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INTRODUCTION

This document contains communications protocol for the IOT device.

1 Packet

Packet Type1:

Each packet must start with a header to identify the device and various attributes of the device

T,S1,3582810001,2,56,1,0,5,75,*****,3.5

Item	Description	Range	Example
Header	The header	–	T
Device Type	Device Type	–	S1
DevEUI	DevEUI	–	3582810001
Software Version	Software Version installed	–	2
Sequence Number	Packet Sequence Number	1 – 65535	56
Event	Event Code	1 – 9	1
State	State of any alarm	0 – 3 0 – Normal Reading 1 – Alarm Started 2 – Alarm Still Active 3 – End of Alarm	1
Temperature	Temperature	–	5
Relative Humidity	Relative Humidity	0 – 100	75
Movement	Accelerometer Value	0 – No Movement 1 – Movement *** – Disable Unit movement**	*****
Battery Voltage	Current Battery Voltage	0 – 5	3.5

<div align="center">Table 1</div>

Packet Type2:

Each packet must start with a header to identify the device and various attributes of the device

T,S1,3582810001,2,56,8,E118.25,N32.78,2020.03.02 15:42:38

Item	Description	Range	Example
Header	The header	–	T
Device Type	Device Type	–	S1
DevEUI	DevEUI	–	3582810001
Software	Software Version	–	2

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Version	installed		
Sequence Number	Packet Sequence Number	1 - 65535	56
Event	Event Code	1 - 8	8
longitude	GPS positioning longitude	E0-E180/ W0-W180/*	E118.25
latitude	GPS positioning latitude	N0-N90/ S0-S90/*	N32.78
time	UTC time	UTC time/*	2020.03.02 15:42:38
Temperature	Temperature	-	5

Table 2

1.1 Device Type

The device Type defines the type of device the server is communicating with.

For most cases this identifier can be ignored.

1.2 DevEUI

The Dev EUI is the number which uniquely identifies each unit.

1.3 Software Version

This field contains the current Software Version on the sensor.

1.4 Sequence Number

This is a number from 1 to 65535 to indicate the message number. Once it reaches 65535 it will reset to 1.

1.5 Event

The unit must send the reason for the data transfer and can be the following.

Event Code	Reason
1	Interval Reading
2	Temperature Alarm - Low Threshold
3	Temperature Alarm - Upper Threshold
4	Relative Humidity - Low Threshold
5	Relative Humidity - Upper Threshold
6	Low unit Battery
7	Unit movement
8	Dismantle Alarm
21	GPS positioning
22	Cached Temperature

Table 2

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1.6 State

This is the state of any alarm sent. When an alarm threshold has reached, the unit must send State 1. If the alarm continues when the next send interval reaches, then the unit must send State 2. When the end of the alarm occurs then a state of 3 must be sent.

```
0     Normal Reading (Also be sent for low battery and movement)
1     Alarm Started
2     Alarm Still Active
3     End of Alarm
```

1.7 Temperature

This is the temperature of the unit in Celsius

Example: 5

1.8 Relative Humidity

This is the Relative Humidity measured in Percentage (%)

Example: 75

1.9 Movement

This is a flag to indicate if the unit has moved.

Example: 1

1.10 Longitude

Longitude of GPS.

The letter 'E' indicates for the east longitude and the letter 'W' for the west longitude.

Example:E118.25

Report'*',if GPS fails to locate successfully.

1.11 Latitude

Latitude of GPS.

The letter 'N' indicates north latitude and the letter 'S' for south latitude.

Example:N32.78

Report'*',if GPS fails to locate successfully.

1.12 Time

UTC time

Example:2020.03.02 15:42:38

Report'*',if GPS fails to locate successfully.

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2 Data Acknowledgement

This Acknowledgement can be ignored as it will not affect Nova track. An ack may be sent between the Sensor and the Gateway.

Once the server receives and saves the packet it will send and acknowledgment to the unit to confirm whether the packet was valid or not.

The ACK or NACK must be in the following format.

ACK   T,S1,SerialNum,SequenceNumber,1

For above packet the ACK would be:

T,S1,358281000146500,56,1

3 Server Commands

The server will occasionally need to send configuration commands to the sensor. The following commands need to be supported and must be acknowledged.

Item	Description	Example
Header	The header	R
DevEUI	DevEUI	3582810001
SequenceNumber	Command Sequence Number to distinguish the command sent	
Command	The command	1
Value	The value of the command	60

Table 3

Command	Description	Type
1	Interval Reading	Integer
2	Temperature - Low Threshold	Double
3	Temperature – Upper Threshold	Double
4	Relative Humidity – Low Threshold	Double
5	Relative Humidity – Upper Threshold	Double
6	Enable/Disable Low unit Battery	Integer
7	Enable/Disable Unit movement	Integer
8	Start/Stop	Integer
9	GPS positioning interval	Integer
10	Unit movement – Angle Threshold	Integer
11	OTA reset	Integer
101	Send stored configuration	Integer

Table 4

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Example: To set the interval timer to 60 minutes the following command must be sent.

R,3582810001,205,1,60

The ACK or NACK must be in the following format.

ACK   R,DevEUI,SequenceNumber,Command,1

For above packet the ACK would be:

R,3582810001,205,1,1

The information command (101) which requires the sensor to send the currently stored configuration should return the following packet.

R,DevEUI,SequenceNumber,101,**INFO**

The INFO must be as follows:

1,Value;2,Value;3,Value;4,Value;5,Value;6,Value;7,Value;8,Value

Where 1,2,3…8 are the command values in <u>Table 4</u> and the Value for each command stored is 'Value'.

Consider the following settings on the sensor:

Command	Description	Value
1	Interval Reading	**Default: 60min**
2	Temperature - Low Threshold	**Default: 2℃**
3	Temperature – Upper Threshold	**Default: 6℃**
4	Relative Humidity – Low Threshold	**Default: 1%**
5	Relative Humidity – Upper Threshold	**Default: 99%**
6	Enable/Disable Low unit Battery	**Default: 1** **0-Disable** **1-Enable**
7	Enable/Disable Unit movement	**Default: 0** **0-Disable** **1-Enable**
8	Start/Stop	**Default: 1** **0-Stop send** **1-Start send**
9	GPS positioning interval	**Default: 180min**
10	Unit movement – Angle Threshold	**Default: 10°**

The response for a 101 command would be as follows:

R,3582810001,205,101,1,60;2,2;3,6;4,1;5,99;6,1;7,0;8,1;9,180;10,10

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4 Supplement

4.1 Automatic Sleep and wake-up mechanism

After leaving the factory's test gateway,the sensor will be sleep within 3 days,that is,it will wake up automatically every 8 hours to search whether lora network can be joined or not.

If it fails to join accepted,it will continue to sleep,and if ioin accepted, it will sending data normally in a 15-minute default cycle.

Press the "reset" button to wake up the sensor manually at any time. Sending the stop command will enable the sensor to enter a low-power mode, which means sending data in an 8-hour period.

4.2 Alarm Message

If multiple alarms occur simultaneously (temperature exceeds the standard, humidity exceeds the standard, low power or moves), each alarm message is sent once at each interval reading point. For example, four alarms occur, and at the interval reading point, four data packets are sent consecutively, corresponding to different alarm types.

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