ESMT

Disposable Sigfox solution

USER GUIDE : SenLog

ESMT Sigfox Solution Line Up

TriGo

Parcel

Description :

Designed for parcel tracking during transportation . Single-use Sigfox device with extremely low cost. Single button operation makes activation and deactivation extremely simple.

Feature :
* RC1234567 Compliant
* Uplink Class 0u for all zones
* Temp. detecting accuracy of ±3.0 ℃
* Battery life : 30 days (max.)
* Temp. logging up to 144 entries each day
* Dimension : 75mm x 37mm x 17mm
* Operating Temp. : -10℃ ~ 60℃

SenLog

Grocery

Description :

Designed for tracking the ambient temperature around the packages during transportation in **logistics** services. Single button operation makes activation and deactivation extremely simple.

Feature :
* RC1234567 Compliant
* Uplink Class 0u for all zones
* Temp. detecting accuracy of ±1.0 ℃
* Battery life : 30 days (max.)
* Configurable temp. threshold
* Temp. logging up to 288 entries each day
* Micro USB for data logger dumping
* LEDs : Green for device activation ;
         Red for abnormal temp.
* Dimension : 75mm x 37mm x 17mm
* Operating Temp. : -10℃ ~ 60℃
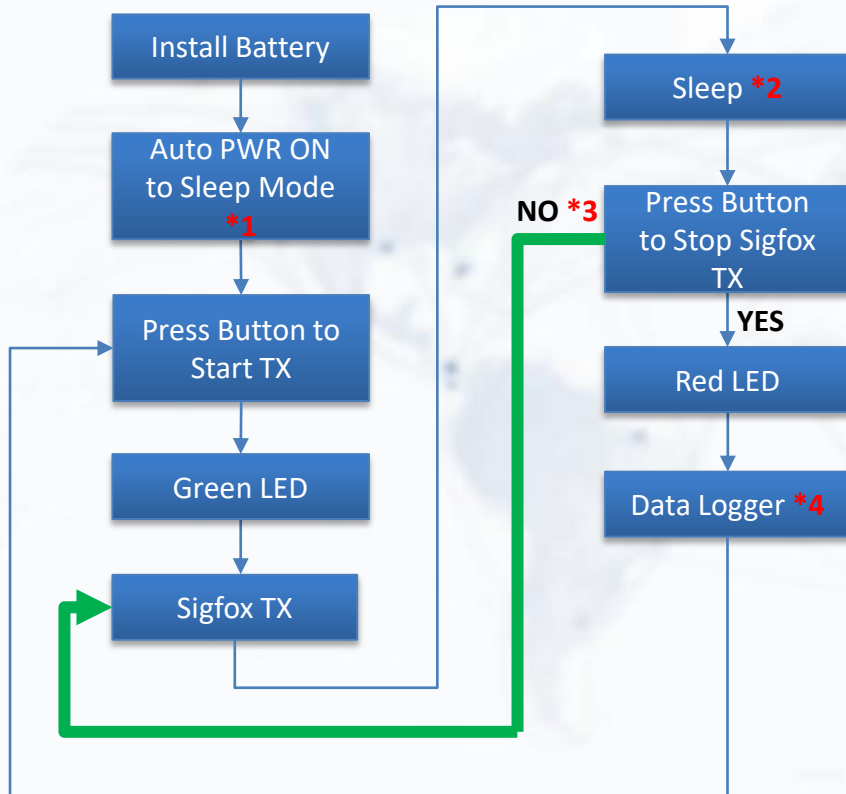
SenLog-Pro

Cold Chain

Description :

Designed for tracking the ambient temperature around the packages during transportation in **cold chain** services. Single button operation makes activation and deactivation extremely simple.

Feature :
* RC1234567 Compliant
* Uplink Class 0u for all zones
* Temp. detecting accuracy of ±0.5 ℃
* Battery life : 30 days (max.)
* Configurable temp. threshold
* Temp. logging up to 576 entries each day
* Micro USB for data logger dumping
* Firmware customization service
* LEDs : Green for device activation ;
         Red for abnormal temp.
* Dimension : 75mm x 37mm x 17m
* Operating Temp. : -10℃ ~ 60℃

sigfox

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SenLog Operation Flow

Install Battery

↓

Auto PWR ON to Sleep Mode ***1**

↓

Press Button to Start TX

↓

Green LED

↓

Sigfox TX

Sleep ***2**

↓

NO *3 Press Button to Stop Sigfox TX

↓ **YES**

Red LED

↓

Data Logger ***4**

Note :

1. Insert batteries (AAA, 2) to power on the device. Device goes into Sleep Mode automatically after boot up. The device would not wake up until the button is pressed.

2. Once the button is pressed, device will periodically wake up from sleep, detect and log current temperature with a customizable interval. This is indicated by 3 Green LED flashes.

3. Device also transmits the logged temp. data via Sigfox periodically with a customizable interval.

4. When the button is pressed the 2nd time, it will stop Sigfox TX but will still wake up to log temp. (Data Logger Mode) Indicated by 3 Red LED flashes.

5. If the button is pressed again, data transmission via Sigfox will resume. Again, 3 Green LED flashes.

6. Remove the batteries to cease all operations and reset the entire operation flow.
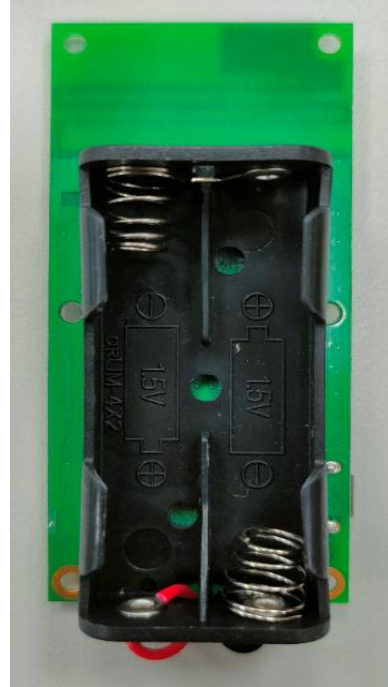
ESMT

SenLog PCBA

Note :
The Micro USB connector is for dumping log data only.
DO NOT connect it to a power source or otherwise the board will get burned out.

Activation Button

Battery Slots
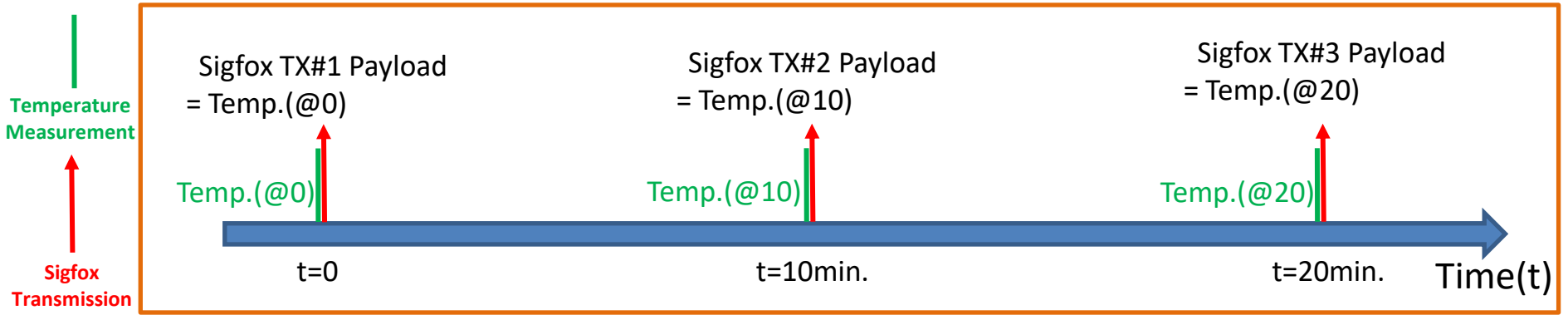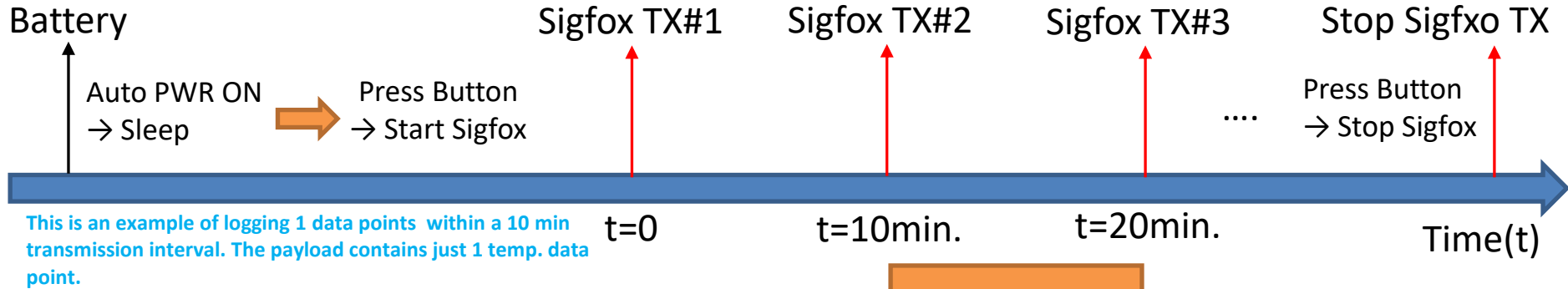(AAA x 2)

ESMT Sigfox Solution Payload

* 6 Bytes (8 Bytes : Optional) payload of Sigfox frame

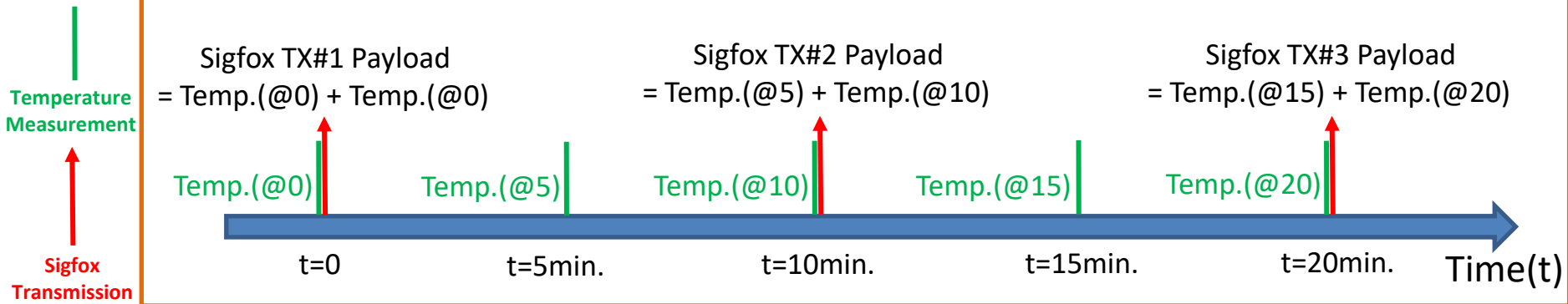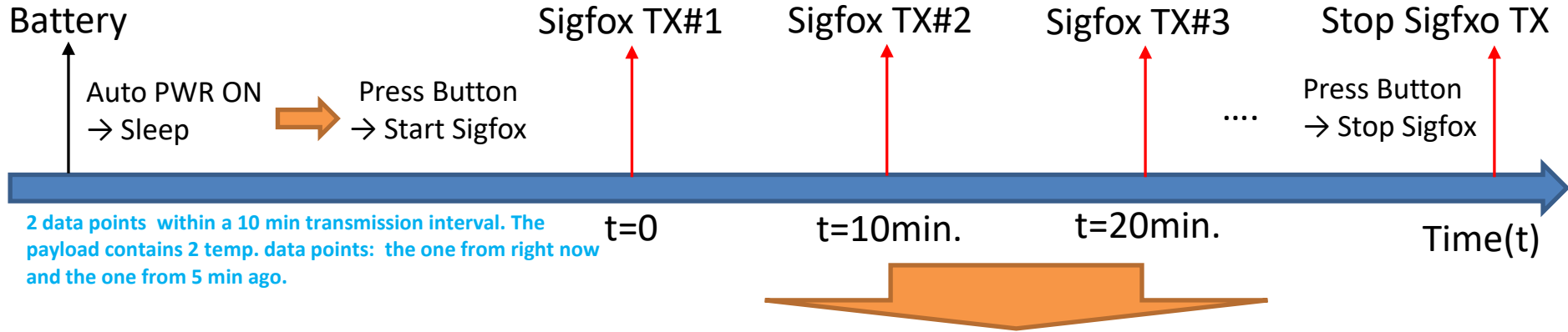| B0	B1	B2	B3	B4	B5		B6		B7
Temperature #1 - T1 (@ t = 10)		Temperature #2 - T2 (@ t = 10 + 5 min.)		Temperature Threshold	(Optional) Temperature Alarm for Customer		(Optional) Temperature Alarm for Driver		Battery Capacity (%)
T1_Integer	T1_Float	T2_Integer	T2_Float		Flag_C1	Flag_C2	Flag_D1	Flag_D2	
19	38	19	25	8A	0 *2	0 *3	0 *4	0 *5	00
25.56℃		25.37℃		-10℃	0	0	0	0	0

Note :

1. The device takes temperature reading **2 times** during a transmission interval, which is fixed at 10 min with current design. Each Sigfox TX frame carries up to 2 data points and therefore provides more information with less cost.

2. (Optional) Flag_C1 : permanent failure indicator to show that temp. has risen over temperature threshold for longer than the allow time threshold. For example, if temperature threshold is set at **A**℃ , and time threshold is set at **Y** minutes, flag C1 will be raised if the detected temperature has been above **A**℃ **and** for longer than **Y** minutes.

3. (Optional) Flag_C2 : temporary failure indicator that shows a higher-than-threshold temperature has been detected. This flag could go back down if the next sample d temperature falls back below the threshold.

4. (Optional) Flag_D1 : temporary failure indicator that shows a **Z** degree higher-than-threshold temperature has been detected, where **Z** is configurable. For example, is the temperature threshold is set at 10 ℃ and **Z** is set to 5, then flash D1 will be raised if a temperature higher than 15 ℃ is detected.

5. (Optional) Flag_D2 : same as Flag_C2.

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ESMT Sigfox Solution Operation Flow (cont.)

Battery

Sigfox TX#1   Sigfox TX#2   Sigfox TX#3   Stop Sigfxo TX

Auto PWR ON → Sleep   Press Button → Start Sigfox   ....   Press Button → Stop Sigfox

t=0   t=10min.   t=20min.   Time(t)

This is an example of logging 1 data points within a 10 min transmission interval. The payload contains just 1 temp. data point.

Temperature Measurement

Sigfox TX#1 Payload = Temp.(@0)   Sigfox TX#2 Payload = Temp.(@10)   Sigfox TX#3 Payload = Temp.(@20)

Temp.(@0)   Temp.(@10)   Temp.(@20)

Sigfox Transmission

t=0   t=10min.   t=20min.   Time(t)

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ESMT Sigfox Solution Operation Flow (cont.)

Battery

Sigfox TX#1   Sigfox TX#2   Sigfox TX#3   Stop Sigfxo TX

Auto PWR ON → Sleep   Press Button → Start Sigfox   ....   Press Button → Stop Sigfox

t=0   t=10min.   t=20min.   Time(t)

2 data points within a 10 min transmission interval. The payload contains 2 temp. data points: the one from right now and the one from 5 min ago.

Temperature Measurement

Sigfox TX#1 Payload = Temp.(@0) + Temp.(@0)

Sigfox TX#2 Payload = Temp.(@5) + Temp.(@10)

Sigfox TX#3 Payload = Temp.(@15) + Temp.(@20)

Temp.(@0)   Temp.(@5)   Temp.(@10)   Temp.(@15)   Temp.(@20)

Sigfox Transmission

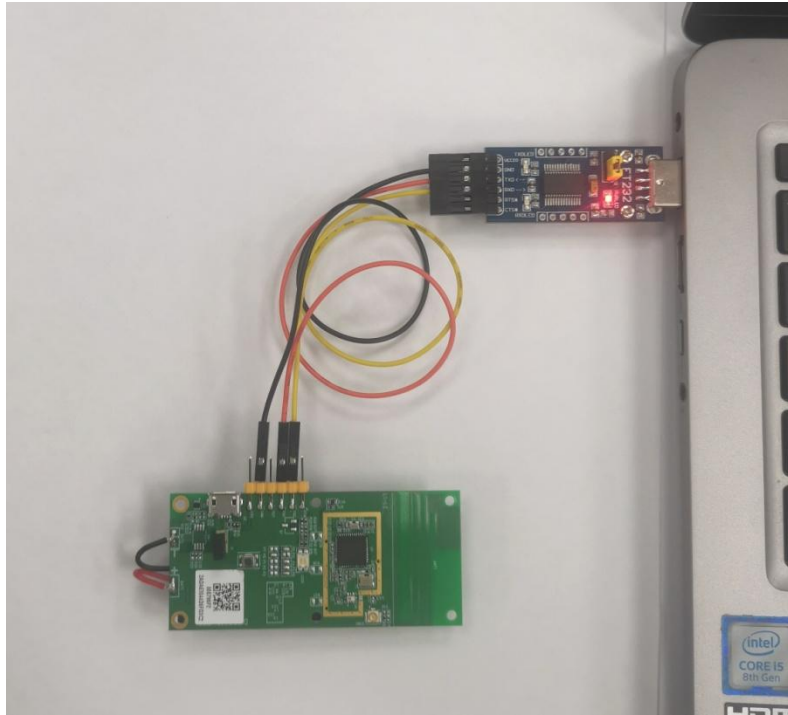t=0   t=5min.   t=10min.   t=15min.   t=20min.   Time(t)

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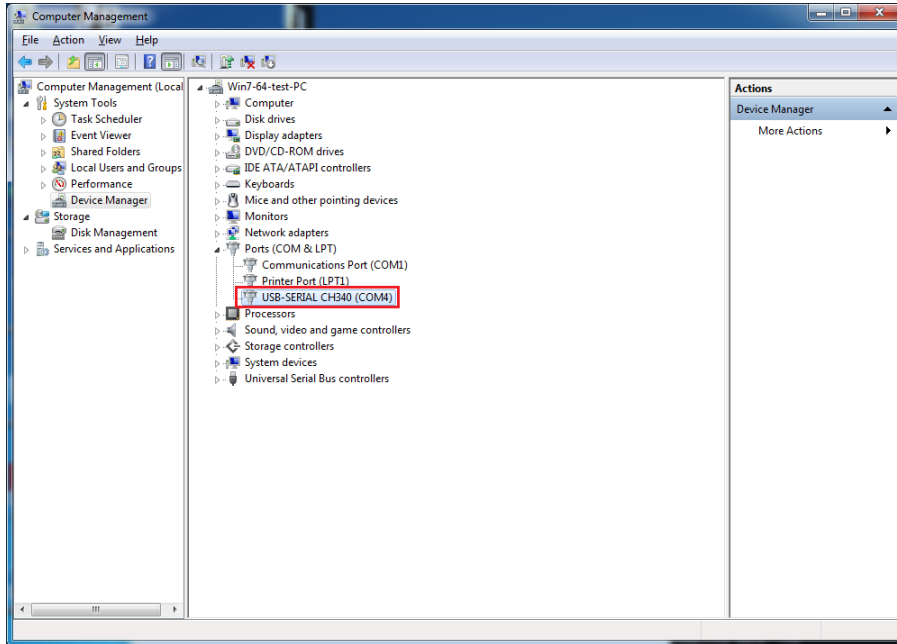
Configure the Device

www.esmt.com.tw

Connecting the Device

- Connect the USB to UART dongle to your testing PC.

- Install dongle driver: when the system ask for device driver, browse to the folder containing the driver files.
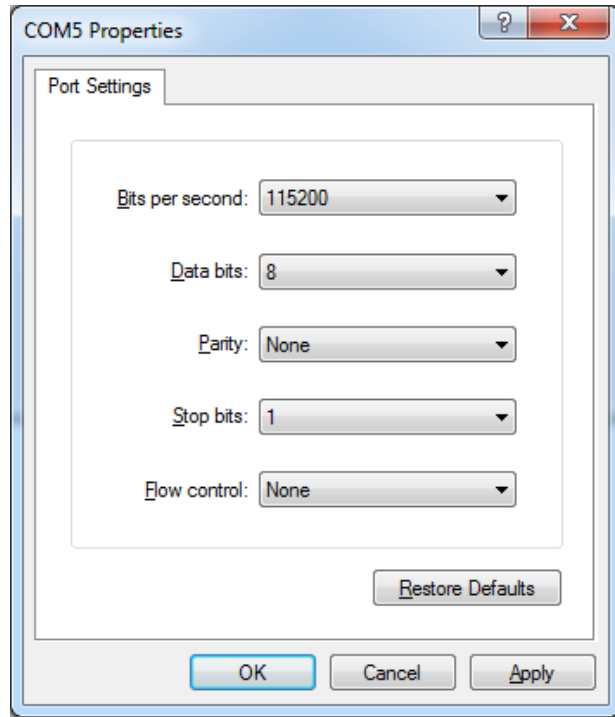
- Driver package: CH340.zip

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Connecting the Device (cont.)

- Make sure you see this device on Device Manager.

- And remember the COM number (COM4 in this case) that the system assigns it. You will need it in the next step.

- If you don't see this device, please check and make sure that the device driver has been installed correctly. You might have to install the driver again if the device didn't show up on the system as shown after the first install. Don't unplug it, just update the driver by browsing to the driver folder again.

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Command Interface Tool

COM5 Properties — Port Settings

- Bits per second: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

Restore Defaults

OK   Cancel   Apply

- Once you have the COM device installed, you need a software tool that works as the interface between you and the device. Any software tool that utilizes system COM port would work: Tera Terminal, Hyper Terminal, putty, etc.

- You do need to configure the COM connection correctly: select the correct COM port, set the baud rate/speed to **115200**, etc.

- Open up the connection and wait for the device to enter Command Mode.

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Entering Boot/Command Mode

Reset Cable
(For Command Mode)
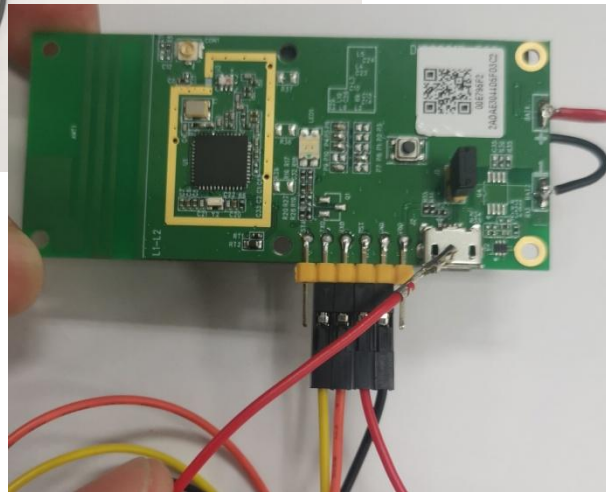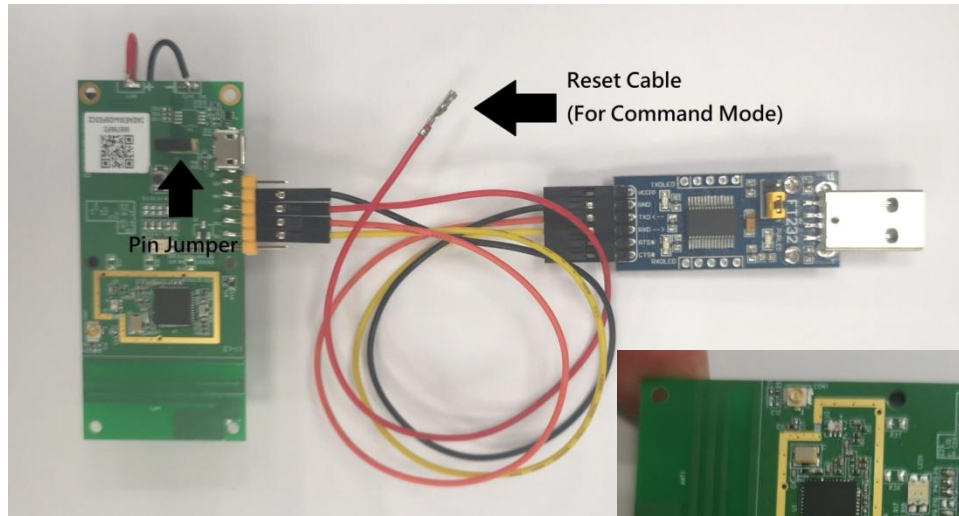
Pin Jumper

- In order to configure the device, you must boot it into boot/command mode.

- Steps:
  1. Insert batteries.
  2. Connect the UART interface cable to the PCBA as shown in the picture.
  3. **Insert Pin Jumper** as shown in the picture to keep the chip's Status Pin in low state. (Remember to remove the pin jumper after finished configuring the device.)
  4. **Send a reset signal to the chip with a brief contact (shouldn't take more than 1 second)between the reset cable and the micro USB connector.**

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Command Mode


```
Uplynx-SOC
uplynx build at Dec  9 2020, 14:46:51.
Device:TriGo
RC = 1
temperature sampling rate = 4
detect_over_temp_period:3 tx interval
range of fluctuation of temp = 5
over_temp_counter = 12,over_temp_diff = 50

Entering System Sleep mode.......b
BOOT>
BOOT>jump
Uplynx-SOC
uplynx build at Dec  9 2020, 14:46:51.

UPLYNX>
```

- If done correctly, you want to see a "**BOOT>** " prompt on the terminal software interface almost immediately after you send the reset signal to the chip. Try pressing Enter a couple of times if you don't see it.

- If you don't see the prompt, reinstall the batteries and try sending the reset signal again (touch micro USB connector with the reset cable).

- At the **BOOT>** prompt, enter "**jump**" command to enter command mode.

- When you see the "**UPLYNX>**" prompt, it means you are in command mode and are ready to configure the device.

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Current Settings: *gcd*

```
UPLYNX> gcd
********  ESMT SENLOG_PRO DEVICE INFO  ********
Device ID       :00E795F2
Device PAC      :2ADAE3044D5FD3C2
nv_mem[0]       :0x0188
nv_mem[1]       :5
nv_mem[2]       :0x1A0C
Frequency       :868130000
config_words[0]:0x00000001
config_words[1]:0x00000000
config_words[2]:0x00000000
defaultFCC_CH   :1
xoOffset        :0
tempOffset      :0
TxPower         :14
RCZ             :1
LBT_TH          :175
Config Area     :0
Config Page     :0
Erase Counter   :1
Block_NUM       :7
ADC Temp Coeff0:0
ADC Temp Coeff1:0
Warning Temp    :10
RTC Start Time :2021/03/12 - 00:30:10
OVT Period X    :3
OVT Period Y    :3
Abnormal Range :5
Sampling Rate  :4
**********************************************
```

- Once you have entered Command Mode, the first thing you should do is checking the current settings of the device. This is done by entering the command **gcd**.

- The result is a list of the current settings as shown in the picture.

- In the following slides, relative parameters will be explained in details.

- Please keep in that the default values of the configurable parameters

ESMT

Setting Current Time

- The command to set the current time is **rtc**:
  - Format: rtc [YY] [MM] [DD] [HH] [mm] [ss]
- The example on the left sets the current time at **15:41:30, March 10, 2021**
- Check the **RTC Start Time** parameter in the **gcd** command print-out to make sure the time was set as desired.

ESMT

Setting Temperature Threshold: *wtmp*

```
UPLYNX> wtmp 5

UPLYNX> gcd
********  ESMT SENLOG_PRO DEVICE INFO  ********
Device ID        :00E795F2
Device PAC       :2ADAE3044D5FD3C2
nv_mem[0]        :0x0000
nv_mem[1]        :0
nv_mem[2]        :0x0000
Frequency        :868130000
config_words[0]:0x00000001
config_words[1]:0x00000000
config_words[2]:0x00000000
defaultFCC_CH   :1
xoOffset         :0
tempOffset       :0
TxPower          :14
RCZ              :1
LBT_TH           :175
Config Area      :0
Config Page      :0
Erase Counter   :1
Block_NUM        :1
ADC Temp Coeff0:0
ADC Temp Coeff1:0
Warning Temp    :5
RTC Start Time :2021/03/10 - 15:41:30
OVT Period X    :3
OVT Period Y    :3
Abnormal Range :5
Sampling Rate  :4
**************************************************
```

- This command sets the temperature threshold.

- The command is **wtmp** :
  - Syntax : wtmp [temp], temp = -10 ~ 60

- The example on the left sets the threshold, or the **Warning Temp** parameter, to 5 ℃.

ESMT

Setting time threshold: *otpx*


```
UPLYNX> otpx 3

UPLYNX> gcd
********  ESMT SENLOG_PRO DEVICE INFO  ********
Device ID      :00E795F2
Device PAC     :2ADAE3044D5FD3C2
nv_mem[0]      :0x0000
nv_mem[1]      :0
nv_mem[2]      :0x0000
Frequency      :868130000
config_words[0]:0x00000001
config_words[1]:0x00000000
config_words[2]:0x00000000
defaultFCC_CH  :1
xoOffset       :0
tempOffset     :0
TxPower        :14
RCZ            :1
LBT_TH         :175
Config Area    :0
Config Page    :0
Erase Counter  :1
Block_NUM      :1
ADC Temp Coeff0:0
ADC Temp Coeff1:0
Warning Temp   :5
RTC Start Time :2021/03/10 - 15:41:30
OVT Period X   :3
OVT Period Y   :3
Abnormal Range :5
Sampling Rate  :4
************************************************
```

- The device must be allowed some time to reach a balance with its surrounding after it's activated in order to report/log the correct temperature data. Therefore, a **start delay** is added right after when the device is activated and before it actually starts to operate. This is the "**OVT Period X**" parameter and it's configurable.

- Syntax:
  - otpx [value], value = 1 ~255

- The example on the left sets the parameter to 3. This delay is calculated by multiplying the transmission interval by the value:
  - **10 min** * **3** = **30 minutes**

- This means that once the button is pressed and device is activated, the device will start to log/report data 30 minutes later.

ESMT

Setting time threshold: *otpy*

```
UPLYNX> otpy 3

UPLYNX> gcd
********  ESMT SENLOG_PRO DEVICE INFO  ********
Device ID        :00E795F2
Device PAC       :2ADAE3044D5FD3C2
nv_mem[0]        :0x0000
nv_mem[1]        :0
nv_mem[2]        :0x0000
Frequency        :868130000
config_words[0]:0x00000001
config_words[1]:0x00000000
config_words[2]:0x00000000
defaultFCC_CH  :1
xoOffset         :0
tempOffset       :0
TxPower          :14
RCZ              :1
LBT_TH           :175
Config Area      :0
Config Page      :0
Erase Counter    :1
Block_NUM        :1
ADC Temp Coeff0:0
ADC Temp Coeff1:0
Warning Temp   :5
RTC Start Time :2021/03/10 - 15:41:30
OVT Period X   :3
OVT Period Y   :3
Abnormal Range :5
Sampling Rate  :4
*************************************************
```

- This sets the "time" component, or the time threshold, for the C1 flag.

- Syntax:
  - otpy [value], value = 1 ~255

- Represented by "**OVT Period Y**" param.

- The time threshold is calculated by multiplying the transmission interval (fixed at **10 minutes**) by this value. In the example the time threshold is set at **10 min * 3** = **30 minutes**.

- The combination of time and temp. threshold gets you the condition for raising C1 flag. In this example, if the temperature detected is above **5 ℃** for over **30 min**, C1 flag is raised.

ESMT

Setting Abnormal Range: *otth*


```
UPLYNX> otth 10

UPLYNX> gcd
********  ESMT SENLOG_PRO DEVICE INFO  ********
Device ID      :00E795F2
Device PAC     :2ADAE3044D5FD3C2
nv_mem[0]      :0x0000
nv_mem[1]      :0
nv_mem[2]      :0x0000
Frequency      :868130000
config_words[0]:0x00000001
config_words[1]:0x00000000
config_words[2]:0x00000000
defaultFCC_CH  :1
xoOffset       :0
tempOffset     :0
TxPower        :14
RCZ            :1
LBT_TH         :175
Config Area    :0
Config Page    :0
Erase Counter  :1
Block_NUM      :1
ADC Temp Coeff0:0
ADC Temp Coeff1:0
Warning Temp   :5
RTC Start Time :2021/03/10 - 15:41:30
OVT Period X   :3
OVT Period Y   :3
Abnormal Range :10
Sampling Rate  :4
**************************************************
```

- Flag D1 is raised if the sampled temperature is greater than temperature threshold + abnormal range.

- Syntax : otth [temp], temp = 1 ~255

- The example on the left sets the Abnormal Range at **Z = 10** ℃, which means that flag D1 will be raised if a temperature 10 ℃ higher than the temperature threshold has been detected.

- Corresponds to the "Abnormal Range " field.

ESMT

Extract log data


```
UPLYNX> ddump

0000  45 53 4D 54 00 E7 95 F2 15 03 0C 00 00 0B 04 02
0001  19 1F 19 0C 19 00 18 5D 18 5D 18 5D 18 57 18 51
```

- As shown, **ddump** command is used to dump/extract data logged on the device. The data are divided into lines with 16 bytes each. The first line of the log provides some crucial information about the device.

  - 45 53 4D 54 00 E7 95 F2 15 03 0C 00 00 0B 04 02
  - 19 1F 19 0C 19 00 18 5D 18 5D 18 5D 18 57 18 51

- The first 4 bytes is a signature that marks the beginning of a log. They are actually the hex representations of the ASCII codes of the 4 letters "E" "S" "M" "T".
- Bytes 5-8 is the device ID.
- Bytes 9-14 is the time set by RTC command.
- Byte 15 is the sample interval that determines the interval between each temperature reading/sampling. Vales are 1, 2, 3 and 4 which correspond to 10 minutes, 5 minutes, 200 seconds and 150 seconds respectively.
- Byte 16 is the device model. Values are 0, 1 and 2 which corresponds to TriGo, SenLog and SenLog Pro respectively.
- From the second line on the values are just temperature data each comes with 2 bytes.

ESMT

Erasing logged temperature data

```
UPLYNX> dre
OK

UPLYNX> ddump
No Data
```

- To logged temperature data could be erased from the internal storage with the command **dre**.

ESMT

Save and double check settings

```
UPLYNX> gcd
*********   ESMT SENLOG_PRO DEVICE INFO   *********
Device ID        :007F0F44
Device PAC       :9B51791E82130320
nv_mem[0]        :0x0018
nv_mem[1]        :3
nv_mem[2]        :0x0008
Frequency        :902200000
config_words[0]:0x00000000
config_words[1]:0x40000000
config_words[2]:0x00000000
defaultFCC_CH  :63
xoOffset         :0
tempOffset       :0
TxPower          :22
RCZ              :4
LBT_TH           :175
Config Area      :0
Config Page      :0
Erase Counter    :1
Block_NUM        :4
ADC Temp Coeff0:0
ADC Temp Coeff1:0
Warning Temp   :5
RTC Start Time :2020/12/12 - 12:12:12
OverTemp Period:02
Abnormal Range :10
Sampling Rate  :02
****************************************************
```

- Once you have finished modifying the configurations and double checked with **gcd** command, type *save* command to make sure the settings are actually stored**.**

- Remember to **remove the pin jumper** before restarting the device (by removing and reinserting the batteries) to apply the new settings.

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