BASIC INFORMATION / PRODUCT DESCRIPTION

First, an application on server must be created with keys labeled on devices. If creating application on server is finished, the device can be turned on and initiate JOIN procedure. After the device has been successfully JOINED to the server, it can start sending and receiving messages to/from server.

THERMOSTAT COMMANDS

There are tree commands which Thermostat sends to the server and one commands which server sends to the Thermostat. Device commands are:

1. Sending current data (current temperature, current humidity, set temperature and battery status) – command is 0x00,
2. Setting desired temperature – command is 0x01.

Message format of these two commands:

- First byte is a command,
- Next two bytes are current temperature,
- Fourth byte is state of humidity
(0 or 100 (%), expected value is number between 2b0 – 80 (%)),
- Fifth and sixth bytes are set temperature.
- 7th byte is battery status (0-100 (%))

The temperature being sent is multiplied by 10 with a resolution of 5. Meaning, if desired temperature is 27, we must send 270.

Reason why two bytes are being used for set and current temperature is because uint8 max is 255 but the range for temperature is from 5 – 35, meaning 50 – 350.

3. Device configuration – command is 0xFF.

- First byte is a command,
- Second byte is LoRa communication period (0 or 5 – 240 min),
- Third byte is temperature span (5 – 0,5°C, 10 – 1°C, 15 – 1,5°C and 20 – 2°C)
- Fourth byte is temperature sample time (3 – 15 min)
- Fifth and sixth bytes are set temperature.
- 7th byte is num of communications in raw (1, 2 or 3)
- 8th byte is regulation status (0 or 1)

Commands which server sends to the device:

1. Setting the temperature from the server. First byte is command - recommended to use 0x01, but every byte except 0x02 (byte reserved for different command) can be used. On the last two places (fifth and sixth bytes) the temperature is being set. The places in between are not important and it is recommended to send 0x00 for them.
    Command example:
    0x01 0x00 0x00 0x00 0x04 0x01 and the set temperature is 26 degrees
    0x04 0x01 is 260 (0x04 + 256 * 0x01 = 260), and 260/10 is 26.
    0x01 0x00 0x00 0x00 0xF0 0x00 and the set temperature is 24 degrees
    0xF0 0x00 is 240 (0xF0 + 256 * 0x00 = 240), and 240/10 is 24.
2. Setting period of communication. First byte is command and it is 0x02, followed by one byte from 0x03 to 0xF0 which represents period of minutes after the device will communicate with the server, if in that period was not themperature or humidity changes).
    Command example:
    0x02 0xF0 0x00 0x00 0x00 0x00– device will communicate with the server every 240 minutes.

If communication period is set to 0, for example, 0x02 0x00 0x00 0x00 0x00 0x00, it means that the device will communicate with the server when temperature has been changed by 0,5°C or when humidity has been changed by 10% or when new temperature has been set.

3. Setting configuration. First byte is command and it is 0x02, followed by one byte from 0x05 to 0xF0 which represents period of minutes after the device will communicate with the server, if in that period was not themperature or humidity changes, or 0x00 to disable this option. Neyt byte is used to set temperature span, which can be 5, 10, 15 and which represent 0,5°C, 1°C, 1,5°C and 2°C temp span. Nex byte is for configure temperature sempling time and it can be 3 – 15 (minutes). Next two bytes are for setting temperature, and last 6th bayte is for setting number of LoRa communication in raw and it can be 1, 2 or 3.
    Command example:
    0x02 0x0F 0x05 0x03 0xF0 0x00 0x01–
    02 - cmd set config
    0F - lora period is 16 min (0 or 5 – 240)
    05 - temp span is 0,5°C (5, 10, 15, 20)
    03 - temp sempling is every 3 min (3 – 15)
    F0 00 - set temp is to 24°C (50 - 350)
    01 - num od lora communication in raw (1, 2 or 3)

4. 0x03 is command to turn device off.
5. 0x04 is command for enable/disable relay regulation
    0x04 0x01 Enable regulation and 0x04 0x02 Disable regulation

COMMUNICATION FLOW AND WORK FLOW

Thermostat Wire LoRaWAN is a complete device, it communicates with server using LoRaWAN protocol, but it also contains low power latching relay and does regulation. Current temperature and current humidity are measured every minute. Thermostat communicates with the server in three cases:

1. Temperature has been changed by 0,5°C (or temp span from configuration) or more,
2. Humidity has been changed by 10% or more,
3. New set temperature has been changed,
4. Period of communication occurs which has been set from the server

In order for Thermostat to have active transfer and radio icon, on every communication with the server, server should echo received message from Thermostat back to Thermostat if there are no other messages in queue. If both server and Thermostat are sending command for set temperature, the advantage has Thermostat, because user is controlling the set temperature command from Thermostat. It is recommended that, if messages are sent from the server, downlink messages should be sent at least three times in order for the device to gather downlink message.

Regulation is doing on same device, so if set temperature is bigger then current temperature for 0.5°C (or temp span from configuration) or more, relay will be in ON state. If set temperature is smaller then current temperature for 0,5°C (or temp span from configuration) or more, relay will be in OFF state.