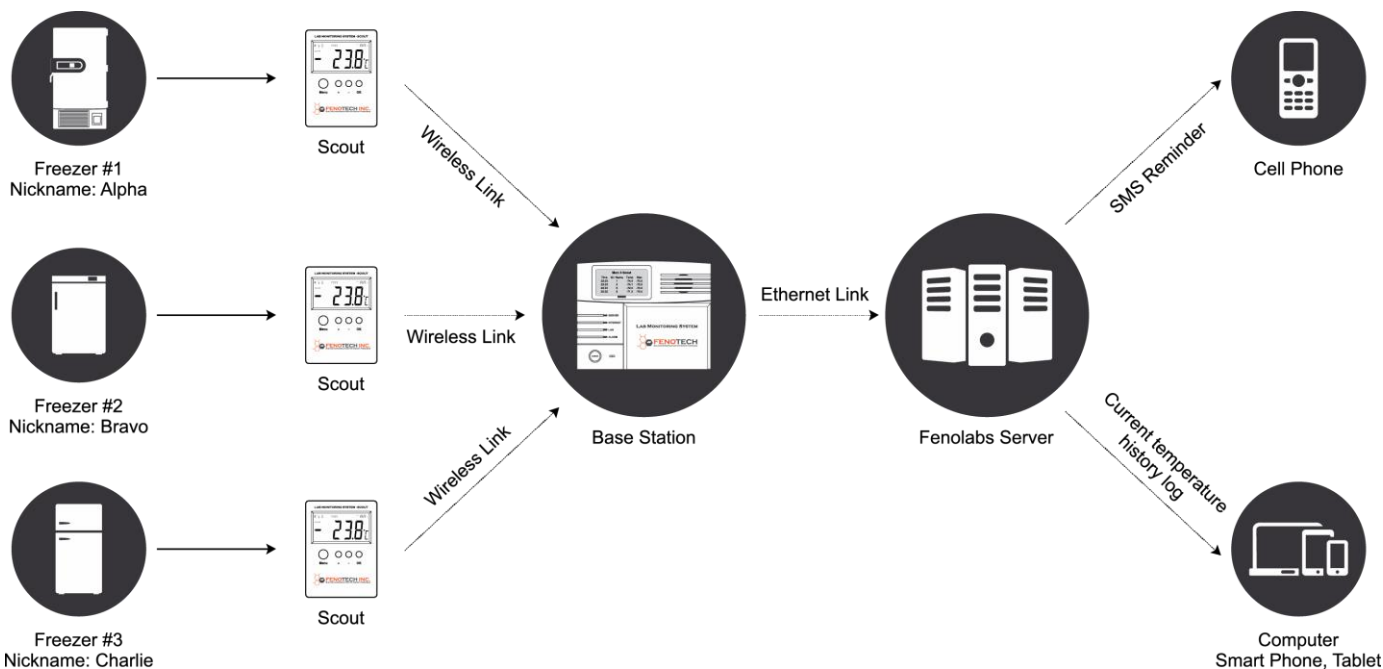## SYSTEM OVERVIEW

In a way, it works like a home security system for your lab or facility, with advanced measurement and reporting capability.
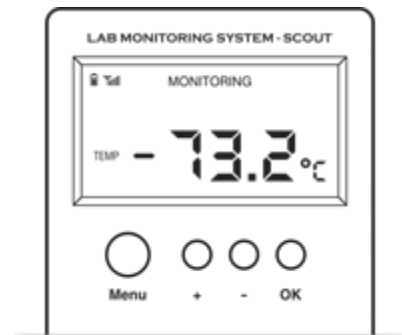
In other words, it is a combination of local alarm, remote alarm + data recording system. And it is cloud based.

The system consists of three parts: 1) Scout modules 2) Base station 3) Fenolabs server. Scout modules are attached to your freezers, measure temperature, and send data to base station through wireless link. Base station displays temperature of each freezer and relays data to Fenolabs server through Ethernet link. Fenolabs server stores temperature data in a database & presents to you when logged in.
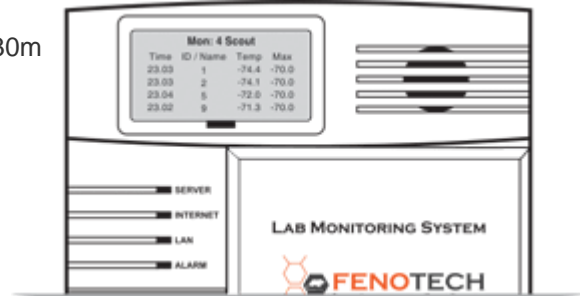
SCOUT

- Sensor type: [Platinum RTD](#)

- Measurement range: -90 – 100° C

- Measurement accuracy: ±0.2° C at 0° C after calibration

- Adaptive polling, captures transient temperature changes

- Ultra thin sensor cable, with diameter at 0.8mm

- Battery life: up to 1 month when external power is off

BASE STATION

- Independent mesh wireless network, coverage up to 100ft/30m

- You don NOT need give out your WiFi password

- Max number of scouts: 20

- Ethernet: IEEE assigned MAC address, DHCP/Static IP

- 4GB MicroSD card, keeps log more than 10 years.

- Battery life: up to 8 hours when external power is off

BACKEND SERVERS

- Different server clusters for different service regions

- Servers distributed in three differnt geographic locations

- Each server is capable of monitoring up to 100,000 freezers

- Can be scaled up in a matter of minutes

- Isolated from our frontend server

Temperature Measurement

Temperature is measured by platinum Resistance-Temperature-Detector (RTD) and digitized by a 24Bit Sigma-Delta ADC. Platinum RTDs provide the highest accuracy in a range as wide as -100 - 150°C among all industrial temperature sensors. The 24Bit ADC provides a resolution of 0.025°C. The combination of platinum RTD and 24Bit ADC is typically found only in high-end precision instrument. Now we offer it to you free of charge.

Multiple measures are employed to prevent possible leakage along the sensor cable. First, cables with diameter less than 0.8mm are used to build the customized platinum RTD. As a comparison, cable diameters of typical temperature sensors are in the range of 2 - 5mm. Also a customized silicone seal is installed along the sensor cable at the edge of freezer's internal seal.

Connecting to the Cloud

Temperature data are first aggregated at base station via wireless mesh network and then fed into fenolabs servers via Ethernet. The range of wireless mesh network exceeds 66ft/20m in typical laboratory settings, and can be as far as 132ft/40m if no barrier stands between scout and base station. Up to 25 scouts can connect to one base station. If your lab have more than 25 freezers or reside in multiple locations, they can be then monitored via multiple base stations. There is no limit on number of base station. Base station connects Ethernet via DHCP by default. Static IP can be also easily entered into base station. Each of our base station has its own unique MAC address assigned by IEEE Registration Authority.

Fail-safe Mechanisms

Temperature data are first aggregated at base station via wireless mesh network and then fed into fenolabs servers via Ethernet. The range of wireless mesh network exceeds 66ft/20m in typical laboratory settings, and can be as far as 132ft/40m if no barrier stands between scout and base station. Up to 25 scouts can connect to one base station. If your lab have more than 25 freezers or reside in multiple locations, they can be then monitored via multiple base stations. There is no limit on number of base station. Base station connects Ethernet via DHCP by default. Static IP can be also easily entered into base station. Each of our base station has its own unique MAC address assigned by IEEE Registration Authority.

Installation and Setup

Our monitoring systems are preconfigured on an individual basis before shipping to you. Only minimum setup is needed from you to get them to work.

Mount Base station at a location within 70ft/20m of all your freezers. Connect Ethernet cable and power adapter. Base station will power up automatically.

(Optional) If a static IP is assigned by your IT administrator, enter it together with network mask and gateway into base station as instructed in user manual. Base station will reboot automatically if needed.

Install battery and power adapter onto scout module, insert temperature sensor into freezer, insert silicone seal (unnecessary for regular refrigerators), and set temperature threshold.

(Optional) Print your favorite image and stick it onto scout modules or your freezers if you purchased nickname package.

Now you can start to watch temperature of each freezer displayed on the LCD of base station, and on our server.

And, most importantly, you can go on vacation or go home with peace of mind. You will get SMS reminder when a threshold is breached. Don't lose any of your valuable reagent and samples collected by hardworking!