	443(tcp) for Communication 123 (UDP) for Time server (Default: pool.ntp.org)
Protocol to Cloud	Sensor communication MQTTS (MQTT over TLS) OTAP and Debugging HTTPS



1. Battery Status LED

When a Micro USB cable is plugged into the Micro USB input (4) and connected to a charger the Battery Status LED will have the following behavior.

- Solid Green: Battery is fully charged.
- Solid Red: Battery is charging.

If both Mode (3) and Battery LED (1) are blinking red:

Battery is almost 100% depleted. Sensor cannot function until the battery is recharged.

2. Power Button

This is a momentary push that functions as an On/Off button.

To power the unit on – briefly press and release the power button. The Mode LED (3) will blink green 5 times very quickly and the display will show “On” indicating the unit is turning on.

To power the unit off- press and hold the power button for 5 seconds. The unit will count showing 1 ... 2 ... 3 ... OFF on the display. Release the power button when you see the word “Off”. When you release the power button the Mode LED (3) will blink red 5 times very quickly indicating the unit is turning off.

Continuing to hold the power button will result in a reboot. The sensor will count 6 and 7. When the power button is released the unit will display “b00t” and the Mode LED (3) will rapidly blink red, blue, and green.

3. Mode Button / LED

The Mode Button / LED has several functions.

LED indicator:

- Green (solid): Sensor is in factory default Direct Mode
- Blue (periodic blink): Sensor is configured to post data to a server.
- Blue (solid): Sensor is configured to post data to a server and is plugged into a power source.
- 5 quick green blinks: Sensor is powering on.
- 5 quick red blinks: Sensor is powering off.
- Blinking red at the same time as Battery Status LED (1): Battery is almost 100% depleted. Sensor cannot function until the battery is recharged.
- Red blinks per debug table included in Troubleshooting.

Switching Modes:

To return the sensor to factory default Direct Mode, press and hold the Mode Button for ~5s. Upon release the Mode Button LED will flash green a few times and stay solid Green.

To return the sensor from Direct Mode to post to the last configured data server, briefly press the Mode Button. The Mode Button LED will flash blue a few times indicating it has been set to report to the last configured data server.

Control LCD Display (7) functions on units with display.

This function is covered in detail in section 7. LCD Display Function.

Control debug function.

Covered in section 8. Troubleshooting.

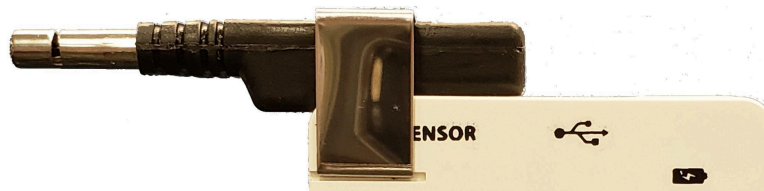
4. Micro USB Input

The Micro USB input is used solely for charging the built-in rechargeable battery. To charge, plug the Micro USB connector into the Micro USB Input. Plug the other end of the micro USB cable into a USB charging brick with rated output of 5Vdc and minimum 150mA.

The Sentinel Next comes with a pre-installed 3.6V rechargeable lithium battery.

5. Probe Input

The probe input is keyed so it is only possible to connect the probe in the correct orientation. Make sure the sensor probe is connected securely and completely. Use only official Sentinel Next probes from Aginova. Below is pictured an example of a probe that is properly connected.



6. Internal Wi-Fi Antenna

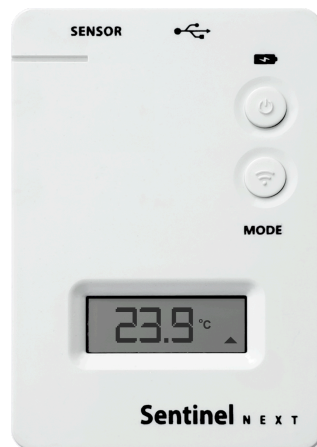
The Sentinel Next communicates via the internal 2.4Ghz antenna and is compatible with 802.11b/g/n Wi-Fi access points. The Sentinel Next is not compatible with 802.11ac and cannot communicate on the 5Ghz band.

When installing, it is best to ensure the front of the Sentinel Next is facing the Wi-Fi access point as directly as possible. It is best to ensure there are as few obstacles between the Sentinel Next and the Wi-Fi access point as possible.

Do NOT place the sensors inside refrigerators/freezers as the radio signal will get significantly attenuated.

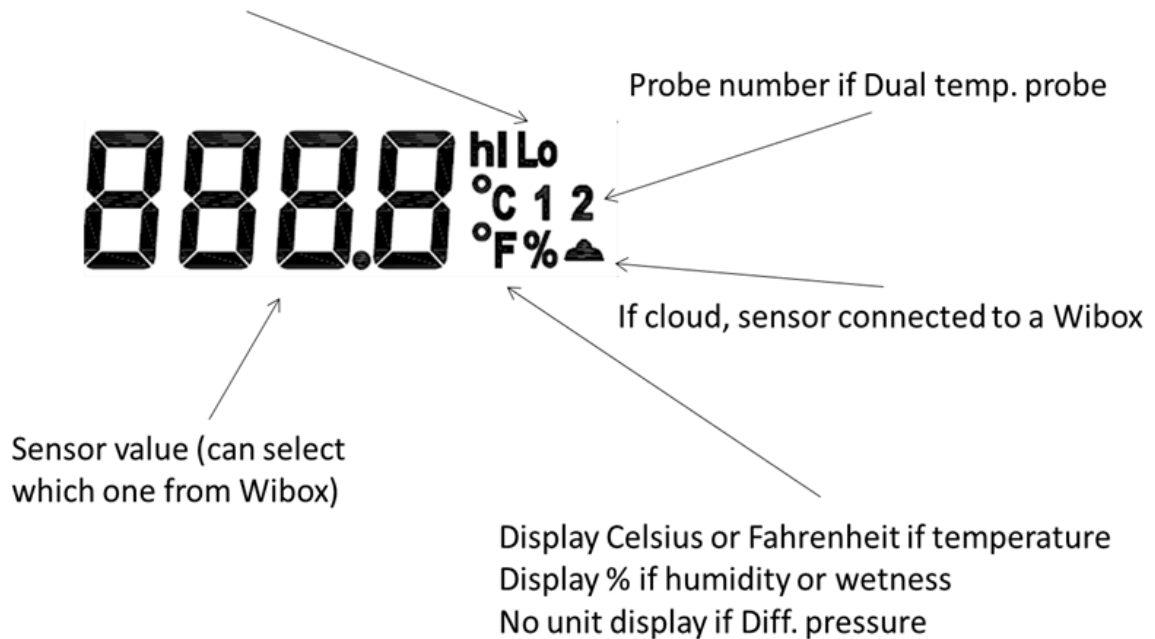
7. LCD Display Function

The following instructions describe the Sentinel Next LCD Display.



Hi: Indicate if a high alarm happend (not ack yet)

Lo: Indicate if a low alarm happend (not ack yet)



Press button

If the Mode Button (3) is pressed once for less than 5s, the sensor will display all live sensor value in sequence. Then it will show the min and max of each sensor value since the last reset (using the LO and HI symbol) Pressing the Mode Button (3) again during this sequence resets the Hi and Lo values stored on the sensor.

Message

On: Mean sensor is switch On

Off: Sensor is switch Off

OtaP: Sensor is being re-flashed over the air

rst: sensor was reset using the press button (min and max values were reset)



ErrX: display the error message (check list below)

DirE: sensor is going to direct mode (after the button was pressed)

inFr: sensor is going to Infrastructure mode

CHAR: Sensor is off but the USB is connected (Lo symbol means not fully charged and HI symbol means fully charged)

COnF: Sensor is reconfigured

rOll: Sensor is rolling back to previous stable setting

Configuration

Use the cloud portal or the Sentinel Config APP to configure or reconfigure the sensor.

8. Troubleshooting

If there are unknown issues getting the Sentinel Next to connect to your network or report to the server, use the debug function (firmware version 7.1.42 or newer). Briefly press the Mode Button (3) and watch the Mode LED for any red blinking. The display will show “Err” followed by a number 1-6, or count the number of red blinks and refer to the table below.

Error	Number of red blinks
No error	0
No access point with corresponding SSID is found	1
Unable to authenticate	2
Security selection failure	3
DHCP failure	4
No HTTP connection with server	5
Unknown Error	6

Verify the following points:

- Make sure that your WiFi Access Point (AP) can reach the internet



- Verify that the AP is correctly configured (SSID, channels, DHCP, etc). You can use another device (PDA, laptop) to verify that it can reach the internet.
- Ensure the sensor probe is properly connected to the Probe Input (5).
- Set the Sentinel Next back to Direct mode and use the Sentinel Next app to reconfigure it.

9. Support

Send emails to support@aginova.com

Call us at +1 (513) 204-5837

Create a ticket in the Cloud Portal

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