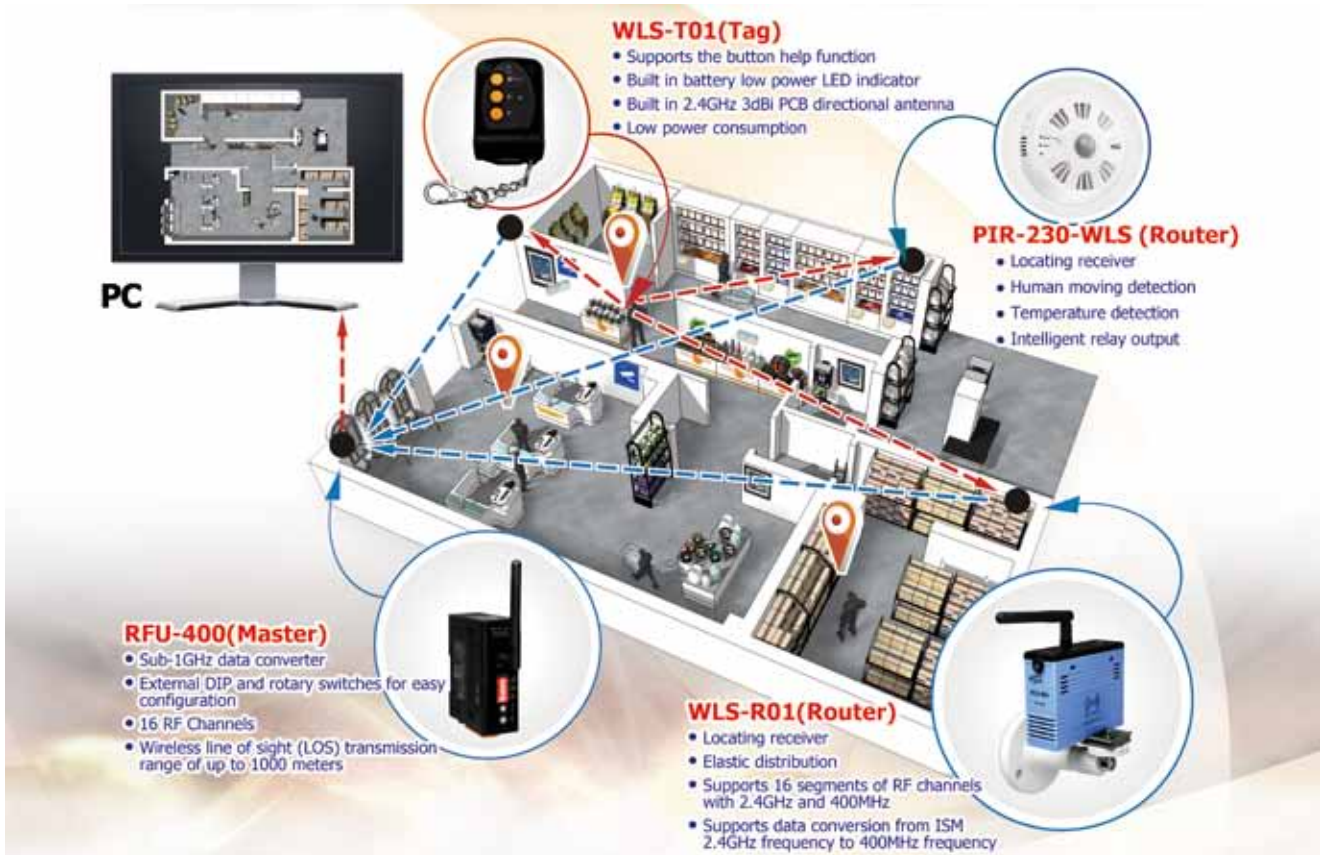


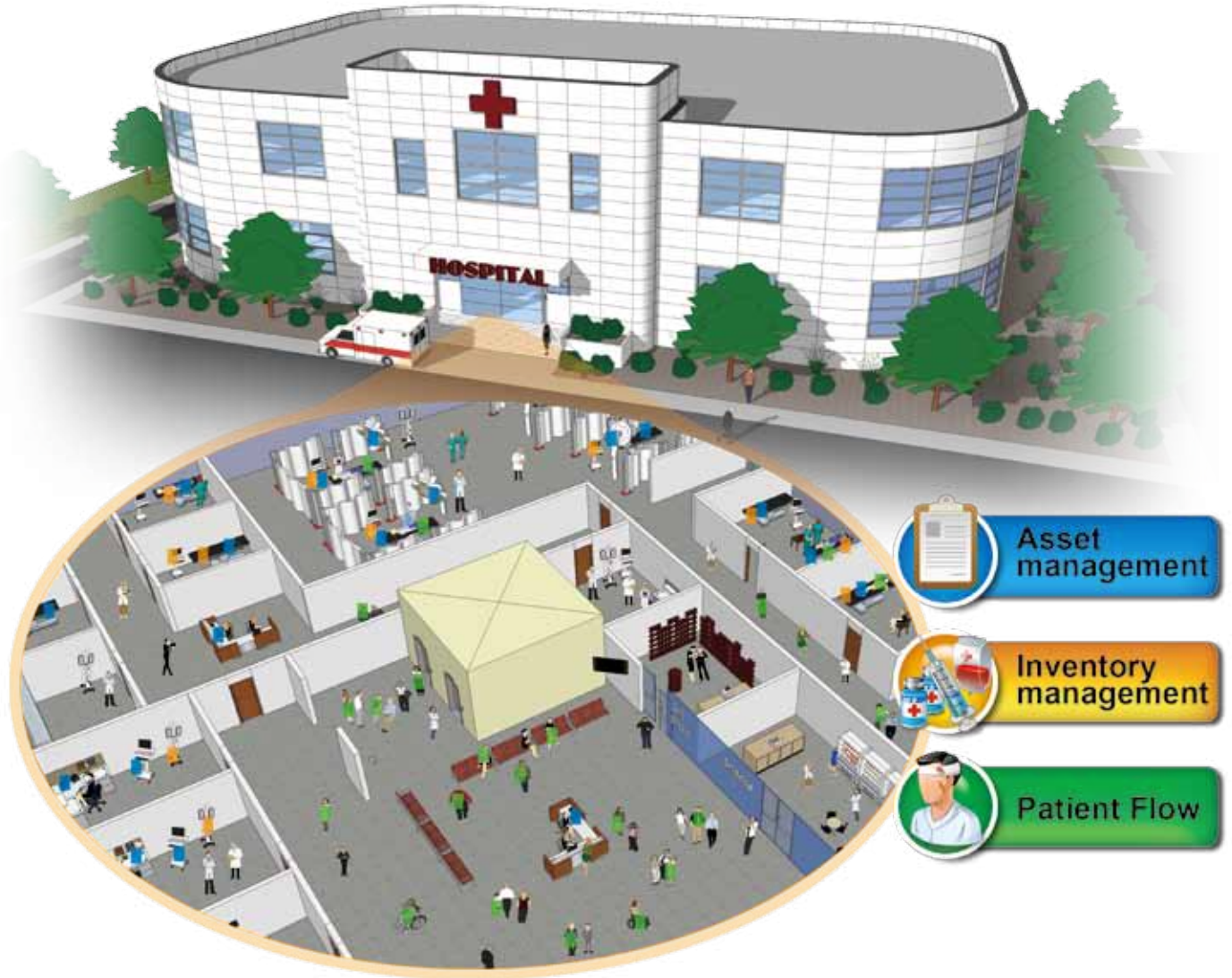
# WLS (Wireless Locating System)



## • Introduction

Wireless Locating System can be used in indoor and outdoor environments. It can monitor the exact location of certain objects or persons and integrate the location information into the back-end servers. In addition, it combines the emergency applications and makes those who call help can be found immediately. And then, the WLS becomes a safety-based locating system. The WLS can be used in industrial or commercial applications, such as: the large commercial offices, the shopping malls, the high-voltage electrical room, the toxic gas room, the ultra-high temperature processing factories, the hospitals or care centers and etc. The customers in the shopping mall probably are changing consumer behavior. Does the store supervisor grasp your opportunity yet? Maybe there are unscrupulous visitors to stroll inside offices or wrongdoing, do you find it? Someone is in danger and calling help in the hazardous working area, do you feel that? Patients who stay in the bathroom or toilet has exceeded the normal time, do you find the situation? These problems are difficult to detect and may cause harm to people or to the enterprise. The WLS could help to find out the problems and provide the efficient way to manage them.





Over twenty years, ICP DAS has developed various Zigbee, Wi-Fi, Sub-1G wireless products and good at various wireless technologies. Of course, we also has put into development of the wireless locating system (WLS) to resolve difficult locating problems. The WLS uses active-based 2.4GHz locator (Tag) with a built-in [help] button. By putting 2.4GHz receiver(Router) in the monitored area, the 2.4GHz locator (Tag) sends positioning signal in regular time or distress message immediately to the Router. The Router collects and transfers locating data and emergency message to the server PC which can record data in time and analysis useful and important information from the large data warehouse, such as to analyze the stay time or moving flow of the customers in the mall, or to find the popular regions where most customers like focus in the mall, to warn the visitors who are going to the private area in the offices or factories, to find out the persons who stayed motionless in the danger field for a long time or is sending distress signals, and etc. The meaningful information could help to control the persons in hazard area, to monitor their safety and to reduce the occurrence.

## Features



Emergency Notification



Hot zone analysis



Asset Finder



Visitor Management



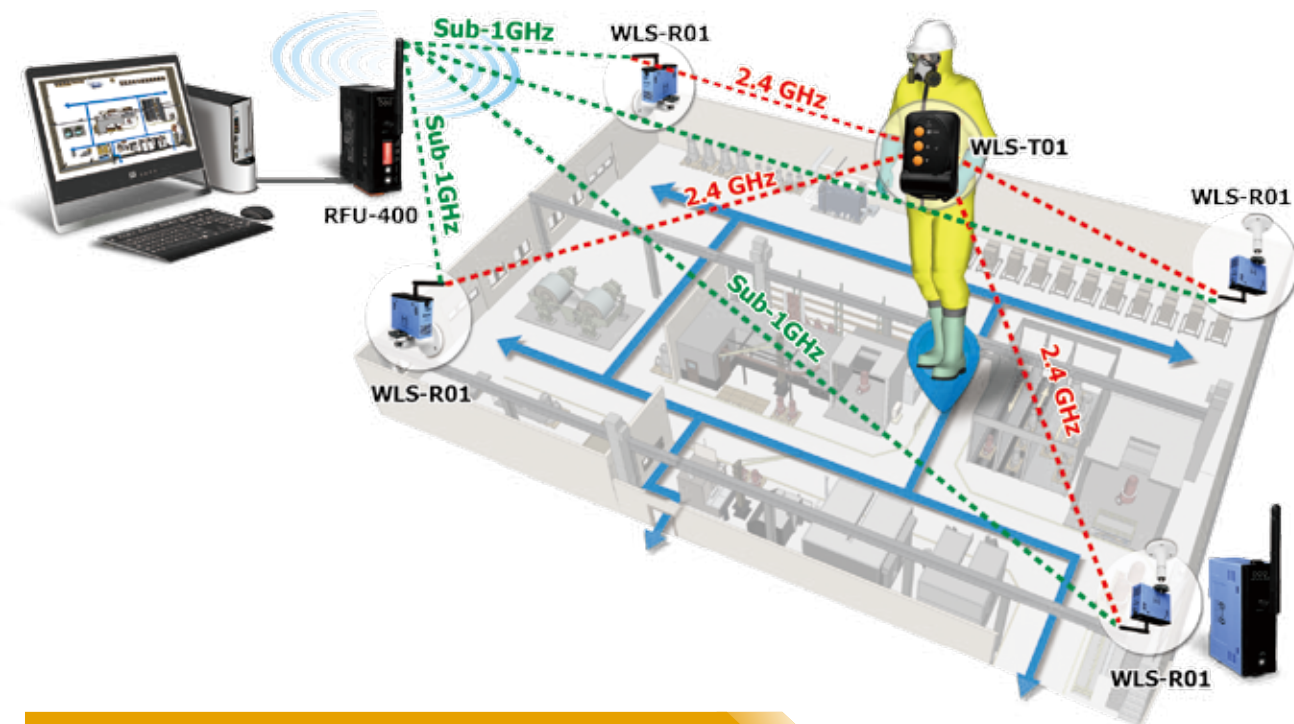
Tracking



Restricted Area

## • Locating Principle

The WLS utilize the wireless of the active-base 2.4GHz locators(Tag) which transferred by the receivers(Router). The WLS retrieves the first three stronger signals of the Routers and use the triangulation algorithm to estimate the location of the Tag. In another words, the first three closer Routers could indicate where the Tag is. Here shows the illustration.



## • Features

### Hardware

1. Support locating function when only one receiver(Router) receive the message of locator(Tags).
2. The locator(Tag) use the ultra low power design and works two years with one built-in CR123A battery.
3. The locator(Tag) built-in one emergency button.
4. The locator(Tag) built-in battery low power indicator LED.
5. To avoid wireless data collision, the locator(Tag) has smart data collision algorithm.
6. The receiver(Router) or locator(Tag) supports 16 RF channels.
7. The receiver(Router) transfers data to server by the Sub-1GHz wireless signal.
8. The distance between receiver(Router) and locator(Tag) is up to 100 meters(line of sight,LoS).

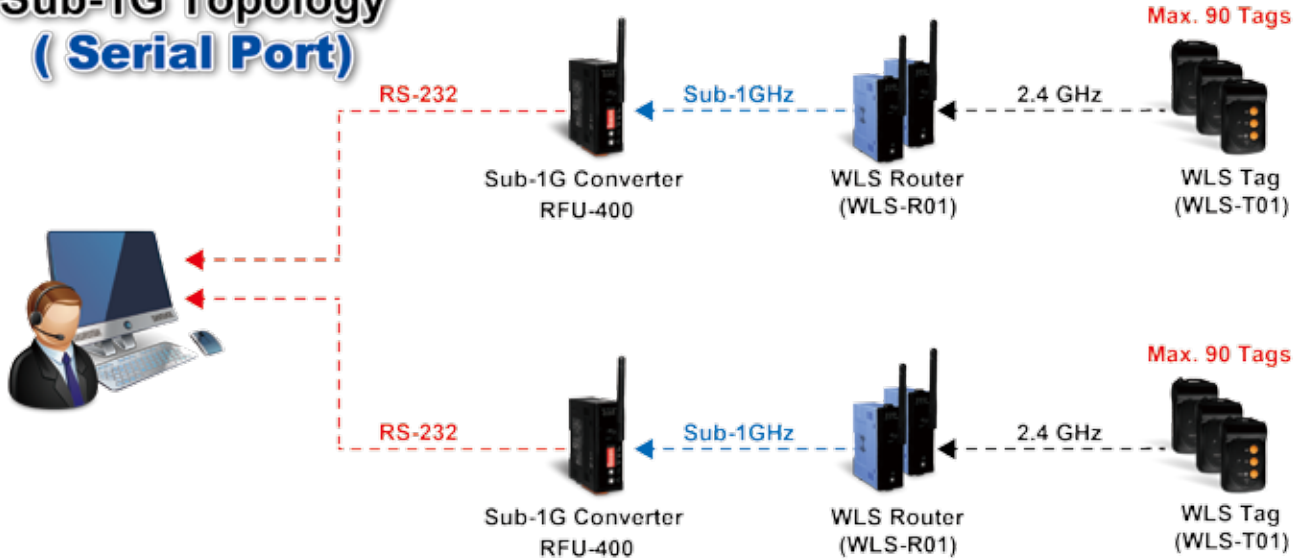
### Software

1. Supports Windows XP/ Win7 / Win10.
2. With graphical and friendly UI, the software indicates all real time locations.
3. Support changing indoor map and indicating the position of the Routers.
4. To receive data from all tags and indicate their positions.
5. The green icon is normal. The red icon shows the person is calling help. The yellow icon is the low power tag.
6. The software will save the emergency record and alert immediately.
7. The software will save the moved path to the files.

• Various System Topologies

Sub-1GHz Topology (Serial Port)

Sub-1G Topology  
(Serial Port)

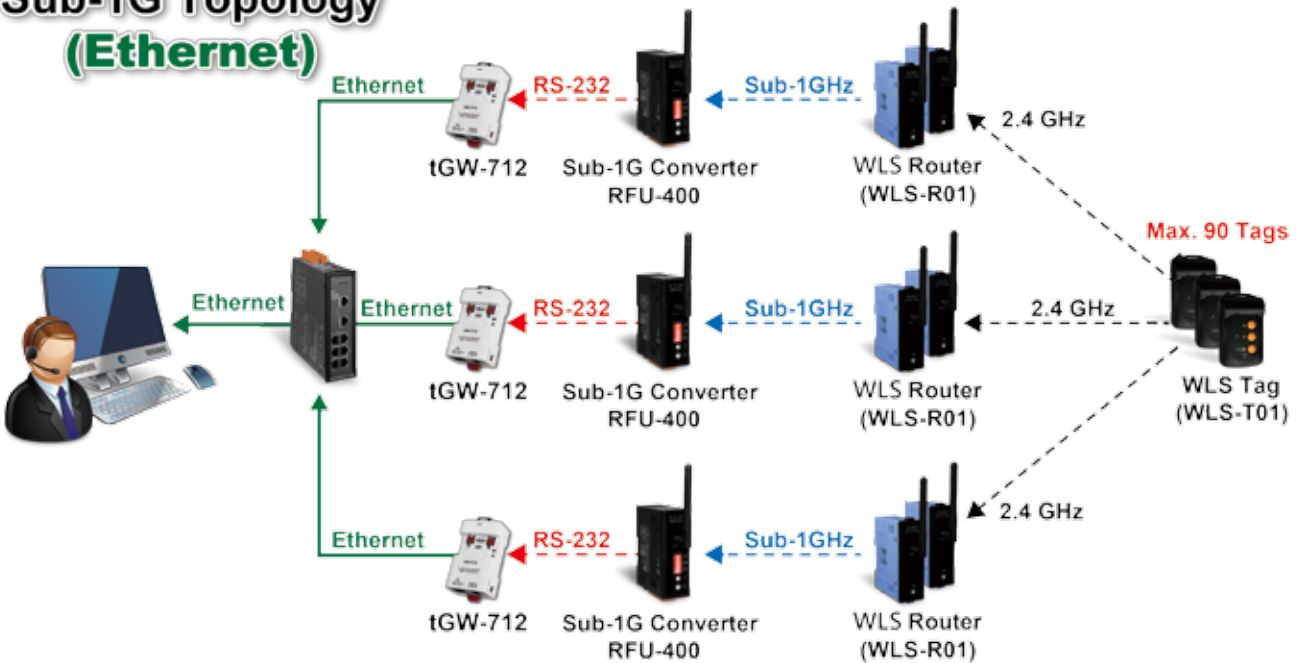


Feature

1. The Routers(WLS-R01) need only DC power to achieve wireless forwarding function.
2. The PC can poll wirelessly the locating data through Sub-1G converter(RFU-400).
3. The distance is 500 meters(LoS, Line of Sight) between the WLS-R01 and the RFU-400.
4. It is suitable for small field with 2~3 sections. It supports 40 tags within single section.

Sub-1G Topology(Ethernet)

Sub-1G Topology  
(Ethernet)

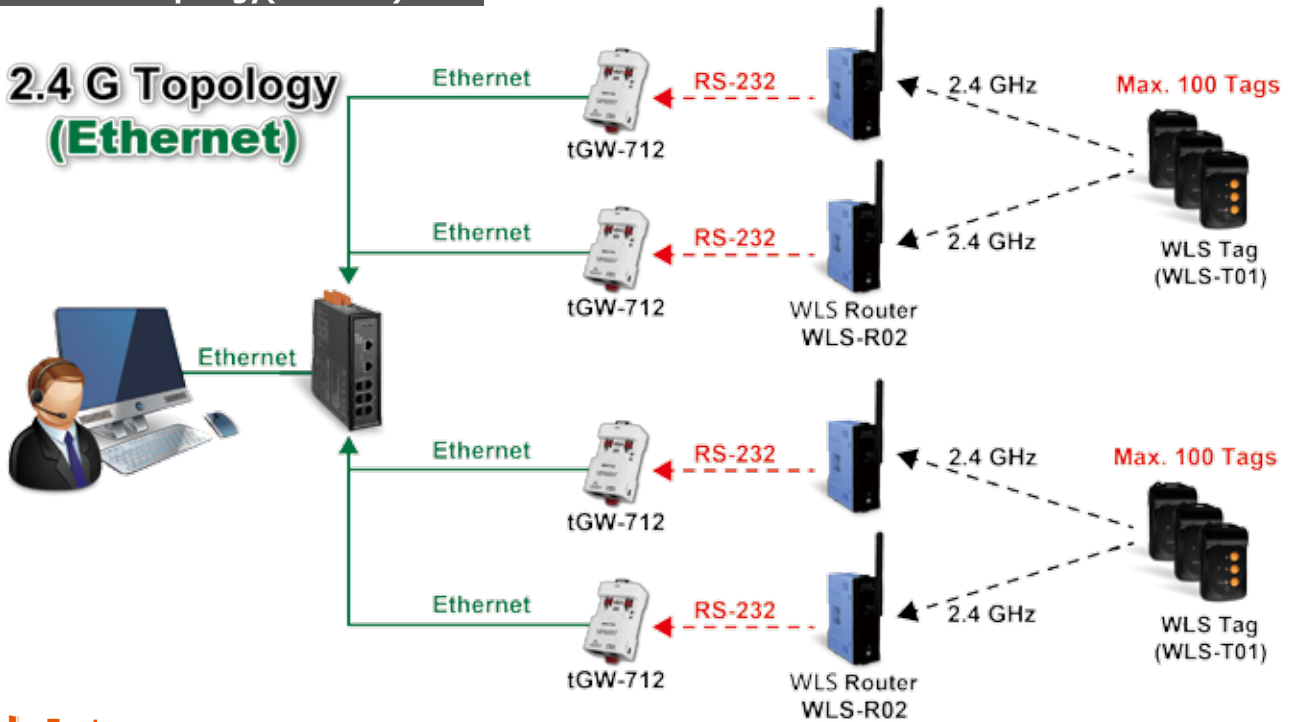


Feature

1. The Routers(WLS-R01) need only DC power to achieve wireless forwarding function.
2. The PC can poll the locating data of Routers(WLS-R01) via multi tDS-712i (Serial to Ethernet device) and RFU-400.
3. The distance is 1000 meters(LoS, Line of Sight) between the WLS-R01 and the RFU-400.
4. It is suitable for large field with hundreds of sections. It supports 40 tags within single section.

**2.4G Topology(Ethernet)**

**2.4 G Topology (Ethernet)**

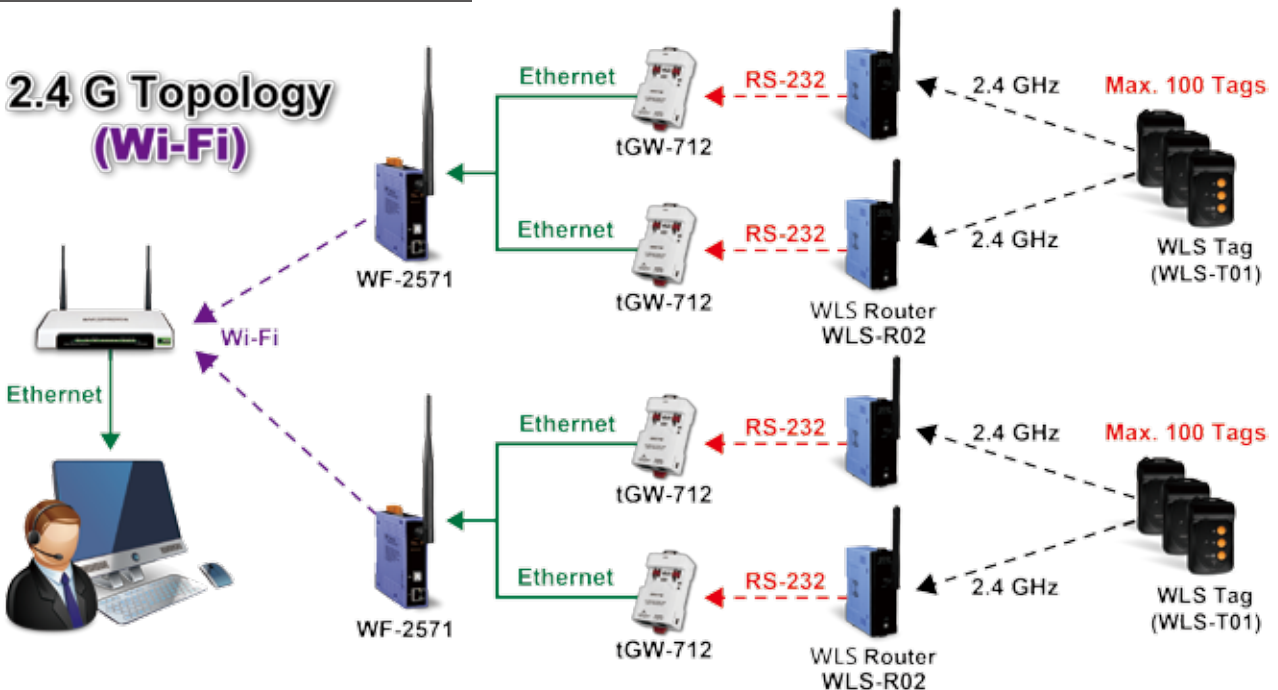


**Feature**

1. The Routers(WLS-R02) need only DC power to achieve wireless forwarding function.
2. The PC can poll the locating data of Routers(WLS-R02) via multi tGW-712 (Modbus TCP to Modbus RTU gateway).
3. It is suitable for large field with hundreds of sections. It supports 100 tags within single section.

**2.4G Topology (Wi-Fi)**

**2.4 G Topology (Wi-Fi)**



**Feature**

1. The Routers(WLS-R02) need only DC power to achieve wireless forwarding function.
2. The PC can poll multi receiver (WLS-R02) via WF-2571 (Wi-Fi to Ethernet converter) and multi tGW-712 (Modbus TCP to Modbus RTU gateway).
3. It is suitable for large field with hundreds of sections. It supports 100 tags within single section.

• Comparison Table

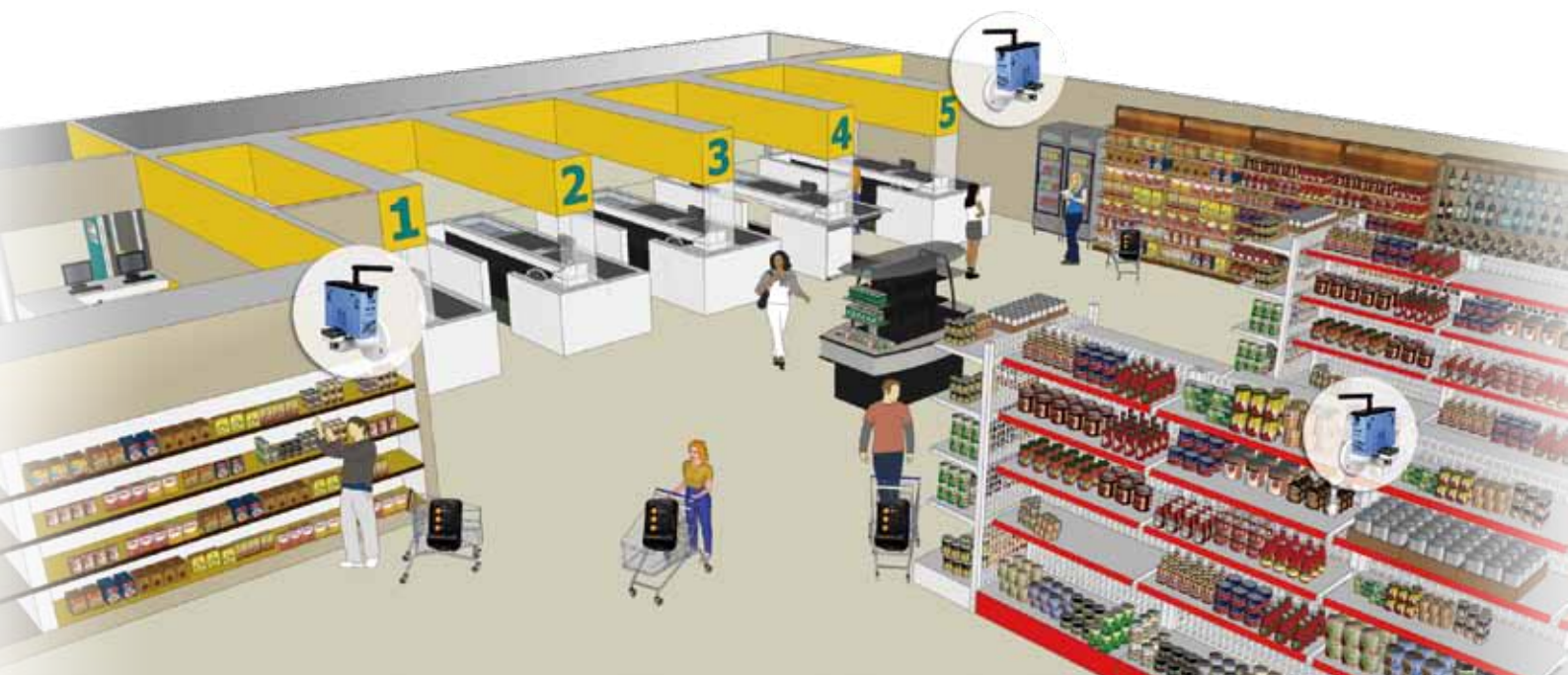
Item	Topology	Sub-1G (Serial Port)	Sub-1G (Ethernet)	2.4G (Ethernet)	2.4G (Wi-Fi)
Tag		WLS-T01	WLS-T01	WLS-T01	WLS-T01
Tag amount per-section		90	90	100	100
Router		WLS-R01	WLS-R01	WLS-R02 + tGW-712	WLS-R02 + tGW-712 + WF-2571
Router Communication		Sub-1GHz	Sub-1GHz	Ethernet	Wi-Fi
Master		RFU-400	RFU-400 + WLS-M01	None	None
PC location		Near the site	Far away the site	Far away the site	Far away the site
Field		Small field	Large field	Large field	Large field
Sections		2~3	More than one hundred	More than one hundred	More than one hundred

• Typical Applications

**Large shopping mall**

Shopping mall management or promotion are commodity-oriented, the customer's shopping behavior is not available. Such as monthly or quarterly promotions, whether the customer really has to go to the regions or the path line of design let customers can not find the activities. Or which hot items have been placed in the less popular areas of customers shopping, resulting in poor sales performance, such as sales of blind spots, through the positioning system to provide behavior of customer, decision-makers can easily detect these problems, and adjust decision.

- Locating trolleys, analyzing popular areas, and determine whether the sales strategy is successful.
- Analysis of a particular area of the stationed rate is particularly high or particularly low, consider whether to increase the trial area or hold promotional activities.
- According to the movement of customers, analysis of seasonal adjustment of the location of goods, or judge the customer preferences season.
- When customer checkout, the goods in the trolleys and locating information will import background information, it will become a large database, and then be analyzed more shopping behavior for decision makers to explore more reference data.



### Factory or business (visitor management)

There are lots of visitors or technical survey in the factories or offices. Usually, the security make the visitors to wear identify card. But visitors may go to the danger zone or to the confidential area for illegal activity. Those headache problems are difficult to against or to alert in time. Here show the solutions of the WLS.

- The visitors can be worn the identify card and WLS tag. The real time position of the visitors could be shown and recorded.
- The employee which has received their visitor can also ware WLS tag. The manager could know whether the employee is in contact with the visitor by the position of the tag.
- When visitors moving into the hazardous area or sensitive areas, it can be found and be alerted immediately.
- When visitors feel illness or need help, they can press the emergency button to call help. It could reduce or avoid industrial accidents.



### Hazardous Working Environment (Security Management)

The factories will always have dangerous working areas, such as: high voltage electric room, toxic gas zone, ultra-high temperature operation area and etc. The employees who are working in this area need to be monitored for their safety or for compliance with safety regulations. When the accident happening, the manager can deal with instantly or notify other persons immediately.

- When working in hazardous areas and wear the tag, the manager can know how many persons in the area and where the persons are.
- When the persons need to call help, they can push emergency button to notify others.
- Toxic materials or controlled materials can be tied the tag. After using those materials, the manager can know whether the material has been put back to its place.
- When the industrial security patrols the hazardous area, the manager can track whether the security has been to the area or not or whether the important place has been checked or not.



### • The modules of system



#### Features

- 429 MHz Radio Frequency
- 16 RF Channels
- 4 RF Baud Rates
- Includes a PA switch that can be used to enhance the RF power
- Wireless line of sight (LOS) transmission range of up to 1000 meters at an RF BaudRate of 9600 bps
- Transparent transmission mode
- Provides Baud Rates from 1200 to 115200 bps for both the RS-232 and RS-485 interfaces
- ESD Protection: Contact  $\pm 4$  kV
- Isolation: 3000 V<sub>DC</sub> for DC-to-DC, 2500 V<sub>rms</sub> using a photocoupler
- DIN-Rail Mountable
- Operating Temperatures,  $-25^{\circ}$  C  $\sim$   $+75^{\circ}$  C



#### Introduction

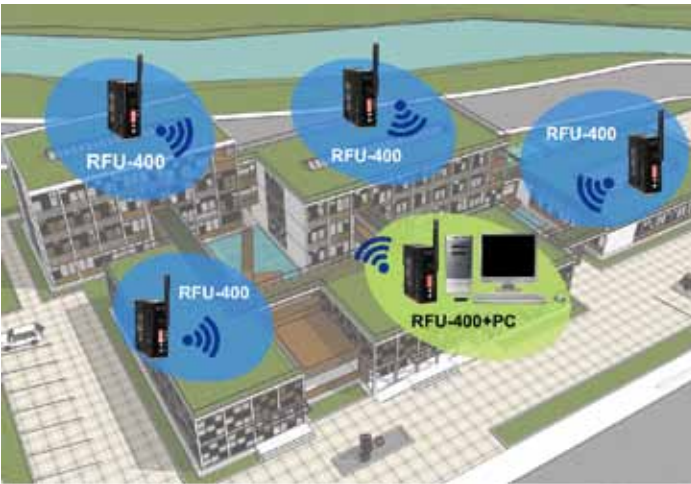
The RFU-400 is an RS-232/RS-485 to 429 MHz radio modem that can be used to convert data from an RS-232/RS-485 device to an RF message that can then be transmitted in transparent mode via the 429 MHz ISM frequency band. The RFU-400 provides a maximum line of sight (LOS) transmission distance of 1000 meters (1 km) at an RF Baud Rate of 9600 bps. In order to overcome the interference that may be encountered in harsh environments, the RFU-400 allows the RF transmission Baud Rate to be configured to a minimum of 650 bps, enhancing the capability of the modem to resist noise and other interference. Additionally, the RF channels and Group IDs are adjustable, which is helpful when attempting to avoid interference encountered when two RFU-400 networks are adjacent. The 16 RF channels and 8 Group IDs can be configured in order to distinguish and control the different RFU-400 networks. The majority of these configuration parameters can be adjusted using a combination of the Rotary and DIP switches, thereby providing a simple method of maintaining the system if the RFU-400 modem needs to be replaced.

#### Specifications

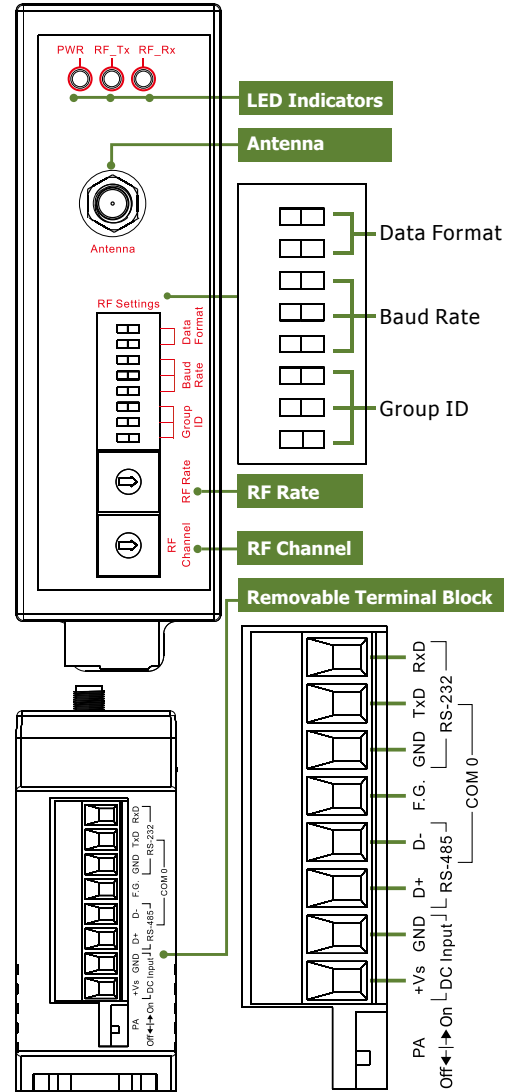
RF Interface	
Radio Frequency	Channel 0 ~ 9 : 429.8125 MHz ~ 429.9250 MHz Channel A ~ F: 429.1750 MHz ~ 429.2375 MHz
Baud Rate	115200 bps, 38400 bps, 9600 bps, 650 bps
Transmission Power	PA Off : 10 dBm , PA On : 19 dBm
Transmission Distance (LoS)	1000 m ( at 9600 bps RF Rate)
Group ID	0 ~ 7
Protocols	Transparent transmit
Temporary Buffer Size	512 Bytes
Configuration	Rotary and DIP switch
COM Port Interface	
COM Port	RS-232 $\times$ 1, RS-485 $\times$ 1
Baud Rate (bps)	1200 ~ 115200
LED Indicators	
RF_Tx / RF_Rx / PWR	Green / Yellow / Red
Isolation	
Intra-module Isolation	2500 Vrms for photocoupler ( RS-485 / RS-232 side )
EMS Protection	
ESD	$\pm 4$ kV Contact
EFT	$\pm 1$ kV
Surge	$\pm 1$ kV
Power	
Input Voltage Range	+10 VDC $\sim$ +30 VDC
Power Consumption	1 W (Max.)
Mechanical	
Flammability	Fire Retardant Materials
Dimensions (L x W x H)	108 mm x 84 mm x 33 mm ( not include antenna )
Antenna Dimensions (L x $\varnothing$ )	108 mm x 10 mm
Installation	DIN-Rail
Environment	
Operating Temperature	$-25 \sim +75^{\circ}$ C
Storage Temperature	$-30 \sim +80^{\circ}$ C
Relative Humidity	0 ~ 90% RH, Non-condensing



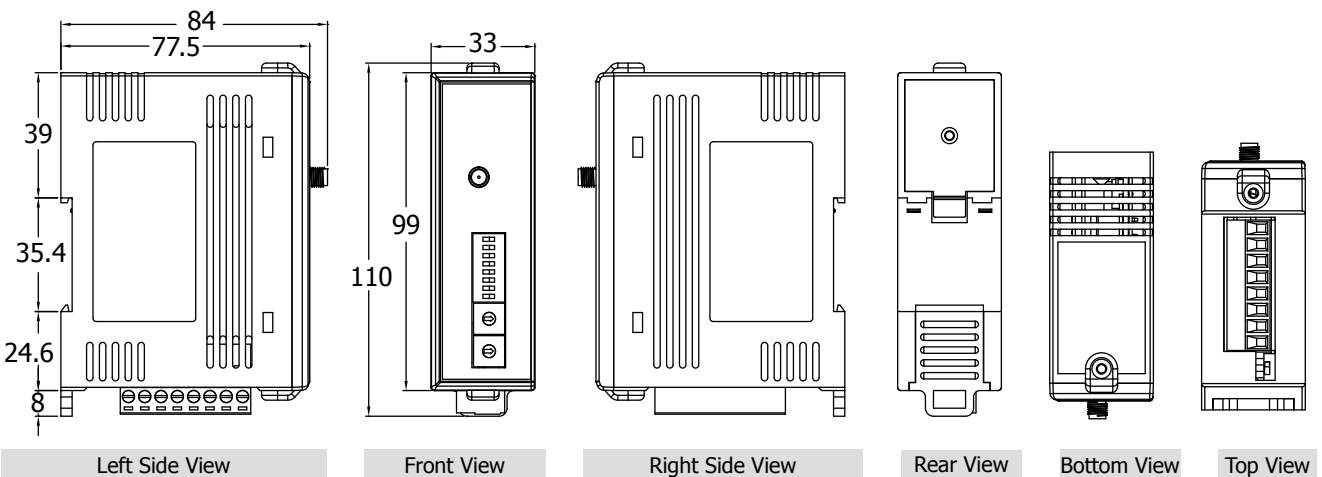
**Applications**



**Appearance**



**Dimensions (Units: mm)**



**Ordering Information**

<b>RFU-400 CR</b>	RS-232 / RS-485 to 429 MHz Radio Modem (RoHS)
-------------------	---

**Accessories**

<b>ANT-104-01</b>	0 dBi 429 MHz External Antenna
-------------------	--------------------------------

## Router



**WLS-R01**

### Features

- Supports data conversion from ISM 2.4GHz frequency to 400MHz frequency
- Supports 16 segments of RF channels with 2.4GHz and 400MHz
- Supports RSSI filtering function
- Built in 2.4GHz 3dBi PCB directional antenna
- 2.4GHz wireless transmission range up to 100 m (Line of Sight)
- 400MHz wireless transmission range up to 500 m (Line of Sight)
- Supports external DIP and rotary switches for easy configuration
- DIN-Rail mountable



### Introduction

WLS-R01 is a 2.4GHz wireless receiver, it is mainly installed in fixed position to receive the 2.4GHz wireless Locating data of WLS-T01 broadcast. In the other hand, WLS-R01 is also a wireless converter (called Router) from 2.4GHz to 400MHz. It can effectively use 400MHz high transmittance characteristics to extend the wireless transmission distance, and don't need add wire between the communication paths. The WLS software in the PC can use transparent function of RFU-400 to poll the wireless Locating data of WLS-T01, and then calculate the relative position of WLS-T01 by the algorithm.

WLS-R01 include two wireless frequency, one is ISM 2.4GHz global common frequency band total have 16 channels, the range of 16 channels are 2.405GHz to 2.48GHz, it can separated into 5MHz segments, and the wireless transmission range (line of sight, LOS) is 100 meters; the other is 400MHz frequency band total have 16 channels, the range of 16 channels are 429.1750MHz to 429.2375MHz and 429.8125 MHz to 429.9250 MHz, and the wireless transmission range (line of sight, LOS) is 500 meters. In addition, the user can divide four groups ID in the each 400MHz channel to avoid adjacent channels affect each other.

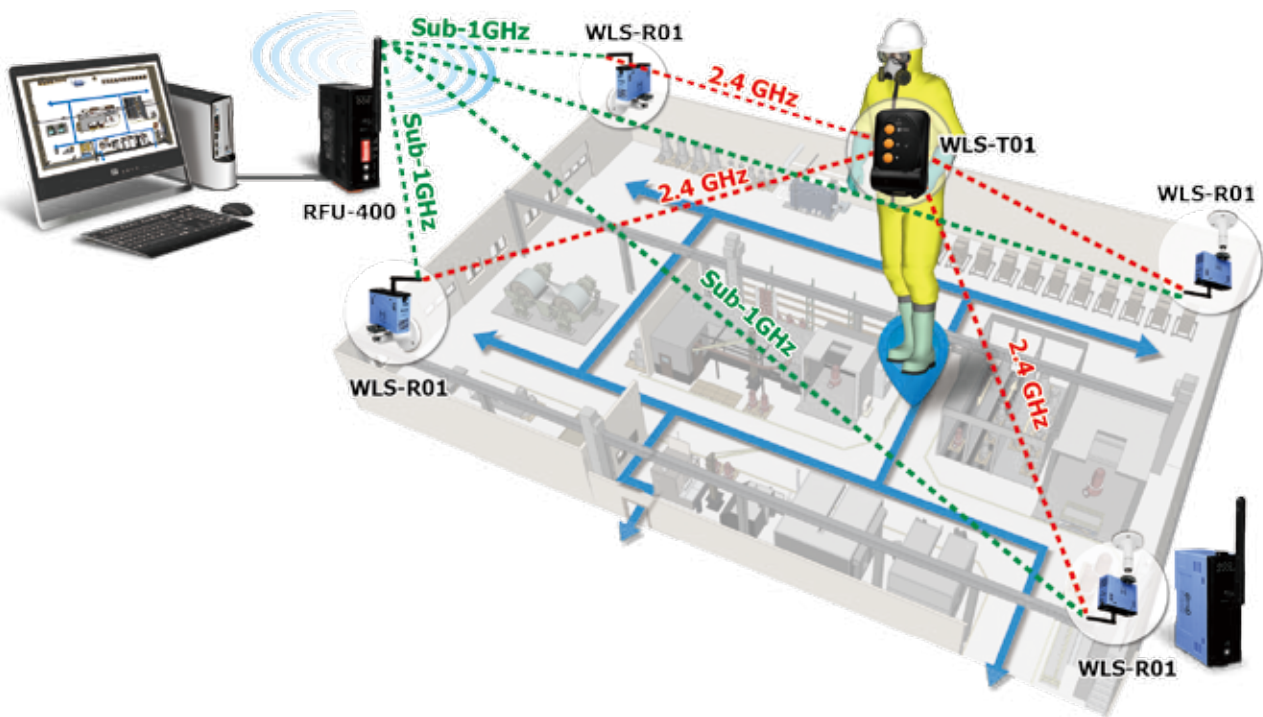
The user can simply use the DIP switch and rotation switch to configure the parameter, and don't need to add wire between the communication paths, that can speed up to build the system, and reduce the cost, so it very suitable for use in item tracking, personnel movements, factory regional management and other applications.

### Specifications

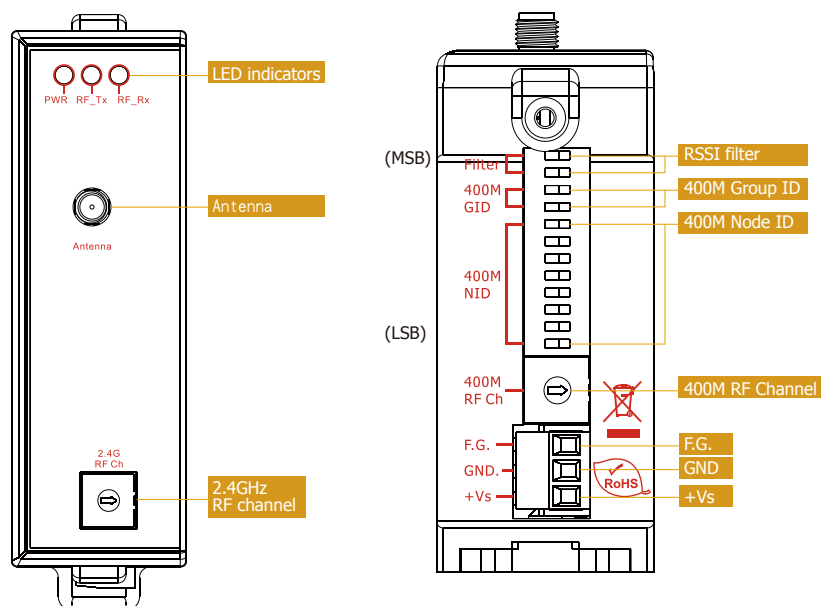
Wireless		
2.4GHz	Modulation	OQPSK (Offset Quadrature Phase-shift Keying)
	Spread Spectrum	DSSS (Direct-Sequence Spread Spectrum)
	RF Channels	16
	Transmission Power	16±1dBm (Default) / 17dBm (Max.)
	Wireless frequency	2.4GHz
	Antenna	2.4GHz - 3dBi PCB directional antenna
	Transmission Range (Line of Sight, LOS)	100m (Default)
	Number of tags supported	90 (Max., Tag Tx interval is 3 seconds)
400MHz	RF Channels	16
	Transmission Power	19dBm (Default / Max.)
	Wireless frequency	Channel 0~9: 429.8125 MHz ~ 429.9250 MHz Channel A~F: 429.1750 MHz ~ 429.2375 MHz
	Antenna	429MHz – 0dBi Omni directional antenna
	Transmission Range (Line of Sight, LOS)	500m(Default)
	Range of address	1~255 (0x01~0xFF)
LED Indicators		
Power		1 LED, Red
400MHz Transmitted status		1 LED, Green
2.4GHz Received status		1 LED, Green
EMS Protection		
ESD (IEC 61000-4-2)		±4 kV Contact for Power Line, ±8 kV Air for Random Point

EFT (IEC 61000-4-4)	±4 kV for Power
Surge (IEC 61000-4-5)	±3 kV for Power
<b>Power</b>	
Required Supply Voltage	+10 V <sub>DC</sub> ~ +30 V <sub>DC</sub>
Power Consumption	1 W Max.
<b>Mechanical</b>	
Dimensions (L × W × H)	110mm x 33mm x 83mm
Installation	DIN-Rail
<b>Environment</b>	
Operating Temperature	-25°C ~ +75°C
Storage Temperature	-30°C ~ +80°C
Relative Humidity	10 ~ 90% RH, Non-condensing

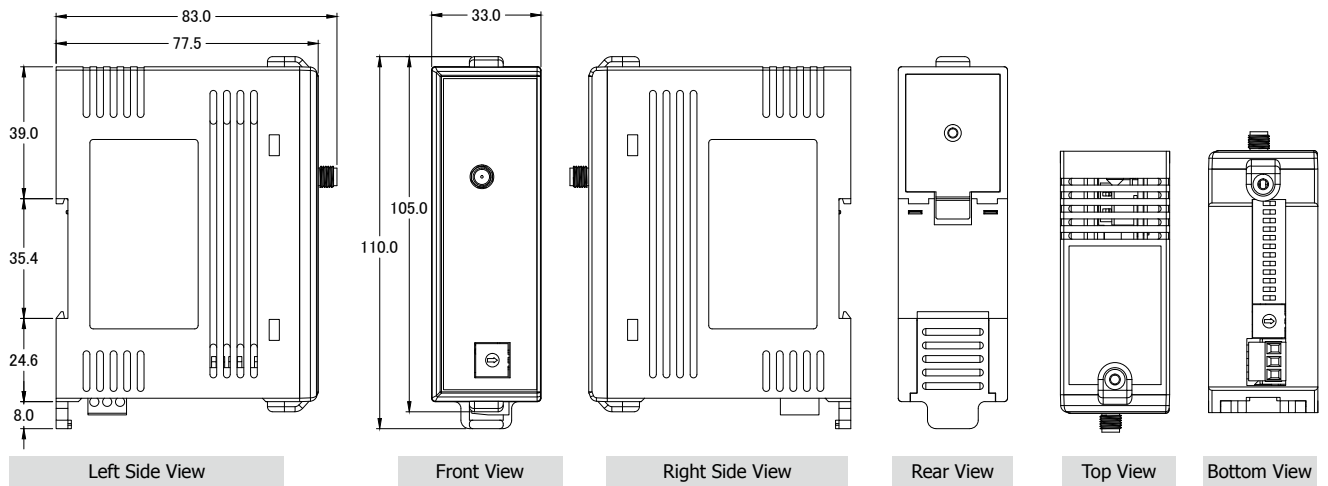
**Applications**



**Appearance**



## Dimensions (Units: mm)



## Installation



## Ordering Information

<b>WLS-R01 CR</b>	Wireless Locating System Receiver (RoHs)
<b>Important Note:</b> The receiver of wireless locating system be used together with the transmitter and the converter, please refer to WLS-T01 and RFU-400.	

## Accessories

WLS-T01 CR	Wireless Locating System Transmitter (RoHs)
RFU-400 CR	RS-232 / RS-485 to 429 MHz Radio Modem (RoHS)
ANT-104-01	0 dBi 429MHz External Antenna
Plastic bracket	Plastic bracket of installation (4PKW1W0000001)

**Tag****WLS-T01**

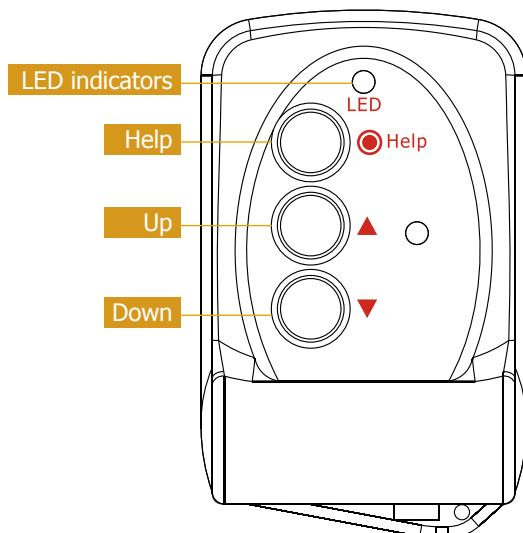
### Introduction

WLS-T01 is a 2.4GHz wireless transmitter (called Tag) by battery supported, it can broadcast automatically 2.4GHz wireless Locating packages to WLS-R01. WLS-T01's wireless frequency use ISM 2.4GHz global common frequency band total have 16 channels, the range of 16 channels are 2.405GHz to 2.48GHz, it can separated into 5MHz segments, and WLS-T01 supports 16 sectors of RF power setting. The user can use the button to adjust the above settings.

In addition, WLS-T01 supports help button, low battery power indicator, and built in Node ID, 3dBi directional PCB antenna and other user-friendly design can effectively reducing the size for the user to carry it. The user can also send a distress signal in an emergency situation, and let people know his relative position to support him.

The wireless transmission range (line of sight, LOS) of WLS-T01 is 100 meters, and WLS-T01 uses low power consumption design architecture, when the user installs a CR-123A battery (3.0 VDC) and the wireless transmission interval is 3 seconds, operating temperature in +20°C to +60°C, the use of time can be up to 2 years, if battery will low power, the user can change the new battery by himself, so WLS-T01 very suitable for use in item tracking, personnel movements in hazardous areas, factory regional management and other applications.

### Appearance



### Features

- Supports the button help function
- Supports 16 segments setting of RF channels
- Supports 16 segments setting of RF power
- Built in battery low power LED indicator
- Built in 2.4GHz 3dBi PCB directional antenna
- ISM 2.4GHz operating frequency
- Direct Sequence Spread Spectrum (DSSS) RF technology
- Wireless transmission range up to 100 m (Line of Sight)
- Low power consumption design  
(1 pcs CR123A battery, when operating temperature from +20° C~+60° C, it can be used 2 years)

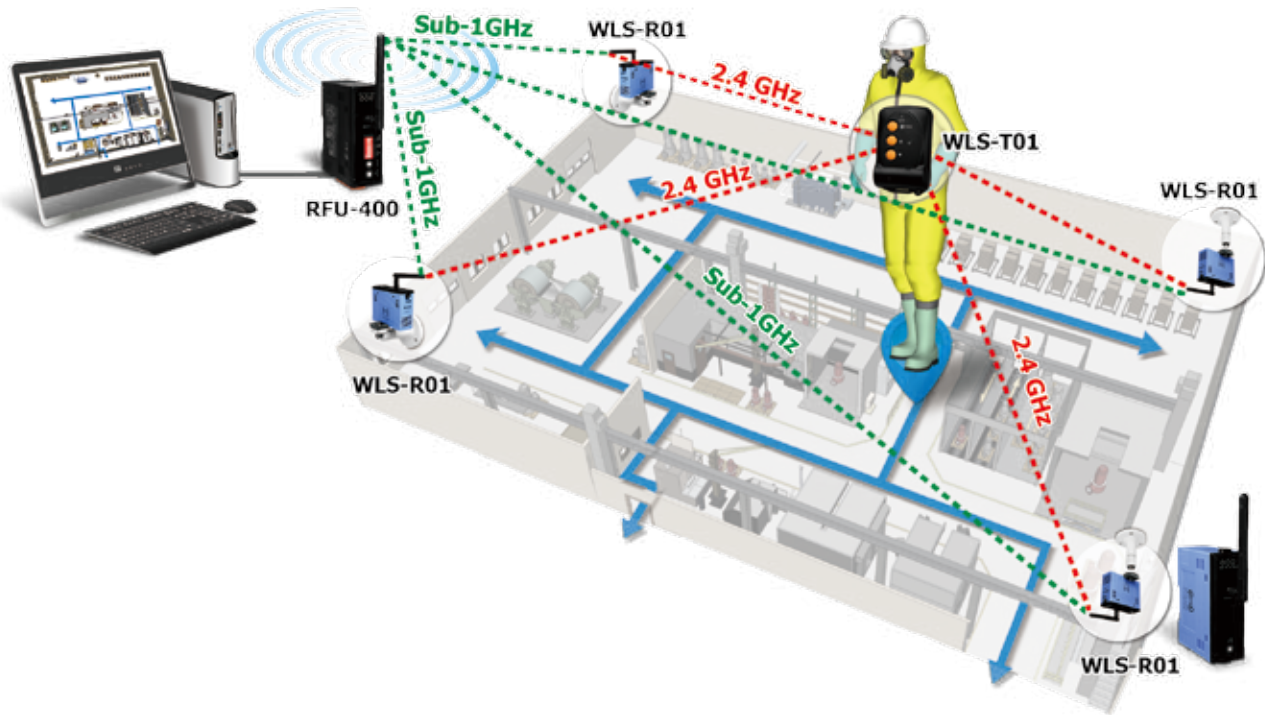


### Specifications

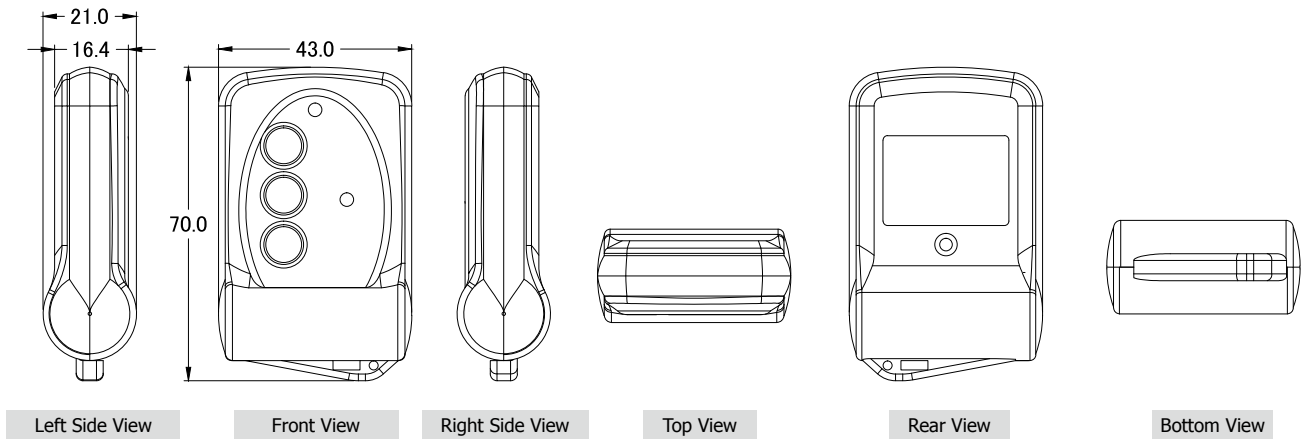
Wireless	
Modulation	OQPSK (Offset Quadrature Phase-shift Keying)
Spread Spectrum	DSSS (Direct-Sequence Spread Spectrum)
RF Channels	16
Transmission Power	16±1dBm (Default) / 17dBm (Max.)
Wireless frequency	2.4GHz
Antenna	2.4GHz-3dBi PCB Directional Antenna
Transmission Range (Line of Sight, LOS)	100 m (Typical)
LED Indicators	
Pressing the button	1 LED, Green
Help / Low battery power	1 LED, Red
EMS Protection	
ESD	±4 kV Contact for Screw
EFT (IEC 61000-4-4)	±4 kV for Power
Power	
Required Supply Voltage	+2.6 VDC ~ +3.6 Vdc
Battery Input	1 x CR123A (3.0 Vdc)
Power Consumption	166uW@3VDC / 1.33mAh@1 Day (3 second Tx Interval)
Mechanical	
Dimensions (L x W x H, mm)	70mm x 43mm x 21mm
Installation	Hook
Environment	
Operating Temperature	-25 ~ +75°C (No battery included) -25 ~ +60°C (Battery included)
Storage Temperature	-30 ~ +80°C (No battery included) -20 ~ +45°C (Battery included)
Relative Humidity	10 ~ 90% RH (Non-condensing, No battery included) 20 ~ 65% RH (Non-condensing, Battery included)



## Applications



## Dimensions (Units: mm)



## Ordering Information

<b>WLS-T01 CR</b>	Wireless Locating System Transmitter (RoHs)
Important Note: The transmitter of wireless locating system be used together with the receiver and the converter, please refer to WLS-R01 and RFU-400.	

## Accessories

WLS-R01 CR	Wireless Locating System Receiver (RoHs)
RFU-400 CR	RS-232 / RS-485 to 429 MHz Radio Modem (RoHS)
Lithium batteries (CR123A)	Voltage 3.0V, Capacity 1700mAh (Disposable non-rechargeable lithium battery)

## • WLS\_analyzer Wireless locating software



### Features

- Supports graphical display the locating position of people
- Supports to load map image
- Statistics the number of people
- Stores the data logs
- Display the alert with red color
- Display the battery low power with yellow color
- Set up simple and easy to use



### Function description

1. Loading map
2. Setting the position of router
3. Start monitor
4. Stop monitor
5. Releasing alert  
(v1.2 all clear)
6. Message prompt
7. Linking status
8. Position of people

