SMR-AI231
User Manual

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1   Introduction

This operating instructions manual provides all the information you need for connection, setup and installation as well as important instructions for operation and maintenance.   Please read this information before putting the SMR-AI231 into installation and operation and keep this operating instruction manual accessible in the immediate vicinity of the product.

SMR-AI231 is to cover large building, campuses, hotel, hospital and enterprise networks areas that support multiple antennas to minimize building penetration loss. It also helps service carriers install or expand Mobile WiMAX Coverage more easily and cost-effectively.   This product requires a wire connection using UTP cable to connect with the core network and an indoor or outdoor antenna for the air interface.

1.1 FCC compliance

SMR-AI231 is complies with Part 15 of the FCC Rules. This device may not cause harmful interference and must accept any interference received, including interference that may cause undesired operation.

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 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.

However, there is no guarantee that interference will not occur in a particular installation.   Of this equipment does cause unacceptable interference to radio and 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

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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.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the users will be required to correct the interference at their own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under part 73 of this chapter, land mobile operation under part 90, etc., shall bear the following statement in a conspicuous location on the device:

1.2 Important safety information

1.2.1 **Caution**

While this device is in operation, a separation distance of at least 20 centimeters (8 inches) must be maintained between the radiating antenna and any person exposed to the transmitter in order to meet the FCC RF exposure guidelines. No change to the antenna or device is permitted.

Doing so may result in the installed system exceeding RF exposure requirements. This device must not be co-located or operating in conjunction with any other antenna or radio transmitter. Installers and end users must follow the installation instructions provided in this guide.

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1.2.2 **Warning**

■ **Do not use the product in a dusty or humid environment**

It may cause a short circuit or a build up heat, result in fire or electric shock.

■ **Protect against static electricity**

An electrostatic discharge may damage components of this product. Do not directly touch any of the connector or component surfaces

Static electricity can be generated on clothing and people. Before handling the product, please discharge static electricity from your body by touching a ground or grounded metal surface.

■ **Do not operate at other than the specified voltage**

Do not operate at other than the specified voltage of AC 100V ~ 240V. Operation at other than the rated voltage may result in fire or out of order.

■ **Do not operate with other than the specified power supply**

Do not operate with other than the specified AC adapter that may result in fire or malfunction.

■ **Handle the AC adapter cord carefully**

Do not place it near hot objects or heavy objects on top of the AC adapter cord which may be damaged result in fire or electrical shock. Not exact altering the cord, excessively bending or pulling the cord may result in fire or electricity shock.

■ **Do not let foreign matters enter the inside of the product**

When water or any foreign matter enters the inside of the product, it may cause fire or electrical shock. In the case rapidly turn off the power switch and pull out the power cable from the receptacle

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Do not disassemble

Do not remove the cover or modify.   For hope internal inspection or repair. Please contact your system integrator directly.

Do not use the product in a damaged condition

Do not drop the product and use the product with its cover, antenna and AC adapter broken. It may result in fire or malfunction of this product. In case the product is damaged, turn off the power of the product and pull out the power cable from the receptacle.

Do not touch AC adapter with wet hands

Do not disconnect or plug in AC adapter when your hands are wet.   Contact with water may result in fire, damage or electric shock.

Do not setup in area that becomes hot

Do not setup in an area exposed to near a heating apparatus or like as direct sunlight outdoor side. The heat can accumulate, causing burns, fire or damage. Also, this product may become deformed exterior or change color

Do not place the product on an unstable place

Do not place the product on an unstable table or slanted or slippery surface.   The product may fall from it, resulting in injuries or malfunction of the product.

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1.3 Physical and Environment

Table 1. Physical Specification

Item		Description
Weight		Under 1.0kg
Temperature	Operating	0°C ~50°C
	Storage	-10°C ~60°C
Humidity	Operating	20%~80%
	Storage	10%~85%
Antenna		SMA
Power		PoE(Power-over-Ethernet) or 5.3 V AC/DC Adaptor

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2   SMR-AI231 Features

SMR-AI231 is composed of the substance, antennas and accessories. Prior to the installation, the element lists below should be identified by operators

2.1 Product Configuration

2.1.1 Features

SMR-AI231 provide a high speed, which means users can be connected to the internet and is designed to be extension for the service coverage.

The main features of the SMR-AI231 are as follows:

- Low cost pico base station for lower OPEX and CAPEX

- Wave 2 (2x2) MIMO(Multi Input Multi Output) support

- WiMAX Specification, Radio Resource Management and Control

- IEEE1588 slave module using for the system synchronization

- Main Power Type : PoE (Power over Ethernet or DC jack)

- DHCP(Dynamic Host Configuration Protocol) Support

- Handover Support

- Multicasting for Downlink

- RF output power control and system parameters handling via EMS Server.

2.1.2 Configuration

SMR-AI231 for in-building solution is designed to offer the WiMAX service using GDM7701(WiMAX Modem chipset), GRF7203(RF chipset) and a couple of GRF7203 for 2-path RF. It makes use of the IEEE1588 solution for the system synchronization. Both of Power supply and data communication will coincide using the UTP cable based on PoE(Power over Ethernet). Also the DC jack will be able to be used

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according to your plan. The power ON/OFF could be activated by the slide switch. There are omni-directional types as antennas. The Product has a 8-bit dip switch to set up the its ID.

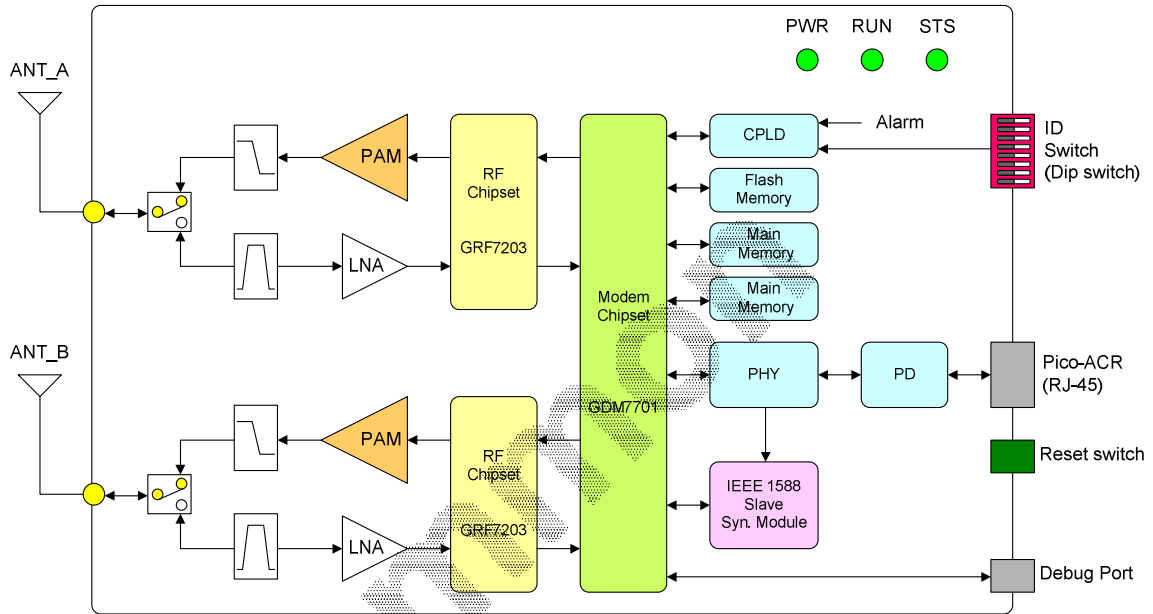You can take a look into the block diagram of SMR-AI231 as below:

Figure 1. SMR-AI231 Block diagram

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2.2 Indicator and operating elements

Power Switch
DC Power Jack
ETH Port
ID Switch / 8Pin
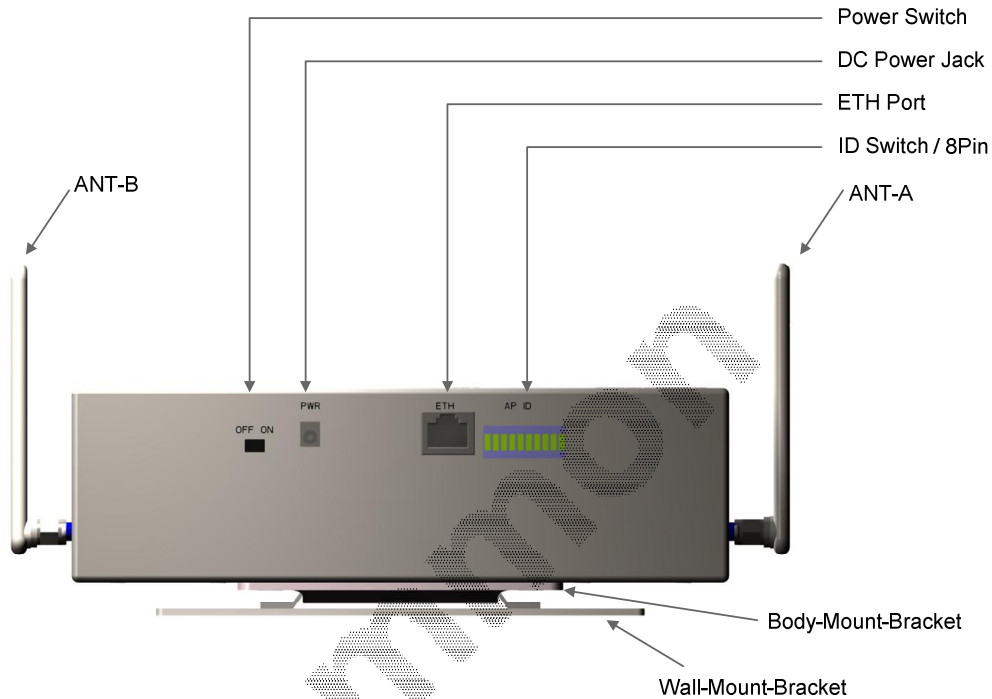ANT-B
ANT-A
Body-Mount-Bracket
Wall-Mount-Bracket

Figure 2. Top side of the SMR-AI231

- ANT-A, ANT-B: Omni Antenna.

- Power Switch: The power switch activates ON or OFF for power. The switch is moving to left side for power on and moving to right side for power off.

- DC Power Jack: The power cable is connected into the power jack in order to activate power on for the SMR-AI231.

- ETH Port: This port is used to be linked with the ASN-GW by using UTP cable which is subject to guarantee the 100 meters distance.

- ID Switch: The ID switch indicates the ID of the SMR-AI231. This is consisted of 8-bits of the dip switch. This will elaborate in the supplement document chapter.

- Body-Mount-Bracket: Mount Bracket for the SMR-AI231.

- Wall-Mount-Bracket: Mount Bracket for the SMR-AI231.

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3   Installation Guide

SK Telesys is not responsible for product damage incurred during shipment. You must make claims directly with the carrier. Inspect your shipment carefully for obvious signs of damage. If the shipment appears damaged, retain the original boxes and packing material for inspection by the carrier. Contact your carrier immediately.

3.1 Pre-confirmation

This chapter explains how to install the Product and activate the service. After following the procedures described in this chapter, you're the product should be fully functional. Product installation consists of the following steps.

1. Unpack the SMR-AI231 and Components check

2. Choose the best location

3. The Body-Mount-Bracket direction setting

4. Installation of the Wall-Mount-Bracket and Product

5. Connect the UTP cable

3.2 Unpack the SMR-AI231 and Components check

The following table is a list of components by each Product type. Unpack the package of the Product and make sure you have all the elements shown below. And then you can conduct the installation process. The following components can be changed.

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Table 2. Element List

Item	Description	Count(EA)
	SMR-AI231	1
	Omni Antenna	2
	AC/DC Adapter	1
	Body-Mount-Bracket	1
	Wall-Mount-Bracket	1
	4Ø Screw	3
	5Ø Screw	4
	User manual	1

NOTE: The unauthorized power adapter can make a problem

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3.3 Choose the best location

Select the installation location that is based on the surrounding environment and Cell planning. After you finish the installation, following these directions, it should not interfere with your decor.

You must use an enclosed Wall-Mount-Bracket to fix the SMR-AI231. Therefore, the installation site has to meet the following recommendation.

1. On top of at least 10 centimeters(4 inches) of space is needed.(When you are using the PoE and the UTP cable is from the ceiling, you should install the Product at least 5~6 centimeters away from the ceiling. Otherwise, when you are using the PoE or the AC/DC Adaptor and the Power line and UTP cable are coming from the floor, you can install the cable duct. And then you can install the Product at least 6~7 centimeters away from the ceiling.)

2. Each side to side, at least 5 centimeters(2 inches) of space is needed

3. Avoid placing the SMR-AI231 close to certain electronic devices, such as microwave ovens and computer monitors, as they can cause interference.

3.4 The Body-Mount-Bracket direction setting

Before you install the product, you need to decide the direction of the UTP cable connection. Because you have to change a direction of the Body-Mount-Bracket depends on the location of the UTP cable.

If a UTP cable comes down from the ceiling, you can use a default set of the Body-Mount-Bracket direction which means the direction of the rear panel looks forward the ceiling

Otherwise, you must change a direction of the Body-Mount-Bracket by the following process:

1. Loose three 4Ø screws in a counterclockwise direction at the behind of the SMR-AI231(ⓐ)

2. Change the direction of a separated the Body-Mount-Bracket (ⓑ)

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3. Turn three 4Ø screws in a clockwise direction to fix the SMR-AI231(ⓒ)

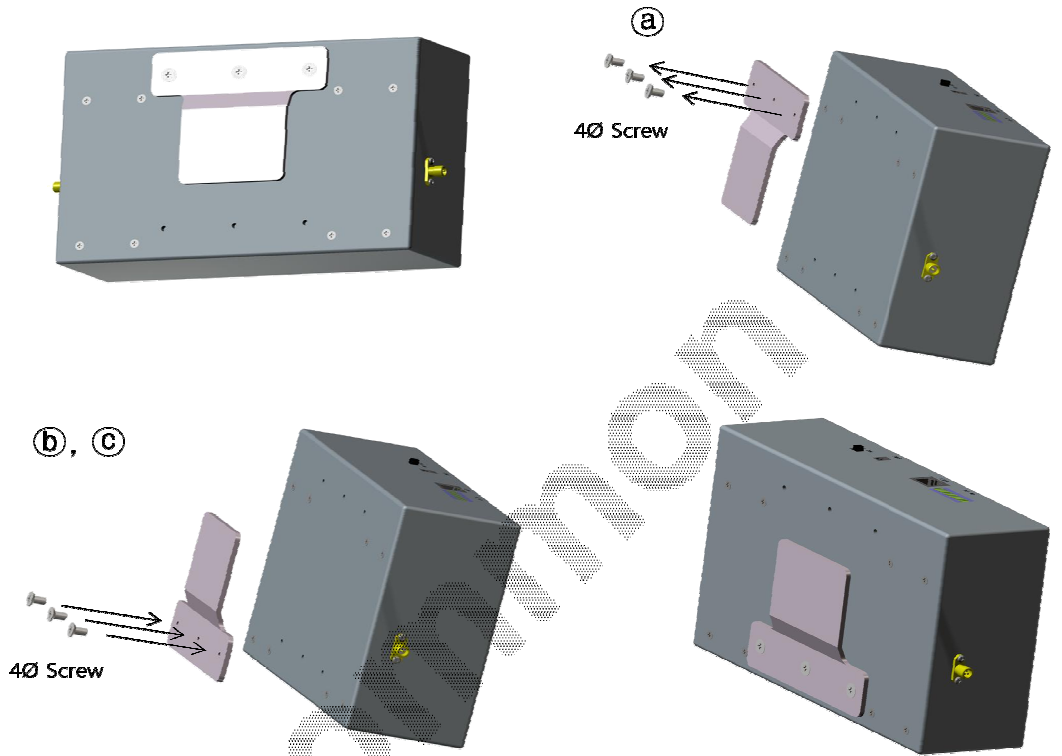4. Refer to the figure below.

Figure 3. The Body-Mount-Bracket change process

3.5 The Wall-Mount-Bracket Installation

The Wall-Mount-Bracket should be installed tightly to the wall. In order to secure the wall-mount-bracket, you can use the enclosed four 5Ø screws.

1. Indicate the position of drilling at the location of a Wall-Mount-Bracket installation.

2. Make a hole in the wall using a drill

3. Fix the Wall-Mount-Bracket in its position using an enclosed four 5Ø screws.
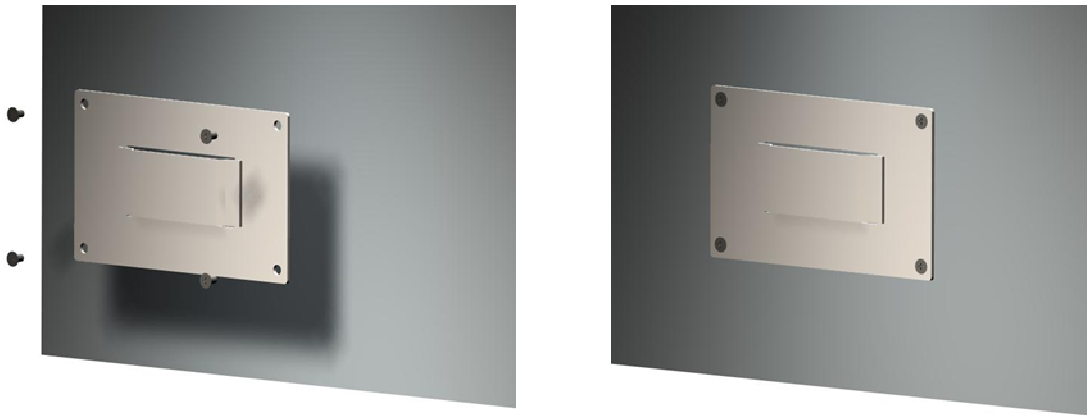
4. Refer to the figure below

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Figure 4. The Wall-Mount-Bracket installation

3.6 The SMR-AI231 Mounting

After the Wall-Mount-Bracket installing, you should connect the enclosed 2 omni-antenna to the port on the side of the product as the figure below. The left and right antenna is the same.

Figure 5. Omni Antenna assembling

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And you need to determine how power is supplied. (PoE(Power-Over-Ethernet) or AC/DC Adaptor)

If you have used the AC/DC adapter, you should connect the enclosed AC/DC adapter to a PWR jack on the top of the SMR-AI231. But if you use the PoE(Power-Over- Ethernet) switch, you will not need the AC/DC adapter.

And then you can connect the UTP cable to the ETH port.

Lastly, you must set the SMR-AI231 ID before you attach the product to a Wall-Mount-Bracket. The product ID setting process is described in the supplement document chapter.

After all above processes are completed, you can attach the SMR-AI231 to Wall-Mount-Bracket by the followings:

1. Check the location of the Wall-Mount-Bracket

2. Check the direction and location of the Body-Mount-Bracket

3. Fit the product to the Wall-Mount-Bracket while down from the top of the Wall-Mount-Bracket.
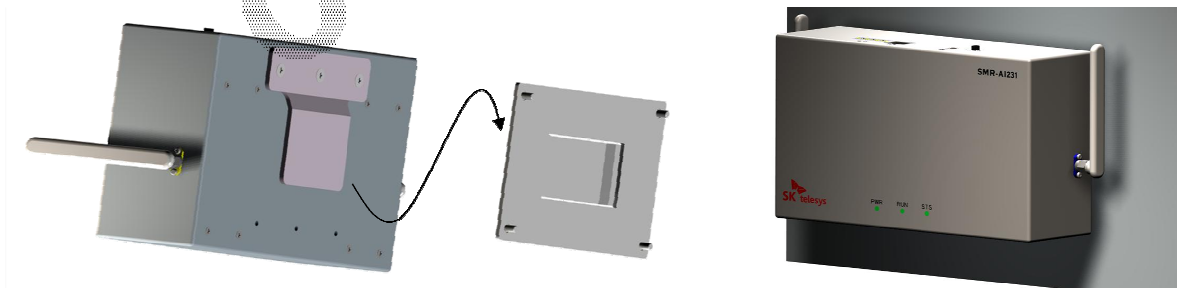
4. Refer to the figure below.

Figure 6. The SMR-AI231 Mounting

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3.7 Power on the SMR-AI231

After mounting the product, you can turn on the switch on the top of the SMR-AI231.

The status of LEDs should be checked with a power supply.

1. The PWR LED should have a green light on when the Product power is on.

2. Make sure the green light stays on after the RUN LED finishes blinking initially.

3. Make sure the green light comes on within 5 minutes after the STS LED has flashed green. The STS LED will blink green when the GPS lock is on. When the GPS lock is completed, the STS LED the green light will be on. If the GPS lock time exceeds 5 minutes, you should replace the Product or check the ASN-GW whether the operation is normal.

4. Contact the EMS manager to identify the status of the Product if all LEDs light up all hope

5. Do call test by connecting to terminal if the status is displayed correctly on the EMS

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4   Maintenance

The description in this chapter contains service and information for abnormal case of SMR-AI231.   To solve the problem directly that effort has to establish the cause is needed.   Basically, the SMR-AI231 supports several functions to indicate problem kinds.

4.1 Diagnostic for LED

There are three LEDs on the front panel that indicates the status of the SMR-AI231:   Power, Run and Status
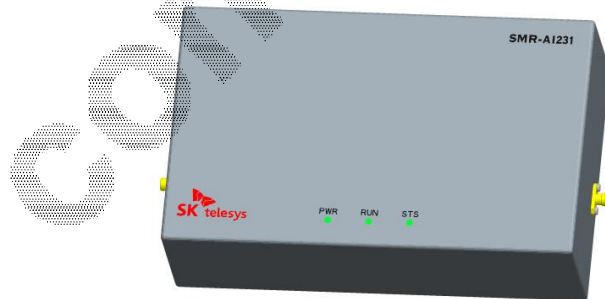
Figure 7. Front View of the SMR-AI231

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4.1.1 **Power LED**

The power LED indicates whether or not the SMR-AI231 is powered on and operating normally. This is located on the leftmost side of three lights

Table 3. Power LED

Power LED	Description
Green	The SMR-AI231 is powered and operating normally. (Power Normal)
Red	An error occurred. The SMR-AI231 is not currently functional. (Power Fail)
OFF	The SMR-AI231 is not getting from power source. (Power Fail or Power Off)

4.1.2 **RUN LED**

The run LED indicates the status of its processor and the synchronization with the reference clock. This is located on the center of three LEDs.

Table 4. Run LED

Run LED		Description
Green	Blinking	TheSMR-AI231 is upgrading its firmware and booting. (Loading, Clock Unlock)

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	ON	The SMR-AI231 is working normally and locked from reference clock. (Normal or Clock Lock)
Red		The SMR-AI231 is restarting by reset
OFF		The SMR-AI231 is working abnormally and power off. (Abnormal or Power Off

NOTE: DO NOT unplug the SMR-AI231 when the green LED is flashing on the RUN LED.

4.1.3 Status LED

The status LED indicates the status of the SMR-AI231 and IEEE1588 slave module. This is located on the rightmost side of three LEDs.

Table 5. Status LED

Status LED		Description
Green		Clock and RF Power Normal
Red	Blinking	ASN-GW Ethernet Link Normal & IEEE1588 Slave Module: Unlock
	ON	ASN-GW Ethernet Link Fail & IEEE1588 Slave Module: Unlock or SMR-AI231 Reset
Yellow		RF Circuit Fail (Over Power alarm/Low Power alarm, LNA fail)
OFF		ASN-GW Ethernet Link Normal & IEEE1588 Slave Module: Unlock or Power Off

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5   Supplement Document

5.1 Technical Specification

The following table illustrates the specification of Sprint AP.

Table 6. The SMR-AI231 Specification

Index	Specification
Frequency	2305MHz ~ 2315MHz, 2350MHz ~ 2360MHz
Bandwidth	5MHz, 10MHz
Max. Output Power	20dBm (17dBm/Ant.)
Input Power	Power over Ethernet (PoE) based on IEEE802.3 or 5.3 V AC/DC Adaptor (Input : AC110~ 220V, 60Hz)
Modulation	Down Link : QPSK, 16QAM, 64QAM Up Link : QPSK, 16QAM
Radio Type	G7W/D7W
Mutiplexing / Duplex	OFDMA/TDD
Dimension	Omni : 240×130×57 (including a bracket and antenna)
Weight	Under 1.0kg
Power Dissipation	Max. 10W(Efficient Power: 6.12W)
Operating Temperature/humidity	0°C ~50°C / 20%~80%
Antenna	Omni, Gain : 2dBi (Outdoor Type: SMA)
Backhaul Port	100BASE-TX 1 Port (Connector Type : RJ-45)
Miscellaneous Port and Switch	Debugger Port, Dip Switch for SMR-AI231 ID

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5.2 Dimensions
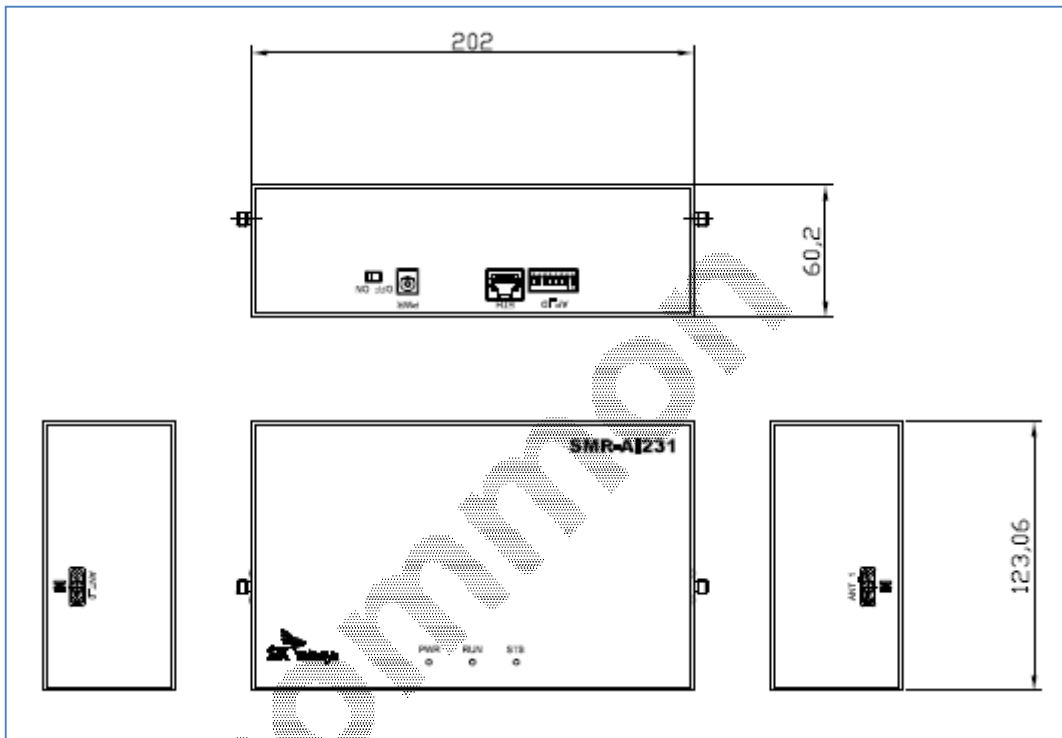
Not include bracket and antennas.

Figure 8. Dimensions of the SMR-AI231

5.3 ID Switch

The ID switch indicates the ID of the SMR-AI23 and ID is set to the hexadecimal. ID switch is consisted of 8-bits dip switch. The relationship between hexadecimal and decimal is in the following table.

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Table 7. The SMR-AI231 ID setting

Hexadecimal	Decimal	Weighted value
0	0	
1	1	1
2	2	2
3	3	1, 2
4	4	4
5	5	1, 4
6	6	2, 4
7	7	1, 2, 4
8	8	8
9	9	1, 8
A	10	2, 8
B	11	1, 2, 8
C	12	4, 8
D	13	1, 4, 8
E	14	2, 4, 8
F	15	1, 2, 4, 8

You need to check the weighted value in the table above to set the specified ID. And then you switch on the corresponding number in the table below. For example, the ID 4C (hexadecimal) can be divided into 4 and C. The hexadecimal number 4 is equal to 4 in decimal. And the weighted value is 4. So you should switch on the second switch.

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The hexadecimal number C is equal to 12 in decimal. And the weighted value of C is 4 and 8. So you should turn on the fifth and sixth switch.
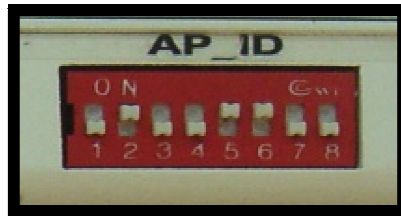

Figure 9. The SMR-AI231 ID Switch

Table 8. Digit Value of ID Switch

Digit	First digit				Second digit			
ID Switch Number	1	2	3	4	5	6	7	8
Weighted value	8	4	2	1	8	4	2	1

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