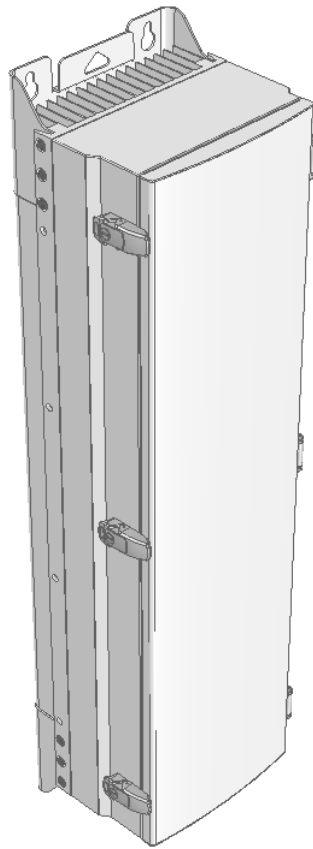


# ALLIANCE\_N20

## User Manual

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| V 1.0   | Aug. 20, 2014 |              | Original |                             |
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| V1.3    | Dec 7, 2017   |              | Update   | Added new products          |
|         |               |              |          |                             |
|         |               |              |          |                             |
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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](http://www.solid.co.kr) or send email at [sjkim@solid.co.kr](mailto:sjkim@solid.co.kr)

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# ***Section1***

## **Safety & Certification Notice**

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**“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 500 cm minimum clearance from the antenna while the system is operating.
- Antennas must be installed in accordance with FCC 27.50 and SRSP 517. For different gain antennas refer to the relevant rules and the local licensing authorities.
- 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.
- 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 on trolled by the authority responsible for the location.
- Notice! Be careful not to touch the Heat-sink part due to high temperature.



- 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(Class B)
  - 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.

- 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

- IC Booster warning label message should include

**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***

### **System configuration and Functions**

## 2.1 HROU (High power Remote Optic Unit)

HROU consists of two unit, one is HMRU(High power Main Remote Unit) and the other is HARU(High power Add-on Remote Unit).

The biggest difference between HMRU and HARU is whether R-OPTIC module exist or not in the enclosure. HMRU receives TX optical signals from ODU and converts them into RF signals. The converted RF signals are amplified through High Power Amp in a corresponding HRDU band combined with UDCU, PAU and Cavity duplexer, 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 HRDU and sends the results to R-OPTIC to make electronic-optical conversion of them. After converted, the signals are sent to a upper device of ODU. HMRU can be equipped with up to four HRDUs (High Remote Drive Unit) and the module supports single band only.

HARU receives TX RF signal from HMRU and amplifies through High Power Amp in a corresponding HRDU combined with UDCU, PAU and Cavity duplexer, and then radiated to the CU(Combining Unit)

When receiving RX signals through the antenna port, HRDU filters out-of band signal in a corresponding HRDU and sends the results to MHRU through RF cable.

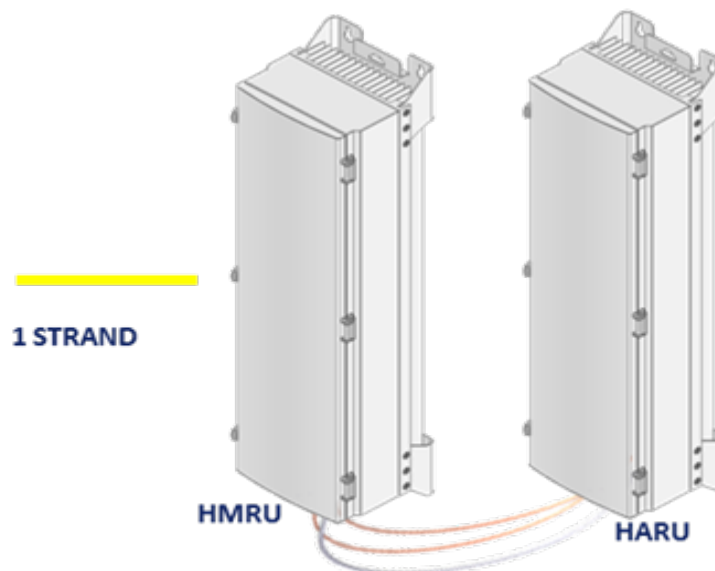


Figure 1. HROU consists of 2 unit

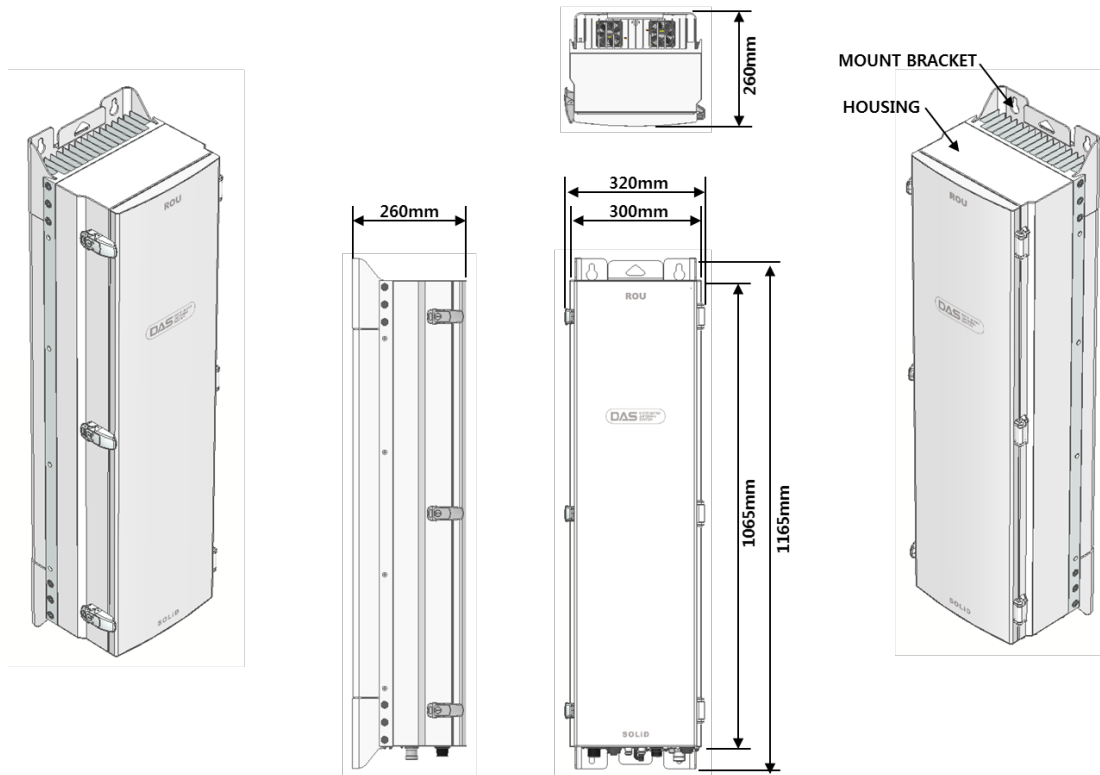


Figure 2. HROU outer Look

### 2.1.1 Specifications of HROU

| Item                                    | Spec.                                                                            |        | Remark |
|-----------------------------------------|----------------------------------------------------------------------------------|--------|--------|
|                                         | HMRU                                                                             |        |        |
| The rated mean output Power<br>per band | 700LTE<br>850IC<br>1900P<br>AWS13<br>2600_FDD                                    | +44dBm |        |
|                                         | 600LTE<br>R-700LTE-FN<br>R-850IC<br>R-1900P<br>R-AWS13<br>A-700LTE-FN<br>A-850IC | +43dBm |        |

|                                   |                                                    |                                  |                                                                                  |
|-----------------------------------|----------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------|
|                                   | A-1900P<br><b>A-AWS13</b><br>2300_WCS<br>2500TDLTE |                                  |                                                                                  |
|                                   | 1900P_40<br>A-1900P_40<br>2500TDLTE_40             | +46dBm                           |                                                                                  |
|                                   | AWS13_40<br>A-AWS13_40                             | +46dBm                           |                                                                                  |
| The nominal downlink<br>bandwidth | 600LTE                                             | 35MHz                            | 617 – 652MHz                                                                     |
|                                   | 700LTE                                             | 28MHz                            | 728 - 756MHz                                                                     |
|                                   | R-700LTE-FN                                        | 39MHz                            | 729 - 768MHz                                                                     |
|                                   | A-700LTE-FN                                        |                                  |                                                                                  |
|                                   | 850IC                                              | 32MHz                            | 862 - 894MHz                                                                     |
|                                   | R-850IC                                            |                                  |                                                                                  |
|                                   | A-850IC                                            |                                  |                                                                                  |
|                                   | 1900P                                              | 65MHz                            | 1930 - 1995MHz                                                                   |
|                                   | R-1900P                                            |                                  |                                                                                  |
|                                   | A-1900P                                            |                                  |                                                                                  |
|                                   | AWS13                                              | <b>70MHz</b>                     | <b>2110 - 2180MHz</b>                                                            |
|                                   | R-AWS13                                            |                                  |                                                                                  |
|                                   | <b>A-AWS13</b>                                     |                                  |                                                                                  |
|                                   | 1900P_40                                           | 65MHz                            | 1930 - 1995MHz                                                                   |
|                                   | A-1900P_40                                         |                                  |                                                                                  |
|                                   | AWS13_40                                           | 70MHz                            | 2110 - 2180MHz                                                                   |
|                                   | A-AWS13_40                                         |                                  |                                                                                  |
|                                   | 2300_WCS                                           | 10MHz                            | 2350 – 2360MHz                                                                   |
|                                   | 2500TDLTE                                          | 67.6MHz (LB, UB)<br>37.8MHz (MB) | LB : 2497.8 ~ 2565.4 MHz<br>MB : 2574.1 ~ 2611.9 MHz<br>UB : 2619.8 ~ 2687.4 MHz |
|                                   | 2500TDLTE_40W                                      | 71.2MHz (LB, UB)<br>40.9MHz (MB) | LB : 2496.8 ~ 2568 MHz<br>MB : 2574.1 ~ 2615 MHz<br>UB : 2618.8 ~ 2690 MHz       |
|                                   | 2600_FDD                                           | 70MHz                            | 2620 - 2690MHz                                                                   |

|                              |               |                                               |                                                                                  |
|------------------------------|---------------|-----------------------------------------------|----------------------------------------------------------------------------------|
| The nominal uplink bandwidth | 600LTE        | 35MHz                                         | 663 – 698MHz                                                                     |
|                              | 700LTE        | 17MHz and 10MHz                               | 699 - 716MHz<br>777 - 787MHz                                                     |
|                              | R-700LTE-FN   | 17MHz and 21MHz                               | 699 - 716MHz                                                                     |
|                              | A-700LTE-FN   |                                               | 777 - 798MHz                                                                     |
|                              | 850IC         | 32MHz                                         | 817 - 849MHz                                                                     |
|                              | R-850IC       |                                               |                                                                                  |
|                              | A-850IC       |                                               |                                                                                  |
|                              | 1900P         | 65MHz                                         | 1850 - 1915MHz                                                                   |
|                              | R-1900P       |                                               |                                                                                  |
|                              | A-1900P       |                                               |                                                                                  |
|                              | AWS13         | 70MHz                                         | 1710 - 1780MHz                                                                   |
|                              | R-AWS13       |                                               |                                                                                  |
|                              | A-AWS13       |                                               |                                                                                  |
|                              | 1900P_40      | 65MHz                                         | 1850 - 1915MHz                                                                   |
|                              | A-1900P_40    |                                               |                                                                                  |
|                              | AWS13_40      | 70MHz                                         | 1710 - 1780MHz                                                                   |
|                              | A-AWS13_40    |                                               |                                                                                  |
|                              | 2300_WCS      | 10MHz                                         | 2305 – 2315MHz                                                                   |
|                              | 2500TDLTE     | 67.6MHz (LB, UB)<br>37.8MHz (MB)              | LB : 2497.8 ~ 2565.4 MHz<br>MB : 2574.1 ~ 2611.9 MHz<br>UB : 2619.8 ~ 2687.4 MHz |
|                              | 2500TDLTE_40W | 71.2MHz (LB, UB)<br>40.9MHz (MB)              | LB : 2496.8 ~ 2568 MHz<br>MB : 2574.1 ~ 2611.9 MHz<br>UB : 2618.8 ~ 2690 MHz     |
|                              | 2600_FDD      | 70MHz                                         | 2500 - 2570 MHz                                                                  |
|                              |               | 700LTE<br>850IC<br>1900P<br>AWS13<br>2600_FDD | 59dB                                                                             |
|                              |               | 600LTE<br>2300_WCS<br>2500TDLTE               | 58dB                                                                             |

|                         |        |                                                                                                                                                                                                                                                                  |             |  |
|-------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--|
|                         |        | R-850IC<br>R-1900P<br>R-AWS13<br>R-700LTE-FN<br>A-850IC<br>A-1900P<br><b>A-AWS13</b><br>A-700LTE-FN                                                                                                                                                              |             |  |
|                         |        | 1900P_40W<br>AWS13_40W<br>A-1900P_40W<br>A-AWS13_40W<br>2500TDLTE_40W                                                                                                                                                                                            | 61dB        |  |
|                         | Uplink | 600LTE<br>R-700LTE-FN<br>700LTE<br>850IC<br>1900P<br>AWS13<br>2600_FDD<br>2300_WCS<br>2500TDLTE<br>R-850IC<br>R-1900P<br>R-AWS13<br>A-700LTE-FN<br>A-850IC<br>A-1900P<br><b>A-AWS13</b><br>1900P_40W<br>AWS13_40W<br>A-1900P_40W<br>A-AWS13_40W<br>2500TDLTE_40W | <b>45dB</b> |  |
|                         |        |                                                                                                                                                                                                                                                                  |             |  |
| Input/ Output Impedance | 50 ohm |                                                                                                                                                                                                                                                                  |             |  |

|                              |                              |                     |
|------------------------------|------------------------------|---------------------|
| <b>Weight</b>                | 39 Kg                        | Common Part         |
| <b>Power consumption</b>     | 50W                          |                     |
| <b>Temperature range</b>     | -25°C to +55°C/ -13 to 131°F | Ambient Temperature |
| <b>Humidity Range</b>        | 0% ~ 90%                     | Non-condensing      |
| <b>Sealing (Remote Unit)</b> | IEC 60 529 EN 60 529         | IP66 Complaint      |
| <b>Size(mm)</b>              | 320 x 1165 x260              | Including Bracket   |

## 2.1.2 Block Diagram of HROU

### 2.1.2.1 HMRU block diagram

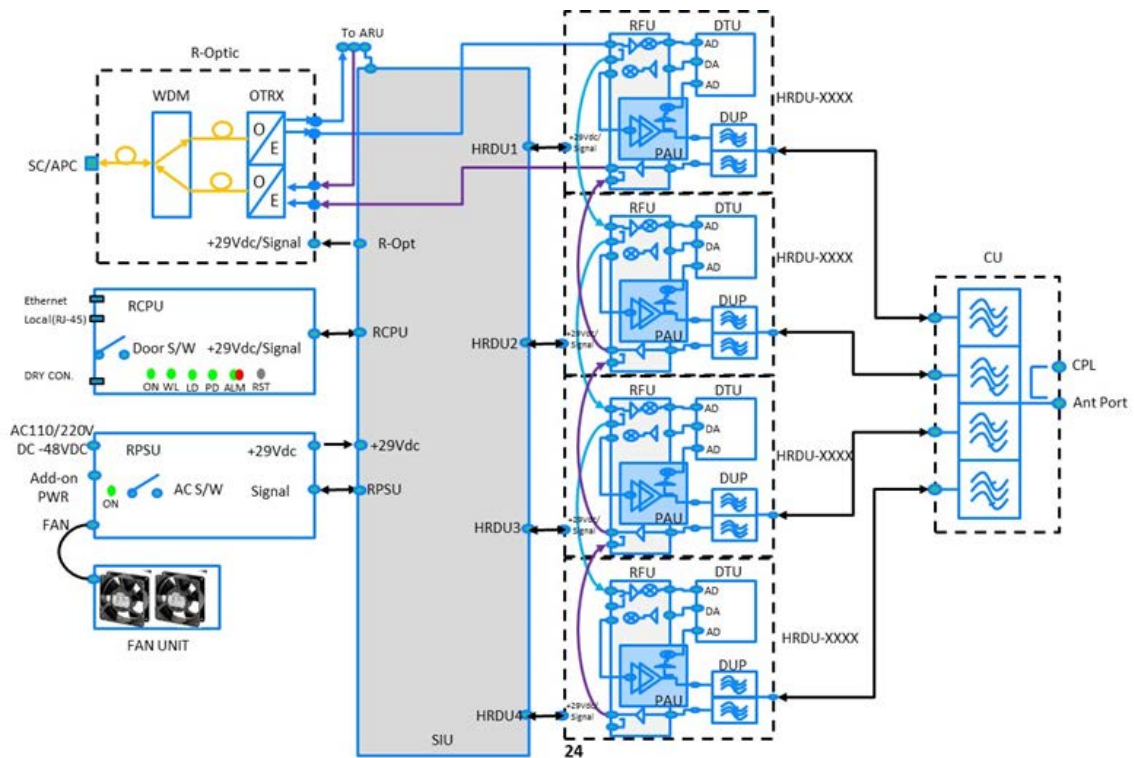
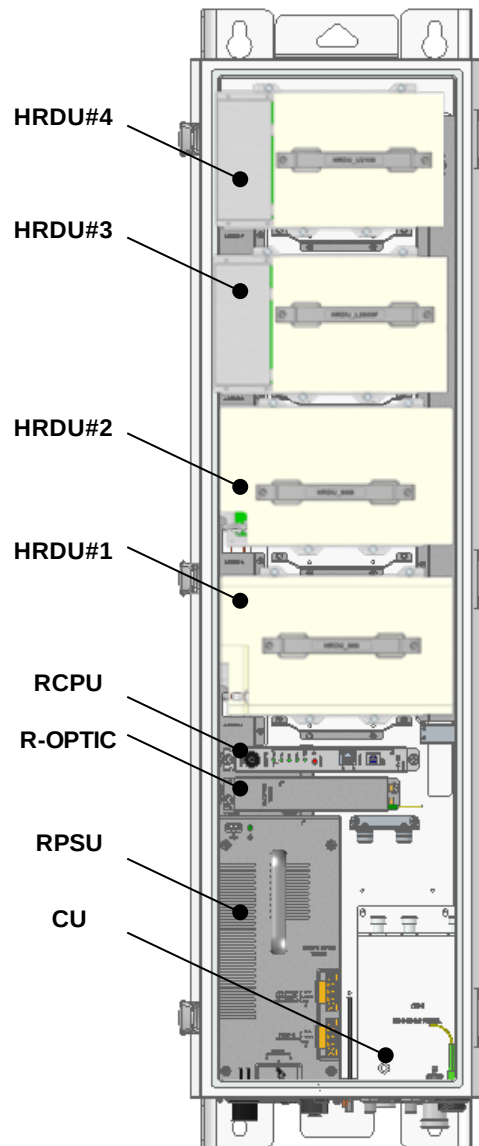


Figure 3. HMRU Block diagram



### 2.1.2.2 ROU inner look



**Figure 4. Inside of Remote Unit**

\*\* In the HARU enclosure, not need to install R-Optic

### 2.1.2.3 HROU part list

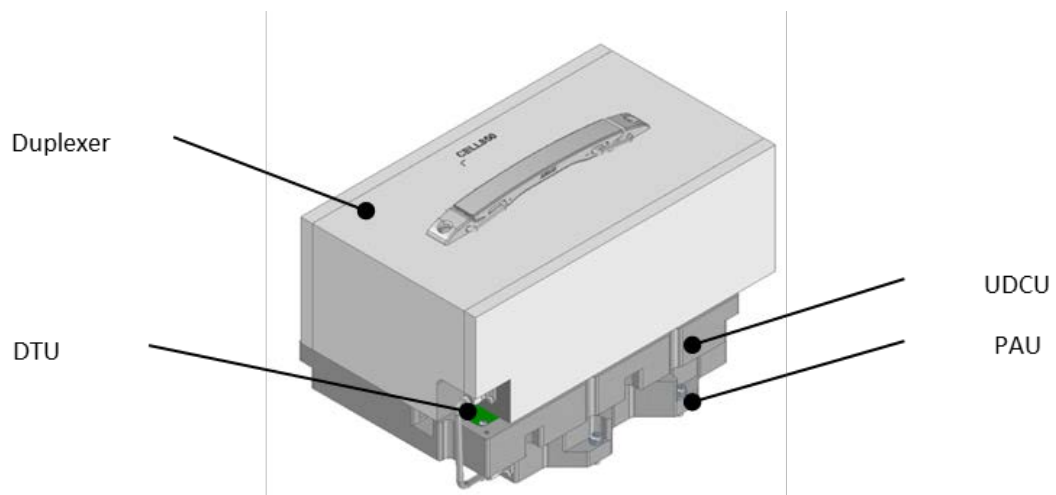
| No. | Unit              | Description                                                                                                                                                                                                                                                                                                                                                               | Remark            |
|-----|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 1   | HRDU X4           | <b>High Remote Drive Unit</b><br>Consist of UDCU, PAU and cavity filter<br>Filter and high amplify TX signals;<br>Filter and amplify RX signals in low noise amplifier;<br>Remove out-of signals through cavity duplexer                                                                                                                                                  | Optional<br>Max 4 |
| 2   | RPSU(AC)          | <b>Remote Power Supply Unit</b><br>Input power: 110 VAC/220VAC (85~264V)<br>Output power: +29 VDC                                                                                                                                                                                                                                                                         |                   |
|     | RPSU(DC)          | <b>Remote Power Supply Unit</b><br>Input power: -48 VDC(-40.8 ~ -57.6V)<br>Output power: +29 VDC                                                                                                                                                                                                                                                                          |                   |
| 3   | R-OPTIC           | <b>Remote Optic</b><br>Make RF conversion of TX optical signals;<br>Convert RX RF signals into optical signals;<br>Compensates optical loss;<br>5dBo optical link between ODU(OM4) and ROU;<br>10dBo optical link between ODU(OM1) and ROU;<br>Fiber Connector: SC/APC Connector;<br>Optical Wavelength: 1310/1550 WDM;<br>Communicates with BIU/OEU though the FSK modem |                   |
| 4   | RCPU              | <b>Remote Central Processor Unit</b><br>Controls signal of each unit<br>Monitors BIU/ODU/OEU status through FSK modem communication                                                                                                                                                                                                                                       |                   |
| 5   | CU1-L7085IC19P21A | <b>Multiplexer1</b><br>This integrated combiner unit combines all bands for output to a single antenna connection.                                                                                                                                                                                                                                                        |                   |
|     | CU2-L7085IC19P21A | <b>Multiplexer2</b><br>This integrated combiner unit combines all low bands (<1 GHz) to one antenna connection and all high bands (>1 GHz) to a second antenna connection.                                                                                                                                                                                                |                   |

|   |             |                                                                                                                                                |  |
|---|-------------|------------------------------------------------------------------------------------------------------------------------------------------------|--|
|   | No combiner | If no combiner is used, all amplifier outputs should be connected directly to the individual antenna connectors on the bottom of the enclosure |  |
| 6 | Enclosure   | Enclosure to satisfy NEMA4(IP66);<br>Wall mounting(Vertical Mount)                                                                             |  |
| 7 | SIU         | <b>System Interface Unit</b><br>Distribute power and signals of each module                                                                    |  |

### 2.1.3 Function by unit

#### 2.1.3.1 High Remote Drive Unit (HRDU)

When receiving TX signals from each band through Remote Optic, HRDU filters the signals and amplifies them with High Power Amplifier. The unit also filters RX signals given through cavity filter and amplifies them to send the signals to Remote Optic. In the unit, there is ATT to adjust gain. HRDU consists of UDCU, DTU, PAU and cavity duplexer like below figure and all modules are merged with one package.

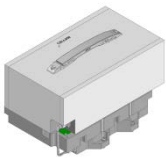
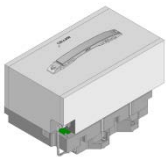
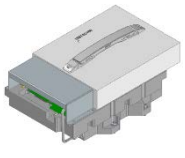


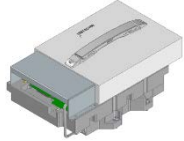
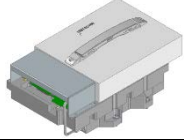
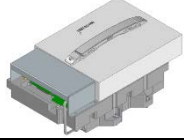
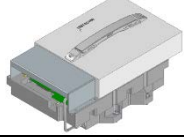
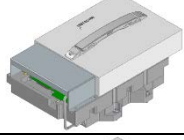
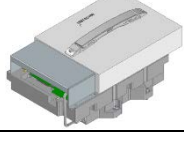
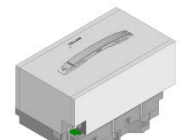
**Figure 5. HRDU Outer Look**

HRDU devices are varied for each frequency band , including the following:

| No | Unit Naming          | Description | Frequency (Bandwidth ) |                              |
|----|----------------------|-------------|------------------------|------------------------------|
|    |                      |             | TX                     | RX                           |
| 1  | N20-HRDU-L700        | Single band | 728~756MHz             | 699 ~ 716MHz<br>777 ~ 787MHz |
| 2  | N20-R-HRDU-700LTE-FN | Single band | 728~768MHz             | 699 ~ 716MHz<br>777 ~ 798MHz |
| 3  | N20-A-HRDU-700LTE-FN | Single band | 729~768MHz             | 699 ~ 716MHz<br>777 ~ 798MHz |
| 4  | N20-HRDU-850IC       | Single band | 862 - 894MHz           | 817 - 849MHz                 |
| 5  | N20-R-HRDU-850IC     | Single band | 862 - 894MHz           | 817 - 849MHz                 |
| 6  | N20-A-HRDU-850IC     | Single band | 862 - 894MHz           | 817 - 849MHz                 |
| 7  | N20-HRDU-1900P       | Single band | 1930 - 1995MHz         | 1850 - 1915MHz               |
| 8  | N20-R-HRDU-1900P     | Single band | 1930 - 1995MHz         | 1850 - 1915MHz               |
| 9  | N20-A-HRDU-1900P     | Single band | 1930 - 1995MHz         | 1850 - 1915MHz               |
| 10 | N20-HRDU-AWS13       | Single band | 2110 - 2180MHz         | 1710 - 1780MHz               |
| 11 | N20-R-HRDU-AWS13     | Single band | 2110 - 2180MHz         | 1710 - 1780MHz               |
| 12 | N20-A-HRDU-AWS13     | Single band | 2110 - 2180MHz         | 1710 - 1780MHz               |
| 13 | N20-HRDU_1900P_40    | Single band | 1930 - 1995MHz         | 1850 - 1915MHz               |
| 14 | N20-A-HRDU_1900P_40  | Single band | 1930 - 1995MHz         | 1850 - 1915MHz               |

|    |                       |             |                                                                                  |                                                  |
|----|-----------------------|-------------|----------------------------------------------------------------------------------|--------------------------------------------------|
| 15 | N20-HRDU_AWS13_40     | Single band | 2110 - 2180MHz                                                                   | 1710 - 1780MHz                                   |
| 16 | N20-A-HRDU_AWS13_40   | Single band | 2110 - 2180MHz                                                                   | 1710 - 1780MHz                                   |
| 17 | N20-HRDU_2300_WCS     | Single band | 2350-2360MHz                                                                     | 2305~2315MHz                                     |
| 18 | N20-HRDU-2500TDLTE    | Single band | LB : 2497.8 ~ 2565.4 MHz<br>MB : 2574.1 ~ 2611.9 MHz<br>UB : 2619.8 ~ 2687.4 MHz |                                                  |
| 19 | N20-HRDU_2600_FDD     | Single band | 2620-2690MHz                                                                     | 2500-2570MHz                                     |
| 20 | N20-HRDU-2500TDLTE-40 | Single band | LB : 2496.8 ~ 2568 MHz<br>MB : 2574.1 ~ 2615 MHz<br>UB : 2618.8 ~ 2690 MHz       |                                                  |
| 21 | N20-HRDU-600          | Dual band   | 617 ~ 652MHz                                                                     | 600+700 B1: 663 ~ 716MHz<br>700 B2: 777 ~ 798MHz |

| No | Unit naming          | Dimension       | Weight | Power consumption | Outlook                                                                               |
|----|----------------------|-----------------|--------|-------------------|---------------------------------------------------------------------------------------|
| 1  | N20-HRDU-L700        | 233 X 155 X 148 | 6.2kg  | 140W              |  |
|    | N20-R-HRDU-700LTE-FN |                 |        |                   |                                                                                       |
|    | N20-A-HRDU-700LTE-FN |                 |        |                   |                                                                                       |
| 2  | N20-HRDU-850IC       | 233 X 155 X 143 | 5.6kg  | 150W              |  |
|    | N20-R-HRDU-850IC     |                 |        |                   |                                                                                       |
|    | N20-A-HRDU-850IC     |                 |        |                   |                                                                                       |
| 3  | N20-HRDU-1900P       | 233 X 155 X 131 | 4.5kg  | 150W              |  |
|    | N20-R-HRDU-1900P     |                 |        |                   |                                                                                       |

|    |                       |                 |        |      |                                                                                       |
|----|-----------------------|-----------------|--------|------|---------------------------------------------------------------------------------------|
|    | N20-A-HRDU-1900P      |                 |        |      |                                                                                       |
| 4  | N20-HRDU-AWS13        | 233 X 155 X 98  | 3.4kg  | 130W |    |
|    | N20-R-HRDU-AWS13      |                 |        |      |                                                                                       |
|    | N20-A-HRDU-AWS13      |                 |        |      |                                                                                       |
| 5  | N20-HRDU-2300_WCS     | 233 X 155 X 89  | 3.4kg  | 145W |    |
| 6  | N20-HRDU-25TDD        | 233 X 155 X 89  | 4.3kg  | 175W |    |
| 7  | N20-HRDU-2600_FDD     | 233x155x129     | 5.3 kg | 155W |   |
| 8  | N20-HRDU_1900P_40     | 233x155x129     | 5.3 kg | 155W |  |
|    | N20-A-HRDU_1900P_40   |                 |        | 215W |                                                                                       |
| 9  | N20-HRDU_AWS13_40     | 233x155x129     | 5.3 kg | 155W |  |
|    | N20-A-HRDU_AWS13_40   |                 |        | 205W |                                                                                       |
| 10 | N20-HRDU-2500TDLTE-40 | 233x155x129     | 5.3 kg | 200W |  |
| 11 | N20-HRDU-600          | 233 X 155 X 148 | TBD    | 150W |  |

### 2.1.3.2 Remote Power Supply Unit ( RPSU)

There are 2 types of RPSU in the HROU for supply to active module in the enclosure and receive power from external.

They are the DC/DC PSU receiving input -48V and the AC/DC PSU receiving input 110V/220V from external.

As order, either of the two types should be decided. MS Connector, which uses ports to receive inputs, is designed to accept any of AC and DC. Only in this case, the input cable is different.

RPSU has a circuit brake to turn the power ON/OFF and has LED indicator at the top to check if input power is normally supplied.

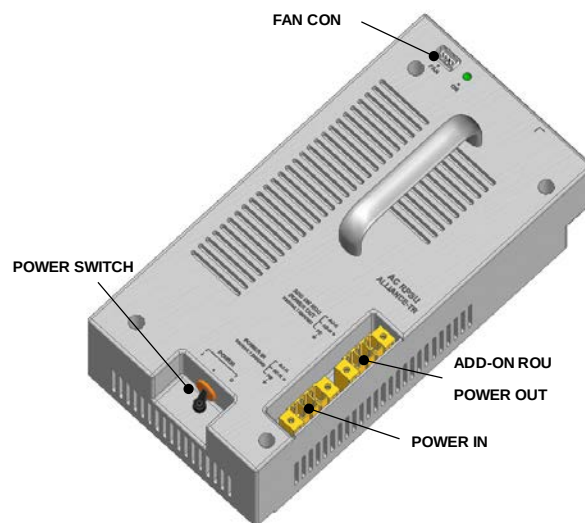


Figure 6. AC-DC RPSU Outer Look

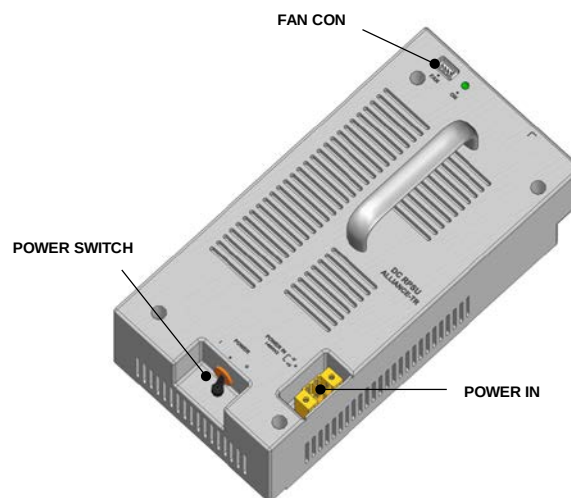


Figure 7. DC-DC RPSU Outer Look

Functions:

- Providing a circuit breaker to turn AC power ON/OFF
- Providing DC power each HRDU
- Providing DC power and signal to FAN tray
- LED indicators for showing alarm status of PSU



Caution

DOUBLE POLE/NEUTRAL FUSING

---

### 2.1.3.3 Remote Optic(ROPTIC)

Remote Optic converts optical signals into RF signals and performs vice versa. It also has internal ATT for optical compensation to compensate for optical cable loss. It provides two path in pairs(TX/RX) to transport RF signal to ARUs.

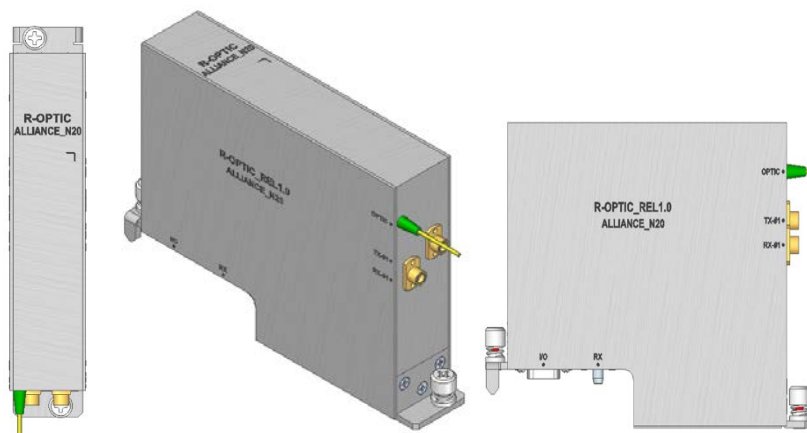


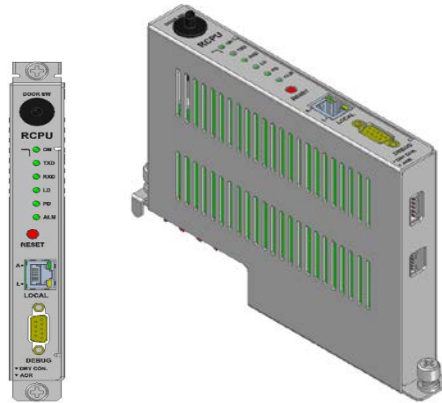
Figure 8. R OPTIC Outer Look

### 2.1.3.4 Remote Central Processor Unit (RCPU)

RCPU can monitor and control each module of HROU. This unit receives and analyzes upper communication data from Remote Optic and reports the unit's own value to upper devices. At the front of the module, it has LED indicator to show system status, letting you check any abnormalities at a time. At the same front, it also has communication LED Indicators to show communication status with upper



devices. Through Local port, the unit enables you to check and control device status through PC and laptop. It provides three interface port with ARUs to communicate with these. It also provide dry contact port, which is (1) output port and (1) input port.

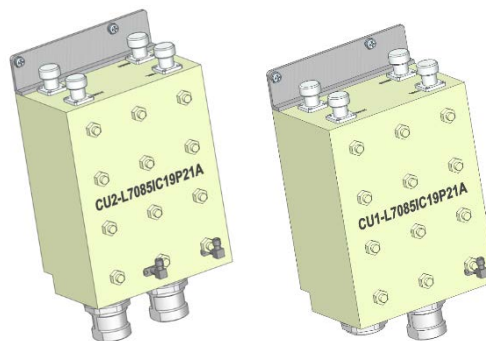


**Figure 9. AC-DC RPSU Outer Look**

#### **2.1.3.5 Multiplexer**

Multiplexer it called combine unit(CU) works as a module to combine or distribute multiple signals into one or two antennas.

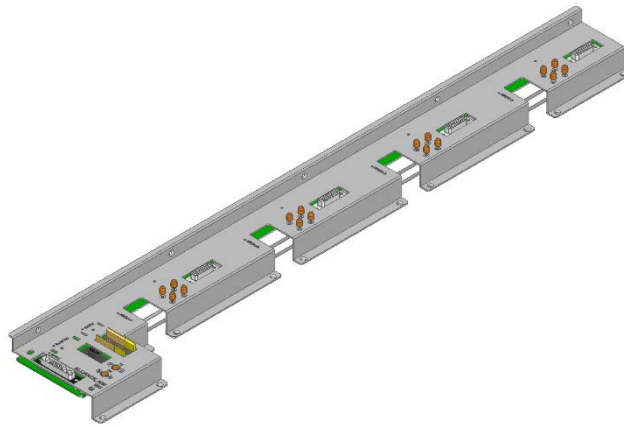
This device has a port to combine multiple signals. You need to connect input and output ports of RDU through a corresponding port.



**Figure 10. Multiplexer Outer Look**

#### **2.1.3.6 System interface unit (SIU)**

This unit connect with HRDU, R CPU, R Optic and RPSU. SIU distributes power and signals to each module. Each unit need to connected to the correct slot of the SIU.



**Figure 11. SIU Outer Look**

## 2.1.4 Bottom of HROU

### 2.1.4.1 Functions

The Bottom look of HROU depends on the combine unit(CU) with 3 options.

The CU option1 and 2 need to install a specified CU in the enclosure like the table below explains.

Thus, the CU option1 has one antenna port, the CU option2 has two antenna ports.

Finally, the CU option3 with 4 antenna ports is not necessary to install CU in the enclosure and needs to apply the panel with 4-DIN Type on the bottom of HROU.

See table and drawing below for.

|                |                                                                                                                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Option1</b> | The HMRU shall provide an integrated combiner that combines all bands for output to a single antenna connection.                                                                               |
| <b>Option2</b> | The HMRU shall provide an integrated combiner that combines all low bands (<1 GHz) to a single antenna connection.<br>All high bands (>1 GHz) will be combined to a single antenna connection. |
| <b>Option3</b> | The HMRU shall provide NO combiner.<br>All amplifier outputs will connect directly to antenna connectors on the bottom of the enclosure                                                        |

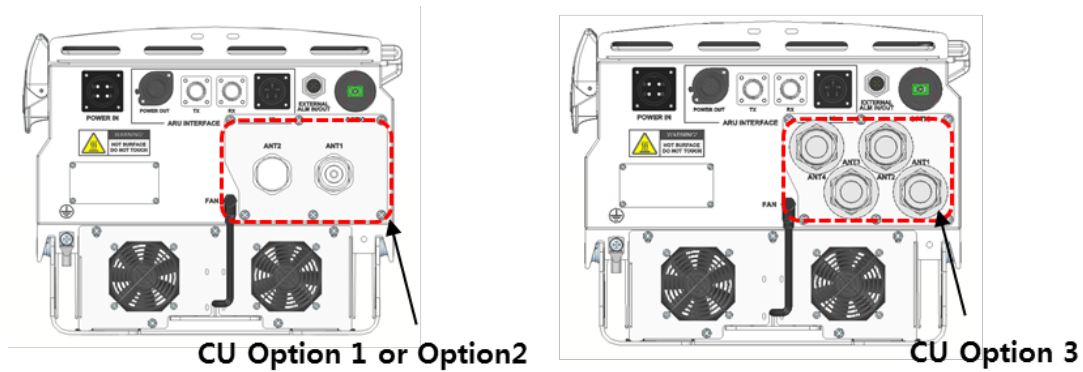


Figure 12. The Bottom Look of HROU and CU options

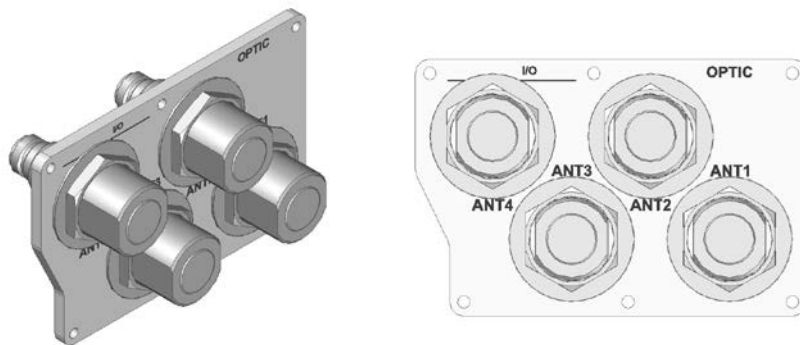


Figure 13. The panel for support CU Option3 with 4 antenna ports

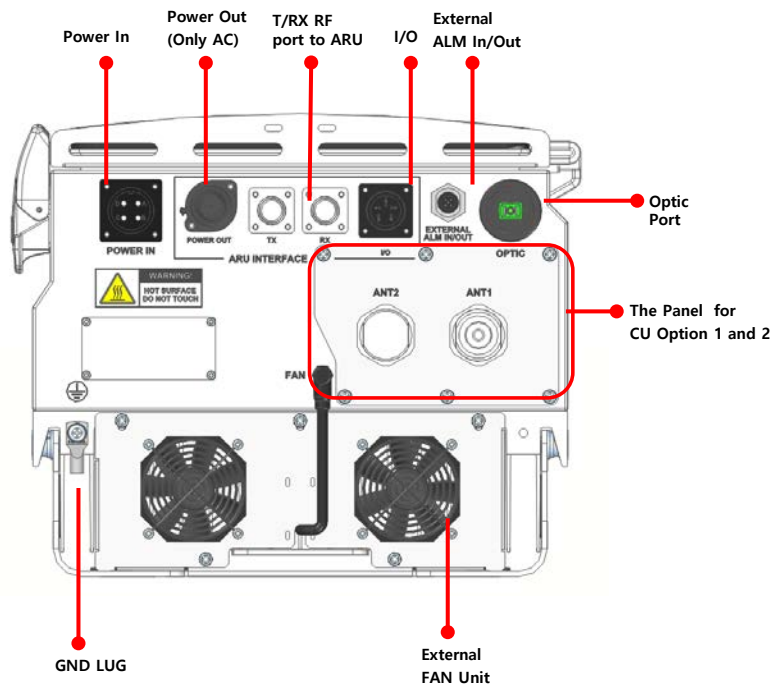


Figure 14. The name of each port on the bottom of HROU

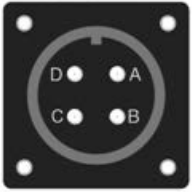
| No | Port                | HMRU | Remark                                                                                     |
|----|---------------------|------|--------------------------------------------------------------------------------------------|
| 1  | Optical Port        | 1EA  | SC/APC, Waterproof<br>Optical Input port                                                   |
| 2  | T/RX RF Port        | 2EA  | N Type-Female<br>Connected for transmitting TX to ARU<br>and receiving RX signal from ARU. |
| 3  | ANT1                | 1EA  | DIN-type female_CU option1 ,2 and 3                                                        |
| 4  | ANT2                | 1EA  | DIN-type female_CU option2 and 3                                                           |
| 5  | ANT3                | 1EA  | DIN-type female_Only CU Option3                                                            |
| 6  | ANT4                | 1EA  | DIN-type female_Only CU Option3                                                            |
| 7  | Power IN            | 1EA  | MS-Con, Waterproof<br>AC Power IN Or DC Power IN                                           |
| 8  | Power OUT           | 1EA  | MS-Con, Waterproof<br>AC 120V Output port(Only AC) to ARU                                  |
| 9  | External FAN unit   | 1EA  | Waterproof-Con                                                                             |
| 10 | GND LUG PORT        | 1EA  | Terminal for system ground                                                                 |
| 11 | External ALM In/Out | 1EA  | Input/output terminal for dry contact                                                      |
| 12 | I/O Port            | 1EA  | Port for communicate with ARU                                                              |

## POWER PORT

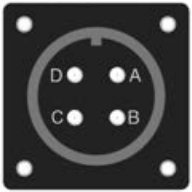
Power ports are used for power-supplying of -48V DC or 120V AC, and specific power cable should be applied to each different types of ROU power supply (AC/DC or DC/DC). Below figure is naming of the power supply by type.

### AC Power

| Port outlook | MS Connector numbering | Name | Description   |
|--------------|------------------------|------|---------------|
|              | A                      | AC_H | AC Hot        |
|              | B                      | AC_N | AC Neutral    |
|              | C                      | N.C  | Not Connected |

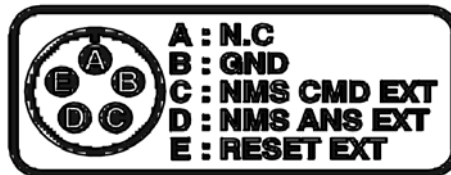
|                                                                                   |   |     |              |
|-----------------------------------------------------------------------------------|---|-----|--------------|
|  | D | F.G | Frame Ground |
|-----------------------------------------------------------------------------------|---|-----|--------------|

#### DC Power

| Port outlook                                                                      | MS Connector numbering | Name | Description   |
|-----------------------------------------------------------------------------------|------------------------|------|---------------|
|  | A                      | N.C  | Not Connected |
|                                                                                   | B                      | N.C  | Not Connected |
|                                                                                   | C                      | +V   | +48V          |
|                                                                                   | D                      | -V   | -48V          |

#### I/O PORT

I/O ports are reserved ports for ARU for future implementation, and used to monitor the status and control the equipments. Below figure is naming of the I/O ports.



# Section3

## System Installation

### 3.1 HROU Installation

This chapter describes how to install each unit and optical cables, along with power cabling method. In detail, the chapter describes how to install shelves or enclosures of each unit, Power Cabling method and Optic Cabling and RF Interface. Furthermore, by showing power consumption of modules to be installed in each unit, it presents Power Cabling budget in a simple way. Then, it describes the quantity of components of modules to be installed in each unit and expansion method.

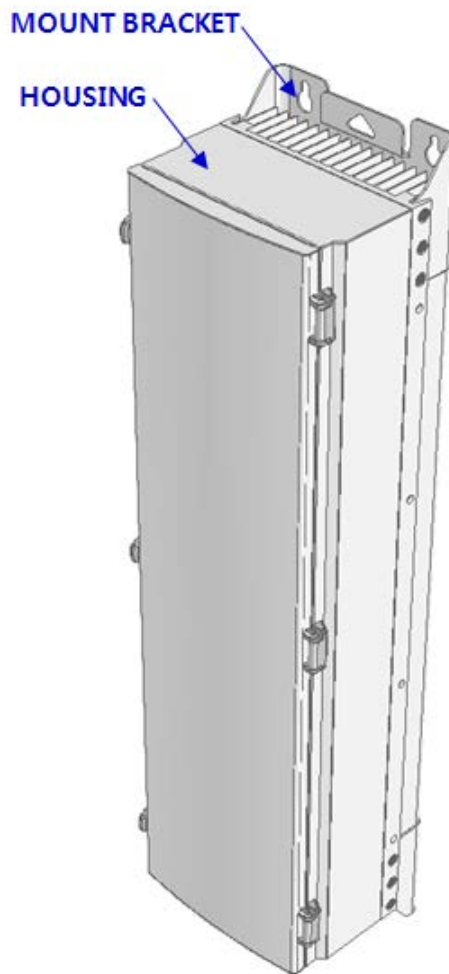
#### 3.1.1 Tools

Tools needed for installation is table below

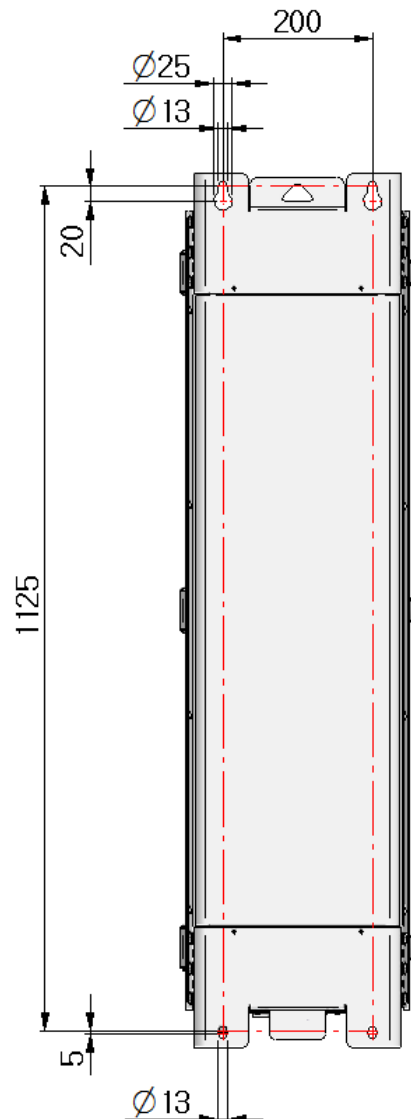
| No | Tools                                                                               | Q'ty | Specification                     | Remark                     |
|----|-------------------------------------------------------------------------------------|------|-----------------------------------|----------------------------|
| 1  |  | 1    | +, 3Ø<br>Length is more than 20mm | For fixing<br>HRDU         |
| 2  |  | 1    | 33mm                              | To tighten<br>antenna port |
| 3  |  | 1    | 19mm                              | To CU N-type<br>port       |

### 3.1.2 HROU Enclosure installation

HROU is designed to be water- and dirt-proof. The unit has the structure of one-Body enclosure. It satisfies water-proof and quake-proof standards equivalent of NEMA4(IP65). The way to install for both HMRU and ARU has same method. Basically HROU is attached with wall mountable bracket. HROU can be mounted into either of wall or on a pole.



**Figure 15. How to install ROU**



**Figure 16. Dimension used to install HROU on the WALL**

### **3.1.3 HROU Wall Mount Installation**

HROU's installation bracket is attached on Enclosure when is delivered. It doesn't need to remove bracket to install enclosure. simply after installing 4 of M12 mounting bolts, secure 4 mounting bolts tightly.

First, install 2 of M12 mounting bolts roughly half way on the enclosure and install enclosure over the bolts and secure tightly.

Second, install 2 of M12 mounting bolts under the enclosure and secure tightly.



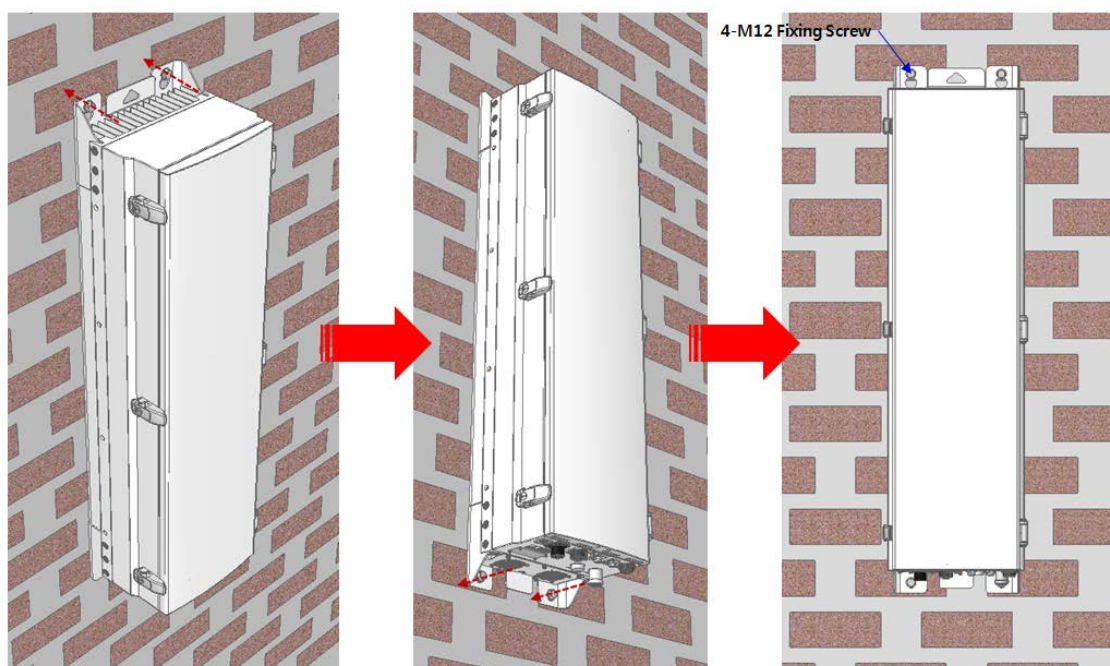


Figure 17. Procedures of installation

### 3.1.4 HROU components

HROU has the following components:

| No.         | Unit                  | Description                                                                                                                                                                | Remark           |
|-------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Common Part | Enclosure             | Including Wall mounting bracket                                                                                                                                            | 1EA              |
|             | RCPU                  | -                                                                                                                                                                          | 1EA              |
|             | R_OPTIC               | With SC/ACP adaptor(only HMRU)                                                                                                                                             | 1EA,optional     |
|             | RPSU                  | AC 110/220V or DC -48V                                                                                                                                                     | 1EA              |
|             | FAN UNIT              | 2 FANs is inside                                                                                                                                                           | 1EA              |
|             | CU1-<br>L7085IC19P21A | <b>Multiplexer1</b><br>This integrated combiner unit combines all bands for output to a single antenna connection.                                                         | 1EA,<br>optional |
|             | CU2-<br>L7085IC19P21A | <b>Multiplexer2</b><br>This integrated combiner unit combines all low bands (<1 GHz) to one antenna connection and all high bands (>1 GHz) to a second antenna connection. | 1EA,<br>optional |

|      |                        |                                                                                                                                                                                                                                                        |               |
|------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|      | CU4-L7085IC19P21A25TDL | <b>Multiplexer3</b><br>The integrated CU that combines all band for output to a single antenna output. Either 700LTE or 850IC band is combined to the single antenna output through the designated port for dual input prepared at upper right corner. | 1EA, optional |
|      | CU7-23W25TDL           | <b>Multiplexer4</b><br>This integrated CU combines two bands for output to a single antenna connection.                                                                                                                                                | 1EA, optional |
|      | No combiner            | If no combiner is used, all amplifier outputs should be connected directly to the individual antenna connectors on the bottom of the enclosure                                                                                                         | 1EA           |
|      | Power Cable1           | MS Connector with 4 hole(AC and DC)                                                                                                                                                                                                                    | 1EA, HMRU     |
|      | Power Cable2           | MS connector for HMRU connection with MS con and Circular connector on the each side of end                                                                                                                                                            | 1EA, HARU     |
| HMRU | HRDU                   | Max 4RDUs in the one enclosure                                                                                                                                                                                                                         | Max 4EA       |

Basically, the common part of HROU should have an enclosure and it is equipped with RCPU to inquire and control state of each module, R\_OPTIC to make both of electronic-optical and optical-electronic conversions, RPSU to supply power for HROU. It should have Power Cable for external rectifier or to supply required power.

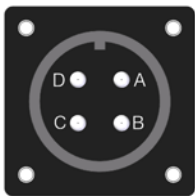
In addition, HRDU can be mounted and removed to provide service for desired band.

### 3.1.5 HROU Power Cabling

#### AC Power

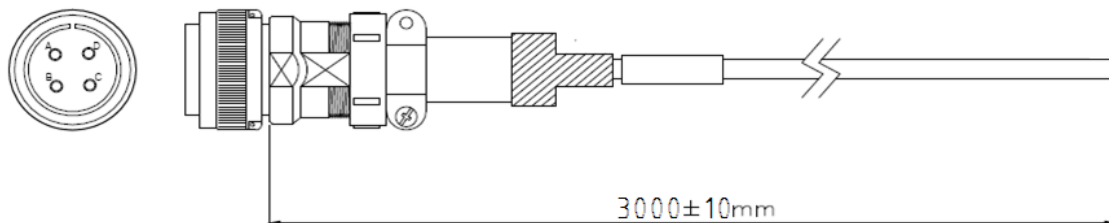
HROU supports AC110V/220V of input power. Provided outside power cable is only one type with AWG#14 3m. Power cable is provided without power plug and it should be attached power plug based on national's power plug type.

The pin discription of AC port is below. You should connect exact polarity of AC.

| Port outlook                                                                                         | MS Connector numbering | Name | Description   |
|------------------------------------------------------------------------------------------------------|------------------------|------|---------------|
| <b>AC POWER</b><br> | A                      | AC_H | AC Hot        |
|                                                                                                      | B                      | AC_N | AC Neutral    |
|                                                                                                      | C                      | N.C  | Not Connected |
|                                                                                                      | D                      | F.G  | Frame Ground  |

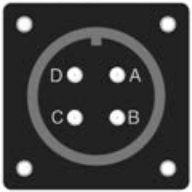
Check if the connection is the same as one seen in the table above and make sure to turn the power ON.

Provided AC power cable's outlook is below



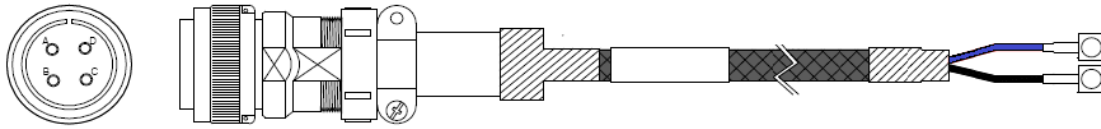
#### DC Power

HROU supports only DC48V of input power. Provided outside power cable is only one type. The pin discription of DC port is below. You should connect exact polarity of DC.

| Port outlook                                                                        | MS Connector numbering | Name | Description   |
|-------------------------------------------------------------------------------------|------------------------|------|---------------|
|  | A                      | N.C  | Not Connected |
|                                                                                     | B                      | N.C  | Not Connected |
|                                                                                     | C                      | +V   | +48V          |
|                                                                                     | D                      | -V   | -48V          |

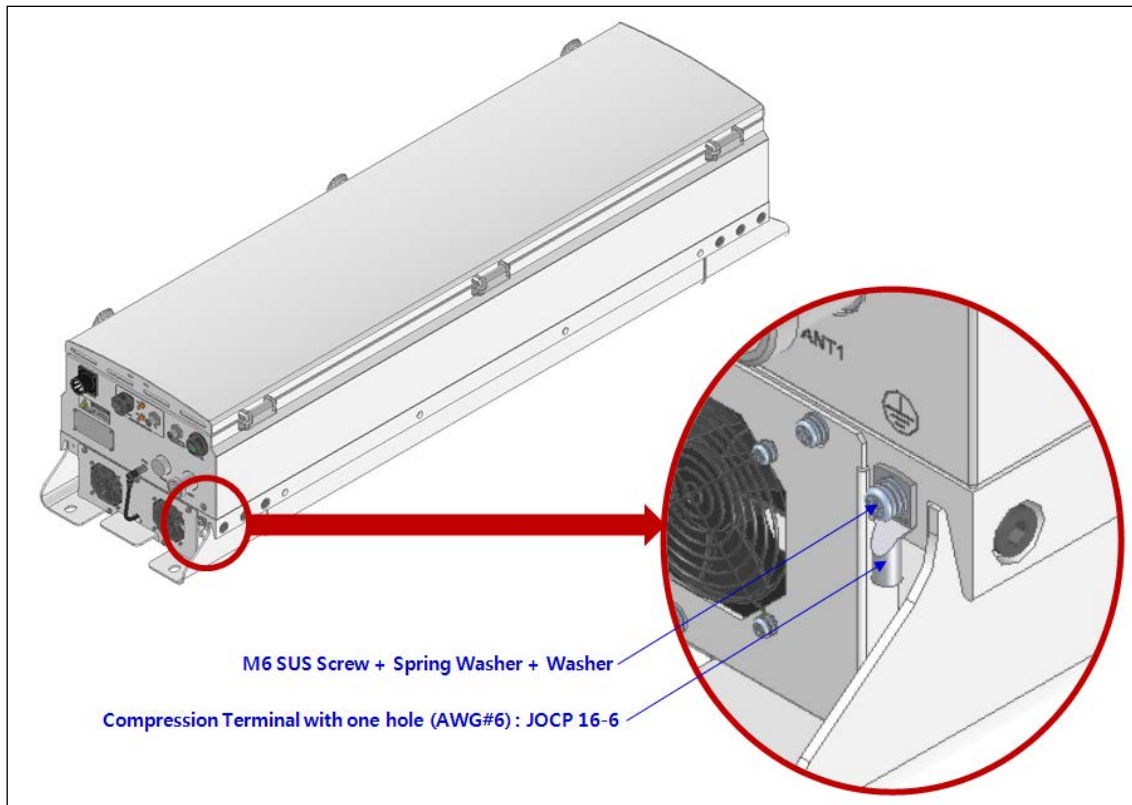
Check if the connection is the same as one seen in the table above and make sure to turn the power ON.

Provided DC power cable's outlook is below



### 3.1.6 HROU Ground cabling

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

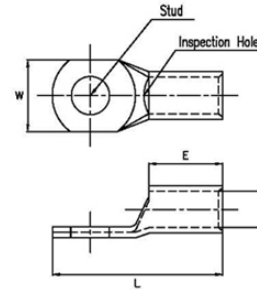


**Figure 18. Location of Ground Terminal**

The specification of compression terminal is like below.

**TUBULAR CABLE LUGS, ONE-HOLE, ROUND COMPRESSED  
TYPE-CP**

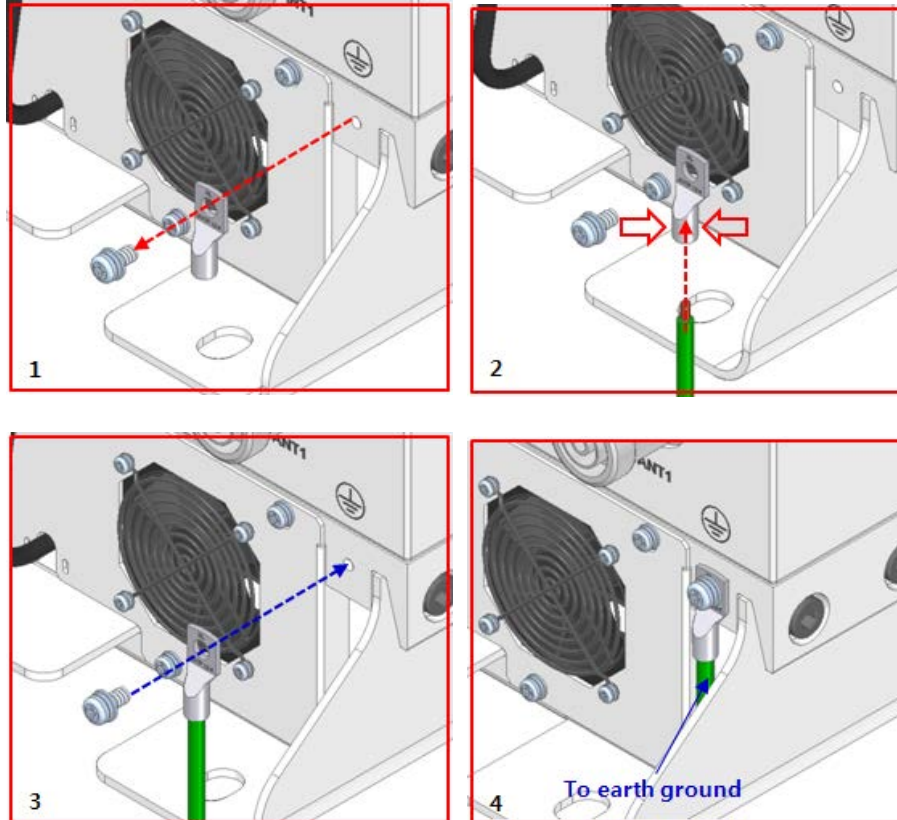
- Material : Electrolytic Copper (TPC)
- Surface : Tin Plated
- With Inspection Hole to visually assure full Conductor insertion.
- Color Coded to Show Proper Die Number and Color 10 mm~70 mm
- To IEC 60228 Class 2 and Class 5
- UL Listed 486A-486B up to 35KV



| Part Number | Wire Range |     |      |     | Stud Size | Dimension (mm) |    |    |     | Code Cable Die Color & No. | Q' ty/ bag |    |
|-------------|------------|-----|------|-----|-----------|----------------|----|----|-----|----------------------------|------------|----|
|             | CODE       |     | FLEX |     |           | W              | E  | L  | d   |                            |            |    |
|             | AWG        | mm² | AWG  | mm² |           |                |    |    |     |                            |            |    |
| JOCP 16-5   | 6          | 16  | 6    | 16  | M5        | 12             | 13 | 29 | 5.4 | Blue 24                    | 300        |    |
| JOCP 16-6   |            |     |      |     | M6        |                |    |    |     |                            |            |    |
| JOCP 16-8   |            |     |      |     | M8        |                |    | 14 |     |                            |            | 33 |
| JOCP 16-10  |            |     |      |     | M10       |                |    | 16 |     |                            |            | 34 |

**Figure 19. Information of Terminal**

The required part number is JOCT 16-6 supporting AWG 6. The way to install the grounding cable comply with below procedures.



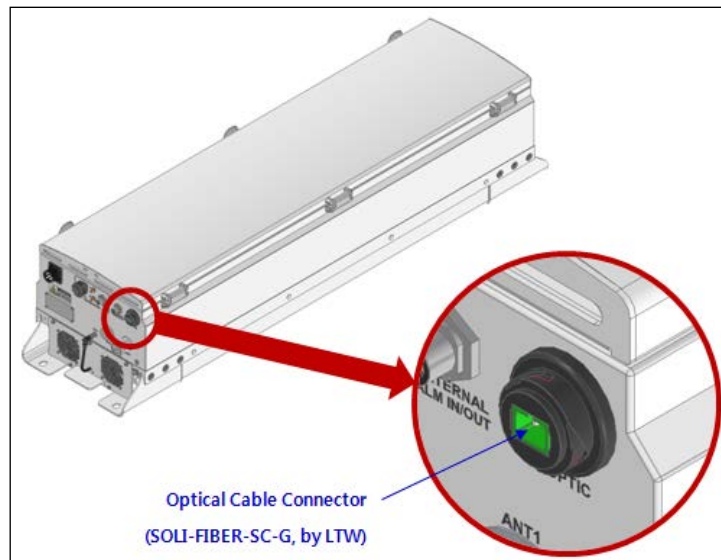
**Figure 20. How to install Ground Terminal**

The procedures are

1. Loosen a two M6 screws and then take compression terminal off
2. Insert AWG#6 Grounding Wire into terminal and then compress a terminal using tool
3. Assemble the terminal which made in step "2" using 2xM6 screws
4. Cut the ground wire to proper length and connect it to the earth ground source  
( Round terminals located on the side of a 1 mm<sup>2</sup> (16 AWG) or more wires Using permanently connected to earth.)

### 3.1.7 HROU Optical Cable

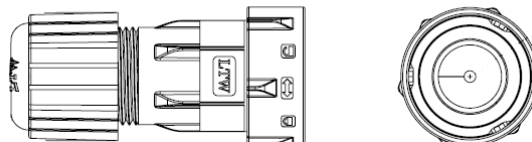
The Optical Connector is located at the bottom of Remote Unit enclosure fixed. Optical Cable can be connected by using connectors.

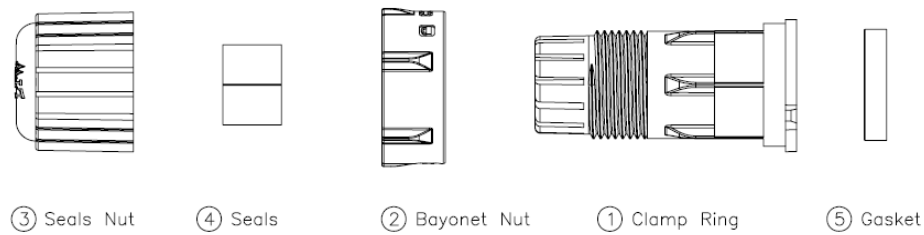


**Figure 21. Location of Optical Connector**

The specification of compression Optic Connector is like below.

SOLI-FIBER-ASSY

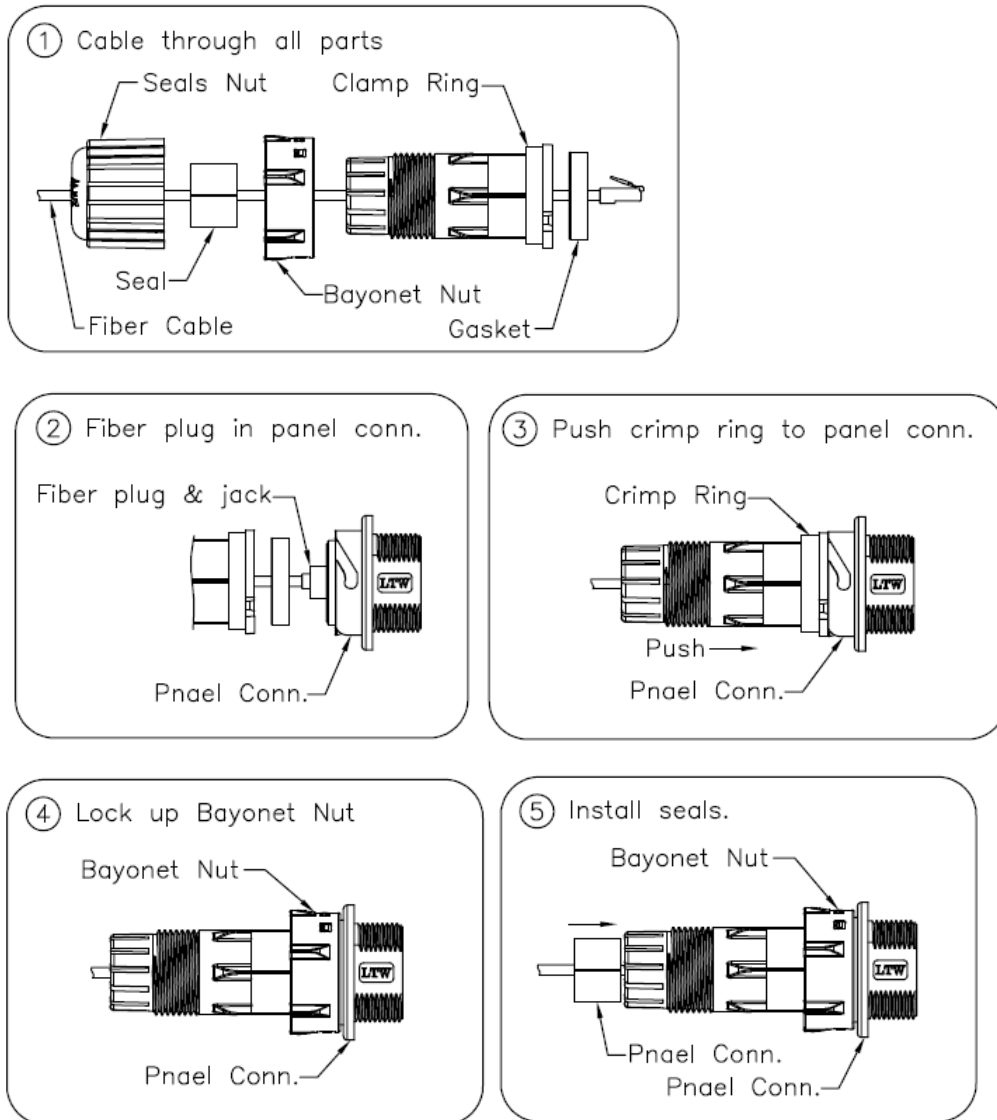




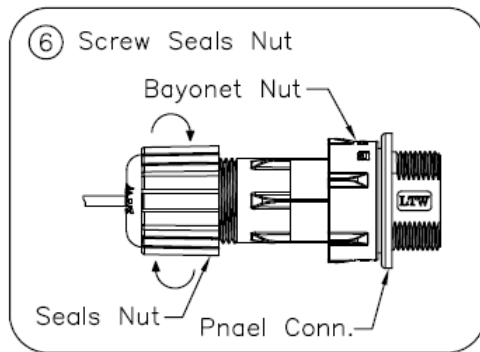
**Figure 22. Information of Optical Connector**

The way to install the Optical cable comply with below procedures

The procedures are



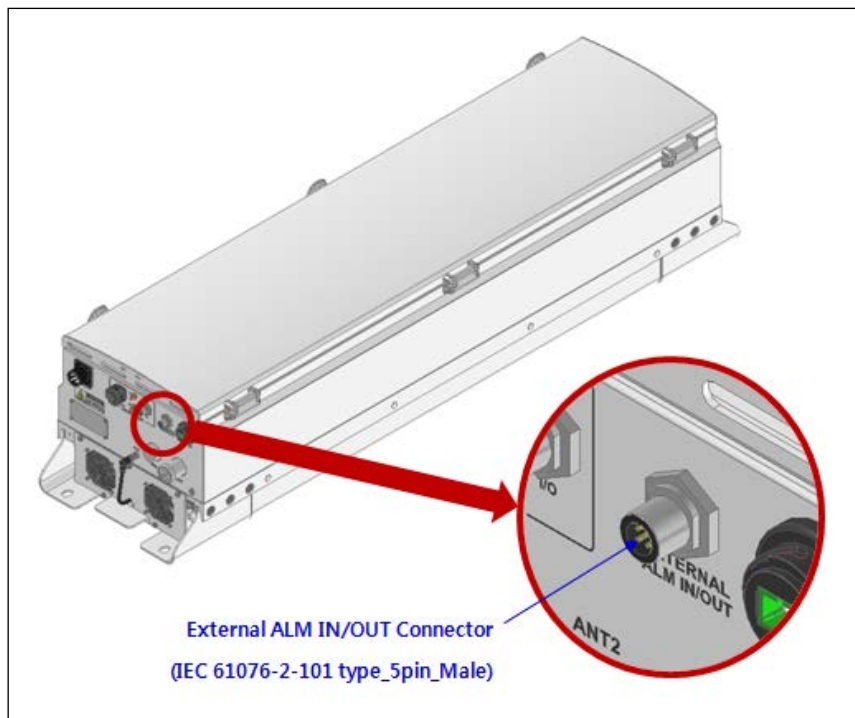




**Figure 23. How to install Optical Cabling**

### 3.1.8 HROU ALM IN/OUT Port cabling

The ALM IN/OUT Connector is located at the bottom of Remote Unit enclosure fixed. Cable can be connected by using connectors.



**Figure 24. Location of ALM IN/OUT Connector**

The specification of compression ALM IN/OUT Connector is like below

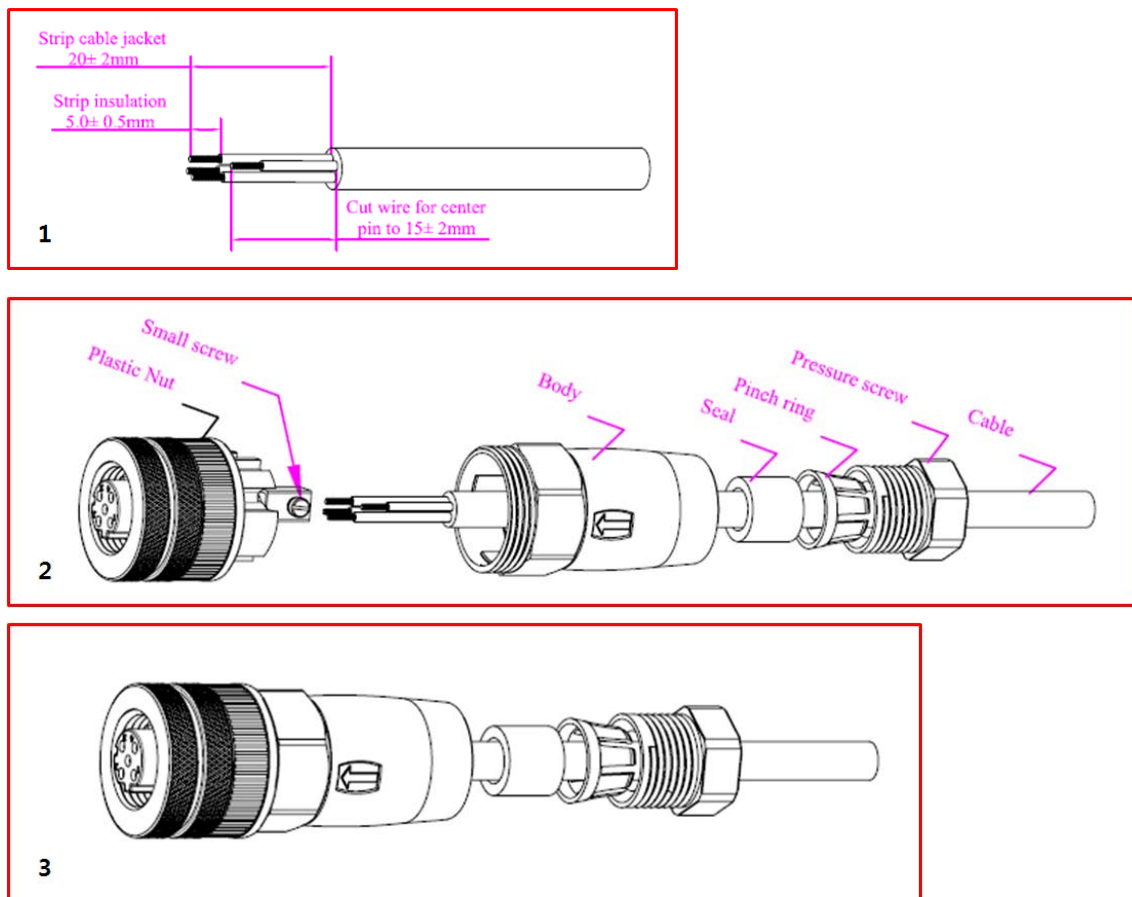


### IEC 61076-2-101 type\_5pin\_Female



**Figure 25. Information of ALM IN/OUT Connector**

The way to install the ALM IN/OUT Connector comply with below procedures



**Figure 26. How to install ALM IN/OUT Cabling**

The procedures are

Peel off sheath of the cable.

Assemble all components on cable as following.

Connect all wires to insert according to wire list, then tighten all small screws.

The torque for small screws is 0.2Nm.

Assemble plastic nut to main body. Recommended torque : 1.0Nm.

(Note : The key inside the main body must go straight to slot of insert.)

Push the cable seal, pinch ring into the main body, then tighten the pressure screw into the body with recommended torque : 1.0Nm.

### 3.1.9 Mounting of HRDU

HROU has slots to enable up to four HRDU modules to be mounted in it.

You can mount a HRDU into designated slot surely and should install each HRDU into its designated location as shown in the installation diagram on the door of enclosure.

It is not possible to provide services with a HRDU module alone; you need to connect HRDU cavity duplexer antenna port with CU's designated port.

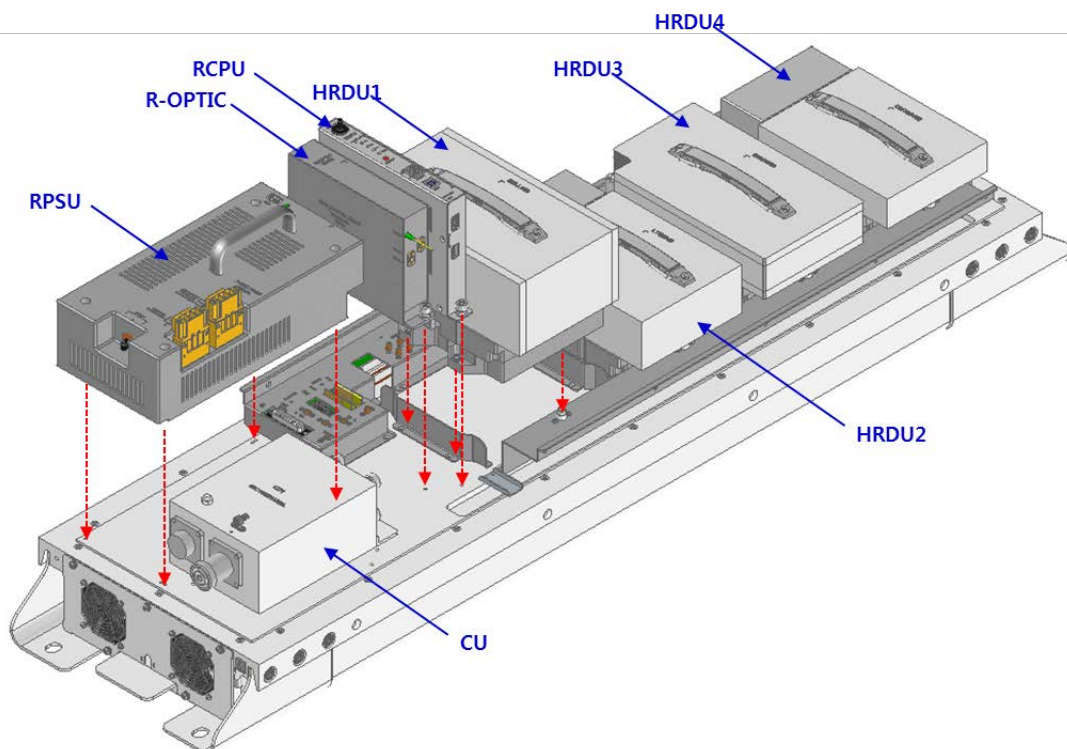
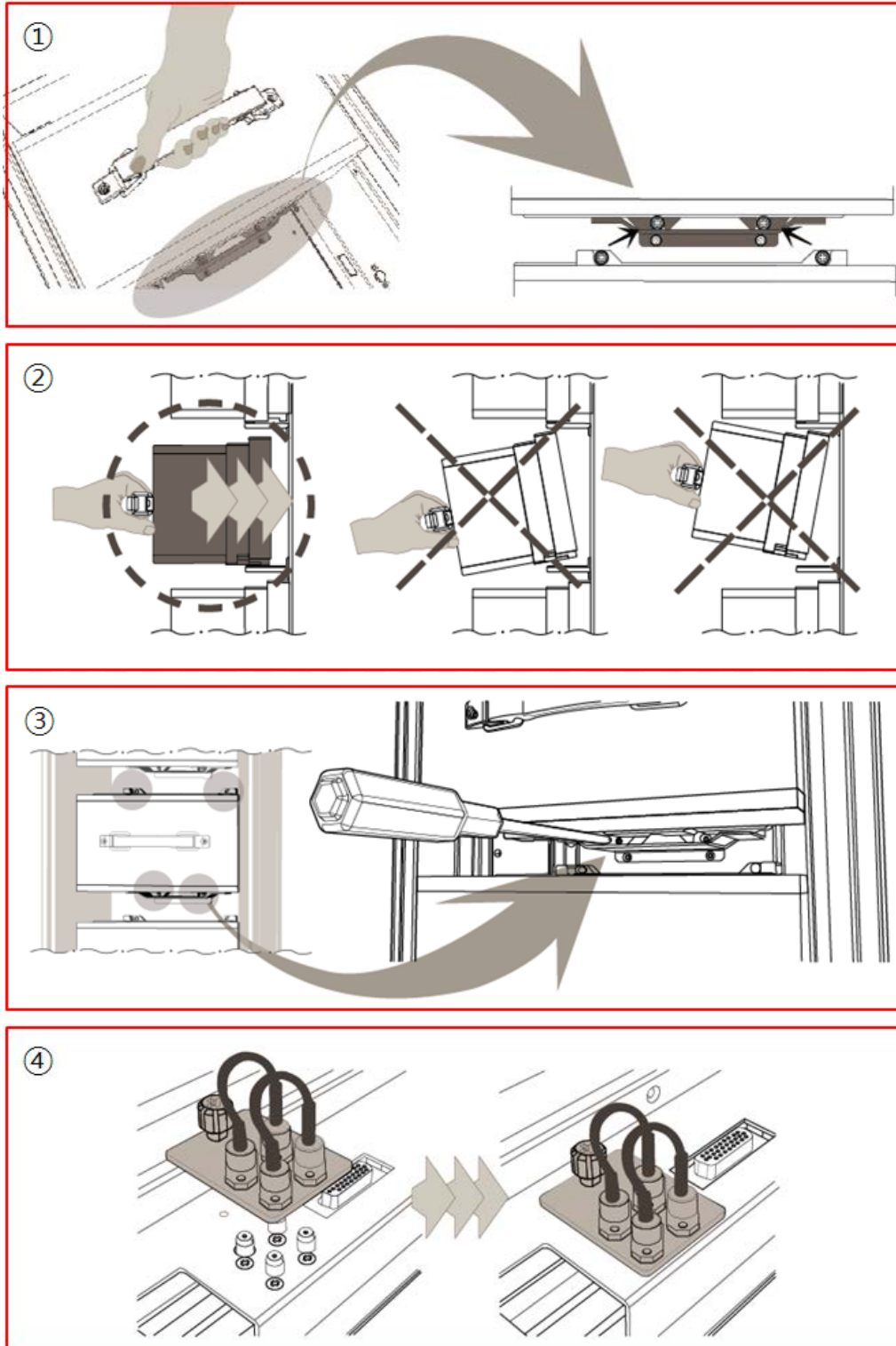


Figure 27. Location of each modules in the HROU

The Remote Unit holds a maximum of 4 HRDUs. Guide brackets on the bottom of each HRDU slot simplify installation as described below. MRDU installation requires a +No.1 tip size screwdriver.



**Figure 28. How to mount HRDU**

The procedures are

1. Lift the HRDU onto the guide bracket and ensure the MRDU is level left to right
2. Push the HRDU into the corresponding slot in the direction of the heat sink while levelling the MRDU to guide bracket
3. Make sure the HRDU is firmly inserted into the corresponding slot. Tighten the 4 corner screws to secure the unit
4. Install HRDU blank cards in all unused slots in the remote. First insert the blank card into the corresponding slot, then tighten the captive screw to secure it

"The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device."

### **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.

(Antenna type: External antenna, Max. Gain: 17dBi)

*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.*

*(type d'antenne: Antenne extérieure, Maximal gain: 17dBi)*

### **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 500 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 may require larger separation distances.

### **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 500 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.*

- IC Booster warning label message should include

**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.

### **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 antenna(s) must be installed such that a minimum separation distance of at least **500** cm is maintained between the radiator (antenna) and all persons at all times. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

**FCC Part 15.19 Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.