

uLory

User Guide

Version: 1.0

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Revision History

Date of Revision	Document Version	Pages Revised	Details of Revision
April 8 th , 2019	1.0	All	New

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Caution

THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

IMPORTANT NOTE : FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

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1. OVERVIEW

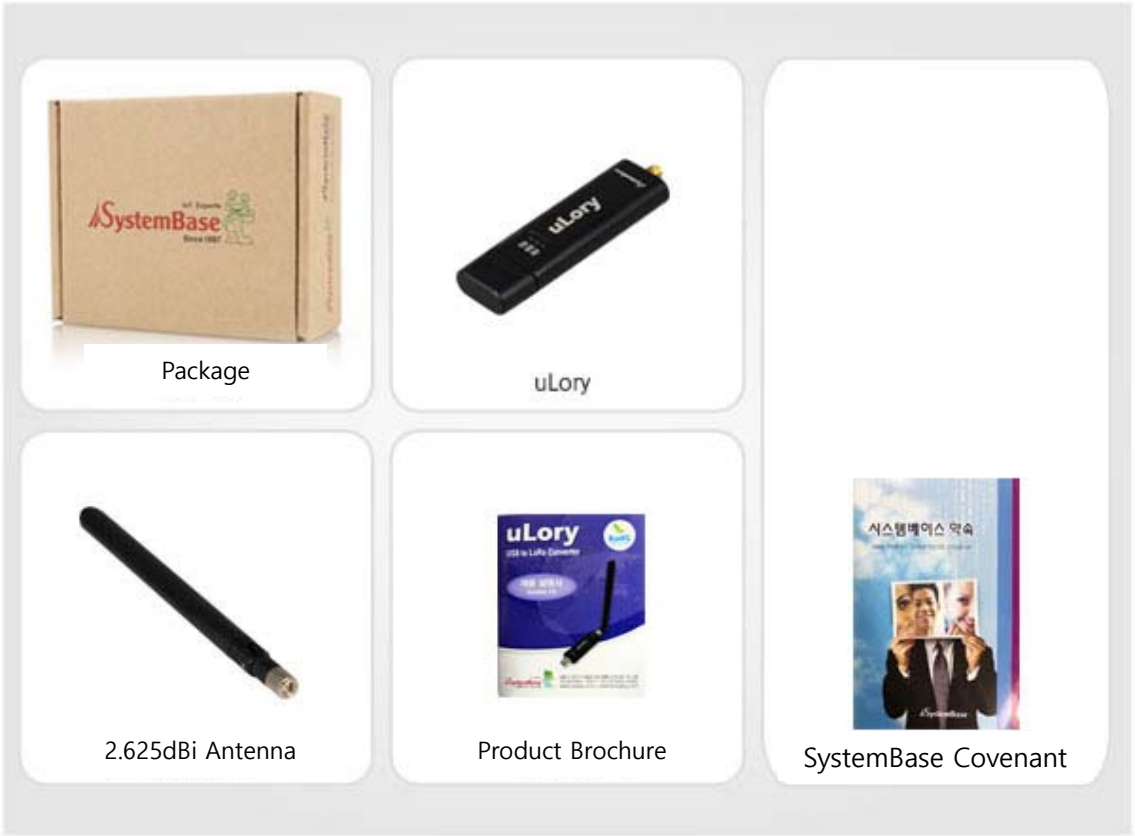
ULory is a device that converts signals of RS232 Serial to LoRa to connect with Serial devices that are several kilometers away.

LoRa (wireless communication technology for sensor networks), the next-generation communication of technology of Low Power Wide Area (LPWA) capable of transmitting small amounts of data over long ranges, enables communications up to 20 km in open terrain.

2. FEATURE

- Support low power and mid and long-range wireless communication of LoRa (Maximum of 20km in open terrain)
- Support industrial operating temperature range from -40 to 85°C
- Provide communication specification of USB 2.0
- Device setup with utilities such as Dip switch, AT Command and LoryView

3. COMPONENTS



COMPONENTS	ORDER NUMBER
uLory-1010UIL, 2.625dBi Antenna, Quick Manuals, SystemBase Covenant	uLory-1010UIL

4. HARDWARE



4.1 Specification

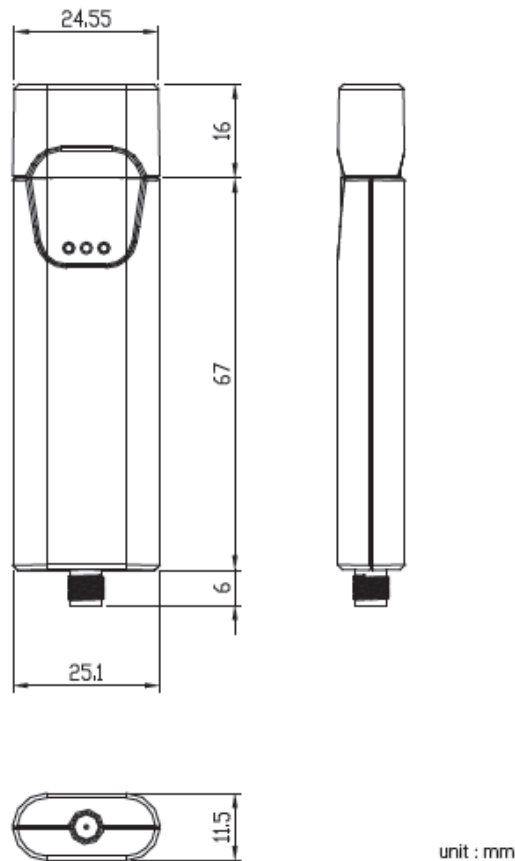
CATEGORY	SUBCATEGORY	SPECIFICATION
Wireless Interface	Frequency Band	917 ~ 923MHz
	Modulation	LoRa
	Antenna	+2.625 dBi Gain Load Antenna
Wired Interface	Standard	USB 2.0 A Type
	Signal	USB DP, DM
Display	LED	TXD, RXD, RDY
Operating Environment	Temperature	-40°C ~ +85°C
	Humidity	5~95%, non-condensable
Power		DC 5V (USB VBUS)

4.2 LED

LED	STATUS	OPERATION
RDY (YELLOW)	Blink (Interval of 0.5 sec.)	Operation Mode (Default)
	Blink (Interval of 0.1 sec.)	Setup Mode
RXD (RED)	On	Reception of Data from LoRa to USB Port
	Off	-
TXD (GREEN)	On	Transmission of Data from USB Port to LoRa
	Off	-

* If the input voltage level is lower than the rated voltage, an operation error occurs and the RDY LED will light up at the same time.

4.3 Drawing of Device



5. How to Connect

After the connection to the USB port of PC, uLory will be booted and RDY LED of the device will "blink" in the 0.1-second interval under the Setup Mode and in the 0.5-second interval under the Operation Mode.

* See 4.2 in the Manuals for details of LED operation.

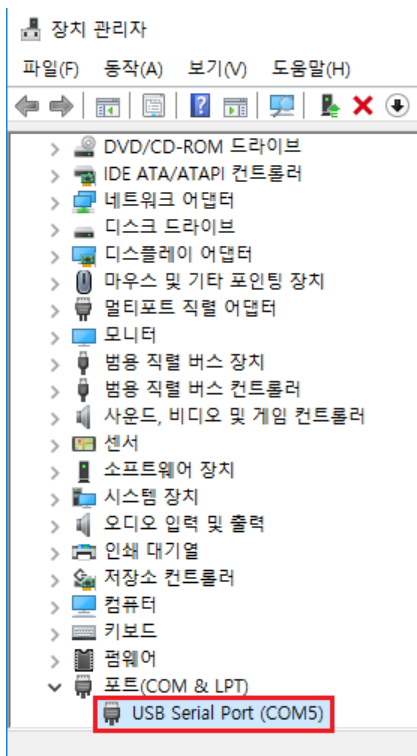
5.1 Install USB Driver Installation

- A driver, USB 2.0 A Type, needed for uLory
- Download a driver from the library at <http://www.sysbas.com>

- Install the downloaded driver (USB One Click Driver) after connecting uLory to USB Port of PC

5.2 Check USB Serial Port

- Check if USB Serial Port is created as below after installing a driver



6. How to Use

Users should adjust setting of Serial (interface, communication speed, parity bits and flow control) and LoRa (channel, Spreading Factor) for the communication between uLorys or with other devices in LoryNet via AT command or LoryView. The default Serial setting is as follows: Baud rate of 9600, Data Bit of 8 and Stop Bit of 1. Here, Data Bit and Stop Bit are not subject to change.

6.1 Switch Setting Table



NUMBER	STATUS	DESCRIPTION
1	ON	Setup Mode
	OFF	Operation Mode (Default)
2	-	Not used

6.2 Operation Mode Setting

There are two Modes for uLory: General Communication Mode and LoryNet Mode. General Communication Mode is for the communication between PC and a device via uLory while LoryNet Mode is used for the communication in a structure of LoryNet Packet.

<General Communication Mode>

Setup via command

Set and open USB Serial Port which was originally created on PCs using the terminal program as belows:

Baud Rate: 9600

Data Bit: 8

Stop Bit: 1

Parity Bit: None



Switch on (Switch 1) to change to the Setup Mode

Change to the Setup Mode via AT Command and then, LED will blink fast during the process of

switching Mode



Switch off (Switch 1) to change it back to the Operation Mode after the completion of setup.

Command Instruction

Command for basic setup

COMMAND	DEFAULT (RANGE)	DESCRIPTION
AT&Z	-	Restart the device
AT&F	-	Initialize all settings and show the initial value on the screen
AT&V	-	Show the current setting
AT&H or ?	-	Show the list of commands
AT&E	-	Shows the current AES KEY, AES IV. However, the initial AES KEY and AES IV values are not shown. Only the changed AES KEY and AES IV values are shown.
AT+PTYPE=<Mode>	1(0~1) 0 = LoryNet Mode 1 = General Communication Mode	0: Setting for connection and communication with LoryNet platform 1: Default value of setting for General Data Communication
AT+PTP	1(0~1) 0 = OFF (LoryNet Table Communication) 1 = ON (Peer to Peer)	0: Setting for LoryNet Table Communication 1: Default value of setting for General Data Communication
AT+DID=<Destination ID>	16777214(1~16777215) (16777215 is a Broadcast ID)	Enter the ID of the device to communicate with

Commands for setup of LoRa

COMMAND	DEFAULT (RANGE)	DESCRIPTION
AT+PWR= <Power>	10(1~10)	Change transmission intensity of LoRa
AT+CH= <Channel No>	20(1~20) 1=917.3MHz 2=917.9MHz 3=918.5MHz 4=919.1MHz 5=919.7MHz 6=920.3MHz 7=920.7MHz 8=920.9MHz 9=921.1MHz 10=921.3MHz 11=921.5MHz 12=921.7MHz 13=921.9MHz 14=922.1MHz 15=922.3MHz 16=922.5MHz 17=922.7MHz 18=922.9MHz 19=923.1MHz 20=923.3MHz	Change channels of LoRa
AT+SFT= <Spreading Factor>	9(7~12)	Change Spreading Factor of LoRa
AT+AES= <Encryption>	0(0, 1) 0=OFF 1=ON	0: Disable the encryption function. 1: Activate the encryption function.
AT+AESKEY= <KEY>	-	If you enter a new AES key (16 Bytes), "you must also type IV (Initialization Vector) [16 Bytes] "message is output. Enter the IV value continuously (16 Bytes).

Command for setup of Serial

COMMAND	DEFAULT (RANGE)	DESCRIPTION
AT+PAB=<Parity Bit>	N(N,O,E) N=None, O=Odd, E=Even	Set Parity Bit
AT+BAU=<Baud rate>	6(0~13) 0=600bps, 1=1200bps, 2=2400bps, 3=3600bps, 4=4800bps, 5=7200bps, 6=9600bps, 7=19200bps, 8=38400bps, 9=57600bps, 10=115200bps, 11=230400bps, 12=460800bps, 13=921600bps	Set baud rate
AT+HF=<Hardware Flow Control>	0=OFF, 1=RTS/CTS	Set flow control
AT+DMT=<Time>	5(1~255) Unit: 10ms Example) 5=50ms	<ul style="list-style-type: none"> - Used to collect serial data and transmit it to LoRa - Wait for the next data after the last data has transmitted from Serial, and then transmit data that it has successfully read to LoRa after specific period of time
AT+STXL=<Length>	0(0~3) Unit: byte 0=Not used.	Set the length of STX(Start of text) of Serial data
AT+STX=<STX1> AT+STX=<STX1>,<STX2> AT+STX=<STX1>,<STX2>,	00(00~7F)	<ul style="list-style-type: none"> - Set STX(Start of text) of Serial data - Refer to the ASCII table and

<STX3>		<p>enter the value of Hex except 0x for STX</p> <p>- Set the length in AT+STXL=<Length> before entering the desired length; For example, in order to register number 1,2 and 3, users firstly input AT+STXL=3 and then AT+STX=31,32,33</p>
AT+ETXL=<Length>	0(0~3) unit : byte 0 = not used.	Set the length of ETX(End of text) of serial data
AT+ETX=<ETX1> AT+ETX=<ETX1>,<ETX2> AT+ETX=<ETX1>,<ETX2>,<ETX3>	00(00~7F)	<p>- Set ETX(End of text) of Serial data</p> <p>- Refer to the ASCII table and enter the value of Hex except 0x for ETX</p> <p>- Set the length in AT+ETXL=<Length> before entering the desired length; For example, in order to register number 1,2 and 3, users firstly input AT+ETXL=3 and then AT+ETXL=31,32,33 .</p>
AT+DMS=<Length>	0(0~116) unit: byte	Serial data will be transmitted to LoRa after a specific length of data as specified is received

The priority is given in order of Length, STX or ETX and Time in case of that uLory includes features of Time, STX, ETX, and Length in the condition for Serial data reception.

For example, if 1237890 will firstly be recognized according to the condition of Length if 1237890456 is entered with less than the 1-second-interval and the condition is set as

follows: Length=7, STXL=3, ETXL=3, STX=31,32,33, ETX=34,35,36, Time=100. If 5671237456 is entered with less than the 1-second-interval, the number 567 will be ignored being considered as not STX because it does not satisfy the condition of Length but the second priority condition. In other words, only the number 7 will be recognized as a result of recognition of 123 for STX and 456 for ETX.

Setup via utility (LoryView)

The utility provided along with uLory is available on <http://www.sysbas.com> where users can download the data from the library of the homepage for the customer convenience. Users can use LoryView for communication, reset, initialization and firmware update, and find the detailed instructions on the use in the LoryView manual.

<LoryNet Mode>

LoryNet is an IoT platform with virtual cable that enables smooth communication as if it were reading and writing to file by connecting devices utilizing low power, mid-range wireless and wired communication technologies to the internet.

As a collection of protocols, cables and equipment in the middle to deliver signals and data between objects, the virtual cable makes it easier to connect devices in LoryNet to establish a new and desired network by improving reception from the distant or complicated connections.

Accordingly, under the LoryNet Mode, uLory reads and writes entries, which are addresses of a table to exchange data between devices with each table serving as an agency

Users can refer to the LoryView Manuals for detailed instructions on LoryNet Mode.

7. Utilization

LoRa is low power, mid- and long-range communication utilizing LPWA(Low Power Wide Area) communication technology. With slow speed but long range of transmission and reception, it is widely used in the area of remote monitoring and control such as smart street lighting, smart metering, smart farm, smart farming and smart factories.

As it boasts a communication range of the maximum of 20km in open terrain, it can be used in a variety of applications through 1:1 and 1:N communications as shown below:

~ 1:1 Diagram



~ 1:N Diagram

