

TempTale RF Temperature Monitor

Sensitech's initiative to automate the cold chain led us to develop a radio frequency-enabled temperature monitor that's capable of recording the condition, time and location of products in real time – or near real time – as they move between locations.

The TempTale RF monitor provides the same quality and reliability of Sensitech's TempTale products and adds wireless communication. It stores temperature values, identifies locations traveled through and stores shipment information. All of this information can be transmitted wirelessly to a local computer. Time and temperature information displayed on the PC also includes the location information during the trip.

The following technology primer offers a detailed look at the capabilities, components, user requirements and technology of the TempTale RF, including how data is captured, transferred and stored.

Sensitech's RF-Enabled TempTale System Technology Primer

System Components

TempTale Manager Desktop and Host Computer (Base Station)

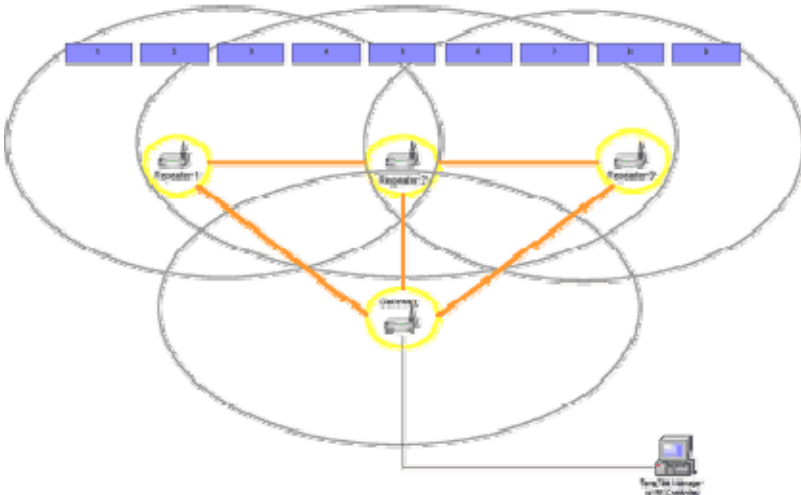
The Base Station is the system's host machine, which is installed with an application that facilitates communication with the Gateway Receiver. Sensitech's TempTale Manager desktop application is also installed on this system. It captures the time/temperature information broadcast from the TempTale RF. This information is then sent up to a central database for display, analysis and trending.

Requirements for Desktop PC:

- » Windows 2000, Windows NT4.0 or XP Professional operating system
- » System must be configured to run NT Services and have the .NET Framework (version 1.1) installed
- » A 450MHz Pentium III processor, 256MB of RAM, 800MB of available free space on the hard drive and a 1024 x 768 display is recommended
- » A network interface card (NIC) and Internet Explorer 6.0 must be installed on the computer to transmit data to a central database

Mesh Network

Mesh Networking is based on the theory that each node in the network has direct contact with immediate neighbor nodes (Gateway or Repeater). Mesh Networking ensures that if a Repeater in the network becomes unavailable (significant RF noise or device failure), data will be automatically re-routed through another path. Application of the mesh network in a warehouse environment is illustrated below.



Gateway Receiver

A Gateway is an appliance hosted by a computer via Ethernet and is powered by a standard wall outlet. The Gateway operates on one of two channels within the 900MHz band. Channel selection is completed during system installation and is based on a signal-to-noise ratio.

Repeater

A Repeater is responsible for receiving an RF signal, strengthening that signal and then retransmitting it to the Gateway. A Repeater listens for a "beacon" transmitted from the Gateway and joins the network on this channel.

The Repeater also acts as a "traffic cop," directing data via the optimal route to the Gateway. If another Repeater is not available, it reroutes data along a different route.

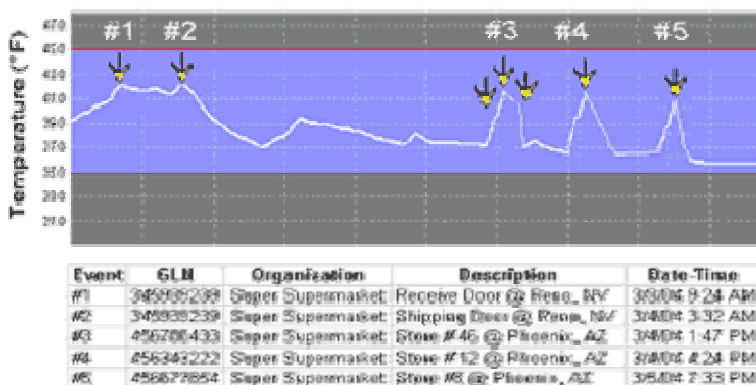
Signpost

A Signpost is a device that continuously broadcasts a Location ID. When an RF-enabled TempTale is within range, it stores the Location ID broadcast from the Signpost. The Signpost derives its power from a standard wall outlet and requires no PC or Ethernet connection.

The Location ID (or alias) will be displayed on the time/temperature display once the RF-enabled TempTale is downloaded.

RF-Enabled TempTale Monitor

The RF-enabled TempTale was designed using Sensitech's temperature monitoring and collecting technology. The device is battery operated, stores temperature values and displays summary temperature data through an LCD (liquid crystal display). Added to this is an RF module that sends and receives data through radio frequency. In addition, data used to describe a particular trip, such as manifest data, can be stored in the device. The additional data storage enables storage of shipment data, as well as location events broadcast from Repeaters and Signposts. The following diagram illustrates the combination location data with time/temperature data.



The RF-enabled TempTale is being developed with a view towards the Class 4 Active Tag standard developed by EPCGlobal.

