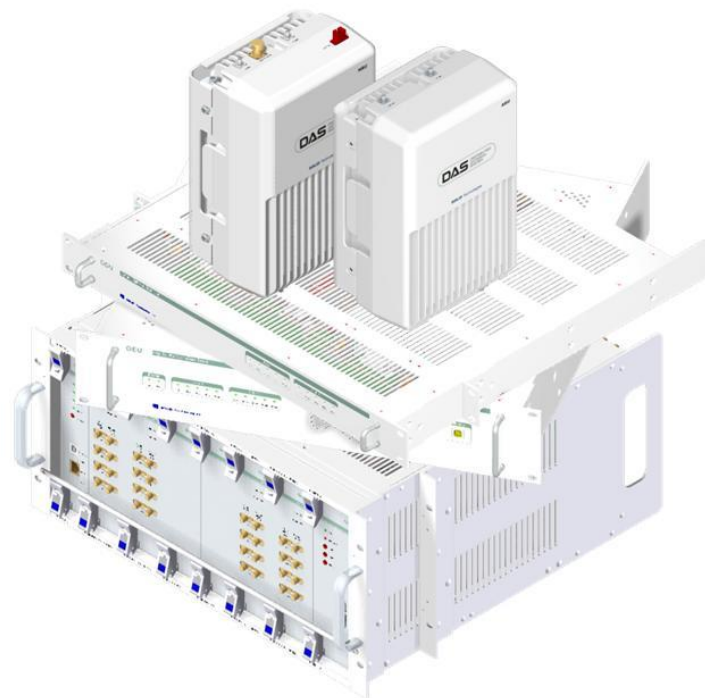


# SC-DAS

## User Manual

---



### Document Reference:

Version:	V1.0
Document Status:	Release 1
Issue Date:	July. 04, 2014
Author:	Young Ju You
Department:	R&D Division Team 3
Authorizing Manager:	Young shin Yeo

---

## REVISION HISTORY

Version	Issue Date	No. of Pages	Initials	Details of Revision Changes
V 1.0	July. 04, 2014		Original	

### Technical Support

SOLiD serial numbers must be available to authorize technical support and/or to establish a return authorization for defective units. The serial numbers are located on the back of the unit, as well as on the box in which they were delivered. Additional support information may be obtained by accessing the SOLiD Tehcnology, Inc. website at [www.st.co.kr](http://www.st.co.kr) or send email at [sjkim@st.co.kr](mailto:sjkim@st.co.kr)

This manual is produced by Global Business Division Business Team 1. Printed in Korea.

---

## Contents

<b>Section1</b>	<b><i>Safety &amp; Certification Notice</i></b> .....	<b>5</b>
<b>Section2</b>	<b><i>System Configuration and Functions</i></b> .....	<b>8</b>
2.1	ROU (Remote Optic Unit).....	8
2.1.1	Specifications of ROU .....	9
2.1.2	Block Diagram of ROU .....	10
2.1.3	ROU parts .....	10
2.1.4	Function by unit.....	12
2.1.5	Bottom of ROU.....	14
<b>Section3</b>	<b><i>System Installation &amp; Operation</i></b> .....	<b>17</b>
3.1	ROU Installation.....	17
3.1.1	ROU Enclosure installation .....	17
3.1.2	ROU Power Cabling.....	25
3.1.3	Optical Cabling .....	26
3.1.4	GND Terminal Connection .....	26
3.1.5	Coaxial cable and Antenna Connection.....	27
3.1.6	Information of LED of ROU.....	28
3.1.7	Consumption of RDU.....	28
3.1.8	Specifications Per band.....	29

---

## Contents of Figure

Figure 2.1 – ROU Outer Look .....	9
Figure 2.2 – ROU block diagram.....	10
Figure 2.3 – ROU Inner Look .....	11
Figure 2.4– PSU Outer Look.....	13
Figure 2.5– ROU Bottom Look.....	14
Figure 2.6 – ROU Power Port Look.....	15
Figure 2.7 – ROU Bottom Look.....	16
Figure 3.1 – Dimension used to install ROU on the WALL.....	18
Figure 3.2 – ROU installation procedure side by side.....	19
Figure 3.3 – ROU installation diagram side by side .....	20
Figure 3.4 – ROU installation procedure for 2layer .....	20
Figure 3.5 – ROU installation diagram for 2layer.....	21
Figure 3.6 – ROU installation procedure for vertical rack.....	22
Figure 3.7 – ROU installation diagram for vertical rack .....	23
Figure 3.8 – ROU installation procedure for horizontal rack .....	24
Figure 3.9 – ROU installation diagram for horizontal rack.....	24
Figure 3.10 – ROU Power Port Look .....	25
Figure 3.11 – ROU optical Port Look.....	26
Figure 3.12 – ROU GND Port Look .....	27
Figure 3.14 – ROU LED indicator information.....	28

# *Section 1*

## **Safety & Certification Notice**

---

**“Only qualified personnel should handle the DAS equipment. Any person involved in installation or service of the DAS should understand and follow these safety guidelines.”**

- Obey all general and regional installation and safety regulations relating to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment.
- The power supply unit in repeaters contains dangerous voltage level, which can cause electric shock. Switch the mains off prior to any work in such a repeater. Any local regulations are to be followed when servicing repeaters.
- When working with units outdoors, make sure to securely fasten the door or cover in an open position to prevent the door from slamming shut in windy conditions..
- Use this unit only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any spare parts which are not sold or recommended by the manufacturer. This could cause fires, electric shock or other injuries.
- Any DAS system or Fiber BDA will generate radio (RF) signals and continuously emit RF energy. Avoid prolonged exposure to the antennas. SOLiD recommends maintaining a 3-foot minimum clearance from the antenna while the system is operating.
- Do not operate this unit on or close to flammable materials, as the unit may reach high temperatures due to power dissipation.

- Do not use any solvents, chemicals, or cleaning solutions containing alcohol, ammonia, or abrasives on the DAS equipment. Alcohol may be used to clean fiber optic cabling ends and connectors.
- To prevent electrical shock, switch the main power supply off prior to working with the DAS System or Fiber BDA. Never install or use electrical equipment in a wet location or during a lightning storm.
- Do not look into the ends of any optical fiber or directly into the optical transceiver of any digital unit. Use an optical spectrum analyzer to verify active fibers. Place a protective cap over any radiating transceiver or optical fiber connector to avoid the potential of radiation exposure.
- Allow sufficient fiber length to permit routing without severe bends.
- For pluggable equipment, make sure to install the socket outlet near the equipment so that it is easily accessible.
- A readily accessible disconnect device shall be incorporated external to the equipment.
- This power of this system shall be supplied through wiring installed in a normal building. If powered directly from the mains distribution system, it shall be used additional protection, such as overvoltage protection device
- Only 50 ohm rated antennas, cables and passive equipment shall be used with this remote. Any equipment attached to this device not meeting this standard may cause degradation and unwanted signals in the bi-directional system. All components connected to this device must operate in the frequency range of this device.
- Only 50 ohm rated antennas, cables and passive components operating from 150 - 3 GHz shall be used with this device.
- The head end unit must always be connected to the Base Station using a direct cabled connection. This system has not been approved for use with a wireless connection via server antenna to the base station.
- Signal booster warning label message should include

**WARNING.** This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENSEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

- Certification

- FCC: This equipment complies with the applicable sections of Title 47 CFR Parts 15,22,24,27 and 90
- UL/CUL: This equipment complies with UL and CUL 1950-1 Standard for safety for information technology equipment,including electrical business equipment
- FDA/CDRH: This equipment uses a Class 1 LASER according to FDA/CDRH Rules.This product conforms to all applicable standards of 21 CFR Chapter 1, Subchapter J, Part 1040

## *Section2*

### System Configuration and Functions

---

#### 2.1 ROU (Remote Optic Unit)

ROU consist of two unit which one is MRU(Main Remote Unit) and the other is ARU(Add on Remote Unit). We simply called as ROU combination of MRU and ARU

MRU receives TX optical signals from ODU or OEU and converts them into RF signals. The converted RF signals are amplified through High Power Amp in a corresponding RU, combined with Multiplexer and then radiated to the antenna port.

When receiving RX signals through the antenna port, this unit filters out-of-band signals in a corresponding RU and sends the results to Remote Optic Module to make electronic-optical conversion of them. After converted, the signals are sent to a upper device of ODU or OEU.

MRU and ARU are composed of maximal dual band

The most difference of MRU an ARU is whether existence of optical module is in it or not



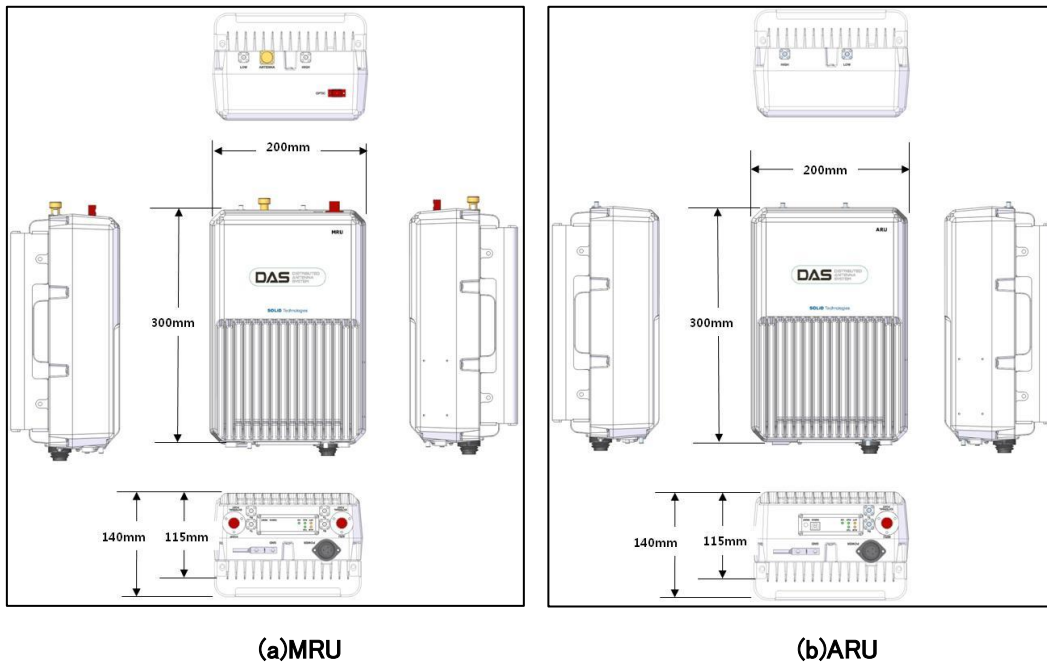


Figure 2.1 – ROU Outer Look

2.1.1 Specifications of ROU

Item	MRU Spec	ARU Spec.	Remark
Size(mm)	300 x 200 x 140	300 x 200 x 140	mm
Weight	6.6kg	6.8 Kg	Full load
Power consumption	50W	40W	

### 2.1.2 Block Diagram of ROU

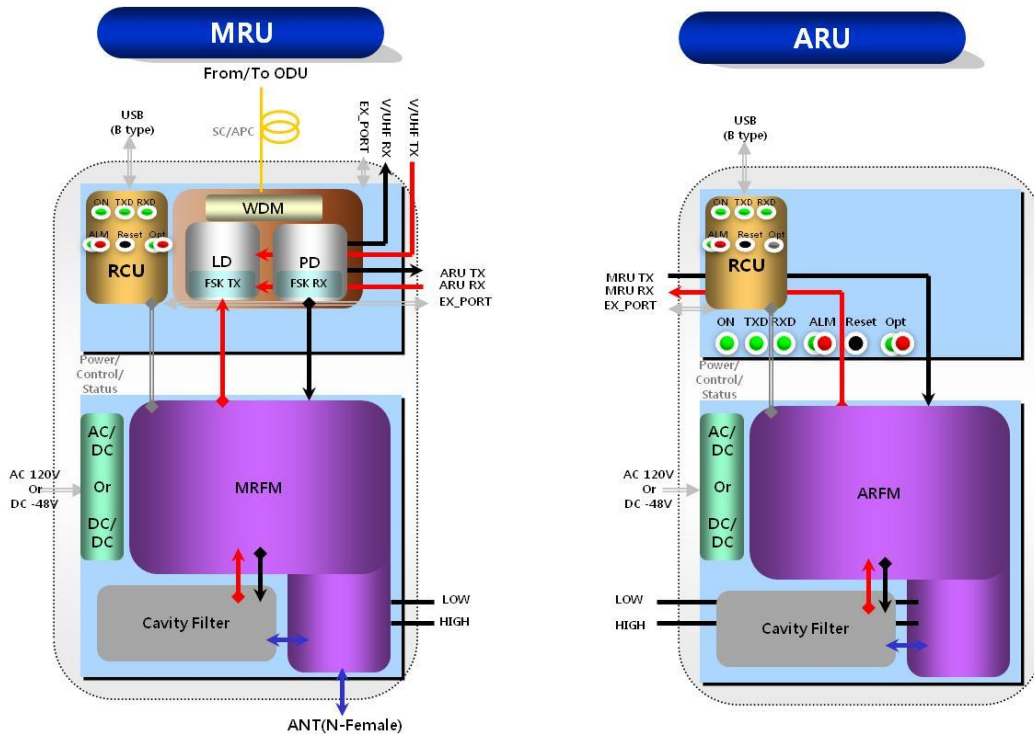
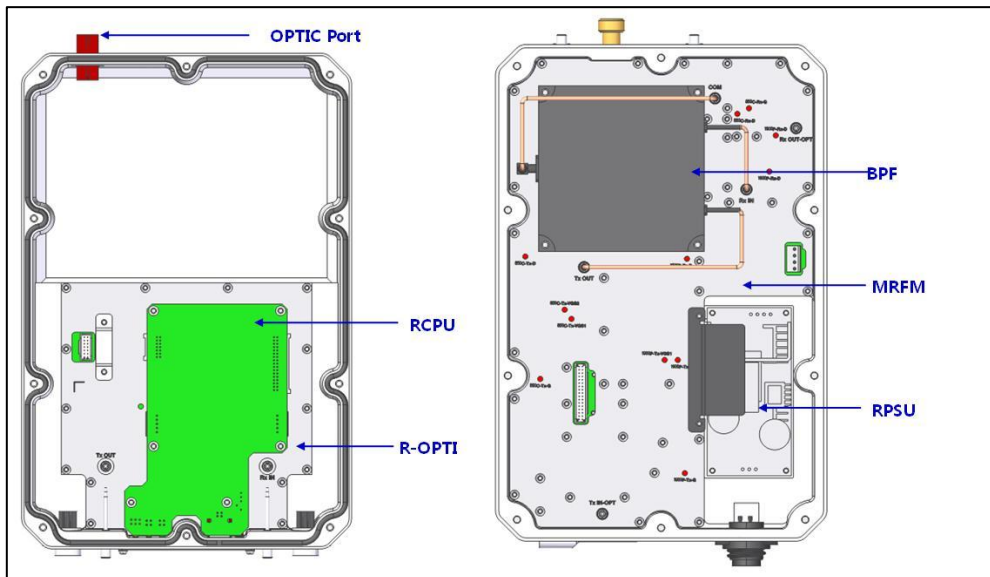
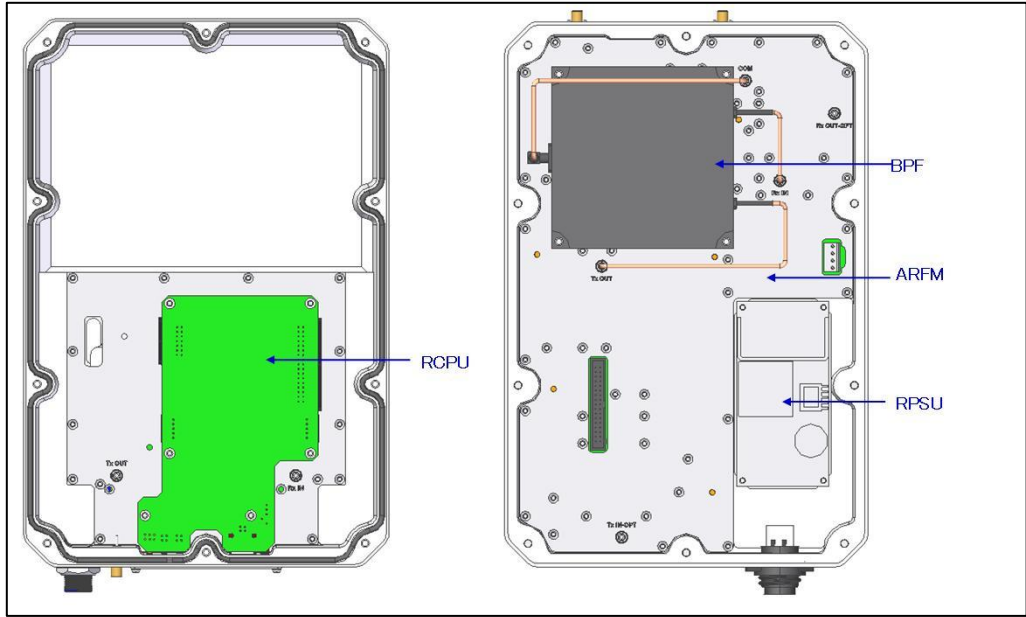


Figure 2.2 – ROU block diagram

### 2.1.3 ROU parts



(a)MRU



(b)ARU

Figure 2.3 – ROU Inner Look

No.	Unit	Description	Remark
1	MRFM/ARFM +BPF	<b>Main/Add on RF Module</b> Filter and high amplify TX signals; Filter and amplify RX signals; Remove other signals through BPF	
2	RPSU	<b>Remote Power Supply Unit</b> Input power: DC -48V or AC120V, Output power: 25V For 120V input of AC/DC; For -48V input of DC/DC	
3	R-OPT	<b>Remote Optic</b> Make RF conversion of TX optical signals; Convert RX RF signals into optical signals; Compensates optical loss interval Communicates with BIU or OEU though the FSK modem	

4	RCPU	<b>Remote Central Processor Unit</b> Controls signal of each unit Monitors BIU/ODU/OEU status through FSK modem communication	
5	Enclosure	Enable Wall Mount; Check if the system is normal, through the bottom panel LED	

### 2.1.4 Function by unit

#### 1) Main RF Module/Add on RF Module (MRFM/ARFM)+BPF

When receiving TX signals from each band through R-Opt, MRFM/AFRM filters the signals and amplifies them with High Power Amplifier. The unit also filters RX signals given through antenna and amplifies them as low noise to send the signals to R-Opt.

In the unit, there is ATT to adjust gain. This devices are varied for each frequency band, including the following:

No	Unit naming	Description	BPF	
			Cavity Filter	Ceramic Filter
1	MRFM 1900P+850C	Dual.	1900P	850C
2	ARFM 700LTE+AWS-1	Dual.	700LTE	AWS-1
3	To be Developed			

#### 2) Remote Power Supply Unit (RPSU)

RPSU receives -48V of input. This unit is divided into DC/DC type to output +25V of DC power and AC/DC type to receive 120V of AC input and to output +25V of DC power.

Upon order, either of the two types should be decided. MS Connector, which uses ports to receive inputs, is designed to different type of AC and DC. The input cable is different as power input conditions.

RPSU don't have switch to turn the power ON/OFF. If power receives, power is automatically operated

Here, you should check for rang of input power as following:

No.	Unit	Range of input power	Remark
1	AC/DC	90 ~ 264VAC	
2	DC/DC	-42V ~ -56VDC	



Figure 2.4- PSU Outer Look

### 3) Remote Optic(R-OPT)

Remote Optic converts optical signals into RF signals and performs vice versa. With an FSK modem in it, the unit communicates with upper devices.

It also has internal ATT to compensate for optical cable loss. Optical wavelength for TX path is 1310nm, for Rx path is 1550nm. It can be transported by a optical strand using WDM(Wavelength Division Multiplexing) technique

### 4) Remote Central Processor Unit (RCPU)

RCPU can monitor and control RU. This unit receives and analyzes upper communication data from Remote Optic and reports the unit's own value to upper devices. At the bottom of the module, it has LED indicator to show system status, letting you check any abnormalities at a time. At the same pannel, it also has communication LED Indicators to show communication status with upper devices. Through USB Port, the unit enables you to check and control device status through PC and laptop. This equipment is indoor use and all the communication wirings are limited to inside of the building. RCPU of MRU have two port to connect exteranl devices which one is for ARU and the other is for VHF&UHF ARU. Using external interface cable, MRU can communicate with ARU/VHF&UHF ARU. MRU collects status information from ARU/VHF&UHF ARU and then communicate with upper device

## 2.1.5 Bottom of ROU

### 1) Functions

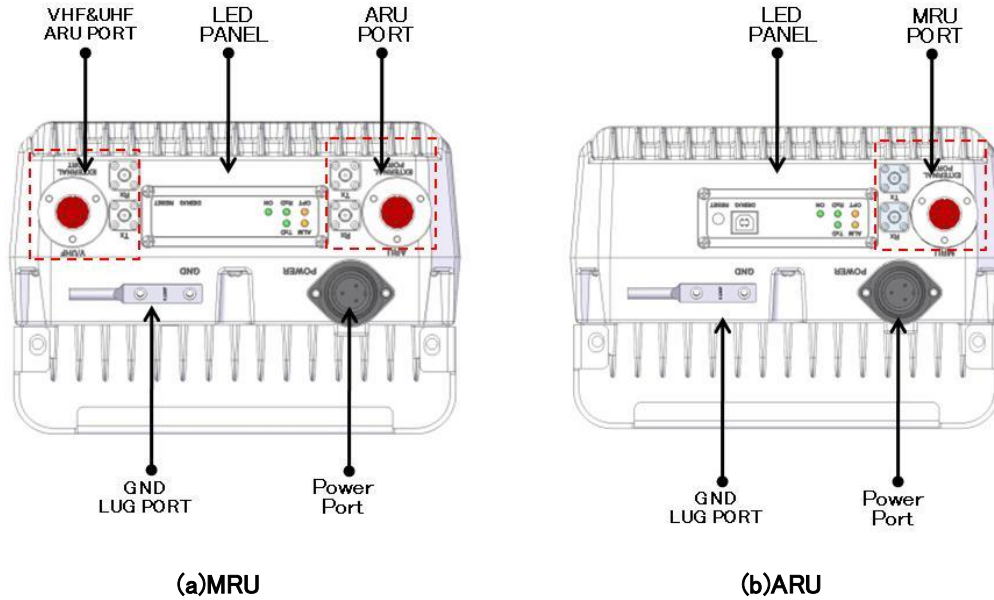
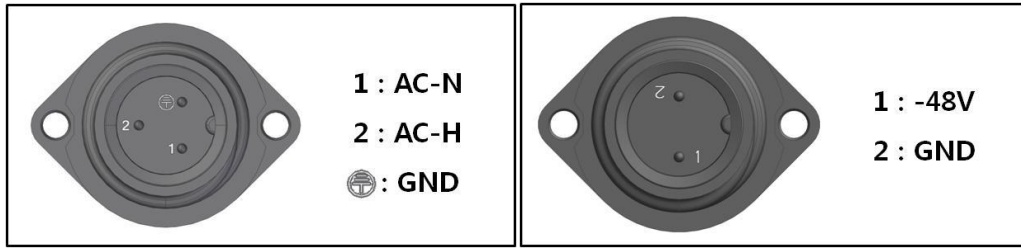


Figure 2.5- ROU Bottom Look

Item	Description	Remark
1. VHF/UHF ARU Port	Terminal for TX and RX RF ports of VHF and UHF Terminal for signal port to interface with VHF and UHF	
2.LED PANEL	Visible LED indicator panel for checking if status is abnormal USB Port for check and control device status through PC and laptop	
3. Power Port	AC 120V input port or DC-48V input port	
4.ARU/MRU Port	Terminal for TX and RX RF ports of MRU/ARU Terminal for signal port to interface with MRU/ARU	
5.GND LUG PORT	Terminal for system ground	

### Power Port

A different type of power ports are used for power-supplying of -48V DC or 120V AC, and specific power cable should be applied to each different types of ROU power supply (AC/DC or DC/DC). Below figure is naming of the power supply by type.



(a)AC/DC

(b)DC/DC

Figure 2.6 – ROU Power Port Look

Top of ROU

1) Functions

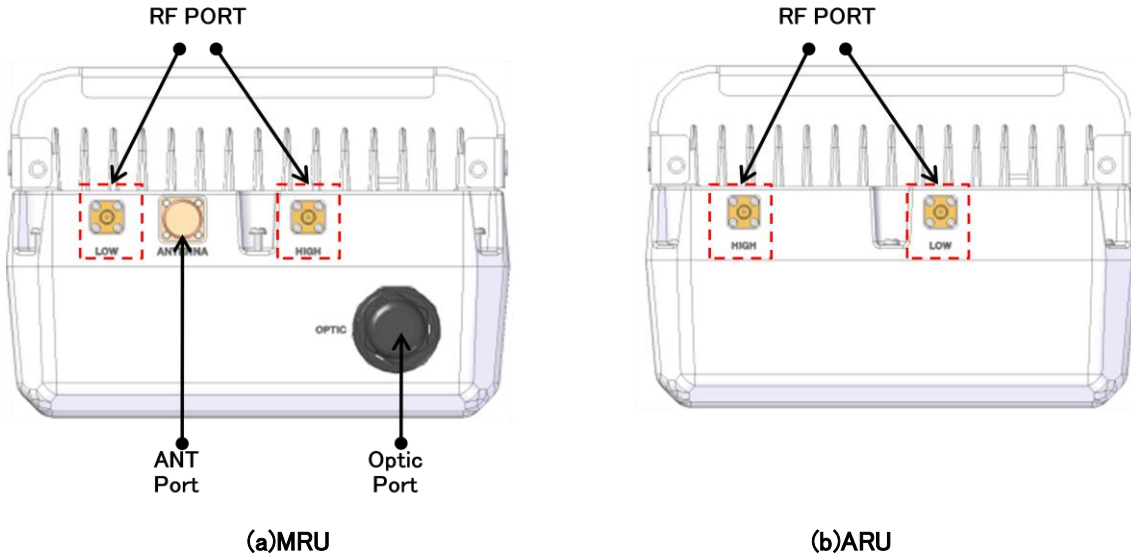


Figure 2.7 – ROU Bottom Look

Item	Description	Remark
1. RF Port	Terminal for Low RF port to connect between MRU and ARU RF Terminal for HIGH RF port to connect between MRU and ARU RF	
2. ANT Port	Terminal for RF port to connect with antenna	
3. Optic Port	Terminal for Optical port to connect with optical cable The supported optical connector type is SC/APC	



## ***Section3***

### **System Installation & Operation**

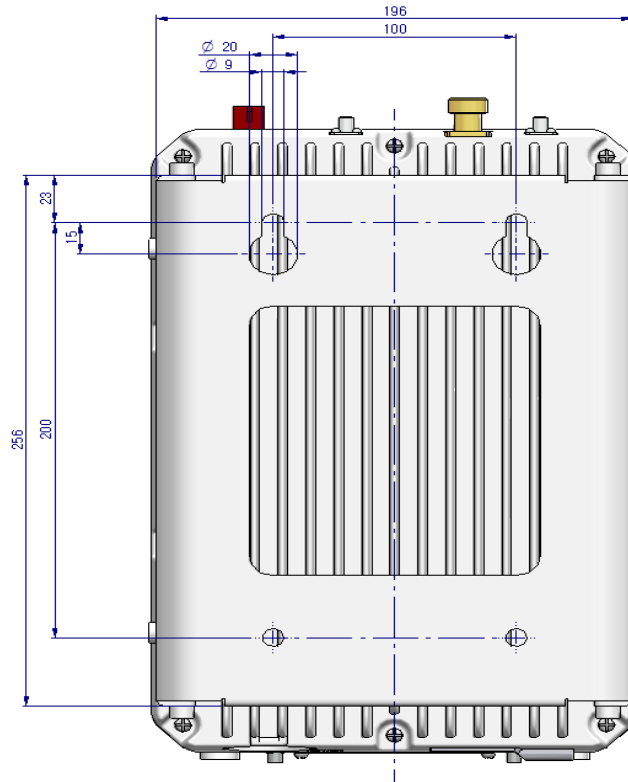
---

#### **3.1 ROU Installation**

##### **3.1.1 ROU Enclosure installation**

ROU enclosure have two optional. One meets with NEMA4 standard and the other does not meet with NEMA4 which is water- and dirt-proof. ROU can be mounted on a Wall basically. Rack mounting is also possible to use extra unit. Extra units have three type and those will be explained on later chapter. ROU consist of MRU and ARU, their dimension is exactly same.

The following shows dimension of the fixing point for the Wall Mount Bracket.



**Figure 3.1 – Dimension used to install ROU on the WALL**

### **ROU Wall Mount Installation**

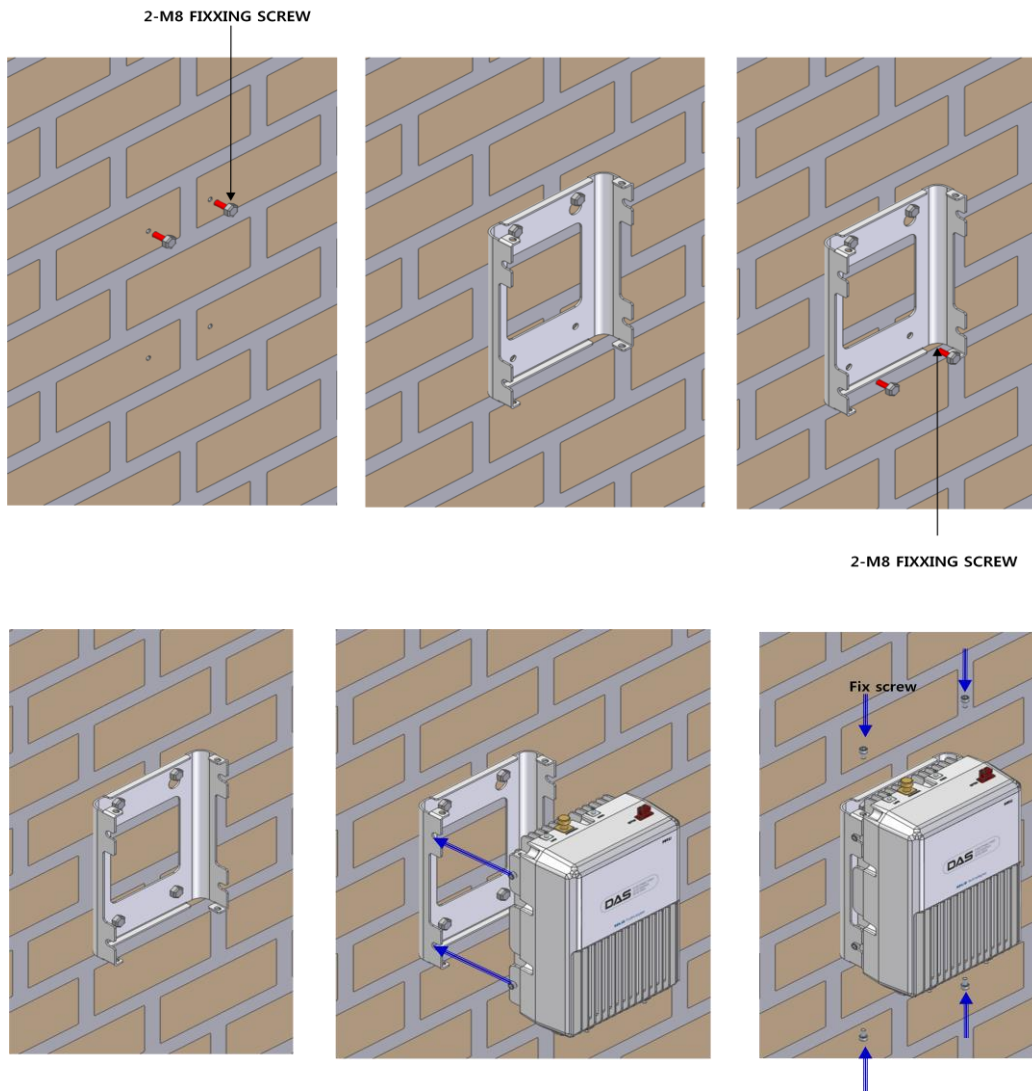
There are two way to install ROU on the wall. One is to install ROUs on the wall side by side, the other is 2layer installation that ARU install above MROU directly

#### **Type1 : Side by Side installation**

Turn M8 Fixing Screws by half on the wall and fully fix the screw with a Wall Mount Bracket on it.

For convenience, the Wall Mount Bracket has fixing holes to let you easily mount an enclosure.

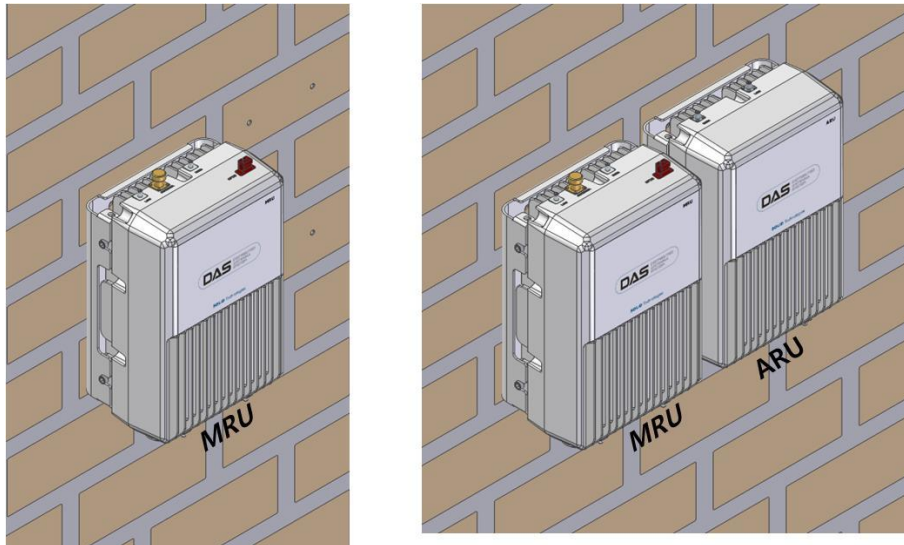
Turn the M6 Wrench Bolt by half at each side of the Heatsink of the enclosure.



**Figure 3.2 – ROU installation procedure side by side**

Put the enclosure with the M6 Wrench Bolt fixed on the fixing groove and fix the M6 Wrench Bolts into the remaining fixing holes.

In this case, you will use 4 M6 Wrench Bolts in total except bolts used for the fixing groove.



**Figure 3.3 – ROU installation diagram side by side**

For connecting cables between MRU and ARU conveniently, MRU should install on left side of ARU.

**Type2 : 2Layer installation**

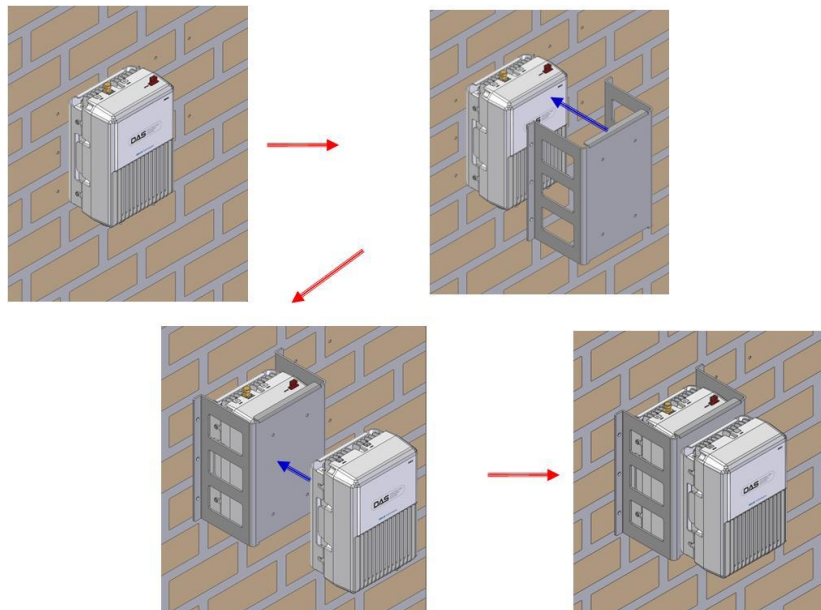
In case of the narrow space to not install MRU and ARU side by side, we can install RUs into 2layer

To install into 2layer, it need barcket for 2layer installation

First, after installing MRU on the wall and then install the bracket for 2layer installation on the MRU

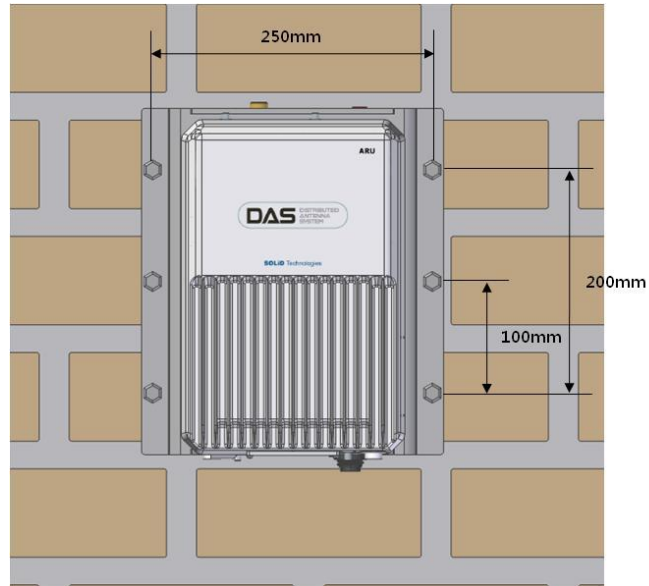
Second, on top of the installed bracket, install ARU

Completed installation diagram is as follows



**Figure 3.4 – ROU installation procedure for 2layer**

The following shows dimension of the fixing point for the 2layer bracket.



**Figure 3.5 – ROU installation diagram for 2layer**

## ROU Rack Mount Installation

There are two way to install on a rack. One is to install ROUs on the rack vertically, the other is to install ROUs on the rack horizontally

### Type1 : Vertical installation on the rack

For vertical installation, vertical bracket needs.

First, install bracket for vertical installation on the rack

Second, mount MRU on the left side of the installed bracket

Third, mount ARU on the right side of the installed bracket

Completed installation diagram is as follows

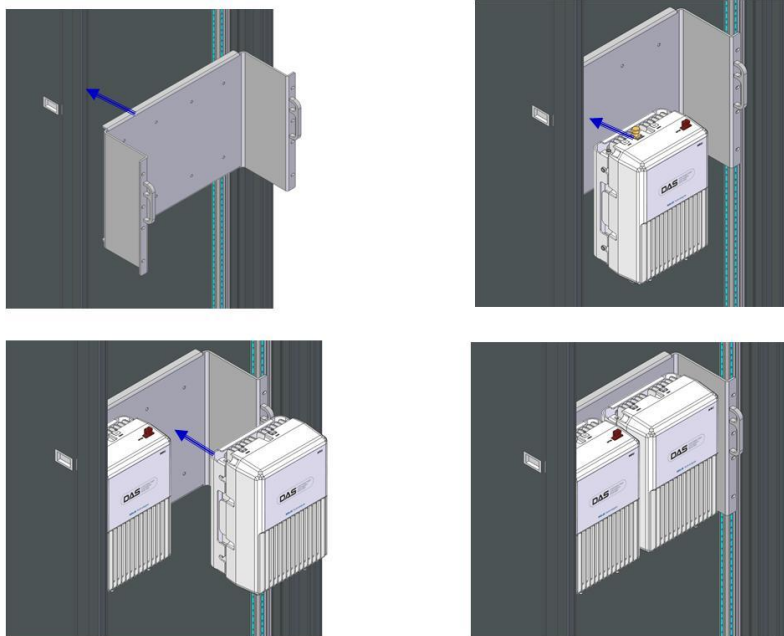
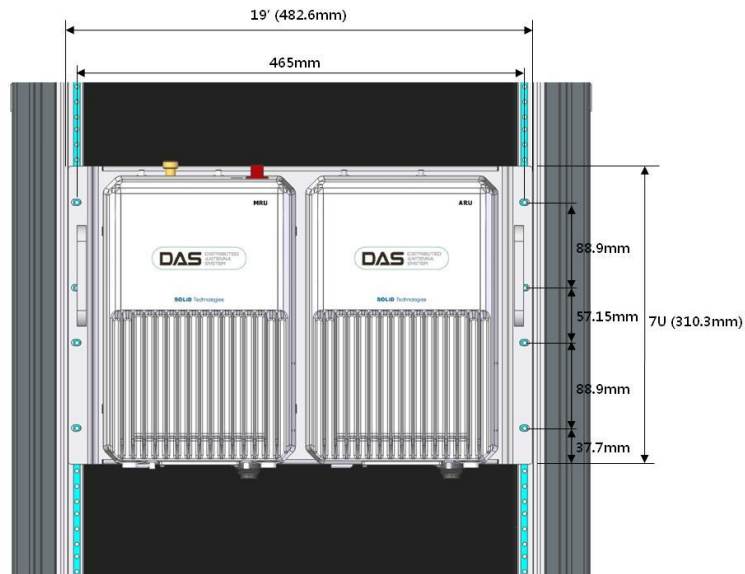


Figure 3.6 – ROU installation procedure for vertical rack

The following shows dimension of the fixing point for vertical installation



**Figure 3.7 – ROU installation diagram for vertical rack**

**Type2 : Horizontal installation on the rack**

For Horizontal installation, horizontal bracket needs. Unlike vertical installation, MRU is mounted on the right of installed bracket first and then ARU is installed on the left of MRU

First, install bracket for horizontal installation on the rack

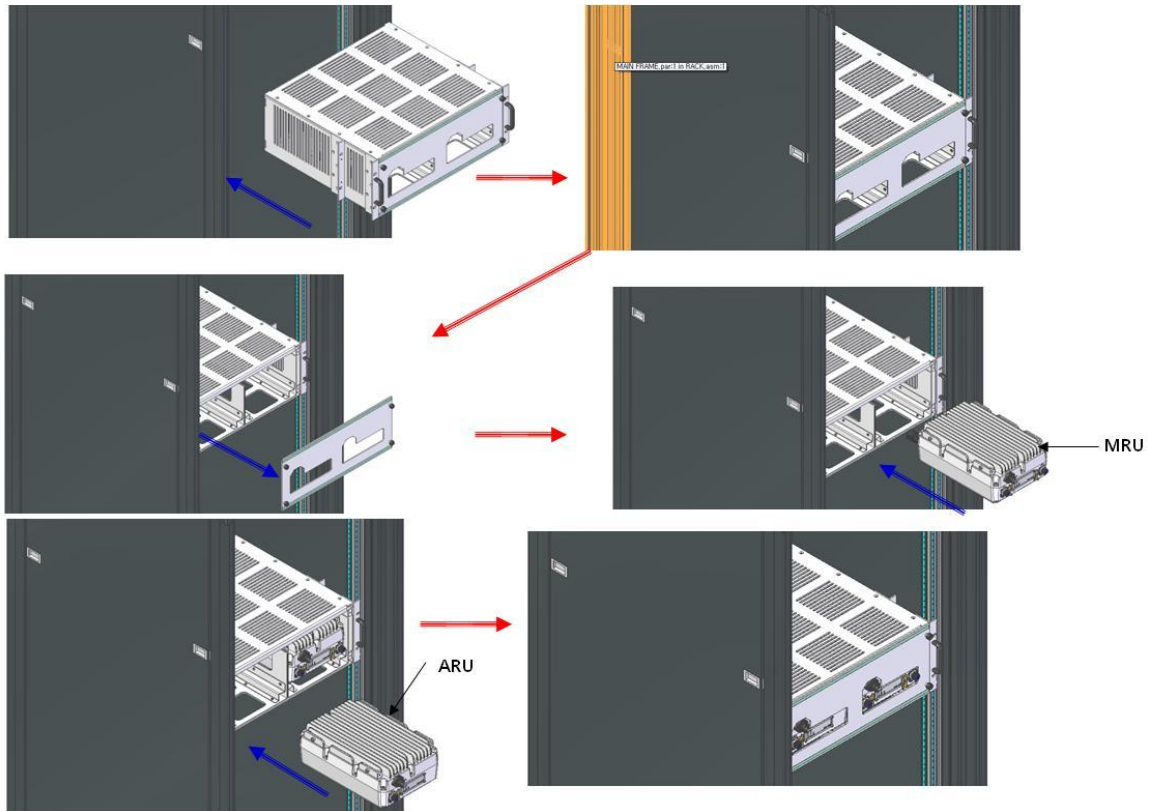
Second, open the front cover of horizontal bracket

Third, mount MRU on the right side of the installed bracket

Fourth, mount ARU on the left side of the installed bracket

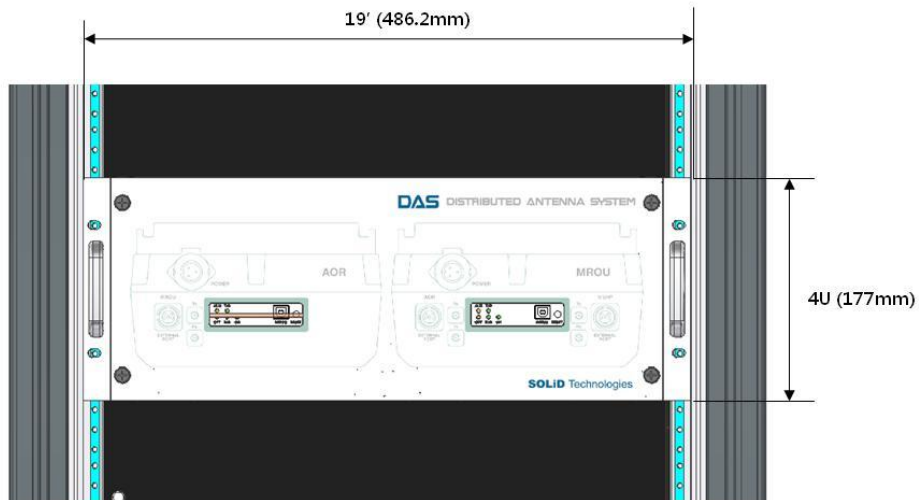
Fifthly, close the front cover of horizontal bracket

Completed installation diagram is as follows



**Figure 3.8 – ROU installation procedure for horizontal rack**

The following shows dimension of the fixing point for vertical installation



**Figure 3.9 – ROU installation diagram for horizontal rack**



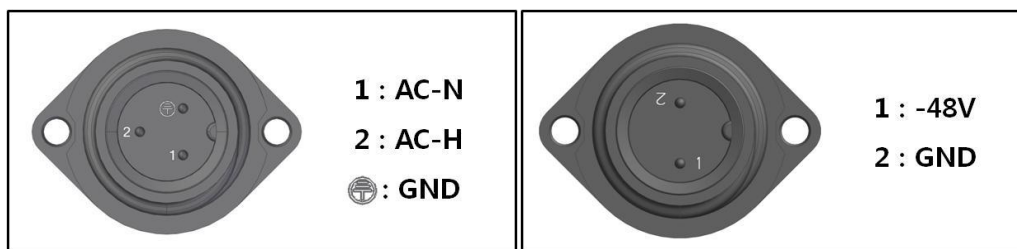
## ROU components

ROU has the following components:

No.	Unit	Description	Remark
MRU	Enclosure	Including Wall cradle	1EA
	Power Cable	– Connector with 3 hole to AC 120 plug(AC) – Connector with 2 lug termination(DC)	1EA(Optical for AC or DC)
ARU	Enclosure	Including Wall cradle	1EA
	Power Cable	– Connector with 3 hole to AC 120 plug(AC) – Connector with 2 lug termination(DC)	1EA(Optical for AC or DC)
	RF cable for optical	– Two RF cables and one signal cable	
	RF cable for antenna	– Two RF cables	

### 3.1.2 ROU Power Cabling

ROU supports both of DC-48V and AC120V of input power. The type of input power of ROU is already determined when ROU produce. Therefore, the ROU has correct power cable in the package box. See the UL name plate of ROU to distinguish the input power type of ROU easily or see the power connector as blow picture. You should order the type of input power as your application.



(a)AC/DC

(b)DC/DC

Figure 3.10 – ROU Power Port Look

Check if the connection is the same as one seen in the table above. ROU does not have power switch to power on/off. If you power plug into concent of power, power supply is operated automatically.

### 3.1.3 Optical Cabling

MRU makes optical–electronic conversion of TX signals from upper ODU and OEU and makes electronic– optical conversion of RX signals. MRU has one optical module in it. As WDM is installed in the R\_OPT module, two pieces of wavelength (TX:1310nm, RX:1550nm) can be sent/received with one optical strand at the same time. MRU has SC/APC of optical adaptor type.

For optical adaptor, SC/APC type can be used. To prevent the optical access part from being marred with dirt, it should be covered with a cap during move. When devices are connected through optical cables, you are recommended to clear them using alcohol to remove dirt.

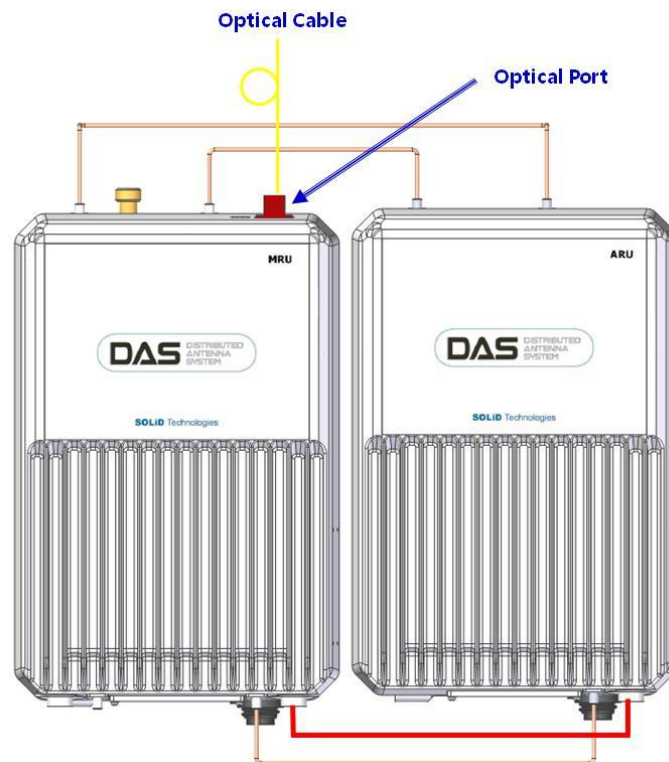
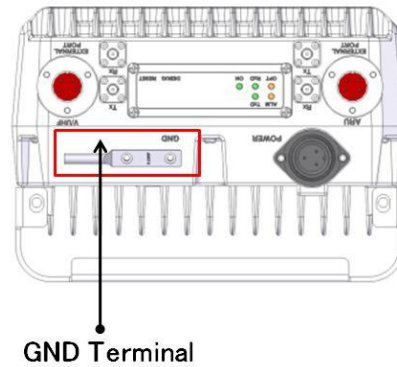


Figure 3.11 – ROU optical Port Look

Only MRU has optical port but ARU don't have optical port

### 3.1.4 GND Terminal Connection

ROU has one GND terminal port where is on bottom side, like below



**Figure 3.12 – ROU GND Port Look**

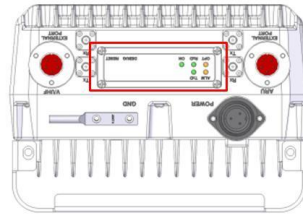
- Take off the GND terminal port from enclosure and connect to ground cable, then fix it the position of enclosure again
- The opposite end of the ground cable should connect to the communication GND of building
- The ground lug is designed meeting the SQ5.5 standard

### 3.1.5 Coaxial cable and Antenna Connection

- The coaxial cables which are connected to antenna distributed network connect to antenna port of ROU. Before connection, check the VSWR value of coaxial cable whether it is within specification using SITEMASTER .
- At this time, check if the Return loss have above 15Db or VSWR have below 1.5
- The part of antenna connection fasten to port not to be loosed and not to be injected the dusty and insects
- The antenna connected to ROU is only serviced in inbuilding
- The ROU which have antenna port is only MRU, ARU transport their signal through RF cable connected both MRU and ARU

### 3.1.6 Information of LED of ROU

ROU has LED panel at the bottom of ROU. The LED indicator is as below



LED		Description
ON	●	Power is not supplied
	●	Power is supplied.
ALM	●	Normal Operation
	●	Abnormal Operation
OPT	●	R-OPT is normal operation
	●	R-OPT is abnormal Operation
TXD	●	Twinkle when data send to upper unit
RXD	●	Twinkle when data receive from upper unit

Figure 3.14 – ROU LED indicator information

### 3.1.7 Consumption of RDU

The following table shows power consumption of ROU

Part	Unit	Consumption Power	Remark
MRU	1900P+850C	50W	Dual Band
ARU	700LTE+AWS-1	40W	Dual Band

### 3.1.8 Specifications Per band

Standard	Unit naming	Description	Frequency range	
			TX(MHz)	RX(MHz)
Cellular	850C	Cellular	869 to 894	824 to 849
PCS	1900P	PCS	1930 to 1995	1850 to 1915
AWS-1	AWS-1	AWS-1	2110 to 2155	1710 to 1755
LTE	700LTE	Long Term Evolution	728 to 757	699 to 716 777 to 787

#### 850MHz Cellular

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	25MHz	25MHz	
Output power	+24dBm	+0dBm	Total
System Gain	44dB	50dB	
input and output impedances	50 ohm	50 ohm	

#### 1900MHz PCS

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	65MHz	65MHz	
Output power	+28dBm	+0dBm	Total
System Gain	48dB	50dB	
input and output impedances	50 ohm	50 ohm	

#### AWS-1

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	45MHz	45MHz	
Output power	+28dBm	+0dBm	Total
System Gain	48dB	50dB	
input and output impedances	50 ohm	50 ohm	

### 700MHz Long Term Evolution

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	29MHz	28MHz	
Output power	+24dBm	+0dBm	Total
System Gain	44dB	50dB	
input and output impedances	50 ohm	50 ohm	