LoRa EVK User Manual

Ver 1P0

1. Scope & Objectives

The Product User Manual is the preliminary document that users have to read before handling & using the LoRa EVK product. It gives an overview of the product characteristics, in terms of functionality, technical characteristics, and features.

Web based UI to represent device data is out of the scope of this document, as it is designed by Tata Communications Ltd.

2. Technical Specifications

GLoBle-916EV	
Model & Version	Model: GLoBle-916EV Version: 1P0
System	LoRaWAN
CPU	STM32L151C6U6
Sensors	GPS; Temperature; Humidity; Accelerometer; BLE; Buttons; Magnet
LED	GREEN; RED; BLUE
Power	USB Charger
Anttena	4.5 dBi Antenna
Interface	9 Pin industrial interface connector
Battery	3.7V Lithium battery, 2500mAH
Power Consumption	Sleep current ~200uAmp [BLE Always ON]* Receive Mode Current <9mAmp average Transmit Mode Current 125mAmp Peak GPS ON Mode Current 38mAmp Average Charging current 500mAmp Max Full Charging time 3 hours

Note:

GLoBle-916EV is an evaluation kit used for demonstrating the sensor data acquisition functionalities over LoRaWAN. The product was originally designed to be always powered from USB power all the times. To meet Tata Communications Ltd order requirement, product is re-engineered put to add battery and efficient power management in the LoRa EVK device. Most of the sensors are in semi ON condition when EVK is in sleep/Idle modes.

For LoRa product such as Temperature & Humidity Sensor we have managed to achieve less than 6 uAmp sleep current for specific customer needs. In case specification are provided, GND Solutions can re-design the LoRa EVK device or end product to meet low power requirement of end customer.

3. Content in the box

Package box contains following items.

a) LoRa EVK [GLoBle-916EV]

GLoBle-916EV is built to demonstrate sensor data acquisition capabilities over LoRa network.

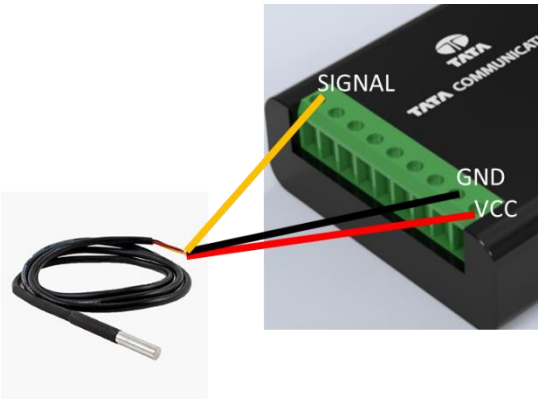
Every device is labeled with EUI, Serial No and model name on side of device.

- LoRa Transceiver
  - Sensitivity -137dBm
  - Output power upto +19dBm
  - Link budget up to 156dB
  - External High gain antenna
- GPS Receiver
  - Acquisition Sensitivity -148dBm
  - Tracking Sensitivity -165dBm
  - Reacquisition Sensitivity -160dBm
  - Horizontal position accuracy up to 2.5m
  - Patch antenna on Board
    - *[All specifications applicable when device is clear to sky]*
- Bluetooth Low Energy
  - Receiver Sensitivity -93dBm
  - Transmit power 9dBm (configurable for range)
  - Dormant mode 0.9uAmp
  - Tx peak power ~18mAmp
  - Rx peak power ~20mAmp
  - BLE transmits EVK ID Number
- User Switch
  - 2 User push button switches SW1 and SW2
- On Board sensors
  - Accelerometer
    - Full-Scale measurement range ±8g
    - Shock detection
  - Humidity
    - Measurement range 0%RH to 100%RH
    - Accuracy ±2%RH
  - Magnetic sensor (alerts close/open)
    - Operating point ±60 gauss
    - Release point ±45 gauss
  - 9 Pin Connector
    - Pin 1 → 3.3V

- Pin 2 → GND
- Pin 3 → NC [reserved for future use]
- Pin 4 → NC [reserved for future use]
- Pin 5 → UART Rx [contact GND Solutions before use it]
- Pin 6 → UART Tx [contact GND Solutions before use it]
- Pin 7 → EXT_IO1 [contact GND Solutions before use it]
- Pin 8 → EXT_IO2 [contact GND Solutions before use it]
- Pin 9 → Temperature sensor signal [refer temperature sensor section C for connections]

b) USB Charger cable [this cable is designed only for charging]

c) DS18B20 Digital Temperature sensor cable
   - DS18B20 Digital Temperature sensor
   - Cable 1 meter
   - Operating Range -5°C to +60°C
   - Accuracy ±0.5°C



4. Power up sequence

Ensure the device is kept for charging for at least 3 hours before using it. Charge with a suitable micro USB charger of rating 5V, 500mA(maximum) or by connecting it to a laptop USB 2.0 port.

For optimum performance please ensure that device is fully charged and ready to use.

After the device is fully charged duration of 6 hours, please disconnect the device.

5. Power ON/OFF

GLoBle-916EV can be turned ON/OFF using SW1 and SW2 switches.

Power ON/ Functional Mode

Press & hold SW1 & SW2 switches simultaneously until all the three LEDs glow.

Once device is in functional mode, Red LED starts glowing once in every 5 seconds.

Power OFF/ Idle Mode

Press & hold SW1 & SW2 switches simultaneously until all the three LEDs glow.

Once device is entered in lower power mode no LED's will glowing.

6. LED Indications
    1. Red LED glows once in every 5 seconds, which means the device is functional.
    2. On events of Button press and accelerometer, Green Led glows for a second which means the event is detected.
    3. On transmitting data to the network, Blue LED glows for a second which means the transmission has completed.
7. Device Settings/ Default Modes

The Product comes with default settings of GPS OFF and periodic message interval of 2 mints.

Regular Reporting of Sensor Data: Every two minute
In case of event: Immediate message is sent

8. Backup time

Idle mode:	up to 6 months
GPS Always ON mode	up to 36 hours
GPS OFF mode with 30 mints LoRa messages	up to 10 days

It is strongly advised that user must use the TCL LoRaWAN Nano Gateway when device is used for Proof of Concept demonstration for more than a week time.

9. Mounting Guidelines

Device can be just placed on table and start using. Use light sticky double side tap when it is needed to attached to any objects. A caution must be taken when removing from double side tap. Any damage to enclosures due to sticky tape, is out of warrantee.

Keep Antenna away from any metal at least 100mm for maximum range coverage and performance.

Device Settings

To change settings on the device, the following commands needs to be sent from portal

Periodic interval: 0xAA 0x01 0x05 – which means interval of 5 mins

GPS: 0xAA 0x02 0x01 – GPS On; 0xAA 0x02 0x00 – GPS Off

Miscellaneous:

1. When GPS is ON, there will be a delay of 5 seconds in transmitting the events in-order to get the latest GPS fix.
2. When GPS is OFF, messages will be transmitted immediately.
3. For No fix, device send latitude and longitude values as 0, dash board app needs to take care of this.

10. Uplink Message Protocol

Device to Server: The packet is of 20 bytes length and details as in below table.

S.No	Byte Position	Information	Remarks/Explanation
1	1	Door Sensor	0 – Door Closed 1 – Door opened
2	2	User Switch 1	0 – Switch not operated 1 – Switch pressed
3	3	User Switch 2	0 – Switch not operated 1 – Switch pressed
4	4	Temperature	MSB(Most Significant Bit) -> Sign of the temperature reported 0 – Positive Temperature 1 – Negative Temperature Bits 7^{th}-1^{st} : Absolute value of the temperature Example: 0x85 indicates -5 degree celsius.
5	5 - 8	Latitude	Example: 0x00 0x01 0xFD 0x04 Decimal equivalent of the above 4 bytes are 130308, the value should be divided by 10000 and resultant value is the actual Latitude value. The latitude reported in the above example is 13.0308 The latitude reports 0x00 in all 4 bytes when no GPS fix is available
6	9 - 12	Longitude	Example: 0x00 0x0B 0xD7 0x10 Decimal equivalent of the above 4 bytes are 775952, the value should be divided by 10000 and resultant value is the actual Longitude value. The Longitude reported in the above example is 77.5952 The Longitude reports 0x00 in all 4 bytes when no GPS fix is available
7	13	Relative Humidity %	One-byte value representing the relative humidity percentage.
8	14	Battery Level %	One-byte value representing the current battery level in percentage.
9	15 - 16	Current	Default value 0X00 [Not Applicable for GLoBle-916EV]
10	17	Movement	0 – No movement detected since last reporting. 1 – Movement detected since last reporting.
11	18	User Switch 3	Default value 0X00 [Not Applicable for GLoBle-916EV]
12	19-20	Beacon in View	Default value 0X00 [Not Applicable for GLoBle-916EV]

11. Downlink Message Protocol

Periodic interval: 0xAA 0x01 0x05 – which means interval of 5 mins

GPS: 0xAA 0x02 0x01 – GPS On; 0xAA 0x02 0x00 – GPS Off