MERLIN RECEIVER UNIT

User Manual

KOJ Electronic Co., Ltd

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Directory

1.Introduction

1.1.Document purpose

According to the intention of Illumicare Group Limited, combined with the previous business and technical communication with the customer, the user requirement specification was designed and prepared according to the actual situation of the customer, and the functional requirements, non-functional requirements, electrical parameters and product specifications of the project were expounded, providing the basis for the generation of product requirement specification.

1.2.Document scope

this document includes Merlin-WiFi functional instructions, non-functional instructions, electrical parameters, appearance and packaging benchmarks, instructions for use, and acceptance checklist.

1.3.Readers

Readers of this program are Merlin-WiFi project stakeholders. including but not limited to Merlin project team members and Illumicare Group Limited related members of koj Intelligent Technology Co., Ltd

1.4.Terminology and interpretation

Terminology	interpretation
Merlin-WiFi	New generation area control system, mainly used for outdoor garden low-voltage lighting. Using a combination of WiFi and LoRa wireless communications technology, compared with the previous generation, allows for the control of RX devices through smartphones and smart speakers, and the barrier-free control range of the handheld remote control has increased from 300 feet to 3000 feet.
RX	Full name RX equipment. The equipment connected with lighting lamps or electrical terminals, using 12 VDC of low voltage power supply, can receive both Wi-Fi and LoRa control signals to control the opening and closing of terminal equipment.
SLAVE	Full name SLAVE remote control. LoRa based handheld remote control, support RX control. Using partition control, one area can control multiple RX,

	and also supports full on-off control of bound RX.
APP	Applications running in smartphones, specifically Tuya APP. RX devices that have been added to Wi-Fi same network can be controlled by Tuya APP,. Bind the third-party smart speakers, also empty through the voice pair
Wi-Fi	A wireless communication protocol and networking technology, which connects terminal devices through wireless routers to realize interconnection between devices. Smartphones usually support the protocol.
LoRa	A low-power wireless transmission protocol based on spread spectrum technology operates in the physical layer, mainly using Sub-GHz frequency bands, and the communication distance can reach thousands of meters.
Distribution network	The process by which a terminal device joins a network. Only after joining the network can the equipment be interconnected. Such as RX devices join HUB and SLAVE LoRa networks; HUB and router Wi-Fi networks.
Binding	The process of establishing interaction between terminal devices. After binding, the transmitter device can control the receiver device. Such as SLAVE and RX binding, user accounts and RX binding.
HUB	Wi-Fi network and LoRa network adapter. Use 12 V1A DC low voltage power supply. APP can further control the RX. connected to HUB by controlling the HUB network

2. Product Overview

2.1.Project background

Under the Illumicare Group Limited's entrustment, Wanliankeju has developed a regional control system (also known as astronomical clock system) based on the 2.4 GHz frequency without protocol stack, that is, the first generation of Merlin..(2) The The system adopts three components: MASTER、 SLAVE and RX. Timing functions (including sunrise and sunset) are controlled by MASTER. Since sunrise and sunset need to be calculated according to the location of the user, the MASTER built-in GPS module makes the product cost higher.

With the progress of technology, smartphones gradually enter the hands of ordinary users, the Internet of things platform has become mature. Since smartphones have built-in GPS modules and the integration of smartphones and Internet of things platforms can provide a more diverse operation and a good user experience, MASTER is no longer necessary. Therefore, the development of a new generation of Merlin products has a certain feasibility.

At the same time, because the product access to the Internet of things platform needs to pass through the Internet, and outdoor products are not suitable for laying network lines, the communication mode based on Wi-Fi is more suitable.

On the other hand, because the communication distance of the Wi-Fi is limited (the effective distance is only ten meters to tens of meters), Illumicare Group Limited hope that the HUB can make up for a certain lack, so it is required that the communication distance can be reached farther. Through investigation, the R & D team decided to use LoRa technology to replace the original no-negotiation stack 2.4 GHz, so that the communication distance can reach thousands of meters.

The new generation of Merlin products is a set of regional control system using Wi-Fi and LoRa dual communication mode. Merlin-WiFi. is the product interior.

2.2.Merlin-WiFi is what

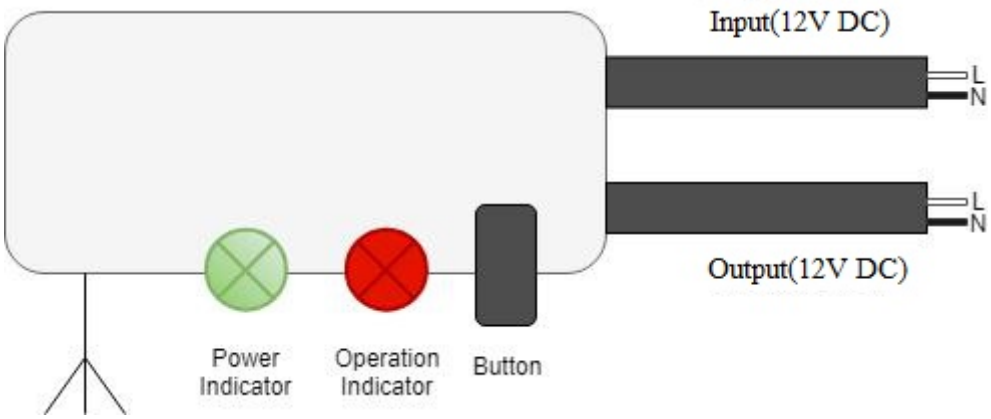
The area control system composed of smart phone end APP,RX equipment, SLAVE remote control and Internet of things platform is mainly used for low voltage lighting in other outdoor gardens. Support APP and SLAVE remote control to RX switch control.

- **APP：** The application running in the smartphone can control its switch to the RX device by WiFi, and can set various timing modes, scenes and automatic opening. tuyaAPP can be downloaded free of charge through the application market such as APPle APP Store or Google Play.
- **SLAVE Remote control：** The maximum unshielded communication distance is 3000 feet through LoRa operation of RX equipment. Its 2 AAA battery power supply. SLAVE based on area control mode, one SLAVE supports 6 regions, each region can bind multiple RX devices. RX equipment in the same area is on or off at the same time. SLAVE also supports the operation of all devices in all regions. SLAVE includes a 2-digit digital tube display, an area switch button, an open button, and a closed button. There is a backlight under the key, when any key is pressed, light up, release and extinguish.

（SLAVE Remote control）

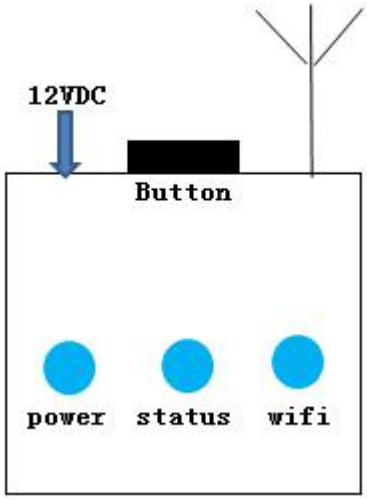
- **RX：** Terminal controlled equipment, using low-voltage DC power supply, placed in outdoor

garden. The input end is connected with the low voltage power supply source, and the output end is connected with the lighting lamp or the electrical appliance. Input and output are reserved for a certain length of wire to facilitate installation. To control its turn on or off by APP or SLAVE. Support lower temperature (-30 degrees Celsius) and meet certain waterproof requirements. RX contains a RESET key, a power indicator, an operating indicator and a rod-shaped LoRa antenna.



（RX）

- **HUB:** Wi-Fi network and LoRa network adapter. Used to connect RX, manage and control RX. You can connect to the Internet of things platform and control RX timing and instant switches through APP or other audio terminal devices.

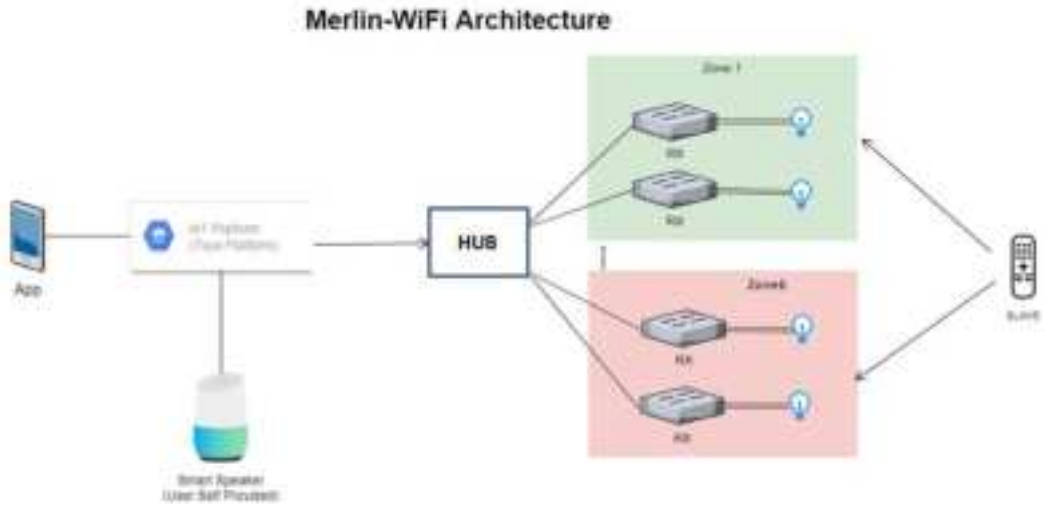


（HUB ）

- **Internet of things platform：** The Internet of things platform is used to manage RX equipment and authenticate the RX safely. End users can manage and control RX through the platform, and can also set up scene automation. Operations and maintenance personnel

can use the data analysis and operation management functions provided by them. This system uses the third party graffiti intelligent platform. APP and RX equipment are connected to the platform for interconnection. A third-party intelligent speaker can be purchased to access the platform to voice control RX equipment.

2.2.Product architecture



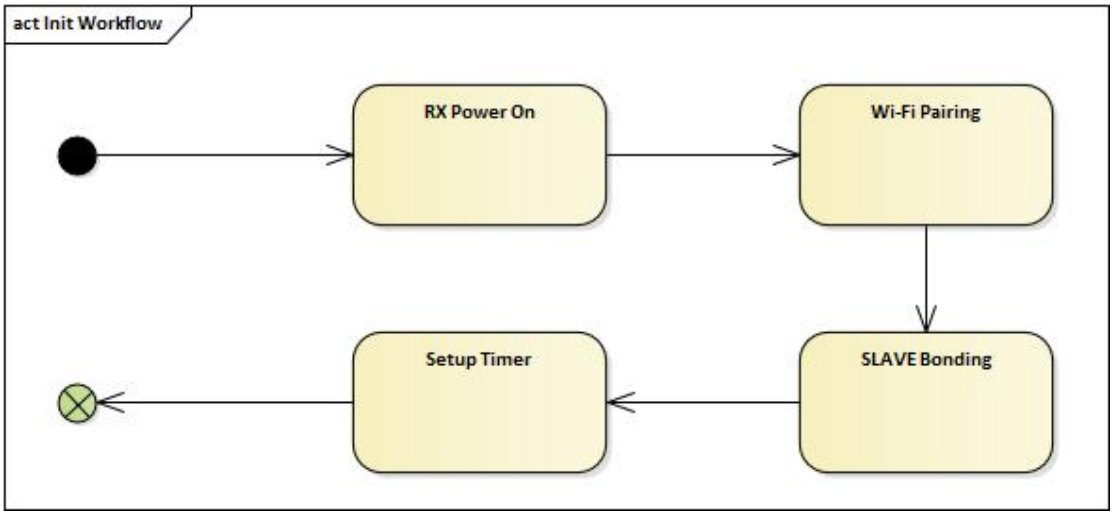
2.3.Product Applicable Population

- General users: villa residents living in North America, their outdoor gardens are larger, usually equipped with multiple garden lighting and electrical appliances. They want to be able to control multiple devices at the same time, preferably timing, especially at sunset and sunrise. Because of the large outdoor range, they also hope that the remote control distance can be as far as possible. It is best to adjust the time easily by mobile phone control.
- Illumicare Group staff: as providers of equipment, they want to track the products sold and know the status and use of the products so that they can respond in time when there is a problem. At the same time, they hope to be able to plan future sales focus according to the product usage distribution area.
- KOJ operator: as the operator, I hope to know the use of the equipment at any time, so that I can respond to the problem in time.

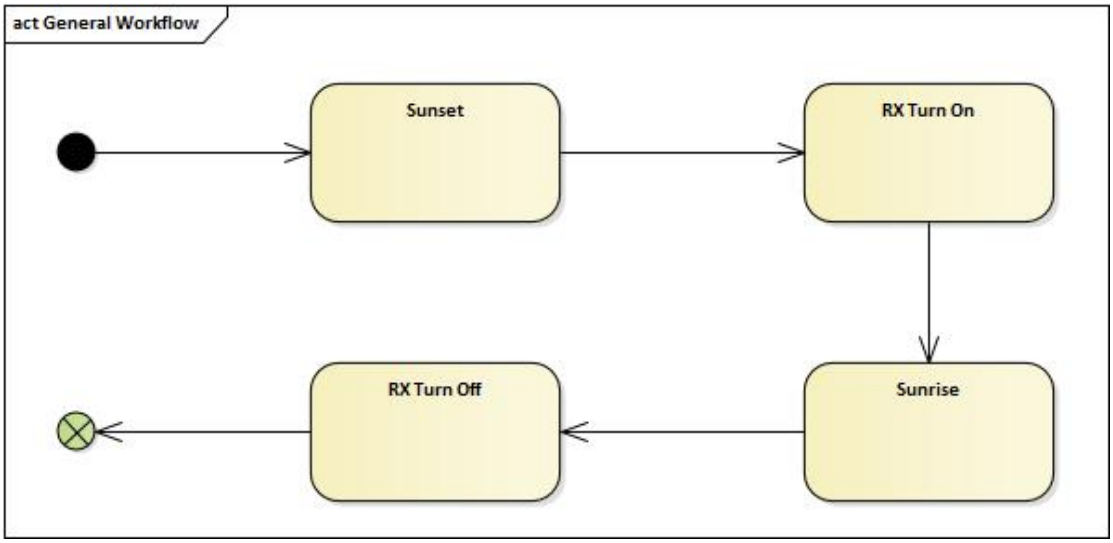
4.Product Function Description

4.1.Product mainstream

4.1.1.Initialization process



4.1.2Daily processes



4.2.Functional matrix

Functional class	NO	Function
APP class	REQ1.1	Registered accounts
	REQ 1.2	Verification account
	REQ 1.3	View a list of RX devices HUB bind
	REQ 1.4	View the specified RX device status
	REQ 1.5	transmitting the specified RX device switch signal
	REQ 1.6	Setting the scene
	REQ 1.7	Automation
SLAVE class	REQ 2.1	Switching current area
	REQ 2.2	send RX open device signal
	REQ 2.3	Send off RX device signal
	REQ 2.4	Sleep patterns
RX class	REQ 3.1	Electrical equipment
	REQ 3.2	Change of equipment status
Distribution network and binding	REQ 4.1	Establishment of accounts associated with HUB equipment
	REQ 4.2	To establish an association between SLAVE area and RX equipment
	REQ 4.3	To establish an association between SLAVE area and HUB equipment
HUB class	REQ 5.1	send RX open device signal
	REQ 5.2	Send off RX device signal
	REQ 5.3	Timing sends open RX device signal
	REQ 5.4	Timing RX off device signal
	REQ 5.5	Data interaction with APP classes

4.3.Functional detail

4.3.1.APP Class

4.3.1.0 .Overview

The system uses graffiti intelligent platform as background support, APP access to the interface of graffiti intelligent platform, and uses the automatic construction function of the platform to construct OEM APP, so all functions are provided by graffiti intelligence. Here's a brief list of Merlin-WiFi main features.

4.3.1.1.Registered accounts

A user can register an account via a mail address or mobile phone number to manage his RX device

4.3.1.2.Verification account

A user logs into his or her account to manage his or her RX device using a mail address or cell phone number.

4.3.1.3.View a list of RX devices HUB bind

Users can view a list of all RX devices that have been bound HUB this account.

4.3.1.4.View the specified RX device status

A user can view the specified RX device status, including switch status, name, and grouping.

4.3.1.5.transmitting the specified RX device switch signal

The user can send a switch signal to the specified RX device, and if it is turned on successfully, the switch state on the APP.

4.3.1.6.Setting the scene

A user can set a scenario to perform a series of operations on one or more RX, including simultaneous on or off, or to set different switching states of the device at specified intervals.

4.3.1.7.Automation

Users can set up automation to change the switching status of one or more RX when RX equipment meets specified conditions such as temperature, humidity, weather, time.

4.3.2.SLAVE Class

4.3.2.1. Switching current area

Click the ZONE button to replace the current controllable area with up to 8 areas. when switching to a AL area, indicates control of all areas. Assuming region 1, then the current region will be region 2, region 2, region 3, region 4, region 5, region 6, region AL(whole region).

4.3.2.2. Send RX open device signal

Click the open button to send an open signal to the RX of the currently selected area.

4.3.2.3. Send off RX device signal

A user clicks the open button to send a closing signal to the RX of the currently selected area.

4.3.2.4. Sleep patterns

- If the user does not operate within 10 seconds SLAVE,SLAVE enter sleep mode, the digital tube display is extinguished.
- The remote controller will exit sleep mode if the user presses any SLAVE button after the SLAVE enters sleep mode. The digital tube display lights up and displays the currently selected control area.

4.3.3.RX Class

4.3.3.1. Electrical equipment

After the equipment is connected to the power supply, the power indicator light will be long and initialized. If an account has been established and the RX equipment is associated, the operating indicator lights up long, otherwise the operating indicator lights out.

4.3.3.2. Change of equipment status

When the device receives a control signal from the HUB or SLAVE, the device output circuit is turned on or off to control the power supply of external lighting lamps or electrical appliances. Note: The state of the device does not last, so when the RX is powered off and re-energized, the

state of the device is off.

4.3.4.HUB Class

4.3.4.1. Electrical equipment

After the equipment is connected to the power supply, the power indicator light will be long and initialized. The indicator on the right is WiFi long if an account has been established the HUB device is connected, otherwise the indicator on the right is extinguished.

4.3.4.2. Received data processing

When the device receives an on or off instruction from the Internet of things platform, it sends RX, instructions to control the power supply of external lighting lamps or appliances connected to the RX. When the device receives a SLAVE, it updates RX turns on or off instructions to the cloud, APP can monitor the state of the RX in real time.

4.3.5. Distribution network and binding

If SLAVE, proceed to steps 4.3.5.1,4.3.5.2 and 4.3.5.3. If there is no SLAVE, only steps 4.3.5.1 and 4.3.5.4.

4.3.5.1. Establishment of accounts associated with HUB equipment

Users must add HUB devices to the APP to manage, that is, distribution networks and bindings. The graffiti intelligent platform integrates the two processes and uses one process to complete the two operations. The main processes are：

A. User connected to the HUB equipment power supply, power lights long light. The right WiFi lamp is extinguished if the HUB is not associated with any account; APP；
B. The user enters the add device APP and selects the Merlin device;
C. HUB long press button 5 s, right WiFi light flash;
D. The user enters the SSID and password of the wireless router in the APP;
E. APP start searching;
F. After APP successfully searching the device, the system will automatically register the device to the Internet of things platform and initialize the device;
G. HUB the device is initialized, the right WiFi lamp is in a long state; if the connection fails, the right WiFi lamp is extinguished. APP interface displays an icon (which may take a long time to display), click modify the name, and then use it normally.

4.3.5.2.To establish an association between SLAVE area and RX equipment

The user must establish an association (i.e. binding) between the SLAVE area and the RX device to control the device through the SLAVE. Mainstream follows:

A. Connect the RX device to input power supply, power supply lights long;
B. A user switches SLAVE to a specified area;
C. The user presses and immediately loosens the RX device key, RX enters the SLAVE to be bound state, at this time RX the red indicator light will flash twice;
D. A user presses a SLAVE open or close key;
E. When the binding is successful, the RX operation indicator flashes three times. If the binding fails, the RX operation indicator lights will go out.

4.3.5.3. To establish SLAVE association with HUB equipment

The user must establish an association (i.e. binding) between the SLAVE and the HUB device in order to pass the SLAVE address to the HUB device so that the RX device bound to the device can be controlled. Mainstream follows:

A. A user connected to the HUB equipment power supply, power lights long light;
B. HUB short press button, Hub middle STATUS lights flicker 2 times;
C. SLAVE user switches to any area;
D. A user presses SLAVE open or close key;
E. The middle STATUS lamp of the HUB flashes 2 times if the binding fails; if the binding fails, the middle STATUS lamp goes out.

4.3.5.4. To establish HUB association with RX equipment

This applies only to cases where only HUB and RX, not SLAVE:

A. First, follow the 4.3.5.1. steps to establish an account association with HUB equipment。
B. HUB press 5 times in a row and Led flash 5 times；
C. Connect the RX device to input power supply, power supply lights long;
D. The user presses and immediately loosens the RX device button RX enters the state to be bound, when the RX red indicator flashes twice;
E. Mobile phone selection area and click。

5.Summary of product parameters

5.1.SLAVE remote control

- Power supply :2 AAA dry batteries, not less than 1.5 V DC
- Temperature requirements :-30° C to 40° C
- Waterproof Grade: IPX3
- Communication distance: not less than 3000 feet without barrier

5.2.RX

- Input voltage:12V DC
- Output voltage:12V DC
- Maximum load:20A
- Temperature requirements :-30° C to 40° C
- Waterproof rating:IPX4
- Communication distance: not less than 3000 feet without barrier

5.3.HUB

- Input voltage:12V DC
- Temperature requirements :-30° C to 40° C
- Waterproof rating:IPX3
- Communication distance: not less than 3000 feet under LORA barrier, not less than 300 feet under WI-FI barrier

6.Appearance and packaging

6.1.Appearance dimensions

6.1.1.SLAVE remote control size

Name	Size
SLAVE	132*50*19mm

6.1.2.RX equipment dimensions

Name	Size
RX	81*62*32mm

6.1.3.HUB equipment dimensions

Name	Size
HUB	129*120*28mm

6.2.Packing size

6.2.1.SLAVE Remote control package size

Name	Size
SLAVE Remote control packaging	140*20*10mm

6.2.2.RX Equipment Packing Size

Name	Size
RX packaging	170*90*110mm

6.2.3.HUB Equipment Packing Size

Name	Size
HUB packaging	192*141*55mm

FCC Compliance Notice

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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. -Consult the dealer or an experienced radio/TV technician for help.

RF Exposure Information

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.