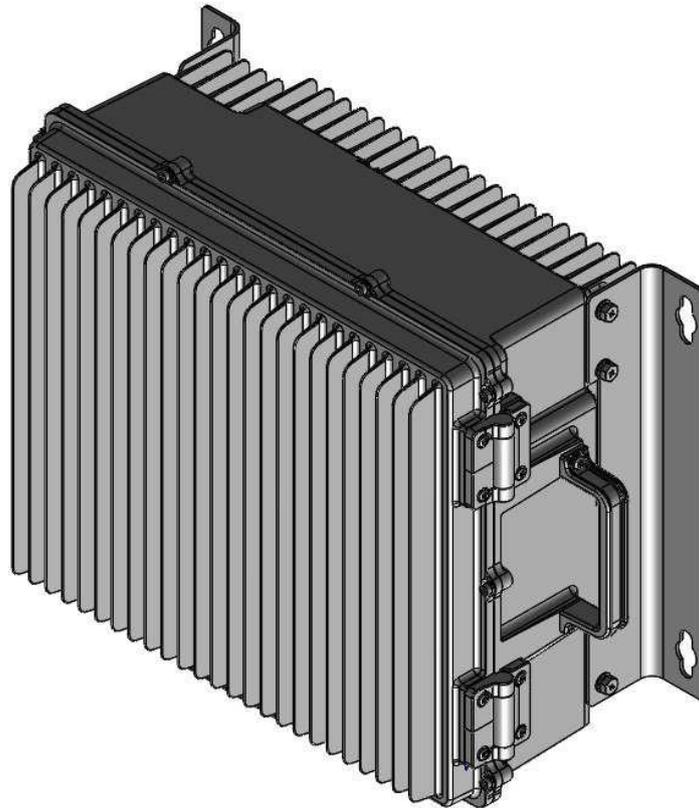


Alliance_N2ROU (Remote Unit)

User Manual



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REVISION HISTORY

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Preface

Technicians using these manuals should have completed the SOLiD Certification Program. SOLiD also recommends technicians be familiar with the concepts of fiber optic cabling, networking and wireless communication technologies, and SNMP. We further recommend training programs offered through CIBET (Certified In Building Engineering Technologist) and BICSI (Building Industry Consulting Service International).

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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.solid.co.kr

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Section1

1.1 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 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.
- 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.
- 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 modify or fit any spare parts that 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 **250 cm** 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.
- 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.

- Certification

- FCC: This equipment complies with the applicable sections of Title 47 CFR Parts 15,22,24 27 and 90 (Class B)
- 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

- 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.

- Round terminals located on the side of a 1 mm² (16 AWG) or more wires Using permanently connected to earth. (Green/yellow color)

- **Prior to equipment use the service must be registered with the FCC. This can be done through the FCC's website at <https://signalboosters.fcc.gov/signal-boosters/>.**
- Access can only be gained by SERVICE PERSONS or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and
- Access is through the use of a TOOL or lock and key, or other means of security, and is controlled by the authority responsible for the location.
- Notice! Be careful not to touch the Heat-sink part due to high temperature.
- **Use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP and/or indoor-only restrictions is prohibited.**
- **Home/ personal use are prohibited.**

FCC booster warning

Part 90 and Part 20 Signal Boosters. THIS IS A 90.219 CLASS B DEVICE 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 have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You MUST register Part 90 Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

IC Booster warning

WARNING: This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENCE or the express consent of an ISED licensee to operate this device.

Section2

2.1 Overview

The N2ROU is a coverage system for in-building services delivering voice and data in high quality and for seamlessly. As a distributed antenna system, it provides analog and digital phone systems that are served in multiple bands through one antenna.

The system covers general public institutions and private facilities.

- Shopping malls
- Hotels
- Campus areas
- Airports
- Clinics
- Subways
- Multi-use stadiums, convention centers, etc.

The system helps improve in-building radio environments in poor condition and make better poor RSSI and Ec/Io. By providing communication services at every corner of buildings, the system enables users to make a call at any site of buildings.

The system uses both analog (AMPS) and digital (TDMA, CDMA and WCDMA) methods.

The N2ROU system supports communication standards and public interface protocols in worldwide use.

Frequencies: **700 MHz, 800 MHz, 1900MHz, 2100MHz (N2RDU_78e1921)**
2300WCS, 2.5TDD , 2.5TDD_M (Optional)

- Voice protocols: AMPS,TDMA, CDMA,GSM,IDEN, etc.
- Data protocols: EDGE,GPRS,WCDMA,CDMA2000, Paging, LTE etc.

The N2ROU is equipped with 4-band (**700M, 800M, 1900M, 2100M**) module by default.

600L, 2300WCS, 2.5TDD, and 2.5TDD_M are available for service, but only two of them can be installed with the default module as optional frequency bands. 600L is not ready at this stage and will be developed later. When 600L is available for service, a maximum of three optional bands can be installed. As it delivers multiple signals with one optical cable, the system, in one-body type, does not require additional facilities whenever new frequency is added.

The system is featured with the following:

- Flexibility & Scalability
 - Support fiber-optic ports up to 60
 - Clustering multiple-buildings (campus) as one coverage
- Option structures
 - Modular frequency upgrade
- Multi-Band, Multi Operator
 - Signals with a plurality of service provider transmit simultaneously
 - Support multi-operator in a band
- Low OPEX / CAPEX
 - Compact design
 - Upgradable design
 - Easy installation and maintenance

2.2 N2ROU

The N2ROU transports signals that multiple operators and multiple technologies are transmitted simultaneously from BTS to a remote location over the same optical fiber. Furthermore, there is reserved N2RDU slot to support 600LTE in the future. And N2RDU slot is also can be replaced with the desired frequency band.

Section 3

3.1 Functional Description

The following figure shows the block diagram of N2ROU. The N2ROU has four different diagrams based on optional modules. The diagram shown below is the first one with the default combination.

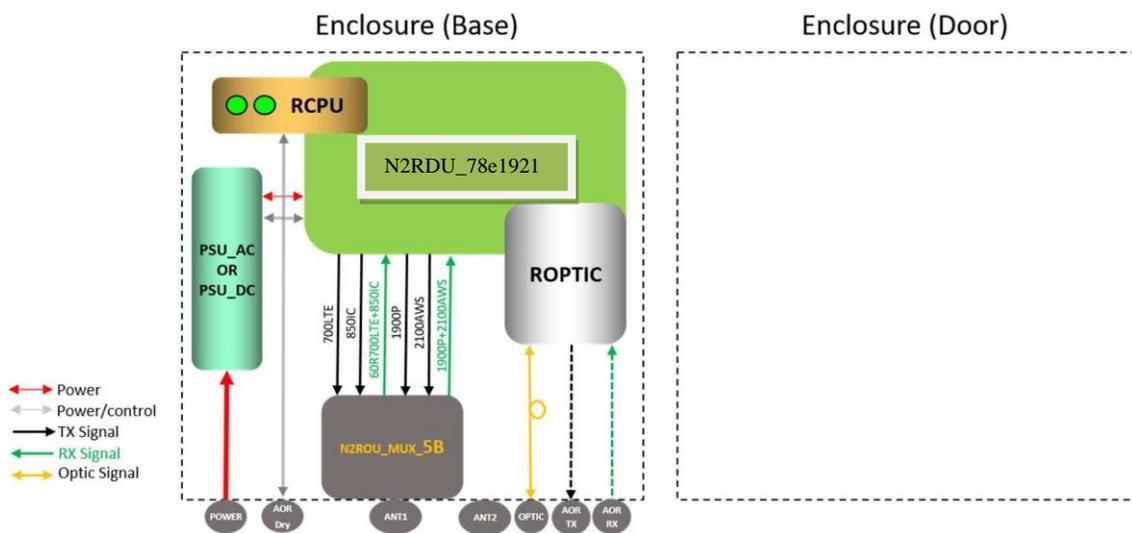


Figure 3.1 – N2ROU Block Diagram (4 Bands)

The components are;

- R-Optic: Remote Optical Unit
- RCPU: Remote Central Processor Unit
- RPSU (AC): Remote AC Power Supply Unit (When using the AC input power)
- RPSU (DC): Remote DC Power Supply Unit (When using the DC input power)
- N2RDU_781921: Remote Drive Unit (4bands)
- N2ROU_MUX_5B: Combining Unit

3.2 N2ROU Component

The following figure shows internal configuration of the N2ROU fully equipped with frequency bands.

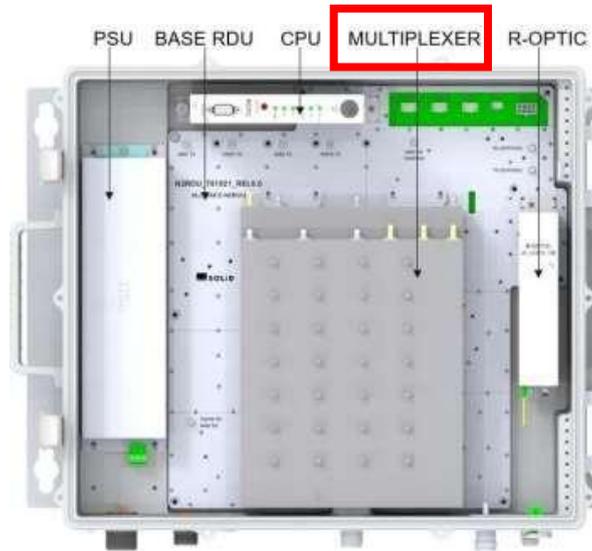


Figure 3.5 – Internal View of Remote Unit

The N2ROU receives TX optical signals from Head-End and converts them into RF signals. The converted RF signals are amplified through High Power Amp in a corresponding RDU, combined with Multiplexer module and then radiated to the antenna port. RX signals received from the antenna port are filtered through the multiplexer module, amplified at the RDU modules, and converted into optical signals via optical module. After converted, the signals are sent to a upper device of ODU or iODU. Four base bands are installed and additional three RDU modules can be installed on the right side of the enclosure. Refer to the image above.

The following table describes components of N2ROU.

Unit	Description
N2RDU	Remote Drive Unit
	Amplify TX signals
	Amplify RX signals
	Remove other signals through BPF
RPSU (AC)	Remote AC Power Supply Unit
	Input power: 90~280 VAC
	Output power: +29.2 VDC
RPSU (DC)	Remote DC Power Supply Unit
	Input power: -42 ~ -56 VDC
	Output power: +29.2 VDC
R-OPTIC	Remote Optic
	Convert RF signals into optical signals and vice versa; Compensate optical loss
	Communicate with legacy BIU or iBIU/OEU through the FSK modem
	5dBo optical link between ODU (OM4) and ROU
	10dBo optical link between ODU (OM1) and ROU
	Fiber Connector: SC/APC Connector
	Fiber Type: Single Mode Fiber
Optical Wavelength: 1310/1550 WDM	
RCPU	Remote Central Processor Unit
	Controls signal of each unit
	Monitors legacy BIU or iBIU/ODU/OEU through the FSK modem
MUX_5B	Multiplexer 5-band
	Combine TX signals from 5 RDUs; Distribute RX signals to 5 RDUs
	Allow to use a single antenna port for 5 bands
MUX_7B	Multiplexer 7-band
	Combine TX signals from 7 RDUs; Distribute RX signals to 7 RDUs
	Allow to use a single antenna port for 7 bands
ROU Enclosure	Enclosure to satisfy IP66
	Vertical Mount
	Wall Mount

3.3 Dimension

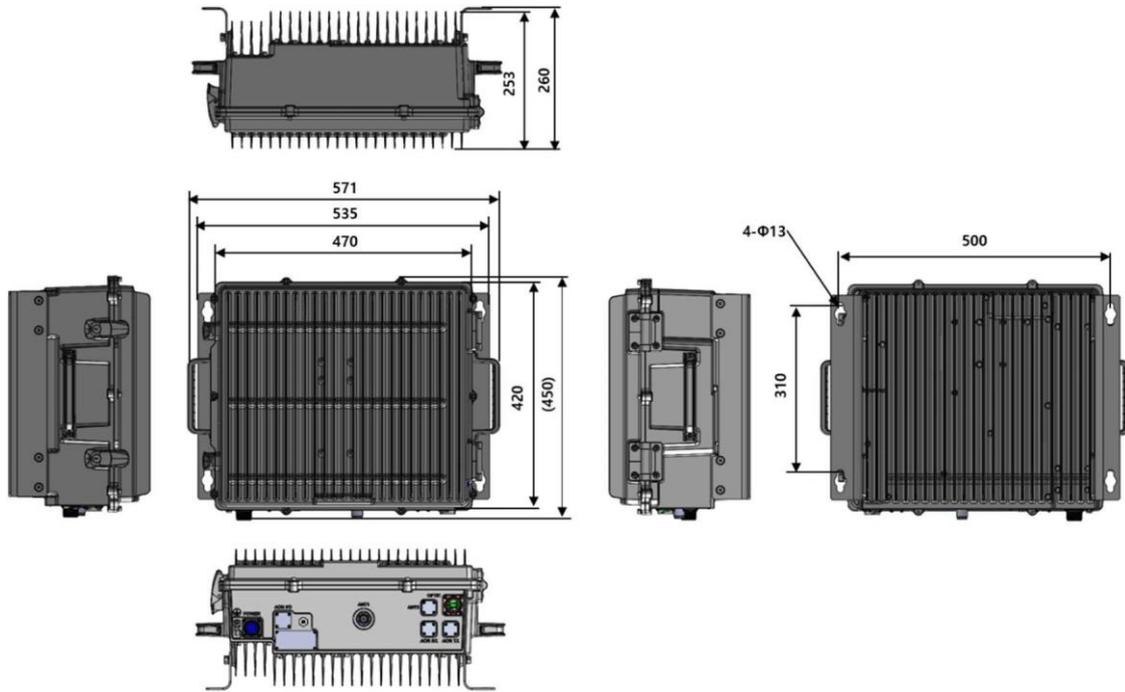


Figure 3.6 – Remote Unit Dimension

ITEM	SPECIFICATION	REMARK
Dimensions (WxHxD)	18.5"x16.5" (10 RU) x 10.2" (470mm x 420mm x 260mm)	Including Bracket
Weight	Max. 73 lbs (33kg) for base model, 4 bands Max. 86 lbs (39kg) for 7 bands	MUX included

Section 4

4.1 Installation

This chapter describes how to install each unit and optical cables. It also explains how to install shelves or enclosures of each unit, power cabling method and optical cabling and RF interface. Required accessories and tools for installation are listed up in the below table.

4.2 Install N2ROU

4.2.1 Install N2ROU

The N2ROU uses a unibody enclosure that is NEMA 4 (IP66) certified to withstand water and dust intrusion. It can be mounted on a pole, wall, or rack. Basically wall-mounted bracket for N2ROU is included.

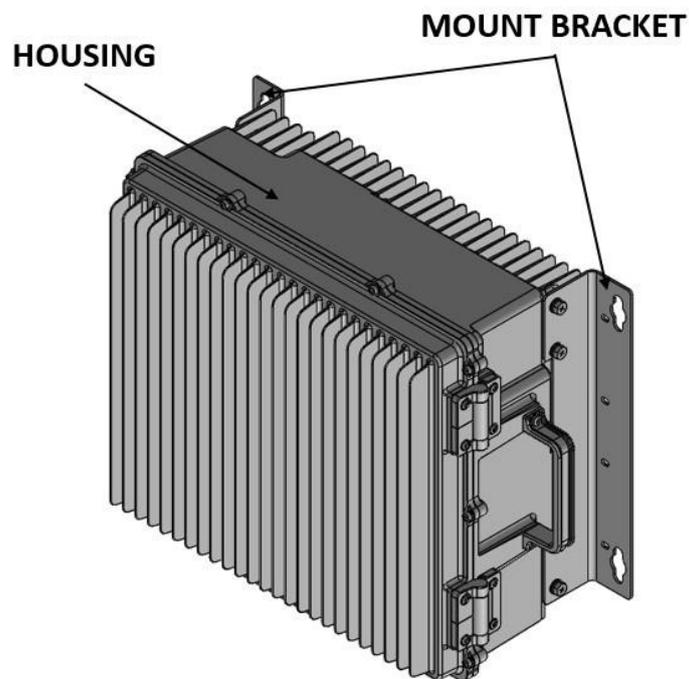


Figure 4.1 – Exterior of N2ROU

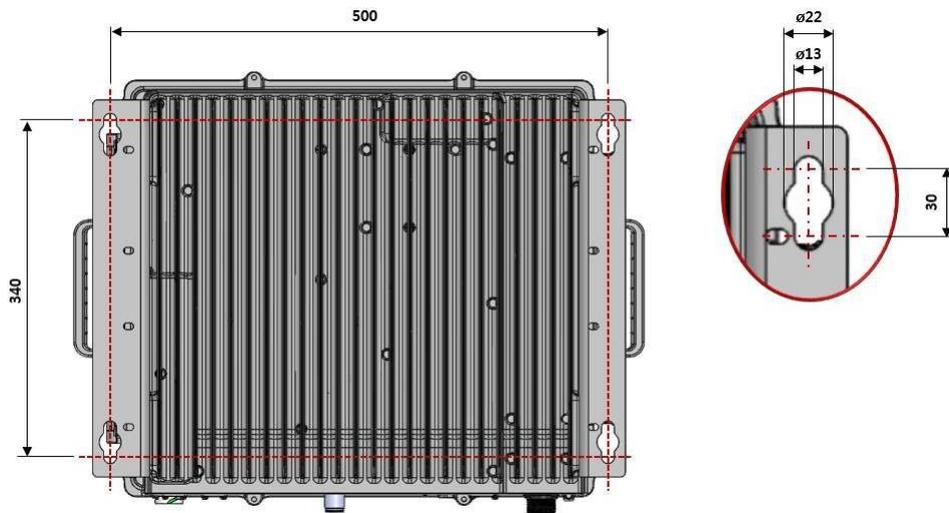


Figure 4.2 – N2ROU Wall Mount Dimensions

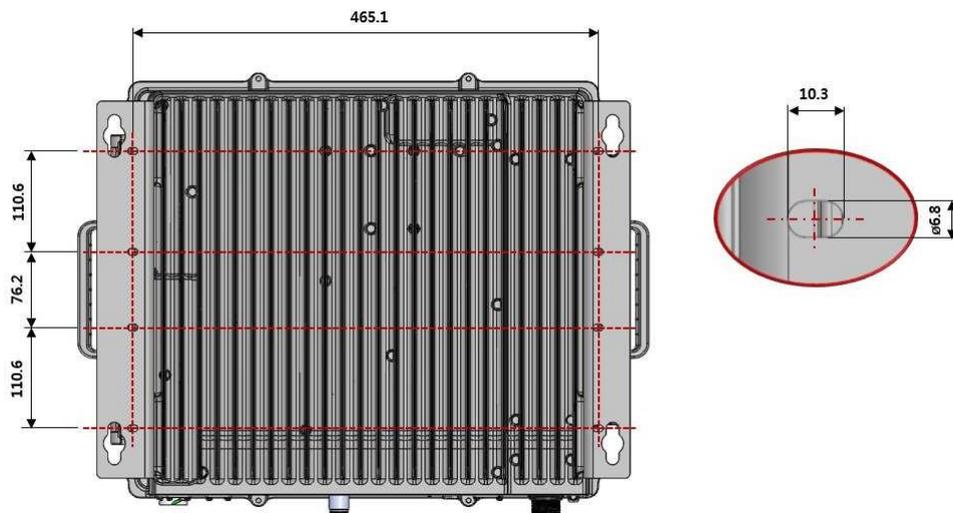


Figure 4.3 – N2ROU Rack Mount Dimensions

N2ROU Wall Mount Procedure

The enclosure comes with the bracket for wall mounting. It doesn't need to remove the bracket to install the enclosure, simply install and tighten 4 mounting bolts to secure the unit. First, install 2 of M12 mounting bolts roughly half way into the wall. Mount the enclosure and tighten the bolts. Second, tighten the remaining M12 mounting bolts under the enclosure and secure the unit tightly.

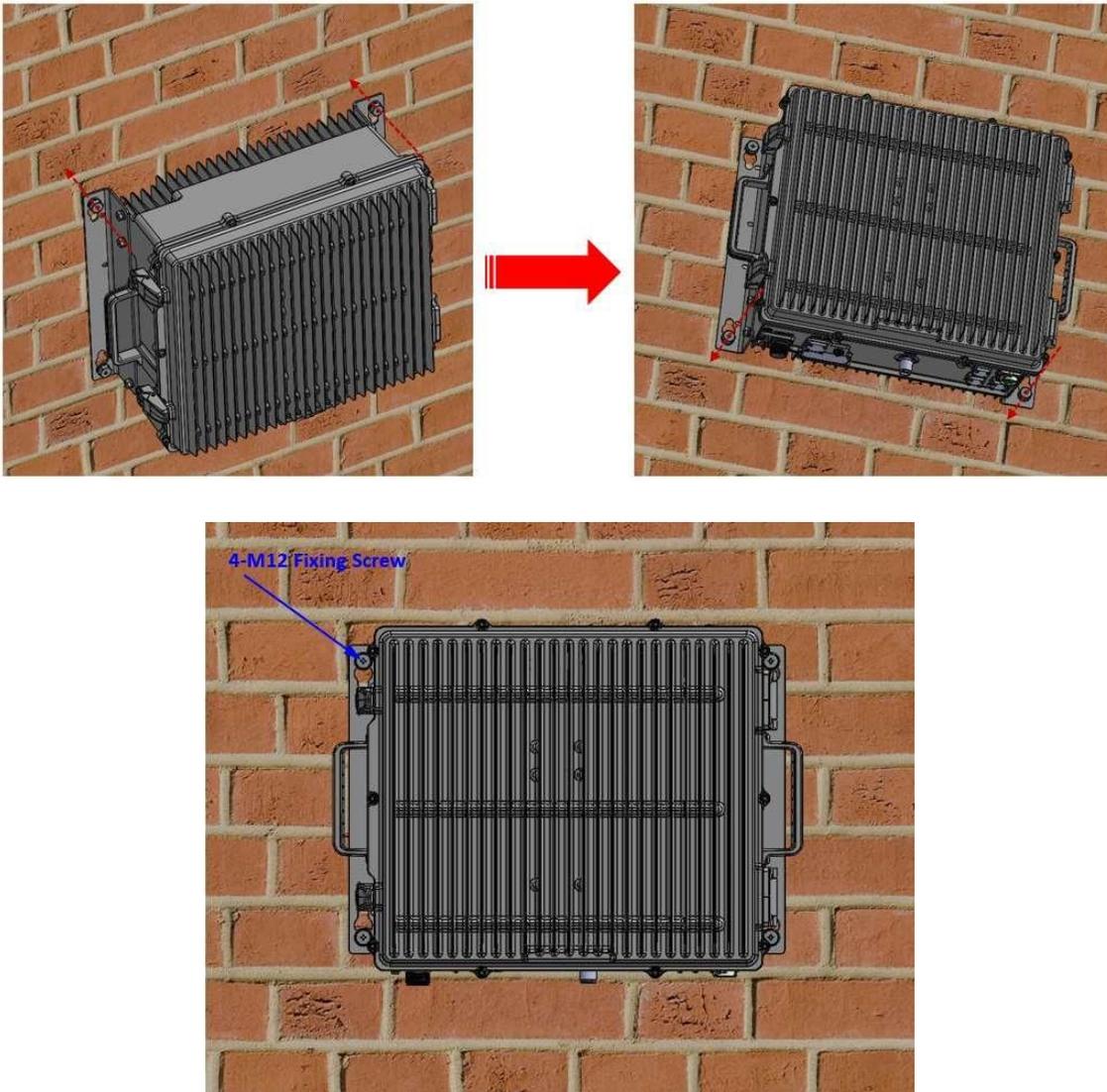
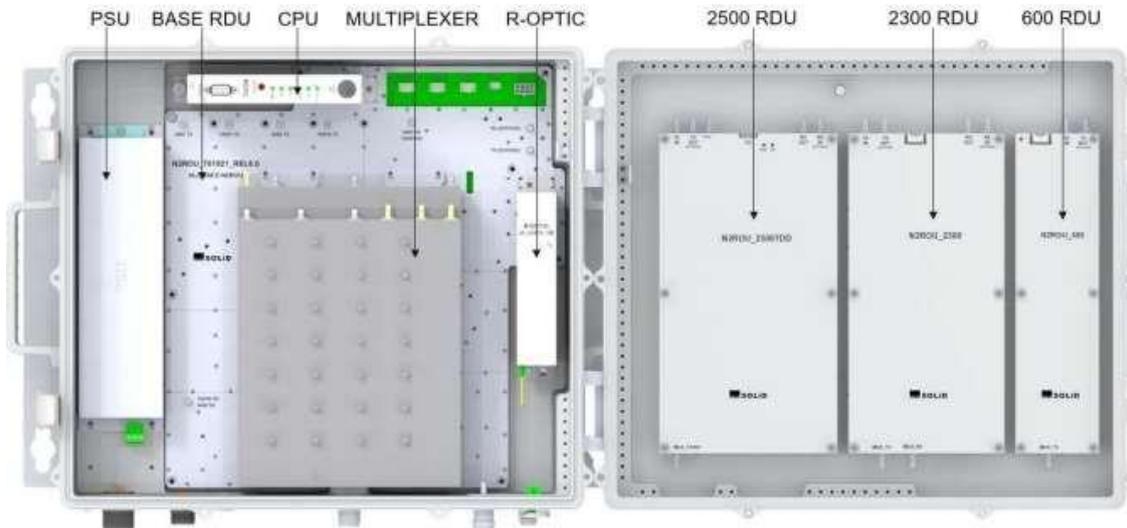


Figure 4.4 – Installation Procedure

N2ROU Components



N2ROU has the following components:

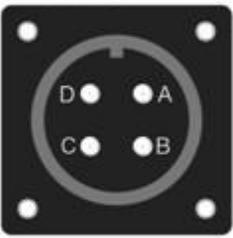
No.	Unit	Description	Remark	
Common Part	Enclosure	N2ROU_BASE_AC or N2ROU_BASE_DC	1EA	
	RCPU	Remote Central Processor Unit	1EA	
	R_OPTIC	Remote Optic (only Remote Unit)	1EA	
	RPSU	Remote AC or DC Power Supply Unit	1EA	
	Power Cable	MS Connector with 4 holes	1EA	
	N2RDU	N2RDU_78e1921 N2RDU_2300 N2RDU_2500TDD N2RDU_600 (Will be developed later)		ANT1
		N2RDU_2500TDD_M		ANT2
	MUX_5B	Internal Combiner Unit for 600RX+700, 800+850, 1900, 2100, and 2500	1EA	
	MUX_7B_8e	Internal Combiner unit for 600+700, 800+850, 1900, 2100, 2500, 2300, and 600TX	1EA	
	DUP Kit	2500TDD_DUP Kit		
BPF Kit	2500TDD_BPF Kit			

Basically, the N2ROU is equipped with RCPU to check and control state of each module, R_OPTIC to convert RF to opticals and vice versa, RPSU to supply power for N2ROU. It should have a power cable for external rectifier or to supply required power.

4.2.2 N2ROU Power Cabling

AC Power

The N2ROU supports only AC 120V input power and only a single type of power cable is provided. The pin discription of AC port is as below. Pay attention to the correct polarity.

AC Power Port	MS Connector No.	Name	Description
	A	AC_H	AC Hot
	B	AC_N	AC Neutral
	C	N.C	Not Connected
	D	F.G	Frame Ground

Check if the connection is the same as one seen in the table above and make sure to turn the power ON. The figure below is the AC power cable that comes with the unit.

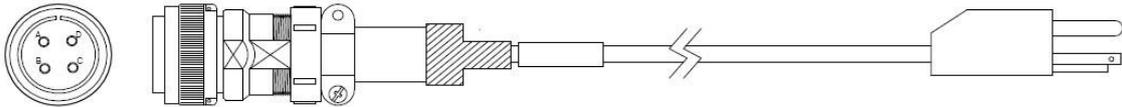
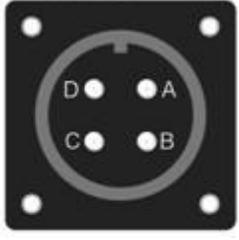


Figure 4.5– AC Power Cable

DC Power

The N2ROU supports only DC48V input power and a single type of power cable is provided. The pin discription of DC port is below. Pay attention to the correct polarity.

DC Power Port	MS Connector No.	Name	Description
	A	N.C	Not connected
	B	N.C	Not connected
	C	+V	+48V
	D	-V	-48V

Check if the connection is the same as one seen in the table above and make sure to turn the power ON. The figure below is the DC power cable included in the package.

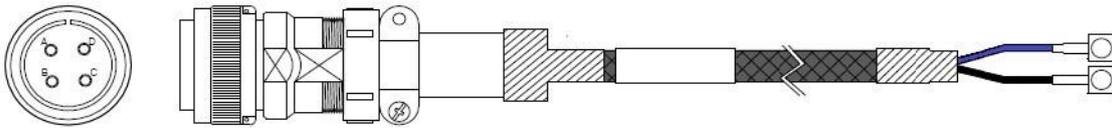


Figure 4.6 – DC Power Cable

4.2.3 N2ROU Ground Cabling

The grounding terminal is located at the bottom of N2ROU enclosure fixed by an M6 screw. Compression terminal is attached already when it is delivered. The recommended thickness of cable is AWG#6 copper grounding wire.

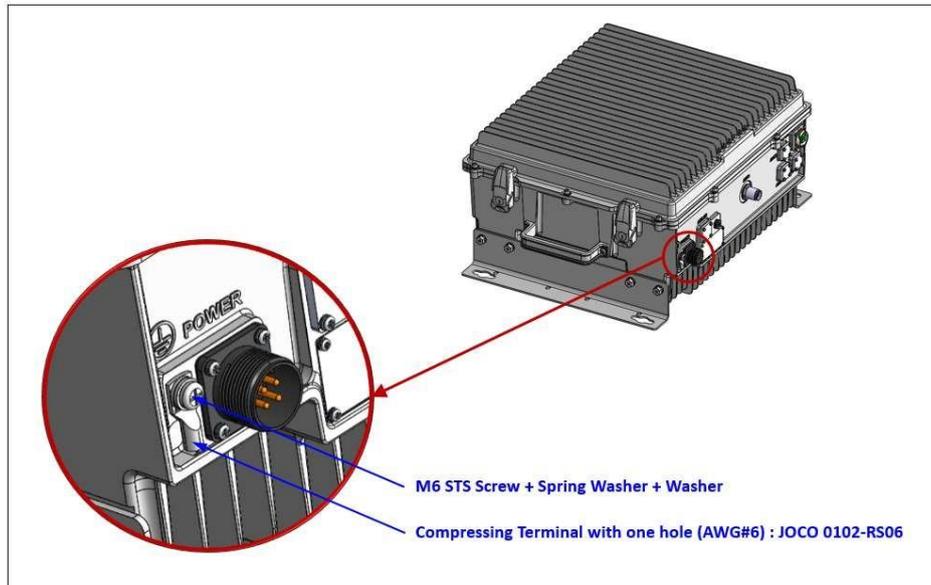
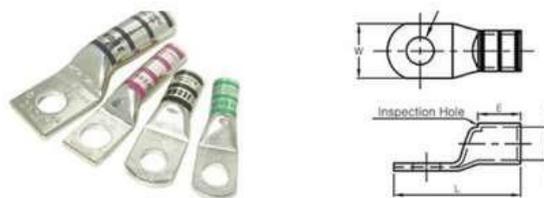


Figure 4.7 – Location of Ground Terminal

The specification of compression terminal is as follows.

- Material : Electrolytic Copper (TPC)
- Surface : Tin Plated
- With Inspection Hole
- Color Coded to Show Proper Die Number and Color 10^{ml}~630^{ml}
- To IEC 60228 Class2
- UL Listed 486A-486B up to 35KV



Part No Explanation : JOCO 0101-X X 04 → Stud Size(mm, UNC)

Tongue Form R : Round Type
S : Square Type
Barrel Form *S : Standard Barrel Type
*L : Long Barrel Type

71Part Number71	Wire Range		Stud Size	Dimension (mm)						Color Code & Die No	Q'ty / bag
	AWG	mm ²		W	d	E		L			
JOCO 0101-XX05	8	10	M5	9.5	4.7	15	21	33	39	Red 21 J OCD-8	500
JOCO 0101-XX06			M6								
JOCO 0101-XX08			M8								
JOCO 0101-XX10			M10								
JOCO 0101-XX12			M12								
JOCO 0102-XX05	6	16	M5	12	5.4	15	21	33	39	Blue 24 J OCD-6	300
JOCO 0102-XX06			M6								
JOCO 0102-XX08			M8								
JOCO 0102-XX10			M10								
JOCO 0102-XX12			M12								

Figure 4.8 – Information of Terminal

The required part number is JOCO 0102-RS06 that supports AWG 6. To install the grounding cable, follow the steps below.

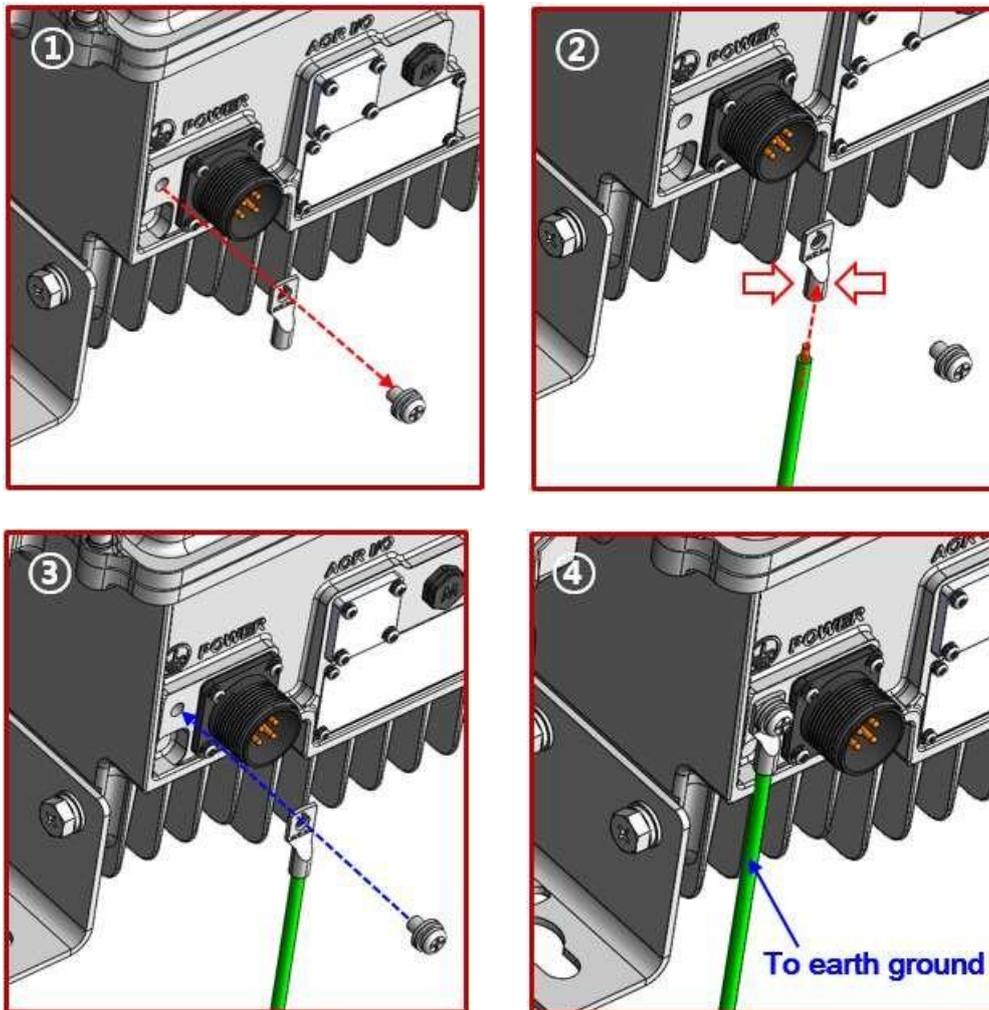


Figure 4.9 –Installing Ground Terminal

The procedures are

1. Loosen two M6 screws and then take compression terminal off
2. Insert AWG#6 grounding wire into terminal, and then compress a terminal using the tool
3. Assemble the terminal with 2xM6 screws
4. Cut the ground wire to proper length and connect it to the earth ground source

4.2.4 Optical Cabling

The Optical connector is located at the bottom of the N2ROU. Optical cable can be connected by using its connectors.

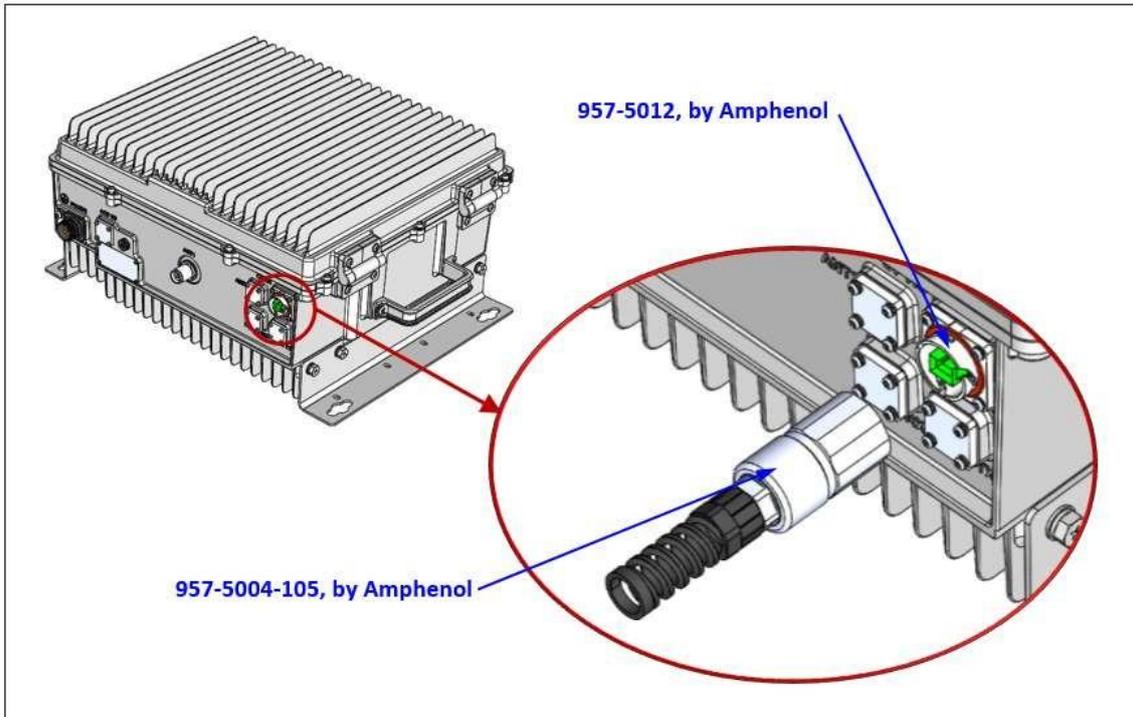


Figure 4.10 –Optical Connector

Refer to the figure below for detailed information. The figure is based on LC type, but can be applied to SC type as well.



4.2.5 Antenna Connection (Optional)

To support service, Antenna connection is required.

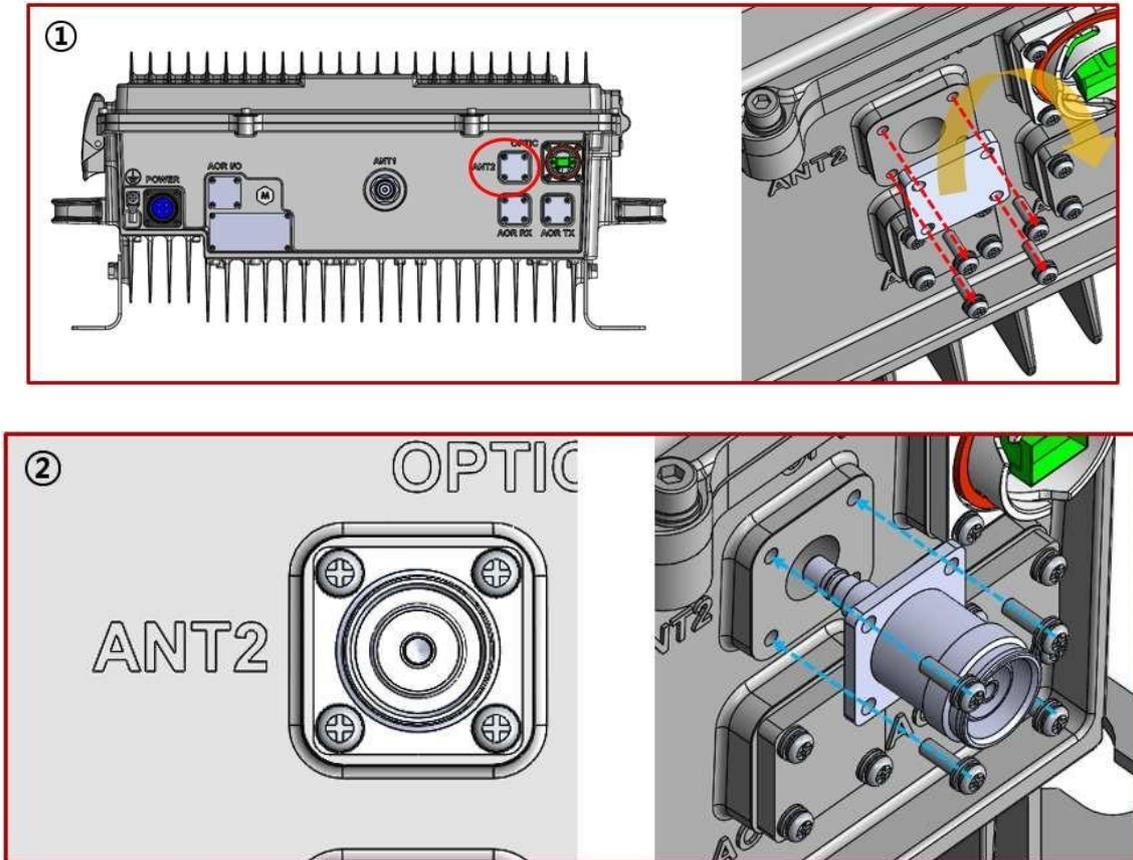


Figure 4.22 – Installing Antenna Adaptor

The procedures are

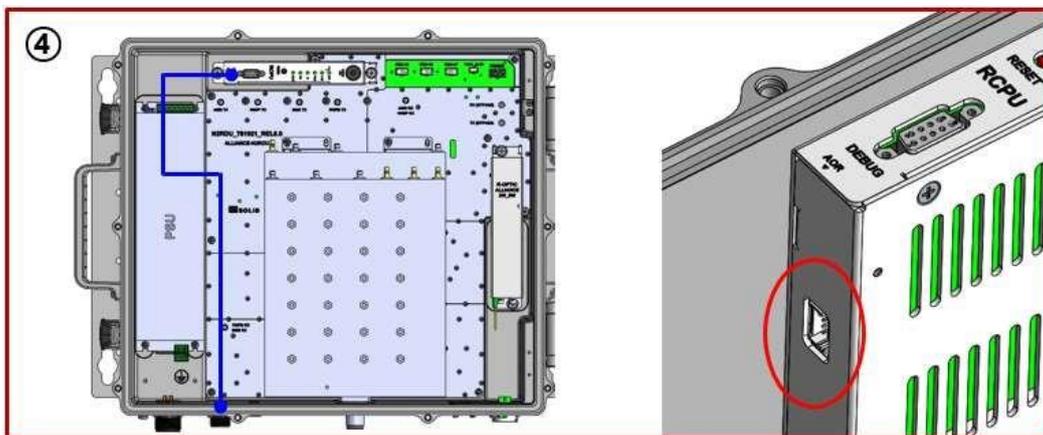
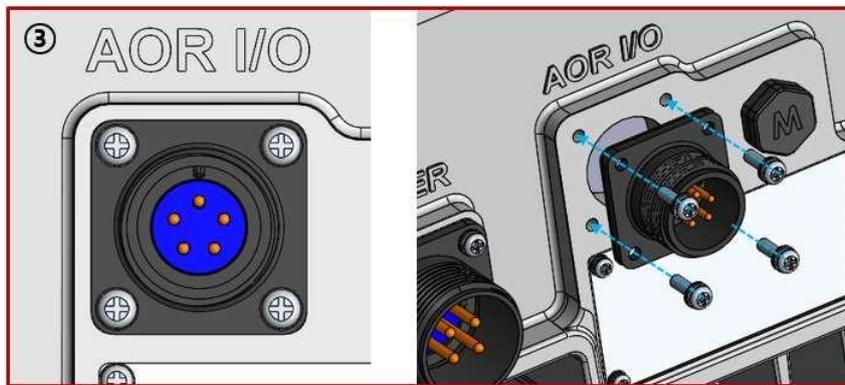
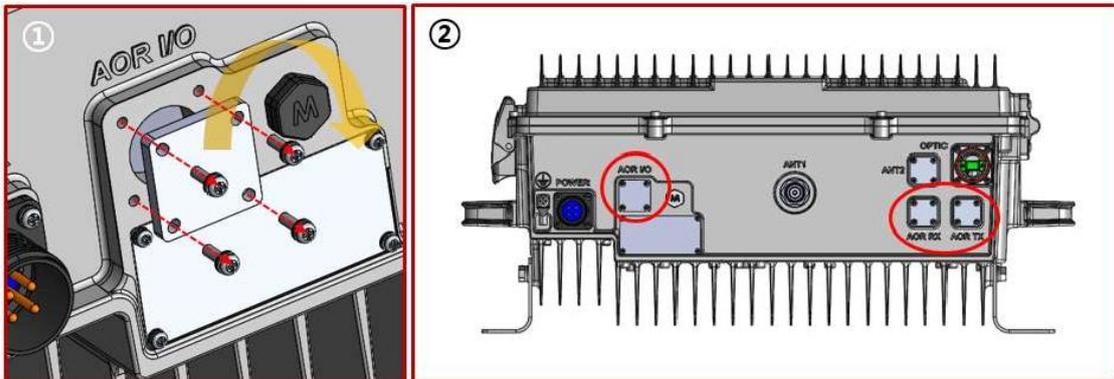
1. Remove the dummy cover from the ANT2 port.
2. Install 4.3-10 DIN(F) to QMA(F) Adaptor with the screws included in the package.

4.2.6 Installing AOR (Optional)

The N2ROU can add Add on Remote (AOR) as optional remote unit. To install and connect the N2ROU with AOR, the materials listed blow are required.

Accessory	Description	Qty	Specification	Remark
1	Inner I/O Cable	1	MS-3106A-14S-5P(M) ST to SMH200(F) ST_0.5m	
2	Inner RF Cable	2	N(F) ST to SMBL(M) ST_0.18m	
3	I/O Cable	1	IEC 61076-2-101(8pin_F) ST_1.5m	
4	RF Cable	2	N(M) ST to SMA(M) ST_1.5m	

To connect AOR with the N2ROU, the steps listed below must be done in advance.



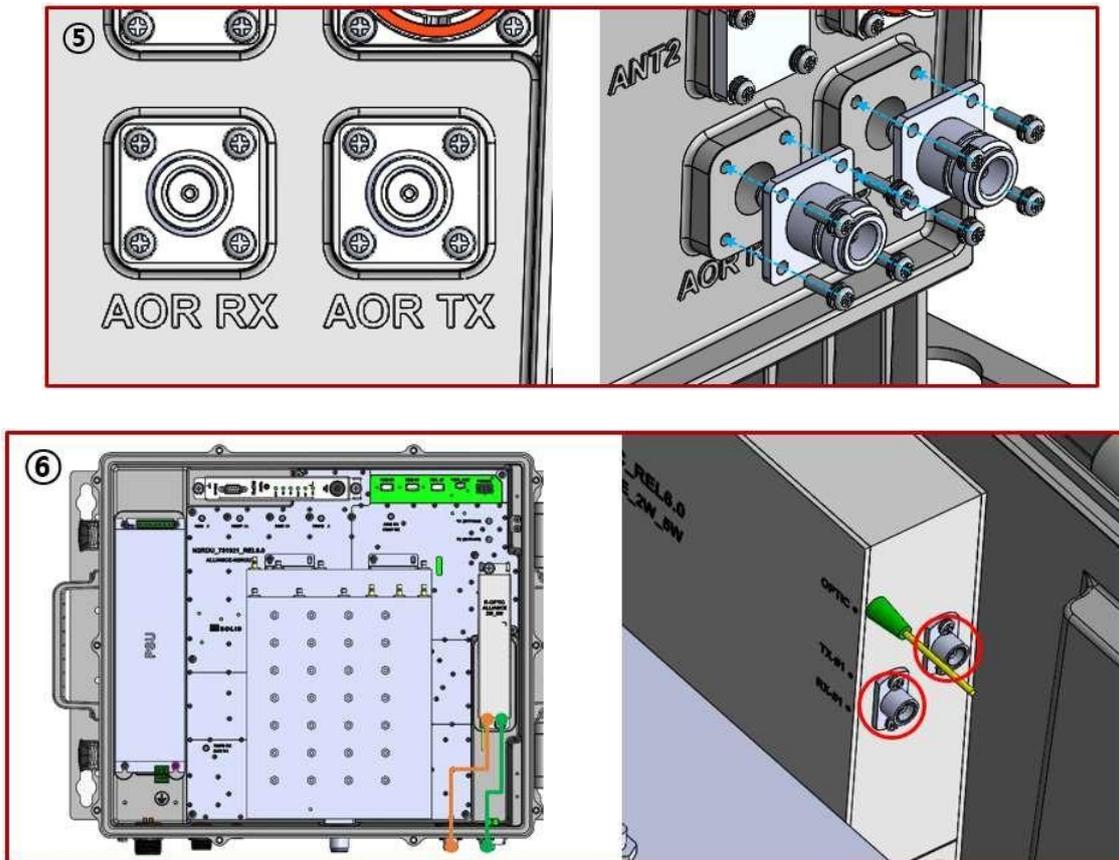


Figure 4.23 – Primary Work for Installing AOR

The procedures are

1. Remove the dummy cover from the port that is used for connecting AOR.
2. The location of ports that need to be removed can be found in the figure No. 2 (The ports are circled in red.). Use the same method of No. 1 to remove the dummy cover.
3. Install the inner I/O cable with the screws included in the package. Pay special attention to the direction of connector when installing them.
4. Connect the inner I/O cable to the defined connector of the RCPU.
5. Install two inner RF cables with the screws included in the package.
6. Check the names of the ports. Match and connect the external port with the correct R-OPTIC port.

The following figure shows the diagram connecting N2ROU with AOR. Refer to the figure below for cabling after the preliminary work. For legacy BIU and eBIU do not need this preliminary work, but for the new version, the preliminary work is required in order to connect AOR. For connecting AOR with the N2ROU, pay attention to the cable length. The cable length between the N2ROU and AOR is 1.5m.

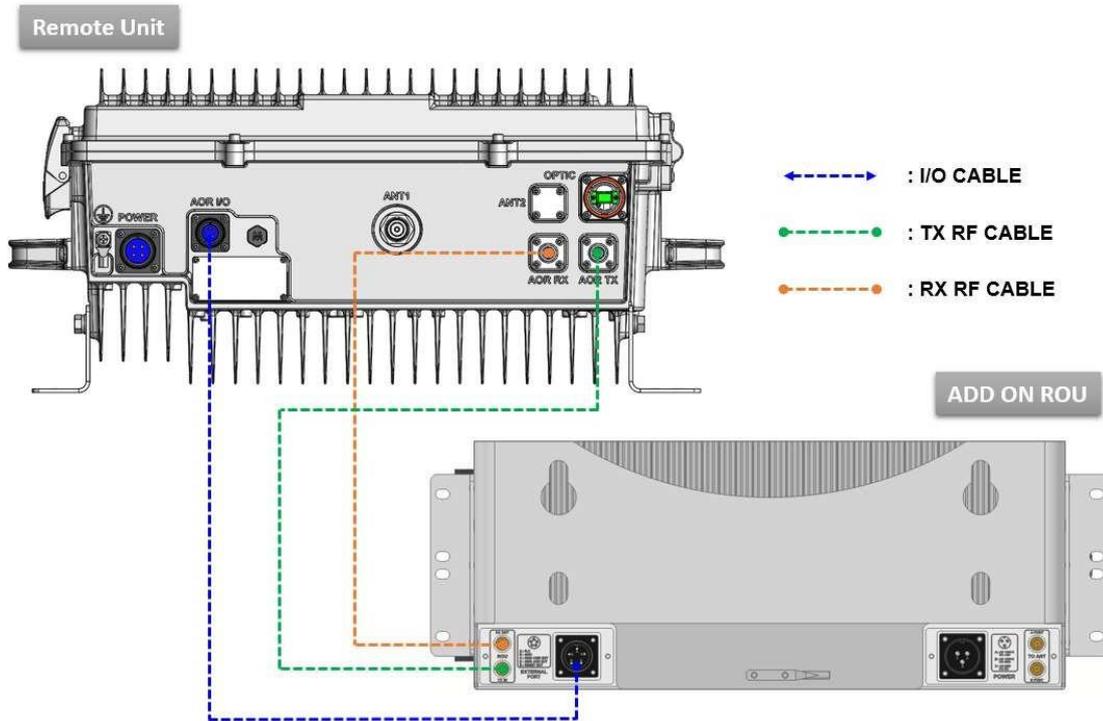
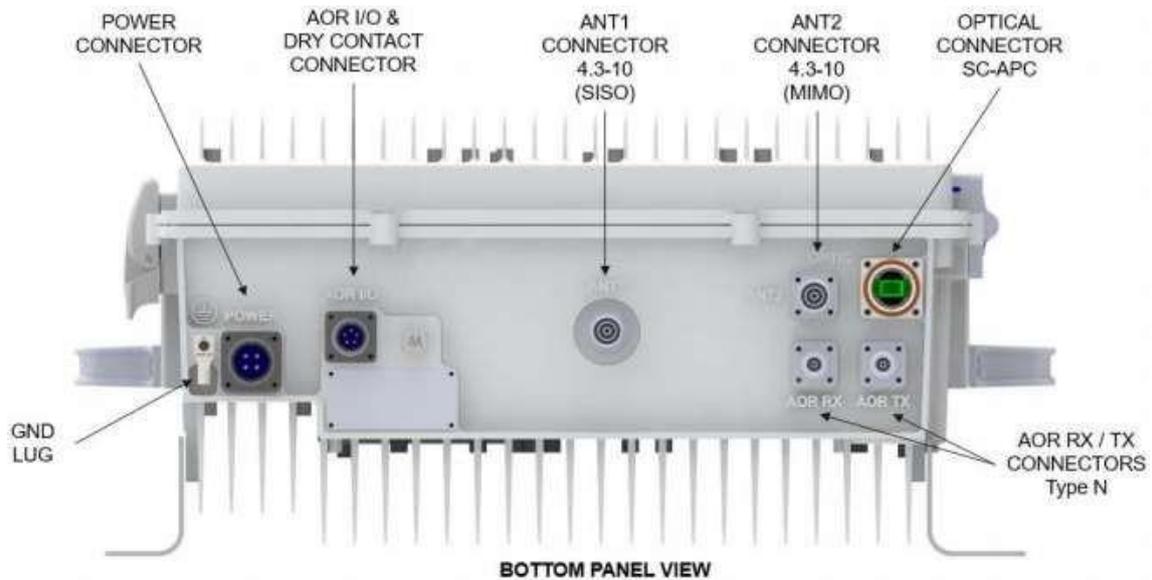


Figure 4.24 – Connecting Diagram between N2ROU and AOR

Section5

5.1 Specifications



Mechanical	Specification
Mounting Type	Wall or rack mounting
Connectors	Antenna port type: 4.3-10 DIN (M) type Fiber connectors: SC/APC for connecting to iODU or OEU
Craft Port	Serial interface RS-232 9-pin D-sub Male for connecting management PC (on CPU)
In/Output Port Type	N Female for connecting AOR
Power Consumption	165W for based model with 4 bands Maximum 260W for 6 bands (Max. 300W for 7 bands if 600 is included)
Environmental	Specification
Environmental & IP Rating	IP66 Compliant, NEMA4
Operating Environment	Temp Range: -10°C to 50°C. Humidity: 5 to 90% non-condensing
Optical	Specification

Optics	SC/APC (Step Ferrule)
Laser Diode/Photo Diode	1550nm/1310nm (Coaxial Type)
Optical Loss	Max 5dBo (4-port optical module); Max 10dBo (1-port optical module)

5.2 RF Performance

N2RDU Specifications per Band

Unit Name	Bandwidth (TX/RX)	Output Power (TX/RX)	Frequency range	
			TX(MHz)	RX(MHz)
N2RDU_78e1921	39 / 17, 21	+33 / -5	729~768	699~716 (B1) 776~798 (B2)
	36.5 / 36.5	+33 / -5	857.5~894	812.5~849
	65 / 65	+33 / -5	1930~1995	1850~1915
	70 / 70	+33 / -5	2110~2180	1710~1780

5.3 Certification

Environmental	Specification
Environmental & IP Rating	IP66 Compliant, NEMA4
Operating Environment	Temp Range: -10°C to 50°C. Humidity: 5 to 90% non-condensing



FCC/IC User Warning

FCC PART 15.105 STATEMENT

This equipment has been tested and found to comply with the limits for a Class A 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC PART 15.21 STATEMENT

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

RF EXPOSURE STATEMENT

The product complies with the FCC Fixed RF exposure limit set forth for an uncontrolled environment and is safe for intended operation as described in this manual.

RSS-GEN, SEC. 7.1.2 – (TRANSMITTERS)

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

RSS-GEN, SEC. 7.1.2 – (DETACHABLE ANTENNAS)

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

RF RADIATION EXPOSURE

This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 250 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. RF exposure will be addressed at time of installation and the use of higher gain antennas require larger separation distances.

(Max. antenna gain: DL 17 dBi)

RSS-102 RF EXPOSURE

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 250 cm entre la source de radiation (l'antenne) et toute personne physique. Cet appareil ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou émetteur. (Max. antenna gain: DL 17 dBi)