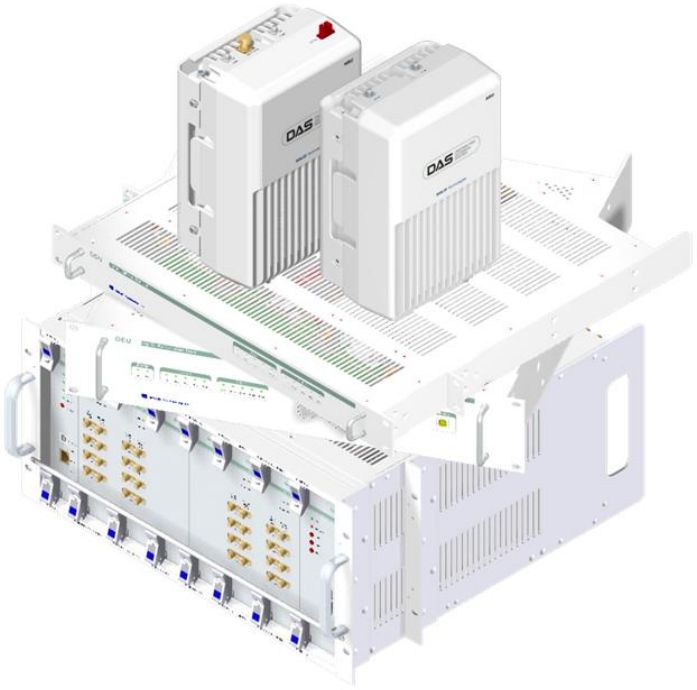
SC-DAS

Installation and Operation Manual



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REVISION HISTORY

Version	Issue Date	No. of Pages	Initials	Details of Revision Changes
V 1.0	April. 11, 2011		Original	
V 2.0	Dec. 08,2011			Add Sprint band
V 3.0	Jan. 06,2012			Add Sprint band
V 4.0	Jan. 07,2013			Add VzW (MRU MIMO) band

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, Inc. website at www.st.co.kr or send email at sjkim@st.co.kr

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Section1

Safety & Certification Notice

"Only qualified personnel are allowed to handle this unit. Read and obey all the warning labels attached in this user manual"

Any personnel involved in installation, operation or service of the SOLiD Technology repeaters must understand and obey the following:

- 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 levels 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.

- The repeater cover (door) should be securely fastened in open position(with a cord), during outdoor work in order to prevent door from slamming due to wind (which could cause bodily harm or damage).

- Use this unit only for the purpose specified by the manufacturer. Do not carry out any modifications or replace any parts which are not sold or recommended by the manufacturer. This could cause fire, electric shock or other injuries.

- Repeaters generate radio signals and thereby give rise to electromagnetic fields that may be hazardous to any person in the immediate proximity of the repeater and the repeater antennas for an extended period of time.

- Due to power dissipation, this repeater may reach a very high temperature. Do not operate this unit on or close to flammable materials.

- Do not use any solvents, chemicals, or cleaning solutions containing alcohol, ammonia, or abrasives.

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

-For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible.

Section2

System Overview

2.1 General overview

SC-DAS platform is a coverage system for in-building services delivering seamless, high quality voice and data As a distributed antenna system, it provides analog and digital phone services in multiple bands through one antenna.

The system covers public and private venues such as:

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

The system enhances in-building radio environments that lack signal quality by improving the RSSI and Ec/Io. By providing communication services throughout the building, the system enables users to make a calls anywhere in the coverage area.

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

The SC-DAS system supports communication standards and public interface protocols in worldwide use.

- Frequencies: VHF,UHF, 700MHz, 800MHz,850MHz 900MHz,1900MHz,2100MHz, etc.
- Voice protocols: AMPS,TDMA, CDMA,GSM,IDEN, etc.
- Data protocols: EDGE,GPRS,WCDMA,CDMA2000,Paging,LTE, etc.

SC-DAS comprises frequency specific modules. Coverage for a specific frequency band is accomplished by inserting a corresponding frequency module into each unit. Because it delivers multiple signals with one strand of single mode fiber, the system, requires no additional hardware modifications whenever a new frequency is added.

The system is featured with the following:

- Flexibiltiy & Scalabiltiy
  - Supports fiber-optic ports up to 32 or 60(using OEU)
  - Connects multiple-buildings (campus) as one DAS
- Modular structures
  - Modular frequency upgrade
  - Plug-in type modules
- Multi-Band, Single operator
  - Supports multiple services from one WSP

- Support multi-operator in a band(Max. 2 operator)

- Low OPEX / CAPEX
  - Compact design
  - Upgradable design
  - Easy installation and maintenance
  - Adopts auto ID scheme

The SC-DAS platform will serve two primary segments; first as a carrier deployed coverage enhancement product for their specific frequencies and second as a low cost, public safety / single carrier product.

2.2 System overview

SC-DAS comprises the components listed below.

The base system consists of a BIU (BTS Interfcace Unit), an ODU (Optic distribution Unit) and a ROU (Remote Optic Unit). For use with multiple ROU's, it has OEU (Optic Expansion Unit).

The BIU has two layer which support both SISO and MIMO configuration using separate optical fiber cable. Fig2.1 shows basic system topology for SISO

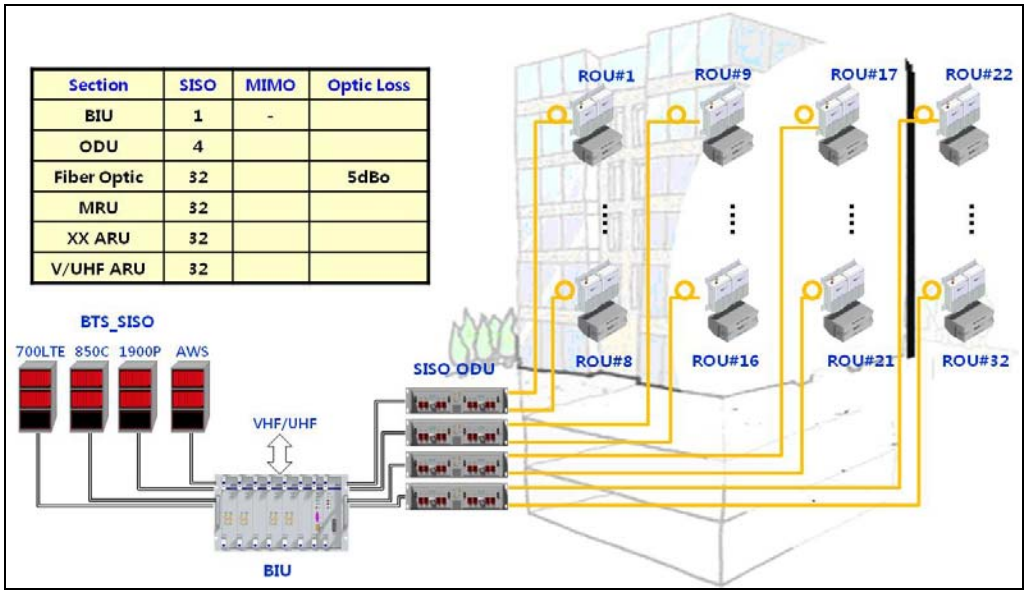

Figure 1.1 – Basic system topology supporting SISO configuration

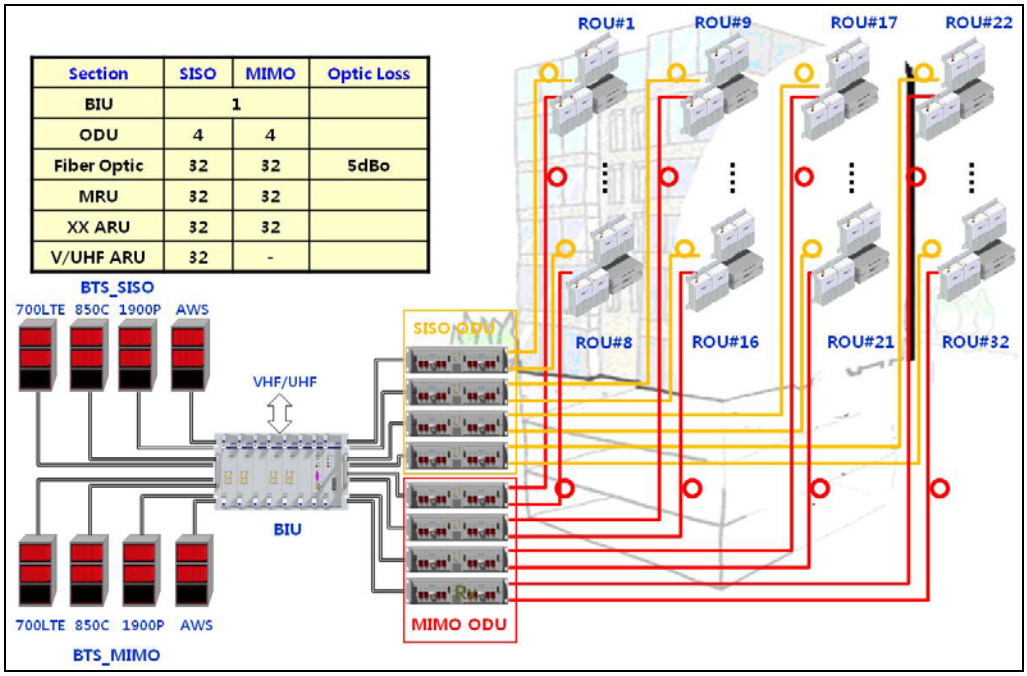

Figure 2.2 – Basic system topology supporting MIMO configuration

As shown at Fig.'s 2.1 and 2.2, one strand of fiber is needed for SISO configuration but two strands are needed for MIMO cofiguration when connected with an ROU. Applications requiring up to 32ROU's for SISO are possible with one BIU. Each SISO ROU will require an additional strand of fiber and an additional 32 ROU's can be added to the same system for MIMO applications. MIMO requires 2 strands of fiber per ROU as well as MIMO specific ODU's.

To reduce number of optical cables between multi-building applications, we can utilize the OEU(Optical Expansion Unit)

Fig 2.3 shows expansion system topology supporting SISO configuration using OEUs

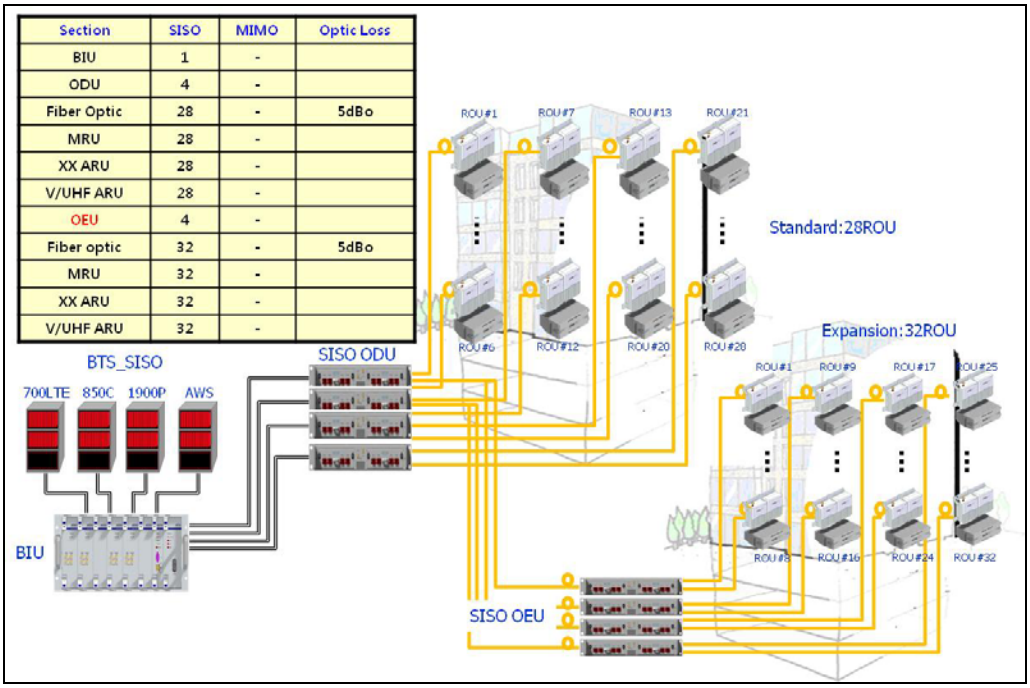

Figure 2.3 – Expansion system topology supporting SISO configuration

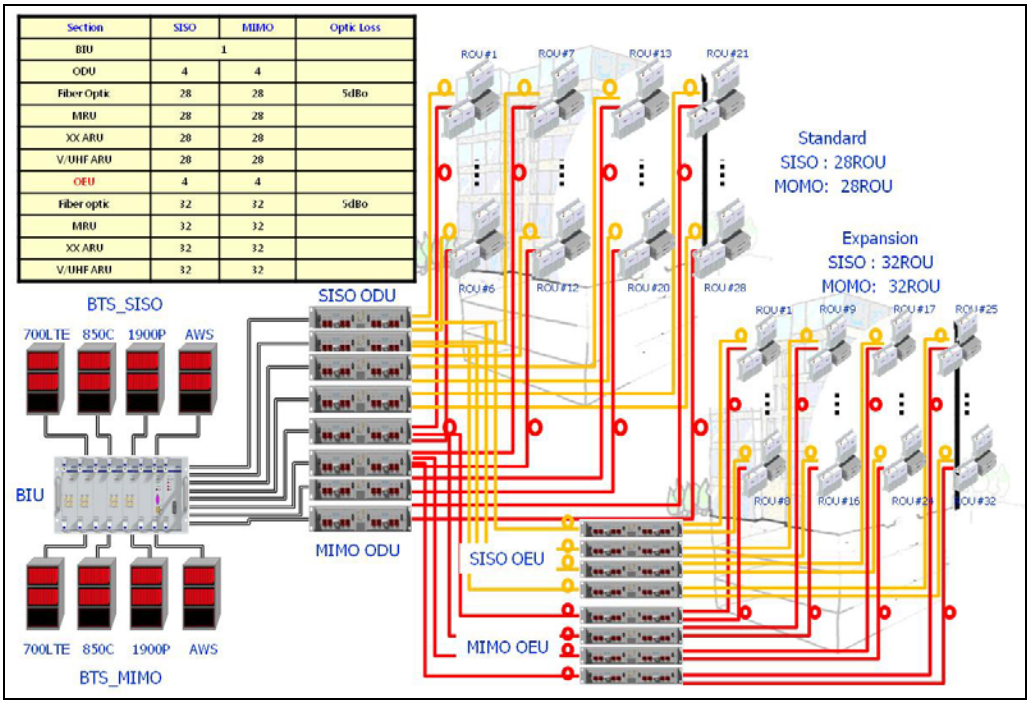

Figure 2.4 – Expansion system topology supporting MIMO configuration

Fig 2.4 shows expansion system topology supporting MIMO configuration using OEU

Section3

System Specifications

3.1 System specifications

3.1.1 Physical Specifications

Parameter	BIU	ODU	OEU	MRU	ARU
RF Connectors	4 SMA pairs(TX,RX) per MDBU	2 SMA	-	1 N-type 2SMA :optical 2SMA :RF	2SMA :optical 2SMA :RF
External Alarm connector (Dry contacts)	TB: 4pcs for output TB: 3pcs for input	-	-	-	-
Serial Interface connector	1 USB(B) type		1 USB(B) type	1 USB(B) type	1 USB(B) type
Fiber connector	-	8pcs, SC/APC for ROU	1 SC/APC for ODU 8 SC/APC for ROU	1 SC/APC for ODU	-
LED Alarm and Status Indicator	MDBU Status ● Power status ● ALM status MCPU ● Power status ● TX Comm ● RX Comm ● ALM status MPSU ● Power status ● DC ALM status	DOU1 Status ● LD status ● PD1/2/3/4 status DOU2 Status ● LD status ● PD1/2/3/4 status	EWDM Status ● LD status ● PD status DOU1 Status ● LD status ● PD1/2/3/4 status DOU2 Status ● LD status ● PD1/2/3/4 status System status ● Power status ● TX1 Comm ● RX1 Comm ● TX2 Comm ● RX2 Comm ● ALM status	System status ● Power status ● TX Comm ● RX Comm ● ALM status ● Opt status	System status ● Power status ● TX Comm ● RX Comm ● ALM status
AC Power	-	-		Normal Range: 120VAC 50/60Hz Operating range 108~132VAC,50/60Hz	Same to left side
DC Power	Normal range: -48 VDC Operating range: -40.8 ~ -57.6VDC	Be provided by BIU		Normal: -48 VDC Operating range: -40.8 ~ -57.6VDC	Same to left side
Power consumption	SISO Mode : 162W (Including SISO ODU 4EA) MIMO Mode : 315W (Including SISO ODU 4EA+MIMO ODU 4EA)	28W (Including DOU2EA)	40W (Including DOU2EA)	MRU1900P+850C:50W MRU 1900P:45W MRU700LTE+AWS:50W	ARU700LTE+AWS:40W ARU900I+800I:44W
Enclosure Dimensions	482.6(19") x 221.5(5U) x 450	482.6(19") x 43.6(1U) x 450	482.6(19") x 88.1(2U) x 450	300 x 200 x 258	300 x 200 x 258
Weight[Full Load]	26.2Kg	6Kg	9.6Kg	6.6Kg~7.1Kg	6.8Kg

3.1.2 Optical wavelength and Laser power

Parameter	ODU	OEU	ROU
Optical Wavelength	TX: 1310nm RX: 1550nm	West optic TX: 1550nm, RX: 1310nm East optic TX: 1310nm, RX: 1550nm	TX: 1550nm RX: 1310nm
Output power	1.5dBm±1dBm to ROU,OEU	1dBm±1dBm to ROU 7dBm±1dBm to ODU	7dBm±1dBm to ODU
Return loss	<45dB	<45dB	<45dB

3.1.3 Environmental specifications

Parameter	BIU, ODU, OEU	ROU/AOR
Operating Temperature	-10 to +50℃	-10 to +50℃
Operating Humidity, non condensing	-	5% to 90%

3.1.4 Available Frequency Bands

Standard	Unit naming	Description	Frequency range		Status
			TX(MHz)	RX(MHz)	
iDEN	700PS	Public safety	763 to 775	793 to 805	In future
iDEN	800PS	Public safety	851 to 869	806 to 824	Completed
Cellular	850C	Cellular	869 to 894	824 to 849	Completed
iDEN	900I	SMR	935 to 940	896 to 901	Completed
Paging	900 PA	Paging	929 to 930	896 to 902	In future
PCS	1900P	PCS	1930 to 1995	1850 to 1915	Completed
AWS-1	AWS-1	AWS-1	2110 to 2155	1710 to 1755	Completed
VHF	VHF	Public safety	136 to 174	136 to 174	In future
UHF	UHF	Public safety(Band1)	396 to 450 450 to 512	396 to 450 450 to 512	In future
E-UHF		Public safety(Band2)	380 to 434 434 to 496	380 to 434 434 to 496	In future
LTE	700LTE	Long Term Evolution	728 to 756	698 to 716 777 to 787	Completed

3.1.5 Band Specifications

SC-DAS platform allows many band combinations as well as different output power levels within the band depending on the combination.

1) Output power level

Below table shows Output power level as a function of band combination

Band Combinations		700PS	700LTE	800PS/I	850C	900I	1900P	AWS	VHF	UHF
MRU	ARU									
1900P+850C	700LTE+AWS	-	24dBm	-	24dBm	-	28dBm	28dBm	24dBm	24dBm
1900P	900I+800I	-	-	26dBm	-	26dBm	31dBm	-		
700LTE+AWS	-	-	28dBm	-	-	-	-	28dBm		
1900P+AWS	-	-	-	-	-	-	30dBm	30dBm		
1900P+850C	700PS+800PS	21dBm	-	21dBm	21dBm	-	30dBm	-		
700PS+800PS	900I+800I	21dBm	-	21dBm		21dBm	-	-		

2) General Specifications

Parameter		Specifications	Remark
Gain Control range	TX	25dB/step 1dB	ROU
	RX	20dB/step 1dB	BIU
TX input power		-20dBm~+10dBm	
Spurious Emission		< -13dBm	
Optical Link AGC		>10dB	
VSWR		1.8:1	
Pass-band Ripple		4dBp-p	
Max optical Loss		5dBo	
Optical wavelength		1310nm/1550nm with WDM	
RX output power		0dBm	
RX input power		-50dBm Max	
Noise Figure		< 8dB	Excluding 700PS, 800PS

Section4

System Configuration and Functions

4.1 BIU (BTS Interface Unit)

The BIU receives signals from the BTS or BDA through coaxial cable and transmits to four ODUs (Optic Distribution Unit).and The BIU separates RX signals received from ODUs according to their frequency band.

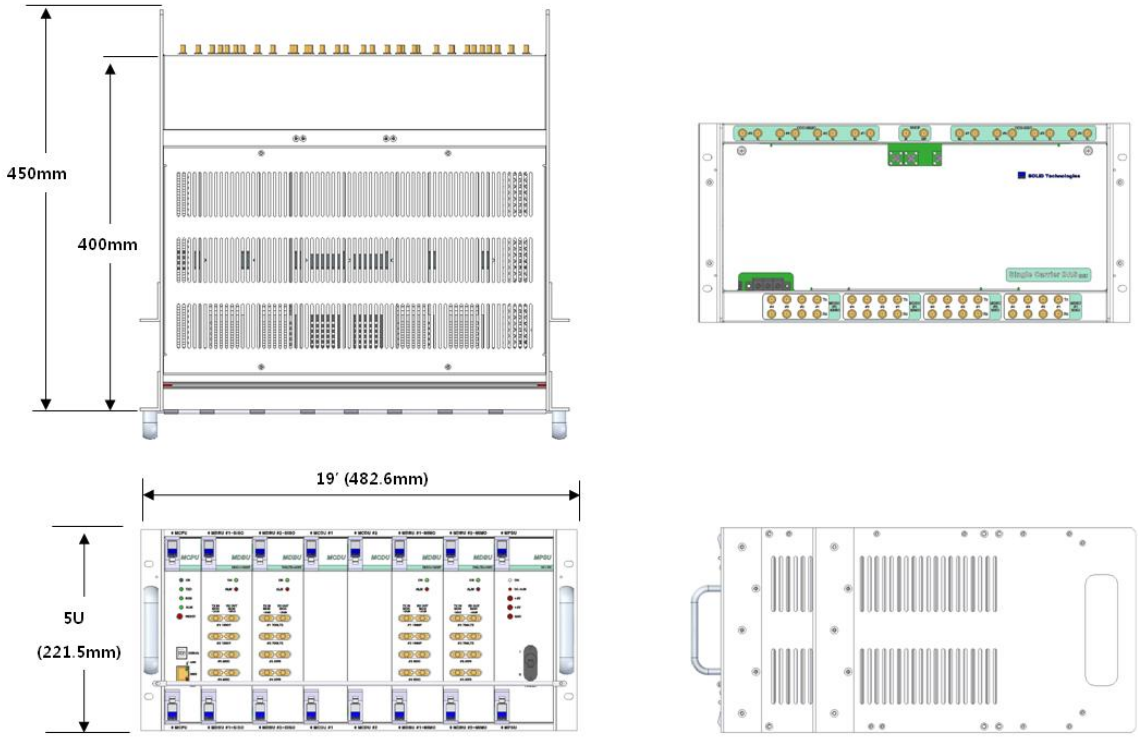

Figure 4.1 – BIU front and side views

4.1.1 BIU Specifications

Item	Spec.	Remark
Size	**482.6(19") x 221.5(5U) x 450**	mm
Weight	26 Kg	Full Load
Power consumption	SISO Mode : 168 W(Including SISO ODU 4EA) MIMO Mode : 315W(Including SISO ODU 4EA+MIMO ODU 4EA)	

4.1.2 BIU block diagram

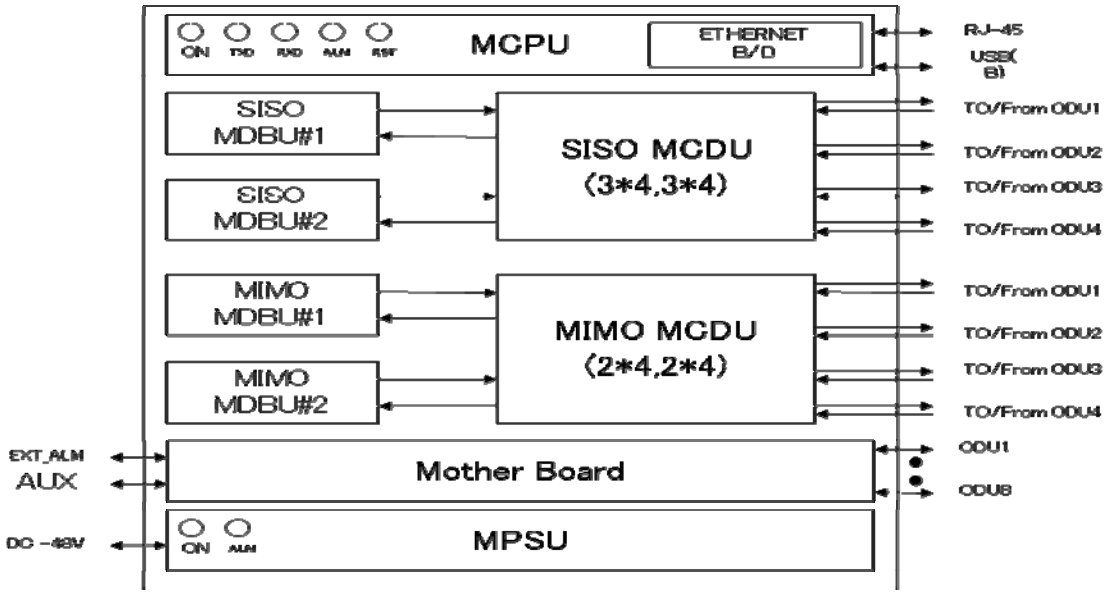

Figure 4.2 – BIU block diagram

4.1.3 BIU assemblies

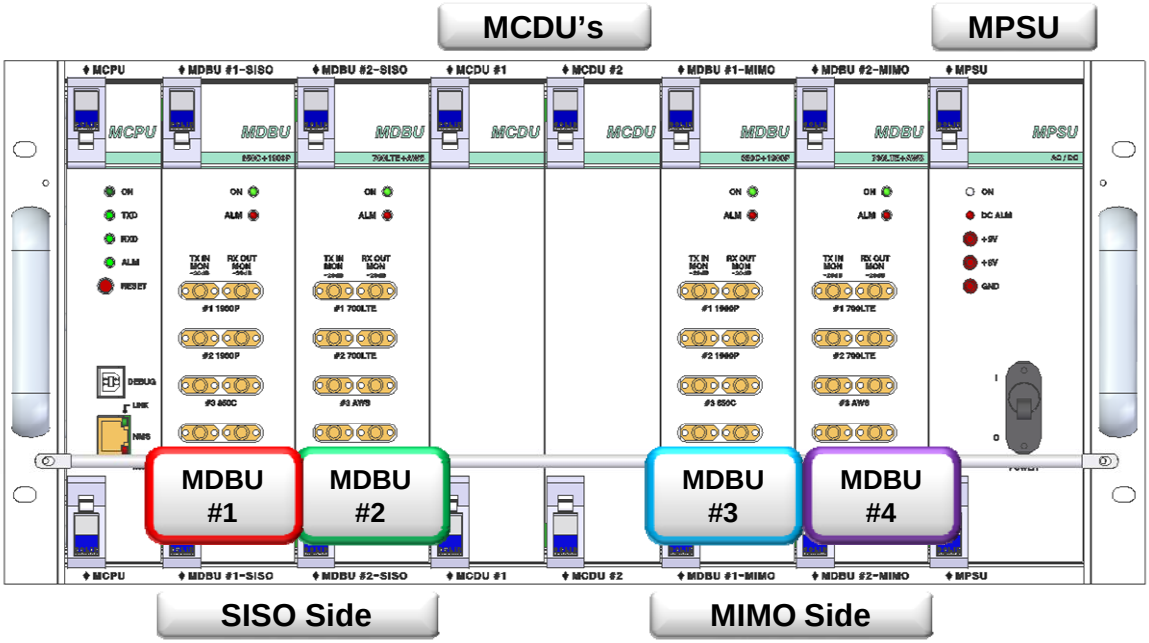

Figure 4.3 – BIU mounting diagram

No.	Unit	Description	Remark
1	MDBU	**Main Drive BTS Unit** Amplify & adjust downlink RF signal Amplify & adjust uplink RF signal	Max 4EA
2	MCDU	**Main Com/Div Unit** Combine 3EA downlink signal and divide 4EA signal to ODU Combine 4EA uplink signal and divide 3EA signal to MDBU Support VHF/UHF interface port	
3	MCPU	**Main Central Processor Unit** Control and monitoring system status Control and monitoring with USB(B) Allows access to upper-level network through GSM or Ethernet	
4	MPSU	**Main Power Supply Unit** Input power: DC -48V, Output power: 9V, 6V	
5	M/B	**Mother Board** Provide signal interface and power for each unit Provide four ports for dry contact output Provide three ports for input Provide two Aux ports for future usage	
6	Shelf	19 inch, 5U	

4.1.4 Sub Assembly Description

1) Main Drive BTS Unit (MDBU)

MDBU delivers TX signals from the BTS or BDA to related devices as well as delivers RX signals from these devices to the BTS or BDA. This unit also monitors TX input level. Using the input AGC function, it automatically adjusts input ATT according to input power. It also has an ATT to adjust RX gain. The MDBU varies per frequency band to including the following:

No	Unit naming	Description	In/out RF Port	
			TX	RX
1	1900P+850C	Dual Band	4 Port	4 Port
2	700LTE+AWS-1	Dual Band	4 Port	4 Port
3	1900P	Single Band	2 Port	2 Port
4	900I+800I	Dual Band	4 Port	4 Port
5	1900P+AWS-1			4 Port
6	700PS+800PS			4 Port
7	900I	Dual Band	2 Port	2 Port

On the loadmap

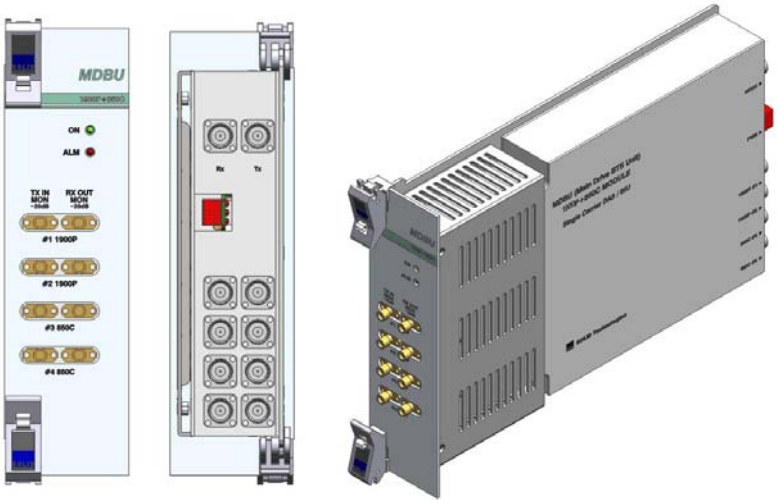

Figure 4.4 – MDBU at a glance

2) Main Com/Div Unit (MCDU)

MCDU combines TX signals that are delivered from MDBU per frequency band and delivers them to four ODUs. It also combines RX signals from up to four ODUs and sends them to up to four MDBUs.The unit has a port to interface with VHF&UHF signals. It has an ATT for input monitoring and input control.

The unit has a reserved port for future usage such as LMU interface, additive MDBU interface ,etc,

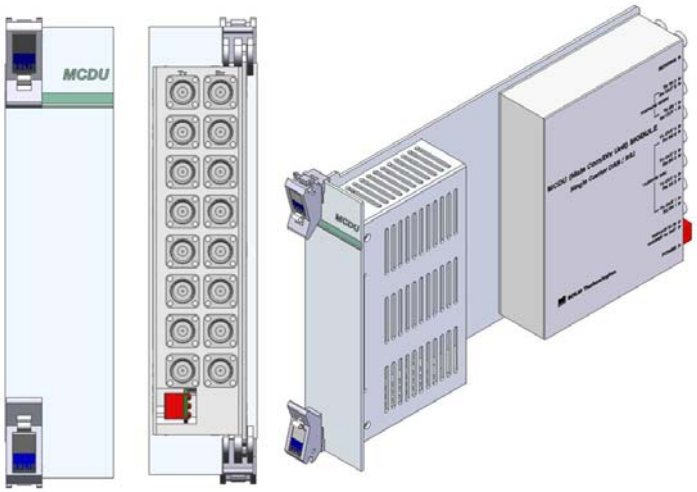

Figure 4.5 – MCDU at a glance

VHF+UHF frequency band includes the following: for use in future

No	Unit naming	Description	In/out RF Port	
			TX	RX
1	VHF+UHF	Dual Band	1 Port	1 Port

3) Main Central Processor Unit (MCPU)

MCPU can inquire and control the state of the modules that are installed in the BIU.

This unit can inquire and control the state of up to four ODUs. Through communication, it also can inquire and control ROUs that are connected.

In addition, the unit has USB(B) port for local monitoring so that it can inquire and control state of devices through a PC. On the front panel, it has communication LED indicators to check communication state with ROU. It also has ALM LED indicators to show whether a device is faulty.

For access to upper network, it has a port to insert an Ethernet port and GSM modem in it.

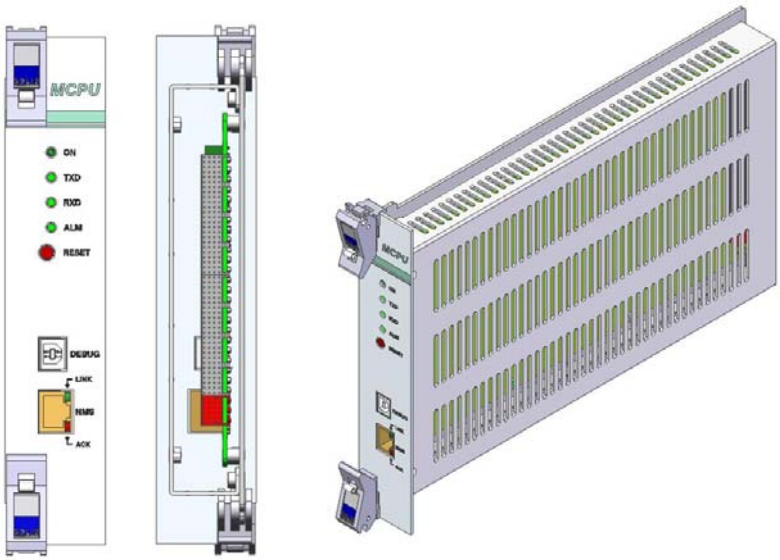

Figure 4.6 – MCPU at a glance

In the Main Central Processor Unit, a lithium battery is installed for RTC (Real Time Control) function.

CAUTION

RISK OF EXPLOSION MAY OCCUR IF BATTERY IS REPLACED BY AN INCORRECT TYPE

DIPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS

[INSTRUCTION]

The equipment and accessories including inner lithium battery are to be disposed of safely after the life span of them according to the national regulation. Do not attempt to replace the lithium battery unless authorized by a qualified service personnel, to avoid any risk of explosion.

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4) Main Power Supply Unit (MPSU)

The MPSU takes a -48V input and outputs +6V and +9V DC power.

On the front panel, this unit has an output test port and it also has DC ALM LED Indicator to show faulty output.

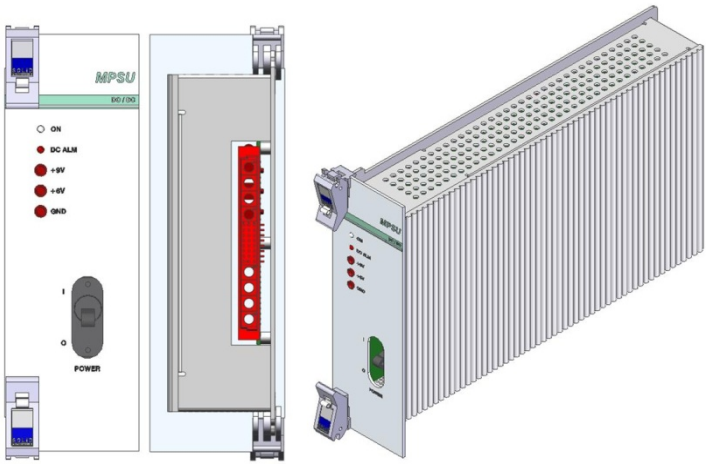


Figure 4.7 – MPSU at a glance

4.1.5 BIU front/rear panel overview

1) Front panel

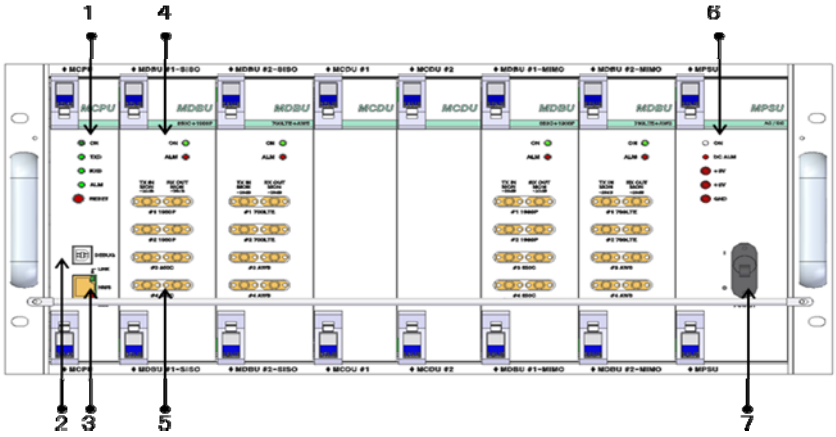


Figure 4.8 – BIU front panel view

Item	Description
1. Alarm LED & Reset	Communication state with devices, alarm status of the system and reset switch
2. DEBUG (USB B)	USB port for communication and diagnosis of devices through PC/laptop This equipment isfor indoor use only and all the communication wirings are limited to indoor use as well.
3. NMS(Ethernet port)	Ethernet port for upper network The supporting network mode is UDP protocol
4. MDBU LED	LED to show whether MDBU is installed and is operating properly

5. RF Monitor Port	20dB Coupling compared with TX Input Level 20dB Coupling compared with RX Output Level
6. Pwr Test Port & ALM	Output DC power test port and ALM LED to show abnormal state, if any
7. Power switch	Power ON/OFF switch

2) Rear panel

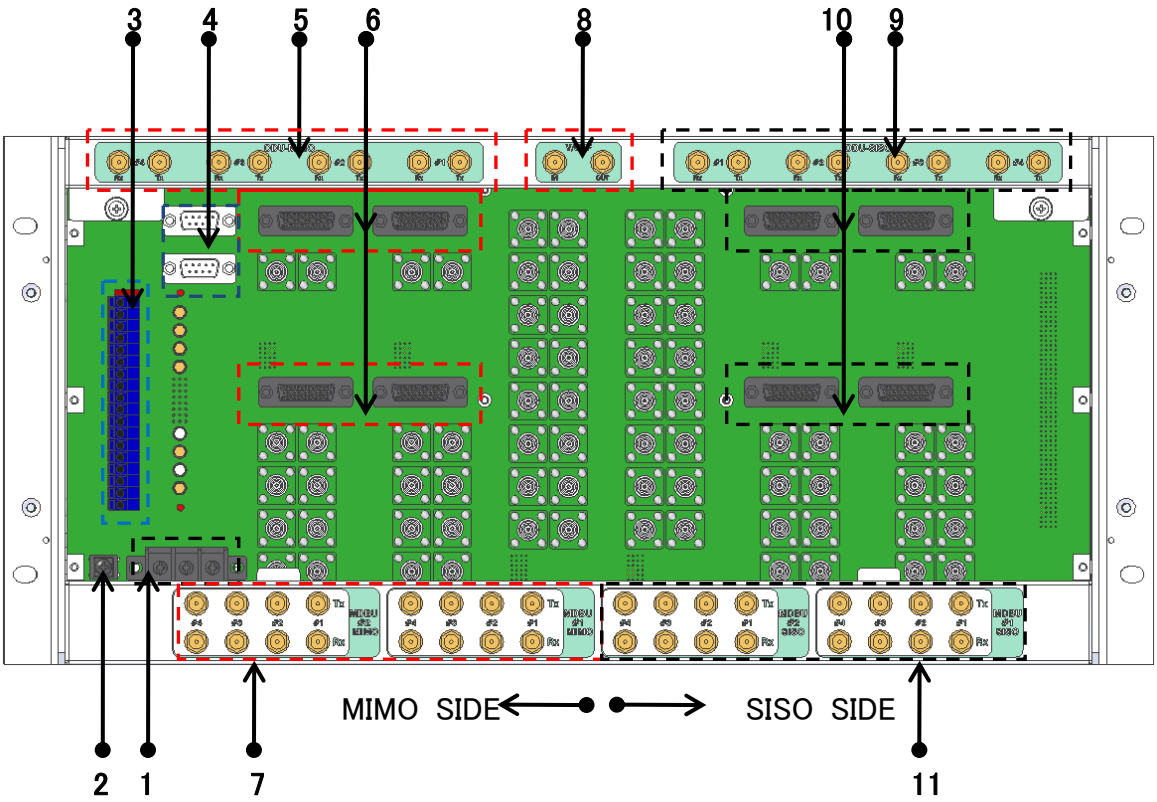


Figure 4.9 – Rear panel view

Item	Description
1. DC Input Port	Input terminal for DC -48V
2. External ALM Port	Input/output terminal for dry contact
3. GND Port	System ground terminal
4. AUX I/O Port	Reserved Port for future uses
5. MIMO ODU I/O Port	RF signal interface terminal for ODU
6. MIMO ODU signal Port	Power and signal interface terminal for ODU
7. MIMO BTS/BDA I/O Port	Input/output interface terminal of BTS/BDA
8. V/UHF I/O Port	RF signal interface terminal of VHF&UHF
9. SISO ODU I/O Port	RF signal interface terminal for ODU
10. SISO ODU signal Port	Power and signal interface terminal for ODU
11. SISO BTS/BDA I/O Port	Input/output interface terminal of BTS/BDA

4.2 ODU (Optic distribution Unit)

ODU receives TX RF signals from upper BIU and converts them into optical signals. The optical signals are sent to ROU through optical cables. This unit converts optical signals from ROU into RF signals and sends the converted signals to BIU.

For each shelf of the ODU, up to two DOUs (Donor Optic Unit) can be installed in it.

One DOU is supported with four optical ports. Therefore, one ODU can be connected with eight ROUs.

Up to four ODUs can be connected with BIU each SISO and MIMO path

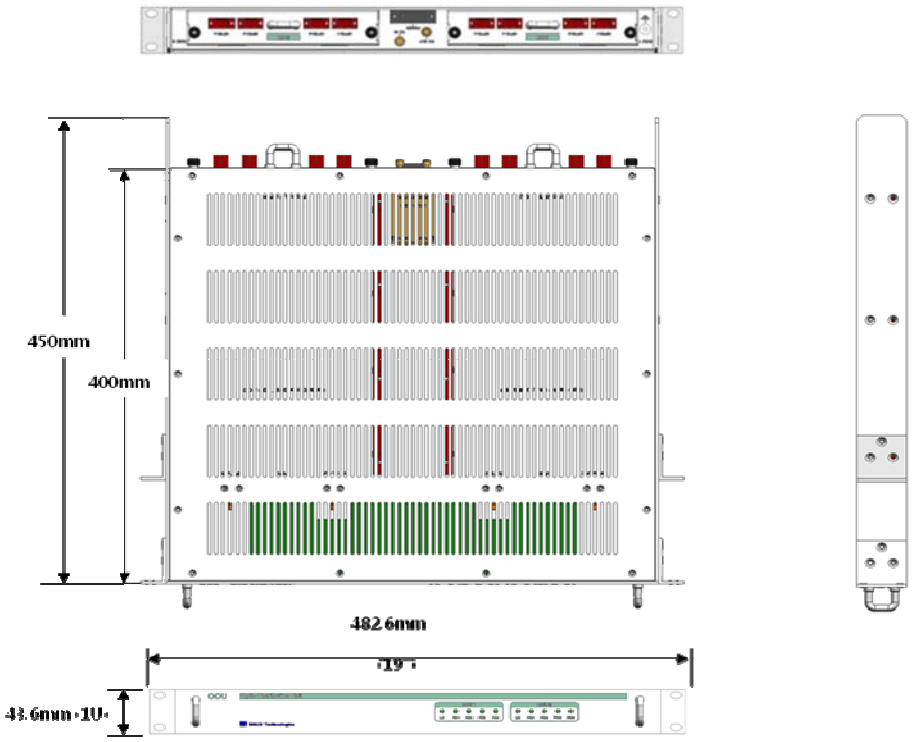


Figure 4.10 – ODU at a glance

4.2.1 ODU specifications

Item	Spec.	Remark
Size	482.6(19") x 43.6(1U) x 450	mm
Weight	6 kg	Full Load
Power consumption	27 W	

4.2.2 ODU block diagram

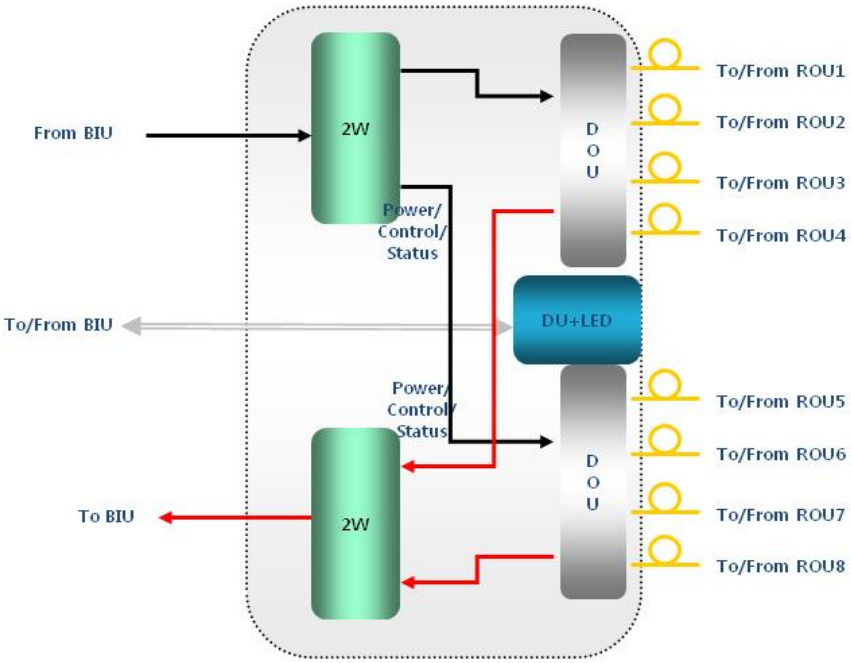


Figure 4.11 – ODU block diagram

4.2.3 ODU assemblies

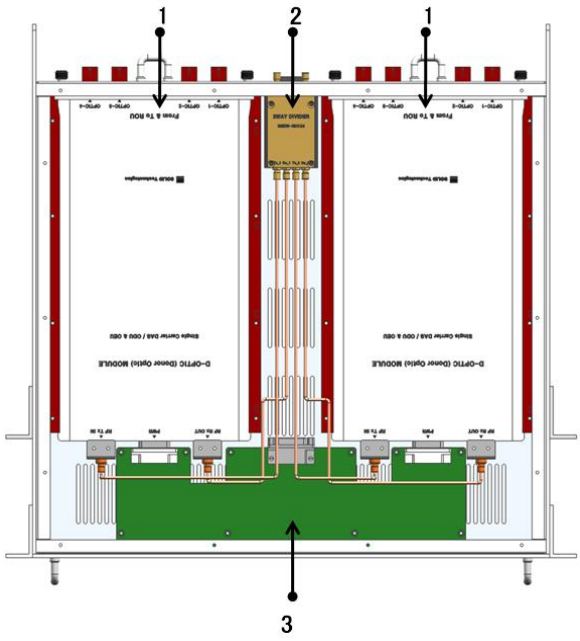


Figure 4.12 – ODU Internal View

No.	Unit	Description	Remark
1	DOU	**Donor Optic Unit** Converts TX RF signals into optical signals; Converts RX optical signals into RF signals; Provides up to four optical ports per DOU	Max 2 ea.
2	2W	**2Way Divider** Divides TX RF signals into two; Combines two RX RF signals into one	
3	DU	**Distribution Unit** Distributes power and signals to DOU	
4	Shelf	19" rack, 1RU	
5	Accessories	25PIN DSUB, Male to female 1pcs RF Coaxial Cable Assembly 2pcs	

4.2.4 Sub Assembly description

1) Donor Optic Unit (DOU)

The DOU performs the RF to optical conversion of TX signals as well as the optical to RF conversion of RX signals.

Using an optical splitter, this unit divides optical signals from a Laser Diode into four and then distributes them to each optical port. With a total of four Photo Diodes in RX, the DOU performs the optical to RF conversion of signals received from each optical port. In addition, the unit is equipped with an ATT to compensate for optical loss in the fiber or fiber connectors.

Since is uses a WDM, it uses only one strand of fiber for each ROU it connects to.

With internal FSK modem, it will allow operation from a remote site.

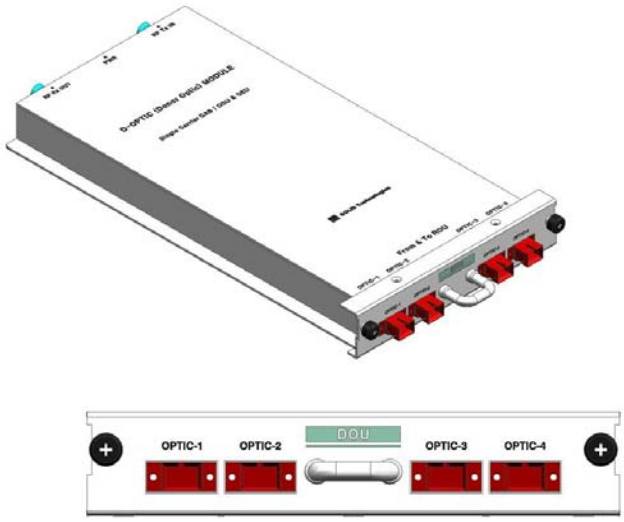


Figure 4.13 – DOU at a glance

2) 2Way Divider (2W)

The 2 way divider is equipped with two 2-way splitters in a single housing and the splitters work for TX/RX signals, respectively.

Designed in broadband type, the divider combines and splits signals from/to the BIU

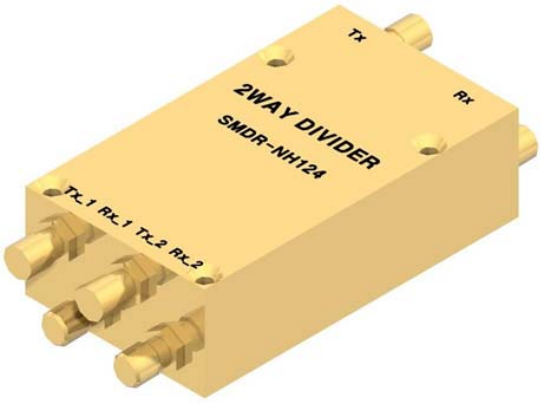


Figure 4.14 – 2Way Divider at a glance

4.2.5 ODU front/rear panel overview

1) Front panel

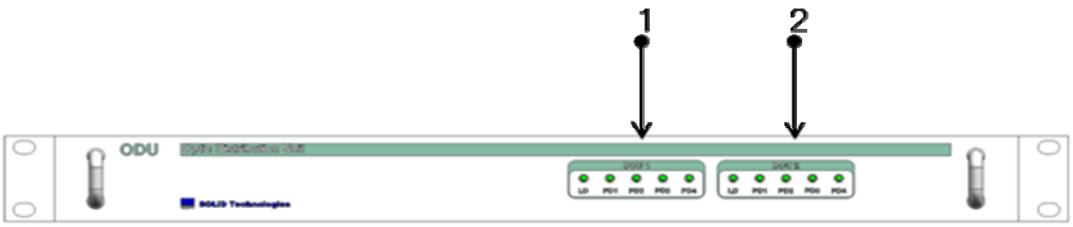


Figure 4.15 – ODU front panel view

Item	Description
1,2	LED indicator to check for faulty DOU module.

2) Rear panel

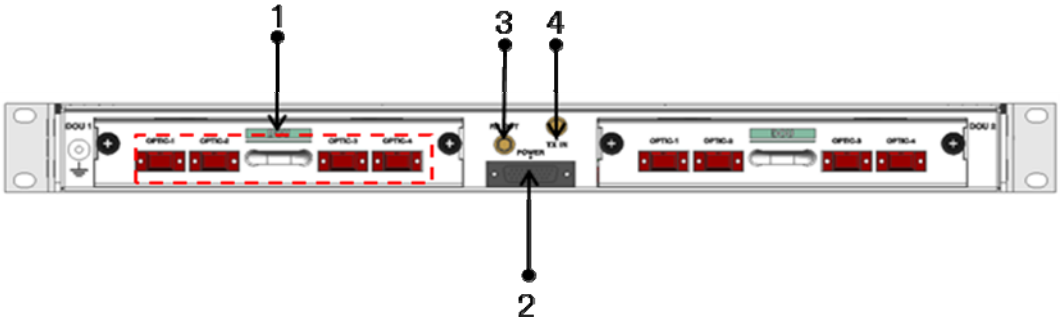
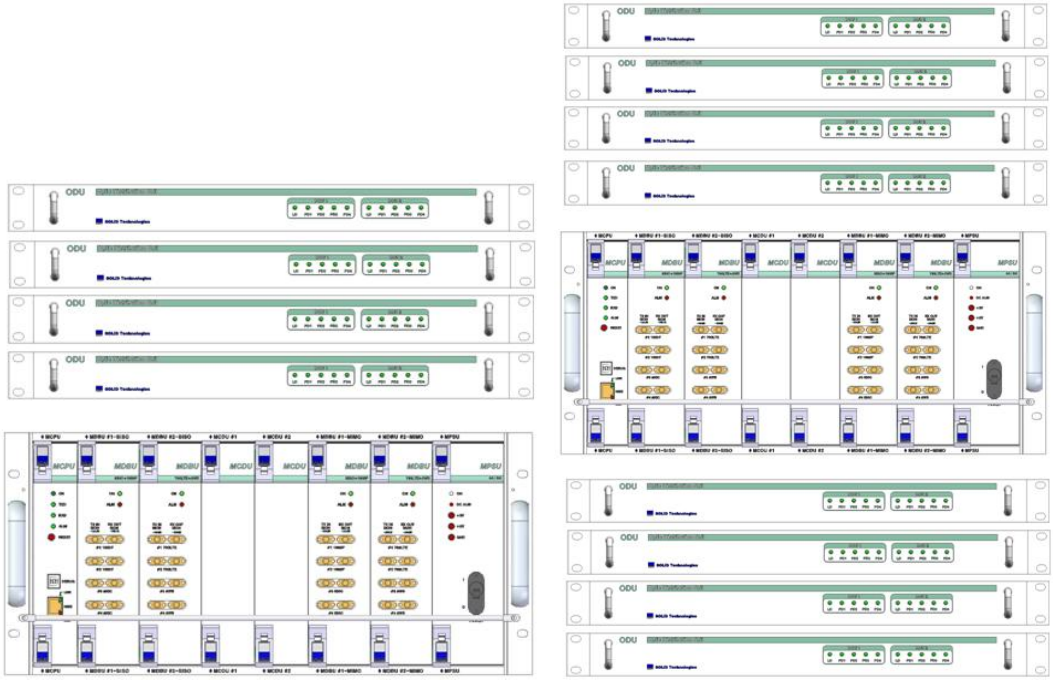


Figure 4.16 – ODU Rear panel view

Item	Description
1. Optic Port	SC/APC optical connector terminal; use one optical cable per ROU.
2. DC I/O Port	Terminal for power and state values
3. RX RF Port	RX RF signal interface terminal
4. TX RF Port	TX RF signal interface terminal

4.2.6 ODU Interface with BIU



SISO Configuration **MIMO Configuration**

Figure 4.17 BIU/ODU interface

For SISO configuration, up to four ODUs can be stacked. above the top of the BIU.

For MIMO configuaration, up to eight ODUs can be stacked above/below the BIU.

In this case, it is recommended to leave a 1RU space between BIU and the ODUs otherwise heat from BIU may degrade the performance of the ODUs,

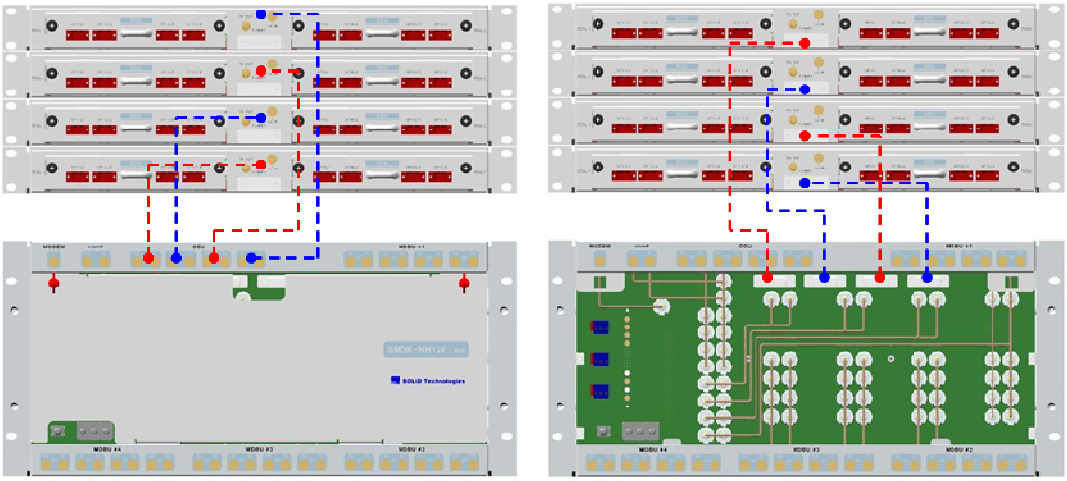


Figure 4.18 – BIU/ODU Interface rear view

As shown in the figure below, connect one coaxial cable for TX and another coaxial cable for RX with corresponding ports at the rear of BIU. For power supply and communication, connect 25Pin D-Sub Connector cable to the corresponding port.

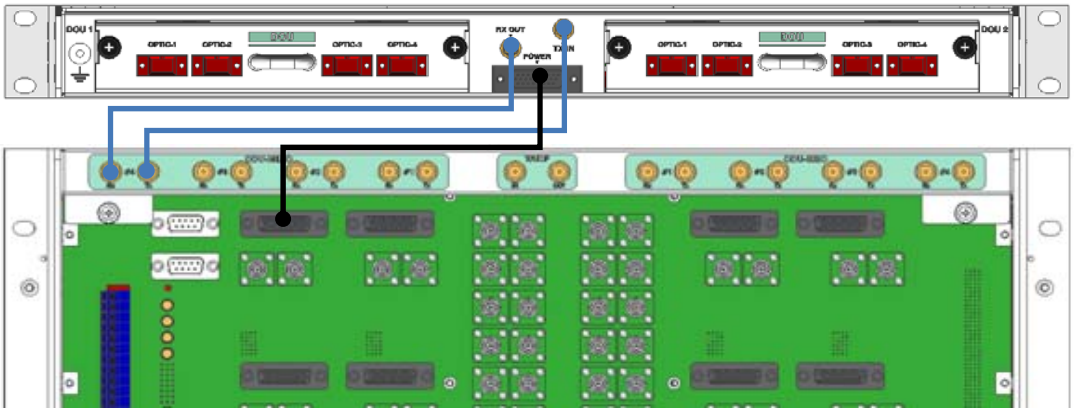


Figure 4.19 – BIU/ODU interface details

4.3 OEU (Optic Expansion Unit)

OEU is mainly used to remotely deliver signals for Campus clusters. At the upper part, this unit combines with ODU and receives TX optical signals to convert them into RF signals. Then, it regenerates the signals to secure SNR and converts them into optical signals. The signals are sent to ROU through optical cables. When it receives RX optical signals from ROU, the unit converts them into RF signals to regenerate the signals and then converts them into optical signals to send them to ODU.

In OEU, one shelf can be equipped with up to two DOUs. The DOU is the same as the module used for ODU. Up to four OEUs can be connected with ODU.

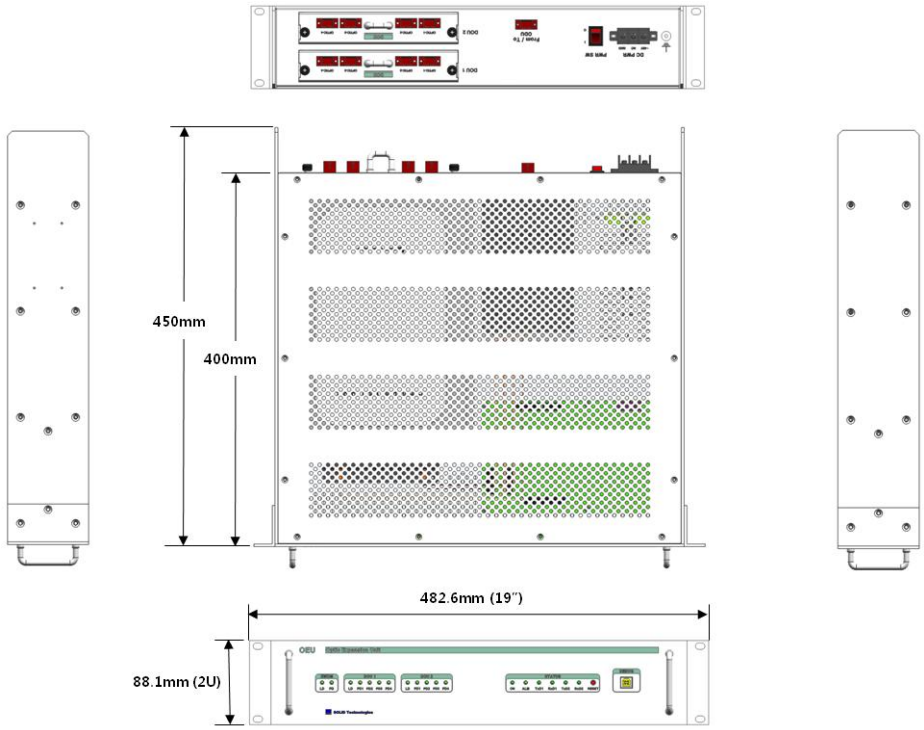


Figure 4.20 – OEU at a glance

4.3.1 Specifications of OEU

Item	Spec.	Remark
Size	482.6(19") x 88.1(2RU) x 450	mm
Weight	9.5 kg	Full Load
Power consumption	40 W	

4.3.2 OEU block diagram

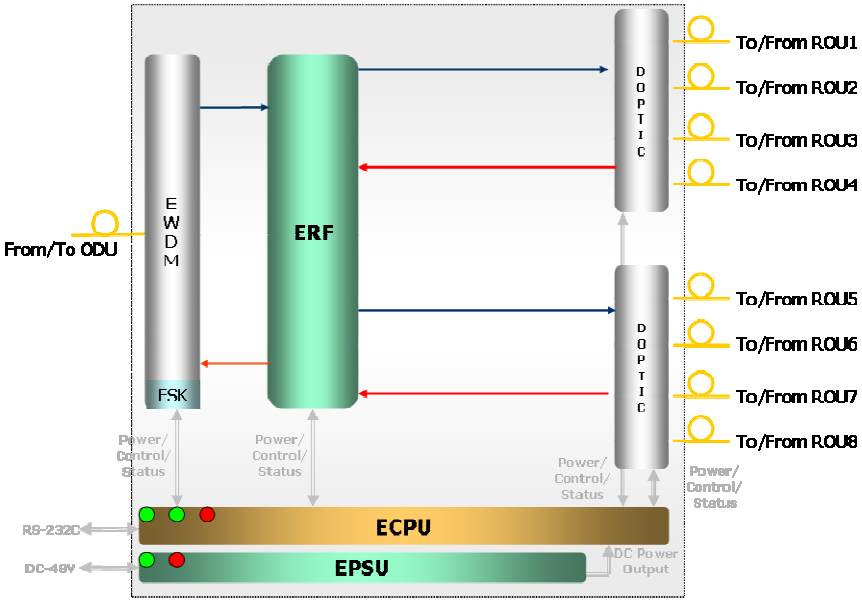


Figure 4.21 – OEU block diagram

4.3.3 OEU assemblies

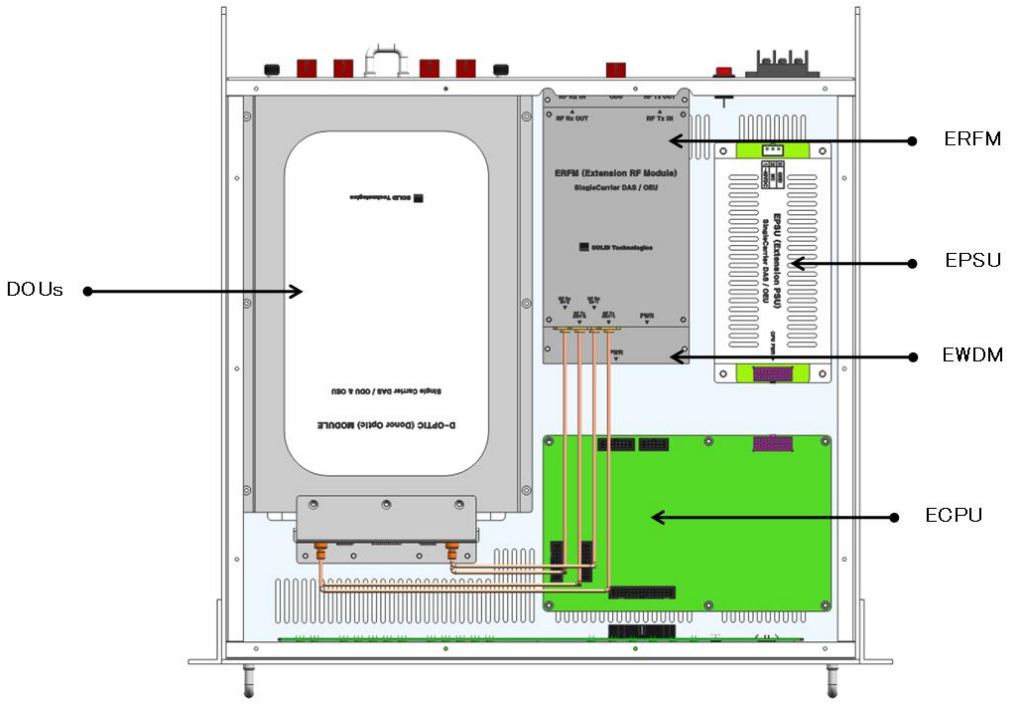


Figure 4.22 – OEU internal view

No.	Unit	Description	Remark
1	DOU	**Donor Optic Unit** Convert TX RF signals into optical signals; Convert RX optical signals into RF signals; Provide up to four optical ports per DOU	Max 2 ea.
2	EWDM	**Expansion Wavelength Division Multiplexer** Convert TX optical signals into RF signals; Convert RX RF signals into optical signals; Compensates for optical cable loss with ODU	
3	ECPU	**Expansion Central Processor Unit** Control and monitoring system status Control and monitoring with RS232 Relays state values of ROU to BIU	
4	EPSU	**Expansion Power Supply Unit** Input power: DC -48V, Output power: 9V, 6V	
5	ERFM	**Expansion Radio Frequency Module** Regenerate TX signals and transmit FSK modem signals; Regenerate RX signals and receive FSK modem signals	
6	Shelf	19" rack, 2RU	

4.3.4 Sub Assembly description

1) Donor Optic Unit (DOU)

The DOU is the same as the module used for the ODU.

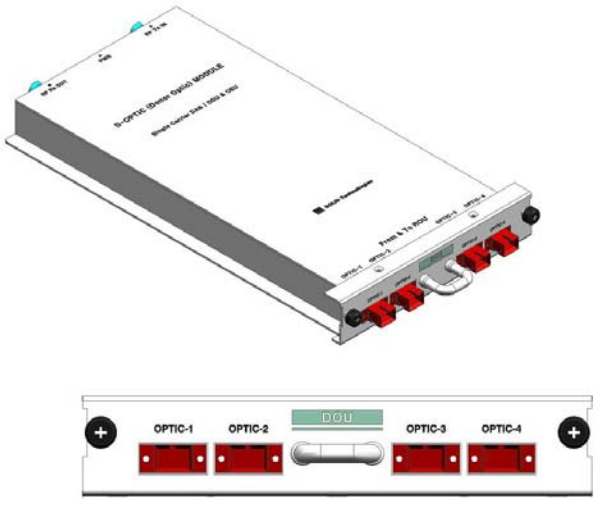


Figure 4.23 – DOU at a glance

2) Expansion Wavelength Division Multiplexer(EWDM)

EWDM module handles the optical to RF conversion of TX signals as well as the RF to optical conversion of RX signals. This multiplexer communicates with the BIU using the built in FSK modem. It also has an ATT to compensate for optical cable loss between ODUs.

Finally , it has internal WDM so it needs only one optical cable to work with an ROU.

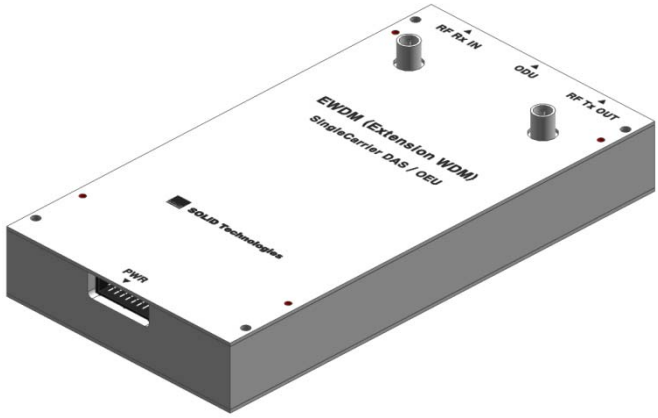


Figure 4.24 – EWDM at a glance

3) Expansion Central Processor Unit(ECPU)

ECPU can query and control the state of modules installed into the OEU. This unit simultaneoulsy communicates with the BIU and the ROUas well as acting as communication bridge between BIU and ROU.

In addition, the unit has a USB port for local communication which enables query and control of devices thorugh a PC. At the front panel, communication LED indicator indicates communication with upper BIU and lower ROU. It also has an ALM LED indicator to show fault.

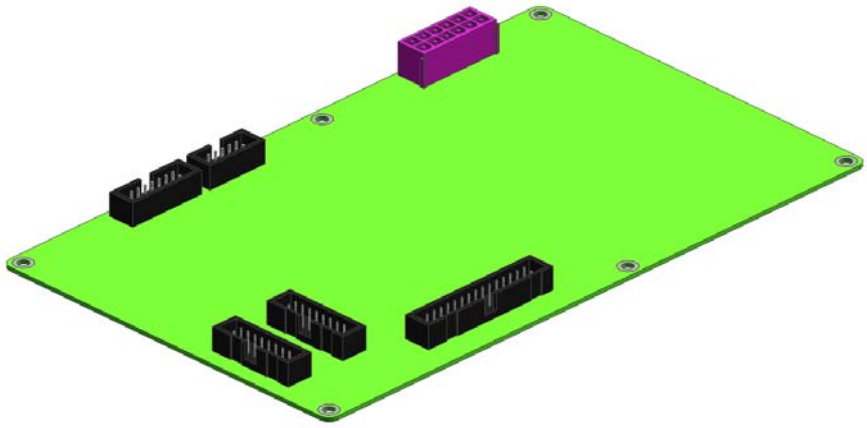


Figure 4.25 – ECPU at a glance

4) Expansion Radio Frequency Module(ERFM)

ERFM repairs Signal to Noise degraded by optical modules.

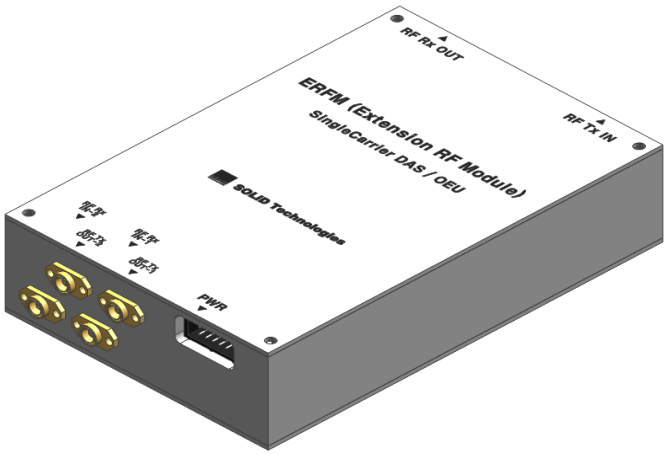


Figure 4.26 – ERFM at a glance

5) Expansion Power Supply Unit(EPSU)

As DC/DC Converter, the EPSU receives -48VDC input and provides +9V and +6V of DC power required for OEU.

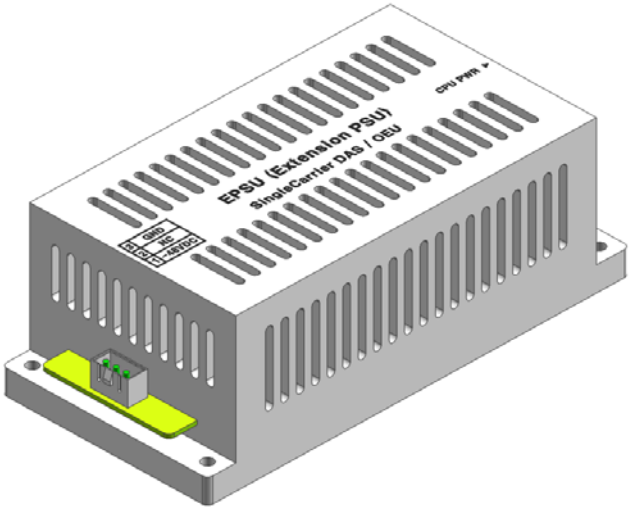


Figure 4.27 – EPSU at a glance

4.3.5 OEU front/rear panel overview

1) **Front panel**

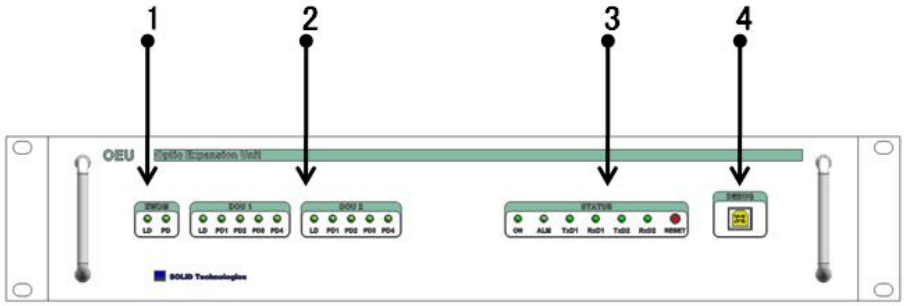


Figure 4.28 – OEU front panel view

Item	Description
1.EWDM LED	LED indicator to check EWDM state to see if it is abnormal
2.DOU LED	LED indicator to check DOU module state to see if it is abnormal
3.System LED and Reset	Communication state with devices, alarm status of the system and reset switch
4. NMS(USB Port)	USB port for communication and diagnosis of devices through PC/laptop. This equipment isfor indoor use only and all the communication wirings are limited to indoor use as well.

2) Rear panel

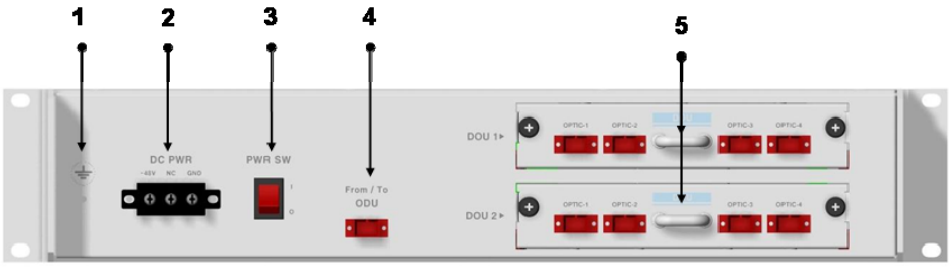


Figure 4.29 – Rear panel view

Item	Description
1. GND Port	Terminal for system ground
2. DC Input Port	Input terminal for DC -48V
3.power switch	Power ON/OFF switch
4. To/From ODU Optic Port	SC/APC optical connector terminal
5. To/From ROU Optic Port	SC/APC optical connector terminal; use one optical cable per ROU.

4.4 ROU (Remote Optic Unit)

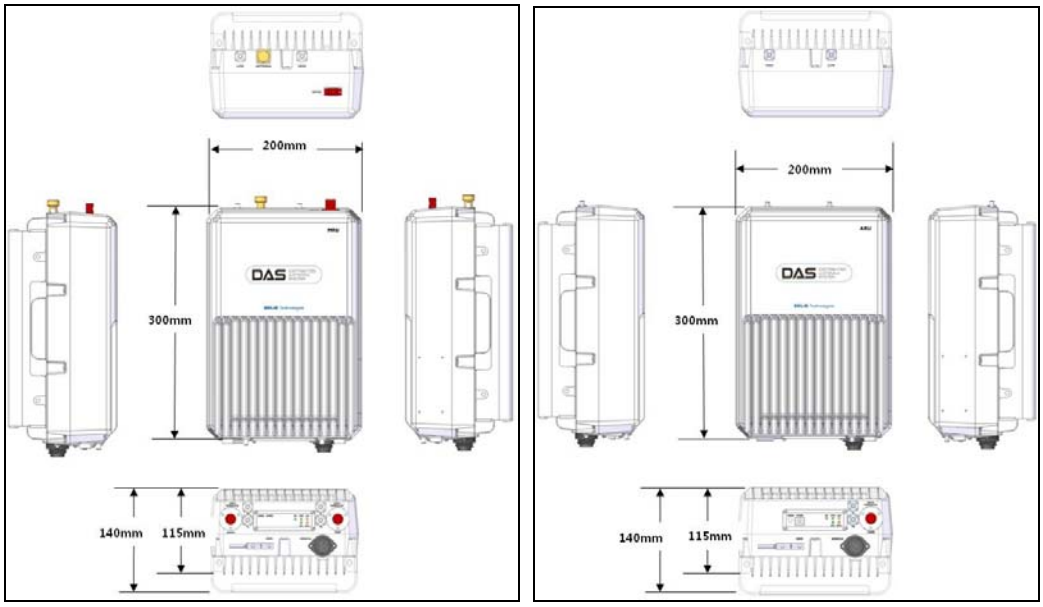
The ROU consists of two units: the MRU(Main Remote Unit) and the ARU(Add on Remote Unit). The ROU is considered the combination of MRU and ARU.

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

The ROU receives RX signals through the antenna port, filters out-of-band signals in a corresponding RU and sends the results to Remote Optic Module to make RF tooptical conversion of them. After converted, the signals are sent to a upper device (theODU or OEU).

The MRU and ARU have a maximum of 2 bands.

The main difference between an MRU an ARU is the presence of an optical module .



(a) MRU **(b) ARU**

Figure 4.30 – ROU at a glance

4.4.1 ROU specifications

Item	Band combination	Size (W x H x D)	Weight	Power consumption	Remark
Band Combination1	MRU 1900P+850C	200 x 300 x 140 mm	6.6kg	50W	Full load
	ARU 700LTE+AWS-1		6.8kg	40W	
Band Combination2	MRU 1900P		6.5kg	45W	
	ARU 900I+800I		6.7kg	44W	
Band Combination2	MRU 700LTE+AWS-1		7.1kg	50W	
Band Combination4	To be developed				
	To be developed				

4.4.2 ROU block diagram

4.4.2.1 Combination of MRU 1900PCS+850C/ARU 700LTE+AWS-1

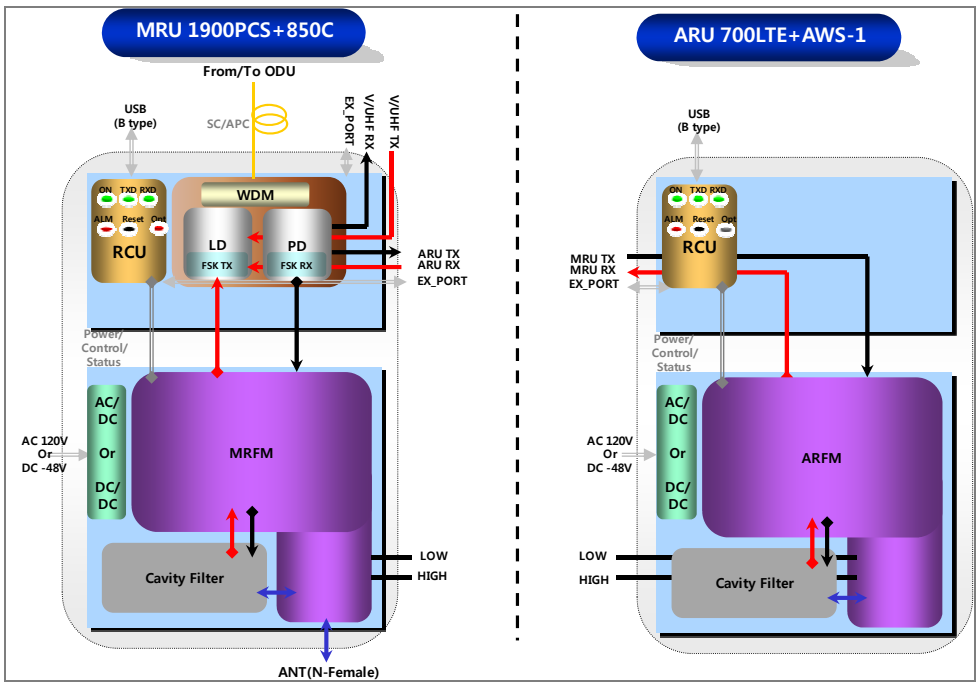


Figure 4.31 – ROU block diagram for MRU 1900PCS+850C and ARU 700LTE+AWS-1

4.4.2.2 Combination of MRU 1900PCS/ARU 900I+800I

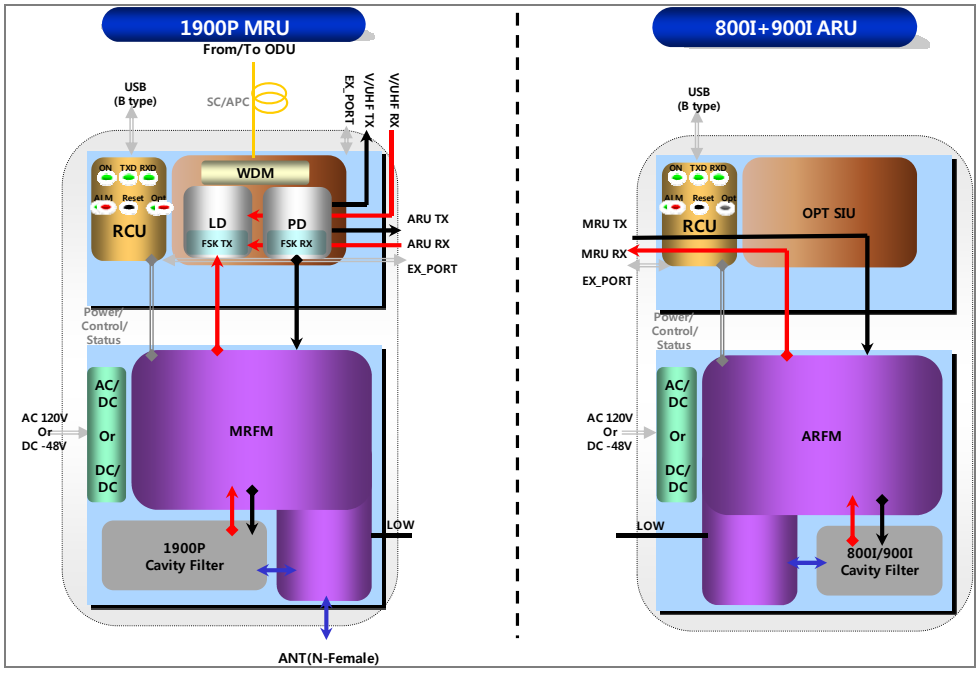


Figure 4.32 – ROU block diagram for MRU 1900PCS and ARU 900I+800I

4.4.2.3 Combination of MRU 700LTE+AWS-1

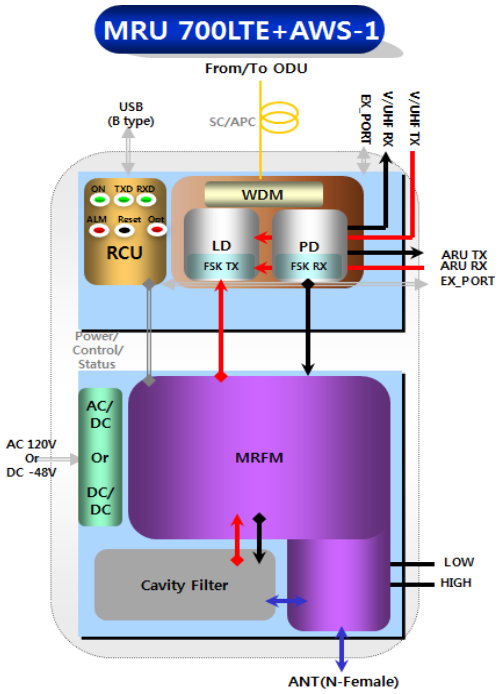
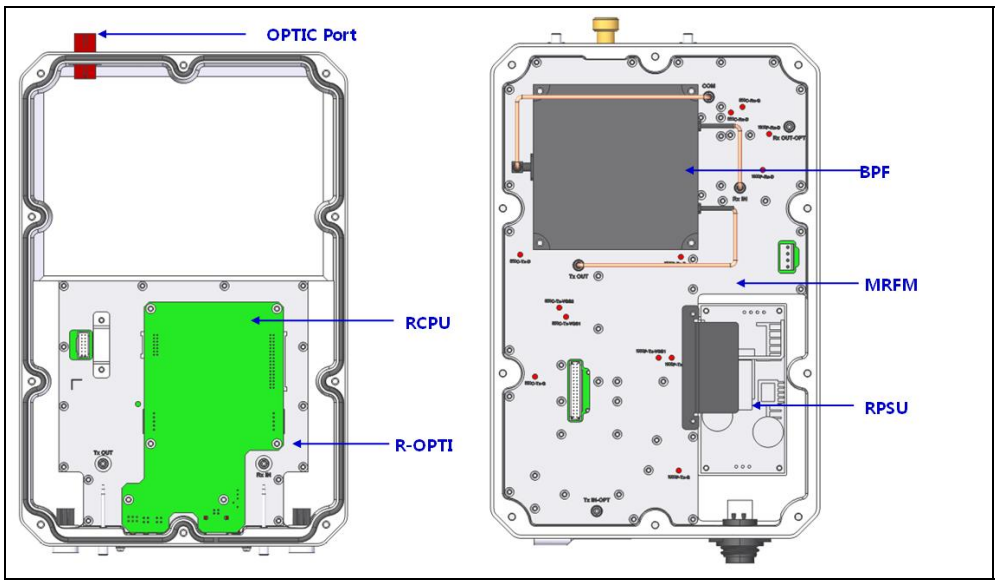
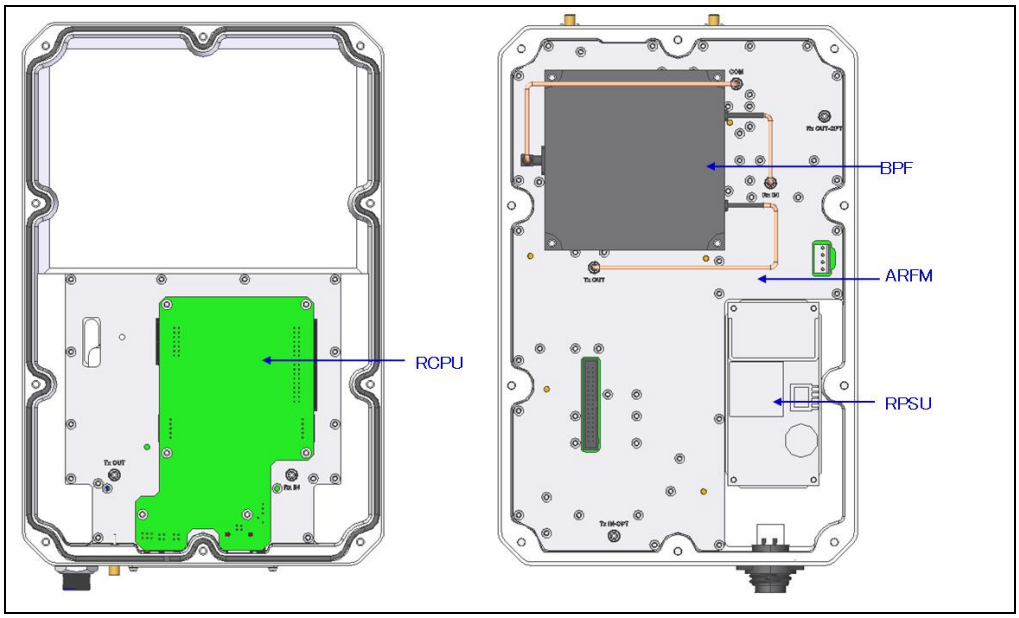


Figure 4.33 – ROU block diagram for MRU 700LTE+AWS-1

4.4.2.4 Combination of MRU 1900PCS+850C/ARU 700LTE+AWS-1



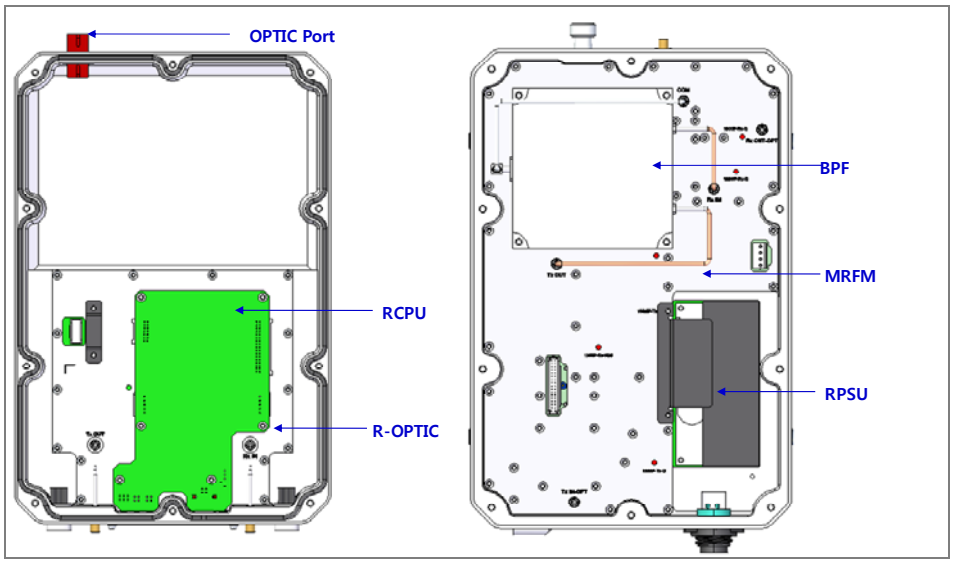
(a) MRU 1900PCS+850C



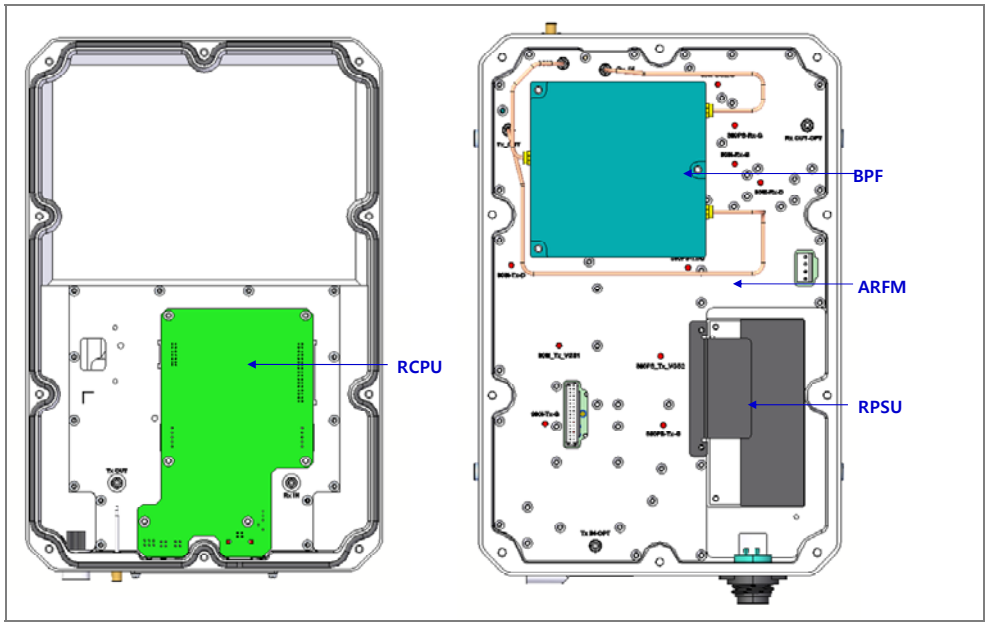
(b) ARU 700LTE+AWS-1

Figure 4.34 – ROU internal view for MRU1900PCS+850C and ARU 700LTE+AWS-1

4.4.2.5 Combination of MRU 1900PCS/ARU 900I+800I



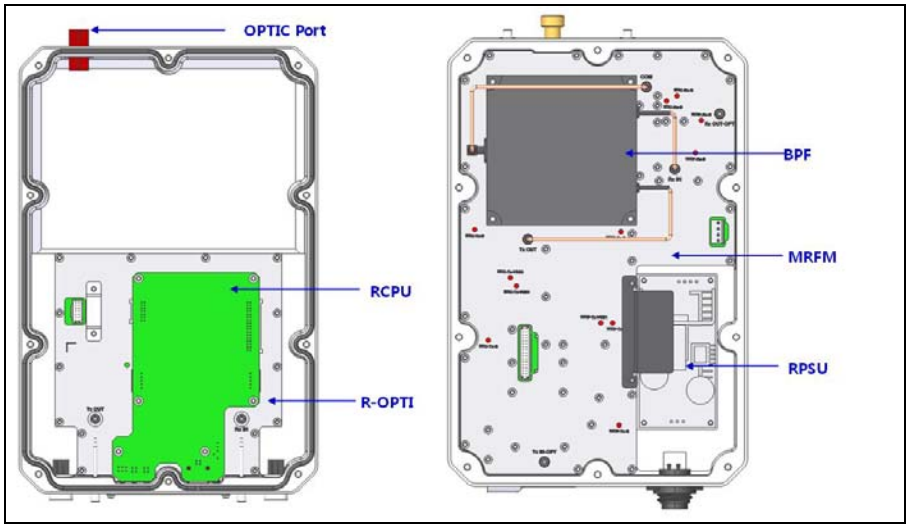
(a) MRU 1900PCS



(b) ARU 900I+800I

Figure 4.35 – ROU internal view for MRU 1900PCS and ARU 900I+800I

4.4.2.6 Combination of MRU 700LTE+AWS-1



(a) MRU 700LTE+AWS-1

Figure 4.36 – ROU internal view for MRU RU 900I+800I

No.	Unit	Description	Remark

1	MRFM/ARFM +BPF	**Main/Add on RF Module** Filter and heavy amplification of TX signals; Filter and amplify RX signals; Remove other signals through BPF	
2	RPSU	**Remote Power Supply Unit** Input power: DC -48V or AC120V, Output power: 25V For 120V input of AC/DC; For -48V input of DC/DC	
3	R-OPT	**Remote Optic** Make RF conversion of TX optical signals; Convert RX RF signals into optical signals; Compensates optical loss interval Communicates with BIU or OEU though the FSK modem	
4	RCPU	**Remote Central Processor Unit** Controls signal of each unit Monitors BIU/ODU/OEU status through FSK modem communication	
5	Enclosure	Enable Wall Mount; Check if the system is normal, through the bottom panel LED	

4.4.3 Sub Assembly description

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

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

In the unit, there is an ATT to adjust gain. This device varies for each frequency band, including the following:

No	Combination	Unit naming	Description	BPF	
				Cavity Filter	Ceramic Filter
1	MRU1900P+850C	MRFM 1900P+850C	Dual.	1900PCS	850C
	ARU700LTE+AWS-1	ARFM 700LTE+AWS-1	Dual.	700LTE	AWS-1
2	MRU1900P	MRFM 1900P	Single	1900PCS	-
	ARU900I+800I	ARFM900I+800I	Dual	900IEN/800IDEN	-
3	MRU700LTE+AWS-1	MRU700LTE+AWS-1	Dual.	700LTE	AWS-1
4	To be developed	-	-	-	-

2) Remote Power Supply Unit (RPSU)

RPSU accepts -48VDC input. This unit is configured 2 ways: the DC/DC type outputs +25V of DC power and AC/DC type takes 120V AC input and outputs +25V of DC power.

Please specify which type when ordering. MS Connector, which uses ports to receive inputs, is designed for either AC and DC input configuration. The input cable is different depending on input voltage conditions.

The RPSU doesn't have a switch to turn the power ON/OFF. Unit is active when power is connected.

Here, you should check for range of input power as follows:

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

(a)AC/DC **(b)DC/DC**

Figure 4.37 – PSU at a glance

3) Remote Optic(R-OPT)

The Remote Optic performs the optical to RF signal conversion as well as the RF to optical conversion. With an FSK modem in it, the unit communicates with the other devices.

It also has an internal ATT to compensate for optical cable loss. The optical wavelength for TX path is 1310nmand 1550nm for the RX path. It is transported by a fiber strand using WDM(Wavelength Division Multiplexing) technique

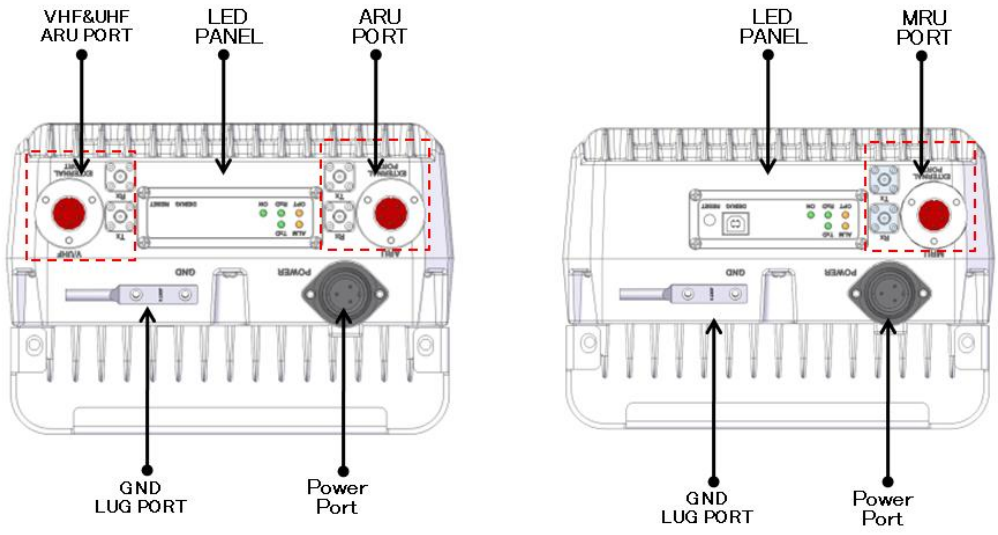
4) Remote Central Processor Unit (RCPU)

The RCPU can monitor and control the RU. This unit receives and analyzes upper communication data from Remote Optic and reports the unit's own value to the upper devices. At the bottom of the module, it has an LED indicator to show system status, letting you check any fault conditions. The same panel also has communication LED Indicators to show communication status with upper devices. Through the USB Port, the unit enables you to check and control device status through a PC or laptop. This equipment is for indoor use only and all the communication wirings are limited to indoor use as well**.**The RCPU of the MRU have two ports to connect exteranl devices (the ARU and the VHF&UHF ARU). Using an external interface cable, the MRU can communicate with the ARU/VHF&UHF ARU.

The MRU collects status information from ARU/VHF&UHF ARU and then communicates with the upper device

4.4.4 Bottom of ROU

1) Functions



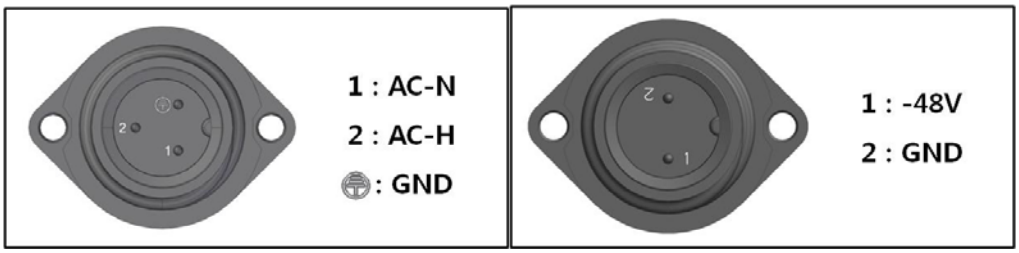
(a) MRU **(b) ARU**

Figure 4.38 – ROU Bottom view

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

Power Port

A different type of power port is used supplying -48V DC or 120V AC, and specific power cable should be applied to each different type of ROU power supply (AC/DC or DC/DC). Below figure shows different power connectors.

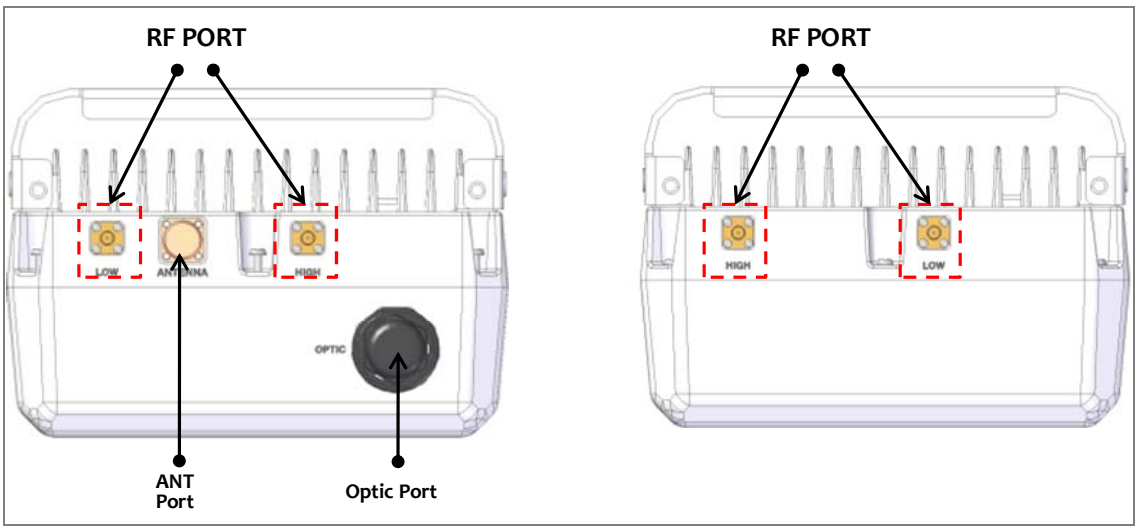


(a)AC/DC (b)DC/DC

Figure 4.39 – ROU Power Port View

4.4.5 Top of ROU

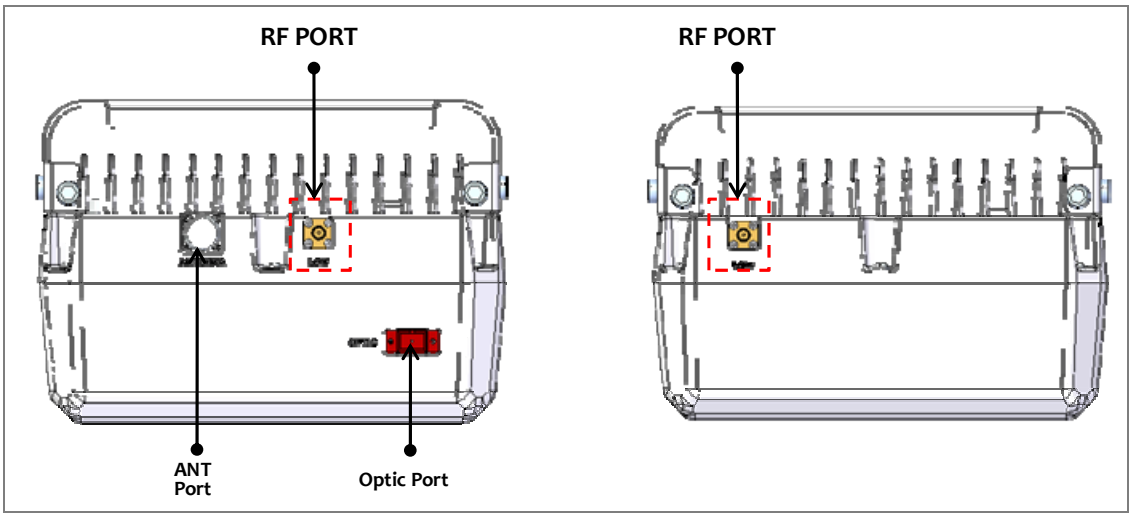
4.4.5.1 Combination of MRU1900PCS+850C/ARU700LTE+AWS-1



(a)MRU (b)ARU

Figure 4.40 – ROU Top View for MRU 1900P+850C and ARU 700LTE+AWS-1

4.4.5.2 Combination of MRU1900PCS+850C/ARU700LTE+AWS-1



(a)MRU (b)ARU

Figure 4.41 – ROU Top View for MRU 1900P+850C and ARU 700LTE+AWS-1