STR250R01C Operating Manual

2011. 6.

Kisan Telecom

Content

IMPORTANT NOTE: FCC RF Radiation Exposure Statement: This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

1. Introduction

1.1. General Introduction

As an equipment to clear RF shadows inevitably generated between the adjacent cells of CDMA, STR250R01C supports CDMA and effectively repeats the signals between mobile terminals in weak coverage area and BTS.

This equipment is Dual Band Optical DAS that support 850MHz and 1900MHz bands simultaneously, and it is designed to support CDMA for each band.

This equipment provides the effective and flexible solution to service providers to improve quality of service for their subscribers.

The main objectives of STR250R01C are as follows:

- **Expansion of coverage**
- **Enhancement of service quality in areas such as tunnels or in-building**
- **Improvement in signal strength at places where the signal level is less than desired.**
- **Support dual bands of 850MHz and 1900MHz.**
- **Support single mode of CDMA for each band.**
- **RU power consumption and RU size optimization by built-in Crest Factor Reduction (CFR) technology for the CDMA signal.**

2. System Network Configuration

2.1. Network configuration

STR250R01C repeater is equipment to clear RF shadows, to fill coverage gaps existing among the adjacent cells and to enhance the quality of service by extending coverage of CDMA.

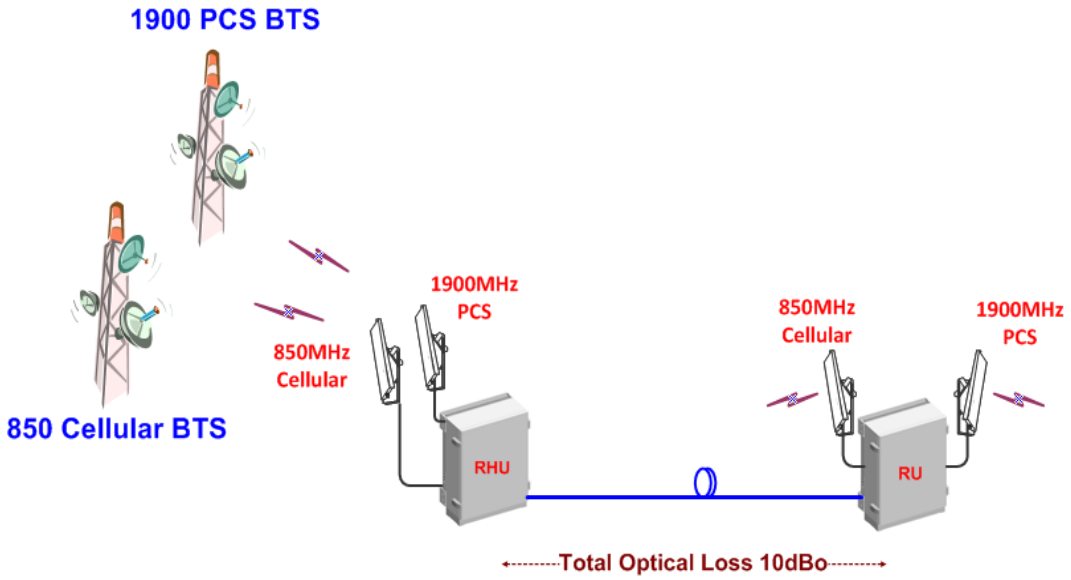
The following network configuration is for a case where the 1 RHU is connected with 1 RU by optical cables. The coverage antennas are connected to RU, and the link antennas are connected to RHU.

The following network configuration is for a case where the RHU co-located with BTS (CDMA) is connected with 6 RU's by optical cables. The coverage antennas are connected to each RU.

⇨ System configuration

- **RHU Capacity: 1 Optical Branch/DOU (1 Optical Branch/RHU)**
- **System Connection: Optical cable between RHU and RU**
- **Optic Wavelength: 1310nm for FWD, 1550nm for RVS**

- Max loss of optic cable (between RHU and RU): 2 ~ 10dBo
- 2 coverage ANT ports on RU. (Separate Ant. Ports for 850MHz and 1900MHz)
- 2 link ANT ports on RHU. (Separate Ant. Ports for 850MHz and 1900MHz)



[Network Configuration of Dual Band Optical DAS]

3. System Specifications

3.1. General Specifications

Item		RHU	RU
Enclosure Type		Cabinet	Cabinet
Dimension (mm)	W × H × D	471.7(H) X 263.4(W) X 304.8(D)mm	471.7(H) X 263.4(W) X 304.8(D)mm
	Weight	26.5 Kg	26.5 Kg
Power Supply		110-120Vac (Tolerance ±10%), 60Hz	110-120Vac (Tolerance ±10%), 60Hz
Power Connector		MS Connecter	MS Connecter
RF In/Out Port		N Type Female, bottom side	N Type Female, bottom side
Optic Connector Type		FC, bottom side	FC, bottom side
Optic Wavelength		FWD: 1310nm / RVS: 1550nm	
Operating Temperature		-5℃ ~ 50℃	-5℃ ~ 50℃

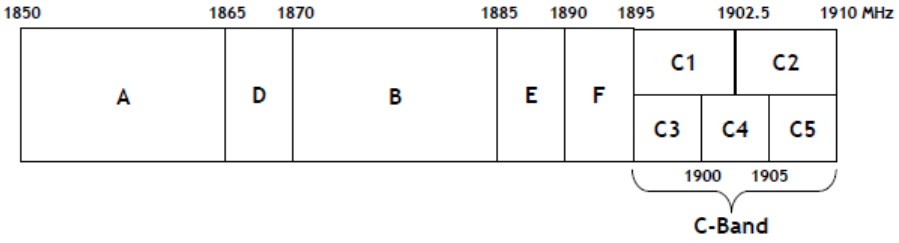
⇨ Environmental requirement

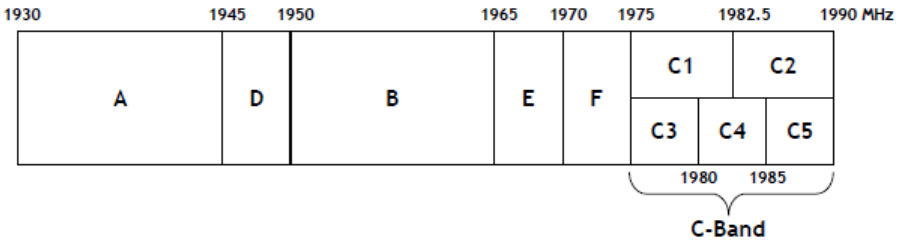
The repeater RHU & RU shall be operated in the temperature range of -5¡É ~ +50¡É.

3.2. System specifications

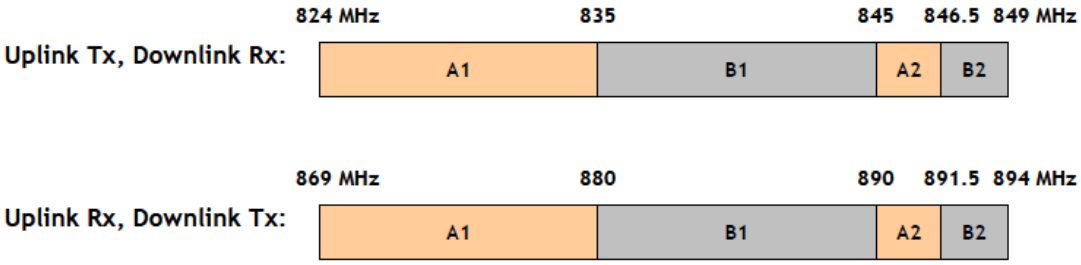
3.2.1. Frequency allocation

✧ **1900MHz Band**





✧ **850MHz Band**



3.2.2. System Specifications

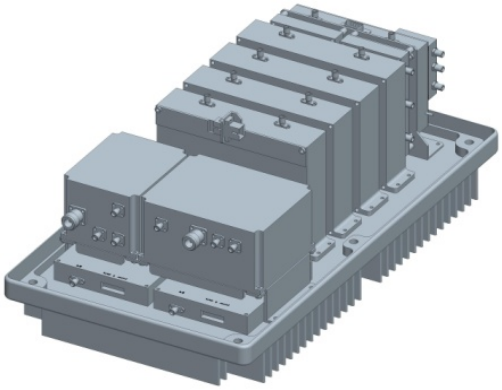
Item	Specification	Remarks
Tx Frequency Range	Contiguous 25MHz Bandwidth in 1930 ~ 1990MHz Contiguous 25MHz Bandwidth of 869 ~ 894MHz	
Rx Frequency Range	Contiguous 25MHz Bandwidth in 1850 ~ 1910MHz Contiguous 25MHz Bandwidth in 824 ~ 849MHz	
Frequency Stability	0.02PPM	
No of Carriers Supported	20CH(PCS) and 17 CH(Cellular) CDMA Carriers	
System Delay	DL: 10usec max. UL: 5usec max.	
Tx-Rx Isolation	110dB min. @Between RU Tx Output and RHU Rx Output	
Impedance	50 Ohm	
Pass-Band Ripple	3dB max.	25MHz BW

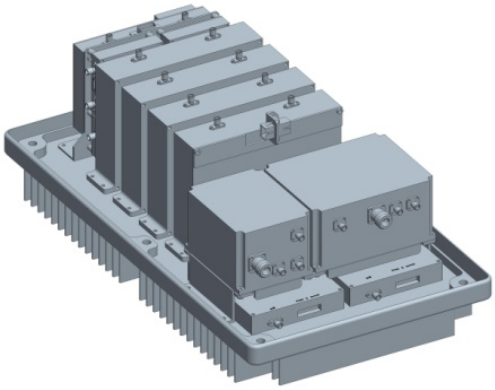
FWD Input Power	-55 dBm/total		Each Band
FWD Output Power	40dBm /total for 1900MHz RU ANT Port 40dBm /total for 850MHz RU ANT Port		
RVS Input Power	-68 dBm/total max. at RU each ANT Port		
RVS Output Power	27dBm/total max. at RHU each Rx ANT Port		
System Gain	FWD: 95dB max.	RVS: 95dB max.	
FWD Spurious	Comply to 3GPP2, FCC regulation		
RVS Noise Figure	10dB max. @ 95dB Gain		Max. Gain
Gain Control Range	FWD: 20dB by 1dB Step	RVS: 20dB by 1dB Step	RU OLC Gain
VSWR	1.5 : 1 max. @ All input/output ports		
Optical Wavelength	FWD: 1310nm	RVS: 1550nm	
RF I/O Connector	RHU: N-type Female	RU: N-type Female	

4. Mechanical Specifications

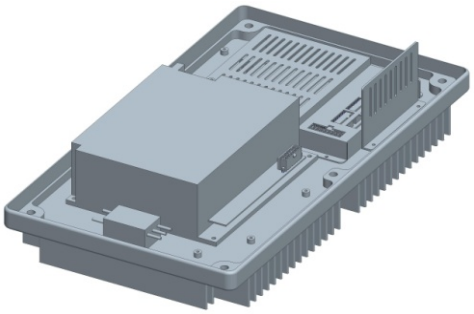
4.1. STR250R01C RHU

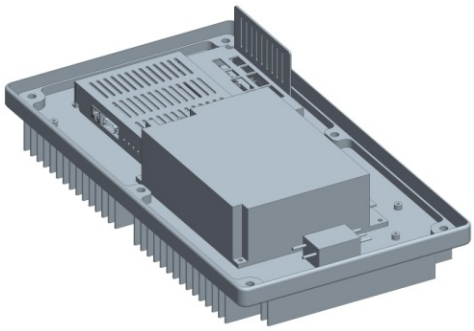
4.1.1. Mechanical Design



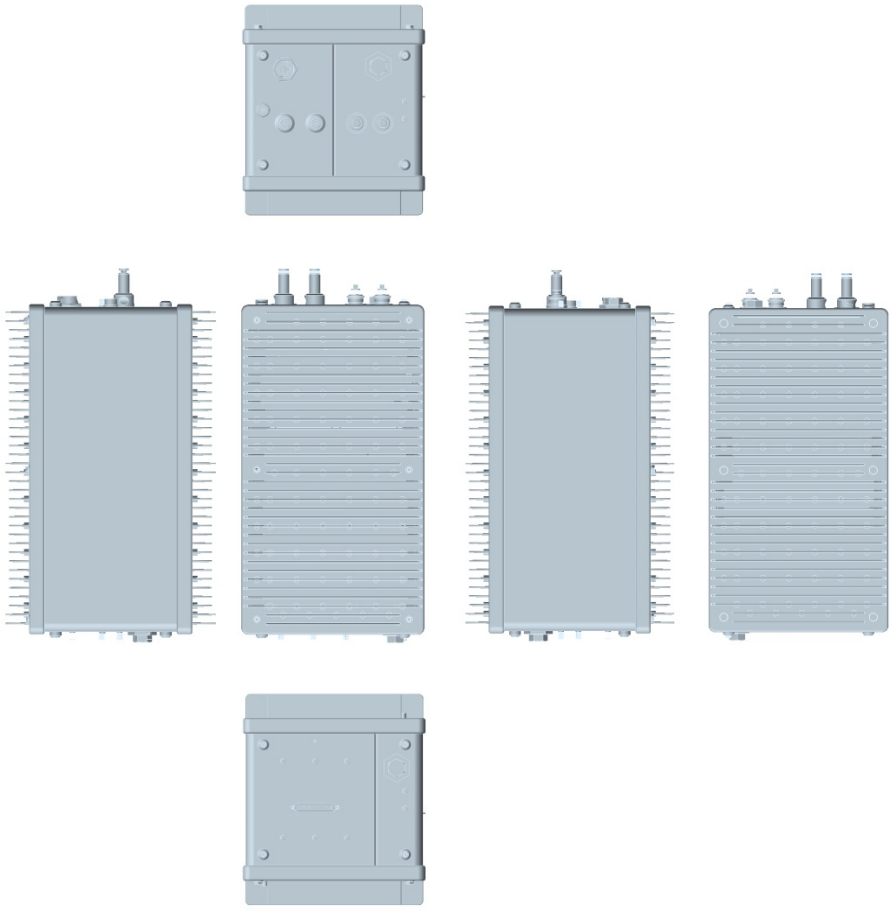


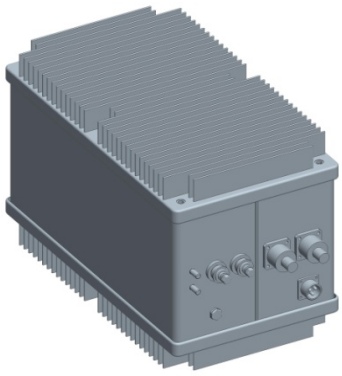
RF SIDE

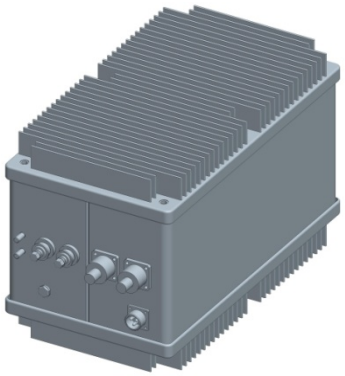




PSU SIDE



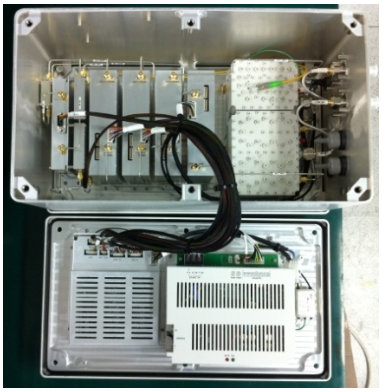




4.1.2. Dimension

⇨ **RHU System picture and Size → 471.7(H) X 263.4(W) X 304.8(D) mm**

[Side]



[Inner Side]

[Front/Rear Side]

4.1.3. Mechanical Specification

No	Item	Description
1	Dimension & Weight	1. Dimension: 471.7(H) X 263.4(W) X 304.8(D) mm (plinth included) 2. Weight: 26.5 Kg
2	Method of Cooling	Natural convection (Heat-sink)
3	Door Locking Type	10 on each side using bolt lock
4	Optic Connector	1. Position: Cabinet inside 2. Connector type: FC/TBD * Optic cable tray is provided inside of cabinet.
5	ANT PORT	1. located at the bottom side of cabinet 2. Connector Type: N Type Female
6	Power Input	1. Power: 110-120Vac, 60Hz 2. Position: bottom side of cabinet 3. Connector: MS connecter
7	Ground	TBD
8	Waterproof condition	TBD
9	Misc. Features	1. Easy to maintain 2. Pole mountable (i.e., telegraph pole) 3. Torque hinge used

4.1.4. Description of STR250R01C RHU

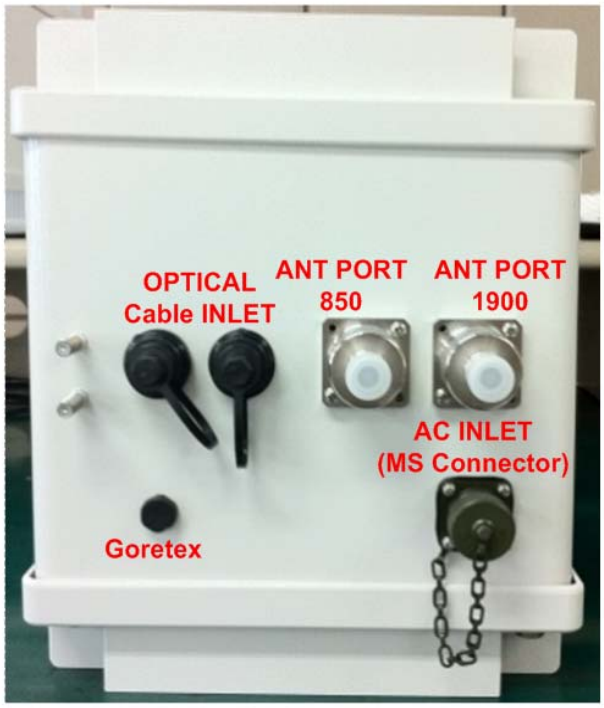
[Forward Path]

The signal from CDMA BTS is fed to the RF link antenna port of RHU. First, RHU Filter rejects the unwanted signal. Then LNA and Up-down converter make gain for transmitting. Combiner combines the signal with the modem signal (360MHz). The combined signal gets transmitted to RU via optical cable.

[Reverse Path]

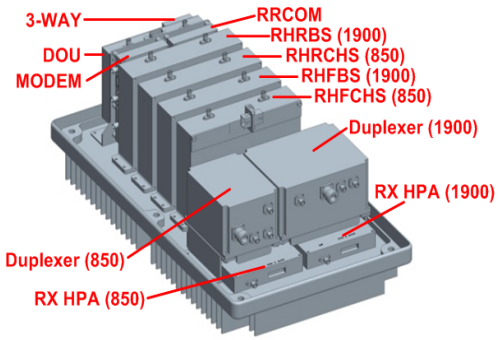
The CDMA RVS signal input from RU through the optic module is separated into RF and modem signal, and then RF RVS module performs optic AGC and RVS HPA makes large signal level for transmitting. Finally RHU Filter rejects the unwanted signal and RHU link antenna outputs RVS RF signal. The RF signal then is fed to the BTS.

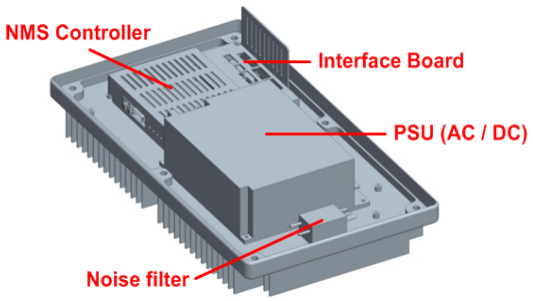
4.1.5. Port Configuration



No	Item	Description
1	AC INLET	110V AC Power Cable Connection Port / MS Connector
2	1900MHz ANT Port	1900MHz Band ANT RF Cable Connection Port / N-type Connector
3	850MHz ANT Port	850MHz Band ANT RF Cable Connection Port / N-type Connector
4	Optical Cable INLET	Optic cable connection Inlet
5	Goretex	

4.1.8. Module Composition of RHU

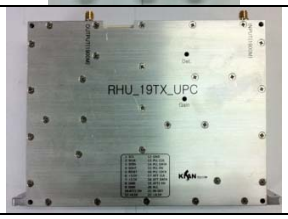
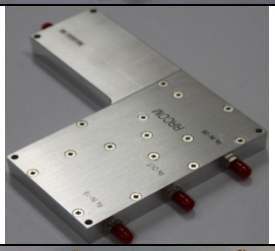


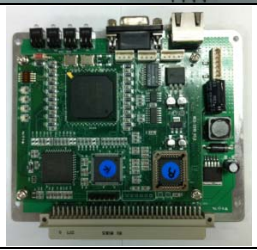


⇨ **Module operational voltage table**

No	Module	Voltage Used	Remarks
1	3-Way Combiner		
2	RHU FWD Band Selector for 1900MHz (RHFBS)	5.5Vdc /6.5Vdc	
3	RHU FWD Channel Selector for 850MHz (RHFCHS)	5.5Vdc /6.5Vdc	
4	Doner Optical Transceiver Unit (DOU)	6.5Vdc	
5	RF Modem (FSK Modem)	9Vdc	
6	RHU RVS COM for Signal combing (RRCOM)		
7	RHU RVS Band Selector for 1900MHz (RHRBS)	6.5Vdc	
8	RHU RVS Band Selector for 850MHz (RHRCHS)	6.5Vdc	
9	RX HPA for 1900MHz	29Vdc	
10	RX HPA for 850MHz	29Vdc	
11	FE-Duplexer(Front-End Filter Unit) for 1900MHz		
12	FE-Duplexer(Front-End Filter Unit) for 850MHz		
13	PSU (AC-DC)	AC 110V	INPUT
14	NMS Controller	9Vdc	
15	Interface Board Ass'y	5.5Vdc /6.5Vdc /9Vdc	

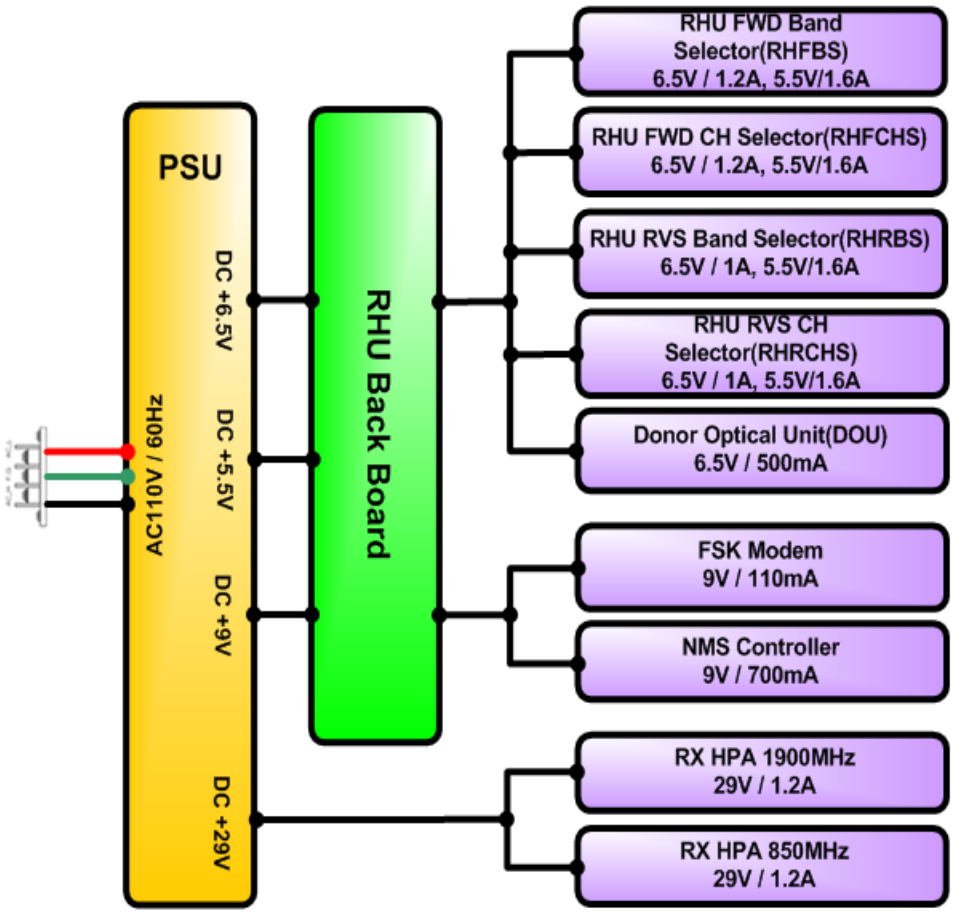
4.1.9. Function of Modules

No	Module	Description
1		[3-Way Combiner] Combine signals into RF and modem signals and sends to DOU.
2		[RHFBS] Controls the gain of 1900MHz FWD path, filters FWD band, and performs the ALC function. Output of the module is sent to 3-Way Combiner.
3		[RHFCHS] Controls the gain of 850MHz FWD path, filters FWD band, and performs the ALC function. Output of the module is sent to 3-Way Combiner.
4		[DOU] Performs E/O (or O/E) conversion for FWD and RVS signals. Wavelength: RX 1550[nm], TX 1310[nm]
5		[FSK Modem] Data modem for RU and RHU communication RU → RHU frequency: 340MHz RHU → RU frequency: 360MHz
6		[RRCOM] Divide RVS 850MHz, 1900MHz and Modem signals
7		[RHRBS] Amplifies RVS 1900MHz signal, filters for the desirable band and controls the RVS path gain of RHU.

8		**[RHRCHS]** **Amplifies RVS 850MHz signal, filters for the desirable band and controls the RVS path gain of RHU.**
9		**[RX HPA 1900]** **27dBm High power amplifier that amplifies the RHU 1900MHz signal by linearizer and sends to RHU ANT through the 1900MHz FE-Duplexer.**
10		**[RX HPA 850]** **27dBm High power amplifier that amplifies the RHU 850MHz signal by linearizer and sends to RHU ANT through the 1900MHz FE-Duplexer.**
11		**[Duplexer 1900]** **Front end duplexer that passes through 1900MHz desired FWD and RVS frequency bands.**
12		**[Duplexer 850]** **Front end duplexer that passes through 850MHz desired FWD and RVS frequency bands.**
13		**[PSU]** **Converts AC 110V to DC 29V/9V/6.5V/5.5V, and distributes the necessary power to each modules.**
14		**[NMS Controller]** **Monitors the status of modules in RHU and controls the configurable parameters of the RHU modules.**

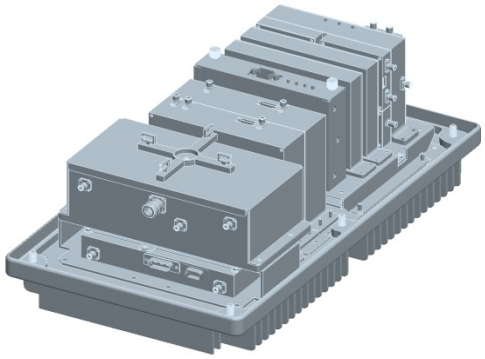
15		**[Interface BD]** **Provides operating voltage and monitors/controls signal to modules connected to interface B'D. Also provides a connection port to communicate with NMS B'D.**

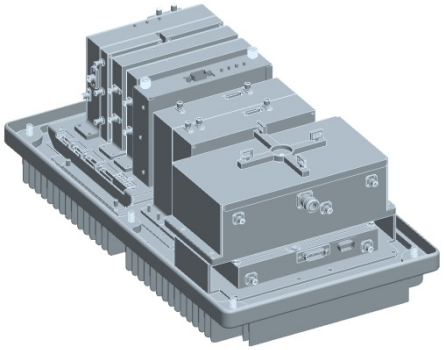
⇨ **Power Distribution Diagram**

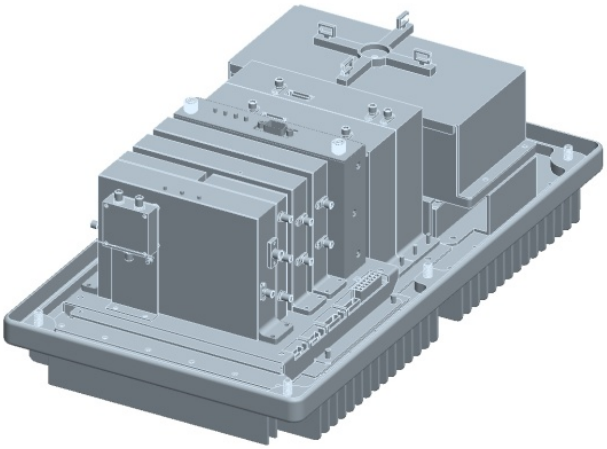


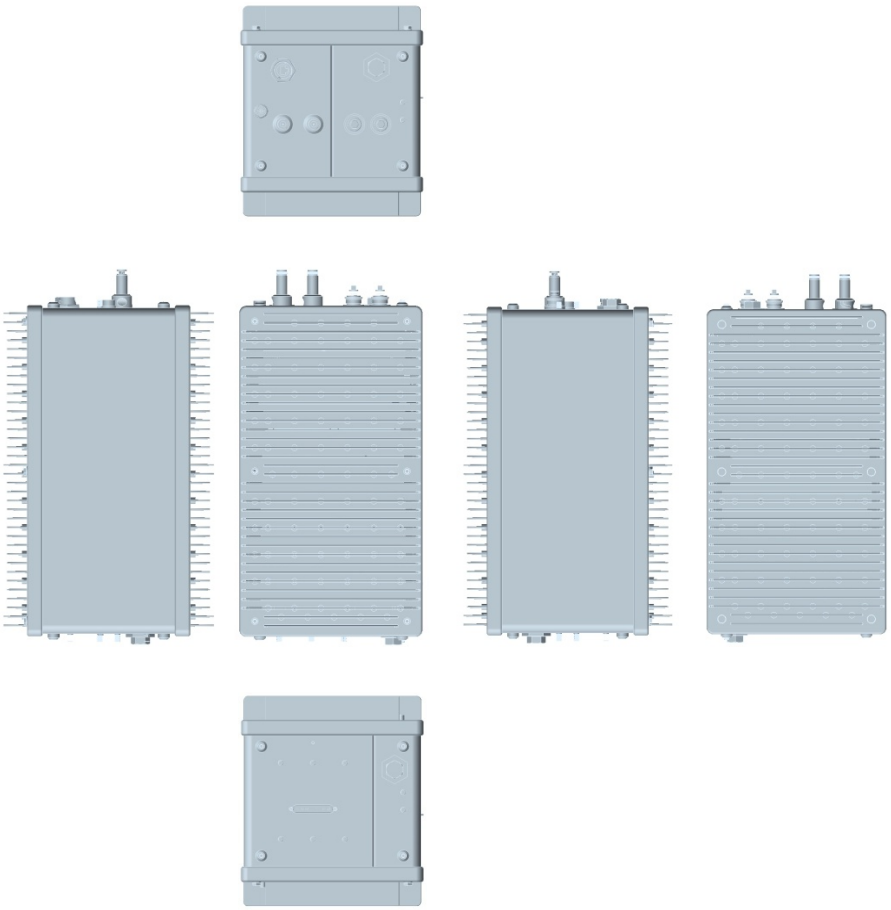
4.2. STR250R01C RU

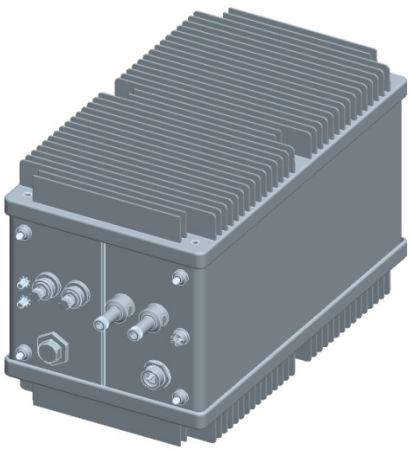
4.2.1. Mechanical Design

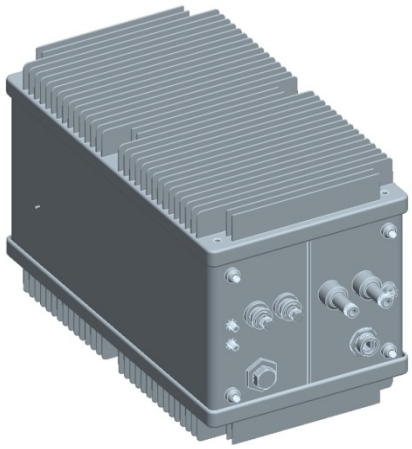








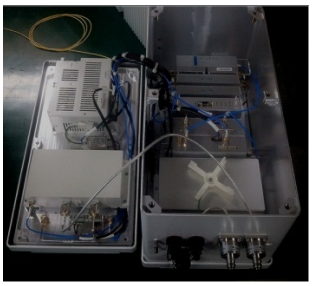




4.2.2. Dimension

⇨ **RU System picture and Size → 471.7(H) X 263.4(W) X 304.8(D) mm**

[Side]



[Inner Side]

[Front/Rear Side]

4.2.3. Mechanical Specification

No	Item	Description
1	Dimension & Weight	3. Dimension: 471.7(H) X 263.4(W) X 304.8(D) mm (plinth included) 4. Weight: 26.5 Kg
2	Method of Cooling	Natural convection (Heat-sink)
3	Door Locking Type	10 on each side using bolt lock
4	Optic Connector	3. Position: Cabinet inside 4. Connector type: FC/TBD * Optic cable tray is provided inside of cabinet.
5	ANT PORT	3. located at the bottom side of cabinet 4. Connector Type: N Type Female
6	Power Input	4. Power: 110-120Vac, 60Hz 5. Position: bottom side of cabinet 6. Connector: MS connecter
7	Ground	TBD
8	Waterproof condition	TBD
9	Misc. Features	4. Easy to maintain 5. Pole mountable (i.e., telegraph pole) 6. Torque hinge used

4.2.4. Description of STR250R01C RU

[Forward path]

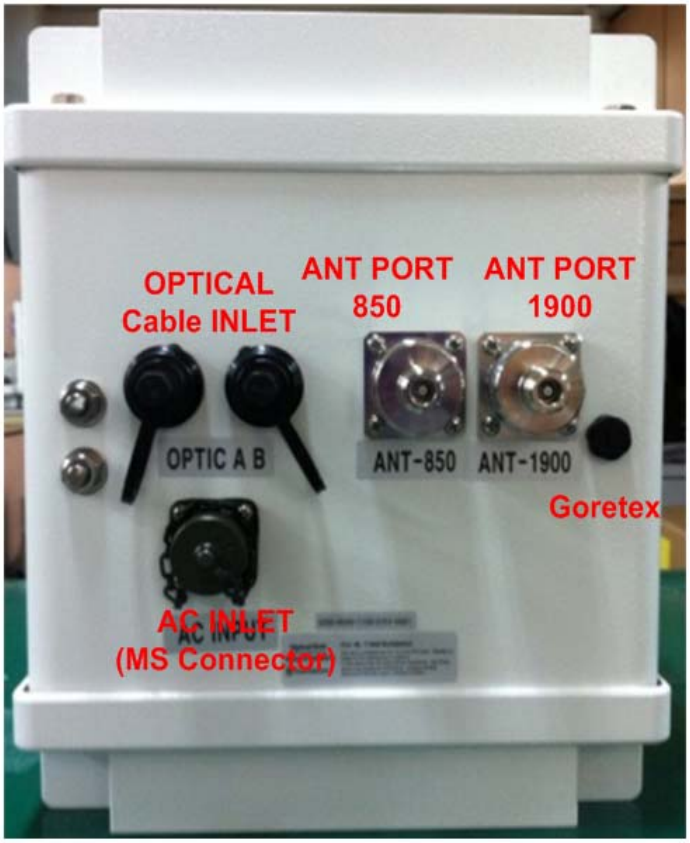
The RF and modem combined signals sent from the optic module of RHU is first divided into RF and modem signals at Divider in RU, then the 1900MHz Tx RF signal is amplified and filtered at the RFBS module, 850MHz Tx RF signal is amplified and filtered at the RFCHS module. The modem signal is conveyed to CPU of NMS controller through FSK modem. CDMA signal is reduced by the Crest Factor passing through the CFR FPGA digital board inside RFBS and RFCHS. This technology enables reduction of PAPR for CDMA signal increasing HPA efficiency. A higher efficiency HPA allows using a smaller enclosure with lower power consumption while decreasing OPEX for the service provider.

The CDMA RF signals from the RFBS module is linearly amplified up to high power level on HPA, passed through the Front-End Filter Unit, and finally transmitted through an antenna.

[Reverse Path]

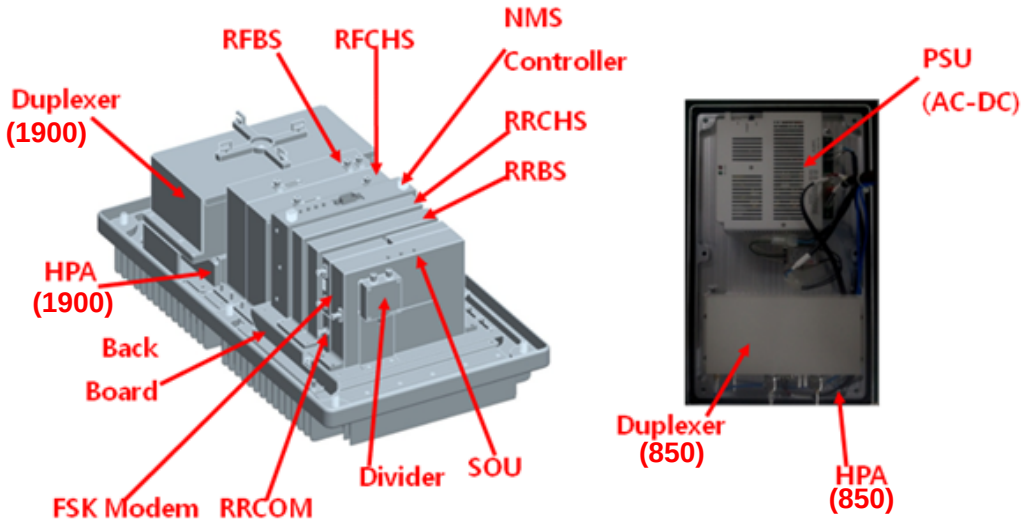
CDMA Rx signals incoming from 1900MHz or 850MHz antenna are first passed by the Front-End Filter Unit, amplified by a low noise and high gain amplifier, filtered in RRBS(for 1900MHz band) or RRCHS(for 850MHz band), and combined with modem signal at combiner(RRCOM). The combined signal is then transmitted to RHU through the optic module.

4.2.5. Port Configuration



No	Item	Description
1	AC INLET	110V AC Power Cable Connection Port
2	1900MHz ANT Port	1900MHz Band ANT RF Cable Connection Port
3	850MHz ANT Port	850MHz Band ANT RF Cable Connection Port
4	1900MHz Monitor Port	Monitor port coupled by -40dB relative to the output power of the 1900MHz ANT Port (Inside)
5	850MHz Monitor Port	Monitor port coupled by -40dB relative to the output power of the 850MHz ANT Port (Inside)
6	Optical Cable INLET	Optic cable connection Inlet

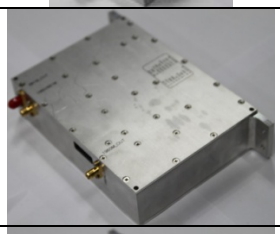
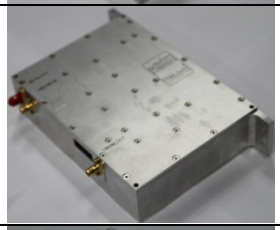
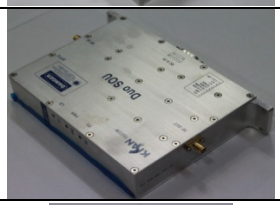
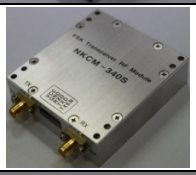
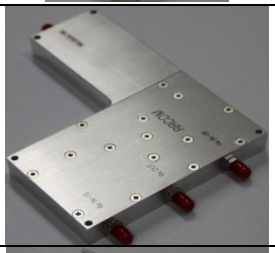
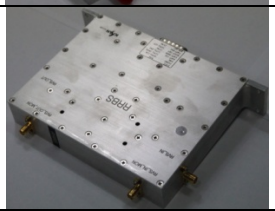
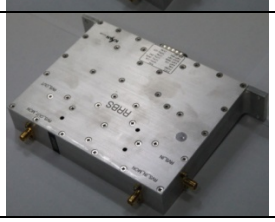
4.2.6. Module Composition of RU

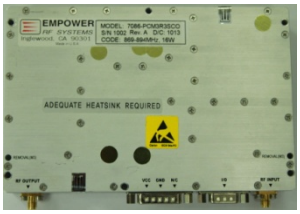
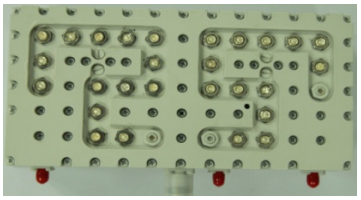
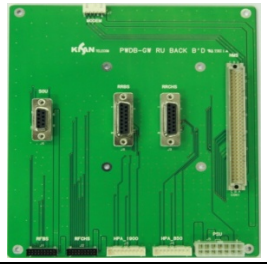


⇨ **Module operational voltage table**

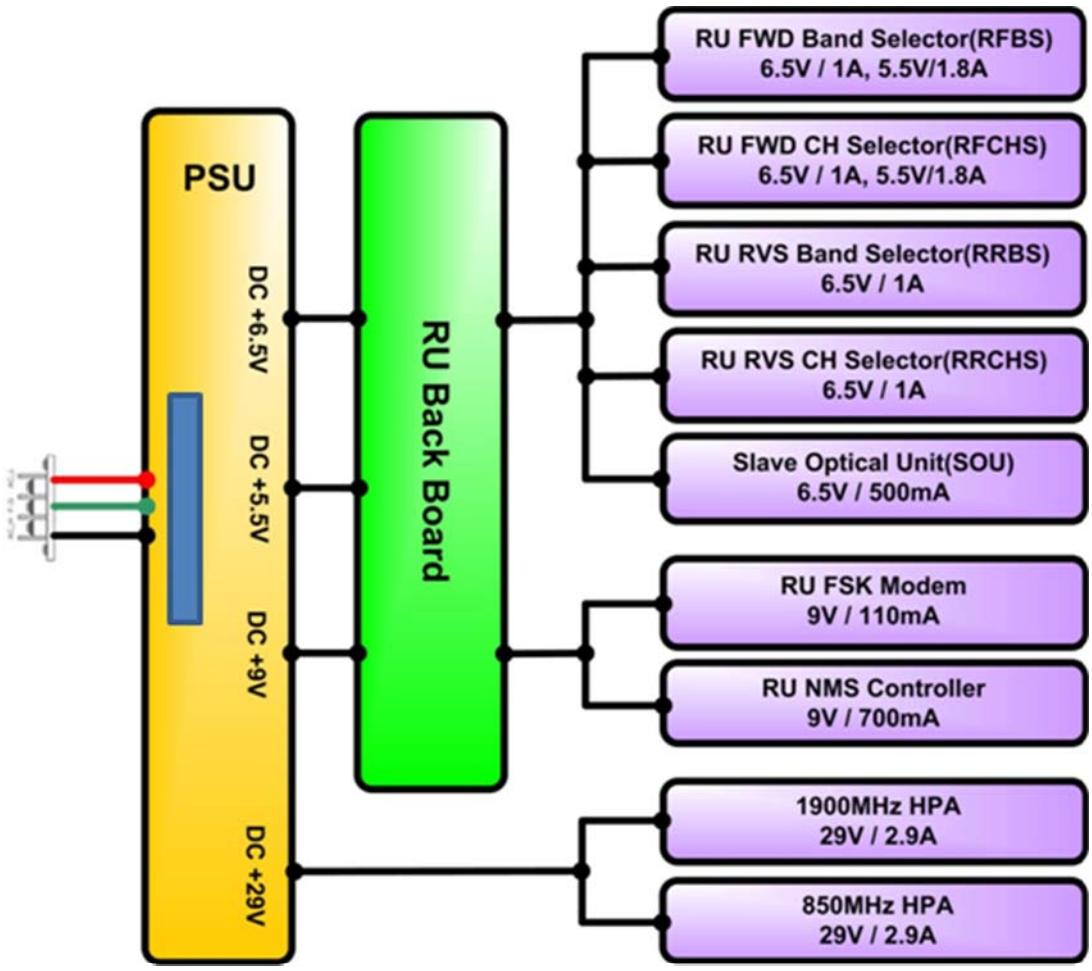
No	Module	Voltage Used	Remarks
1	Divider		
2	RF FWD Band Selector for 1900MHz (RFBS)	5.5Vdc /6.5Vdc	
3	RF FWD Channel Selector for 850MHz (RFCHS)	5.5Vdc /6.5Vdc	
4	Slave Optical Transceiver Unit (SOU)	6.5Vdc	
5	RF Modem (FSK Modem)	9Vdc	
6	RU RVS COM for Signal combing (RRCOM)		
7	RU RVS Band Selector for 1900MHz (RRBS)	6.5Vdc	
8	RU RVS Band Selector for 850MHz (RRCHS)	6.5Vdc	
9	HPA for 1900MHz	29Vdc	
10	HPA for 850MHz	29Vdc	
11	FE-Duplexer(Front-End Filter Unit) for 1900MHz		
12	FE-Duplexer(Front-End Filter Unit) for 850MHz		
13	PSU (AC-DC)	AC 110V	INPUT
14	NMS Controller	9Vdc	
15	Back Board Ass'y	5.5Vdc /6.5Vdc /9Vdc	

4.2.7. Function of Modules

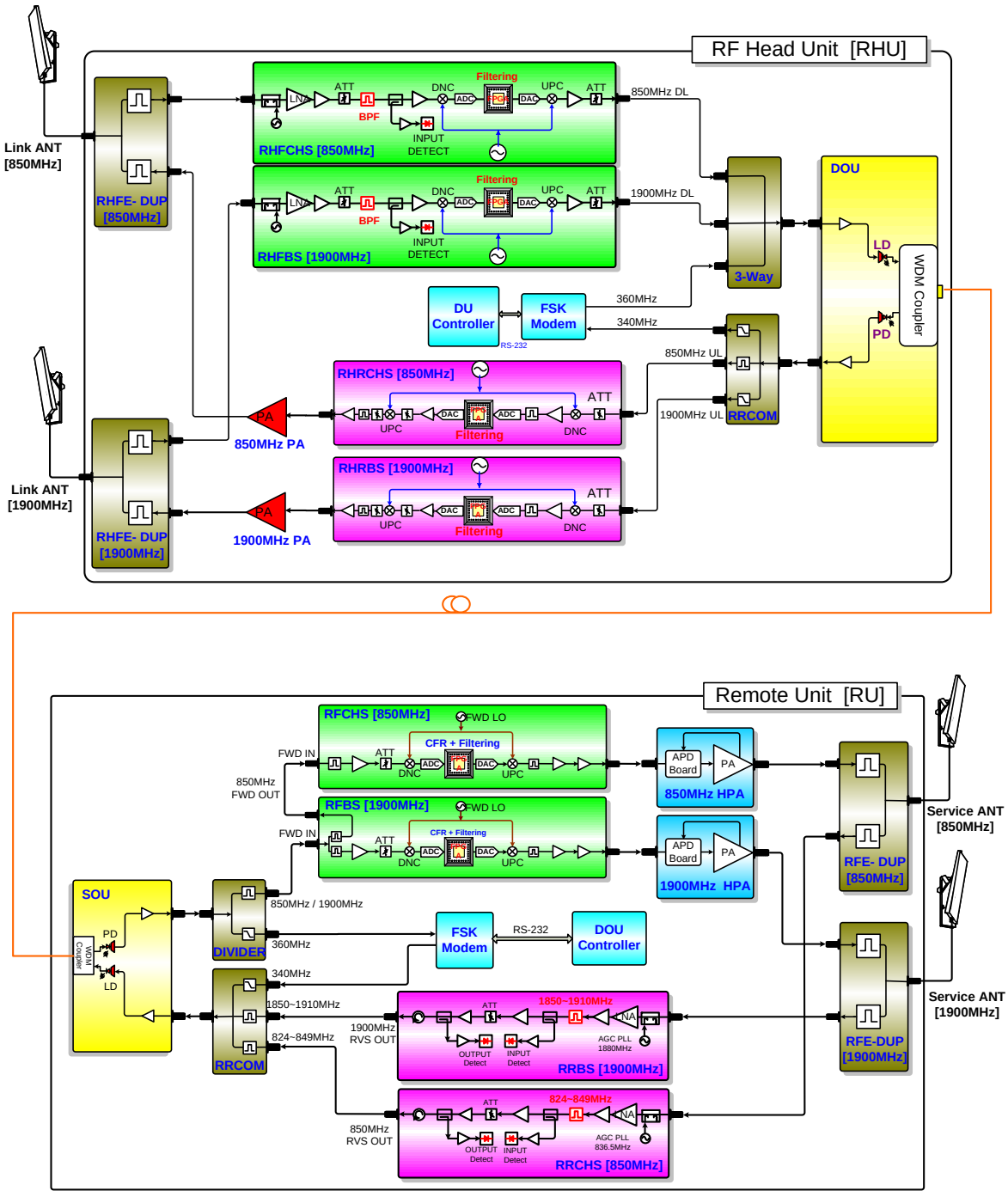
No	Module	Description
1		[Divider] Divides signals into RF and modem signals and sends to RFBS/RFCHS and FSK modem.
2		[RFBS] Controls the gain of 1900MHz FWD path, filters FWD band, controls the crest factor of 1900MHz FWD signal, and performs the ALC function. Output of the module is sent to 1900MHz HPA.
3		[RFCHS] Controls the gain of 850MHz FWD path, filters FWD band, controls the crest factor of 850MHz FWD signal, and performs the ALC function. Output of the module is sent to 850MHz HPA.
4		[SOU] Performs E/O (or O/E) conversion for FWD and RVS signals. Wavelength: TX 1550[nm], RX 1310[nm]
5		[FSK Modem] Data modem for RU and RHU communication RU → RHU frequency: 340MHz RHU → RU frequency: 360MHz
6		[RRCOM] Combines RVS 850MHz, 1900MHz and Modem signals, and provides the combined signal to optical module in order to perform E/O conversion.
7		[RRBS] Amplifies RVS 1900MHz signal by low noise high gain, filters for the desirable band and controls the RVS path gain of RU.
8		[RRCHS] Amplifies RVS 850MHz signal by low noise high gain, filters for the desirable band and controls the RVS path gain of RU.

9		[1900MHz HPA] 16Watt(42dBm) High power amplifier that amplifies the RU 1900MHz signal by linearizer and sends to RU ANT through the 1900MHz FE-Duplexer.
10		[850MHz HPA] 16Watt(42dBm) High power amplifier that amplifies the RU 850MHz signal by linearizer and sends to RU ANT through the 850MHz FE-Duplexer.
11		[1900MHz FE-Duplexer] Front end duplexer that passes through 1900MHz desired FWD and RVS frequency bands.
12		[850MHz FE-Duplexer] Front end duplexer that passes through 850MHz desired FWD and RVS frequency bands.
13		[PSU] Converts AC 110V to DC 29V/9V/6.5V/5.5V, and distributes the necessary power to each modules.
14		[NMS Controller] Monitors the status of modules in RU and controls the configurable parameters of the RU modules.
15		[Interface BD] Provides operating voltage and monitors/controls signal to modules connected to interface B'D. Also provides a connection port to communicate with NMS B'D.

⇨ **Power Distribution Diagram**



5. Block Diagram



6. Administration Program (RptMan-STR250D01C)

Administration program (RptMan-STR250D01C) is a management program for STR250D01C and provides status monitoring and controlling functions to users.

6.1. System Requirement

- ⇨ System: Desktop or laptop PC
  (highly recommended that PC supports Bluetooth interface.)
- ⇨ OS: Windows XP or later version. GUI developed under XP.
- ⇨ Resolution: 1024 ✕ 768 or more
- ⇨ Connection Cable: 9 pin serial cable (cross type)

6.2. Bluetooth interface

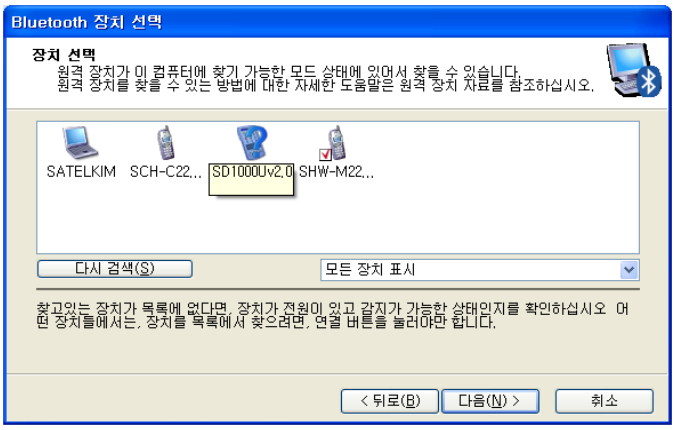
The Bluetooth to RS232 convertor is installed in enclosure. Before use local GUI, the virtual COM port must be available. Here is an example to activate virtual COM port under XP professional. Some procedures described here may be different to other OS such as Windows 7.

- ⇨ Check the Bluetooth can be supported by your PC or laptop.
  If it supported, you may be able to see an icon on Taskbar as below.

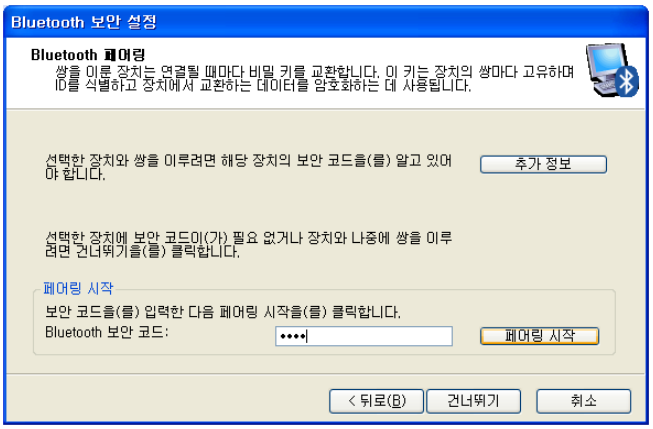
- ⇨ Turn on your Bluetooth.
- ⇨ Click the right button of mouse on the Bluetooth icon.
- ⇨ Select menu "Add Bluetooth Device"

- ⇨ When Bluetooth Configuration Wizard appeared, click "Next" button.

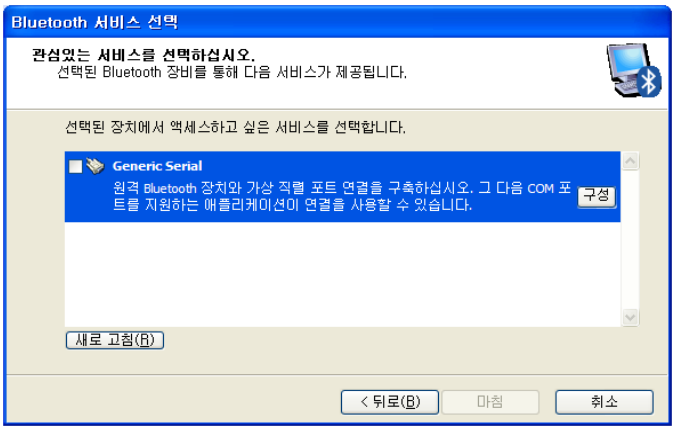
⇨ When finding remote Bluetooth devices is finished, select the device name installed in RHU. If you can see device name started with "**SD1000**", that may be correct. If you can see multiple devices, you have to know which is correct to connect.
After selection, press "Next" button.



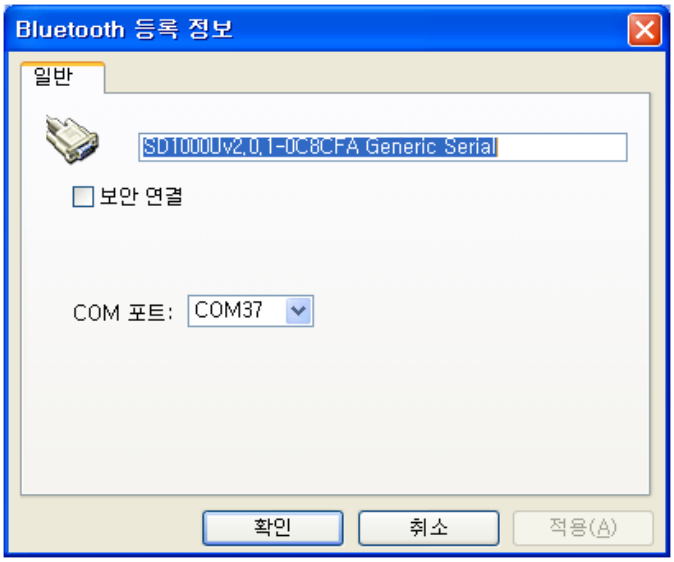
⇨ Type security code and press "start pairing" button. Default security code is "**1234**"



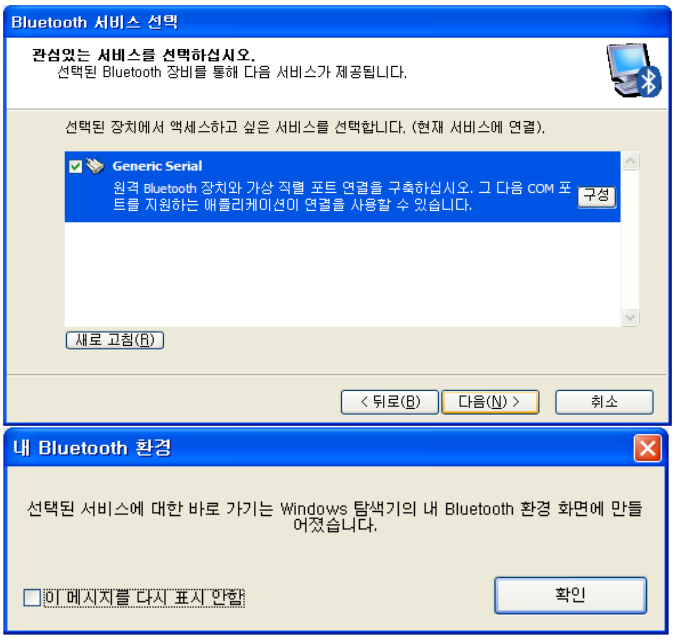
⇨ Select and check the service named "Generic Serial", then press "Configure" button.



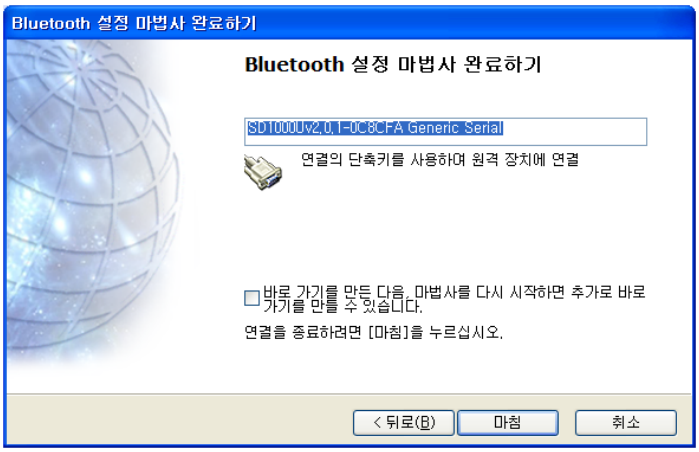
⇨ Keep in your mind the device and COM port name. Press "OK" button.



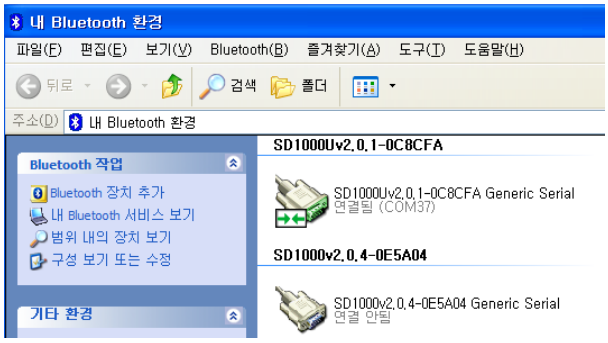
⇨ Press "Next" button



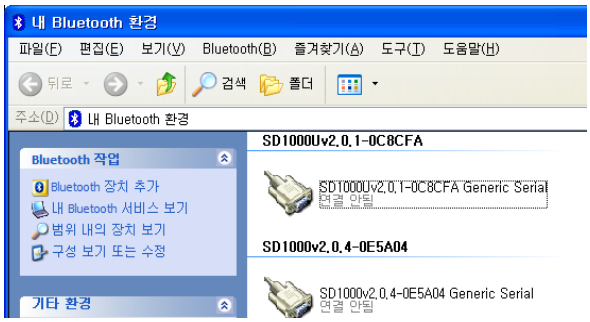
⇨ Finish the creating the new virtual COM port to connect to RHU.



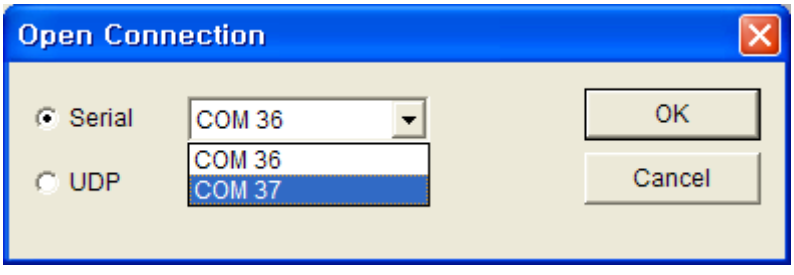
⇨ A new connection is created and connected to remote "RHU".



⇨ Disconnect the connection to make it free. Local GUI will use this freed serial port.

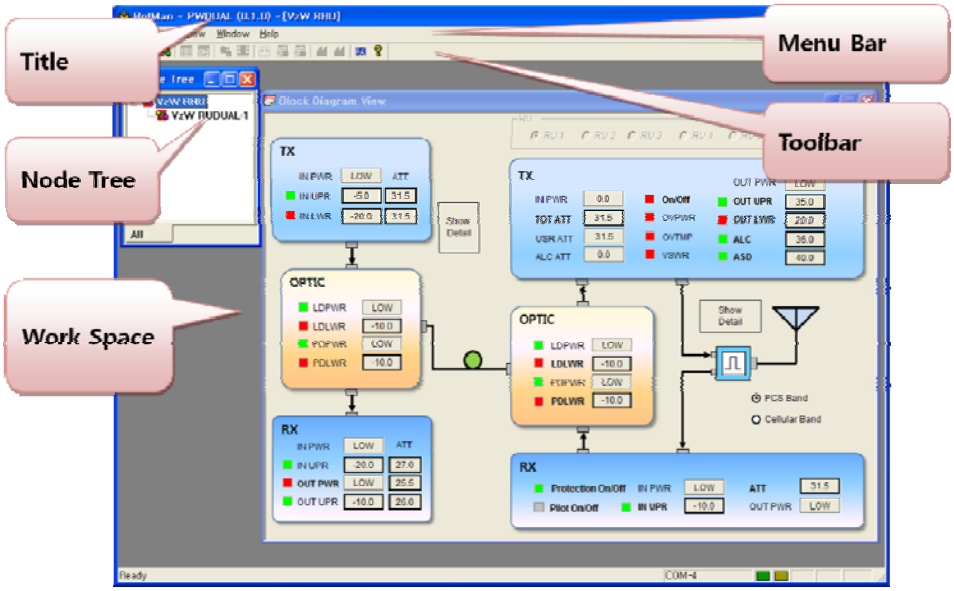


⇨ When the local GUI started, you can establish a connection and communicate with "RHU" via it.



⇨

6.3. Main Window



Section	Description
Window Title	 Displays the name of management program(GUI), i.e. RptMan-STR250R01C. Displays the type of equipment currently connected to the program (RHU or RU).
Menu Bar	 Presents working menu for operators. It is associated with tool icons, which can activate the tool bar menus.
Toolbar	 Presents icons (button type) for frequently used commands. User-friendly icons are used. Icons are activated or disabled as to the status of repeater.
Work Space	Status information and control functions are provided with a block diagram view of RHU and RU. Provides the working space for windows or dialogs.

6.4. Status Display

Status of repeater is displayed by LED's and values.

⇨ LED

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

  Exception) for HPA, ■ is ON, ■ is OFF

⇨ Value

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

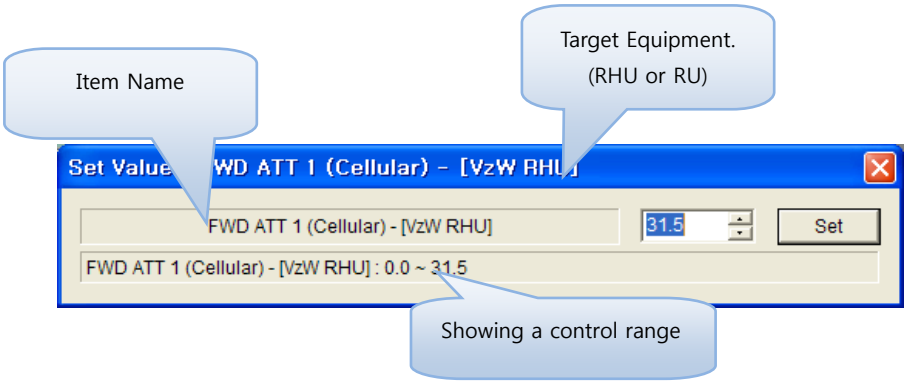
⇨ Control

- The shape of mouse cursor is changed to on controllable items.
- The texts of controllable LED or values are displayed in BOLD font.

6.5. Control Policy

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

⇨ Click a controllable item (LED, text, or button) to popup control dialog.



⇨ Once a control dialog popped up, it stays there for repeated control until user closes the window.

6.6. Menu

Menu	Sub Menu	Function
File	Connect	Establishes connection between PC(GUI) and repeater
	Disconnect	Disconnects connection between PC(GUI) and repeater
	Exit	Finishes admin program.
Action	Power Table	Presents RF/Optic power table. (ADMINISTRATORS ONLY)
	TC Table	Presents temperature compensation table
	Image Compression	Compress the firmware file (executable file of repeater) for download

	RHU image download	Downloads compressed firmware file to RHU equipment
	RU image download	Downloads compressed firmware file to RU equipment
	Factory Setting	Restores all parameter values to initial factory settings
	System action	Not available
	Gain Setting	Tx: change system gain to setup remote output to pre-defined level (about 30 dBm). Rx: set ATT to have 40dB of Rx total gain from RU to RHU including optical loss.
	Polling period	Controls the polling period between PC and repeater
View	Block window	Presents system window including RHU and RU
	RHU Window	Presents RHU status window in work space
	RU Remote Window	Presents RU status window in work space
Window	Cascade	Cascade or tile horizon arrangement of repeater status windows in work space
	Tile Horizon	
	Arrange icons	Arrange all icons under many window is opened
	Close all	Close all window
	Packet Debug	Presents debug window in workspace displaying packets between repeater and GUI program
Help	About	Displays the version information of GUI program, RptMan (Repeater Manager)

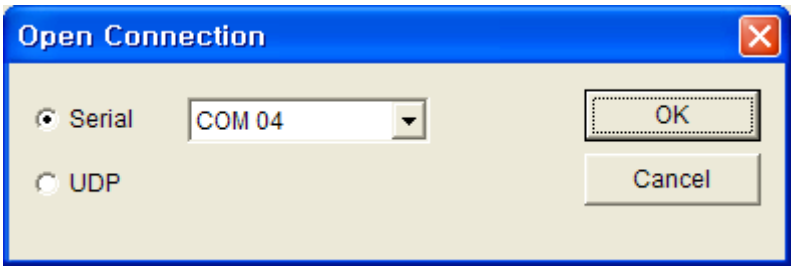
6.7. Toolbar

ITEM	ICON	Function
Communication Establishment		Establishes RS-232C connection to the repeater, then GUI starts to communicate and status of repeater are polled and displayed.
Communication Disconnection		Disconnects communication with connected repeater. Repeater status is not updated.
Polling Stop/Resume		Toggle to pause or resume status polling.
Power Table		Presents RF/Optic power table
T/C table		Presents temperature compensation table
Debug Packet		Displays packet data between GUI and repeater like protocol analyzer and it may help debugging of software
Compression of image file		Compresses image file of repeater
Gain Setting		TX: set ATT to have 35dBm of output at the RU ANT Port RX: set ATT to have 40dB gain of Rx path → Tx/Rx Gain setting function carry out Tx/Rx gain setting including optical loss compensation automatically.

RHU Download		Download RHU firmware files to RHU equipment.
RU Download		Download RU firmware files to RU equipment.
RHU Factory Setting		Initialize RHU parameters to factory setting values.
RU Factory Setting		Restores RU parameters back to original factory setting values.
Help		Shows version information

6.8. Program operation

6.8.1. Initiating communication



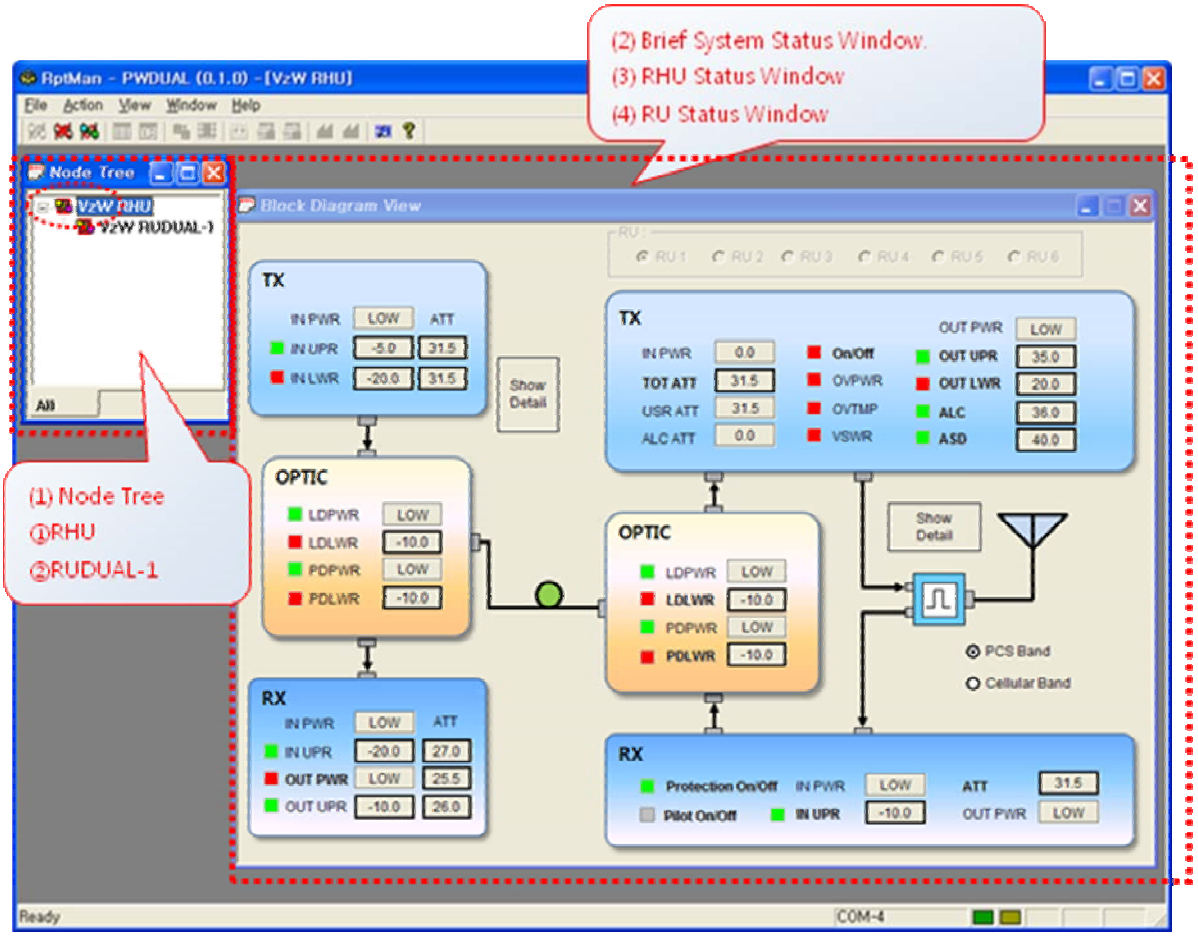
Function	Establishing communication between GUI and repeater	
Method	Click  button in toolbar of GUI program	
Description	Serial	Combo box to set the com port (COM1, COM2, …)
	UDP	 When RHU connected to Ethernet, GUI can communicate RHU via UDP. To establish connection, you have to specify IP address of target RHU.
	OK Button	Initiates communication between GUI and repeater, then closes this popup window("Open Connection") When communication port is established, you can see the communication status by blinking icons.  (right-bottom of the main window)
	Cancel Button	Cancels and closes the popup window

6.8.2. Disconnect

Function	Disconnecting GUI from repeater

Method	Click  button in toolbar of GUI program
Description	The communication between GUI and repeater becomes disconnected.

6.8.3. STR250R01C Brief System Status (Block Diagram View)



(1) Node Tree: This window displays the tree configuration of RUs connected with RHU

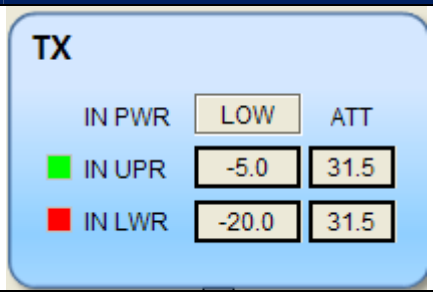
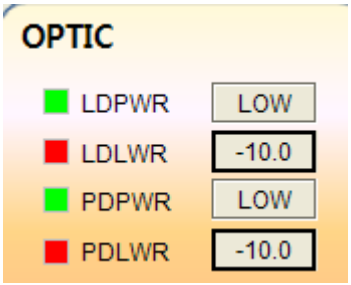
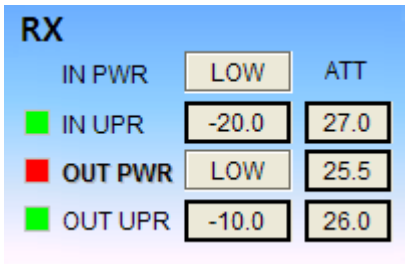
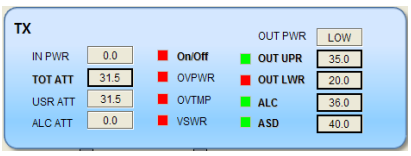
Nose Tree	VzW RHU	Double click to open the RHU status window
	VzW RUDUAL-1	Double click to open the RU status window.

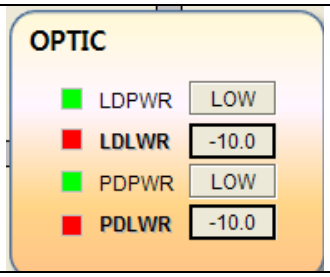
Icon shows a status of repeater node as follows:

-  : not installed
-  : normal
-  : critical alarm(s) was(were) happened
-  : link fail : communication between RHU and RU is not stable,
-  : RU was installed, but type of RU cannot be recognized

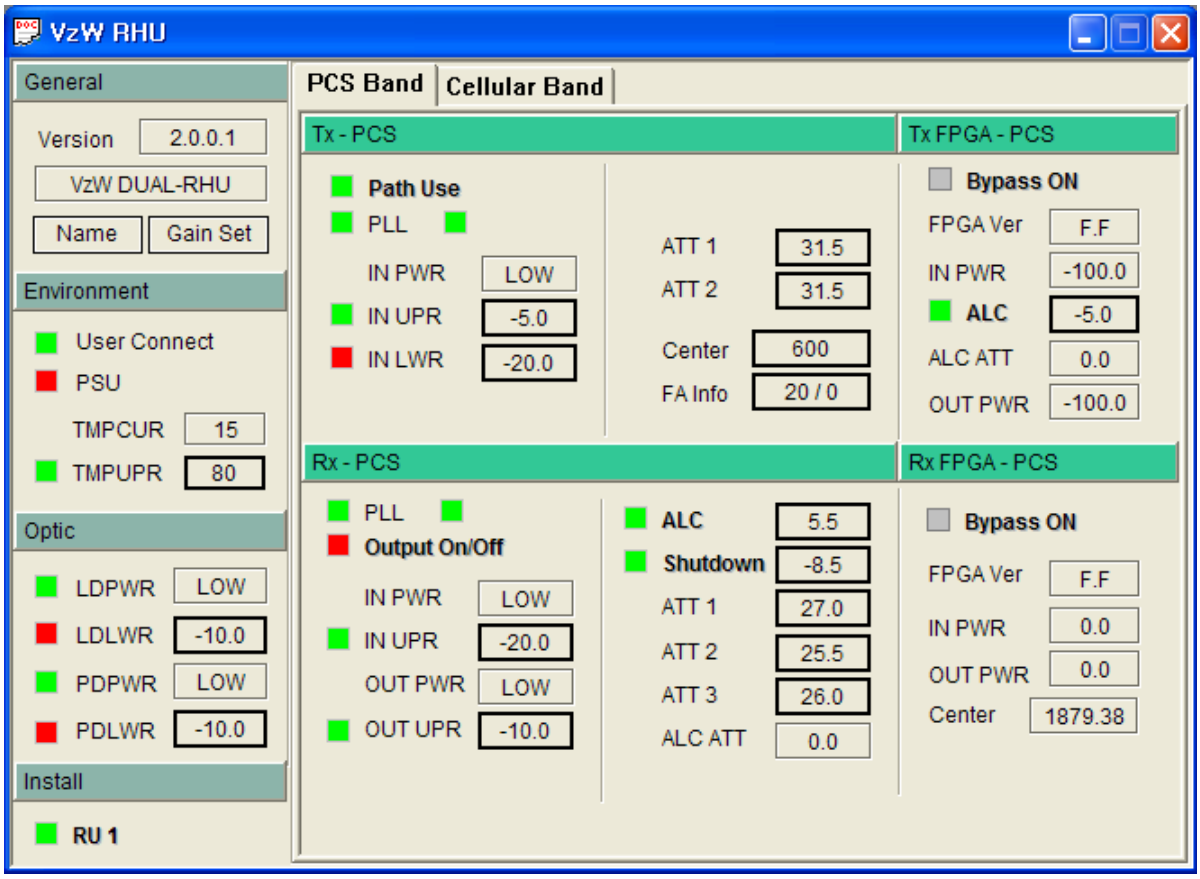
(2) Brief System Status Window

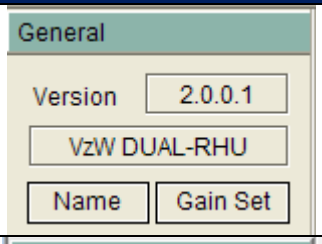
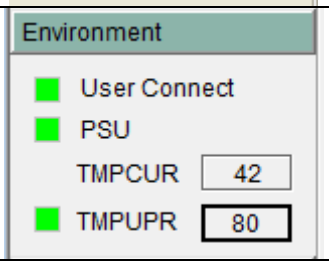
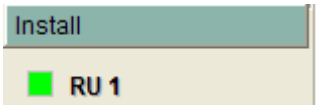
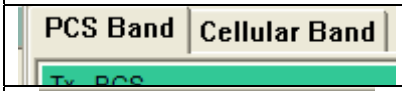
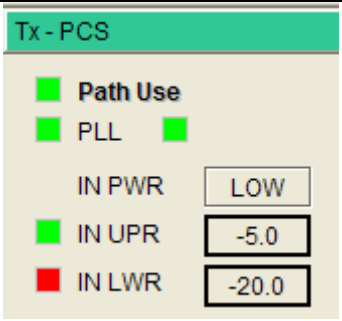
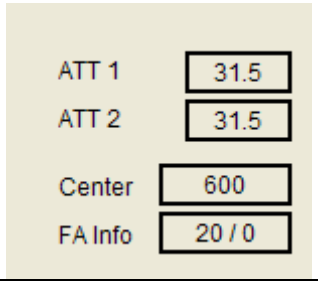
This window shows some important status items of RHU and RU on one window.

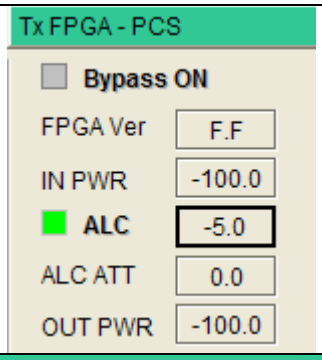
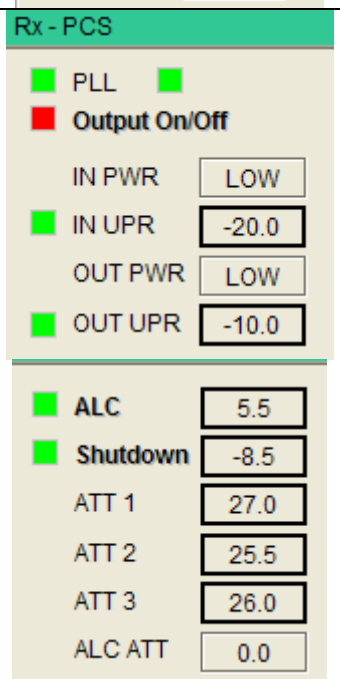
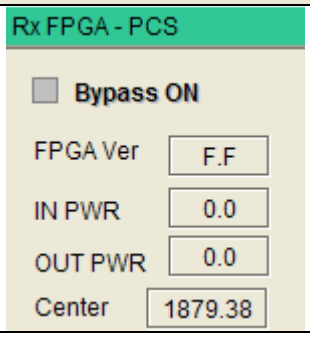
Device	Category	Item
RHU		● IN PWR : Tx Input Power ● IN UPR : Tx Input upper limit value and alarm represented by LED. ● IN LWR : Tx Input lower limit value and alarm represented by LED. ● ATT
		● LD PWR : detected LD power and LD bias alarm. ● LD LWR : LD power lower limit value and alarm LED ● PD PWR : detected PD power and PD fail alarm detected by optic module. ● PD LWR : PD power lower limit value and alarm LED
		● IN PWR : detected Rx input power. It shows almost "LOW", because Rx traffic is rare. ● IN UPR : Rx input power upper limit value and alarm LED. ● OUT PWR : detected Rx output power. LED shows the enable status of Rx HPA. ● OUT UPR : Rx output upper limit value and alarm LED. ● ATT
RU		● IN PWR : Tx input power ● TOT ATT : total ATT value. TOT ATT = USR ATT + ALC ATT ● USR ATT : ATT value configured by user. ● ALC ATT : ATT value added by ALC function. ● HPA related alarms detected by HPA itself: ■ On/Off : turn on or off HPA ■ OVPWR : over power alarm ■ OVTMP : over temperature alarm ■ VSWR : over VSWR alarm

		● OUT PWR : detected Tx output power ● OUT UPR / OUT LWR : upper and lower limit value and alarm LED ● ALC : turn on / off ALC function block and ALC level value. ● ASD : turn on / off ASD function block and its activation level.
		See RHU.
		● Protection On/Off : turn on / off Rx protection function block. ● Pilot On/Off : turn on / off piolot to check Rx gain. It may be automatically turned off after reboot. ● IN PWR : detected Rx input power ● IN UPR : input upper limit value and alarm LED ● ATT ● OUT PWR : detected Rx output power.
LINK		●  : RU is not installed. ●  : RU is installed and communication status is good. ●  : RU is installed but communication status is not stable.

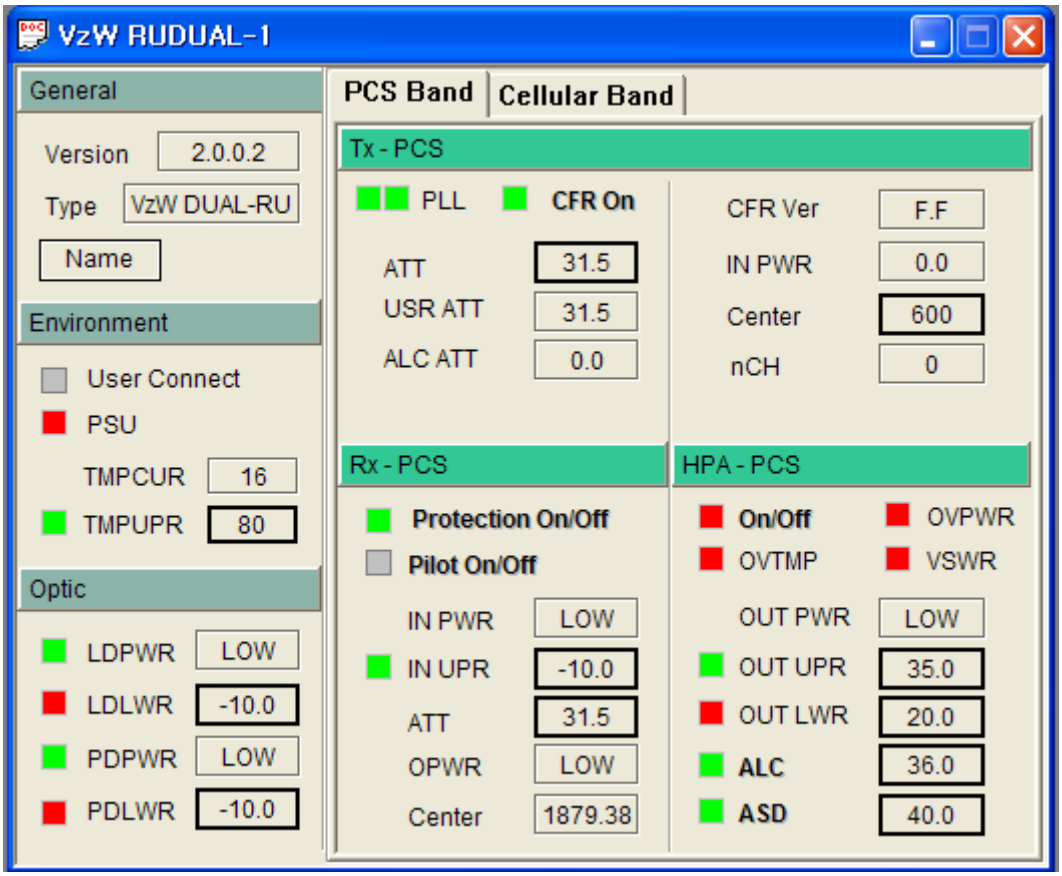
6.8.4. STR250R01C RHU Status Window

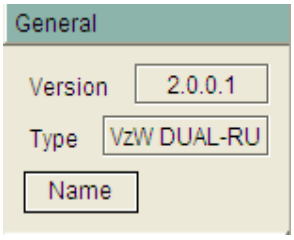
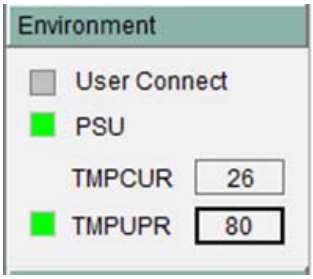


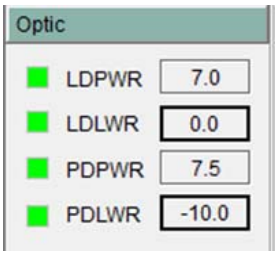
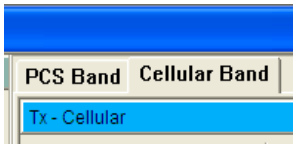
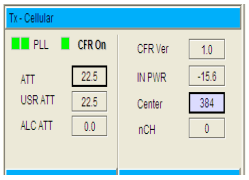
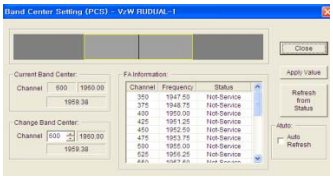
Group	Description
	⇨ Version: Firmware Versoin ⇨ Type: Repeater unit type ⇨ Name: ID of RHU for the communication ⇨ Gain Setting ■ TX: sets ATT to have 30dBm of output at the RU ANT Port
	⇨ User Connect: Connection status of COM port of repeater ⇨ PSU: Status of PSU ⇨ TMPCUR: Current temperature of the equipment ⇨ TMPUPR: set the upper threshold value of temperature (button) and alarm status (LED)
	⇨ Install: This sets up the RU to communicate with RHU. Even when an RU is connected to RHU physically by optic cable, the RU cannot communicate with RHU if RU is not installed.
	⇨ Band selection TAB.
 	⇨ Path Use : PCS or Cellular band is used or not ⇨ PLL : PLL lock / unlock status ⇨ IN PWR : Tx input power value. ⇨ IN UPR : Tx input upper limit value and alarm status ⇨ IN LWR : Tx input lower limit value and alarm status ⇨ ATT 1, 2 : ⇨ Center : center channel number of Tx band. See “Additional features” ⇨ FA Info : represents detected channel and configured channel.

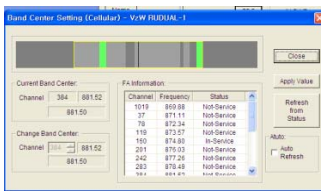
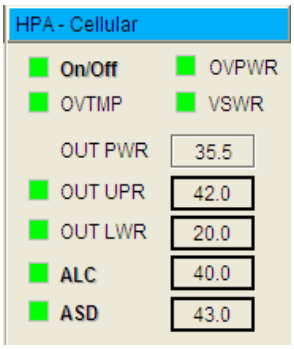
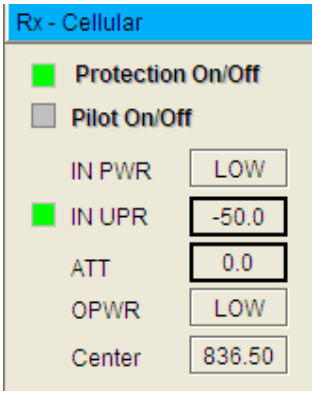
<table>
<tr>
<td> 
</td>
<td>⇨ Bypass ON : turn on / off bypass function.
⇨ FPGA Ver : shows version information. When “F.F” is showed, communication with FPGA is not stable.
⇨ IN PWR : detected input power before filter.
⇨ ALC : ALC level and on/off status.
⇨ ALC ATT : added ATT value by ALC feature.
⇨ OUT PWR : last Tx output power after filter.</td>
</tr>
<tr>
<td> 
</td>
<td>⇨ PLL : PLL lock status of internal PLL module.
⇨ Output On/Off : turn on/off information of Rx HPA
⇨ IN PWR : detected Rx input power.
⇨ IN UPR : upper limit value and alarm LED for input power.
⇨ OUT PWR : detected Rx output power.
⇨ OUT UPR : upper limit value and alarm LED for output power
⇨ ALC : ALC level and on/off LED
⇨ Shutdown : shutdown level and on/off LED
⇨ ATT1, ATT2, ATT3
⇨ ALC ATT : ATT value added automatically by ALC feature.</td>
</tr>
<tr>
<td> 
</td>
<td>⇨ See “Tx FPGA”</td>
</tr>
</table>

6.8.5. STR250R01C RU Status Window



Group	Description
	⇨ Version: Firmware version ⇨ Type: Type of repeater ⇨ Name: Set the Name, ID, Serial No. of repeater RU
	⇨ User Connect: Connection status of COM port of repeater ⇨ PSU: Status of PSU ⇨ TMPCUR: Current temperature in repeater RU ⇨ TMPUPR: Value/control of upper threshold of temperature (button) and alarm status (LED)

	⇨ LDPWR: Value of LD power (box) and status of LD (LED) ⇨ LDLWR: Value/control of lower threshold of LD power (button) and lower alarm status of LD power (LED) ⇨ PDPWR: Value of PD power (box) and status of PD (LED) ⇨ PDLWR: Value/control of lower threshold of PD power (button) and lower alarm status (LED)
	⇨ RU parameters for PCS/Cellular band are displayed by the tab selection. Each band has the identical items which can be monitored and controled.
	⇨ PLL: Alarm LED for 2 PLL's ⇨ CFR On: On/Off status of Crest Factor Reduction function ⇨ ATT: Sets ATT to control FWD gain, and shows its value. Displayed ATT value = USR ATT + ALC ATT ⇨ USR ATT: This is the main FWD Gain setting point. It is used for FWD auto gain setting or gain fine tuning ⇨ ALC ATT: When HPA output level is higher than ALC level it automatically controls FWD gain to maintain output level below HPA ALC level. ⇨ CFR On: On/Off control the Crest factor reduction function ⇨ INPWR: Input total power level on CFR board ⇨ Center: Set the center frequency of FWD band by CDMA CH No. ⇨ nCH: Indicates the current no. of CDMA CH. When pressed, more information about CDMA CHs can be viewed.
	⇨ Channel Setting Window for PCS CDMA CH and band center ⇨ Center: 25MHz operating band center frequency setting ⇨ Apply Values: setting action for Center and CDMA CH ⇨ Refresh from Status: verification action for set valuses after setting the Center and CDMA CH

	⇨ Cellular Spectrum View Window ⇨ Center: CDMA CH for center freq. of 25MHz band ⇨ FA Information: Number of CDMA CH currently dectected
	⇨ On/Off: Status/control the operation state of HPA ⇨ OVTMP: Alarm status of HPA Over-temperature ⇨ OVPWR: Alarm status of HPA Over-Power ⇨ VSWR: Alarm status of HPA VSWR ⇨ OUT PWR: Output power level of HPA(box) ⇨ OUT UPR: Display/control of upper threshold of HPA output power(button), alarm status(LED) ⇨ OUT LWR: Value/control of lower threshold of HPA output power(button), alarm status(LED) ⇨ ALC: Set ALC level for HPA output, and shows ALC on/off status of function(LED). ⇨ ASD(Auto Shutdown): ASD level(button), and shows ASD on/off status of function(LED).
	⇨ Protection On/Off: In order to protect RU from over input RVS(Rx) signal power. In case that input signal is more than IN UPR level, RU shuts down and LED is changed to RED. ⇨ Pilot On/Off: Sets CW signal generation, and shows its status. It is used for RVS gain setting. ⇨ IN PWR: RVS power value at the LNA output point ⇨ IN UPR: Sets RVS input upper threshold, and shows the alarm status of input upper threshold. ⇨ OUTPWR: RVS RF output power of RRBS(RRCHS) ⇨ ATT: Sets ATT to control RVS gain, and shows it's value. ⇨ Center Freq: It indicates pilot signal frequency value. This value changes with FWD(Tx) center frequency automatically.

6.8.6. 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.

The following steps should be taken for firmware download.

① Convert firmware source file (*.bin) to a downloadable file format.

Main menu: Action → Image Compression, toolbar: 

② Open a pop-up window showing the status of the target equipment for firmware download.

Step 1) Main menu View ¡æ Select Donor Windows or Remote Windows

Step 2) In Block View Dialog window, select Donor Windows or Remote Windows

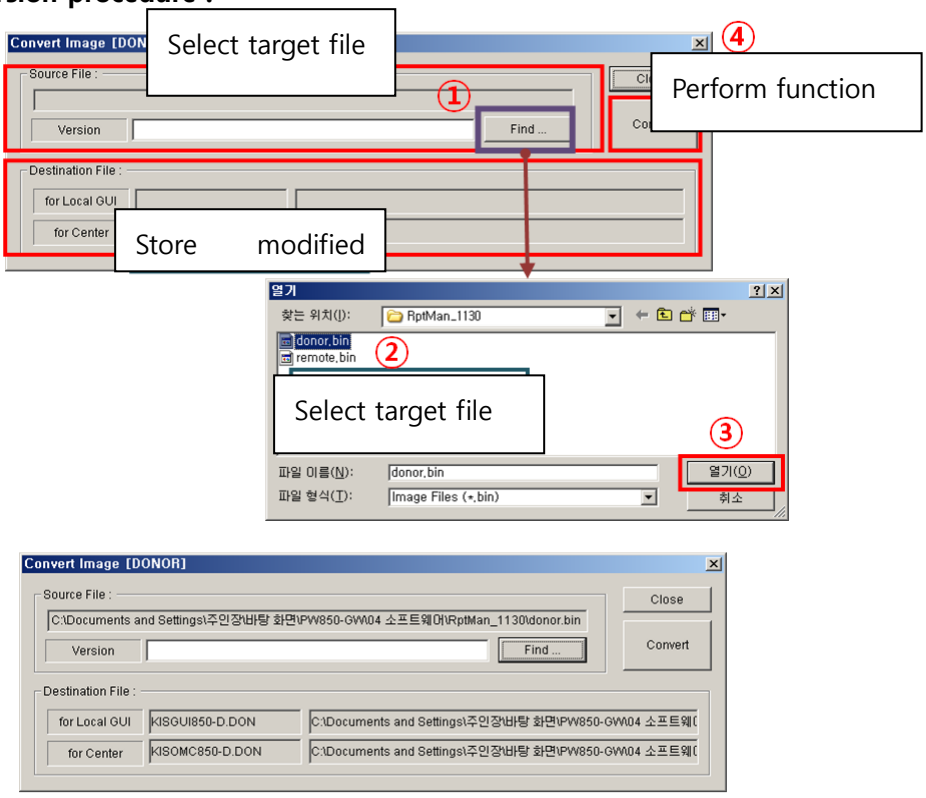
③ Download firmware to the target equipment.

Step 1) Main menu Action ¡æ select Image Download menu

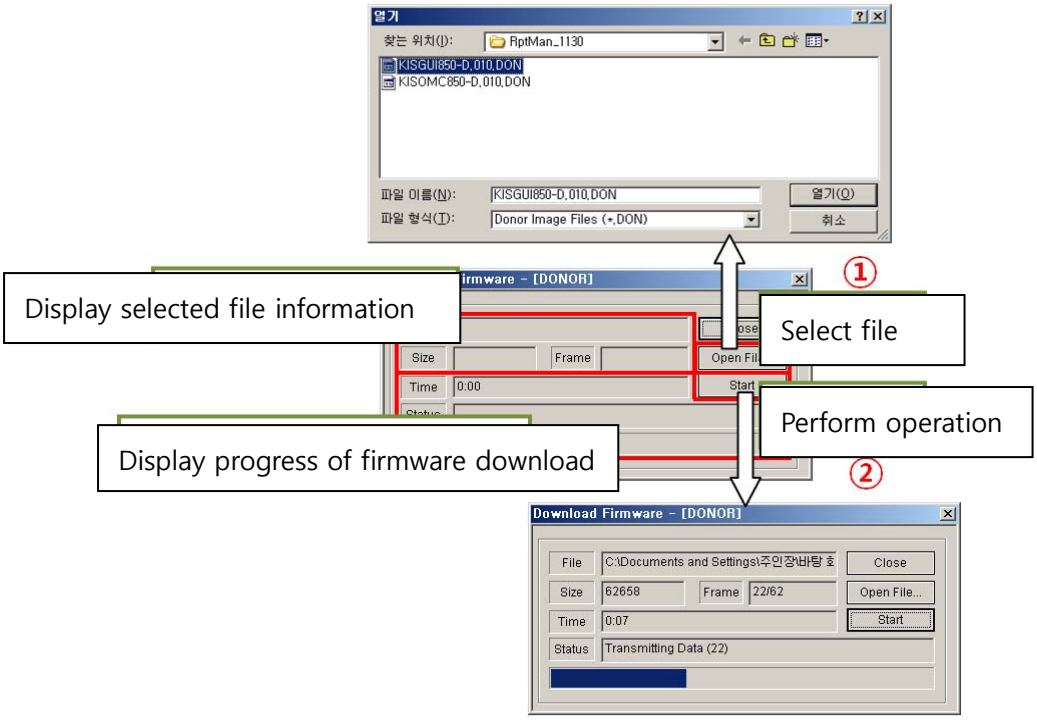
Step 2) In toolbar, select  for RHU, and select  for RU

Download firmware after selecting the firmware file for the target equipment.

File conversion procedure :



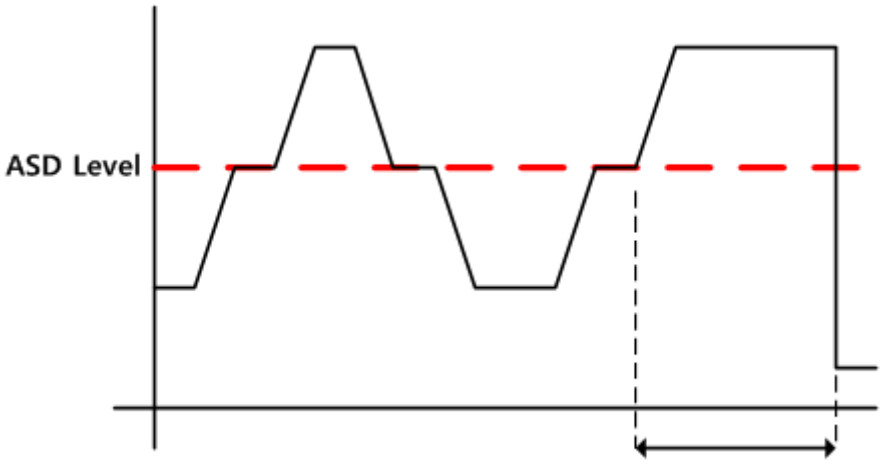
Download procedure :



6.9. Additional features

6.9.1. ASD (Auto Shutdown) Function

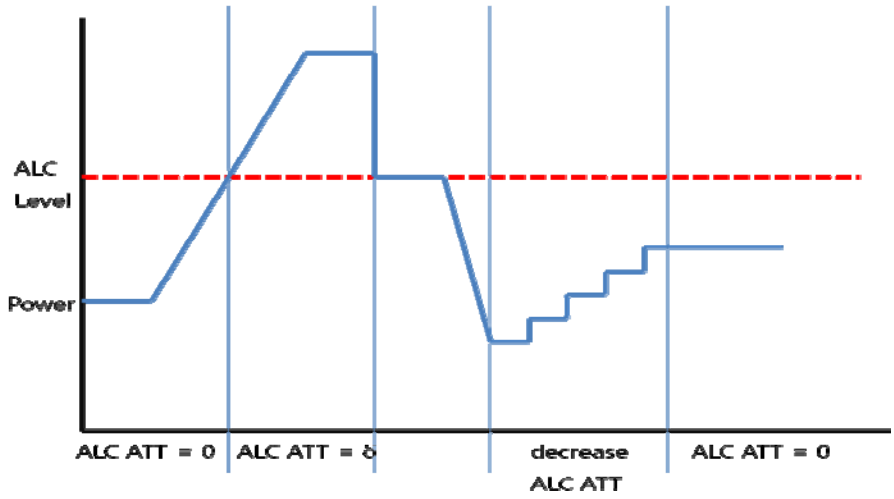
1. If the power level is above the shut down level for longer than 1 second, turn off HPA.
2. During shutdown state, monitor RU input power. If the level is below 5dB from shut down level, turn on HPA automatically.
3. Monitor HPA output power in normal operation, and monitor RU input power during shut down.



Longer than 1 sec, HPA off

6.9.2. ALC (Auto Level Control) Function

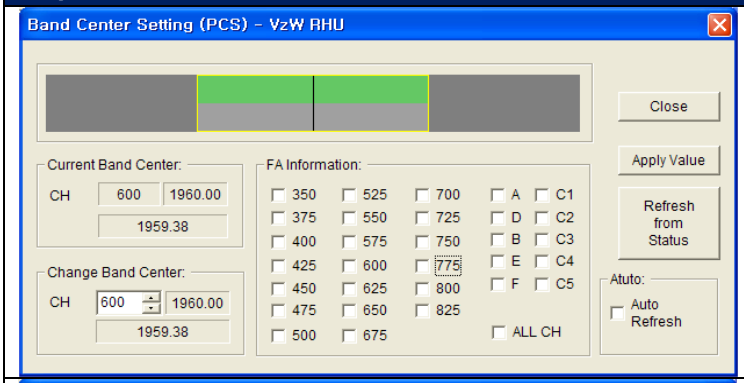
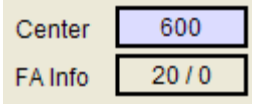
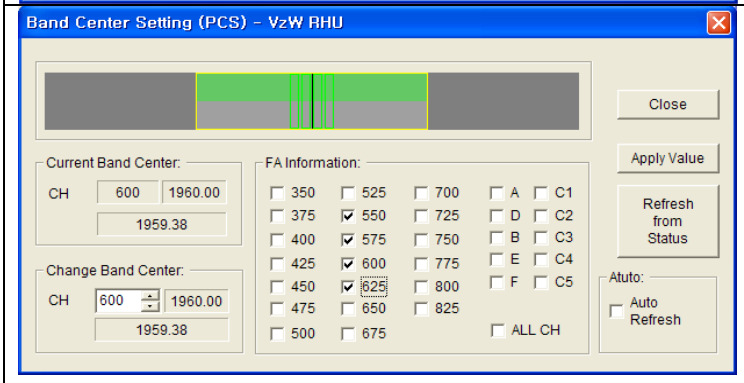
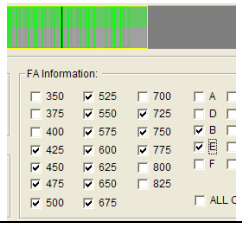
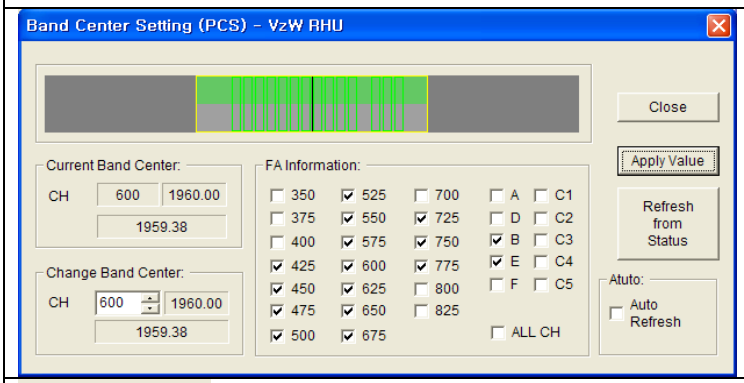
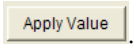
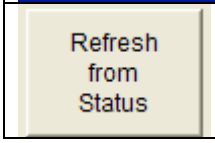
1. If the power level reaches the ALC level, prevent from transmitting higher than ALC level by using ATT control.
2. When power level goes down under ALC level, ALC ATT will be decreased until it becomes 0. It will decreased 1dB per about 500 mS or 1 sec.

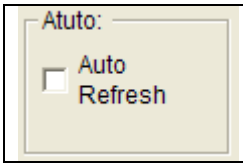


6.9.3. Center Channel Selection

RHU and RU can cover only 25MHz band width. For Cellular band, it will be OK, But for PCS, user have to choose proper center channel of device. It seems to sliding window.

User can specify center channel as following table:

Step	Descriptions
	Activated dialog by click  Select center channel. (for Cellular, center channel cannot be changed)
	Select channels in-serviced. You can select them by : ● Individual channel ● Band name e.g. A, B, F 
	Finish center channel selection and FA channels by click  .
	Ignores all values you specified, and refresh values from RHU.

	Refresh all values every 1 sec. It is useful, if you want to check current service channel.

Appendix A Factory setting value for each equipment

RHU		RU	
Item	Value	Item	Value
RHU TEMP UPR	80	RU TEMP UPR	90
1900/850MHz Tx IN UPR	-25	Tx ATT1	31.5
1900/850MHz Tx IN LWR	-63	Tx ATT2 (Hidden ATT)	N.A
Optic LD LWR	0	PLL	N.A
Optic PD LWR	-10	HPA-850, HPA1900 On/off	Off
Tx ATT1, ATT2	31.5	HPA-850, HPA-1900 OUT UPR	42
Center	N.A	HPA-850, HPA-1900 OUT LWR	20
FA Info	N.A	HPA-850, HPA-1900 ALC Level	40
Tx FPGA ALC	-5	HPA-850, HPA-1900 ALC On/Off	ON
Rx IN UPR	-20	HPA-850, HPA-1900 ASD Level	43
Rx OUT UPR	29	HPA-850, HPA-1900 ASD On/Off	ON
Rx ALC	27	Rx Protection ON/OFF	ON
Rx ASD	30	Rx IN UPR	-40
Rx ATT1, ATT2, ATT3	31.5	1900/850MHZ Rx ATT	31.5
FPGA Bypass ON	Off	Optic LD LWR	0
		Optic PD LWR	-10

Appendix B Cellular CDMA Frequency Map

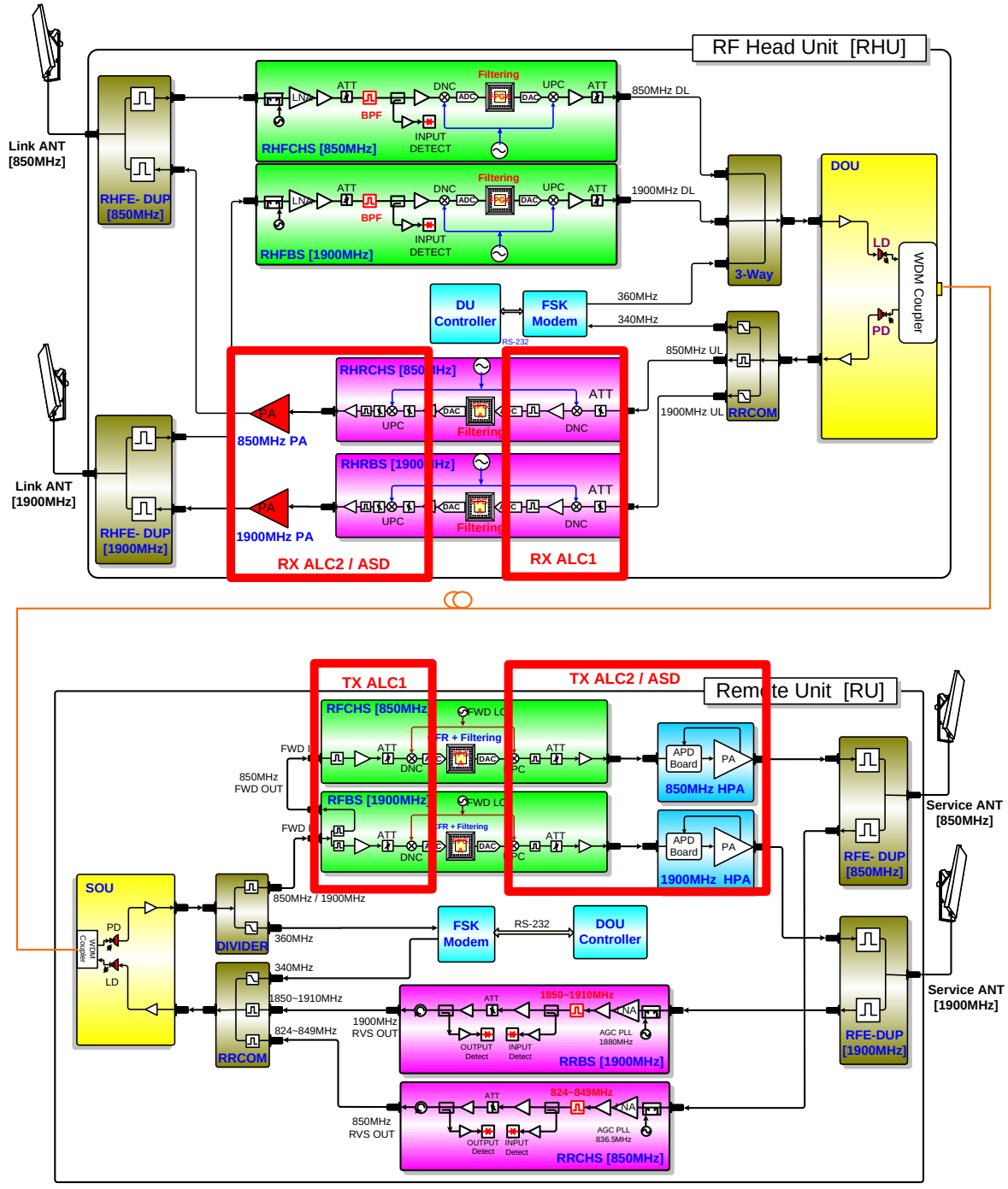
Sub-Band	Channel #	DL (MHz)	UL (MHz)	Remarks
A1	1019	869.88	824.88	DL : 869.265~879.105MHz
	37	871.11	826.11	UL : 824.265~834.105MHz
	78	872.34	827.34	
	119	873.57	828.57	
	160	874.8	829.8	
	201	876.03	831.03	
	242	877.26	832.26	
	283	878.49	833.49	
B1	384	881.52	836.52	DL : 880.905~889.515MHz
	425	882.75	837.75	UL : 835.905~844.515MHz
	466	883.98	838.98	
	507	885.21	840.21	
	548	886.44	841.44	
	589	887.67	842.67	
	630	888.9	843.9	
A2	691	890.73	845.73	DL : 890.115~891.345MHz
				UL : 845.115~846.345MHz
B2	777	893.31	848.31	DL : 892.695~893.925MHz
				UL : 847.695~848.925MHz

Appendix C PCS CDMA Frequency Map

Sub-Band	Channel #	DL (MHz)	UL (MHz)	Remarks
A	25	1931.25	1851.25	DL : 1930.625~1944.375MHz
	75	1933.75	1853.75	UL : 1850.625~1864.375MHz
	100	1935.00	1855.00	
	125	1936.25	1856.25	
	150	1937.50	1857.50	
	175	1938.75	1858.75	
	200	1940.00	1860.00	
	225	1941.25	1861.25	
	250	1942.50	1862.50	
	275	1943.75	1863.75	
D	325	1946.25	1866.25	DL : 1945.625~1949.375MHz
	350	1947.50	1867.50	UL : 1865.625~1869.375MHz
	375	1948.75	1868.75	
B	425	1951.25	1871.25	DL : 1950.625~1964.375MHz
	450	1952.50	1872.50	UL : 1870.625~1884.375MHz
	475	1953.75	1873.75	
	500	1955.00	1875.00	
	525	1956.25	1876.25	
	550	1957.50	1877.50	
	575	1958.75	1878.75	
	600	1960.00	1880.00	
	625	1961.25	1881.25	
	650	1962.50	1882.50	
	675	1963.75	1883.75	
E	725	1966.25	1886.25	DL : 1965.625~1969.375MHz
	750	1967.50	1887.50	UL : 1885.625~1889.375MHz
	775	1968.75	1888.75	
F	825	1971.25	1891.25	DL : 1970.625~1974.375MHz

	850	1972.50	1892.50	UL : 1890.625~1894.375MHz
	875	1973.75	1893.75	
C1	925	1976.25	1896.25	C3 Band
	950	1977.50	1897.50	
	975	1978.75	1898.75	
	1000	1980.00	1900.00	
	1025	1981.25	1901.25	C4 Band
	1050	1982.50	1902.50	
C2	1075	1983.75	1903.75	
	1100	1985.00	1905.00	
	1125	1986.25	1906.25	C5 Band
	1150	1987.50	1907.50	

* Auto gain control function



→To activate Automatic Gain Setting function

On the Tx path, the default gain is set to put out 30 dBm, which is 10 dB lower than the maximum output power with consideration of traffic fluctuation of the base station. If different output level is desired, **Tx ATT** value of RU can be set manually to change output power level. When output power level is manually changed by adjusting Tx. ATT value, ALC(Auto Level Control)/ASD(Auto Shutdown) function should be turned **ON** with **40 dBm**

levels respectively for ALC and ASD to protect the system from overpower.
On the Rx path, the default gain is set to put out 20 dBm, which is 7 dB lower than the maximum output power with consideration of traffic fluctuation of the mobile station. If different output level is desired, **Rx ATT** value of RU can be set manually to change output power level. When output power level is manually changed by adjusting Rx. ATT value, ALC(Auto Level Control)/ASD(Auto Shutdown) function should be turned **ON** with **27 dBm** levels respectively for ALC and ASD to protect the system from overpower.