

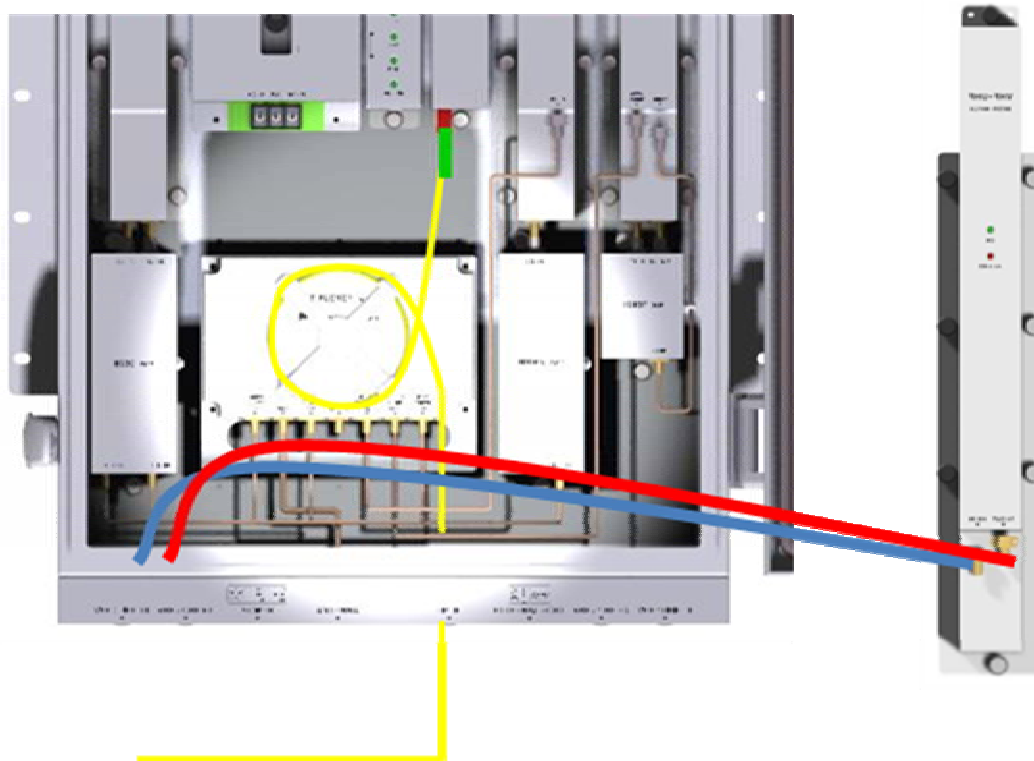
- ② Connect BPF 1900P port with 1900P port of 1900P RDU through 1900P+AWS-1 RF-01 RF CABLE.
- ③ Insert the combined 1900P+AWS-1 BPF Ass'y into any slot of ROU.
- ④ Combination point of 1900P+AWS-1 BPF Ass'y of the multiplexer

Multiplexer Port naming	Interface Point		Remark
	1900P+AWS-1 RDU	1900P BPF	
AWS-1+1900P COM	1900P+AWS	-	

How to install RDU VHF+UHF Ass'y

The following components are required:

No.	Unit	Description	Remark
1	RDU VHF+UHF	RF Module	
2	RDU VHF+UHF RF CABLE	SMA(M) to SMA(M), 460mm	
3	RDU VHF+UHF RF CABLE	SMA(M) to SMA(M), 380mm	



- ① Insert the combined VHF+UHF RDU into any slot of ROU.
- ② Connect RDU VHF+UHF Port with ROU VHF+UHF Port through VHF+UHF RF CABLE



You cannot insert the same module and band into MULTIPLEXER port at the same time.

For example, you are not supposed to insert both of 800PS RDU and 800PS+900I+PA RDU into ROU at the same time. In the same way, you cannot concurrently insert both of 850C RDU and 850C+700PS RDU into ROU.

Information of LED at the front RDU

RDU has the structure of enabling a random RDU to be inserted into three slots. ROU can be equipped with a total of three RDUs. If only one RDU is inserted into a slot and the other slots remain reserved, you need to insert BLANK cards into the other slots.

When RDU is inserted into ROU, LED of the front panel shows the following information:



LED		Description
ON		Power is not supplied
		Power is supplied.
ALM		Normal Operation
		Abnormal Operation



Up to three RDUs can be inserted. If one or two units are used, then you need to terminate the unused slot of RDU with a BLANK card.

5.3.5 Consumption of RDU

The following table shows power consumption of RDU:

Part	Unit	Consumption Power		Remark
Common Part	Enclosure	17W		
	RCPU			
	ROPTIC			
	RPSU			
	Multiplexer			
RDU	RDU 800PS	39W		
	RDU 800PS+900I+Paging	800PS	49W	900I+PA HPA OFF
		900I+PA	72W	800PS HPA OFF
		FULL	79W	Both HPA ON
	RDU 850C	39W		
	RDU 850C+700PS	850C	49W	700PS HPA OFF
		700PS	58W	850C HPA OFF
		FULL	93W	Both HPA ON
	RDU 1900P+AWS-1	1900P	46W	AWS-1 HPA OFF
		AWS-1	46W	1900P HPA OFF
		FULL	68W	Both HPA ON
	RDU VHF+UHF	VHF	47W	VHF HPA OFF
		UHF	47W	UHF HPA OFF
		FULL	74W	Both HPA ON

For power consumption of ROU, the common part consumes 17W. Depending on the quantity of each RDU, you can add overall power consumption of ROU. Only, in case of Dual-Band signals, power consumption is calculated respectively when HPA of the other party is turned OFF and two HPA devices are turned ON. Note that when you calculate Power Budget.

5.4 OEU Installation

OEU is used to expand ROU in Campus Site.

OEU is located at a Remote Closet. As it can be equipped with up to two DOUs , you can expand a total of eight ROUs.

5.4.1 OEU Shelf installation

OEU is a shelf in around 2U size. Its width is 19" and so this unit should be inserted into a 19" Standard Rack. OEU is in a Remote Closet, providing optical ports of ROU.

The following table shows power consumption of OEU:

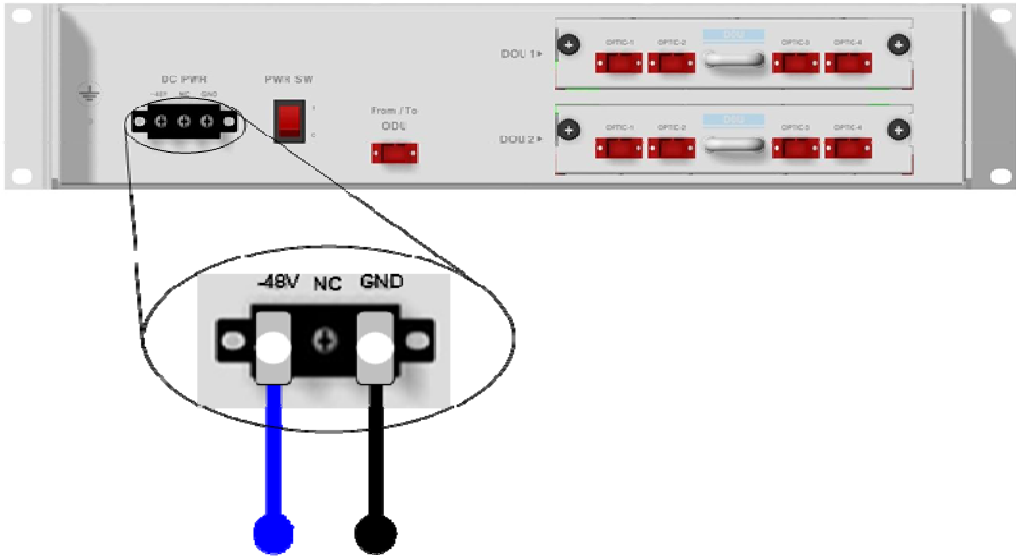
No.	Unit	Description	Remark
Common Part	Shelf	Including EWDM,ERF,EPSU,ECPU, 19",2U	1EA
	Power Cable	-48Vdc Input with two lug terminal	1EA
Optional Part	DOU	Optical Module with 4 Optic Port	Up to 2EA to be inserted

5.4.2 OEU Power Cabling

The input power of OEU is DC -48V. You need to connect DC cable with the Terminal Block seen at the rear of OEU.

Terminal	Color of cable	Description	Remark
-48V	Blue color	Input range: -42 ~ -56Vdc	
NC	Not Connected		
GND	Black color		

Before connecting the power terminal, you need to connect "+" terminal of Multi Voltage Meter probe with the GND terminal and then connect "-" terminal with -48V to see if "-48Vdc" voltage is measured. After the check, connect the power terminal through the terminal seen below.



Note that OEU does not operate if the "+" terminal and the "-" terminal of the -48V power are not inserted into the accurate polarity.

5.4.3 OEU Optic Cabling

OEU is connected with upper ODU. With DOU inserted in it, the unit is connected with ROU.

As OEU has a shelf with EWDM in it, the unit makes electronic-optical conversion of TX signals from ODU and makes optical-electronic conversion of RX signals. In addition, OEU can be equipped with up to two DOUs. One DOU supports four optical ports and one optical port can be connected with ROU. With WDM in DOU, the unit can concurrently send/receive two pieces of wavelength (TX:1310nm, RX:1550nm) through one optical core. DOU has SC/APC of optical adaptor type.



Figure 5.7 – Optical cable of SC/APC Type

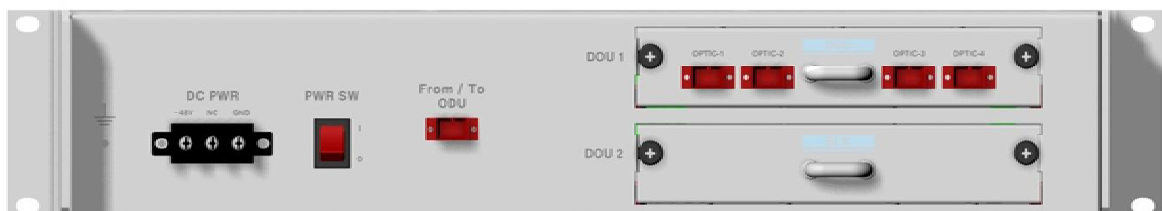
For optical adaptor, SC/APC type should be used. To prevent the optical access part from being marred with dirt, it should be covered with a cap during move. When devices are connected through optical cables, you need to clear them using alcohol to remove dirt.

5.4.4 Insert DOU to OEU

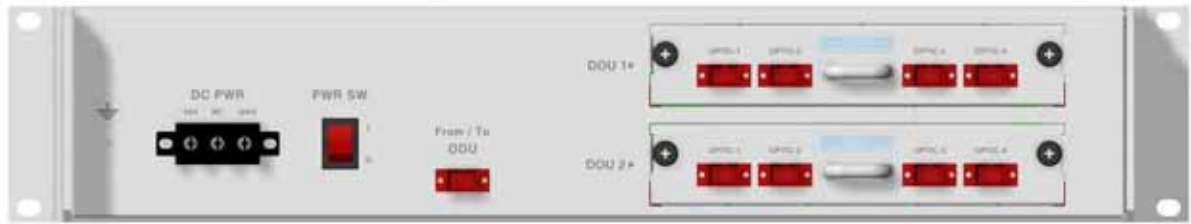
Into OEU Shelf, up to two DOUs can be inserted. DOU module is in Plug in Play type.

When you insert DOU in OEU, insert the unit into the top DOU1 slot first. You can be careful as the number is silk printed at the left.

The following figure shows installation diagram of OEU with one DOU inserted in it.



The following figure shows installation diagram of OEU with two DOUs inserted in it.



When you insert DOU into OEU, insert the unit into the top DOU1 first. For unused slots, you need to install BLANK UNIT into them.

5.4.5 Consumption Power of OEU

OEU has -48V DC Power supply in it. ODU can be equipped with up to two DOUs. Depending on the quantity of DOU, power consumption is varied.

The following table shows power consumption of OEU:

Part	Unit	Consumption Power	Remark
Common Part	Shelf	12W	
	EWDM		
	ERF		
	EPSU		
OEU_4	DOU 1 EA	23W	
OEU_8	DOU 2 EA	33W	

5.5 System Operation and Alarm Status

This section describes operation of SMDR-NH124. It deals with procedures and operations for normal system operation after installation. It also describes operations per unit and interworking methods.

Section 6

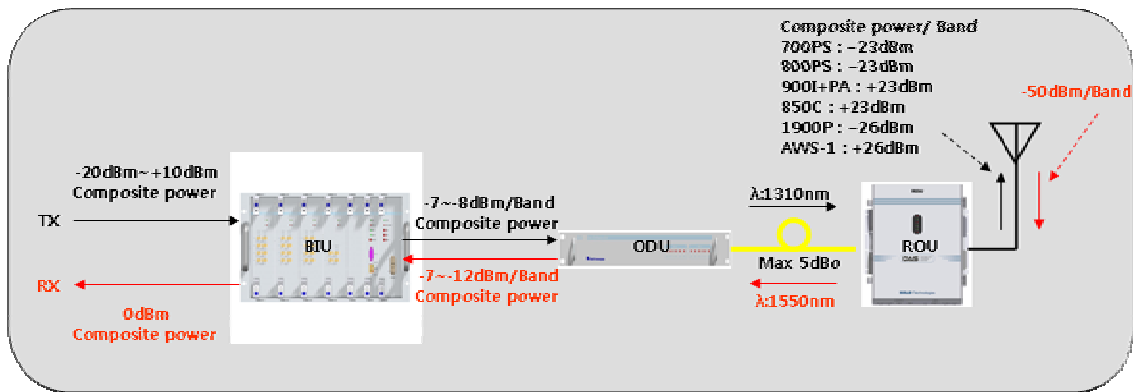
Operation

-
- 6.1 BIU Operation**
 - 6.2 ROU Operation**

This chapter describes operation of SMDR-NH124. It deals with procedures and operations for normal system operation after installation. It also describes operations per unit and interworking methods.

6.1 BIU Operation

6.1.1 BIU



6.1.2 TX Operation at BIU

TX level to be sent to BIU should be in the range of -20dBm ~ + 10dBm. If the level exceeds the range, you need to connect an attenuator with the front end of BIU input and adjust the level in the corresponding range. Out of the range, maximal power cannot be outputted and so you need to increase output power of BDA or adjust attenuation amount of BTS's coupler or ATT to adjust the level.












For signals of all bands, you need to check, using spectrum, if they are in an appropriate level before making connection with input port of BIU and then check if there are spurious signals.

You need MDBU of a band you want to use. Insert the unit into BIU and check if it works normally. For MDBU, up to two TX inputs are provided. Input level per port is -20dBm~+10dBm. The following describe settings for 800MHz Public safety MDBU.

Checking the status of the system's LED Indicator

After turning on the switch of the power supply in BIU, check information on each module's LED of the system. The table below shows normal/abnormal cases depending on the status of each module's LED.

LED information

Unit	LED		Indicates
MDBU	ON		Green: MDBU is normally power-supplied.
	ALM		Green: MDBU is normal.
			Red: MDBU is abnormal; check the alarm through RS-232C.
MCPU	ON		Green: MCPU is normally power-supplied.
	TXD		Green flicker: TX signals are transmitted to communicate with ROU.
	RXD		Green flicker: RX signals are received from ROU.
	ALM		Green: BIU system is normal.
		Red: BIU system is abnormal; check the alarm through RS-232C.	
MPSU	ON		Green: BIU is connected with power and MPSU works normally.
	ALM		Green: DC output is normal.
			Red: DC output is abnormal.

MDBU Setting

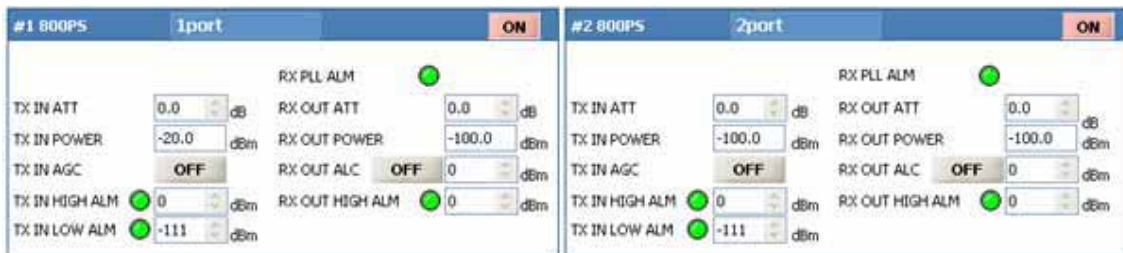
Insert MDBU into BIU. Check if the "ON" LED Indicator at the front panel of MDBU is lit green. Make connection with DEBUG port of MCPU through RS-232 Cable (Direct Cable). Check if the ID of MDBU module is searched for in those 1~4 slots of MDBU through GUI. When you select the tab of a corresponding slot (MDBU 1~4) from the main window, you can inquire and set the status of a corresponding MDBU module.



Check if MDBU is inserted into a corresponding slot of BIU. The ID screen shows the following:

- A. MDBU ID: 800Public Safety, 800PS+900I+Paging, 850C, 700PS+850C, AWS-1,1900P
- B. Not Insert: This status value appears when MDBU has not been set.
- C. Link Fail: This status value appears when MDBU has been set but it fails to communicate with modules.

Use the ON/OFF (Activation/de-activation) function for a port you want to use and turn it ON.



Depnding on whether to use a port, output varies. Thus, make sure to turn OFF unused ports.

In the case of VHF+UHF, it contain to MCDU.

The table below shows output power depnding on whether to use a port:

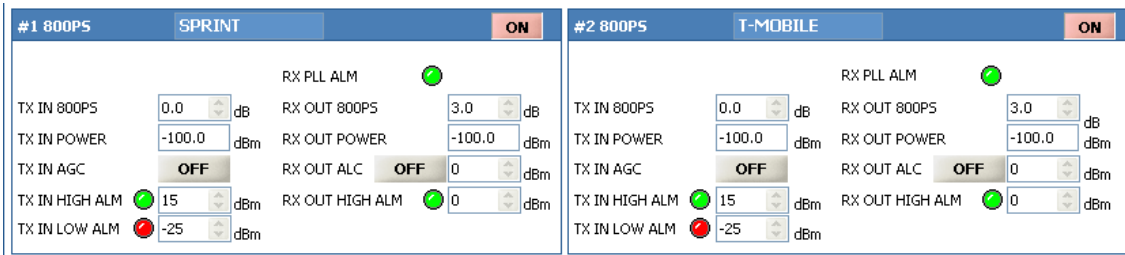
MDBU Band	Output level (Composite power)	No. of Max port (N)
700PS	23dBm-10*LOG(N)	2
800PS	23dBm-10*LOG(N)	2
850Cellular	23dBm-10*LOG(N)	2
900I+Paging	23dBm-10*LOG(N)	2
1900PCS	26dBm-10*LOG(N)	4

AWS-1	26dBm-10*LOG(N)	4
VHF	24dBm-10*LOG(N)	1
UHF	24dBm-10*LOG(N)	1

Check if the level of TX IN POWER is the same as the value measured through spectrum (Within $\pm 3\text{dB}$). Use TX IN AGC function and automatically set internal ATT depending on input level. ATT is automatically set based on -20dBm of input . The table below shows TX IN ATT depending on TX IN POWER. For manual setting, you can set ATT depending on input according to the table.

TX IN POWER	TX IN ATT	TX IN POWER	TX IN ATT	TX IN POWER	TX IN ATT
-20dBm	0dB	-9dBm	11dB	+1dBm	21dB
-19dBm	1dB	-8dBm	12dB	+2dBm	22dB
-18dBm	2dB	-7dBm	13dB	+3dBm	23dB
-17dBm	3dB	-6dBm	14dB	+4dBm	24dB
-16dBm	4dB	-5dBm	15dB	+5dBm	25dB
-15dBm	5dB	-4dBm	16dB	+6dBm	26dB
-14dBm	6dB	-3dBm	17dB	+7dBm	27dB
-13dBm	7dB	-2dBm	18dB	+8dBm	28dB
-12dBm	8dB	-1dBm	19dB	+9dBm	29dB
-11dBm	9dB	0dBm	20dB	+10dBm	30dB
-10dBm	10dB				

Edit Naming of a port and set it as a desired character string (up to 12 characters). The figure below shows a screen when you set "SPRINT" for port 1 and "T-MOBILE" for port 2.



Use various upper/lower limits. The following table shows recommended limit settings:

Item	Recommended Limit	Remark
TX IN HIGH ALM	15dBm	Alarm
TX IN LOW ALM	-25dBm	Alarm
RX OUT ALC	0dBm	Auto Level control
RX OUT HIGH ALM	5dBm	Alarm

As such, when you finish setting normal input levels and alarm limits, check if the value of MODULE FAILUER LED Indicator is lit green (Normal case).

6.1.3 RX Operation at BIU

For RX operation at BIU, you need to set RX gain to prevent BTS or BDA from being affected. There is an ATT setting window to let you adjust gain per band and port.

Total RX gain is 50dB. To adjust a desired gain, you need to do the following. For RX gain of a desired gain, you can set it as 50dB-RX ATT. Use the terminal and check if TX Adjust value and Ec/Io value is appropriate.

To block high signals from entering BTS or BDA, keep ALC mode activated (ON).

6.1.4 Setting whether to use ROU/OEU at BIU

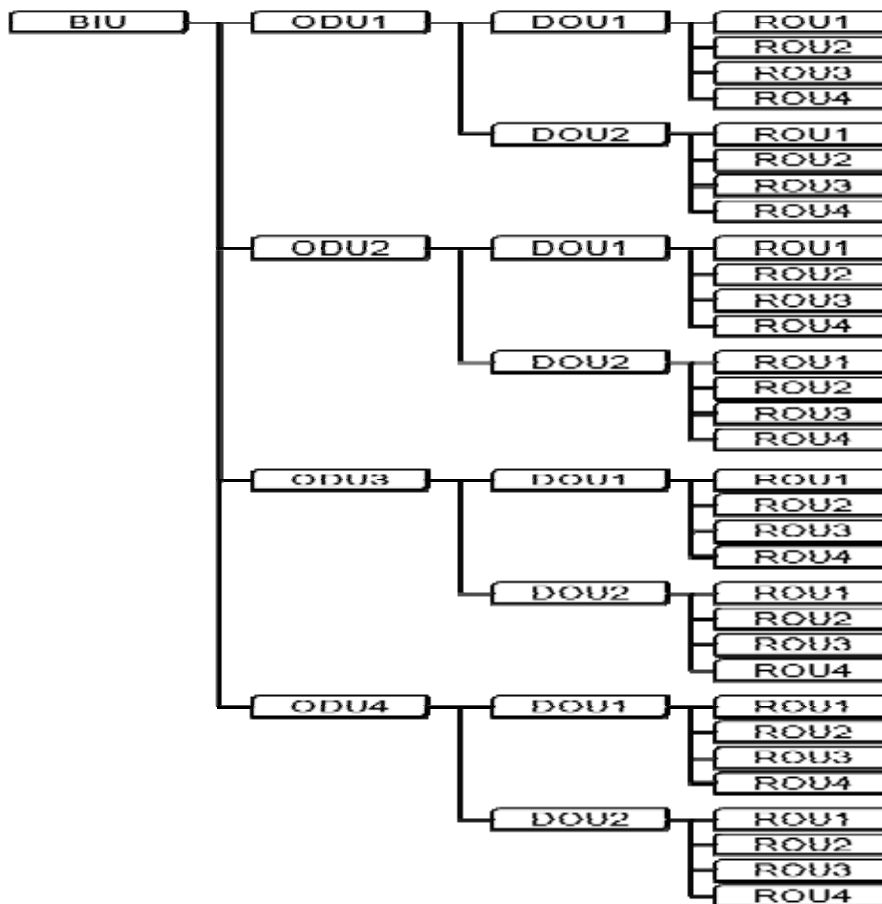
BIU controls overall system, working as common part in any equipment. Connect BIU with such units as ODU, OEU and ROU to be interfaced with the BIU and manually set whether to use the units at the INSTALL window of BIU.

To inquire and set information on units in lower level (OEU and ROU) at BIU, you need to check on a corresponding item at INSTALL Menu for a unit to be actually used. This

setting makes BIU actually try to communicate with lower units while collecting the status value of units.

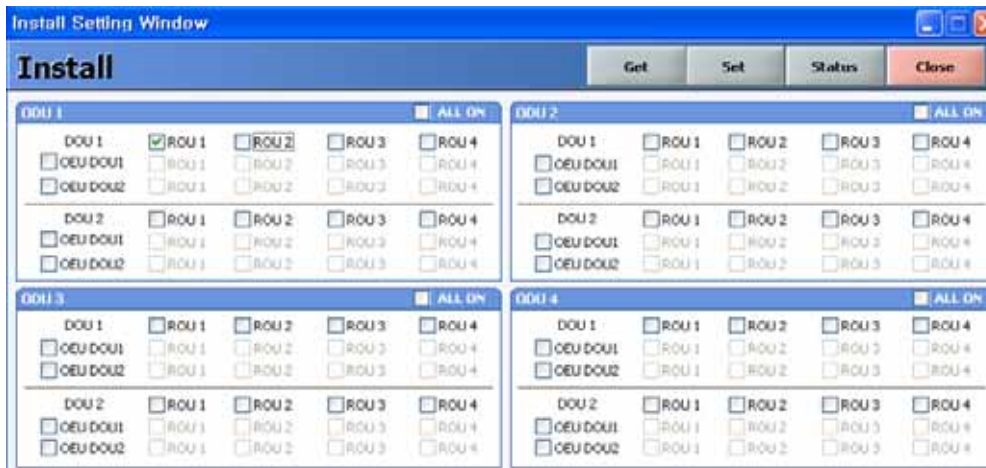
The menu below shows INSTALL menu, where you can see topology for overall units at a glance.

Overall topology for SMDR-NH124 Configuration of BIU-ODU-ROU

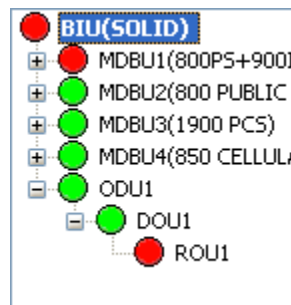


Configuration on whether to use BIU varies depending on the topology above and so you need to check on a unit to be installed.

Ex.) How to set INSTALL menu when ROU is connected with DOU1 of ODU1, which is connected with BIU:



1. Select INSTALL from GUI menu.
2. Check on ODU1 menu>DOU1>ROU1.
3. Close the INSTALL menu.
4. Check if ROU is created, which was checked on at the left TREE panel.



6.1.5 ODU Operation at BIU

BIU can be equipped with up to four ODUs. One ODU can hold two DOUs in it. For information on insertion/deletion of DOU in ODU, you can see at the main window of BIU.

ODU Insert Information		
	DOU#1	DOU#2
ODU#1	<input checked="" type="radio"/>	<input type="radio"/>
ODU#2	<input type="radio"/>	<input type="radio"/>
ODU#3	<input type="radio"/>	<input type="radio"/>
ODU#4	<input type="radio"/>	<input type="radio"/>

When you select ODU screen from the left TREE panel, you can see DOU1 or DOU2 menu activated depending on whether DOU has been inserted. Then, the optical port set at the INSTALL menu is also activated to let you check PD value of the optical port. Any optical port not set at the INSTALL menu is seen de-activated in grey.

ODU1
Set Mode
Close

DOU 1

Reset

Optic Over Pow

LD POWER 4.0 dBm

OPTIC PORT 1

PD POWER 1.7 dBm

RX OPTIC ATT 2.0 dB

RX OPTIC COMP **OFF**

RESULT

OPTIC PORT 2

PD POWER -10.0 dBm

RX OPTIC ATT 2.0 dB

RX OPTIC COMP **OFF**

RESULT

OPTIC PORT 3

PD POWER -10.0 dBm

RX OPTIC ATT 12.0 dB

RX OPTIC COMP **OFF**

RESULT

OPTIC PORT 4

PD POWER -10.0 dBm

RX OPTIC ATT 12.0 dB

RX OPTIC COMP **OFF**

RESULT

DOU 2

Reset

Optic Over Pow

LD POWER 0.0 dBm

OPTIC PORT 1

PD POWER 0.0 dBm

RX OPTIC ATT 0.0 dB

RX OPTIC COMP **OFF**

RESULT

OPTIC PORT 2

PD POWER 0.0 dBm

RX OPTIC ATT 0.0 dB

RX OPTIC COMP **OFF**

RESULT

OPTIC PORT 3

PD POWER 0.0 dBm

RX OPTIC ATT 0.0 dB

RX OPTIC COMP **OFF**

RESULT

OPTIC PORT 4

PD POWER 0.0 dBm

RX OPTIC ATT 0.0 dB

RX OPTIC COMP **OFF**

RESULT

The level of Laser diode received from ROU/OEU is $+7\text{dBm} \pm 0.5\text{dB}$. The level of Photo diode will be displayed with losses related to the length of optical cables and insertion loss of optical connectors.

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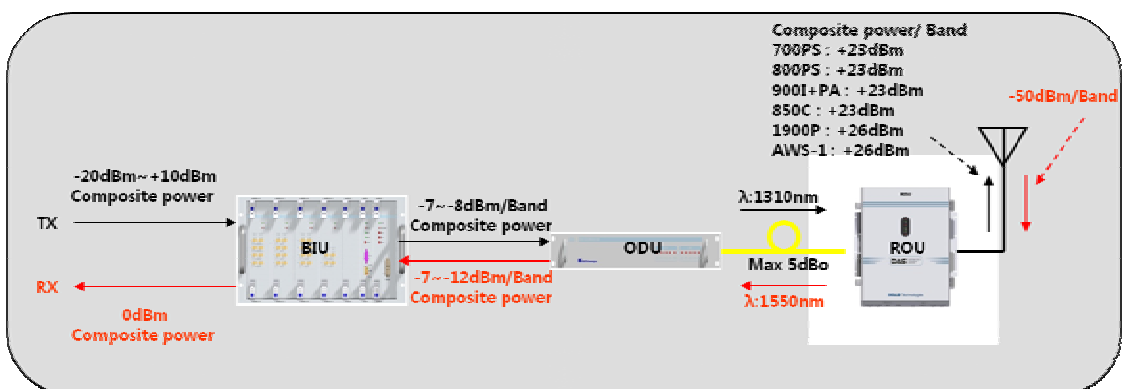
In general, the level of optical PD POWER should be +6dBm~ +2dBm±1.5dB.

What is more, ODU has the function of automatically compensating for optical cables. The following procedure is related to how to make optical compensation with ROU connected with port, at a corresponding DOU window of ODU:

1. Check if ODU is smoothly communicating with a corresponding ROU.
2. Select ODU or DOU from the left Tree panel.
3. Set "RX OPTIC COMP" of the optical port of a corresponding DOU as "ON."
4. During optical compensation , the Result window shows "Processing" and then a result value. There are three types of results as follows:
 - A. Success: The optical compensation is normally made.
 - B. Over Optic Loss: Generated optical loss is 5dBo or more.
 - C. Communication Fail: Communication with ROU is in poor conditin.
5. ATT of optical compensation can work based on the numerical expression of $12-2*(LD\ POWER-PD\ POWER)$.
6. Optical compensation can be made not only in ODU but also in ROU.

6.2 ROU Operation

The figure below shows the level of the system link of SMDR-NH124 (BIU-ODU-ROU). This section describes ROU-related information. ROU receives various signals through optical modules. The signals are filtered only for corresponding signal band from a corresponding RDU module and amplified with a High Power Amplifier. Then, the multiplexer combines the signals with others and sends them with an antenna.



6.2.1 ROU Operation

ROU is in one-body enclosure type. ROU is located at a remote closet in a building.

And it can be installed on a wall or into a rack.












Basically, one antenna is provided. To install a variety of antennas, you need such devices as a divider and a coupler. ROU can work with a DC Feeder and an Optic Cable Feeder. For power supply of ROU, a power supply in AC-DC and DC-DC type is provided to let you select a power supply suitable for an application.

For upper level, ROU can be connected with ODU and OEU. It has AGC function for 5dBo of optical cable loss.

The following show operational procedures after installation of ROU.

Checking the status of ROU's LED Indicator

After turning on the switch of the power supply in ROU, check information on each module's LED of the system. The table below shows normal/abnormal cases depending on the status of each module's LED.

Unit	LED	Indicates
RCPU	ON	 Green: ROU is normally power-supplied.
	LD	 Green: Laser Diode is normal.
		 Red: Laser Diode is abnormal.
	PD	 Green: Photo Diode is normal.
		 Red: Photo Diode is abnormal; check optical cables.
	TXD	 Green flicker: TX signals are transmitted to communicate with BIU/OEU.
	RXD	 Green flicker: RX signals are received from BIU/OEU.
ALM	 Green: ROU system is normal.	
	 Red: ROU system is abnormal; check the alarm through RS-232C.	
RDU	ON	 The power is not supplied.
		 The power is supplied.

	ALM	●	Normal Operation
		●	Abnormal Operation
RPSU	ON	●	The power is not supplied or the polarity of -48V is reversed.
		●	The power is supplied.

ID Setting

Use an RS-232 Cable(Direct Cable) for connection with DEBUG port of ROU RCPU. Execute GUI (Graphic User Interface). When you connect ROU directly with a Serial port, the screen will show the TREE of a direct line of units connected with ROU. Basic ROU ID is set as ODU1-DOU1-ROU1. Set it with the ID of a designed ROU. Before setting an ROU ID, you need to check if ROU is connected with the optical port of ODU or OEU (See System Topology at "Setting whether to use BIU").

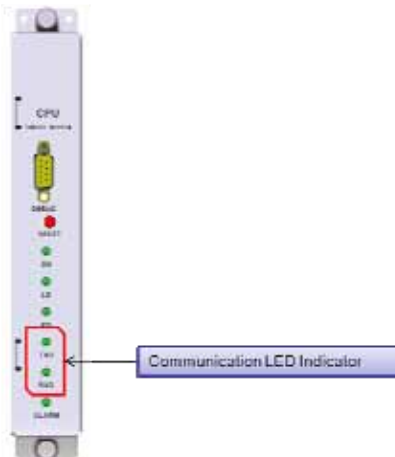
ID



If multiple ROUs connected to BIU share the same ID, the screen will fail to read status information on the ROUs with the same IDs. Therefore, make sure not to redundantly set ROU ID.

Checking Communication LED of RCPU

Check if TXD and RXD LEDs in RCPU make communication. Receiving FSK signals from BIU, ROU sends requested status value to BIU. During reception, RXD LED flicks. During transmission, on the other hand, TXD LED flicks. At this time, you need to check if whether to use a corresponding ROU is checked on (See "whether to use BIU OEU/ROU").

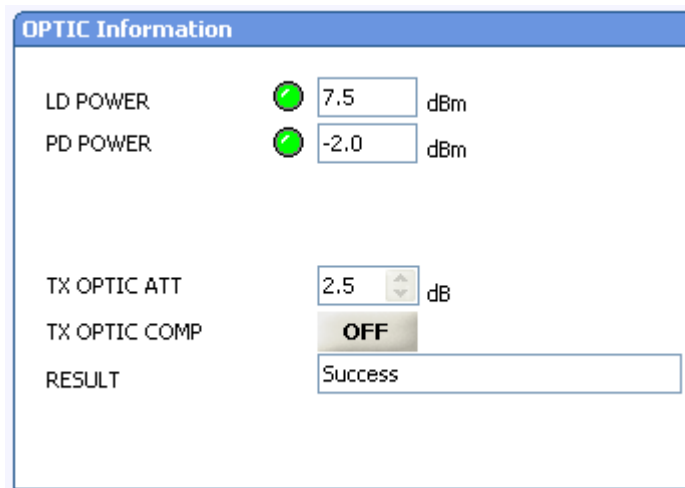


ROU Optic Comp Operation

ROU has the function of automatically compensating for optical loss. It can do the work for up to 5dBo of optical loss. Set "TX OPTIC COMP" of ROU as "ON." Optical compensation of ROU can not be made without communication with such units in upper level as ODU or OEU. For 1dBo of optical loss, basic TX OPTIC ATT is 12dB; for 5dBo of optical loss, TX OPTIC ATT is 4dB. OPTIC COMP works only one time before it stays dormant.

The figure below shows a screen for OPTIC Information in ROU GUI.

LD POWER means output level of ROU Laser Diode, which is sent to a upper unit by ROU. PD POWER means input level of Photo Diode to be received from a upper unit.



OPTIC Information	
LD POWER	<input type="checkbox"/> 7.5 dBm
PD POWER	<input type="checkbox"/> -2.0 dBm
TX OPTIC ATT	2.5 dB
TX OPTIC COMP	OFF
RESULT	Success

During optical compensation, the Result window shows "Processing" and then a result value.

There are three types of results as follows:

1. Success: The optical compensation is normally made.
2. Over Optic Loss: Generated optical loss is 5dBo or more.
3. Communication Fail: Communication with ROU is in poor condition.



If ROU does not make optical compensation, there will be errors in the budget of system link. It can cause lower output level or make Spurious Emission not satisfying for a standard.

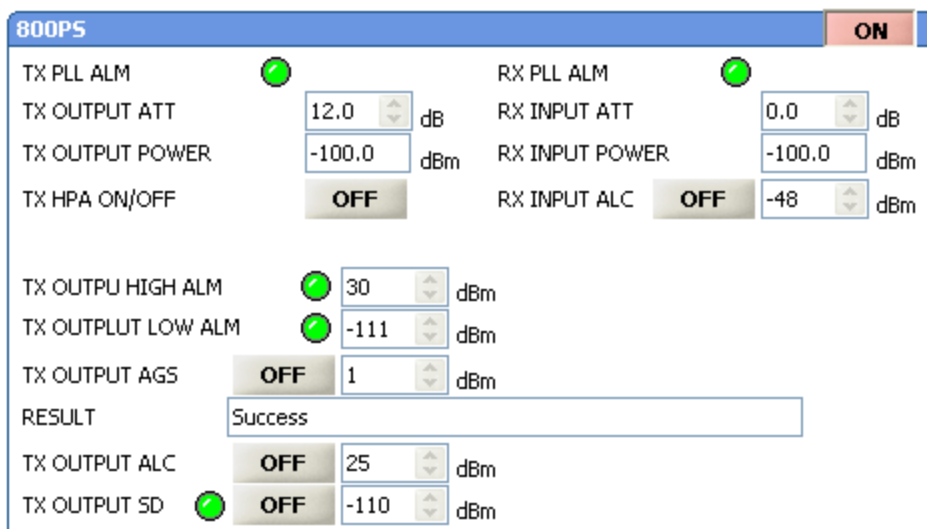
RDU Setting

Insert an RDU+BPF assembly you want to offer service with it and then connect the Multiplexer with interface cable (See Sector 5: How to install RDU at the INSTALL part).

Through GUI, check if the ID of RDU module is inquired at LEFT, MIDDLE and RIGHT slots of RDU. When you select the tab of a corresponding slot (LEFT, MIDDLE and RIGHT) from the main window of ROU, you can inquire and set the status of a corresponding RDU module.

MIDDLE RDU	AWS-1+1900P
LEFT RDU	850C+700PS
RIGHT RDU	800+900I+PA

Set HPA of a corresponding RDU as "ON." Use TX OUTPUT AGS function and set it as a desired output level.



The screenshot shows the configuration window for the 800PS RDU. The window title is "800PS" and it has an "ON" status indicator in the top right corner. The settings are as follows:

- TX PLL ALM:** ON (green indicator)
- TX OUTPUT ATT:** 12.0 dB
- TX OUTPUT POWER:** -100.0 dBm
- TX HPA ON/OFF:** OFF
- RX PLL ALM:** ON (green indicator)
- RX INPUT ATT:** 0.0 dB
- RX INPUT POWER:** -100.0 dBm
- RX INPUT ALC:** OFF
- TX OUTPUT HIGH ALM:** ON (green indicator), 30 dBm
- TX OUTPUT LOW ALM:** ON (green indicator), -111 dBm
- TX OUTPUT AGS:** OFF, 1 dBm
- RESULT:** Success
- TX OUTPUT ALC:** OFF, 25 dBm
- TX OUTPUT SD:** ON (green indicator), OFF, -110 dBm

The table below shows maximally available Composite Powerlevels that can be set per band:

RDU Band	Power that can be maximally set	Setting range
700PS	23dBm	0 ~ 23dBm
800PS	23dBm	0 ~ 23dBm
850Cellular	23dBm	0 ~ 23dBm
900I+Paging	23dBm	0 ~ 23dBm
1900PCS	26dBm	0 ~ 26dBm
AWS-1	26dBm	0 ~ 26dBm
VHF	24dBm	0~24dBm
UHF	24dBm	0~24dBm

AGS function enables you to adjust output power as you like. While the AGS function is being executed, the Result window shows "Processing" and then a result value. There are three types of results as follows:

- A. Success: The AGS function is normally made.

B. Not Operate OPTIC Comp: Optic Comp is not executed.

C. Lack of ATT: There is no attenuation available.

Use various upper/lower limits. The following table shows recommended limit settings:

Item	Recommended Limit	Remark
TX OUTPUT HIGH ALM	Max Composit Power+1dB	Alarm
TX OUTPUT LOW ALM	0dBm	Alarm
TX OUTPUT ALC	Max Composit Power	Auto Level control
TX OUTPUT SD	Max Composit Power+2dB	Shutdown
RX ALC	-45dBm	

If TX OUTPUT HIGH ALM is higher than a setting value, alarms will be genrated.

If TX OUTPUT LOW ALM is lower than a setting value, alarms will be genrated. TX OUTPUT HIGH ALM/LOW ALM tends to work only as warning.

When you activate (“ON”) TX OUTPUT ALC, outputs will be restricted depending on a setting output value.

When you activate (“ON”) TX OUTPUT SD, output will be turned OFF once output power level reaches the same as SD setting value. Upon SD operation, check output level after 10 minutes and then check the status again.

When you activate (“ON”) RX ALC, inputs will be restricted depending on a setting value.

As described above, when normal output level and alarm limit values are set, you need to check if the value of MODULE FAILUER LED Indicator is normally seen green.

For unused bands, you need to use band turning-ON/-OFF function to turn them off. Once a RDU band is turned off, its status value will not be used in case of alarms.