



# **Bulldog Temperature Monitor User Guide**

**Bulldog Technologies Inc.**

**980-00011 Rev B**

**TTM.exe Revision 1.0.0.2**

**Host firmware Revision 2.0**

**Remote Firmware Revision 2.0**

**11-16-2005**

## **Warnings**

IMPORTANT INFORMATION ON SAFE AND EFFICIENT OPERATION.

READ ALL INSTRUCTIONS & INFORMATION IN THIS USER GUIDE BEFORE USING YOUR BULLDOG TEMPERATURE DEVICE.

- There are no user serviceable parts within the Bulldog temperature device. Refer all servicing to Bulldog certified service personnel.
- There are no user serviceable parts within the Bulldog temperature device. Tampering with, or opening the product housing **will void** the warranty and the user's authority to operate the product.
- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Copyright © 2005 Bulldog Technologies Inc. All rights reserved. Contents subject to change without prior notice. All other trademarks belong to their respective owners

No part of this document may be reproduced in any form or by any means without the express permission of Bulldog Technologies Inc.

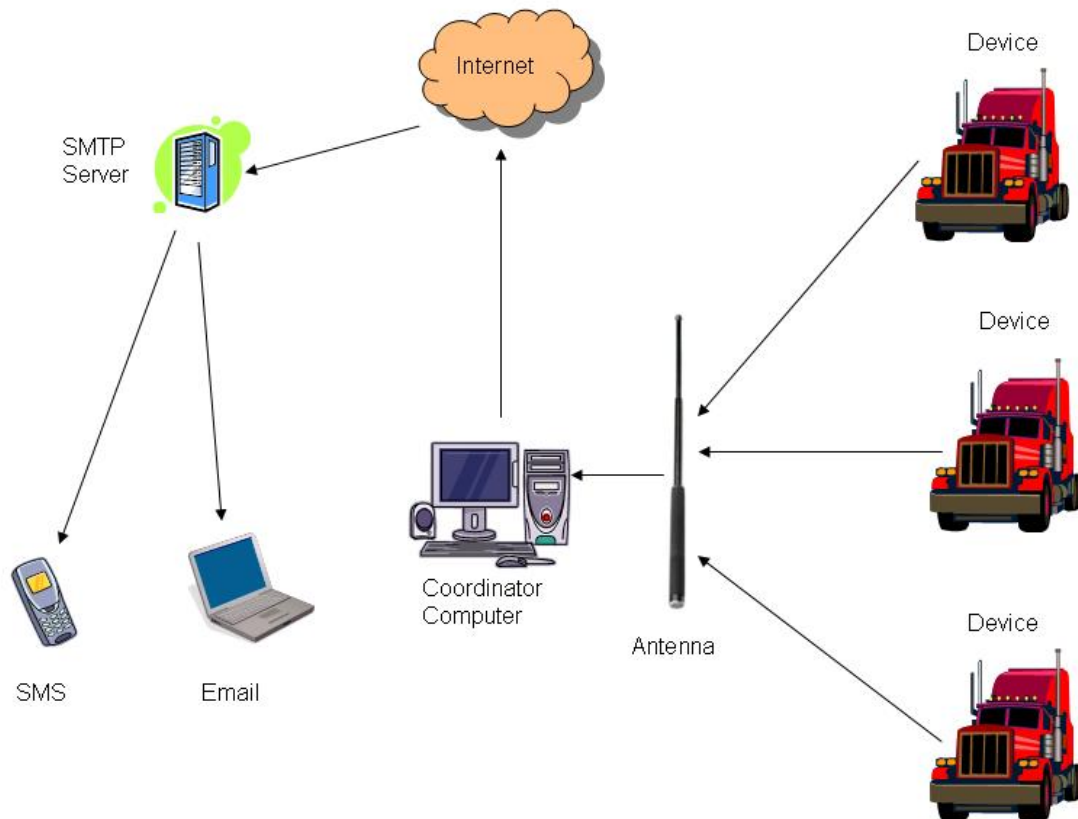
## Table of Contents

1	Introduction to Telemetry Temperature Monitor version 1.0 .....	
2	System Installation .....	
2.1	System Requirements .....	
2.1.1	Devices requirements .....	
2.1.2	Computer requirements .....	
2.1.3	Application requirements .....	
2.2	Software Components.....	
2.2.1	TTM.exe .....	
2.2.2	Devices.dbd .....	
2.3	Installation .....	
3	Usage .....	
3.1	Startup.....	
3.2	Indicators (LEDS) .....	
3.3	Query process .....	
3.4	Responses from the devices .....	
3.5	Buttons .....	
3.5.1	Connect/Disconnect.....	
3.5.2	Settings .....	
3.5.3	Devices .....	
3.5.4	To Celsius/To Fahrenheit.....	
3.6	Files generated by the application .....	
3.6.1	Settings file .....	
3.6.2	Userdevs.bdb .....	
3.6.3	Log file.....	
4	Antenna Specifications .....	
4.1	9dBi Antenna for Master Transceiver .....	
4.2	5dBi Antenna for Device Transceiver .....	

# 1 Introduction to Telemetry Temperature Monitor version 1.0

The Bulldog Telemetry Temperature Monitor a system that consists of three parts that interact to remotely monitor temperature. The three parts the TTM consist of are:

1. The Coordinator (or Base Station). This is an electronic device that permits the computer to contact and query the remote devices utilizing radio frequency. This devices has a RS422 serial connector to allow the connection with the Computer that contains the application
2. The Remote devices (or Remote Units) are electronic devices that contain Radio Frequency capabilities and also contain the Thermometer utilized to measure the temperature around them. The devices are encased in a metallic box that permits the thermometer to have a very close contact with the external temperature and also it increases the thermometer temperature readings accuracy. The devices can go within range and out of range, re-registering themselves in the network without the need of intervention. Currently, the system only allows devices ids with two characters. However, letter case is not important, that is, the unit 0A is different to the unit 0a so there is some room for a good amount of devices. If we utilize all the numbers and upper case and lower case letters, we can have thousands of devices utilizing only two characters to identify the devices.
3. The Computer Application (TTM.exe) is a windows application that will query the remote units via the Coordinator in a timely basis. This application will also detect temperatures out of specification and will generate an 'alarm' email to be sent to the email recipient set in the settings section of the application.



Telemetry Temperature Monitor system workflow diagram: Truck temperature monitoring

 Neither the temperature monitor devices nor the coordinator have user serviceable parts. If the devices cease to function correctly, they should be serviced only by Bulldog certified service personnel.

## 2 System Installation

### 2.1 System Requirements

#### 2.1.1 Devices requirements

- Antenna installed
- Coordinator installed, connected to the antenna and powered up. Coordinator also needs to be connected to the computer where the application will be running
- Remote devices installed where the temperature needs to be measured, powered up, antennas connected

#### 2.1.2 Computer requirements

- An available serial port (RS232C).
- Converter RS232-RS422 connected directly to the computer's serial port
- Windows XP / 2000 (Service pack 4)
- 233Mhz or faster Intel or compatible processor
- 256MB of RAM or greater
- SVGA 1024x768 display or better

#### 2.1.3 Application requirements

- TTM.exe installed on computer
- Devices.bdb devices database file living in the same folder as the TTM.exe application
- An available SMTP server with a valid account to send emails from the computer.

### 2.2 Software Components

#### 2.2.1 TTM.exe

This is the actual application. This application performs the following:

- Connects the computer with the coordinator
- Queries the devices through the coordinator
- Creates a daily log of activity
- Detects temperatures out of specification
- Generates alarm emails
- Allows the user to modify the device's data (temperature ranges, names)
- Allows the user to modify the application's settings (serial port to use, email settings, time gap between alarm emails)

#### 2.2.2 Devices.dbd

This file contains the ID's of the remote devices. This file is read by the application TTM.exe upon startup. If the file is modified, the application needs to be restarted.

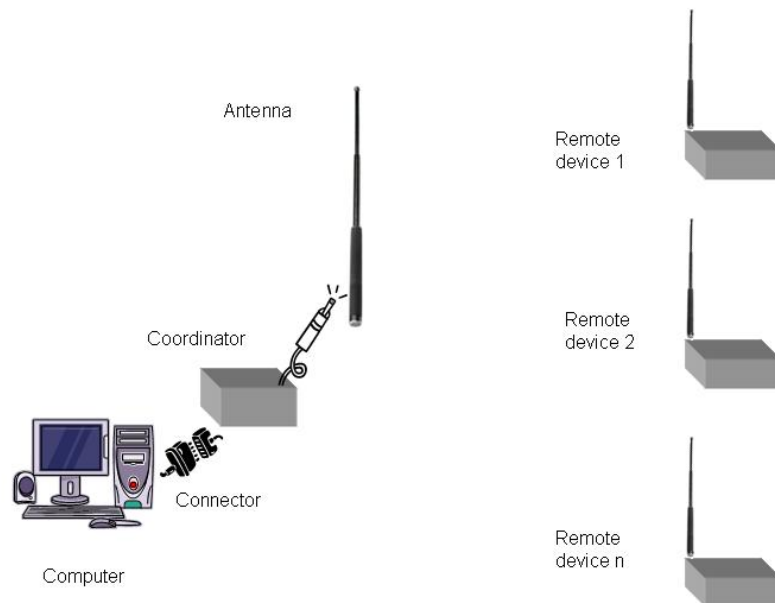
The file Devices.bdb looks like this:

0T  
0a  
0b  
0c  
0d  
0e  
0f  
0g

(these are the device's ids) Please note that this file needs one (1) extra blank line at the end of the file.

## 2.3 Installation

- Install the antenna
- Connect the antenna to the coordinator
- Connect the coordinator to the computer: make sure the computer has the RS422 converter attached to the serial port to use. Also, *make sure* that the RS232 part of the connector is connected to the computer.
- Connect coordinator to 9 volts or 12 volts power source.
- Install the devices where the temperature needs to be monitored.
- Copy the provided executable application to where you wish to save it on your local computer. Also, the file Devices.dbd must be present in the same folder as the application.

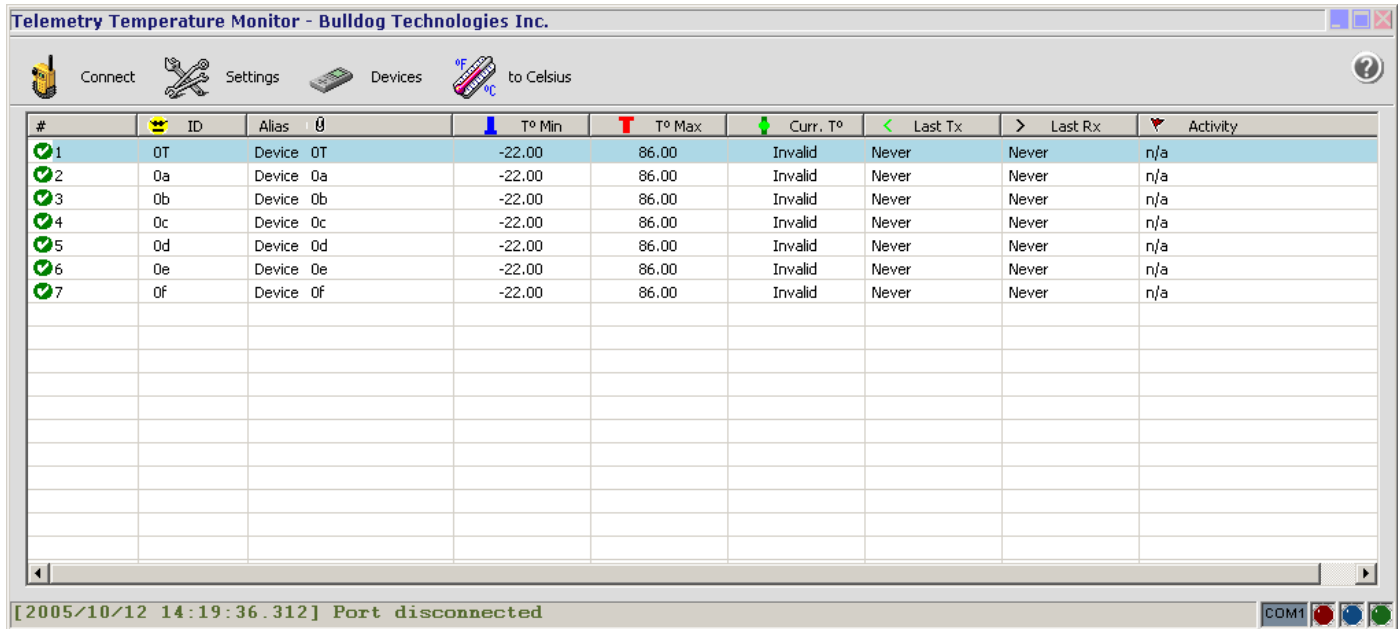


TTM hardware settings.

## 3 Usage

### 3.1 Startup

Double click the TTM icon. The application's main window looks like this:



TTM application running

Upon start up, the application will read the Devices.bdb file to populate its devices list.

### 3.2 Indicators (LEDS)



TTM Connection detail

The application has a set of indicators at the low right corner of the main window:

**COM indicator:** Indicates which port is being used to communicate with the coordinator and also indicates if there is a connection present: it changes to green if the communication was established.

**Timeout indicator:** (Red LED) it blinks while the coordinator is timing out.

**Tx indicator:** (Blue LED) It blinks when data is being transmitted

**Rx indicator:** (Green LED) It blinks when data is being received.

### 3.3 Query process

Once started and the device list is populated, the application will query the coordinator to test if there is communication between the computer and the coordinator.

If the application can't contact the coordinator, the process stops there. The user then must troubleshoot the communications problem (most likely the lack of a RS232-RS422 converter or a loose cable) and retry the connection by clicking on the "Connect" button.



If the application can contact the Coordinator, The “Connect” button will change to “Disconnect” and the application will start querying the devices. The coordinator receives the command from the application and tries to contact the required device. The Coordinator sends the message and then waits for a response from the queried device.

### 3.4 Responses from the devices

There are two different responses from the coordinator: The device responds with a temperature reading or the device is timed out.

1. A temperature reading from the device. This temperature can be:
  - a. Within specs: The temperature is displayed. The Application queries the next device in the list
  - b. Out of specs: The application generates an alarm email that is sent to the recipient in the email settings. This email will be sent once every  $n$  minutes, where  $n$  depends on the value given in the settings dialog.
2. If the Coordinator timeouts, the application logs a “DEVICE  $n$  TIMED OUT” message in the log file. The application then waits for three seconds before try to re-query the same device. If after three times the device still does not respond, the device is considered to be “Out of Range”. The device will stay there because it might come within range again. If this happens, the device will be detected and a temperature reading will be received from it next time it is queried

Every time the application sends or receives a message, it is displayed in the Status bar and logged in the Log file. The status bar is located at the bottom of the application’s main window.

### 3.5 Buttons



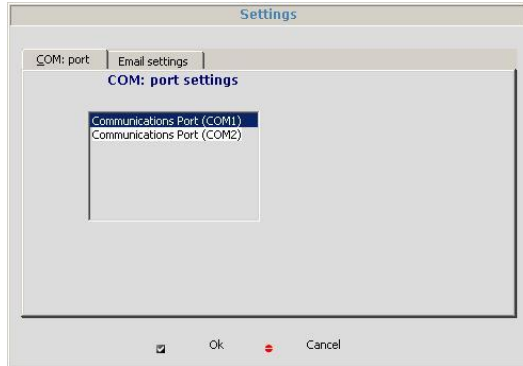
TTM buttons

#### 3.5.1 Connect/Disconnect

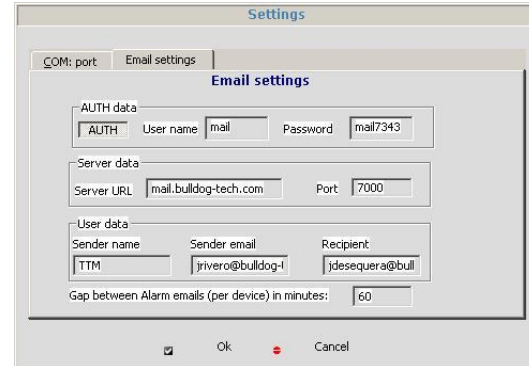
This button will perform three functions:

- It will create a connection with the serial port if is disconnected
- It will disconnect the serial port if connected
- If is connecting, it will try to contact the coordinator to see if it is available. If it is not available, this module will close the connection with the serial port.

## 3.5.2 Settings



COM port settings



Alarm email settings

The settings button will open a tab control that contains the settings for the serial port connection and the alarm email settings.

### 3.5.2.1 COM port settings

The only setting available to be modified by the user is the communication port to utilize. The application detects all the available serial communication ports and displays them in a list.

### 3.5.2.2 Email settings

#### AUTH DATA

If the server requires authorization, click the AUTH button to enable the username and password fields. Enter the required data in the relevant fields. The password will not be hidden. If the server does not require authorization, the username and password are not enabled.

#### Server Data

Enter the URL of the SMTP server and also enter the server's SMTP port. This is required because some SMTP server change the default SMTP port to avoid spam.

#### User data

**Sender name:** to be used in the email's sender name field. Enter some meaningful name here to let the recipient know that this email comes from the TTM application.

**Sender email:** Also, enter some email that the email client (or server) will not filter out as spam.

**Recipient:** This is the email of the person that will be in charge of the correction actions in case of having temperatures out of spec.

**Gap between emails per device in minutes:** Time (in minutes) between two successive alarm emails.

### 3.5.3 Devices

Devices dialog.

The application will assign default values to the devices located in the Devices.bdb file. If the user modifies this values, the application will store these values in the file “Userdevs.bdb”. This file will be read next time the application is started, restoring the values entered by the user. This dialog contains a button to locate devices and also contains navigation buttons “CD Player” style.

#### Device ID

This field cannot be modified. This value corresponds to the value embedded in the device’s software and cannot be accessed except by Bulldog Technologies Inc. authorized personnel.

#### Alias

The application creates a default alias for each device. The user must assign a meaningful alias to each device to reflect the area the device is monitoring, for instance “Freezer, 2<sup>nd</sup> floor”.

#### Min

Minimum temperature that is considered within specs for this device/monitored area.

#### Max Temperature

Maximum temperature that is considered within specs for this device/monitored area.

### 3.5.4 To Celsius/To Fahrenheit

This button will switch the temperature units between Celsius and Fahrenheit. Upon restart, the application will ‘remember’ the setting and display the temperature values utilizing the proper unit of measure.

## 3.6 Files generated by the application

### 3.6.1 Settings file

Once the settings are modified by the user, this file is created and utilized to retrieve the setting values each time the application is started.

### 3.6.2 Userdevs.bdb

When the user modifies the default values for the devices this file is created and utilized each time the application is restarted.

### 3.6.3 Log file

The application creates a text file containing time stamped events occurred during the application’s operation.

## 4 Antenna Specifications

The approved antennas for this application are a 9dBi Antenna (OD9-2400) for Master Transceiver and a 5dBi Antenna (IMAG5-2400) for the Device Transceiver. These antennas must be professionally installed by Bulldog Technologies or an approved service representative. The antenna detailed specifications are as follows.

### 4.1 9dBi Antenna for Master Transceiver



Model Number	Frequency (MHz)	Gain dBi	Applications	Connector	Length /Weight	Mominal Impedance
OD9-2400	2400-2485	9	ISM, WAN	N Female	27 inches /2.5 lbs	50 ohms

### 4.2 5dBi Antenna for Device Transceiver



Model Number	Frequency (MHz)	Gain dBi	Applications	Connector	Length /Weight	Mominal Impedance
IMAG5-2400	2400-2485	5	ISM, WAN	Male SMA With 3' RF-195 Cable	5 inches /0.3 lbs	50 ohms