



TempTale® RF² System Installation Manual

T82003843
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Table of Contents

1. Overview of the TempTale RF ² System	1
1.1. Important Installation Notes.....	3
1.2. Mounting the Gateway and Repeater	4
2. TempTale RF ² Gateway	6
2.1. Gateway Components.....	6
2.2. Gateway Assembly.....	7
2.3. RF ² Gateway Specifications.....	9
3. TempTale RF ² Repeater.....	10
3.1. Repeater Components	10
3.2. Repeater Assembly	11
4. Repeater Specifications	12
5. TempTale RF ² Datalogger.....	13
5.1. Datalogger Components	13
5.2. RF Auto-Roaming	13
5.3. Logging Data.....	14
5.4. Alarms	14
5.5. Datalogger Specifications.....	15
6. TempTale RF ² Gateway Software.....	16
6.2. Windows Services \ Applications.....	16
Sensitech Network Manager.....	16
Sensitech Rule Manager	16
DataTransporter.....	17
Configuration Utilities	17
Sensitech Rule Viewer.....	17
Sensitech Manual API Updater	17
Declaration of Conformity (DoC)	18
FCC Statement	19
Industry Canada Statement	19

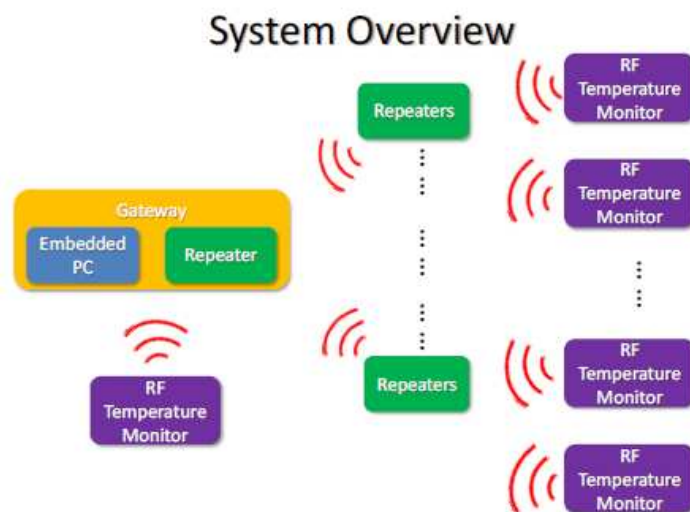
1. Overview of the TempTale RF² System

The TempTale® RF² system consists of infrastructure components and dataloggers. The infrastructure components, TempTale RF² Gateways (Gateways) and TempTale RF² Repeaters (Repeaters), are installed permanently while the TempTale RF² Dataloggers (Dataloggers) travel with the cargo and report their data when they arrive at a location that has an installed TempTale RF² infrastructure.

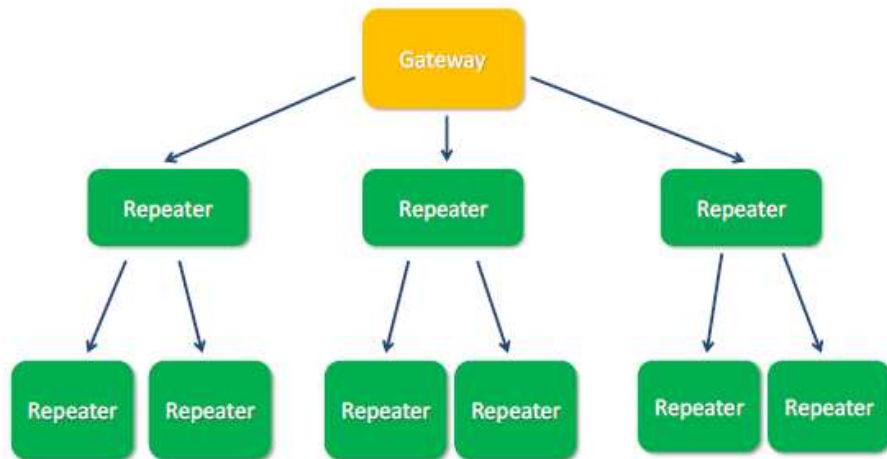
This manual presents information relevant to Sensitech personnel who have been trained to install the TempTale RF² system.

Each location can only have one Gateway installed but many Repeaters. The Gateway receives and sends data to and from Repeaters using RF signals and also connects to the Internet to make this data widely available. Repeaters receive and send data or commands to the TempTale RF² Dataloggers through RF signals. The infrastructure devices, the TempTale RF² Gateway and TempTale RF² Repeaters, communicate with each other at 2.4 GHz frequencies. However, the system can accommodate smaller installations as the Repeaters and Gateways can also communicate directly with the TempTale RF² Dataloggers at 868 MHz or 915 MHz frequencies. This unique feature makes the infrastructure scalable and flexible for use at large or small installations.

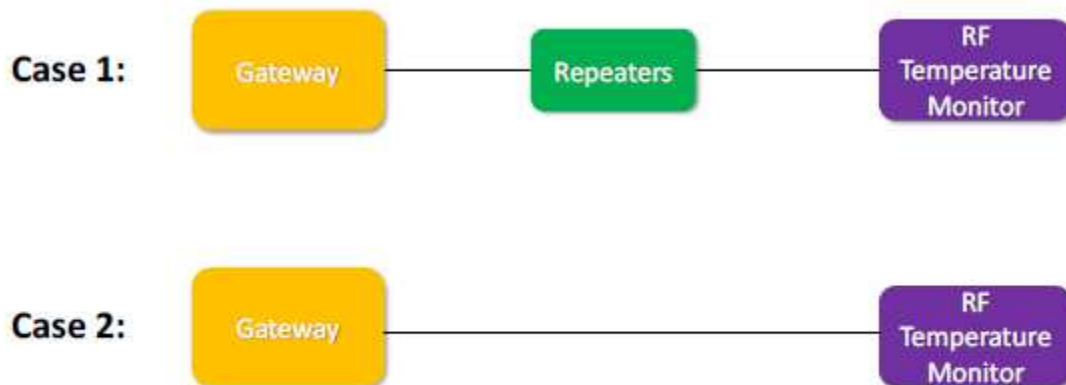
The Gateway consists of a ruggedized, embedded computer loaded with the programs required to read, process the data and connect to the Internet. The Gateway programs also performs data buffering and error checking and data decryption to insure data integrity.



The layout of the system can be viewed as a tree with the Gateway as the root and Repeaters as nodes. When planning for the layout of the TempTale RF² infrastructure, keep in mind that Repeaters can communicate with other Repeaters, as shown below.

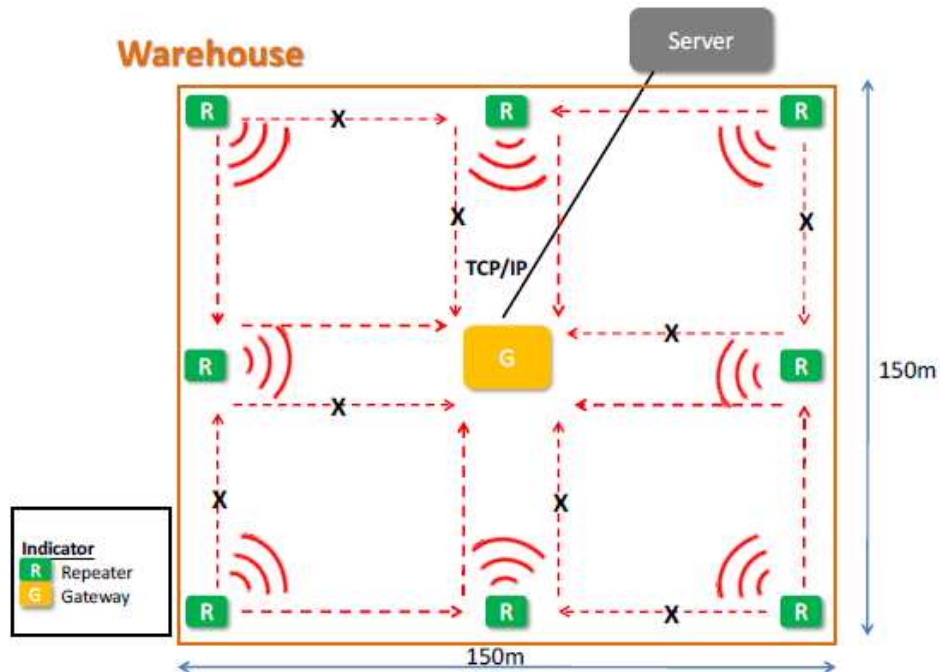


Since the Gateway is also capable of the same functions as Repeaters, a Gateway could also communicate directly with Dataloggers to download data.



The maximum network coverage for a single Repeater or Gateway is about 80 - 100 meters, but this is very dependent on the location. To cover more area, the network can be expanded simply by adding more Repeaters.

The following is a diagram illustrating the network layout for a 150 meter x 150 meter warehouse:



1.1. Important Installation Notes

Regarding RF2 installation, the following important rules must be taken into consideration when determining where to mount the Gateway and Repeater infrastructure components:

1. The Gateway and Repeater **MUST** be mounted inside a building, where they would not be exposed to rain or dripping water. They are designed to be installed in a location with temperatures in the range of 0C to 40C, 10% to 90% humidity, non-condensing.
2. The Gateway and Repeater **MUST NOT** be mounted in a location where they would be exposed to an explosive atmosphere, a corrosive atmosphere or conductive debris.
3. The Gateway and Repeater **MUST ONLY** be installed with the antennas included in the kit. Changing antenna types or installation of an outside antenna is not permitted and will void the Agency Approvals for the system.
4. The Gateway and Repeater **MUST ONLY** be powered by a +12 Vdc SELV Limited Power Source only.
5. The RF² system has been tested for compliance to relevant standards and approved. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

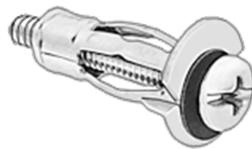
1.2. Mounting the Gateway and Repeater

The Gateway enclosure has a set of mounting tabs integrated into the enclosure, and the Repeater is supplied with a plastic mounting plate. When securing either, the correct fasteners for the wall type must be used.

- **For hollow wall construction** studded with metal or wood framing and sheathed with Drywall, Plaster or Plywood, an appropriate hollow wall such as a 3/16" toggle bolt or #10 re-usable anchor.

Typical drill size is 1/2" for the 3/16" toggle bolt.

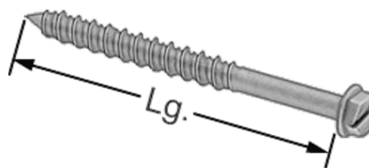
Each of the four **Re-Usable Anchors** used must be rated for 10 lb. (4.6 kg) minimum and be the appropriate size for the sheathing thickness. Use #10 size minimum.



Typical drill size is 3/8" for the #10 re-usable anchor shown. Follow the manufacturer's instructions.

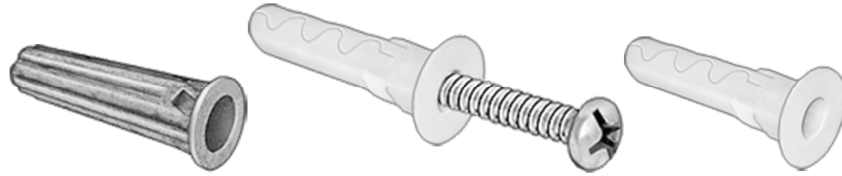
If the rear side of the sheathing is accessible, it is alternately acceptable to bolt the units to the wall sheathing using four #10-#12 Pan Head Steel Machine Screws with fender washers and lock nuts behind the sheathing. Length used must be adequate to fully engage all threads on the nuts.

- **For concrete or masonry wall construction**, use 3/16" concrete screws. Each of the four screws must be rated for 10 lb (4.6 kg) minimum.



Typical drill size is 5/32" for the 3/16" concrete screw. Follow the manufacturer's instructions. Follow the manufacturer's recommendation for drill depth for screws being used.

Various types of concrete inserts are available that are adequate for use in concrete, such as conical lead or flanged Polypropylene that will be adequate for installation. They must be individually rate to support 10 lb. (4.6 kg) minimum. Use sizes that support a #10 screw, minimum.



Typical drill size is 5/16" for the #10 conical lead anchor for concrete. Follow the manufacturer's instructions. Follow the manufacturer's recommendation for drill depth for insert being used.

Typical drill size is 1/4" for the #10 flanged Polypropylene anchor for concrete. Follow the manufacturer's recommendation for drill depth for insert being used.

2. TempTale RF² Gateway

As mentioned previously, the TempTale RF² Gateway is the core of the infrastructure for the network and only one Gateway can be installed per facility. The Gateway is a ruggedized, self-contained embedded computer with four antennas; two of the antennas are for 868 MHz or 915 MHz operation while the other two antennas are for 2.4 GHz operation. The 2.4 GHz frequency is fixed regardless of where the Gateway is installed, but the 868 MHz and 915 MHz frequencies are specific to the country of installation. Some countries use 868 MHz, so when installing in those countries both 868 MHz antennas must be used. When installing in countries where 915 MHz is the supported standard, two 915 MHz antennas must be used. A universal power supply is shipped with the Gateway. When ordering the Gateway, specify the location where it will be installed so Sensitech can provide the power cable with the correct type of plug.

The TempTale RF² Gateway components are pictured in the next section.

2.1. Gateway Components

Gateway



Antennas

- 915 MHz – Yellow Tip
- 2.4 GHz – Solid Black
- 868 MHz – Gray Tip (not shown)



Power Cable

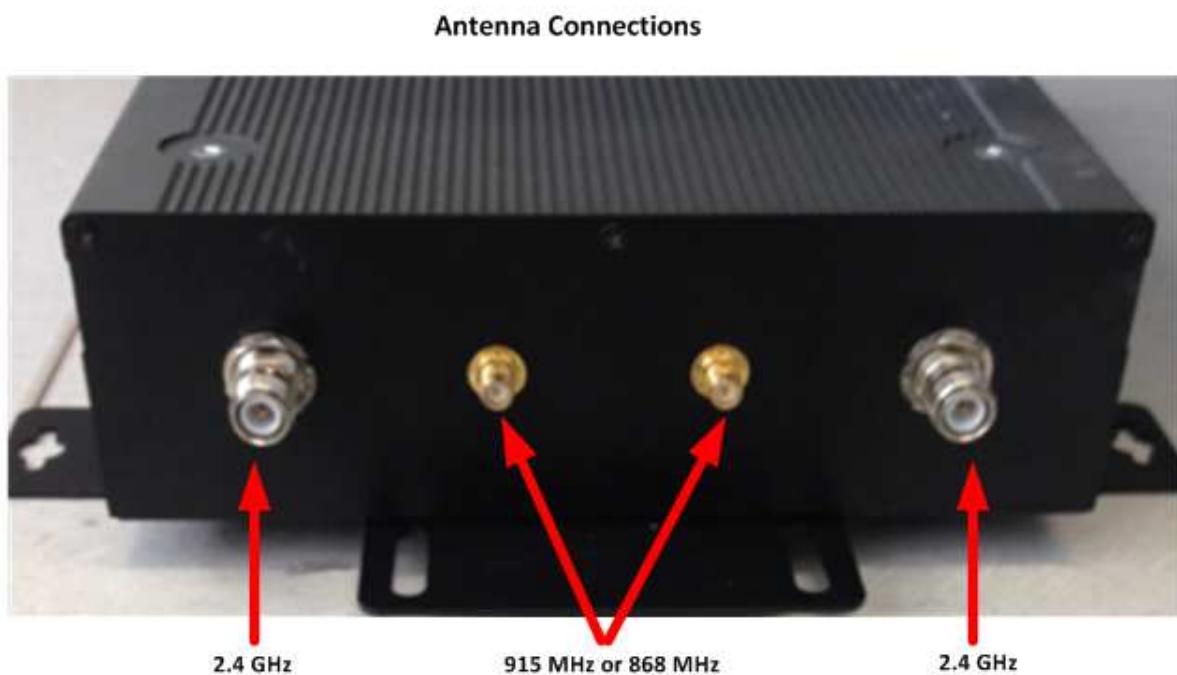


2.2. Gateway Assembly

When you receive the Gateway, carefully remove it from the shipping container and inspect for damage, especially if the shipping packaging appears to be damaged. If you determine there has been shipping damage, contact the carrier immediately.

Determine if 915 MHz or 868 MHz antennas are required, and attach them as indicated in the diagram below. The 915 MHz antennas have two yellow stripes and the 868 MHz antennas have two gray stripes.

If you attach the wrong antennas, the RF performance of the Gateway may be degraded.

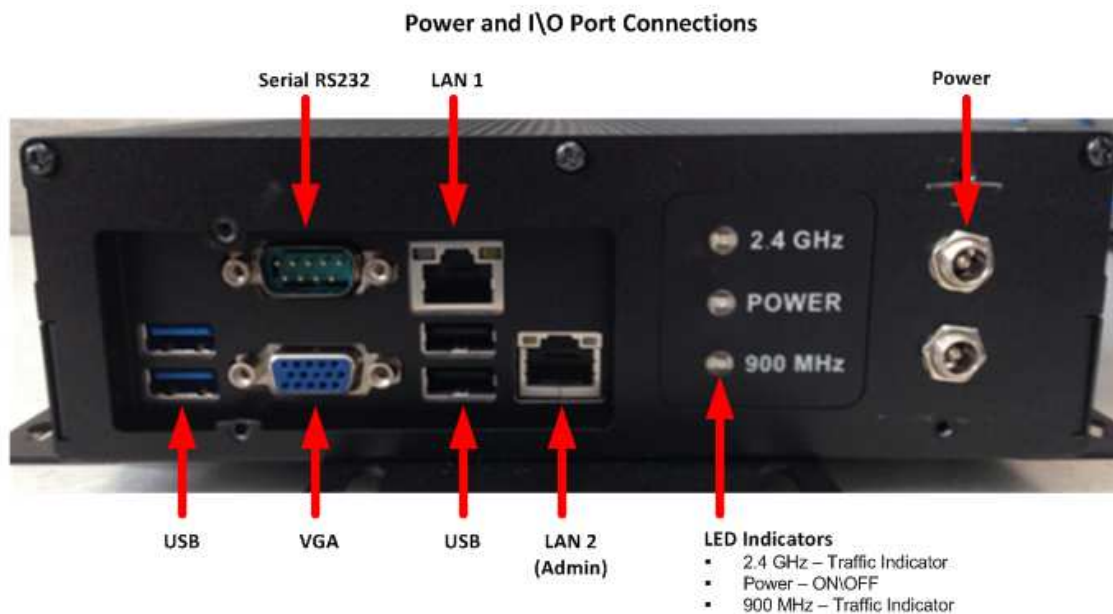


Next, connect the power supply provided at either of the two barrel power connectors provided. You may need to first loosen the two thumbscrews that hold the securing plate into place. After you slide the plate back, insert the power connector, slide the plate in place and tighten the thumbscrews.

NOTE: YOU SHOULD ONLY USE THE 12 VDC POWER SUPPLY PROVIDED! USING ANY OTHER POWER SUPPLY MAY DAMAGE THE GATEWAY. THE SECURING PLATE IS NOT DESIGNED TO PHYSICALLY SUPPORT THE POWER SUPPLY. DO NOT CONNECT THE REPEATER POWER SUPPLY TO THE GATEWAY!



There are additional connectors under the metal TempTale RF² nameplate, but they are typically not required at installation. During installation, the plate should be left in place and only removed under the direction of Sensitech factory personnel.



2.3. RF² Gateway Specifications

Input Power	+12Vdc from a SELV limited power source					
Weight	6 lbs.(2.75 kg)					
RF Band: Gateway to Datalogger	North American ISM Band from 902 – 928 MHz European SRD Band from 863 to 870 MHz					
Frequencies - 915 MHz band	921.5 MHz	923.0 MHz	923.5 MHz	924.0 MHz	924.5 MHz	
Frequencies - 868 MHz band	866.1 MHz	866.5 MHz	866.7 MHz	867.1 MHz	867.3 MHz	
RF Reading Distance	80 to 100 meters clear-line-of-sight					
RF Data Rate	200 Kbit/s at 868 MHz; 250 Kbit/s at 915 MHz					
RF Band: Gateway to Repeater	2.4 GHz ISM Band					
RF Power Output - 2.4 GHz band	2442 MHz	2443 MHz	2444 MHz	2445 MHz	2446 MHz	2454 MHz

IMPORTANT: The RF2 Gateway contains a CR2032 lithium battery. This battery is not a customer serviceable item and if replacement is needed, it should be done only by Sensitech personnel.

3. TempTale RF² Repeater

The TempTale RF² Repeater serves as a connection between the Datalogger and the Gateway. The Repeater will receive the temperature records from the TempTale RF² Datalogger and then pass the data to the Gateway which then delivers the data to the end-user software application or host computer. An installation may require no Repeaters or many, depending on the coverage area needed.

The Repeater components are pictured in the next section.

3.1. Repeater Components

Repeater



Antennas

- 915 MHz – Yellow Tip
- 2.4 GHz – Solid Black
- 868 MHz – Gray Tip (not shown)



Power Cable



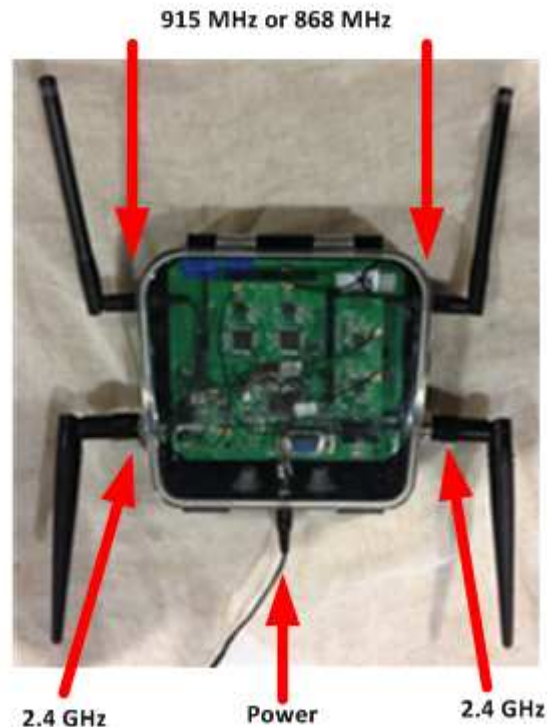
3.2. Repeater Assembly

When you receive the Repeater, carefully remove it from the shipping container and inspect for damage, especially if the shipping packaging appears to be damaged. If you determine there has been shipping damage, contact the carrier immediately.

Determine if 915 MHz or 868 MHz antennas are required, and attach them as indicated in the diagram below. The 915 MHz antennas have two yellow stripes and the 868 MHz antennas have two gray stripes.

If you attach the wrong antennas, the RF performance of the RF² Repeater may be degraded!

Next, connect the power supply provided at the two barrel power connector provided facing down on the Repeater enclosure.



NOTE: YOU SHOULD ONLY USE THE 12 VDC POWER SUPPLY PROVIDED! USING ANY OTHER POWER SUPPLY MAY DAMAGE THE REPEATER. DO NOT CONNECT THE GATEWAY POWER SUPPLY TO THE REPEATER!

4. Repeater Specifications

Input Power	+12Vdc from a SELV limited power source					
Weight	2 lbs.(1 kg)					
RF Band: Repeater to Datalogger	North American ISM Band from 902 – 928 MHz European SRD Band from 863 to 870 MHz					
Frequencies - 915 MHz band	921.5 MHz	923.0 MHz	923.5 MHz	924.0 MHz	924.5 MHz	
Frequencies - 868 MHz band	866.1 MHz	866.5 MHz	866.7 MHz	867.1 MHz	867.3 MHz	
RF Reading Distance	80 to 100 meters clear-line-of-sight					
RF Data Rate	200 Kbit/s (868 MHz) , 250 Kbit/s (915 MHz)					
RF Band: Gateway to Repeater	2.4 GHz ISM Band					
RF Power Output - 2.4 GHz band	2442 MHz	2443 MHz	2444 MHz	2445 MHz	2446 MHz	2454 MHz

5. TempTale RF² Datalogger

The TempTale RF² Datalogger will travel with the cargo and continuously store temperature information and a corresponding time stamp. The Datalogger will start operation when the “Start” button is pressed.

The Datalogger also has two LEDs visible on the front panel; the green LED blinks to indicate that the Datalogger is operating, taking data points, while the red LED blinks to indicate an error or alarm condition.

Until a Datalogger enters a TempTale RF² network, it will remain in low power mode where it does not transmit but instead wakes up on a specific time interval to collect data. Each time the Datalogger wakes up, it also checks if it can ‘hear’ the RF signals from a TempTale RF² infrastructure network. If it does hear the RF signals, it communicates with the network. The Gateway can then determine what information it needs from the Datalogger and send the appropriate commands.

Dataloggers also support a secondary download to a local PC using a Sensitech RF download cable. The Datalogger can be downloaded using the Sensitech ColdStream or TempTale Monitor Download application (TTMD).

The Datalogger and secondary download cable are pictured in the next section.

5.1. Datalogger Components



5.2. RF Auto-Roaming

The TempTale RF² Gateway and Repeater infrastructure devices can be configured for operation at 868 MHz or 915 MHz, depending where they are installed. The Datalogger will automatically detect the frequency of the infrastructure and switch to the corresponding frequency for the network detected.

5.3. Logging Data

The Datalogger has the capacity to store 1920 temperature records. When the 1920 record locations are full, the Datalogger will stop taking new temperature records so no existing temperature records will be overwritten. The time interval used to store data points is configurable based on the desired length of operation and is programmed into the Datalogger when shipped.

When the Datalogger is running and no alarms have been triggered, the green LED will flash once every four seconds. If the Datalogger is stopped and no alarms have been triggered, the green LED will flash once every eight seconds. If there is no red Alarm LED and no green Status LED flashing, the device has not been started and is not logging data points.

5.4. Alarms

Based on programmed parameters, the Datalogger makes its own decision as to whether it is in alarm and if it is, it flashes a red LED to indicate that. Once the red LED is lighted because of an alarm, the alarm will be sent to the TempTale RF² network infrastructure as soon as the Datalogger detects it.

If the red Alarm LED is flashing once every four seconds, this means an alarm was triggered and the Datalogger is still running. If the LED flashes once every eight seconds, this means an alarm has been triggered but the Datalogger has stopped taking data point.

There are four different alarm types and the logic behind each is listed below:

Alarm Type	Alarm Logic
Continuous events for high alarm	Alarm will trigger when a certain number of consecutive temperature records are higher than a predetermined level.
Cumulative events for high alarm	Alarm will trigger when a certain number of cumulative temperature records are higher than a predetermined level.
Continuous events for low alarm	Alarm will trigger when a certain number of consecutive temperature records are lower than a predetermined level.
Cumulative events for low alarm	Alarm will trigger when a certain number of cumulative temperature records are lower than a predetermined level.

5.5. Datalogger Specifications

RF Band: Gateway to Datalogger	North American ISM Band from 902 – 928 MHz European SRD Band from 863 to 870 MHz				
Frequencies - 915 MHz band	921.5 MHz	923.0 MHz	923.5 MHz	924.0 MHz	924.5 MHz
Frequencies - 868 MHz band	866.1 MHz	866.5 MHz	866.7 MHz	867.1 MHz	867.3 MHz
RF Reading Distance	80 to 100 meters clear-line-of-sight				
RF Data Rate	200 Kbit/s (868 MHz), 250 Kbit/s (915 MHz)				
Anti-Collision	Algorithm accommodates more than 200 active Dataloggers				
Battery Life	Shelf			Operation	
	12 Months			12 Months	
Battery Type	Lithium CR123A				
Temperature Range	-30 C to +70 C				
Temperature Accuracy	-30 C to -10 C		-10 C to +25 C		+25 C to +70 C
	+/- 1.0 C		+/- 0.5 C		+/- 1.0 C
Secondary Download Option	Datalogger can be downloaded via USB using Sensitech ColdStream or TempTale Manager Desktop applications				

IMPORTANT: The Datalogger contains a CR123A-type lithium battery and is not removable. If you plan to dispose of the monitor, it must be done in a manner consistent with local and national regulations for a device containing a lithium battery of this type.

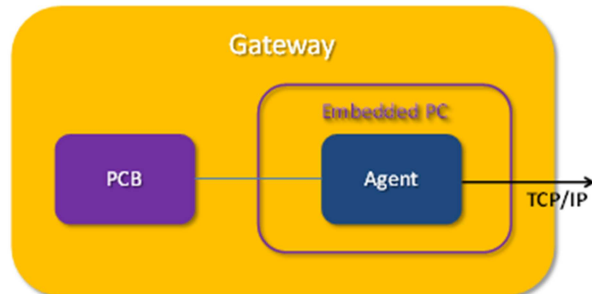
6. TempTale RF² Gateway Software

6.1. Software Overview

The program to perform the functionality of the RF² Gateway is installed on the embedded computer at the factory.

This program handles 4 main functions:

- Manage the network and Dataloggers
- Download and transmit data to the server
- Manage alarms and event triggering
- Log network activity



6.2. Windows Services \ Applications

The functionality required for the Gateway has been divided into a number of different programs and groups of programs, which are:

- Sensitech Network Manager
- Sensitech Rule Manager
- Data Transporter
- LCRF Configuration Utilities
- Sensitech Rule Viewer
- Sensitech Manual API Updater

Sensitech Network Manager

The Sensitech Network Manager is a service that manages the TempTale RF² Repeater network, handles data routing and talks with Dataloggers.

Sensitech Rule Manager

Sensitech Rule Manager is the core of the system and it decides what commands are to be issued to Dataloggers. It also handles all the rules updates and communicates with Sensitech's web service.

DataTransporter

This is a utility provided by Sensitech to transfer downloaded Datalogger data to Sensitech's server.

Configuration Utilities

This is the collection of software tools that communicate with the Sensitech Network Manager to allow an operator to manually issue commands to the Gateway and Repeater network. These tools are usually used exclusively for diagnostic and testing purposes.

Sensitech Rule Viewer

This is a tool that visually illustrates the rule system. It tracks all the Dataloggers in use in the system and shows the progress on how the rules are being executed.

Sensitech Manual API Updater

This is a tool for network setup, used before deploying the system for unattended operation.

Declaration of Conformity (DoC)

We,

Sensitech, Inc.
800 Cummings Center, Suite 258X
Beverly, Massachusetts 01915-6197 USA

declare under our own responsibility that the product:

Product Description: Battery powered device that transmits temperature
data and related information by RF

Model Number: TempTale RF² Datalogger, TempTale RF² Gateway, TempTale RF² Repeater

to which this declaration refers conforms with the relevant standards or other standardizing documents:

EN60950
FCC Part 15
EN300 220
EN 301 489-1 / -3

I understand that the manufacturer would take all the responsibilities for the above product(s).

For and on behalf of

Authorized person

Location

Name: _____

Position: _____

Date of issue: _____

*I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

FCC Statement

NOTE: 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.

Industry Canada Statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3(B)/NMB-3(B)