Intelibs, Inc.

iDAS RHU Product Manual

RHU Operational Manual for GPS-iDAS application
Version: 1.3
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FCC WARNING

This equipment generates or uses radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.
This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLER. You MUST have an FCC LICENSE or express consent of an FCC License to operate this device. Unauthorized use may result in significant forfeiture penalties including penalties in excess of $100,000 for each continuing violation.

INFORMATION TO THE USER

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can generate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
· Reorient or relocate the receiving antenna.
· Increase the separation between the equipment and receiver.
· Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
· Consult the dealer for technical assistance.
Suitable for use in environmental air space in accordance with Section 300-22 (c) of the National Electrical Code, and Sections 2-128, 12-010 (3), and 12-100 of the Canadian Electrical Code, Part 1, C22.1.

CAUTION Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment. This equipment is intended for use only with Intelibs Hybrid DAS systems.

Important health and safety precautions

When using this product, the safety precautions below must be taken to avoid possible legal liabilities and damages. Retain and follow all product safety and operating instructions. Observe all warnings in the operating instructions included with the device.

DANGER Only use antennas, transceivers and chargers approved by Intelibs. The use of any non-approved antenna, transceiver and charger may be dangerous.

DANGER Allow only authorized personnel to service the DAS. Unauthorized service can invalidate the warranty.

CAUTION Any modification of this product, including opening the unit, is prohibited and will void your warranty. Any use of the product or its components for purposes not expressly authorized by this document, including any use in an airplane or any other aviation application, is prohibited and will void your warranty.

NOTE When using your device for prolonged periods of time, the device may become warm. In most cases, this condition is normal and therefore should not be interpreted as a problem with the device.

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1 Introduction

Radio Hub Unit (RHU) is a part of the Hybrid Distributed Antenna Systems (HDAS) to provide RF link solution between RF Source and Remote Unit (RU). This RHU receives RF signal over-the-air or wire line and this unit filters, amplifies and converts RF signal into optic signal and transmits to child unit such as FHU and RU through single mode fiber. RHU is built on a small form factor with six antenna ports for 700MHz, 850MHz, 1900MHz, AWS band and two GPS antenna ports with the following features

- Support for a multi frequency band, multi-technology and multi-carrier
- Wide band sub-channel selection by digital filter
- Antenna isolation detection and oscillation protection function
- Low Power consumption that can be operated by PoE or small AC/DC converter
- 20dBm Up Link composite power per band
- SNMP based remote management support
- Provide signal to remote unit(RU) site as far as 10Km distance that has 5dBo loss via single mode fiber
- Optic fiber sharing between different carriers
- AGC (Auto Gain Control), ALC(Auto Level Limit Control), IGC(Gain Control due to lack of antenna Isolation and ASD(Auto Shut Down) function
- Compact and high capacity with scalable design
- Ruggedized enclosure with more outdoor temperature compliance
- GPS port redundancy function in order to switchover when other GPS fails

Hybrid DAS RHU is comprised of the following subsystems:

- FHU (Fiber Hub Unit): Interface unit between RHU and Remote Units, Convert O/E, compensate loss and convert E/O. this unit has optic input port and optic output port.
- SRU (Small power Remote Unit): Small power (23dBm per band) remote unit for indoor
- MRU(Medium power Remote Unit): Medium power(33dBm per band) remote unit for indoor
- HRU(High power Remote Unit): High power(37 ~ 43dBm per band) remote unit for outdoor
- MU (Master Unit): Element management server

As illustrated in Figure 2-2, Hybrid DAS network is comprised of RHU, FHU and SRU/MRU/HRU. RHU and *x*RUs can transmit signal to coverage area. An optic cable can be shared between different carriers and different band.

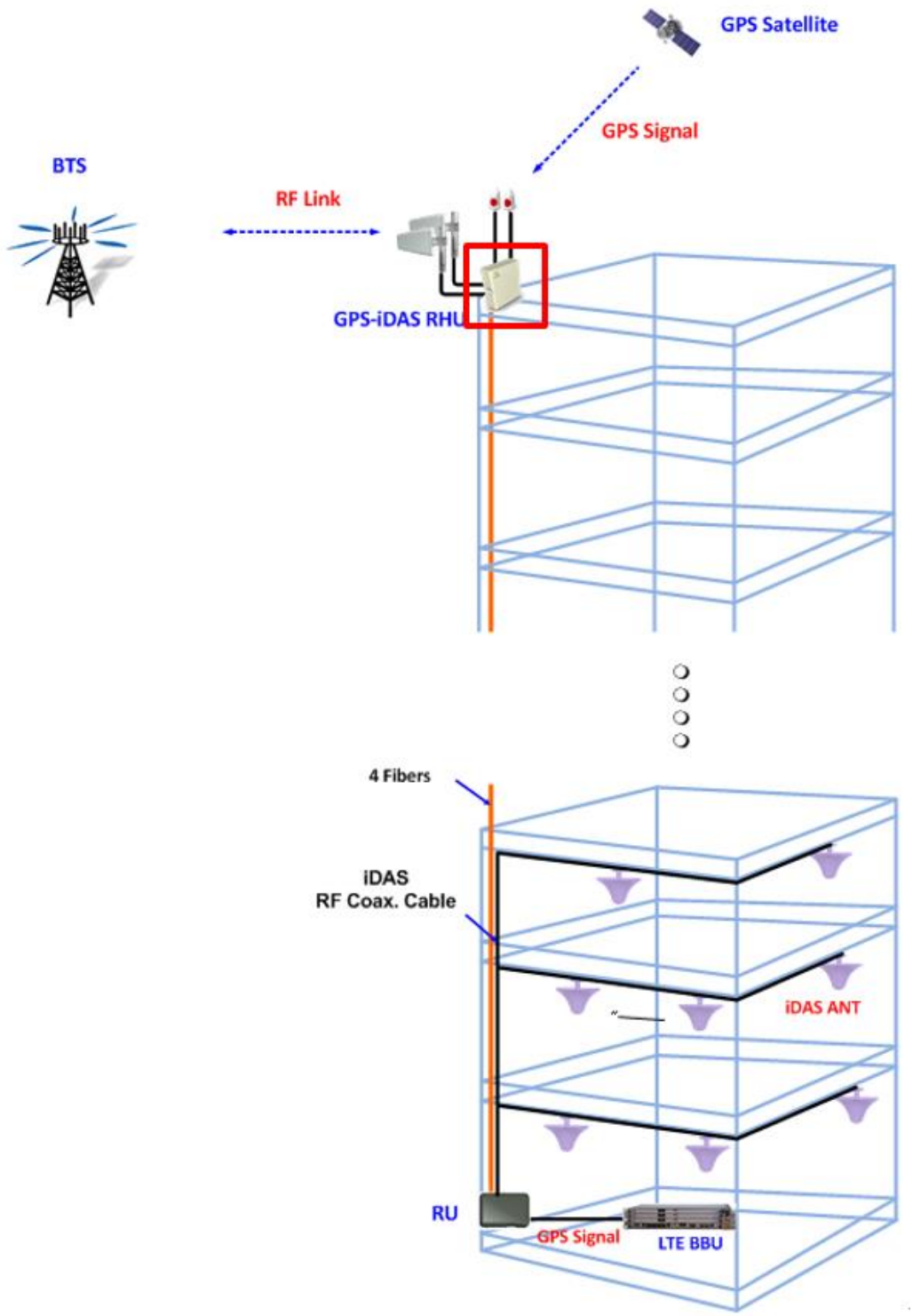


Figure 1-1 RHU-RU connection configuration

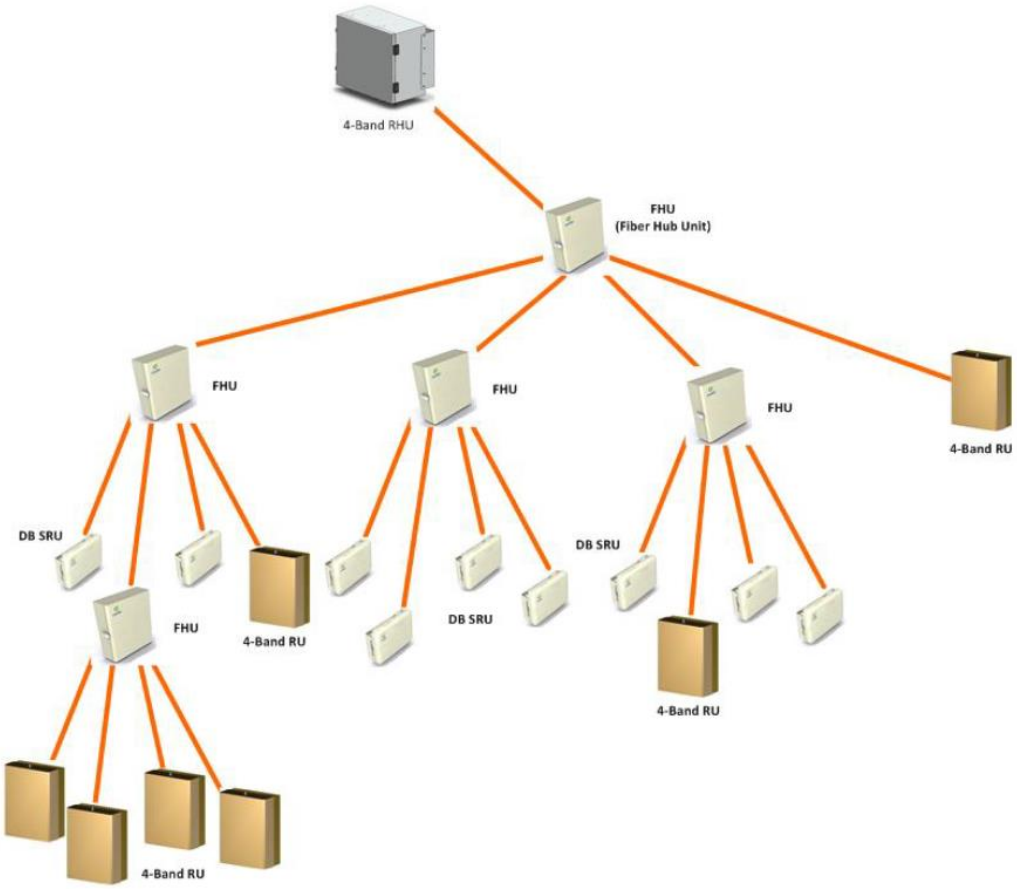


Figure 1-2 Typical iDAS RHU-FHU-SRU/MRU network diagram

2 Product Description

Radio Hub Unit (RHU) is a part of the Distributed Antenna System (DAS) to provide link between RF Source and DAS RU, to fill coverage gaps and to enhance the quality of service of extending coverage of mobile service.

As shown in Figure 2-1, RHU is a compact platform with the natural heat convection. As unified form factor, RHU services multiple technologies on a single platform with 700/850/1900/2100MHz Quadruple-band and GPS L1 band frequencies reception. It can be mounted on the wall or 19” rack. Variety of the donor antenna can be used from Yagi directional antenna to high F/B Ratio directional antenna (or panel antenna).

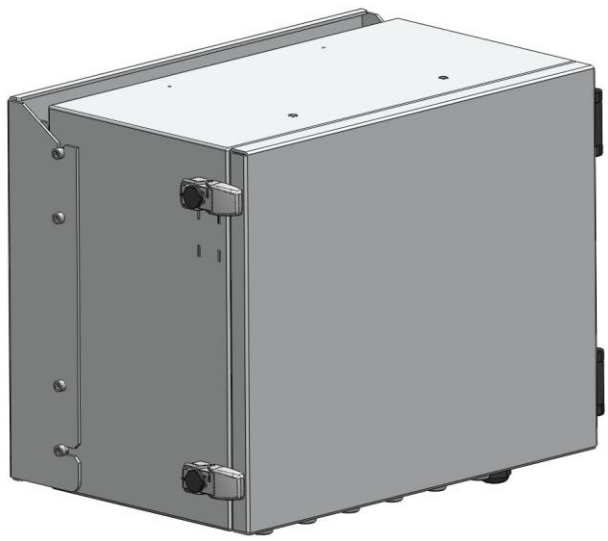


Figure 2-1 RHU system

2.1 Network configuration

Four band RF signals such as 700/850/1900/2100MHz or 2 GPS L1 band from link and GPS antenna are fed to RHU and RHU amplifies these RF signals and converts into optical signal, and transmits this optical signals to child unit likes FHU or *x*RU. RHU can have up to 16 RUs and 5 FHU connections.

A fiber optic cable can be shared between different carriers or different band. Each frequency band signals are combined to one wavelengths in a single fiber. Table 2-1 describes those wavelength assignments. Maximum allowed optic loss between RHU and RU system is 10 dBo.

Table 2-1 Optic wavelength of each frequency band

Frequency band	Downlink Wavelength	Uplink Wavelength
700/850/1900/2100MHz band	1,310 nm	1,550 nm
GPS L1 band	1,550 nm	1,310 nm

RHU systems with different operating frequency band can be interconnected via over-the-air or RF Head-End unit. Typical RHU-FHU-SRU/MRU/HRU network diagram is depicted in figure 1-2.

2.2 External interface ports

RHU has all interface connections at bottom side of an enclosure, which includes fiber, antennas and power port. Figure 2-3 shows the bottom side of RHU system.

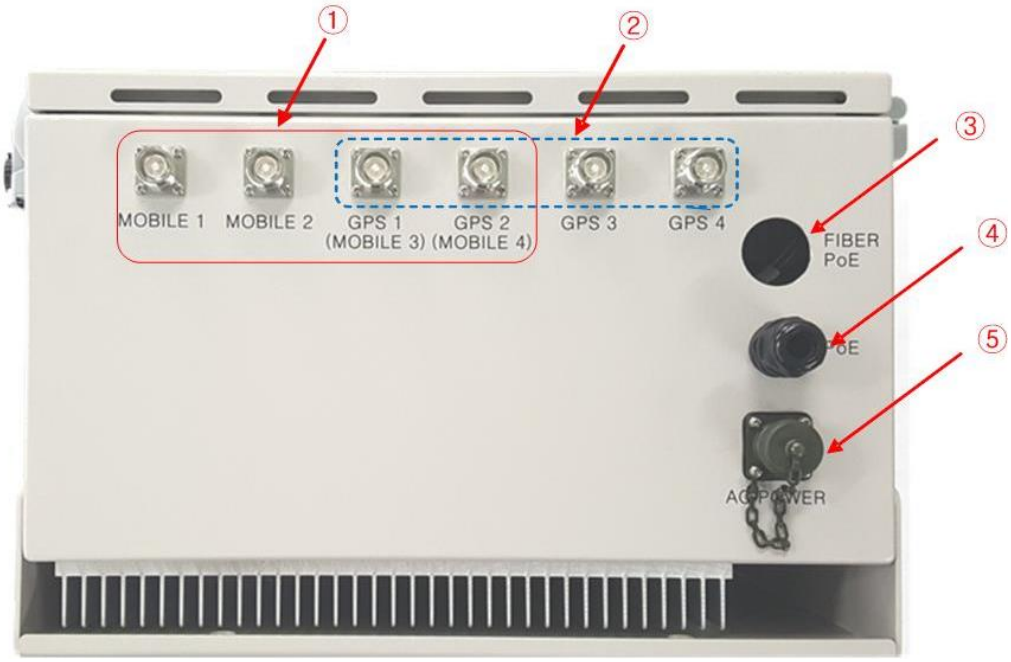


Figure 2-2 Bottom view of RHU system

Table 2-2 Interface ports

No.	Port	Connector type	Description
1	MOBILE 1 ~ 4	4.3-10 Female	Antenna RF cable connection port for 4-band
2	GPS 1~4	4.3-10 Female	GPS Antenna cable connection port. Two ports of these ports may be used for Mobile or GPS antenna connection
3	FIBER	Cable gland	Fiber inlet port
4	PoE	Cable gland	Ethernet cable inlet port for PoE power supply
5	AC POWER	MS Female - 3PIN	120VAC Power cable connector

2.3 Configuration of RHU inside

RHU system is comprised of several internal modules such as Radio Hub Modules (RHM), GPS Front-End Module (GPS FEM), optic module, and controller modules. Figure 2-3 shows inside of RHU system.

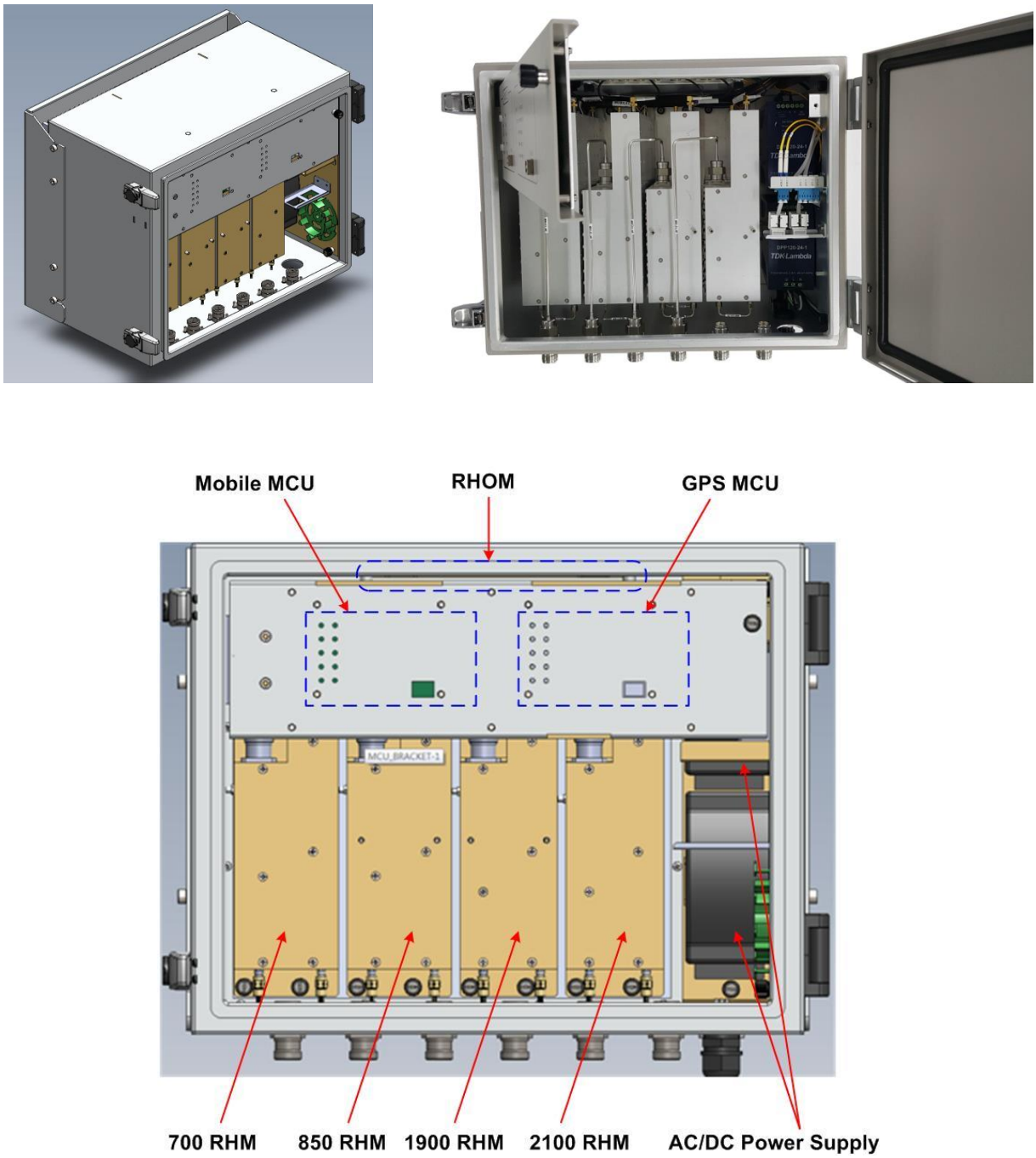
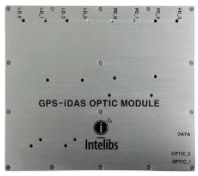
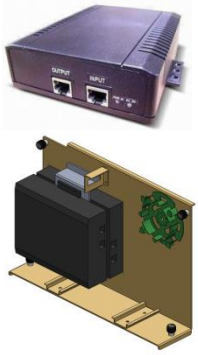


Figure 2-3 Module configuration of RHU inside

Table 2-3 RHU system's modules

Module	Picture	Description
700 RHM		[Down Link] This module filters 700 DL RF signal from link antenna, amplifies with low noise, filters A/B/C/UpperC sub-band signals by digital band pass filters and transmits the selected 700 DL RF signal to optical module. [Up Link] This module filters 700 UL RF signal from optical module, filterers A/B/C/UpperC sub-band signals by digital band pass filters, amplifies to get high power and transmits 700 UL RF signal via antenna port.
850 RHM		[Down Link] This module filters 850 DL RF signal coming from link antenna, amplifies with low noise, filters sub-band by digital band pass filters and transmits the selected 850 DL RF signal to optical module. [Up Link] This module filters 850 UL RF signal coming from optical module, filters sub-band by digital band pass filters, amplifies to get high power and transmits 850 UL RF signal to antenna.
1900 RHM		[Down Link] This module filters 1900 DL RF signal coming from link antenna, amplifies with low noise, filters sub-band by digital band pass filters and transmits the selected 1900 DL RF signal to optical module. [Up Link] This module filters 1900 UL RF signal coming from optical module, filters sub-band by digital band pass filters, amplifies to get high power and transmits 1900 UL RF signal to antenna.
2100 RHM		[Down Link] This module filters 2100MHz DL RF signal coming from link antenna, amplifies with low noise, filters sub-band by digital band pass filters and transmits the selected 2100MHz DL RF signal to optical module. [Up Link] This module filters 1700 UL RF signal coming from optical module, filters sub-band by digital band pass filters, amplifies to get high power and transmits 1700 UL RF signal to antenna.
GPS FEM		This unit filters GPS L1 band signal, amplifies by low noise, converts GPS signal into optical signal and transmits this optic signal to RU site via fiber. This unit has two GPS ports to support GPS redundancy function. If one GPS fails, second GPS port switch over automatically.
RHOM		[Down Link] This module combines 4-band mobile RF signal from 700/850/1900/ AWS RHM or GPS-FEM and converts into optical signal and transmits to RU site via fiber. [Up Link] This module converts optical signal coming from fiber into RF UL signals and amplifies UL signals to compensate fiber loss and transmits to 700/850/1900/AWS RHM or GPS-FEM.

RF Controller (RFCU)		This module controls and monitors all parameters of 700/850/1900/ AWS RHM and RHOM which related to 4-band DL/UL RF circuits.
GPS Controller (GPSCU)		This module manages all parameters of RF circuits of two GPS path.
PoE Splitter		This module receives DC voltage through the Ethernet cable, converts into 24VDC and supplies DC voltage to each module. RHU can use one of PoE Splitter and ACDC converter according to installation environment.
ACDC Converter		This module converts AC120V voltage to DC 24V and supply this DC voltage to each module. RHU can use one of PoE Splitter and ACDC converter according to installation environment.

2.4 Mechanical Drawing

Figure 2-4 RHU Outside drawing

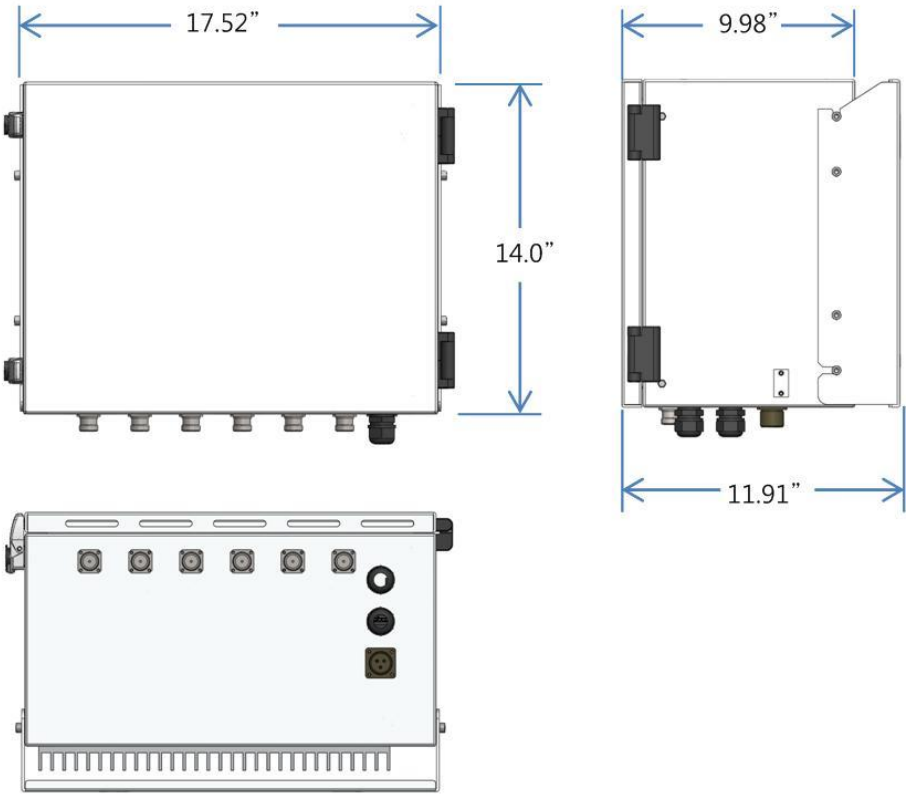


Figure 2-5 RHU dimension

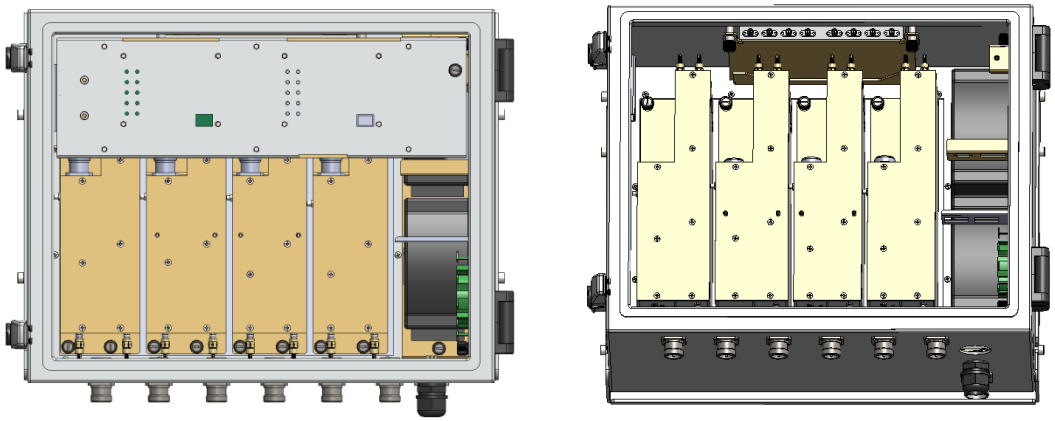


Figure 2-6 RHU Inside drawing

2.5 Technical Specifications

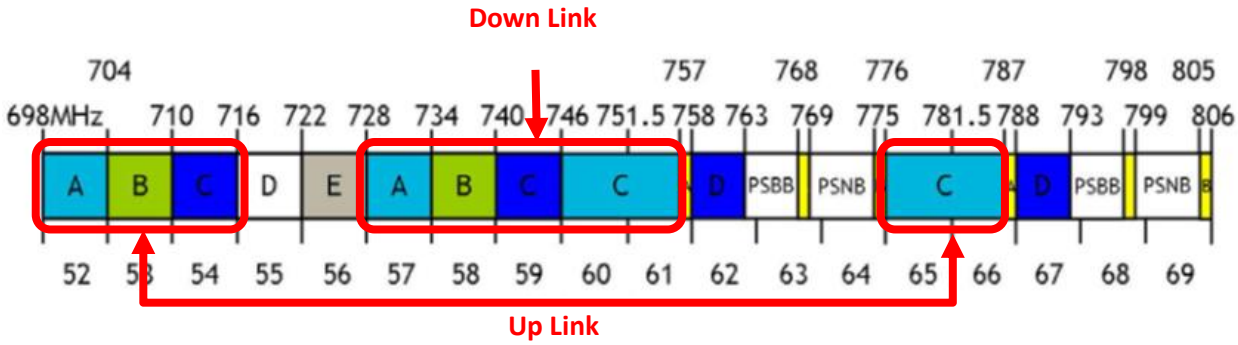
2.5.1 General specifications

Table 2-4 General Specifications

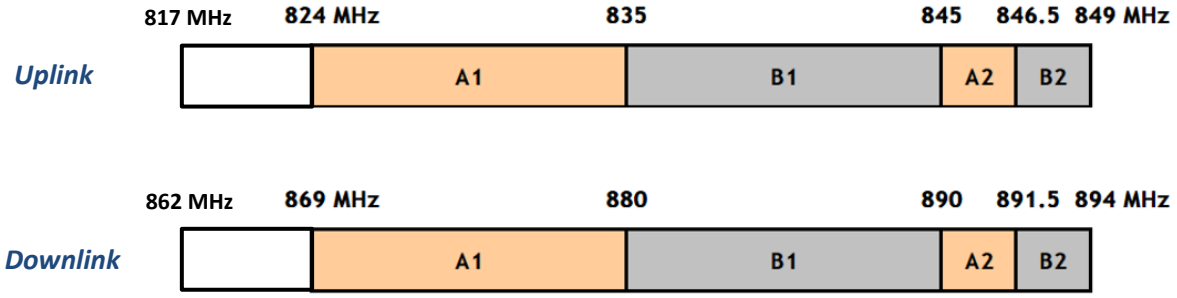
Specification	Values
Enclosure Type	Cabinet, Natural convection type
Dimension (mm)	14.0(H) X 17.5(W) X 12(D) inch
Weight (Kg)	70.5lb(32 Kg) @ 4band
Power Supply	120VAC, 60Hz
	PoE 48 ~ 56VDC
Power Connector	MS Connecter for AC Input
	Cable gland for PoE Input
ANT RF In/Out Port	4.3-10 Type Female, bottom side
Optic Connector Type	LC/UPC, inside
Optic Wavelength	❖ DL: 1310nm / UL: 1550nm for 700/850/1900/2100MHz ❖ DL: 1550nm / UL: 1310nm for GPS only
Operating Temperature	-30℃ ~ 55℃

2.5.2 Frequency allocation

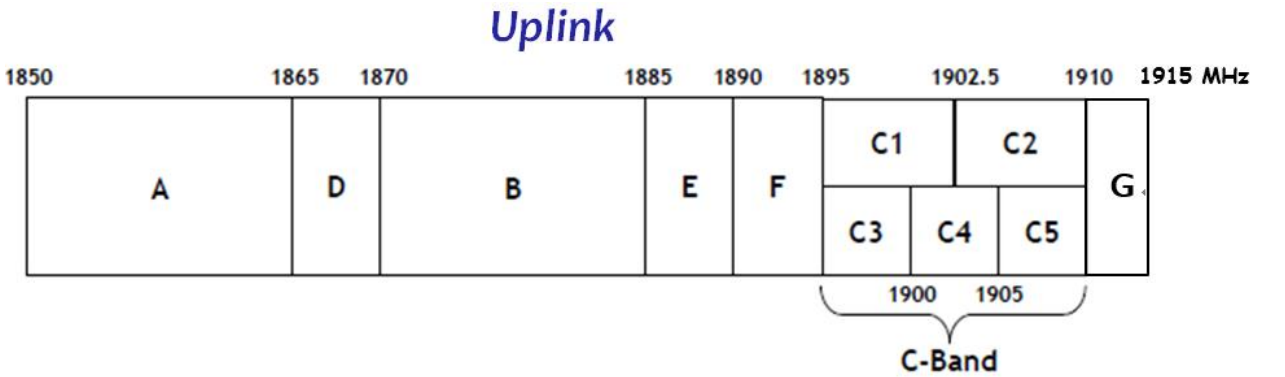
2.5.2.1 700 MHz band

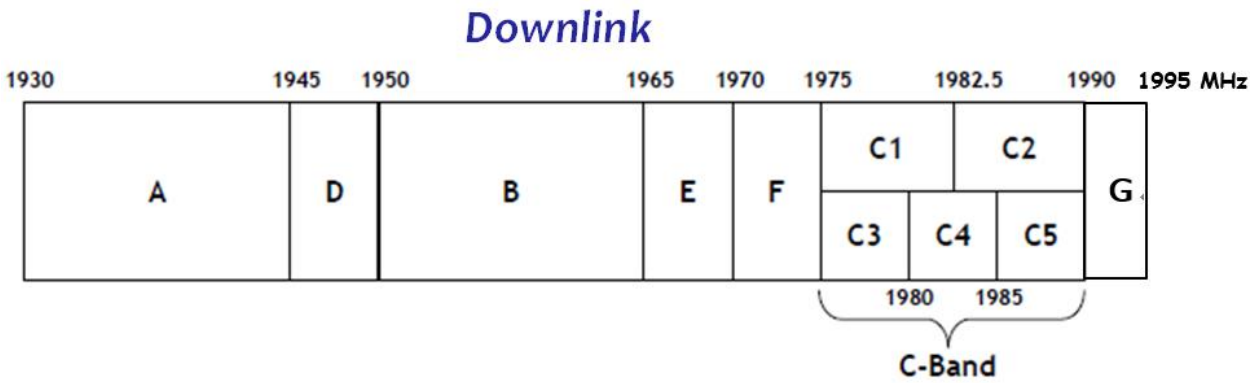


2.5.2.2 850 MHz band



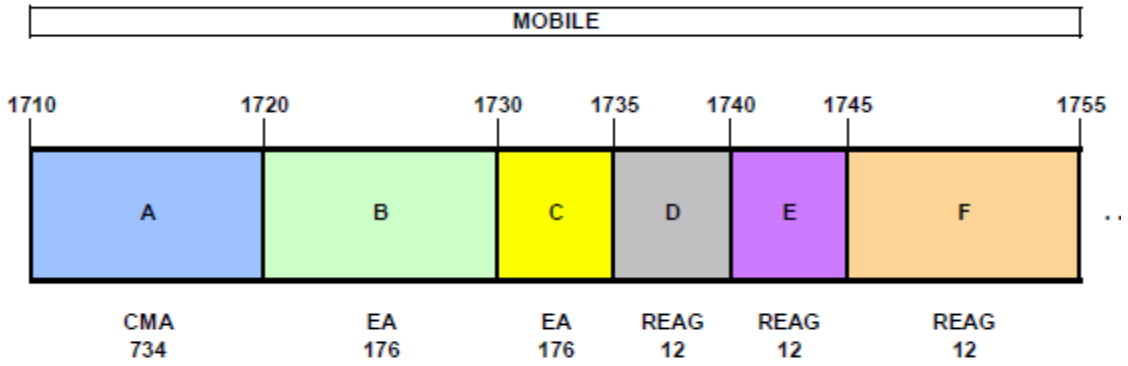
2.5.2.3 1900 MHz band



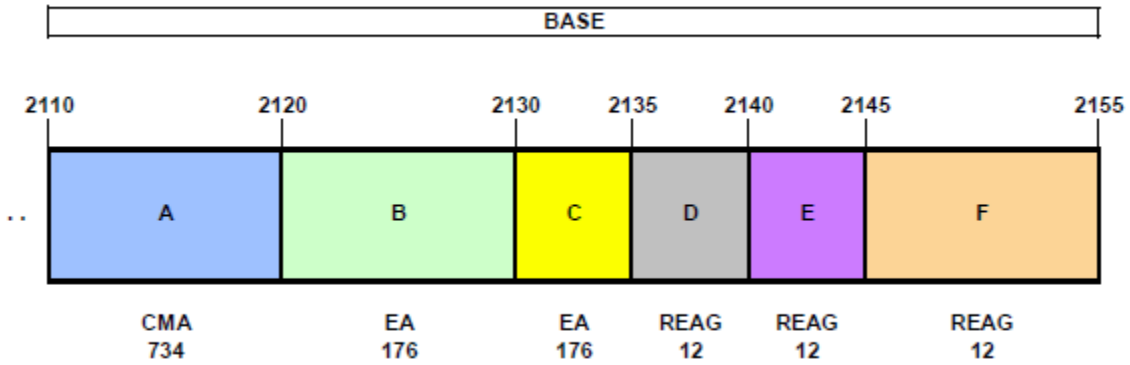


2.5.2.4 AWS band

Up Link



Down Link



2.5.2.5 GPS L1 Band

- 1575.42 +/- 10MHz band

2.5.3 RHU RF specifications

Table 2-5 RF specifications

Parameters	Values		Remarks
Frequency	Band	DL	UL
	700MHz	728 - 757MHz	698 – 716MHz, 776 – 787MHz
	850MHz	862 – 894MHz	817 – 849MHz
	1900MHz	1910 – 1995MHz	1850 – 1915MHz
	AWS	2110 – 2155MHz	1710 – 1755MHz

Bandwidth	Any 30MHz BW in each band		
Channel filter BW	Combination of 1.25MHz BW		@ Except 850MHz band
Input level	DL	-60 ~ -30dBm/total	@ each band total input level
	UL	0dBm/total max.	@ from SRU/BEU
Output level	DL	0dBm/total	@ optic input level
	UL	20dBm/total	@ Link ANT output level
RF Gain	DL	45dB typ. by 1dB step	@ 10 ~ 40dB gain control
	UL	45dB typ. by 1dB step	@ 10 ~ 40dB gain control
Gain Flatness	2dBp-p		@ Any 30MHz BW
Inband gain difference	3dB max.		@ all band width of each band
Noise Figure	DL	Less than 6dB	@ 40dB gain of DL
Noise level	UL	Less than -88dBm/Hz	@ RHU UL 45dB gain
Optical wavelength	DL 1310nm / UL 1550nm		
Available Optic Loss	5dBo max.		@ RHU – RU
Out of band rejection	More than 40dBc More than 100dBc More than 100dBc		@ ±1.25MHz from band edge @ out of band @ DL/UL Isolation
RF port VSWR	1.5: 1 max.		@ All of RF Port
Frequency Stability	±0.02 ppm		
System Delay	3.0usec max.		
Isolation Margin detect	0dB ~ 20dB Margin		
Fiber Connector	LC/UPC		
RF connector	ANT Port: 4.3-10 Female		
Power consumption	100W max. for 4-Band RHU 80W max. for 2-Band &		@ 20dBm output of UL HPA
DC power	PoE/AC120V AC120V only		@ 2-Band Mobile and 2-GPS @ 4-Band Mobile

3 Installation

3.1 Installation Requirements

Before and during installation, the following should be carefully verified in order to avoid any problem:

- Faulty Cabling/Connectors: Fiber cable and connectors must be verified prior to plugging into the RHU
- Dirty Connectors and ports
- Faulty Radio Hub Unit (RHU) components
- RF source equipment issue
- External RF Interface problem such as antenna port

The following guidelines are required when the RHU is installed on the 19” rack of Headend room:

- Locate the equipment with the space for the sufficient airflow to prevent build-up from the overheating. Do not compromise the amount of airflow required for safe operation of the equipment.
- Verify the power connection and Fiber cables prior to turning on the systems.

WARNING: Equipment loading must be verified prior to mounting the equipment on the wall or 19" rack.

3.1.1 General Safety Precautions

The following precautions apply to the RHU:

- The units have no user-serviceable parts. Faulty or failed units are fully replaceable through Intelibs.
- When the Fiber cable is connected to the equipment, the connectors must be free from the dust and connected according to the cable manufacturer's instructions. (WARNING: For the safety, DO NOT conduct eye-contact at the connector ends of the fibers or the port of the RHU and SRU unless equipped with protection goggle. Invisible infrared radiation may be present at the front panel of the RHU and SRU. Do not remove the fiber port dust caps unless the port is going to be used. Do not stare directly into a fiber port.)

3.2 Installation Tools

Table 3-1 Installation tools

Torque Wrench1	Torque Wrench 2	ESD Gloves	Shrink Tubes
LC/UPCOptic Fiber, 10m	Ground wire line	5ea of ANT RF Cable	Wire Stripper & Cutter
Digital Multi-meter	Screw Driver	Optic connector cleaner	Heat Gun
Wideband Link Antennas	Fixing bolts and nuts		

3.3 Item Check List

Check that all the following items have been included with the box delivered. If anything is missing, please contact Intelibs.

Table 3-2 Item check list

RHU	AC power cable or PoE Injector		Mounting bracket
RHU 1set	AC power cable: 1.5m, 1 ea	PoE Injector 1 ea	

3.4 Mounting

RHU supports wall mount. The following diagrams illustrate the methods for mounting RHU on a typical wall.

Step 1

- Mark the upper position by using the wall mount bracket drawing paper.
- Mark the lower position by using the wall mount bracket drawing paper.

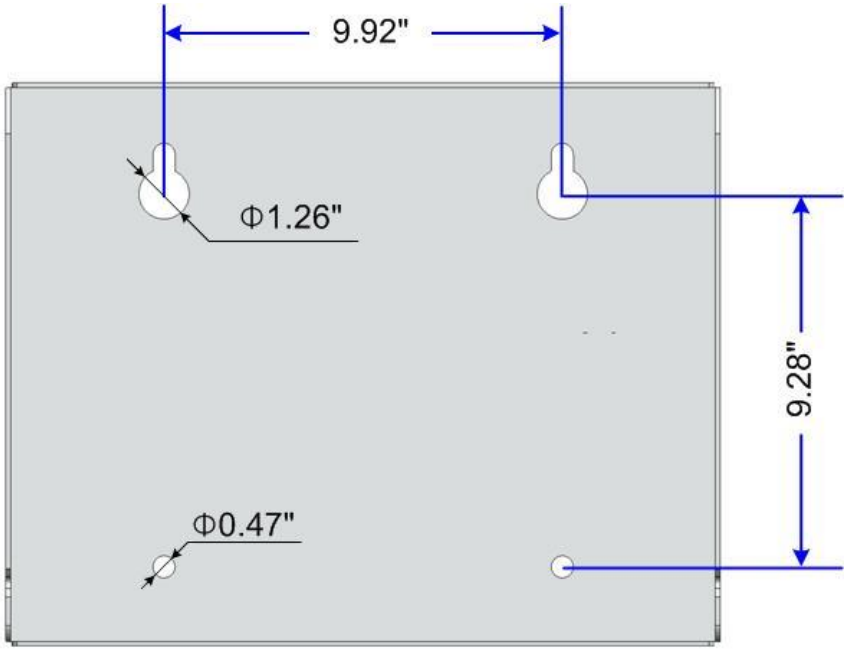


Figure 3-1 Mark the installation position

Step 2

- Install wall mount bracket to the wall using 4 anchor bolts.

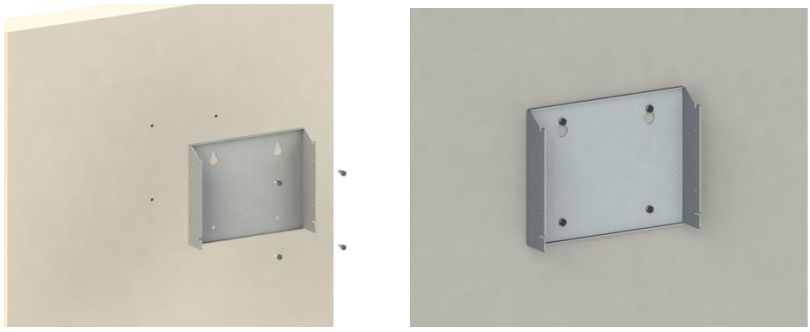


Figure 3-2 Install the wall mount bracket

Step 3

- Install the RHU system as figure below.

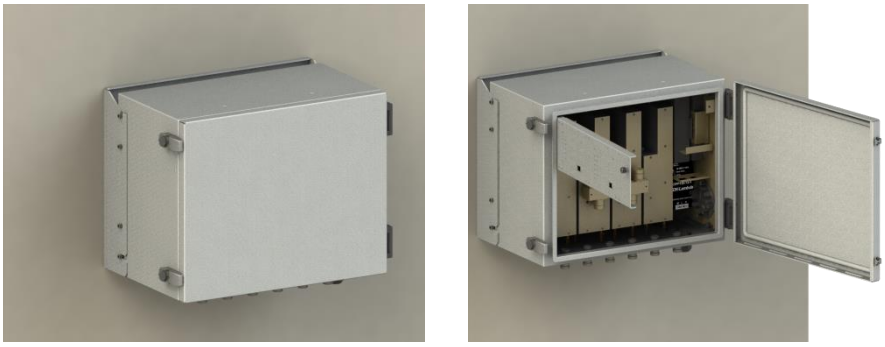
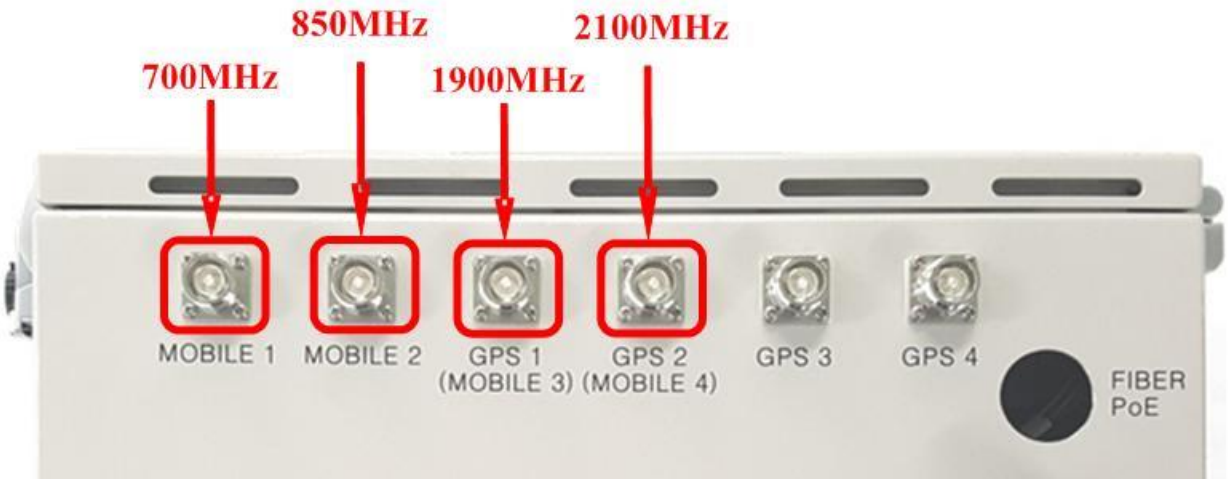


Figure 3-3 Install the RHU to the installed wall mount bracket

3.5 Link (Donor) Antenna

RHU has six antenna ports. 4 ports of them are the ports for 700MHz/850MHz/1900MHz/2100MHz antennas and the other two/four ports are the ports for two/four GPS antennas. Connect each 4.3-10 male antenna cable to the desired antenna port, as Figure below.



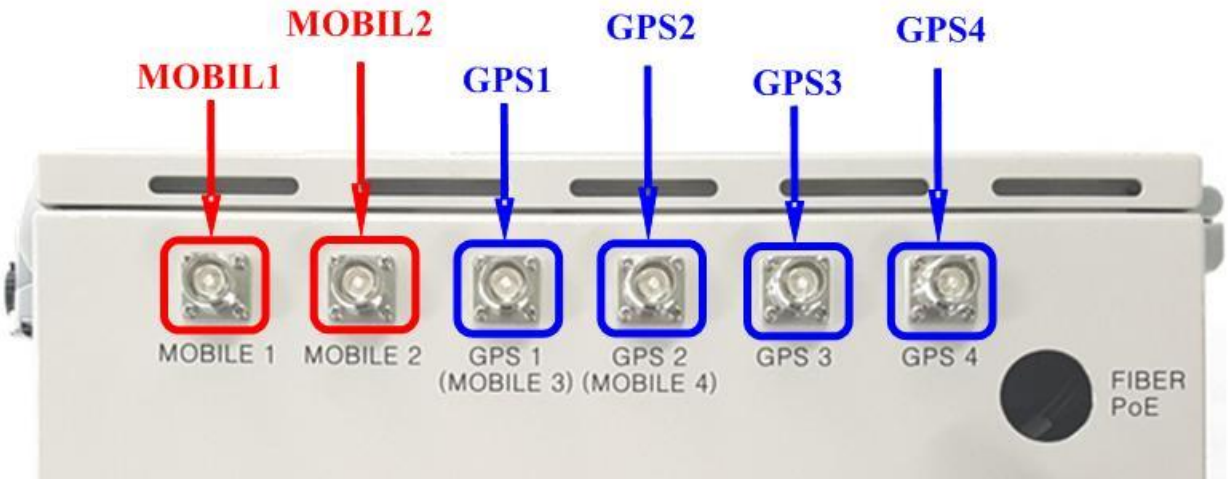


Figure 3-4 Link/GPS Antenna port

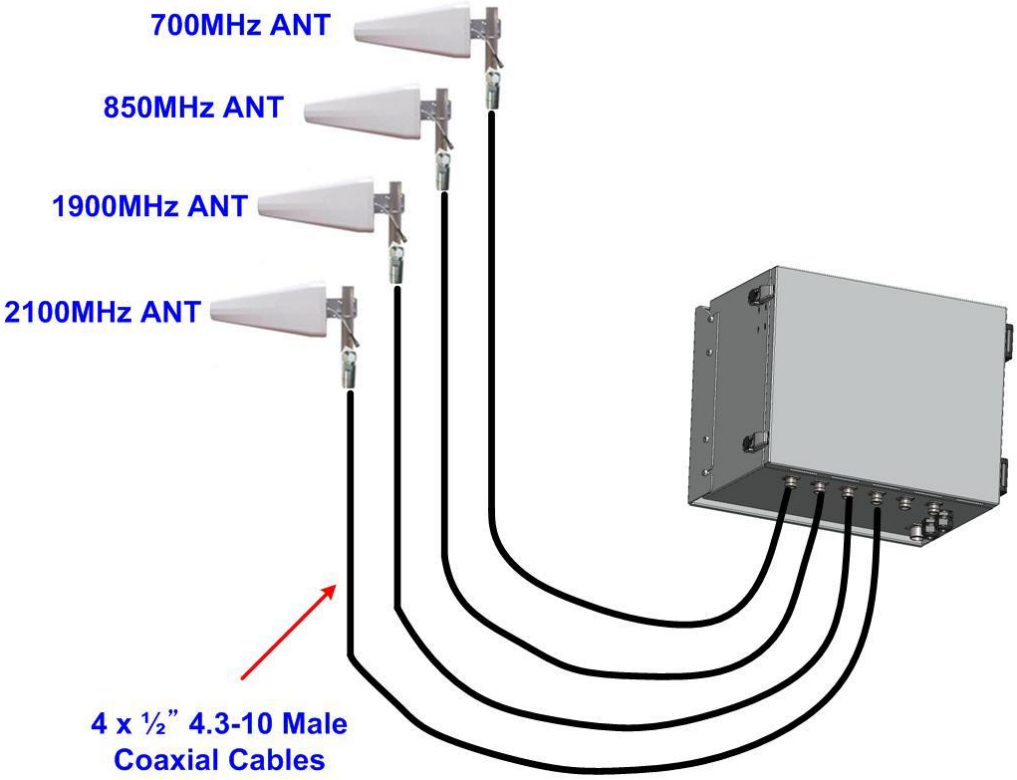


Figure 3-5(a) 4Band Link Antenna connection diagram

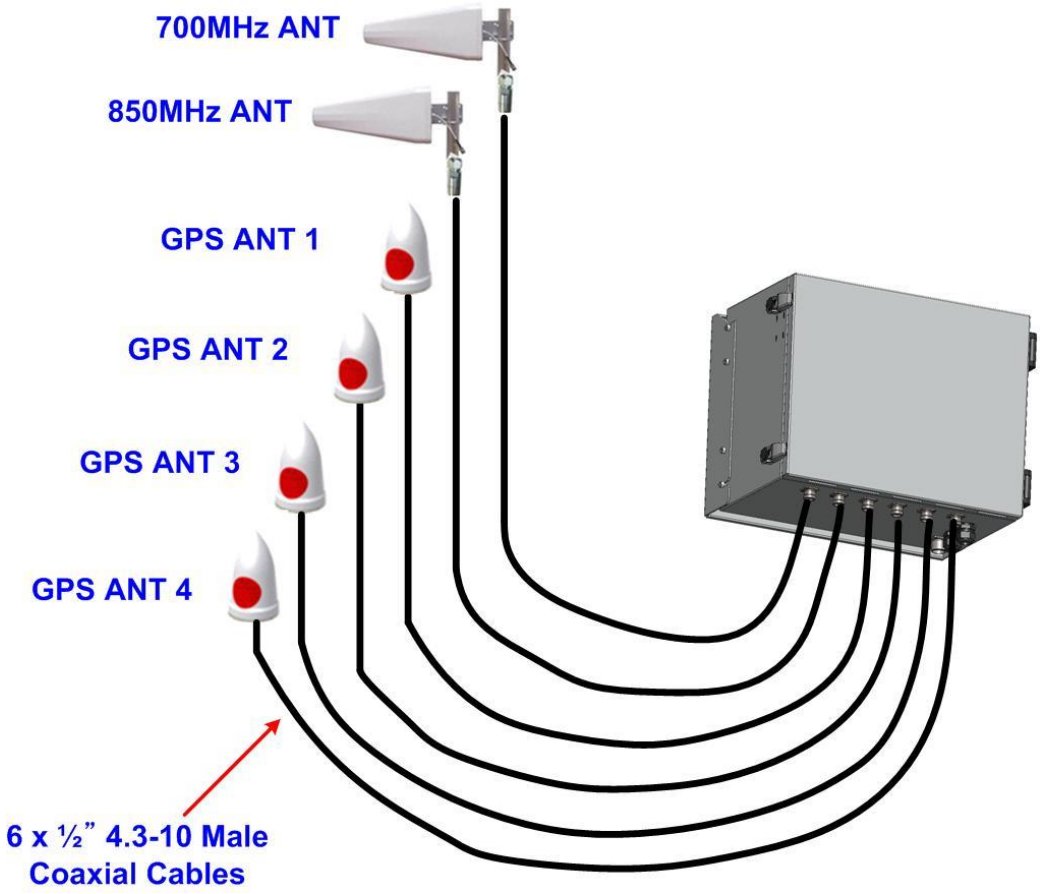
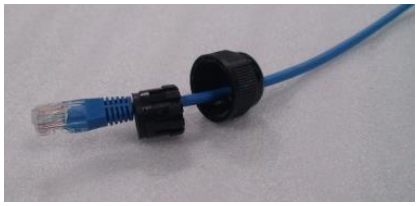


Figure 3-5(b) 2Band Link Antenna and 4CH GPS Antenna connection diagram

3.6 Power cable

1. The case of PoE Input
   1) Please release gland cap and put Ethernet cable into cap and water protection rubber ring as following picture.



   2) Reassemble cable gland to insert Ethernet cable into RHU enclosure as follows.

3) Please connect Ethernet cable to RJ-45 connector of RHU inside as following picture. And you can find LEDs are turned on if Ethernet cable has DC power.

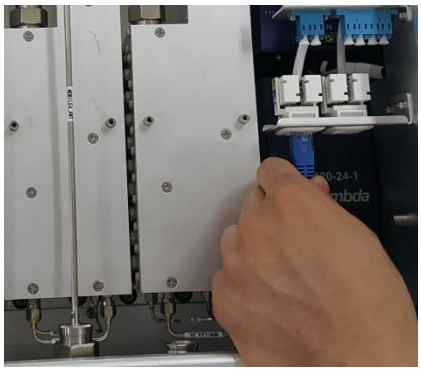


Figure 3-6 Power cable connection (PoE type)

2. The case of AC Input
   Connect MS connector-type power cable which is supplied with RHU to the “AC POWER” port. When connecting the end terminal, align connector at latch and hole position as figure below.

Figure 3-7Power cable connection (AC type)

3.7 Optic cable

RHU provides Six optic ports. Fiber_1 and Fiber_2 are the ports to connect with FHU/SRU/MRU, and Fiber_3 to Fiber_6 are the ports to connect with GPS BEUs. The type of fiber connector is all LC/UPC type connector as figure below.

[LC/UPC type fiber connector]

Figure 3-8 LC/UPC fiber connector connection

Connect the fiber connector to the desired optic port in RHU. When connecting the optic connector, align the connector at latch and hole position, then plug in deeply to get the right connection.

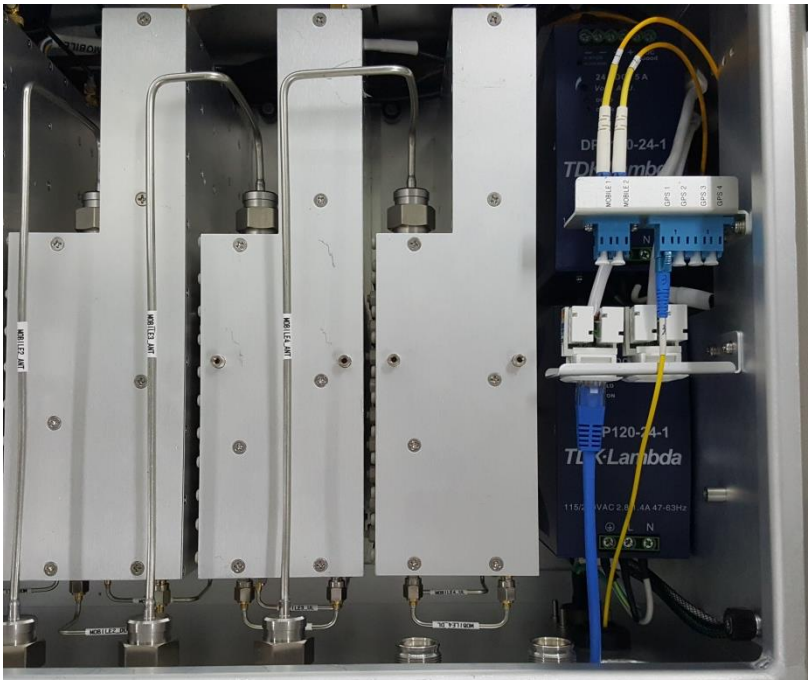


Figure 3-9 Fiber cable connection on RHU

4 Configuration and Maintenance

RHU can be configured in three ways via remote internet connection or local serial port connection.

- Local management interface through the internet and serial connection.
- Web interface through the internet
- SNMP interface through the internet

Master Unit is a remote management system that provides SNMP v3 and Web interface, and maintains all functions of iDAS system including configurations, monitoring, and real time alarm reporting.

LMT (Local Management Terminal) is local management interface through serial interface.

The configuration and maintenance for RHU is performed by accessing RHU through any interfaces.

Figure below describes a typical iDAS management system network and the entities and management system network of RHU-iDAS is a part of total DAS management. Red marked part is the management network of RHU iDAS system.

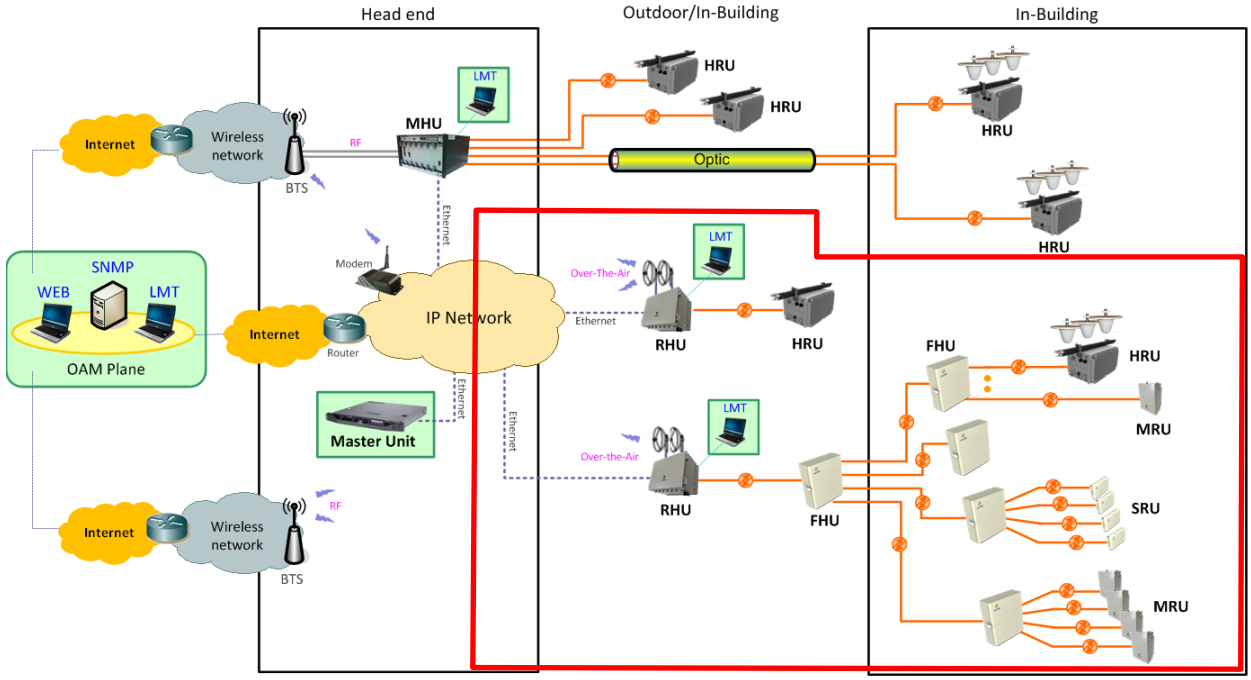


Figure 4-1 DAS management network and entities

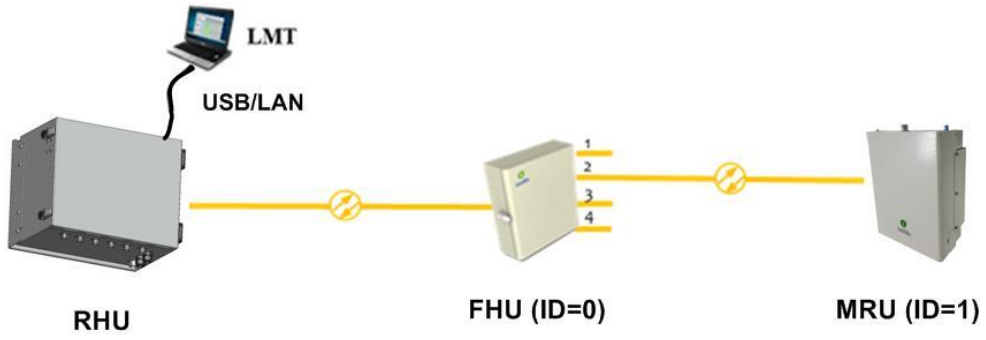


Figure 4-2 RHU-MRU network

Figure 4-2 is an example of DAS network using LMT to configure DAS system. Following sections describes how to configure and manage RHU system using LMT via serial/LAN connection or using Web Interface via Internet.

4.1 Configuring RHU using LMT

If one of serial connection has been established, LMT is ready to start. Launch the Local Management application by clicking the icon “iDAS” and refer to following information.

4.1.1 LMT GUI (Graphic User Interface) Program

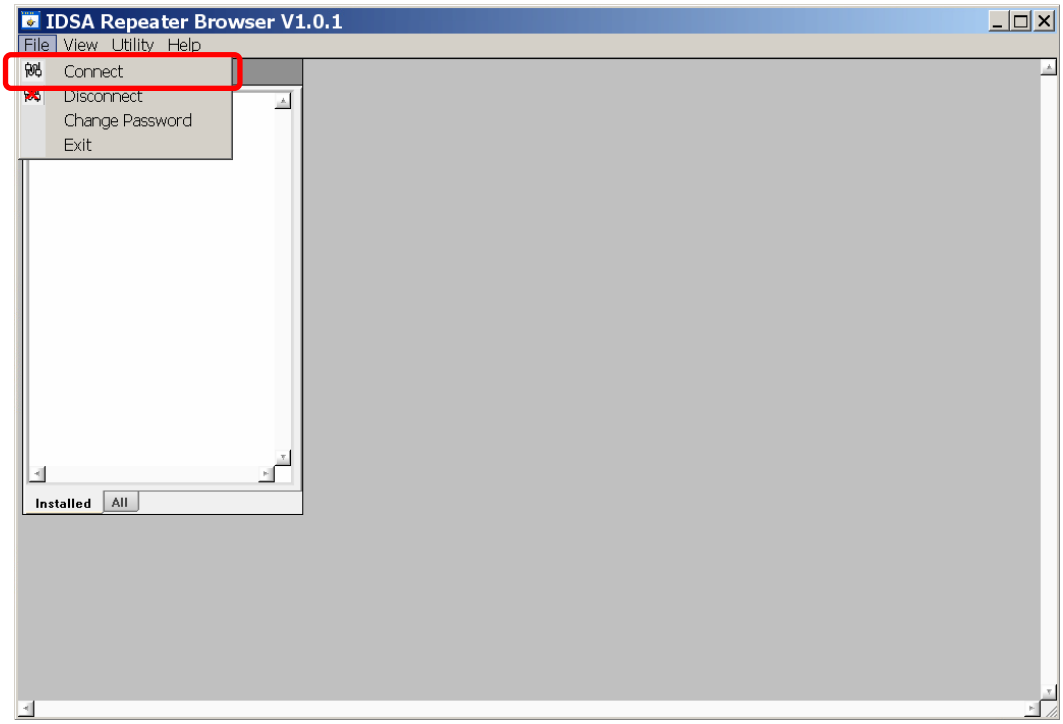
This program is a iDAS management program and provides status of all DAS parameter and can control each parameter you want to control.

4.1.2 System Requirement

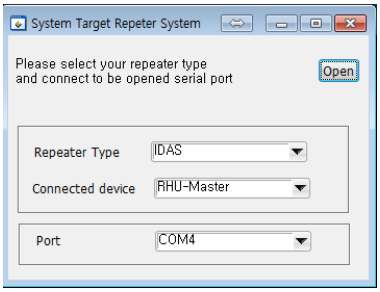
- ⇨ System: Desktop or laptop PC
- ⇨ OS: Windows XP or later version. GUI developed under Windows 7.
- ⇨ Resolution: 1024 ✕ 768 or more

4.1.3 How to connect RHU using LMT GUI

1. Double click iDAS.exe ( ) icon to open LMT GUI of RHU. Then you can see following screen. Press “Connect” button in drop down menu of File.

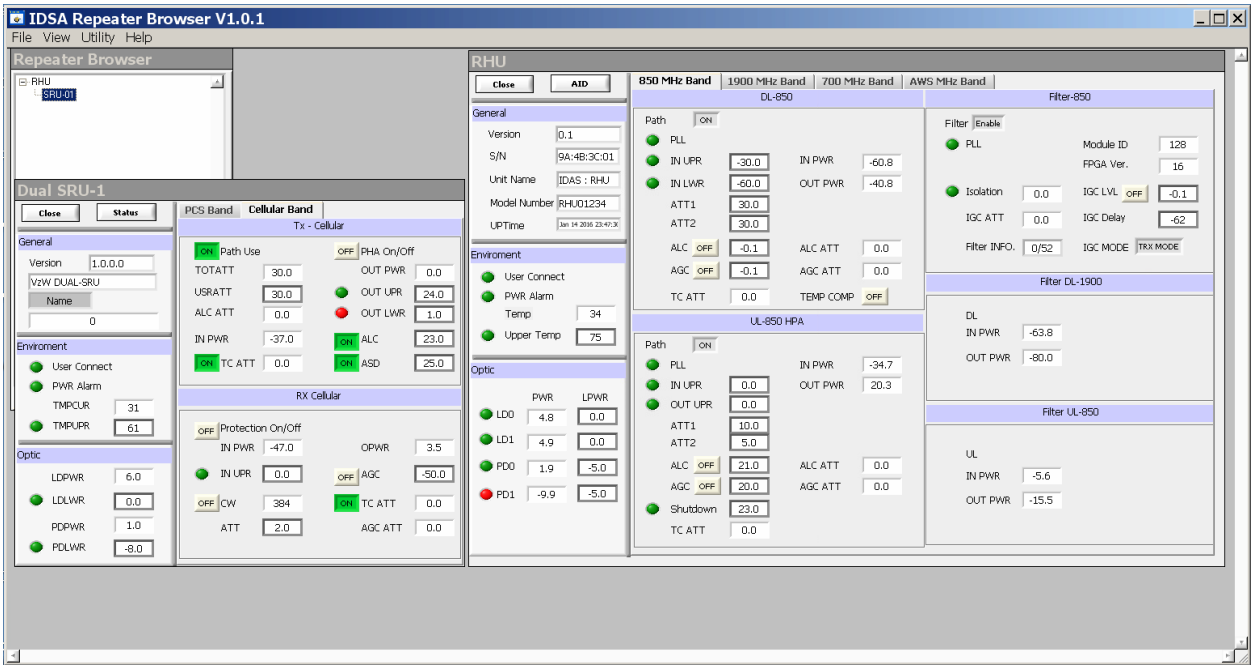


2. After following screen is appeared, please select parameters on this screen as refer to the table below.



Function	Establishing communication between GUI and repeater	
Method	Click button in Menu bar of GUI program	
Description	Port	Combo box to select the com port (COM1, COM2, …) which serial port is set up in Laptop
	Repeater type	Select the “iDAS” system
	Connected device	Select “RHU-Master” if you want to connect to RHU unit

4.1.4 Main Window of LMT GUI



Section	Description
Window Title	IDSA Repeater Browser V1.0.1 , RHU Displays the name and version of management program (GUI) Displays the type of equipment currently connected to the program (RHU or SRU).
Menu Bar	File View Utility Help Presents the working menu for operation. It is associated with tool icons which can activate the tool bar menus.
Work Space	Status information and control functions are provided with new window screen of RHU and SRU.

4.1.4.1 Status Display of LMT GUI

Parameters status of each unit are displayed by color of LED's and values.

⇨ LED

- Alarm: indicates ALARM, indicates NORMAL
- On/Off: ON means ON, OFF means OFF

⇨ Value

- Units are not displayed.
- Value displayed in box (0.0)

⇨ Control

- The texts of controllable LED or values are displayed in BOLD font. AID

4.1.4.2 *Control Policy of LMT GUI*

⇨ Basically, user can change one item at a time.

⇨ Click a controllable item (text, or button)

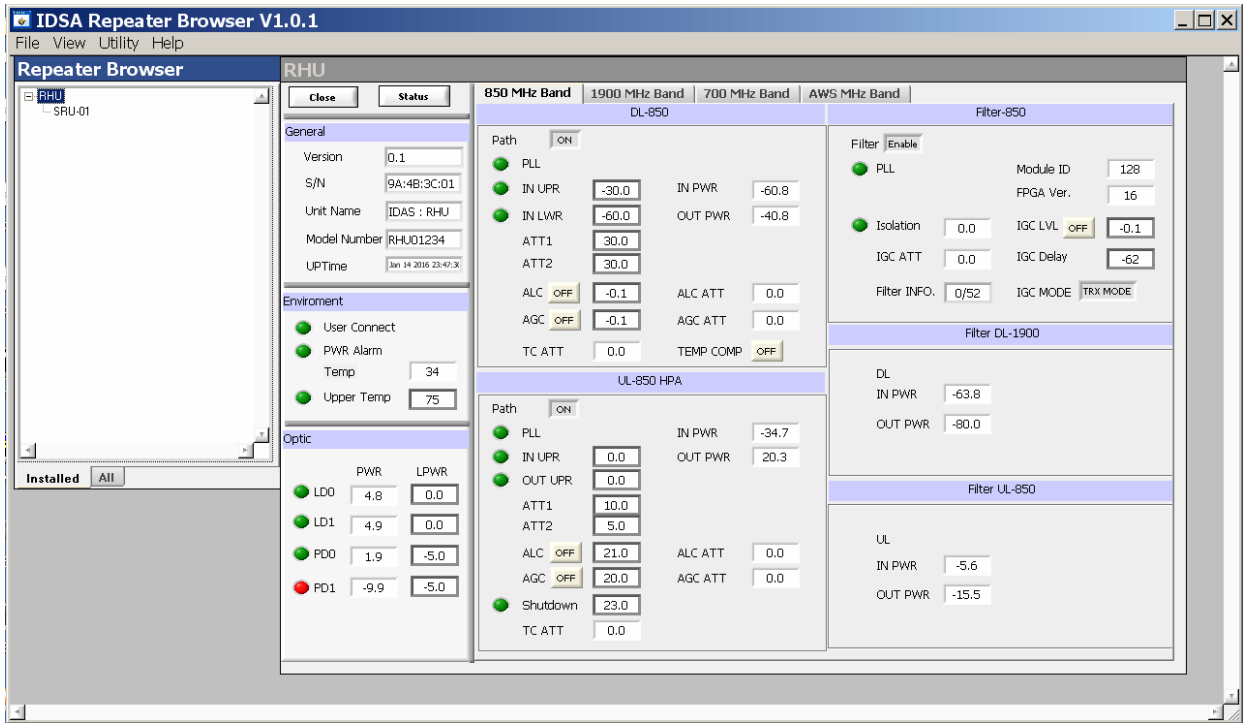
⇨ To go to Control Mode, press Status button. Then this button will be changed to AID. Please "enter" key to confirm the control action after changing any parameter you want to change.

4.1.4.3 *Description of Manu bar of LMT GUI*

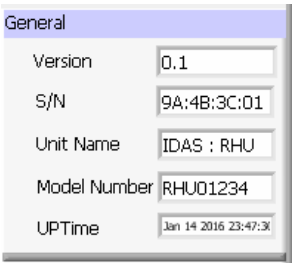
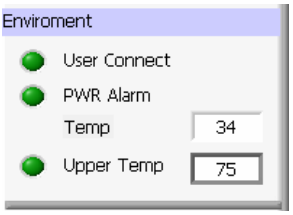
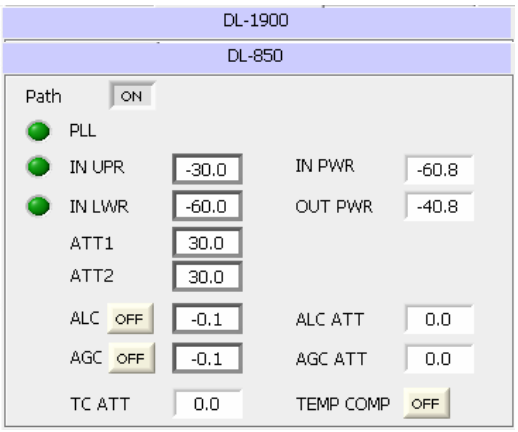
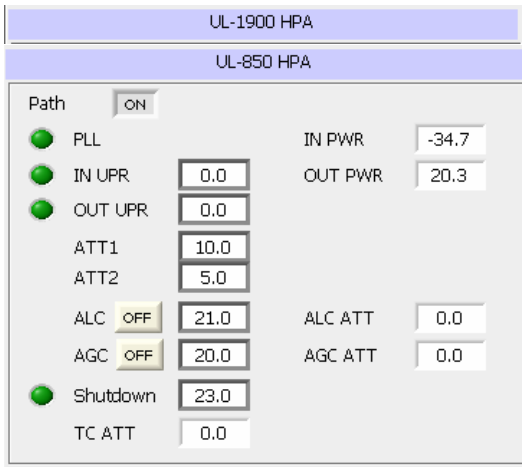
Menu	Sub Menu	Function
File	Connect	Establishes connection between PC(GUI) and DAS unit
	Disconnect	Disconnects connection between PC(GUI) and DAS unit
	Exit	Finishes the GUI program.
View	Packet Debug	Presents debug packets of communication between DAS unit and GUI program
Utility	Firmware Download	Downloads compressed firmware file to RHU equipment
	Table	Presents RF/Optic power, temperature compensation, Attenuator table
Help	About	Displays the version information of GUI

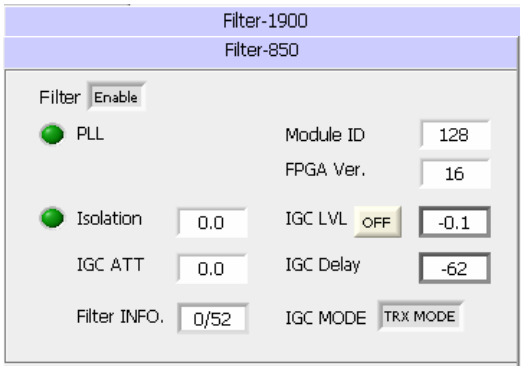
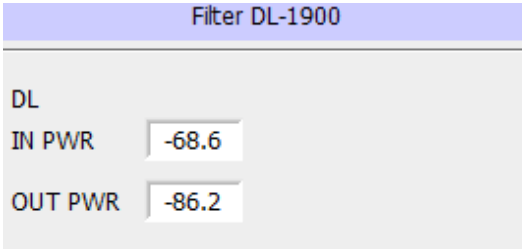
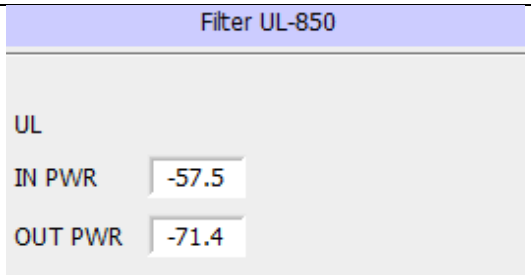
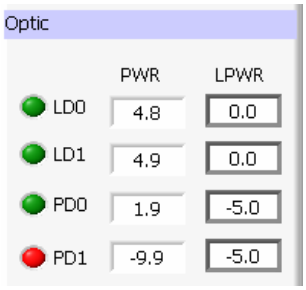
4.2 Detail description of Manu bar in GUI

4.2.1 RHU window in GUI screen

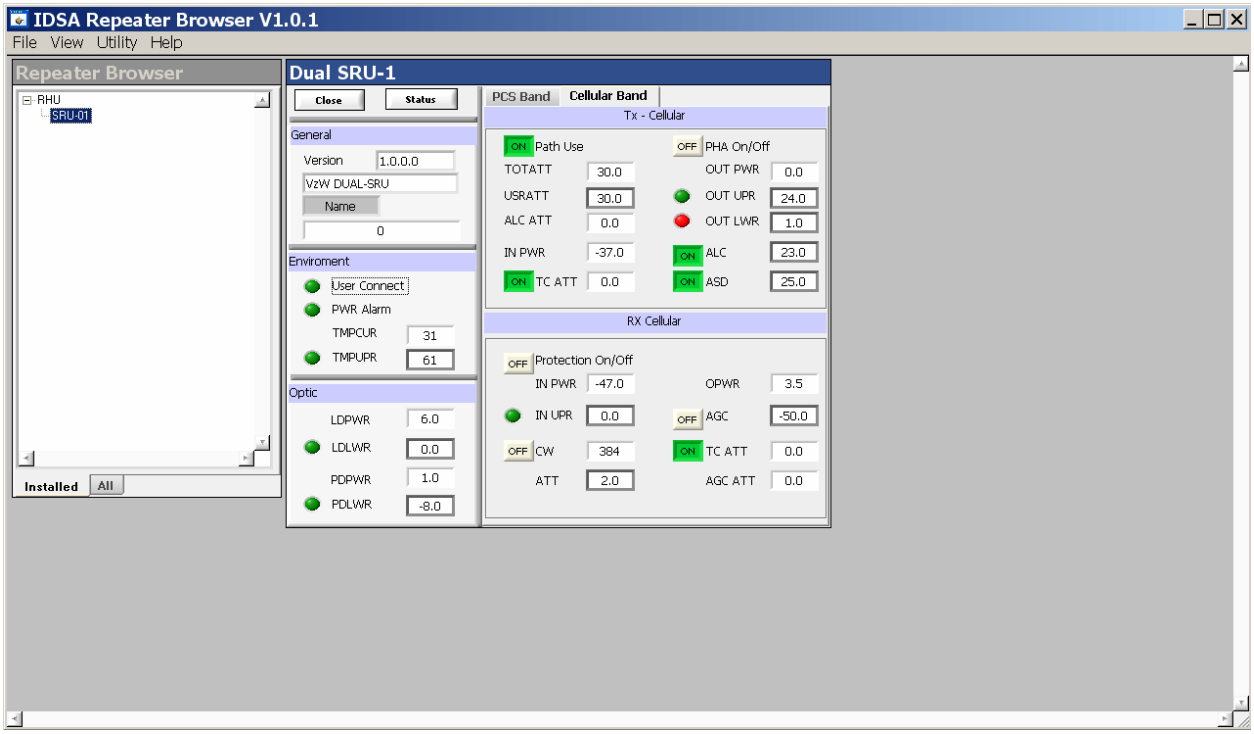


4.2.2 Parameters details in RHU window

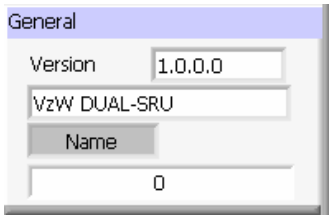
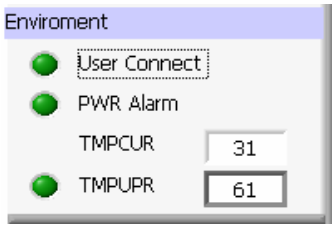
Group	Description
	⇨ Version: Firmware Version ⇨ S/N: RHU Serial Number ⇨ Unit Name: RHU ⇨ Model Number: Model number of RHU ⇨ Up Time: operating time and date
	⇨ User Connect: Connection status between Laptop and RHU ⇨ PWR Alarm: DC power alarm ⇨ Temp: Current temperature of the inside of unit ⇨ Upper Temp: set the upper threshold value of temperature(Value) and alarm status (LED)
	⇨ Band screen selection TAB.
	❖ Down Link monitoring and control item of each band ⇨ Path ON/OFF: DL Path ON/OFF function ⇨ PLL: PLL lock alarm indicator ⇨ IN PWR: DL input power level coming from ANT ⇨ OUT PWR: DL output power level transmit to OMU ⇨ IN UPR: DL input upper limit value and alarm ⇨ IN LWR: DL input lower limit value and alarm ⇨ ATT 1&2: DL attenuation value for the DL gain control ⇨ ALC: Auto level limit control value and on/off button ⇨ AGC : Auto gain control level and on/off set button ⇨ TC ATT: Temperature compensation Attenuation and On/Off set button
	❖ Up Link monitoring and control item of each band ⇨ Path ON/OFF: UL Path ON/OFF function ⇨ PLL: PLL lock alarm indicator ⇨ IN PWR: UL input power value ⇨ OUT PWR: UL Output power value ⇨ IN UPR: UL input upper limit value and alarm ⇨ IN LWR: UL input lower limit value and alarm ⇨ ATT 1 & 2: UL Attenuation value for the UL gain control ⇨ ALC: Auto level limit control value and on/off set ⇨ AGC : Auto gain control level and on/off set ⇨ Shutdown: Auto shutdown level value set ⇨ TC ATT: Temperature compensation Attenuation and On/Off button

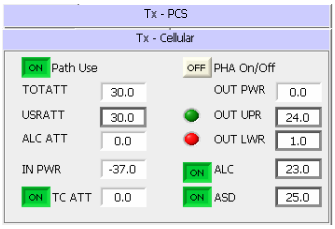
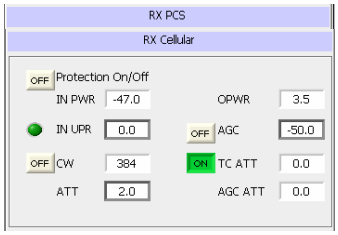
	❖ Digital Filter monitoring and control item of each band ⇨ Filter Enable: Digital filter Enable set ⇨ PLL: FPGA PLL lock alarm ⇨ Module ID: Digital filter ID information of FPGA. ⇨ FPGA Ver.: FPGA SW version ⇨ Isolation: Isolation margin between two antennas ⇨ IGC LVL: Isolation gain control target margin level set and IGC protection function On / Off ⇨ IGC ATT: applied attenuation value by IGC function ⇨ IGC Delay: Delay set for IGC function ⇨ Filter Info: Digital filter setting information ⇨ IGC MODE: IGC control Tx only or Tx/Rx simultaneously
	❖ DL Input/Output level indicator of Digital Filter ⇨ IN PWR: DL input level at digital filter input port ⇨ OUT PWR: DL output level at digital filter output port
	❖ UL Input/Output level indicator of Digital Filter ⇨ IN PWR: UL input level at digital filter input port ⇨ OUT PWR: UL output level at digital filter output port
	❖ Optic parts monitoring and control item of RHU ⇨ LD0: Transmitting LD power level value from Optic1 port ⇨ LPWR: Lower alarm limit value of LD0 power level and lower alarm status of LD0 ⇨ LD1: Transmitting LD power level value from Optic2 port ⇨ LPWR: Lower alarm limit value of LD1 power level and lower alarm status of LD1 ⇨ PD0: Receiving PD power level value from Optic1 port ⇨ LPWR: Lower alarm limit value of PD0 power level and lower alarm status of PD0 ⇨ PD1: Receiving PD power level value from Optic2 port ⇨ LPWR: Lower alarm limit value of PD1 power level and lower alarm status of PD1

4.2.3 SRU window in GUI screen



4.2.4 Parameters details in SRU window

Group	Description
	⇨ Version: Firmware version ⇨ Type: Type of RU unit ⇨ Name: Set the Name, ID, Serial No. of iDAS RU
	⇨ User Connect: Connection status between Laptop and SRU ⇨ PSU: DC alarm status ⇨ TMPCUR: Current temperature of SRU inside ⇨ TMPUPR: Value/control of upper threshold of temperature (button) and alarm status (LED)
	⇨ LDPWR: TransmittedLD power level value ⇨ LDLWR: Lower threshold of LD power level and lower alarm status of LD ⇨ PDPWR: ReceivedPD power level value ⇨ PDLWR: Lower threshold of PD power level and lower alarm status of PD

PCS Band Cellular Band	⇨ SRU parameter screen selection for PCS/Cellular band TAB.
	⇨ Path Use: Path use/not use selection ⇨ TOTATT: Total attenuation value that is applied to DL path [TOTATT= USRATT + ALCATT + TCATT] ⇨ USRATT: User attenuation set value for user gain set ⇨ ALCATT: Attenuation value that controls DL gain automatically to maintain output level under ALC level when HPA output is higher than ALC level. ⇨ INPWR: Input power level which input to SRU ⇨ TCATT: Temperature compensation attenuation value and temperature compensation Function ON/OFF ⇨ HPA On/Off: HPA ON/OFF function ⇨ OUT PWR: Transmitting output power level from SRU antenna port ⇨ OUT UPR: Output upper threshold level value and alarm ⇨ OUT LWR: Output lower threshold level value and alarm ⇨ ALC: Auto level limit control threshold value and on/off set ⇨ ASD: Auto level shutdown threshold value and on/off set
	⇨ Protection On/Off: Protection Function ON/OFF to protect SRU from over input power ⇨ IN UPR: UL(Rx) input upper threshold level value and alarm ⇨ CW: CH number of pilot signal and ON/OFF function to check UL path gain budget (Pilot signal power level is -60dBm) ⇨ IN PWR: RVS power value at the LNA output point ⇨ ATT: User attenuation set value to control UL(Rx) gain ⇨ OPWR: UL output power level of SRU ⇨ AGC: Auto gain control level value and Function ON/OFF ⇨ AGC ATT: Applied attenuation value by AGC function ⇨ TC ATT: Applied temperature compensation attenuation value and function ON/OFF

4.3 Firmware download

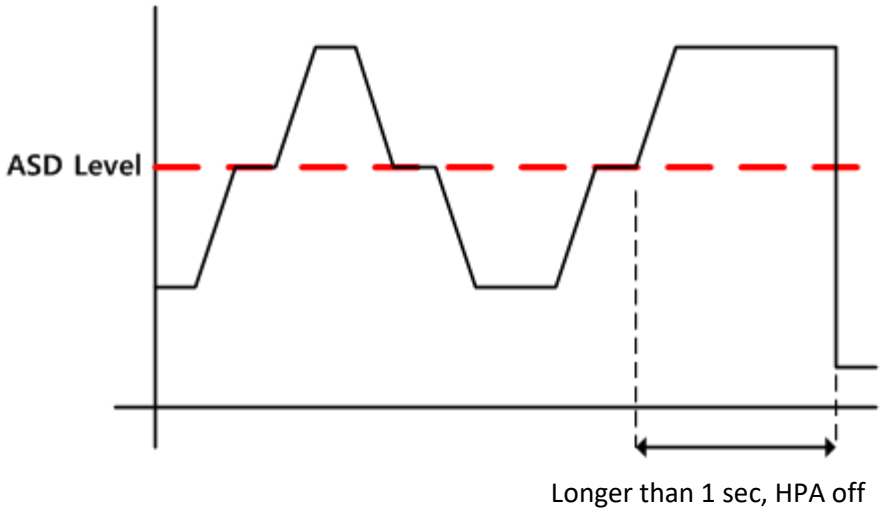
Firmware download is performed when system needs to be updated.

Downloading improper images (executable file of repeater CPU) may cause harmful damages to equipment.

4.4 Additional function of RHU

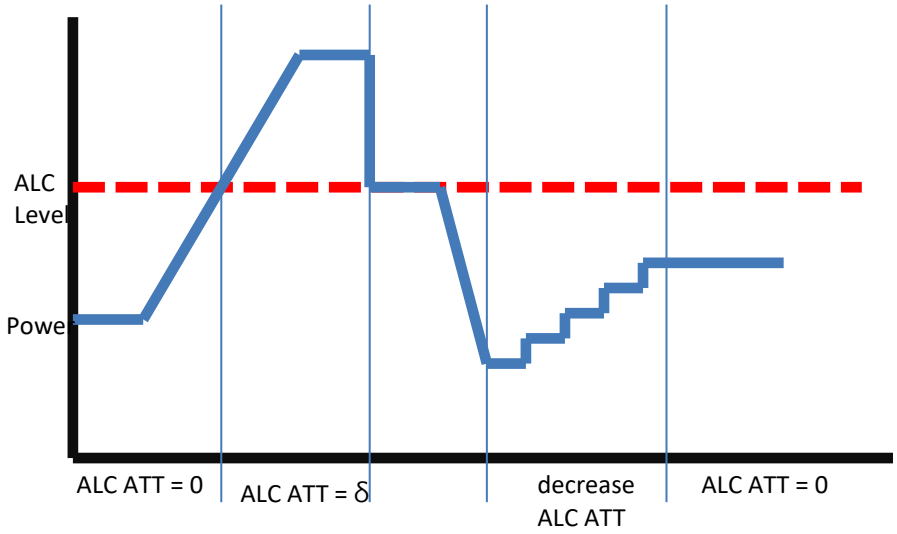
4.4.1 ASD (Auto Shutdown) Function

1. If UL output power level of RHU is above the shutdown level longer than 1 second, RHU automatically turns off amplifier to protect undesirable transmission.
2. During shutdown state, monitor RU input power. If the level is below5dBfrom shut down level, turns on UL amplifier automatically.



4.4.2 ALC (Auto Limit level Control) Function

1. If UL output power level of RHU reaches the ALC level, RHU decrease the output power to maintain ALC level automatically.
2. When power level goes down under ALC level, RHU increase output power until ALC ATT is 0 by 500msec ~ 1sec speed.

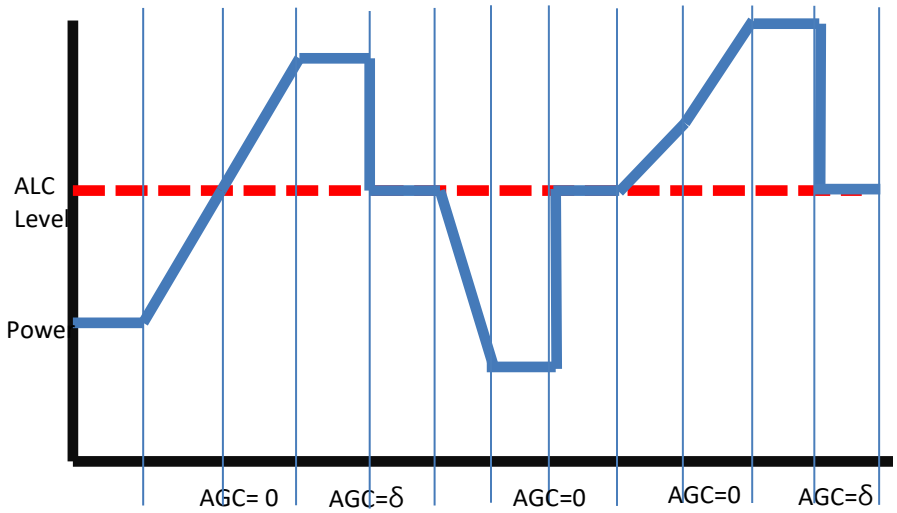


4.4.3 AGC (Auto Gain Control) Function

1. In order to have stable output power, RHU has AGC function that can maintain constant output power with setting output level.
2. When input level is decreased RHU increase gain to maintain continuous output level, when

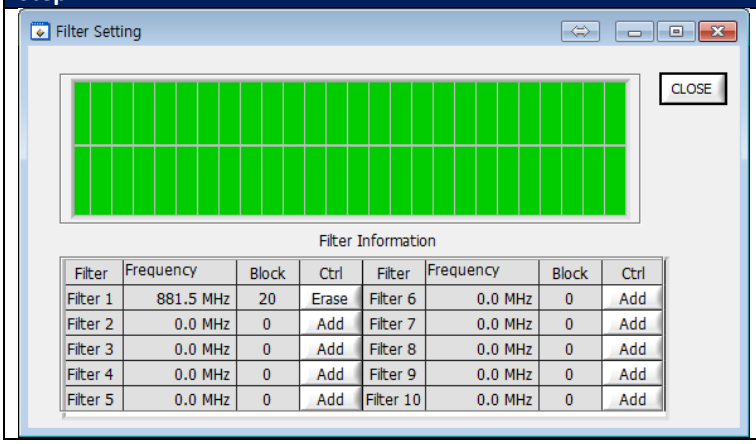
input power is increase RHU decrease gain to have same output power automatically.

3. RHU works AGC function by 500msec ~ 1sec speed.



4.4.4 Sub-band selection Function

RHU can select sub-band up to 10 bands in 65MHz bandwidth using digital filter function. These sub-band filters have very sharp cut-off characteristics and RHU can provide the signal of selected band of 65MHz BW to coverage area. This digital signal processing function also provide input signal information and antenna isolation information between link and coverage antennas.

Step	Descriptions
	If you click “Filter INFO” like following picture Filter INFO. 0/52 You can build up band pass filter up to 10 filters. Input center frequency, number of block for sub-band and click “Add” button, sub-band filter is built up. If you want to erase filter, click “Erase” button.

Filter	Frequency	Block	Ctrl	Filter	Frequency	Block	Ctrl
Filter 1	881.5 MHz	20	Erase	Filter 6	0.0 MHz	0	Add
Filter 2	0.0 MHz	0	Add	Filter 7	0.0 MHz	0	Add
Filter 3	0.0 MHz	0	Add	Filter 8	0.0 MHz	0	Add
Filter 4	0.0 MHz	0	Add	Filter 9	0.0 MHz	0	Add
Filter 5	0.0 MHz	0	Add	Filter 10	0.0 MHz	0	Add

5 Human RF Exposure and Antenna placement guide

Actual distance is determined upon gain of antenna used. Please maintain a minimum safe distance of at least 40 cm while operating near the donor antennas with the maximum permissive antenna gain up to 18 dBi and 8.45 dBi for the 1710-1755 MHz frequency band.

Note: According to Part 27.50 (d)(4), fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground.

Limited Warranty

Intelibs, Inc. ("Intelibs") offers a standard two year warranty from defects in material and installation. INTELIBS may at any time exclude from this Agreement any Hardware or Software which (1) has been modified, repaired or serviced by anyone other than Intelibs' service staff without the prior written approval of Intelibs, (2) has been subjected to unusual physical or electrical stress, whether such stress results from accident, neglect, misuse, lightning, failure of electrical power, air conditioning, humidity control, transportation, the making of specification or configuration changes requested by Customer, or any other cause other than ordinary use, and whether or not such stress is the fault of the Customer, (3) has been purchased from another Vendor and is networked, linked, attached or otherwise intended to work with the System or (4) has been moved from the place of installation. When the system has been improperly modified, repaired, stressed, used or moved as described above, Intelibs may, at its option and subject to the approval of the Customer, perform such corrective work, including any repairs, replacements and adjustments, as are in Vendor's opinion necessary to restore the System to the condition it would have been in if subjected only to normal wear and tear at the Customer's expense.

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SNMPv3 30
Web interface 30

Contact: supports@intelibs.com

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