Weightless Starter Kit
Getting Started

Ubiik

1.0.11

Dec. 04 2019

Revision History

Revision Code	Date	Description	Comments
1.0.0	Aug 16 2017	Initial Draft	
1.0.5	Sep 5 2017	Firmware 1.0.5	
1.0.7	Nov 11 2017	Firmware 1.0.7	LED Behavior
1.0.8	Jan 8 2018	Firmware 1.0.8	
1.0.9	May 9 2018	Firmware 1.0.9	
1.0.10	Sept 18 2018	Firmware 1.0.10	Offline setup, Links
1.0.11	Dec. 04 2019	Corrections related to description	

Table of Contents

Inside Your Kit

- 1 x Base Station
- 1 x Base Station Antenna*
- 1 x AC power adaptor for Base Station (5V, 3A)
- 2 x End Device Module Evaluation Boards (EVB)
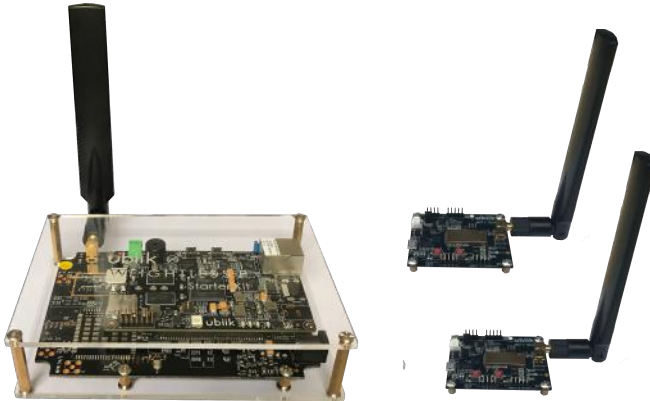- 2 x End Device Antennas*
- 2 x Micro USB to USB cable

*Base Station and End Device EVB antennas are interchangeable. Your antennas may look different from the antennas pictured in this manual (depending on whether you have ordered a 915 MHz or 868 MHz kit)

Base Station Set Up

Follow these steps before starting testing your Weightless SDK kit.

Step 1: Set-Up Hardware

Mount antennas to the Base Station and End Device EVB(s). The antennas used for the Base Station and the End Device EVB(s) are the same.

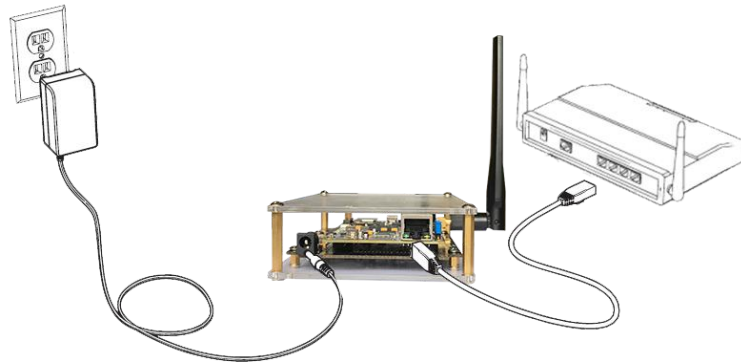## Step 2: Create Ubiik Cloud Account

Each kit includes free **ubiik cloud license** for 60days from day of Base Station registration. If customer wants to continue the usage of **ubiik Cloud** after 60days period, contact your **ubiik** representative. The starter kit can also be tested using **Offline Config Tools**

Go to https://sdk.ubiik.com/ and login into your account using the email address and password provided by your ubiik representative
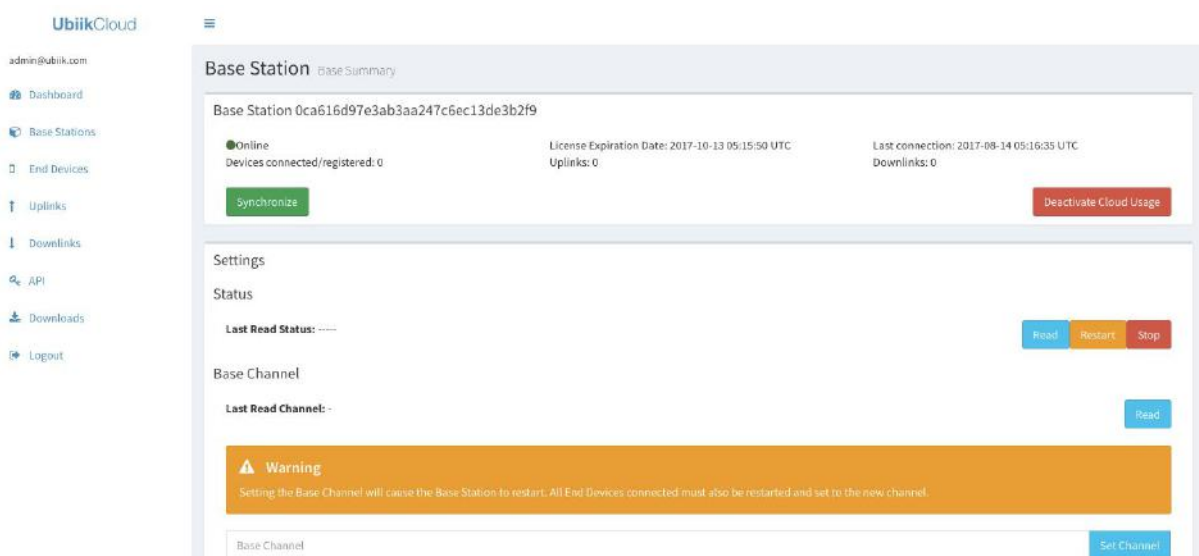
Step 3: Connect Base Station to the internet

Attach AC adaptor power cable to the base station and then plug into the power outlet to turn it ON, and then use **Ethernet cable** to **connect** to the **Base Station** and **router** with DHCP enabled.
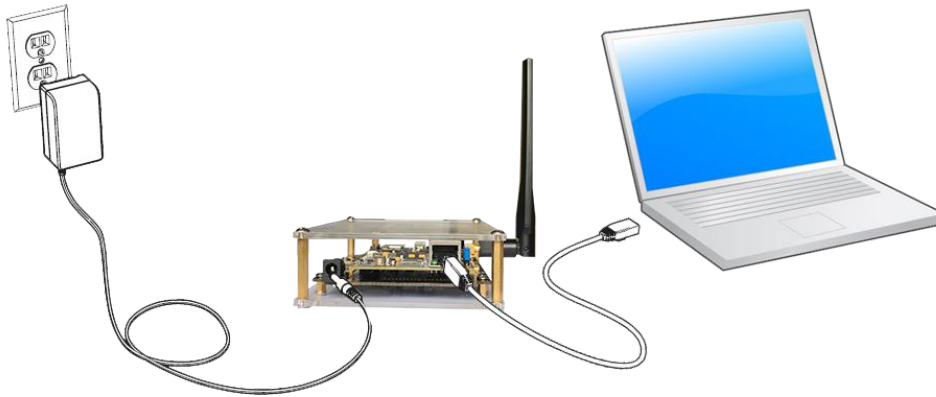
.

Wait for 2 minutes to boot and register the Base Station to the cloud. When the boot and registration is successful, you should see the Base Station appear as **"online"** (it may take another 1 to 2 minutes) on the **ubiik Cloud.**

Once your Base Station is in "**online"** state, then you can use our Offline Config Tool with lower latency or continue with online **Ubiik** Cloud tool.

Offline Hardware Setup

1. Connect your Base Station to a PC via Ethernet cable and then power on the Base Station by plug into the power outlet.

When connecting your Base Station directly to your computer, the Base Station IP address is *192.168.5.11*. It is necessary that your ethernet interface is set up to have a static IP address *192.168.5.X* with *X* different than *11* and with network mask *255.255.255.0*

See how to use the Config Tool in this setup in the *Config Tool Section*
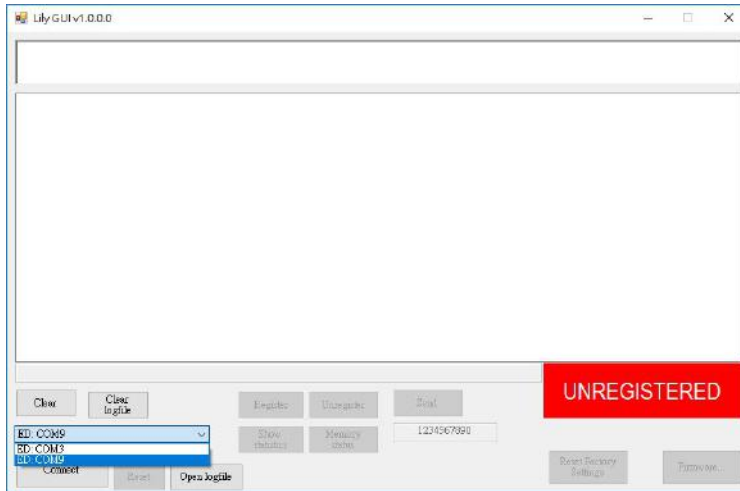
Connecting an End Device EVB

1) Download the latest Lily GUI (EVB GUI) here

The Lily GUI is used for registering and sending AT commands to your End Device EVB.

2) Once downloaded, run the program (if a security reminder pops up, please choose "yes" to run app)
3) Using the *Micro USB to USB cable,* connect your End Device EVB to a PC

4) Select COM PORT that your End Device EVB is plugged into. (You can only register one device at a time)
   "ED: COMXX" (the number depends on your computer settings)
   In the example screenshot below, our End Device EVB is ED: COM9

5) Click "Connect"
6) Once connection is established you will see "connection successful" in the top content box.

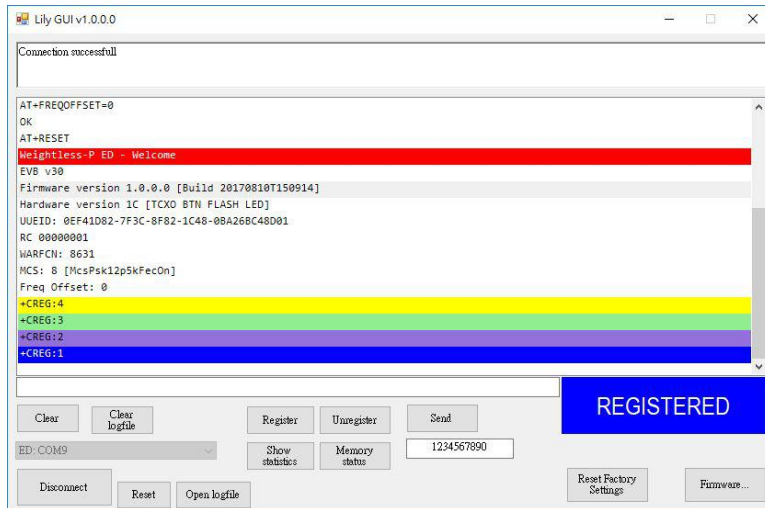7) Check that Base Station Channel and End Device frequency match.

In the End Device, you can get the WARFCN value with the AT command *AT+WARFCN=?* and set it with AT+*WARFCN=X* where *X* is the value to set.

8) Check that the MCS setting in the Base Station and End Device match

	SIB_MCS in Config Tool configuration view	**End Device**
GMSK, 100Kbps, FEC OFF	0	0
PSK, 12.5Kbps, FEC	1	2
GMSK, 50Kbps, FEC ON	2	6
PSK, 6.25Kbps, FEC ON	3	8

In the End Device, you can get the MCS value with the AT command *AT+MCS=?* and set it with *AT+MCS=X* where *X* is the value to set.

9) In about 30 seconds, the Registration process should begin. Once the Registration is completed, you will see the following content in the console.
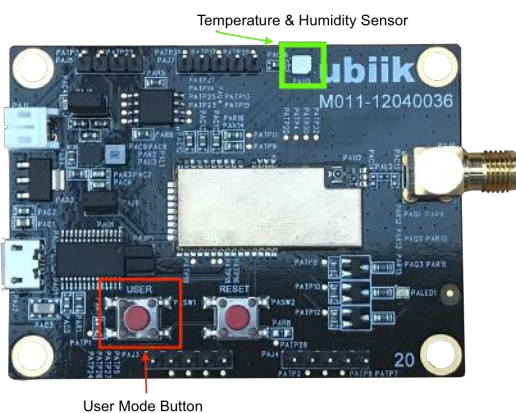

10) Now you can see the connected End Device EVB(s) in your Ubiik Cloud Dashboard and/or Config Tool Devices view.
To connect your other End Device EVB(s), click **Disconnect** and repeat steps #3-8.
*End Device EVB(s) that have completed steps #3-8 will automatically start searching for a network and registration when powered up or reset.

End Devices

UUID	Uplinks	Downlinks	Date connected	Status
0DF41DC3763C8F8B1D480BA32256A901	27	2	2017-08-13 06:51:42 UTC	● Connected
0EF41D827F3C8F821C480BA26BC48D01	2220	45	2017-08-13 06:33:26 UTC	● Connected

11) You can view the uplinks in **Ubiik** Cloud and Config Tool. By default, your EVB will be sending temperature and humidity packets every 30 seconds. To switch the mode, click the **User Mode Button.**

Temperature & Humidity Sensor

User Mode Button

User Mode (Button)

Pressing the "User Mode" button switches between two applications.

Application	Function	LED Light Color
RSSI	Sends RSSI & number of packets received periodically	Blinks Red Once Then Returns to Blue
Temp & Humidity	Sends temperature and humidity periodically	Blinks Green Once Then Returns to Blue

Uplinks and Downlinks from Ubiik Cloud

See Uplinks from the Cloud

Once the devices have been connected and sent an uplink, click on **Uplinks** on the menu and you will see a list containing the Device ID, Base Station, Data, and time at which the event was sent.
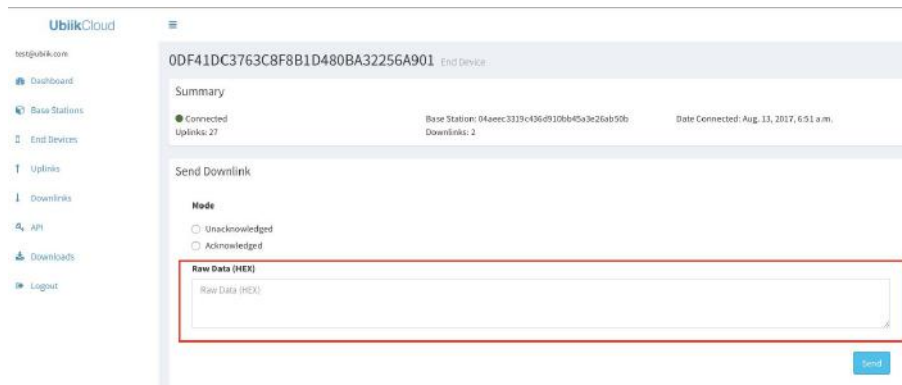The Device ID, Base Station and Data are encoded in Base64.

Send Downlinks From the Cloud

After a device has been connected to the Base Station, it will be listed in the Dashboard and the Base Station Detail page.

In order to send a downlink to an End Device EVB, click on **UUID** of the desired End Device EVB.

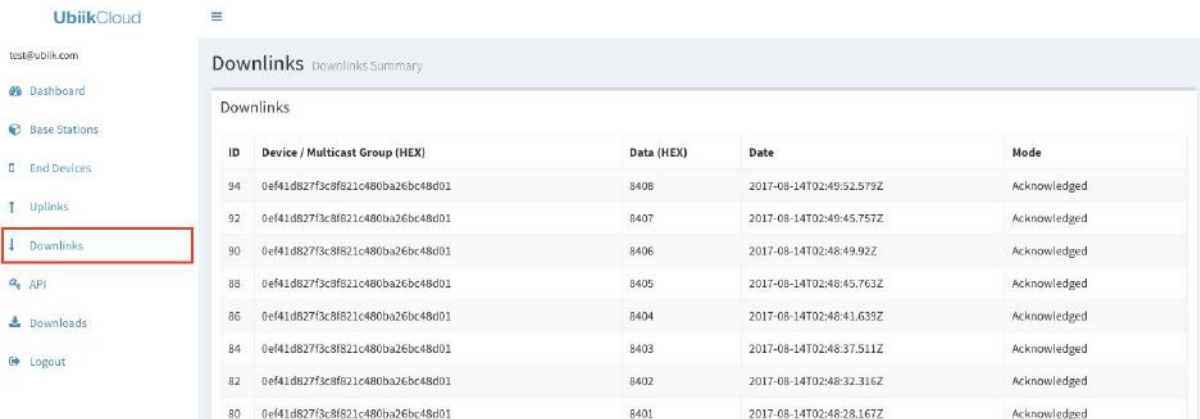You can issue downlink commands by inputting HEX data into the RAW Data (HEX) input field

Downlink Demo: Change End Device EVB LED Light

Input one of the following HEX data into the RAW Data (HEX) input field to change the End

Device EVB's LED light. Then Click **Send** to send the Downlink.

Hex Data	LED Light Color
8401	Red
8402	Green
8403	Yellow
8404	Blue
8405	Purple
8406	Cyan
8407	White
8400	LED OFF

You can view the complete downlink history in the Downlink Tab.

For more features and in-depth tutorial of **Ubiik** Cloud, please refer to *Ubiik Cloud* - *User Manual*.

Downloads:
Ubiik Cloud: User Manual https://www.ubiik.com/resources

Config Tool

1. Download the **Configuration Tool** Download link: https://www.ubiik.com/resources
   **In order to run the Configuration tool you must have Java Runtime Environment 8.
   Java Runtime Environment 8 (Official download)

This tool connects directly to the WP Protocol Stack and allows you to see the current status of the Base Station, see Uplinks, send Downlinks and perform some basic configurations.
The tool can be used with the Base Station connected directly to your PC. No internet connection is needed for it to work.
NOTE: If you have not yet registered your Base Station in Ubiik Cloud, please do so before moving forward. (see **Ubiik Cloud** section).
The application is contained in a JAR file. You can launch it by double clicking on the file or by typing the following in a terminal:

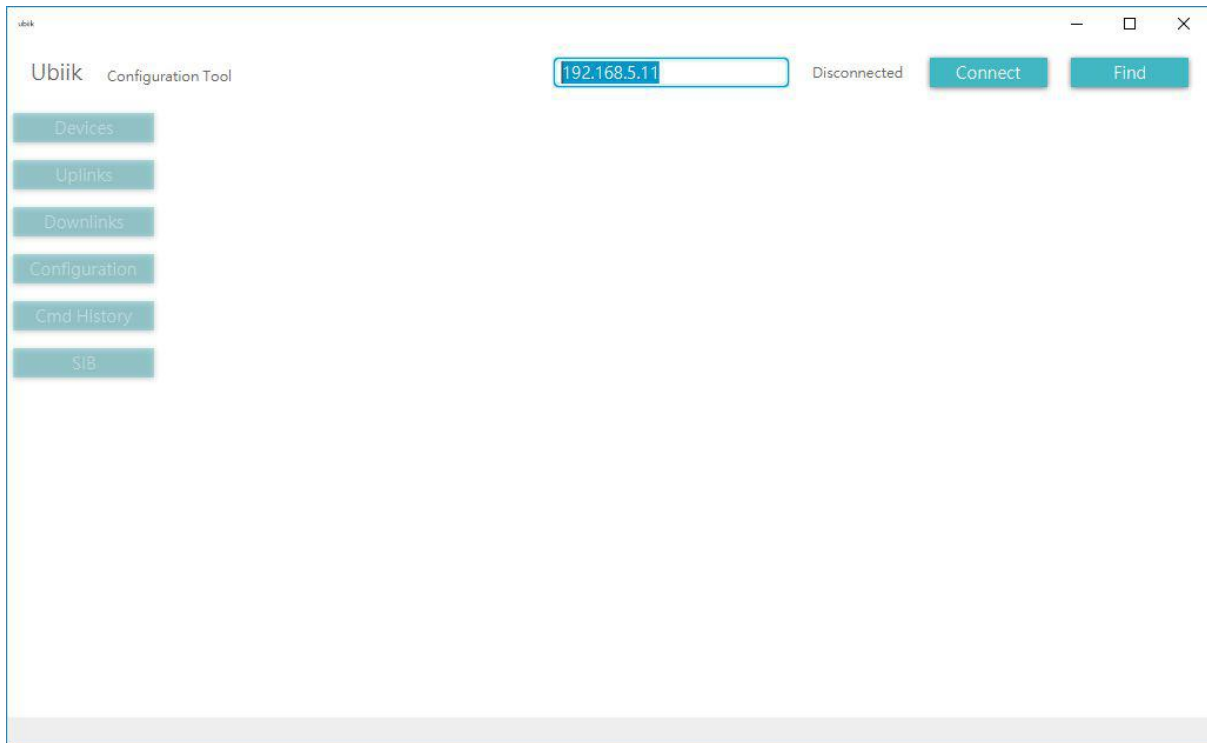> ***java -jar wp-config-tool.jar***

If you choose to use OpenJDK, you also need to install OpenJFX.
In Linux you can install with aptitude:

> ***apt-get install openjfx***

2. Launch the **Configuration tool.** Once the application has been launched, you will see the following screen

3. Connect to the Base Station

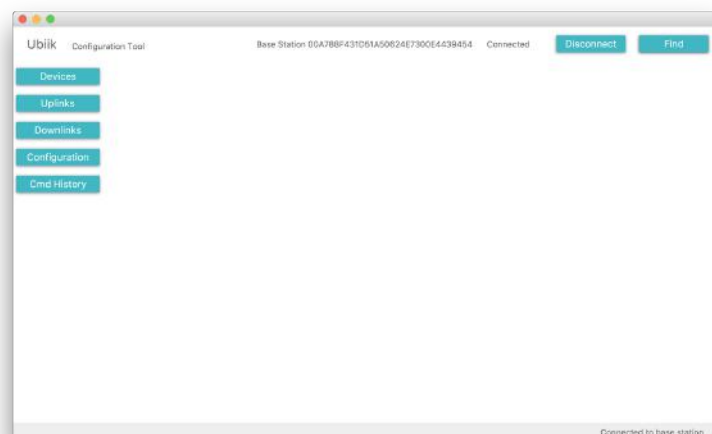   a. Base Station connected directly to your PC using a Static IP address

Connect the tool to your Base Station, you can use the address *192.168.5.11*. Then set your your PC ethernet interface to have a static IP address *192.168.5.X* (eg. *192.168.5.*1) and with network mask *255.255.255.0.*

Type the IP address and press **Connect.**

    b. Base Station connected to the local network

Press *Find* on the top right and wait for the results. Select your Base Station and click on *Connect*.

4. After connecting, the left menu will become unlocked.

5. Click on *Uplinks.* If you have already connected an End Device to this Base Station, you will be able to see the incoming uplinks in this screen.

For more features and in-depth tutorial of the Configuration Tool and LILY GUI (EVB GUI) please refer to the following

Downloads
Configuration Tool: https://sdk.ubiik.com/analytics/downloads/
Config Tool User Manual https://www.ubiik.com/resources

Downloads
LILY GUI (EVB GUI): https://sdk.ubiik.com/analytics/downloads/
LILY GUI (EVB GUI): User Manual https://www.ubiik.com/resources

Base Station

Main Components

End Device Module EVB image shows labels: Antenna Port, Ethernet RJ-45, Micro SD Card Slot, Power Supply

End Device Module EVB

Main Components

Labels: Battery Connector, Temp Humidity, Antenna Port, Micro USB, User Mode, Hard Reset, RGB LED

User Mode (Button)

Pressing the "User Mode" button switches between two applications. When this button is pressed and LED blinks RED, the RSSI application will start. This application sends RSSI and number of packets received periodically

Application	Function	LED Light Color
RSSI	Sends RSSI & number of packets received periodically	Blinks Red
Temp & Humidity	Sends temperature and humidity periodically	Blinks Green

Hard Reset (Button)

Pressing the "Hard Reset" button triggers the EVB to reset.

RGB LED

Light Color	Light Pattern	Status
Red	Solid	Disconnected
Red	Blinks Once	User Mode Button - send RSSI and number of packets received periodically
Cyan	Solid	Searching for a Base Station
Yellow	Solid	Camped & trying to REGISTER
Green	Solid	Authentication 1 of 2
Green	Blinks Once	User Mode Button - send temp/humidity periodically
Purple	Solid	Authentication 2 of 2
Blue	Solid	Fully registered & secure link established
Blue	Blinks Once or twice every 4 sec.	Connected: Blinks when receiving Resource Allocation (only Downlink Resource Allocation unless there is uplink data queued in which case also Uplink Resource Allocation)
White	Blink	Actual uplink transmission

1. End Device EVB LED starts RED signaling it is disconnected. Once you start registration by AT+CREG it will turn CYAN to indicate it is searching for a Base Station on the configured WARFCN.

2. Once a base Station is successfully found it will turn YELLOW to indicate it is camped and trying to REGISTER

3. Once the base Station accepts the registration request, the End Device will go into authentication. The LED will turn GREEN signifying security stage 1 of 2 (received Nonce from BS), then LED will turn PURPLE signifying security stage 2 of 2 (has sent ED Nonce)

4. Then the LED will turn BLUE indicating, the End Device has fully registered and established secure link

5. Every 4 seconds (adjustable beacon period), it will blink when it receives a 'beacon'.

> A Blue LED light blinking once every 4 seconds indicates a proper link with the BS.
> The LED blinks whenever the ED receives either a Downlink Resource Allocation or an Uplink Resource Allocation. It will blink twice only when it has data to transmit, in which case it would listen to Uplink Resource Allocation as well until it has an available Uplink Resource for its transmission. The actual transmit of that packet would be indicated with a White blink.
> When maximum range is reached, it would stop blinking, and it would have a Radio Link Timeout after 2 minutes, in which case it would go back to RED, then cycle again trying to find a BS.
> When sending data with AT+TX=data[,lch] you can select whether to ACK the data or not (lch 1 for *acknowledged logical channel*, 0 for *unacknowledged logical channel*. If not, then if the data is lost nothing would happen. If ACK mode is on, then it would retry until it timeout or it sends successfully.
> This can be observed from the console, where you would have
> "+TX-ACK[seq]:status" to notify of the message being sent or acknowledged.
> If sending unacknowledged, then +TX-ACK only indicates if it has been sent (status = 00). If sending acknowledged, then +TX-ACK would indicate whether Ack has been successfully received. +TX-ACK[seq]:00 indicates ACK success, other non-zero values indicate errors.

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