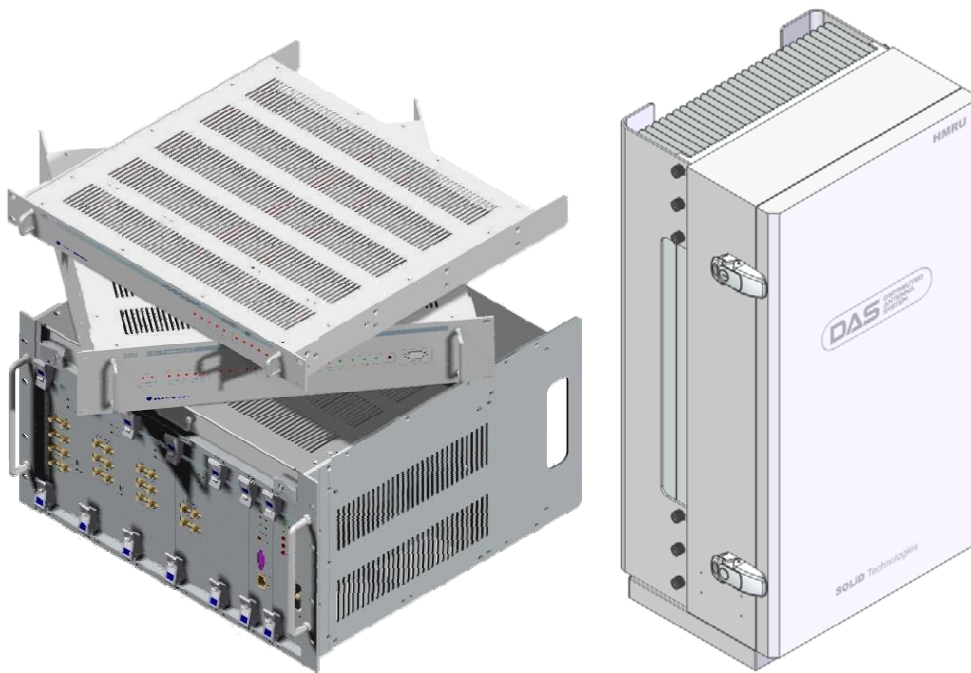


---

# TiTAN

## Installation and Operation Manual

---



### Document Reference:

Version:	V1.0
Document Status:	Release 1
Issue Date:	MAR. 03, 2012
Author:	Kyung Eun Han
Department:	R&D Division Team 3
Authorizing Manager:	Youngshin Yeo

---

## REVISION HISTORY

Version	Issue Date	No. of Pages	Initials	Details of Revision Changes
V 1.0	MAR. 03, 2012		Original	
V 2.0	MAY. 15, 2012		2 <sup>ND</sup> Version	Adding 700LTE RDU MIMO

### Technical Support

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

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

## Contents

<b>Section1</b>	<b><i>Safety &amp; Certification Notice</i></b> .....	<b>8</b>
<b>Section2</b>	<b><i>System Overview</i></b> .....	<b>10</b>
	2.1 General overview .....	11
	2.2 System overview.....	12
<b>Section3</b>	<b><i>System Specifications</i></b> .....	<b>13</b>
	3.1 System specifications .....	14
	3.1.1 Physical Specifications .....	14
	3.1.2 Optic wavelength and Laser power.....	14
	3.1.3 Environmental specifications .....	14
	3.1.4 Operating Frequencies range .....	15
	3.1.5 Specifications Per band .....	16
	3.1.5.1 700MHz LTE .....	16
	3.1.5.2 700MHz Public safety .....	17
	3.1.5.3 800MHz Public safety .....	17
	3.1.5.4 850MHz Cellular .....	18
	3.1.5.5 900MHz iDEN & Paging .....	18
	3.1.5.6 1900MHz PCS .....	19
	3.1.5.7 1700MHz&2100MHz AWS-1 .....	19
<b>Section4</b>	<b><i>System Configuration and Functions</i></b> .....	<b>20</b>
	4.1 HROU (High power Remote Optic Unit).....	21
	4.1.1 Specifications of HROU.....	22
	4.1.2 Block Diagram of HROU.....	22
	4.1.2.1 HMRU block diagram.....	22
	4.1.2.2 HARU block diagram .....	23
	4.1.3 HROU parts.....	24
	4.1.3.1 HROU inner look .....	24
	4.1.3.2 HROU part list .....	25
	4.1.4 Function by unit .....	26
	4.1.5 Bottom of HROU .....	30
<b>Section5</b>	<b><i>System Installation</i></b> .....	<b>32</b>
	5.1 HROU Installation.....	33
	5.1.1 Tools.....	33

5.1.2	HROU Enclosure installation .....	34
5.1.3	How to expand ARU at the HMRU .....	38
5.1.4	HROU Power Cabling .....	40
5.1.5	HROU Ground cabling.....	41
5.1.6	Optical Cabling .....	43
5.1.7	Mounting of RDU.....	45
5.1.8	How to mount FAN Unit.....	50
5.1.9	Consumption of HROU .....	51
<b>Section6</b>	<b><i>Operation</i></b> .....	<b>52</b>
6.1	HROU Operation .....	53
6.1.1	HROU Operation .....	53

---

## Contents of Figure

Figure 2.1 – Basic system topology .....	12
Figure 4.1 – HROU Outer Look .....	21
Figure 4.2 – HMRU Block diagram.....	22
Figure 4.3 – HARU Block diagram .....	23
Figure 4.4 – HROU Inner Look .....	24
Figure 4.5 – RDU Outer Look .....	26
Figure 4.6 – RPSU Outer Look .....	28
Figure 4.7 – R OPTIC Outer Look .....	29
Figure 4.8 – RCPU Outer Look.....	29
Figure 4.9 – SIU Outer Look .....	30
Figure 4.10 – HROU Bottom Look .....	30
Figure 5.1 – How to install HROU .....	34
Figure 5.2 – Dimension used to install HROU on the WALL .....	35
Figure 5.3 – Procedures of installation.....	36
Figure 5.4 – Connection diagram between HMRU and HARU .....	39
Figure 5.5 – Location of Ground Terminal .....	41
Figure 5.6 – Information of Terminal.....	41
Figure 5.7 – How to install Ground Terminal.....	42
Figure 5.8 – How to work optical port .....	43
Figure 5.9 – Wrong optical port installation method.....	44
Figure 5.10 – How to mount RDU .....	45
Figure 5.11 – The Guide bar .....	46
Figure 5.12 – RDU accessories .....	46

Figure 5.12 – RDU and accessories .....	47
Figure 5.13 – Installation diagram of RDU .....	47
Figure 5.14 – Connection diagram of RDU1 .....	48
Figure 5.14 – Connection diagram of RDU2 .....	49
Figure 5.14 – How to mount FAN Unit.....	50
Figure 6.1 – Level diagram .....	53
Figure 6.2 – ID setting Menu .....	55
Figure 6.3 – Communication LED indicator.....	55
Figure 6.4 – Optic information window.....	56
Figure 6.5 – Information HROU and RDU ID.....	57
Figure 6.6 – RDU Setting window .....	57
Figure 6.7 – Fan information.....	59
Figure 6.8 – Fan setting window .....	59

## Glossary

HROU : High Power Remote Optical Unit, is composed of HMRU and HARU

HMRU : High Power Main Remote Unit

HARU : High Power Add-on Remote Unit

# ***Section 1***

## **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 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.
  - The repeater cover should be (door) securely fastened in open position, e.g. by tying it up, at outdoor work in order to prevent door from slamming due to wind causing bodily harm or damage.
  - 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 repeater, including this repeater, will generate radio signals and thereby give rise to electromagnetic fields that may be hazardous to the health of any person who is extensively exposed to the signals at the immediate proximity of the repeater and the repeater antennas.
  - Due to power dissipation, 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, Subchapter 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**

**2.2 System overview**

## 2.1 General overview

TiTAN is a coverage system for outdoor services delivering voice and data in high quality and for seamlessly.

As a distributed antenna system, it provides analog and digital phone systems that are served in multiple bands.

The system covers general public institutions and private facilities.

- Campus areas
- Airports
- Subways
- Multi-use stadiums, convention centers, etc.

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

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

The TiTAN 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: LTE,EDGE,GPRS,WCDMA,CDMA2000,Paging, etc.

TiTAN is in modular structure per frequency band. To provide desired frequency in the outdoor, all you need to do is to insert a corresponding frequency module into each unit. As it delivers multiple signals with one optical cable, the system, in one-body type, does not require additional facilities whenever new frequency is added.

The system is featured with the following:

- Flexibility & Scalability
  - Support fiber-optic ports up to 39
  - Clustering multiple-buildings (campus) as one coverage
- Modular structures
  - Modular frequency upgrade
  - Plug-in type module
- Multi-Band, Multi Operator
  - Signals with a plurality of service provider transmit simultaneously
  - Support multi-operator in a band
- Low OPEX / CAPEX

- Compact design
- Upgradable design
- Easy installation and maintenance

## 2.2 System overview

TiTAN is composed of devices given below.

- HMRU(High power Main Unit)
- HARU(High power Add-on Main Unit)

A HMRU can support up to three ARU. HMRU transmits/receives optical signal from/to ODU and OEU. The budget of optical link is maximum 10dBo with DOU supported 1optical port and can support up to 5dBo with existing DOU supported 4optical port. System topology is like below.

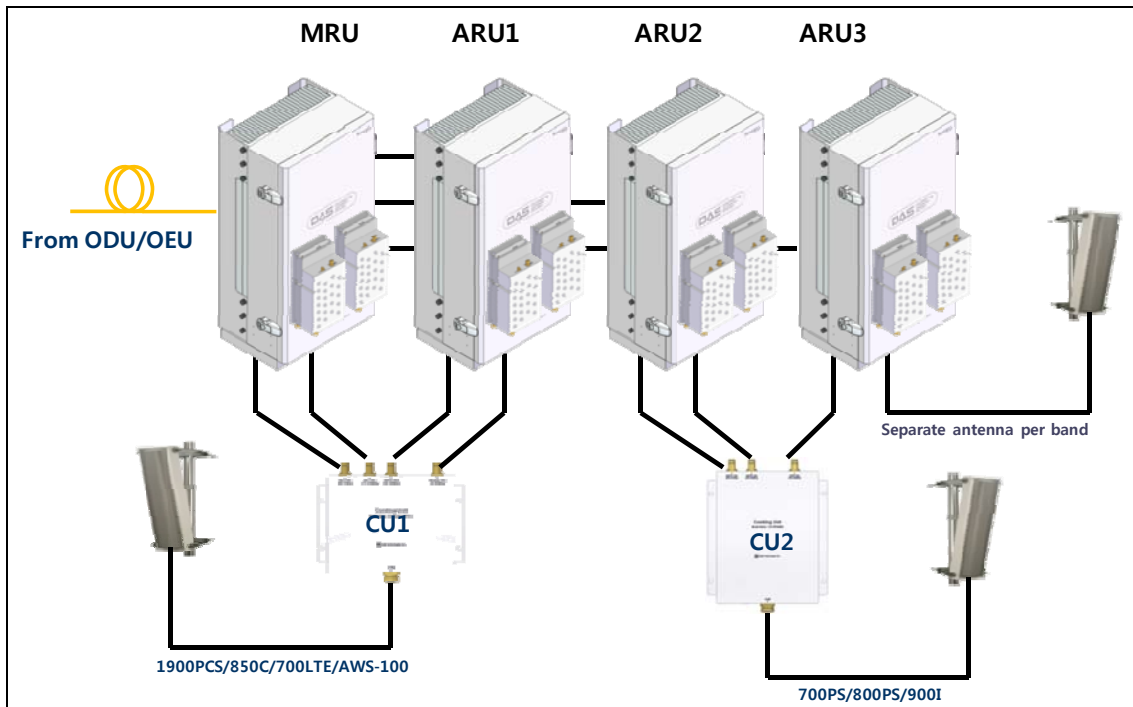


Figure 2.1 – Basic system topology

Table 3.1 – System topology Charts

System elements	Optical Loss [dBo]	Remark
With DOU supported 1optical port	1~10dBo	
With DOU supported 4optical port	1~5dBo	

# ***Section3***

## **System Specifications**

---

- 3.1 System specifications**
  - 3.1.1 Physical Specifications**
  - 3.1.2 Optic wavelength and Laser power**
  - 3.1.3 Environmental specifications**
  - 3.1.4 Operating Frequencies range**
  - 3.1.5 Specifications Per band**

### 3.1 System specifications

#### 3.1.1 Physical Specifications

Parameter	HMRU	HARU
RF Connectors	3N-type, female 6SMBL, female	1N-type, female 2SMBL, female
Serial Interface connector	1 RS-232 9-pin D-sub, male	1 RS-232 9-pin D-sub, male
Fiber connector	1 SC/APC	-
LED Alarm and Status Indicator	System status <ul style="list-style-type: none"> <li>● Power on status</li> <li>● TX Communication</li> <li>● RX Communication</li> <li>● LD status</li> <li>● PD status</li> <li>● ALM status</li> </ul>	System status <ul style="list-style-type: none"> <li>● Power on status</li> <li>● TX Communication</li> <li>● RX Communication</li> <li>● LD status</li> <li>● PD status</li> <li>● ALM status</li> </ul>
AC Power	Normal Range: 120VAC 50/60Hz Operating range 108~132VAC,50/60Hz	Normal Range: 120VAC 50/60Hz Operating range 108~132VAC,50/60Hz
Power consumption	50W Common part only	40W Common part only
Enclosure Dimensions	360 x 700 x 280mm	360 x 700 x 280mm
Weight[Common part]	28Kg	27Kg

#### 3.1.2 Optic wavelength and Laser power

Parameter	HROU	Remark
Wavelength	TX: 1550nm RX: 1310nm	
Output power	7dBm±1dBm to ODU	

#### 3.1.3 Environmental specifications

Parameter	HMRU,HARU	Remark
Operating Temperature	-30 to +55°C	
Operating Humidity	5% to 90%,Non-condensing	

### 3.1.4 Operating Frequencies range

Standard	Unit naming	Description	Frequency range	
			TX(MHz)	RX(MHz)
LTE	700LTE	LTE	728 to 756	698 to 716 777 to 787
iDEN	700PS	Public safety	758 to 775	788 to 805
iDEN	800I/PS	Public safety	851 to 869	806 to 824
Cellular	85C0C	Cellular	869 to 894	824 to 849
Iden	900IDED	SMR	929 to 940	896 to 902
Paging	900 PA	Paging	929 to 930	896 to 902
PCS	1900PCS	PCS	1930 to 1995	1850 to 1915
AWS-1	AWS-1	AWS-1	2110 to 2155	1710 to 1755

### 3.1.5 Specifications Per band

#### 3.1.5.1 700MHz LTE

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	28MHz	18MHz/10MHz	
System ripple	≤4dB	≤4dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

#### 3.1.5.2 700MHz LTE MIMO

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	28MHz	18MHz/10MHz	
System ripple	≤4dB	≤4dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU



### 3.1.5.3 700MHz Public safety

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	17MHz	17MHz	
System ripple	≤4dB	≤4dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

### 3.1.5.4 800MHz Public safety

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	18MHz	18MHz	
System ripple	≤4dB	≤4dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

### 3.1.5.5 850MHz Cellular

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	25MHz	25MHz	
System ripple	≤4dB	≤4dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

### 3.1.5.6 900MHz iDEN & Paging

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	12MHz	6MHz	
System ripple	≤4dB	≤4dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

### 3.1.5.7 1900MHz PCS

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	65MHz	65MHz	
System ripple	≤5dB	≤5dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

### 3.1.5.8 1700MHz&2100MHz AWS-1

Parameters	Typical		Remarks
	TX	RX	
Bandwidth	45MHz	45MHz	
System ripple	≤5dB	≤5dB	
Input Power level	-20 to +10dBm	≤-50dBm	
Output power	+44.5dBm	+0dBm	Total
System Gain	64.5dB	50dB	
Gain Control range	39.5 to 64.5dB	30 to 50dB	
Spurious Emissions	-13dBm	-	
IP3	-	+23dBm	
Noise figure	-	8dB	1HROU

# ***Section4***

## **System Configuration and Functions**

---

### **4.1 HROU (High power Remote Optic Unit)**

#### 4.1 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.

HMRU receives TX optical signals from ODU or OEU and converts them into RF signals. The converted RF signals are amplified through High Power Amp in a corresponding RDU combined with RFU, 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 RDU 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 or OEU. HMRU can be equipped with up to two RDUs (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 RDU combined with RFU, PAU and Cavity duplexer, and then radiated to the antenna port

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

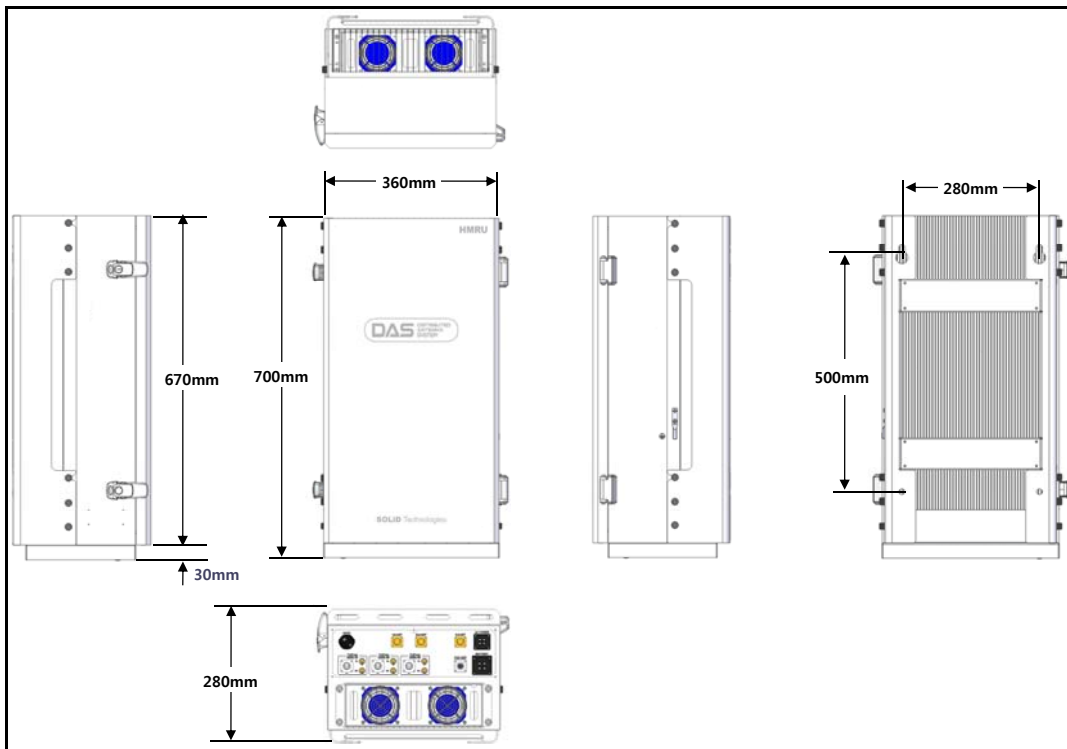


Figure 4.1 – HROU Outer Look

### 4.1.1 Specifications of HROU

Item	Spec.		Remark
	HMRU	HARU	
Size(mm)	360 x 700 x280		Including Bracket
Weight	28 Kg	27kg	Common Part
Power consumption	50W	40W	

### 4.1.2 Block Diagram of HROU

#### 4.1.2.1 HMRU block diagram

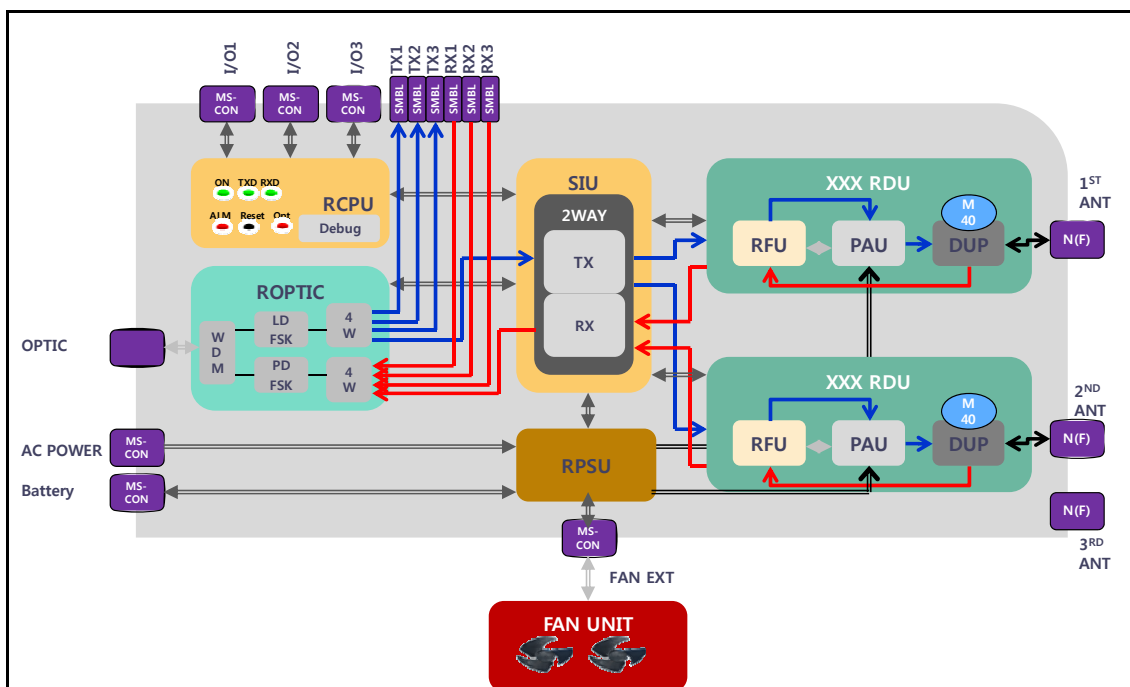


Figure 4.2 – HMRU Block diagram

### 4.1.2.2 HARU block diagram

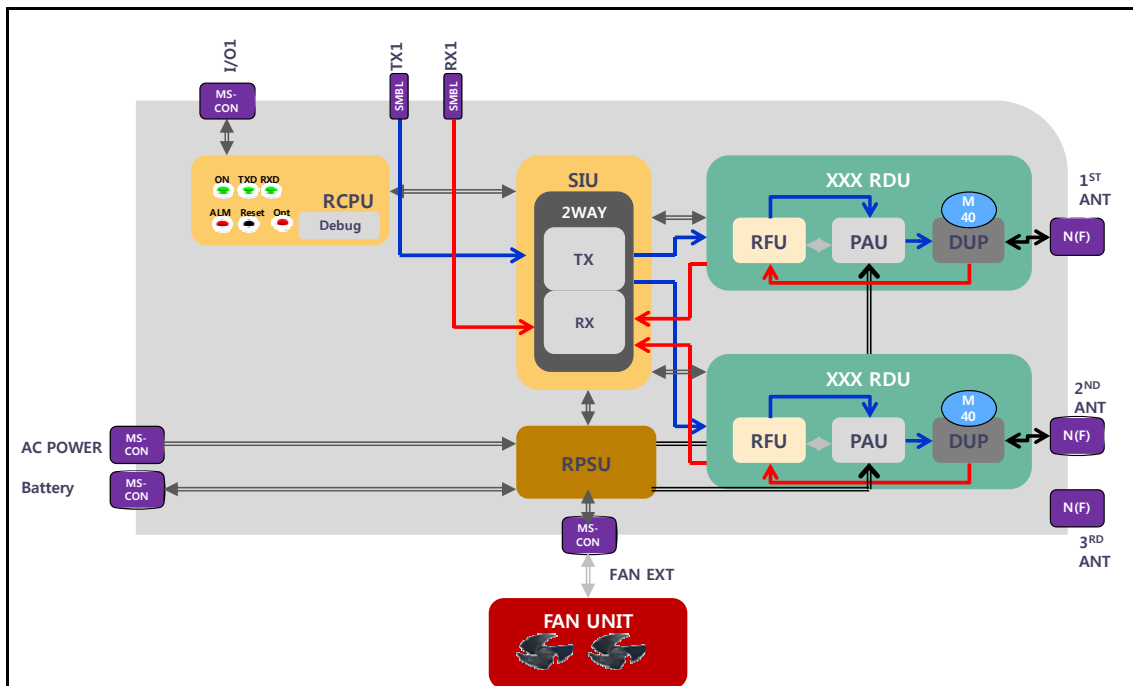


Figure 4.3 – HARU Block diagram

### 4.1.3 HROU parts

#### 4.1.3.1 HROU inner look

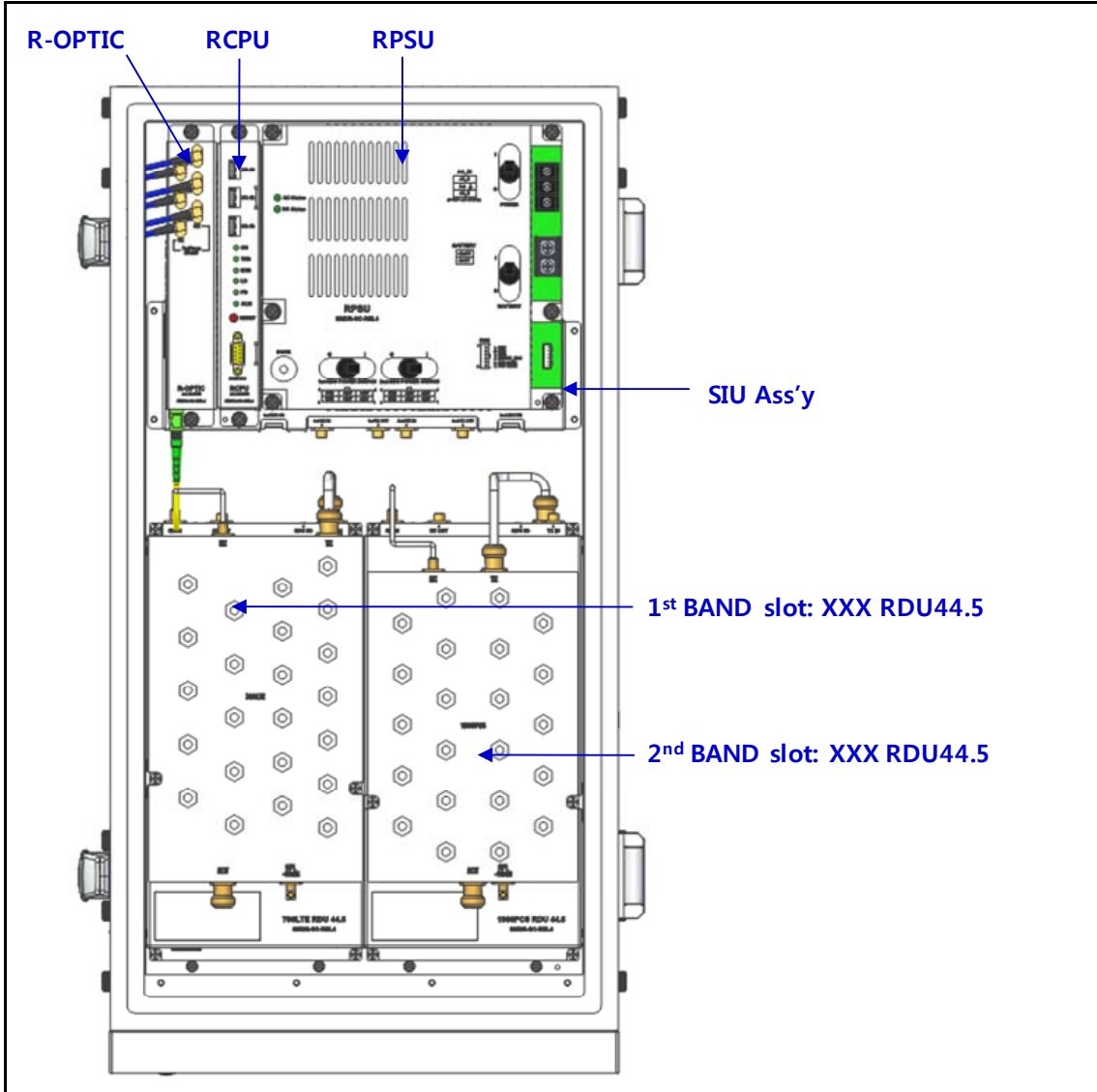


Figure 4.4 – HROU Inner Look



### 4.1.3.2 HROU part list

No.	Unit	Description	Remark
1	R-OPTIC	<b>Remote Optic</b> Make RF conversion of TX optical signals; Convert RX RF signals into optical signals; Compensates optical loss Communicates with BIU/OEU though the FSK modem	Optional Only HMRU
2	RCPU	<b>Remote Central Processor Unit</b> Monitoring status of each unit Communicating with BIU/ODU/OEU Support LED indicators on it to check alarm	Common
3	RPSU	<b>Remote Power Supply Unit</b> Input power: 120V, Output power: 28V single voltage	Common
4	SIU Ass'y	Distributes data signal and power signal to each module	Common
5	RDU	<b>Remote Drive Unit</b> Consist of RFU, PAU and cavity filter Filter and high amplify TX signals; Filter and amplify RX signals in low noise amplifier; Remove out-of signals through cavity duplexer	Optional Max 2
6	Enclosure	Enclosure to satisfy NEMA4; Enable Wall/Rack Mount	Common
7	FAN Unit	<b>FAN Unit</b> Attach outside of enclosure Cool the enclosure's heat using two fans Operate either on or off according to designated temperature	Common

#### 4.1.4 Function by unit

##### 1) Remote Drive Unit (RDU)

When receiving TX signals from each band through Remote Optic, RDU 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. RDU consist of RFU, PAU and cavity duplexer like below figure and all modules are merged with one package

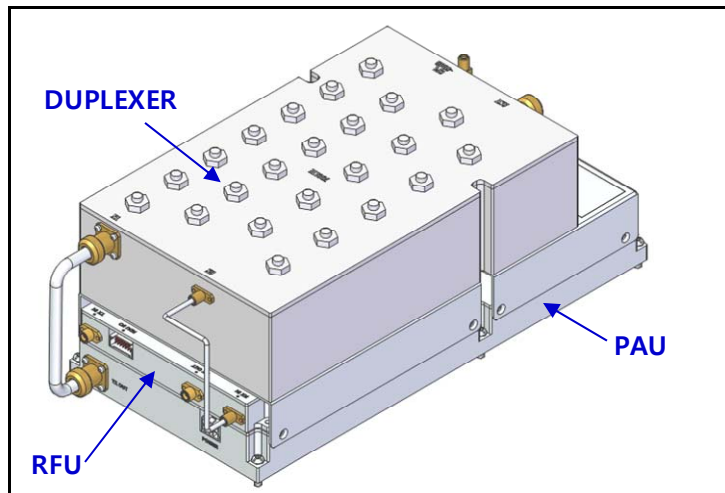


Figure 4.5 – RDU Outer Look

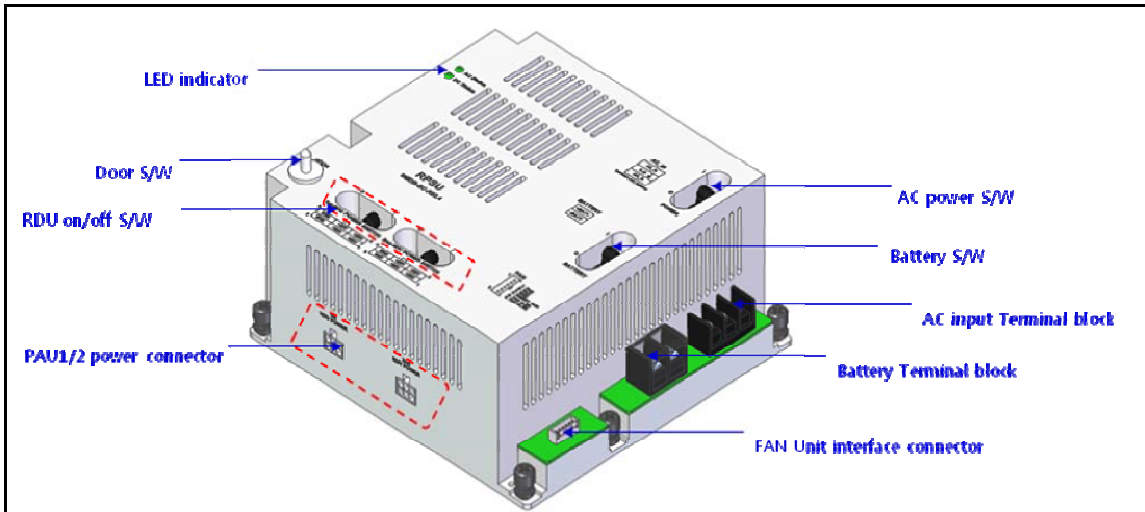
RDU devices are varied for each frequency band, including the following:

No	Unit naming	Description	Frequency	
			TX	RX
1	1900PCS RDU44.5	Single band	1930-1995MHz	1850-1915MHz
2	850CEL RDU44.5	Single band	869-894MHz	824-849MHz
3	700LTE RDU44.5	Single band	728-756MHz	698-716MHz 777-787MHz
4	AWS-1 RDU44.5	Single band	2110-2155MHz	1710-1755MHz
5	700PS RDU44.5	Single band	758-775MHz	788-805MHz
6	800I/PS RDU44.5	Single band	851-869MHz	806-824MHz
7	900I RDU44.5	Single band	929-941MHz	896-902MHz
8	700LTE MIMO RDU 44.5	Single band	728-756MHz	698-716MHz 777-787MHz

No	Unit naming	Dimension	Weight	Power consumption	Outlook
1	1900PCS RDU44.5	150x310x112	7kg	350W	
2	850CEL RDU44.5	150x310x116	7kg	300W	
3	700LTE RDU44.5	150x310x120	7kg	300W	
4	AWS-1 RDU44.5	150x310x113	6kg	330W	
5	700PS RDU44.5	150x310x132	6kg	320W	
6	800I/PS RDU44.5	150x310x128	6.5kg	300W	
7	900I RDU44.5	150x310x123	6.5kg	300W	
8	700LTE RDU44.5	150x310x120	7.5kg	300W	

## 2) Remote Power Supply Unit (RPSU)

RPSU is provided of 120Vac at input and provide output +28V only single voltage of DC power basically. Optionally, RPSU supports battery backup using battery port. Battery operates charge and discharge function.



**Figure 4.6 – RPSU Outer Look**

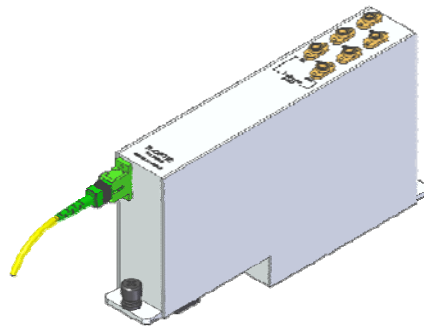
Functions:

- Providing a circuit breaker to turn the power ON/OFF
- Providing a circuit breaker to turn battery ON/OFF
- Providing DC power each RDU using RDU on/off switch
- Providing DC power and signal to FAN tray
- LED indicators for showing alarm status of PSU
- Door open/close status using Door switch

### 3) Remote Optic(R OPTIC)

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

It also has internal ATT for optical compensation to compensate for optical cable loss. It provides three path in pair to transport RF signal to ARUs

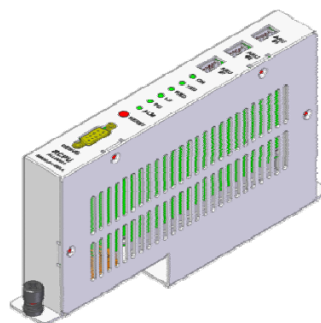


**Figure 4.7 – R OPTIC Outer Look**

### 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 RS-232C Serial Port, the unit enables you to check and control device status through PC and laptop.

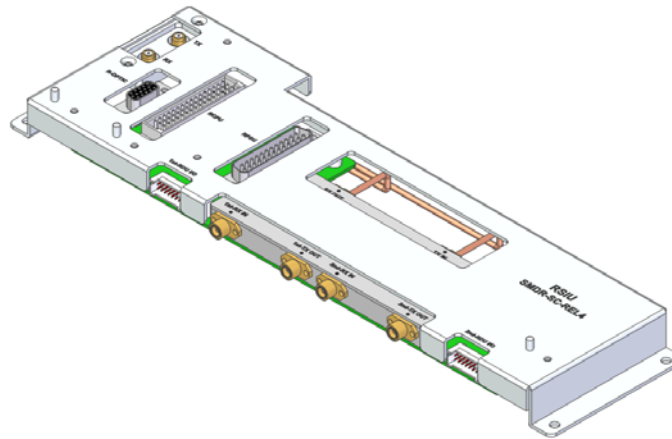
It provides three interface port with ARUs to communicate with these. RCPU is common module for both HMRU and HARU.



**Figure 4.8 – RCPU Outer Look**

**5) System Interface Unit(SIU)**

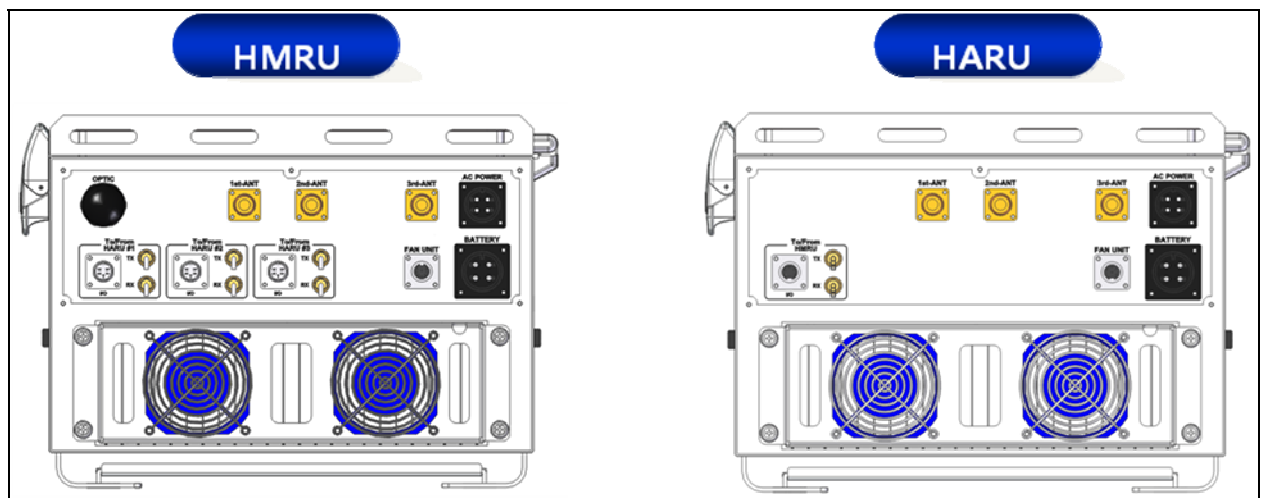
SIU distributes power and signals to each module.



**Figure 4.9 – SIU Outer Look**

**4.1.5 Bottom of HROU**

**1) Functions**



**Figure 4.10 – HROU Bottom Look**

No	Port	HMRU	HARU	Remark
1	Optical Port	1EA	X	SC/APC, Waterproof
2	ARU Interface	3EA, (3)CON,(6)SMBL- Female	1EA, (1)CON,(2)SMBL- Female	
3	1ST ANT	1EA	1EA	N-type female, 1ST BAND Antenna port
4	2ND ANT	1EA	1EA	N-type female, 2ND BAND Antenna port
5	3RD ANT	1EA	1EA	N-type female, Reserved port in future
6	AC Power	1EA	1EA	MS-Con, Waterproof
7	Battery	1EA	1EA	MS-Con, Waterproof
8	EXT-FAN	1EA	1EA	Waterproof-Con