

STR250D01C Operating Manual

2011. 3.

Kisan Telecom

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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, STR250D01C 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 STR250D01C 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

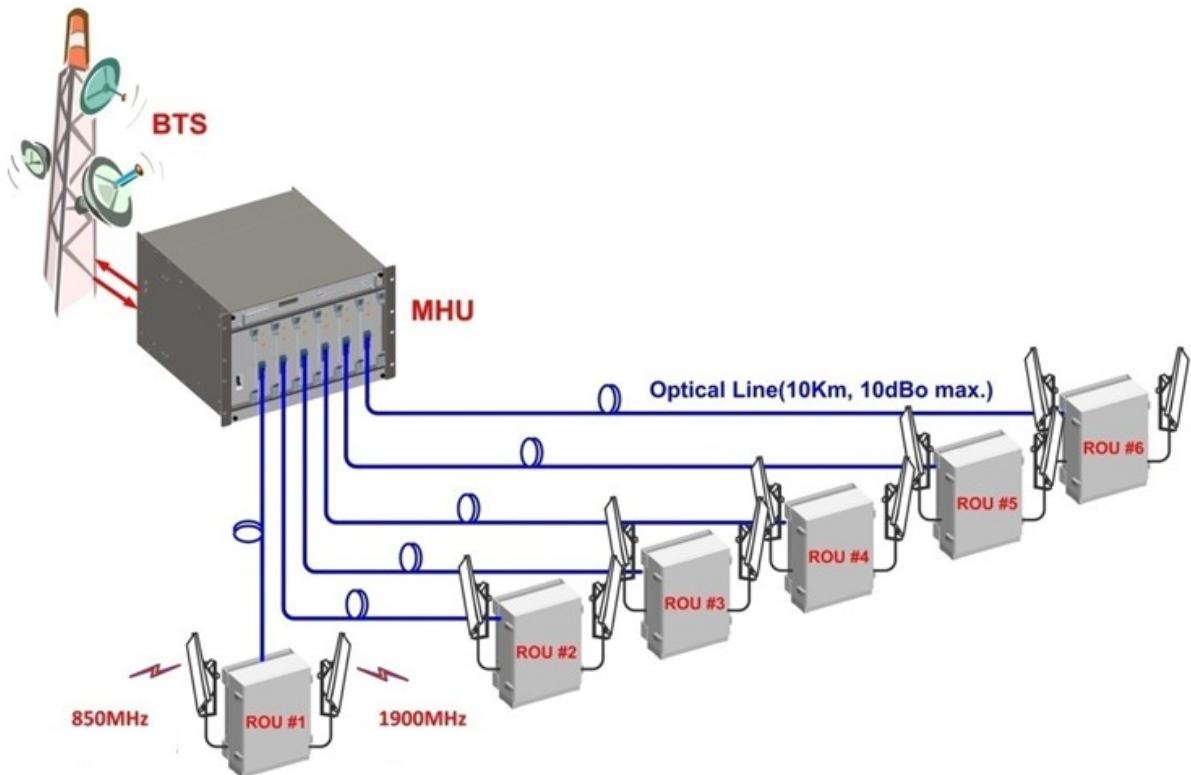
2.1. Network configuration

STR250D01C 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 MHU co-located with BTS (CDMA) is connected with 6 RU's by optical cables. The coverage antennas are connected to each RU.

⇒ System configuration

- MHU Capacity: 1 Optical Branch/DOU and 6 DOU/MHU (6 Optical Branch/MHU)
- System Connection: Optical cable between MHU and RU
- Optic Wavelength: 1310nm for FWD, 1550nm for RVS
- Max loss of optic cable (between MHU and RU): 2 ~ 10dB
- 2 ANT ports on RU. (Separate Ant. Ports for 850MHz and 1900MHz)



[Network Configuration of Dual Band Optical DAS]

3. System Specifications

3.1. General Specifications

Item		STR250D01C MHU	STR250D01C RU
Enclosure Type		7U-Shelf type 19" standard rack mountable In-door use	Cabinet
Dimension (mm)	W × H × D	19"(482.4) X 310(7U) X 450mm	471.7(H) X 263.4(W) X 304.8(D)mm
	Weight	16.5Kg(Includes DOU1)	26 Kg
Power Supply		110-120Vac (Tolerance $\pm 10\%$), 60Hz	110-120Vac (Tolerance $\pm 10\%$), 60Hz
Power Connector		ID-NO3BEH	MS Connector
RF In/Out Port		SMA Female, rear side	N Type Female, bottom side
Optic Connector Type		FC/APC, front side	FC, bottom side
Optic Wavelength		FWD: 1310nm / RVS: 1550nm	
Operating Temperature		-5°C ~ 40°C	-5°C ~ 50°C

⇒ Environmental requirement

The repeater RU shall be operated in the temperature range of -5°C ~ +50°C.

3.2. System specifications

3.2.1. Frequency allocation

✧ 1900MHz Band

Guard											Guard			
CHAN	0	25	275	325	375	425	675	725	775	825	875	925	1175	1200
BS FREQ		1931.25	1943.75	1946.25	1948.75	1951.25	1963.75	1966.25	1968.75	1971.25	1973.75	1976.25	1988.75	
FREQ	1930		1945		1950		1965		1970		1975		1990	

✧ 850MHz Band

Guard											Guard			
CHAN	127	128	132	133	182	183	232	233	239	240	251	252		
BS FREQ	869	869.2	870	870.2		880	880.2		890	890.2	891.4	891.6	893.8	
FREQ	869		870.1		880.1		890.1		891.5		894			

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	20 CH(PCS) and 17 CH(Cellular) CDMA Carriers		
System Delay	DL: 8usec max. UL: 5usec max.		
Tx-Rx Isolation	100dB min. @Between RU Tx ANT and MHU Rx Output		
Impedance	50 Ohm		
Pass-Band Ripple	3dB max.		25MHz BW
FWD Input Power	-10 ~ 0dBm/total, -5dBm/total is recommended at MHU IN		Each Band
FWD Output Power	40dBm /total for 1900MHz RU ANT Port 40dBm /total for 850MHz RU ANT Port		
RVS Input Power	-60dBm/total max. at RU each ANT Port		
RVS Output Power	-20dBm/total max. at MHU each Rx Output Port		
System Gain	FWD: 50dB max. RVS: 40dB max.		
FWD Spurious	Comply to 3GPP2, FCC regulation		
RVS Noise Figure	5dB max. @ 40dB 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	DU: SMA Female	RU: N-type Female	

4. Mechanical Specifications

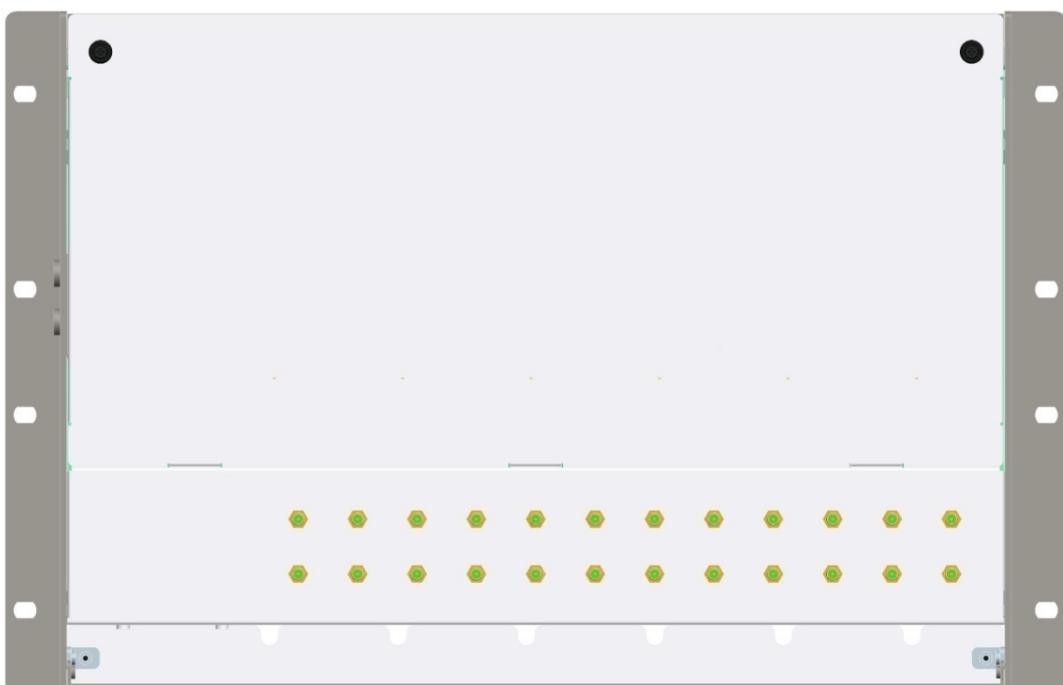
4.1. STR250D01C MHU

4.1.1. Mechanical Design

[FRONT]



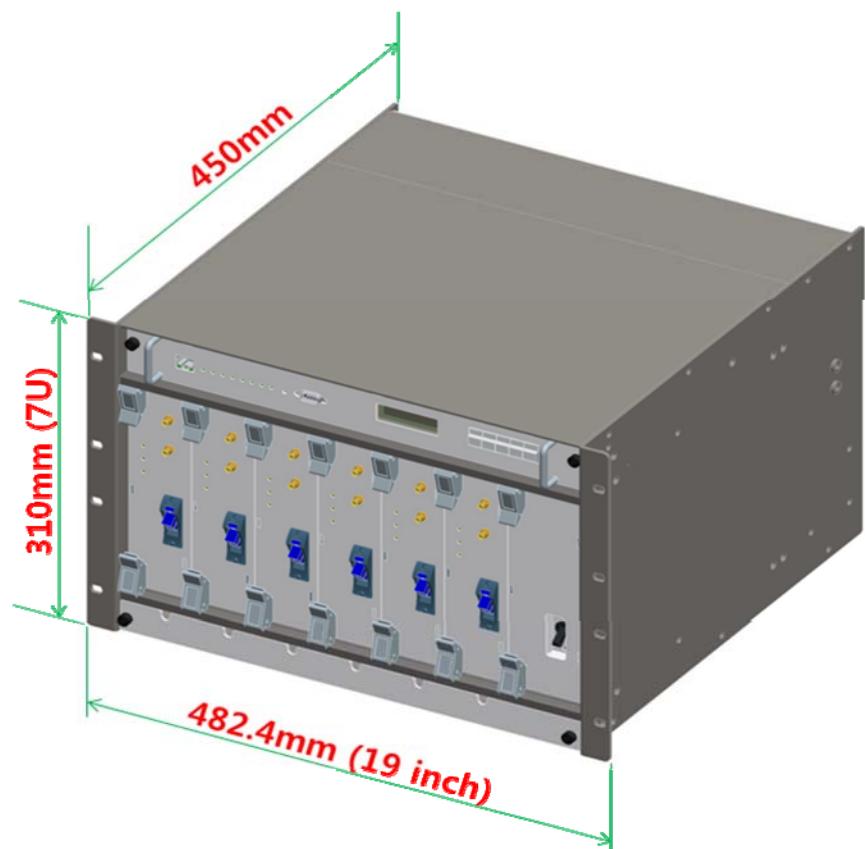
[REAR]



[MHU Figure]



4.1.2. Dimension



4.1.3. Mechanical specification

No	Items	Specifications
1	Exterior view	1. Shelf attachable type to both INDOOR and OPEN RACK 2. W 19"(482.4) X H 310(7U) X D 450mm 3. Weight: 16.5 Kg (1DOU included)
2	Material	Aluminum (AL5052, AL6063) is mainly used for protection from corrosion by outdoor conditions.
3	Connector Type	1. Optic I/O: FC/APC at front side 2. RF I/O: SMA Female at rear side 3. Monitor port: SMA Female at front side
4	Power Input	1.Power: 110-120Vac, 60Hz 2.Connector: IN-NO3BEH
5	Ground	14SQ 2Hole ground pipe (right side of shelf) and M4 "O" rug ground (rear side of shelf)
6	Communication Port	9P D-SUB (GUI) and RJ-45 at front side

4.1.4. Descriptions of STR250D01C MHU

[Forward Path]

The signal from CDMA BTS is fed to the RF input port of MHU. First, MHU RVS/FWD Combiner (MRFCOM) module measures the input signal power level and combines the signal with the modem signal (360MHz). The combined signal then gets transmitted to RU via optical cable.

[Reverse Path]

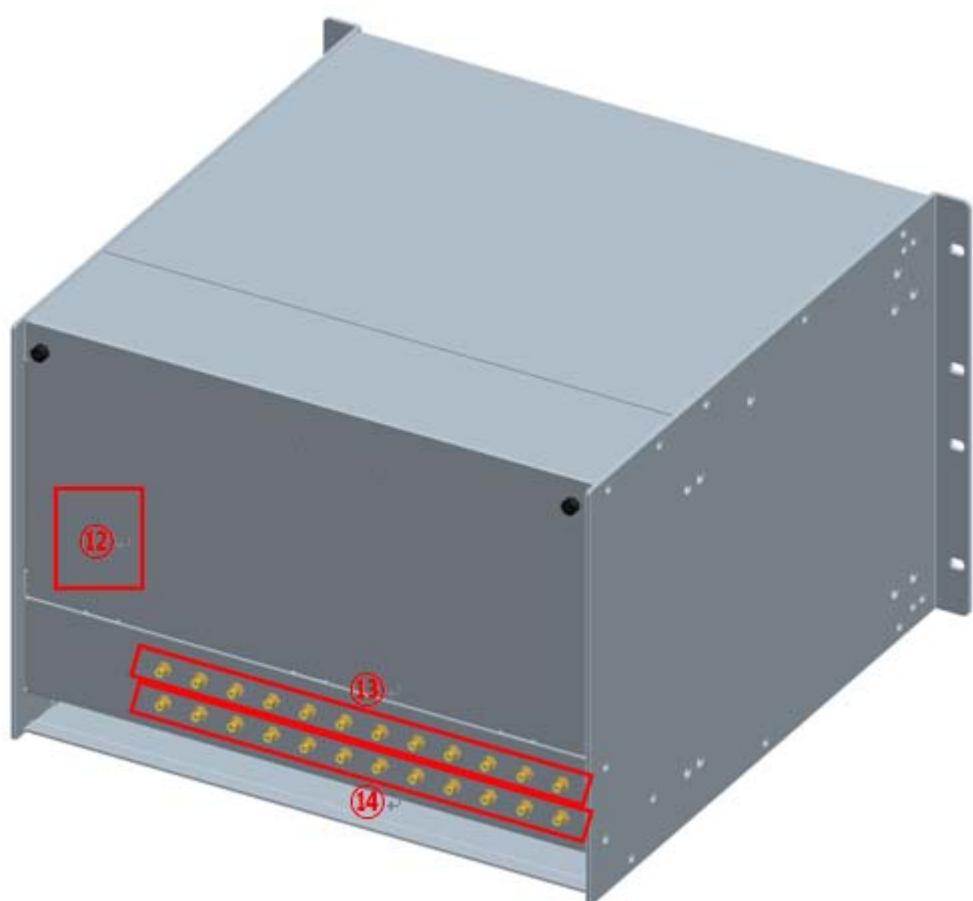
The CDMA RVS signal input from RU through the optic module is separated into RF and modem signal, and then RF RVS signal level is measured by the MRFCOM module. The RF signal then is fed to the BTS.

4.1.5. Port Configuration

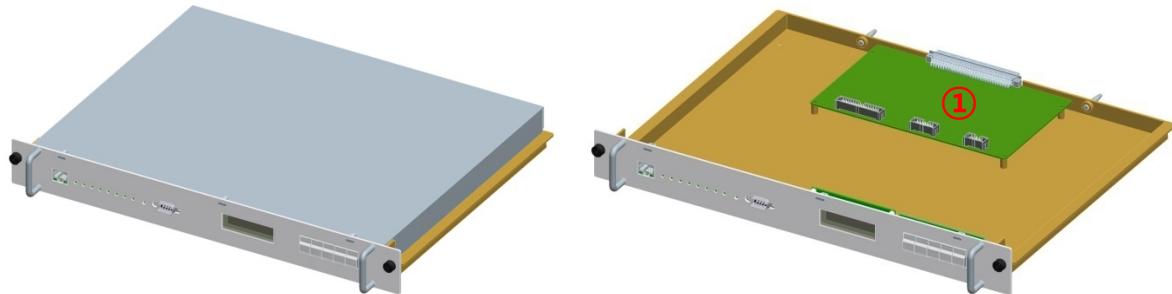


No	Items	Description	
1	TX_MON	Monitor port for MHU FWD input signal from BTS (-20dB)	
2	RX_MON	Monitor port for MHU RVS output signal to BTS (-20dB)	
3	LED1	RUN	Green Blinking: CPU run, OFF(Gray): CPU stop
		ALM	Summary Alarm of MHU, Green: Normal, Red: Alarm
		RU1	The status of communication with RU1, Green: Normal, Red: Alarm
		RU2	The status of communication with RU2, Green: Normal, Red: Alarm
		RU3	The status of communication with RU3, Green: Normal, Red: Alarm
		RU4	The status of communication with RU4, Green: Normal, Red: Alarm
		RU5	The status of communication with RU5, Green: Normal, Red: Alarm
		RU6	The status of communication with RU6, Green: Normal, Red: Alarm
		RESET	NMS board HW Reset
4	DEBUG	PC connection port for GUI S/W (9pin D-SUB)	
5	DISPLAY	Key pad input display	
6	DATA INPUT	Equipment status/check, control data input	
7	Power Switch	AC110V power ON/OFF switch	

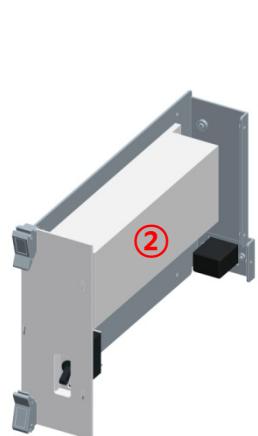
8	Optic Connector	FC/APC type optic connector
9	LED2	PWR DC power supply status of the DOU Card
		LD LD Alarm, Green: Normal, Red: Alarm
		PD PD Alarm, Green: Normal, Red: Alarm
10	RJ45(To Master)	Connection port to the master for the NOC
11	NMS board	Sliding type
12	AC INPUT	External AC power input port (rear part)
13	Tx1900/Tx850 IN	MHU dual band FWD RF connection port from BTS (rear part)
14	Rx1900/Rx850 OUT	MHU dual band RVS RF connection port to BTS (rear part)



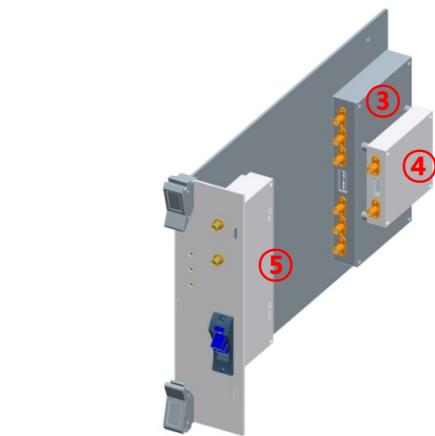
4.1.6. Module Composition



[NMS UNIT]



[PSU]



[DOU]

No	Module	Voltage Used	Remarks
①	MHU NMS Controller	9Vdc	
②	MHU PSU(Power Supply Unit)	9Vdc/6.5Vdc	
③	MRFCOM(MHU RVS FWD Combiner)	6.5Vdc	
④	MHU FSK Modem	9Vdc	
⑤	MHU Optical Transceiver Unit (DOU)	6.5Vdc	

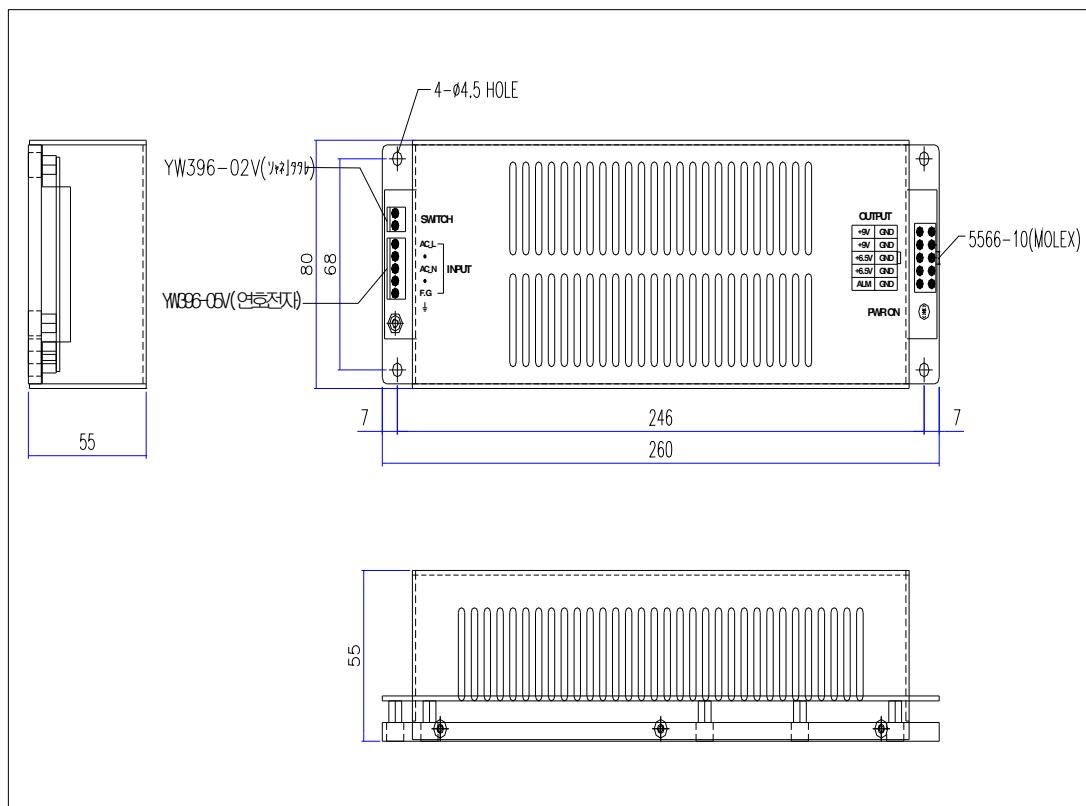
4.1.7. Function of modules

No	Module	Functions
1		[MHU NMS Controller] Monitors/controls the status and configurable items of each module in MHU
2		[PSU] Converts AC110V into DC9V and DC6.5V, and provide supply voltage to each module in MHU
3		[MRFCOM] Detects the FWD/RVS RF signal power level of input/output ports of the MHU. Also provides the connection pin to NMS controller and FSK modem. This module combines/divides the RF signal and FSK modem signal. Provides -20dB monitor port for Tx input/Rx output.
4		[FSK Modem] Data modem for MHU and RU communication MHU → RU frequency: 360MHz RU → MHU frequency: 340MHz
5		[DOM] Converts E/O(or O/E) the FWD and RVS signals. Wavelength: Tx 1310[nm], Rx 1550[nm]

4.1.8. PSU

PSU converts external AC110V into DC and supplies +9V, +6.5V to each module in MHU.

The drawing of PSU is as follows.



[PSU Capacity]

Output Voltage	Maximum current	Watt
+9V	3 A	59.5 W
+6.5V	5 A	

[PSU Pin Map]

SWITCH PIN Type: YW396-02V

Pin no.	1	2
Spec.	Switch_IN	Switch_Out

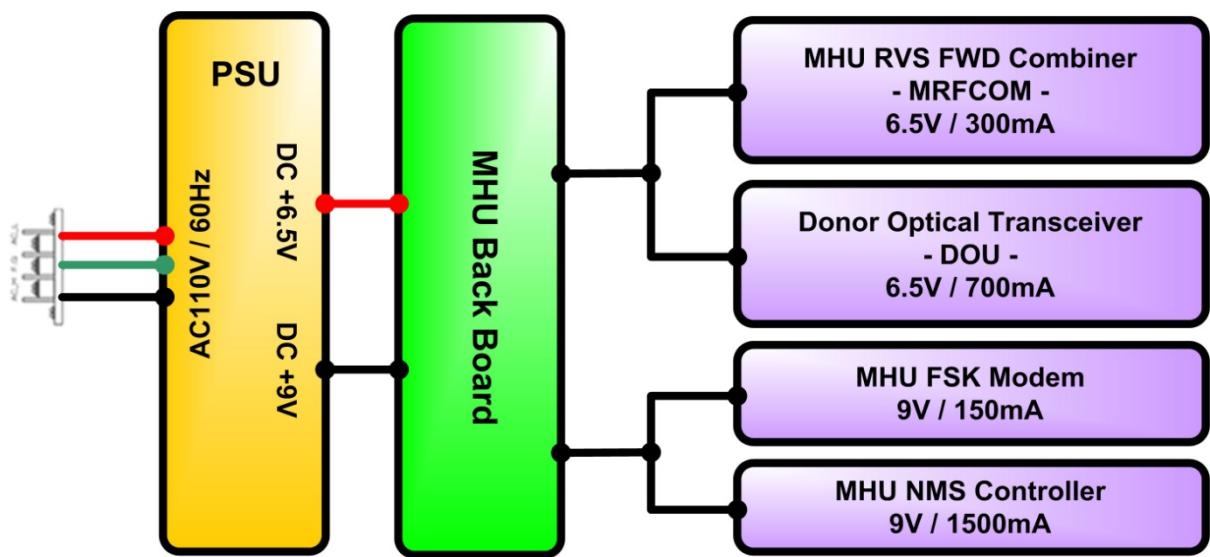
INPUT PIN Type: YW396-05V

Pin no.	1	2	3	4	5
Spec.	AC_L	N.C	AC_N	N.C	F.G

OUTPUT PIN type: 5566-10 (MOLEX)

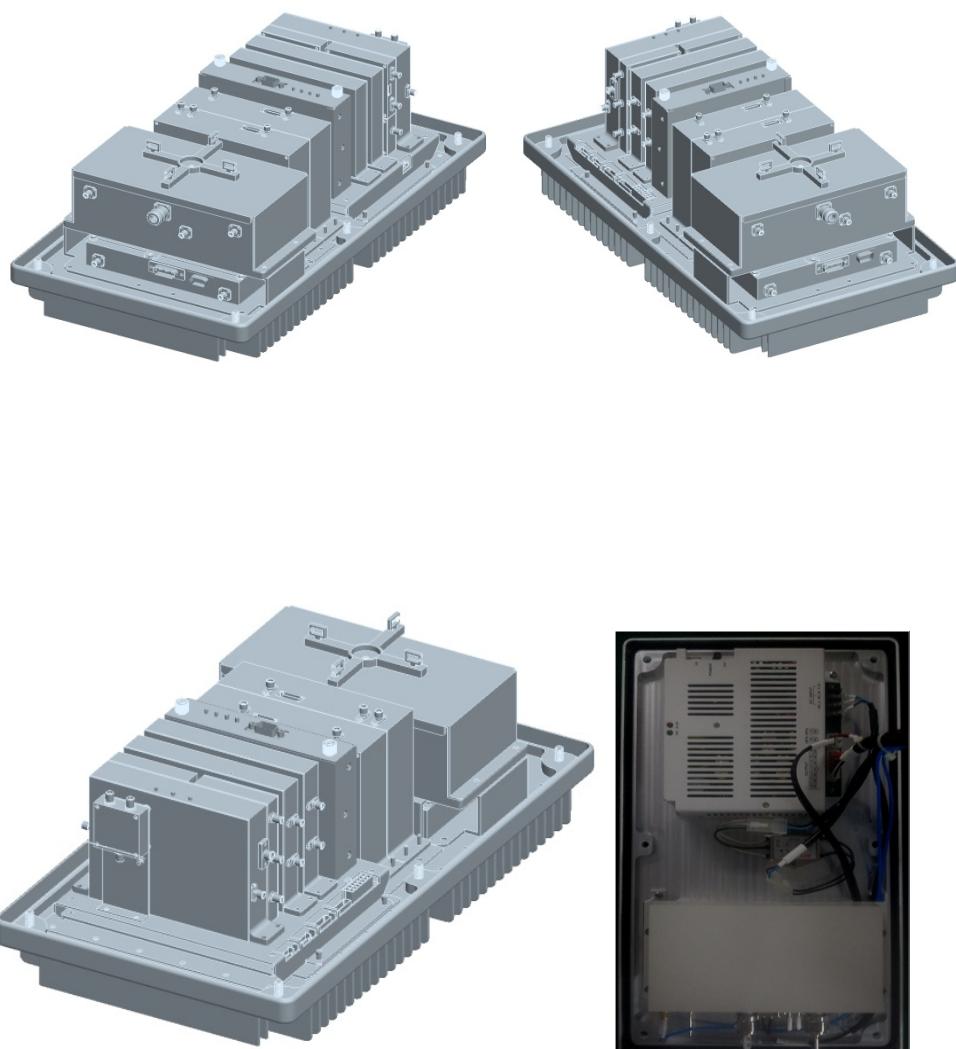
Pin no.	1	2	3	4	5
Spec.	ALARM	+6.5V	+6.5V	+9V	+9V
Pin no.	6	7	8	9	10
Spec.	GND	GND	GND	GND	GND

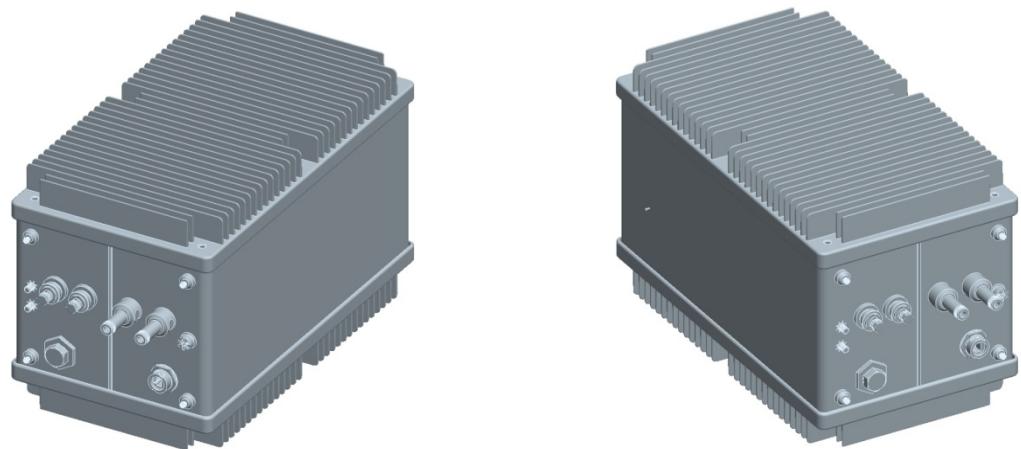
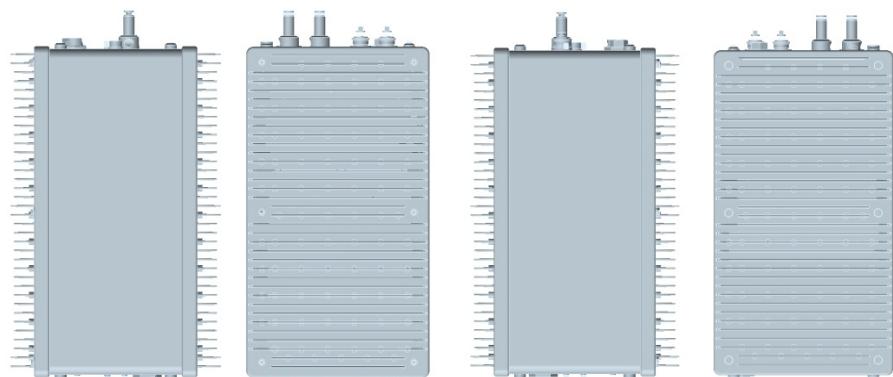
Power Distribution/Consumption Diagram



4.2. STR250D01C 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	<ol style="list-style-type: none"> Dimension: 471.7(H) X 263.4(W) X 304.8(D) mm (plinth included) Weight: 26 Kg
2	Method of Cooling	Natural convection (Heat-sink)
3	Door Locking Type	10 on each side using bolt lock
4	Optic Connector	<ol style="list-style-type: none"> Position: Cabinet inside Connector type: FC/TBD <p>* Optic cable tray is provided inside of cabinet.</p>
5	ANT PORT	<ol style="list-style-type: none"> located at the bottom side of cabinet Connector Type: N Type Female
6	Power Input	<ol style="list-style-type: none"> Power: 110-120Vac, 60Hz Position: bottom side of cabinet Connector: MS connecter
7	Ground	TBD
8	Waterproof condition	TBD
9	Misc. Features	<ol style="list-style-type: none"> Easy to maintain Pole mountable (i.e., telegraph pole) Torque hinge used

4.2.4. Description of STR250D01C RU

[Forward path]

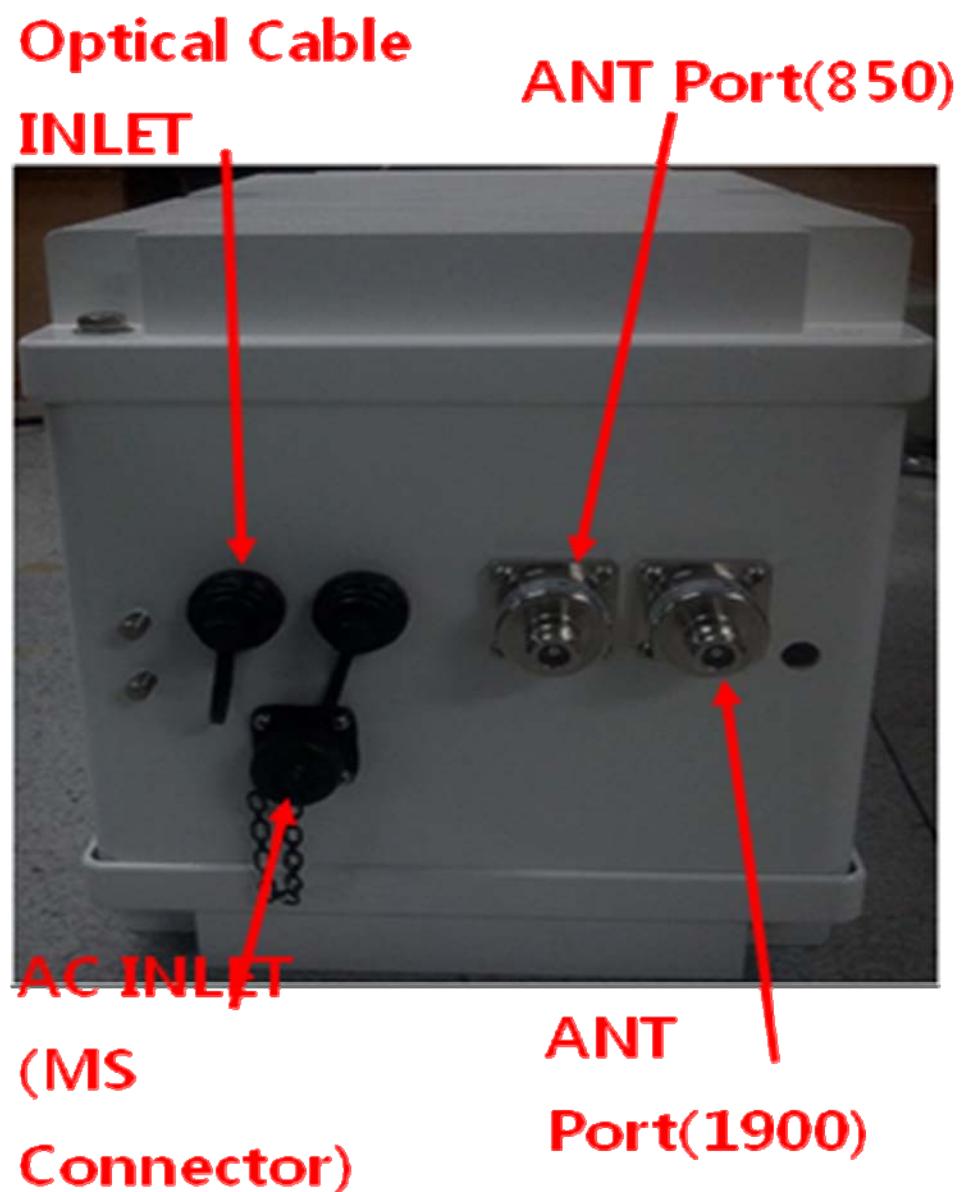
The RF and modem combined signals sent from the optic module of MHU is first divided into RF and modem signals at Divider in RU, then the 1900MHz Tx RF signal is amplified and filtered at the RFBS module, 850MHz Tx RF signal is amplified and filtered at the RFCHS module. The modem signal is conveyed 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]

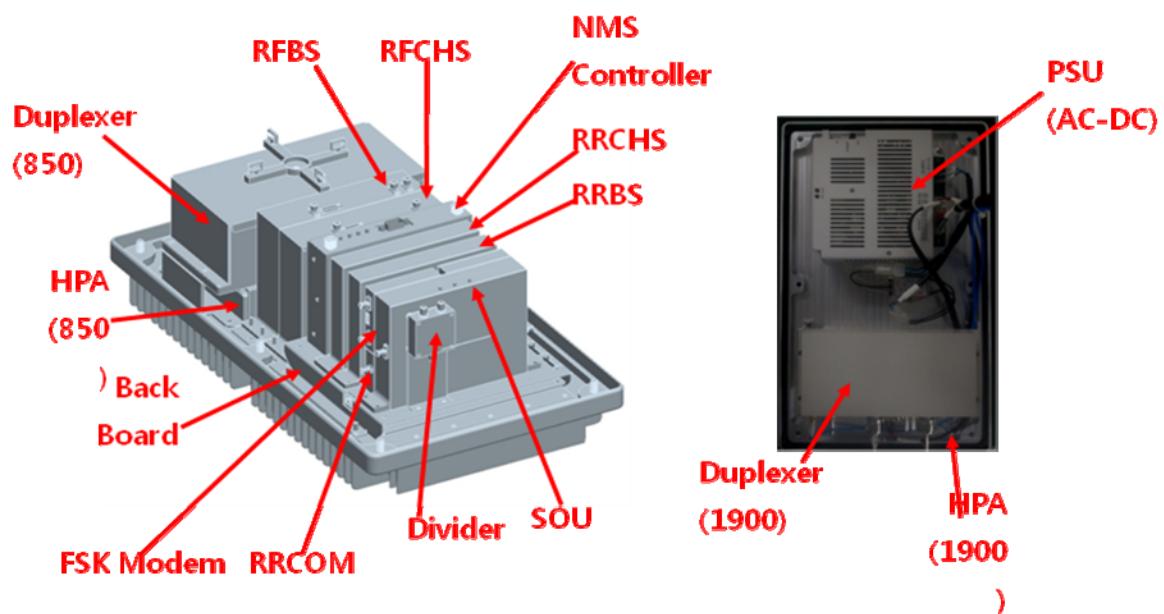
CDMA Rx signals incoming from 1900MHz or 850MHz antenna are first passed by the Front-End Filter Unit, amplified by a low noise and high gain amplifier, filtered in RRBS(for 1900MHz band) or RRCHS(for 850MHz band), and combined with modem signal at combiner(RRCOM). The combined signal is then transmitted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

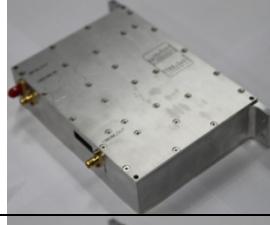
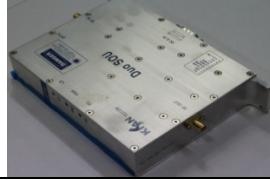
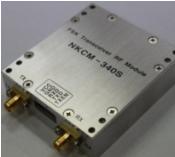
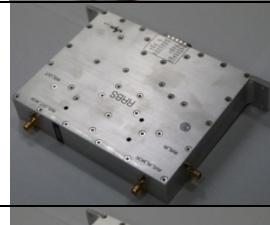
4.2.6. Module Composition of RU

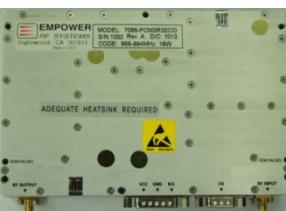
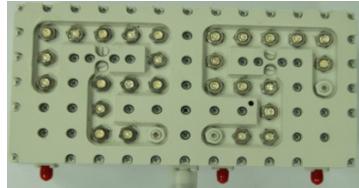
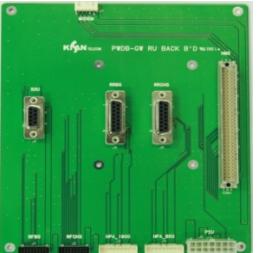


⇒ **Module operational voltage table**

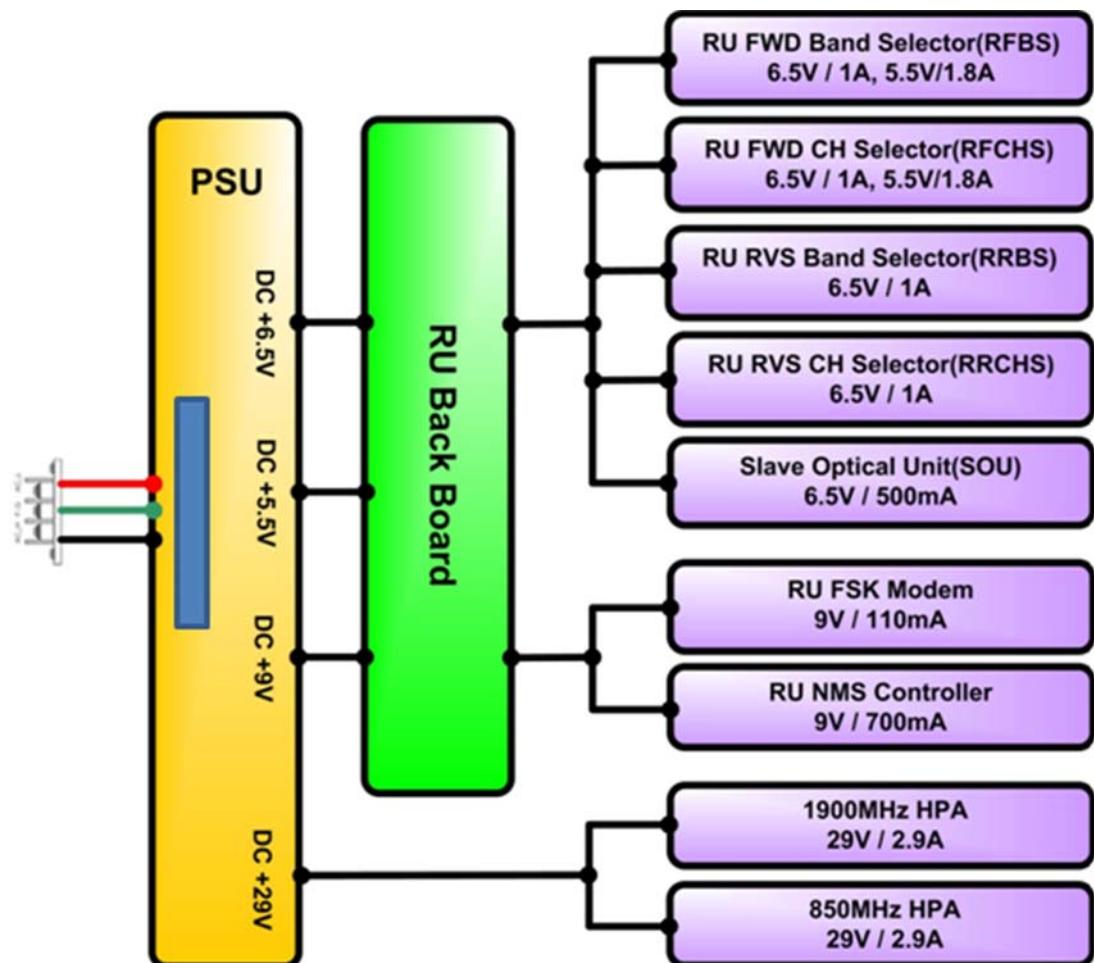
No	Module	Voltage Used	Remarks
1	Divider		
2	RF FWD Band Selector for 1900MHz (RFBS)	5.5Vdc /6.5Vdc	
3	RF FWD Channel Selector for 850MHz (RFCHS)	5.5Vdc /6.5Vdc	
4	Slave Optical Transceiver Unit (SOU)	6.5Vdc	
5	RF Modem (FSK Modem)	9Vdc	
6	RU RVS COM for Signal combing (RRCOM)		
7	RU RVS Band Selector 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

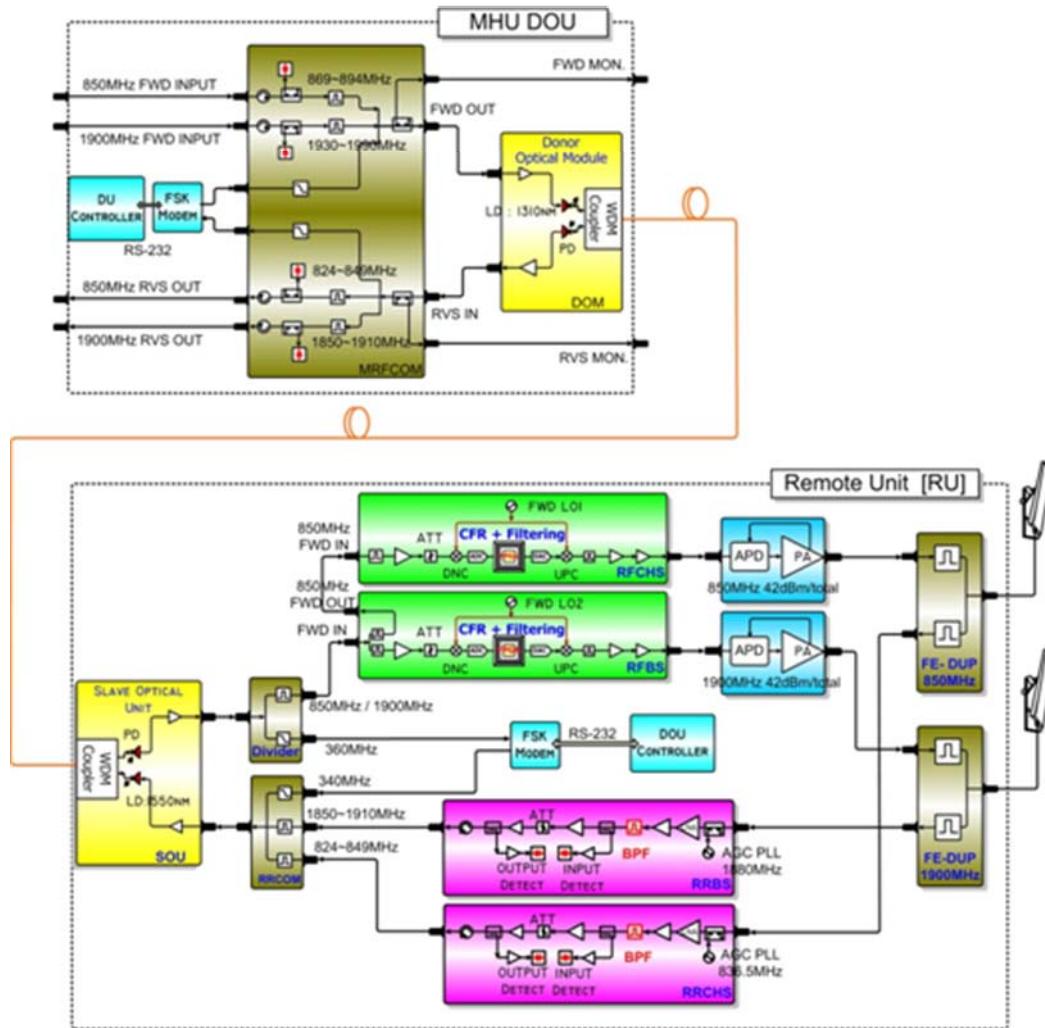
No	Module	Description
1		<p>[Divider] Divides signals into RF and modem signals and sends to RFBS/RFCHS and FSK modem.</p>
2		<p>[RFBS] Controls the gain of 1900MHz FWD path, filters FWD band, controls the crest factor of 1900MHz FWD signal, and performs the ALC function. Output of the module is sent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

9		<p>[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.</p>
10		<p>[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.</p>
11		<p>[1900MHz FE-Duplexer] Front end duplexer that passes through 1900MHz desired FWD and RVS frequency bands.</p>
12		<p>[850MHz FE-Duplexer] Front end duplexer that passes through 850MHz desired FWD and RVS frequency bands.</p>
13		<p>[PSU] Converts AC 110V to DC 29V/9V/6.5V/5.5V, and distributes the necessary power to each modules.</p>
14		<p>[NMS Controller] Monitors the status of modules in RU and controls the configurable parameters of the RU modules.</p>
15		<p>[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.</p>

⇒ Power Distribution Diagram



5. Block Diagram



6. Administration Program (RptMan-STR250D01C)

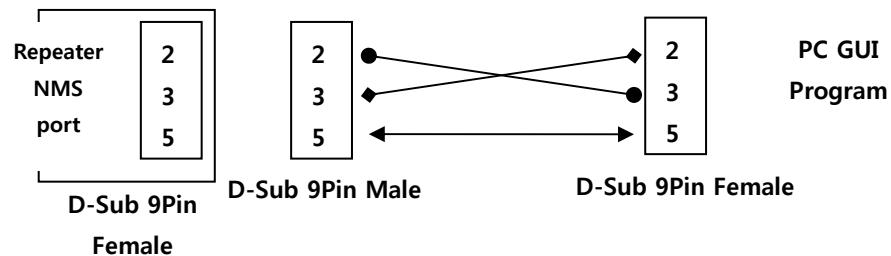
Administration program (RptMan-STR250D01C) is a management program for STR250D01C and provides status monitoring and controlling functions to users.

6.1. System Requirement

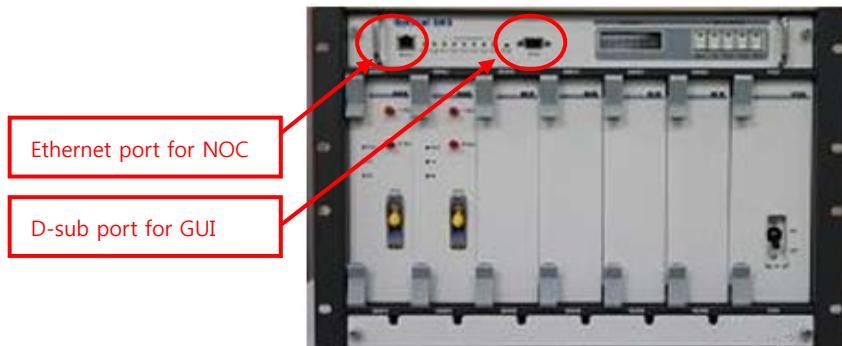
- ⇒ System: Desktop or laptop PC
- ⇒ OS: Windows XP or later version
- ⇒ Resolution: 1024 × 768 or more
- ⇒ Connection Cable: 9 pin serial cable (cross type)

6.2. Cable connection

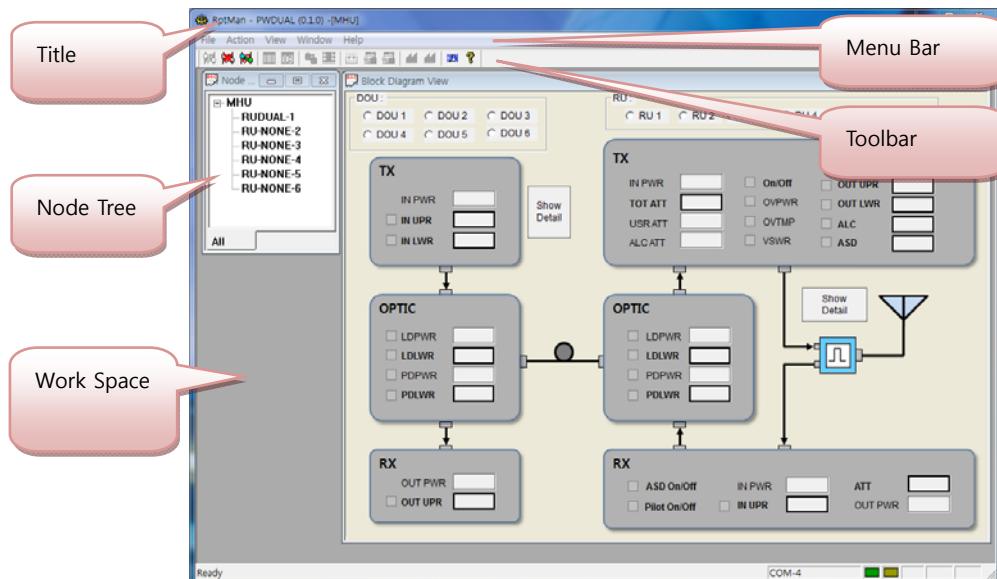
The cable connection between repeater and PC (GUI program) is illustrated below.



The NMS port of MHU provides two ports; one is a D-sub port for local GUI. The other is an Ethernet port for NOC (Network Operating Center).



6.3. Screen



Section	Description
Window Title	<p>RptMan - PWDUAL (0.1.0) - [MHU]</p> <p>Displays the name of management program(GUI), i.e. RptMan-STR250D01C.</p> <p>Displays the type of equipment currently connected to the program (MHU or RU).</p>
Menu Bar	<p><u>File</u> <u>Action</u> <u>View</u> <u>Window</u> <u>Help</u></p> <p>Presents working menu for operators.</p> <p>It is associated with tool icons, which can activate the tool bar menus.</p>
Toolbar	 <p>Presents icons (button type) for frequently used commands.</p> <p>User-friendly icons are used.</p> <p>Icons are activated or disabled as to the status of repeater.</p>
Work Space	<p>Status information and control functions are provided with a block diagram view of MHU and RU.</p> <p>Provides the working space for windows or dialogs.</p>

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**

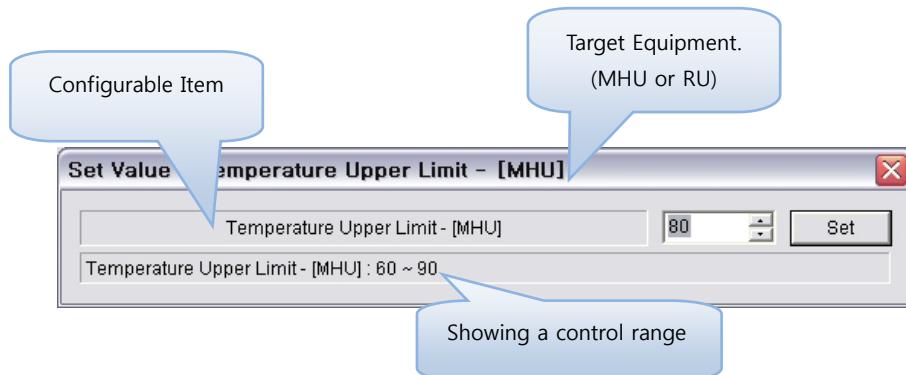
- Units are not displayed.
- Value displayed in box ()

⇒ **Control**

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

6.5. Control Policy

- ⇒ System parameter can only be controlled one at a time.
- ⇒ Click a control item (button) to bring up a control popup dialog window.



- ⇒ Once a dialog popup window is opened, 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
	TC Table	Presents temperature compensation table
	Image Compression	Compress the firmware file (executable file of repeater) for download
	MHU image download	Downloads compressed firmware file to MHU 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: set ATT to have 35dBm on the remote ANT output. Rx: set ATT to have 40dB of Rx total gain from RU to MHU including optical loss.
	Polling period	Controls the polling period between PC and repeater
View	Block window	Presents system window including MHU and RU
	MHU Window	Presents MHU 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 RptMan.Dual	Displays the version information of GUI program, RptMan (Repeater Manager)

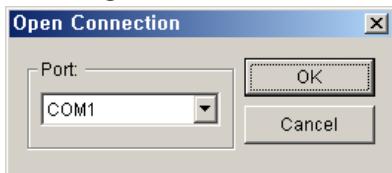
6.7. Toolbar

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		Stops or resumes polling action of GUI program. (activated in toggling way)
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.
MHU Download		Download MHU firmware files to MHU equipment.
RU Download		Download RU firmware files to RU equipment.

MHU Factory Setting		Initialize MHU 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

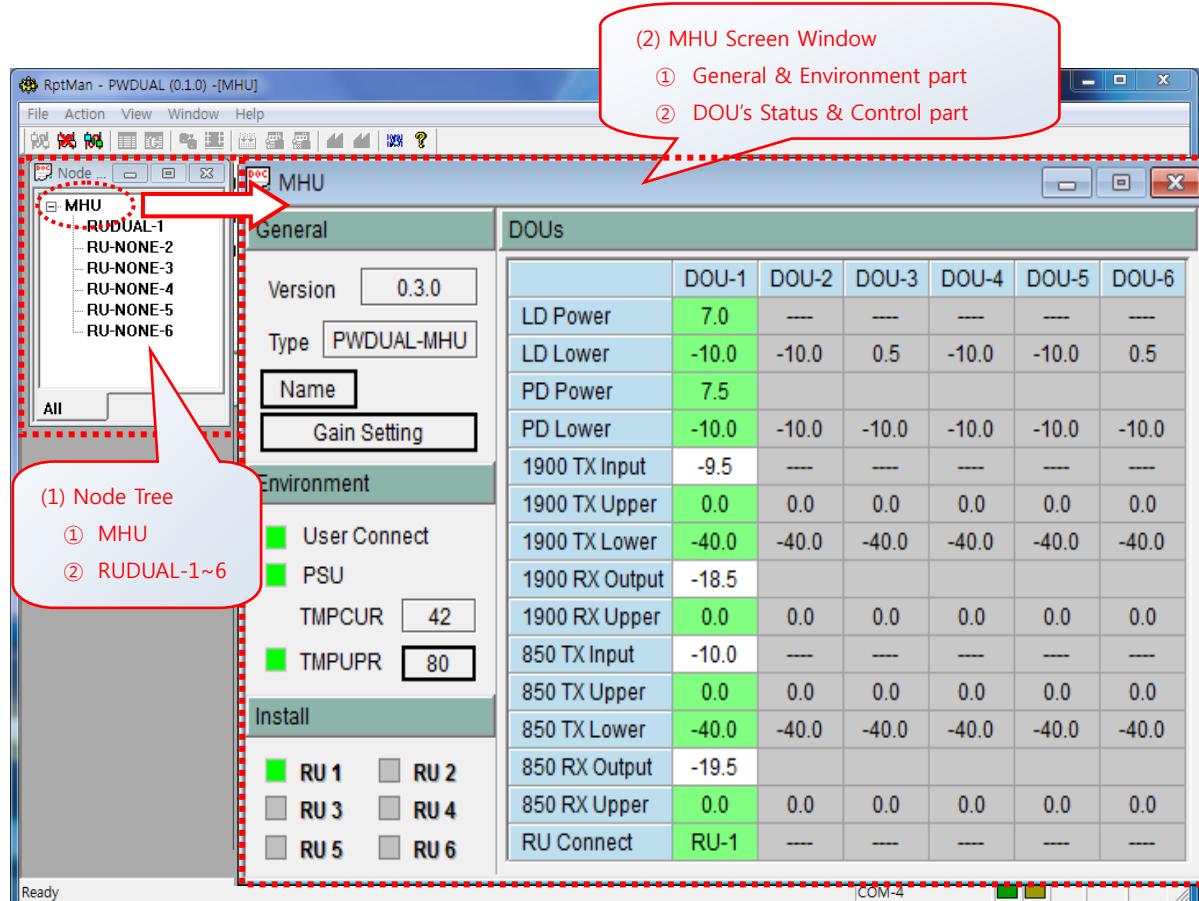


Function	Establishing communication between GUI and repeater	
Method	Click button in toolbar of GUI program	
Description	Port	Combo box to set the com port (COM1, COM2, ...)
	OK Button	Initiates communication between GUI and repeater, then closes this popup window("Open Connection") When communication port is established correctly, you can see the communication status by blinking icons.  (right-bottom side of the main screen)
	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 on PC and repeater becomes disconnected.

6.8.3. STR250D01C MHU Status Retrieval and Control

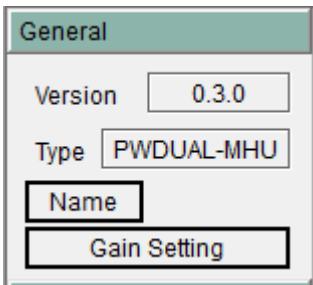
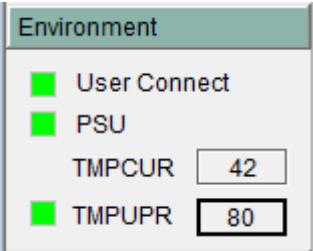
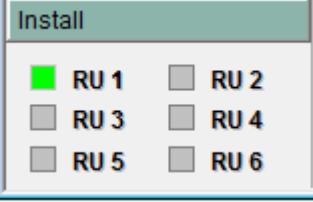
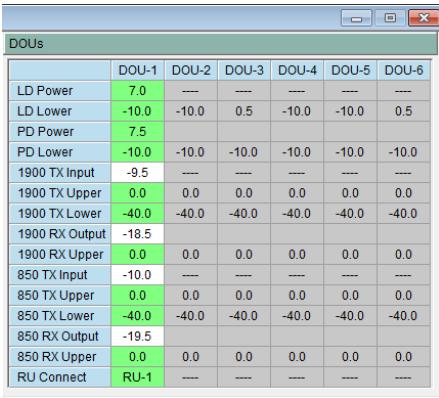


(1) Node Tree: This window displays the tree configuration of RUs connected with MHU

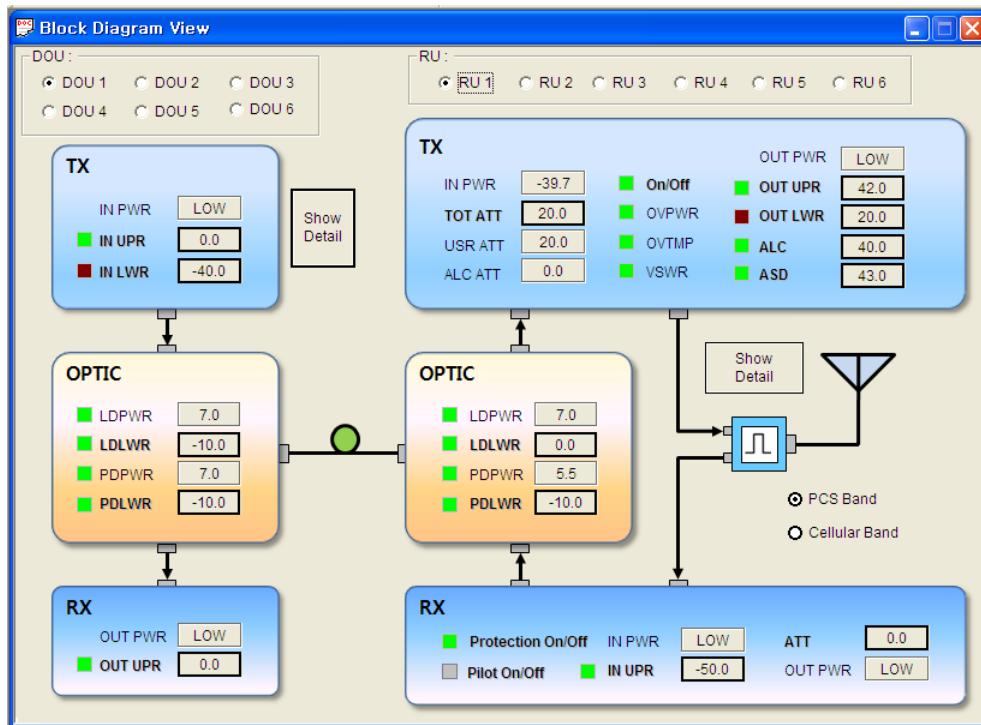
(1) Node Tree	① MHU	Press MHU to open the MHU screen
	② RUDUAL-1 ~ 6	Press RUDUAL-# to open each RU screen

(2) MHU Screen window

(2) MHU Screen	① General & Environment	This part includes common parameter of MHU like system information or environments
	② DOU Status/Control	This screen provides information on 6DOUs → LD Power & Lower limit value → PD Power & Lower limit value → Tx Input, Rx Output Power & Limit value → RU Install information

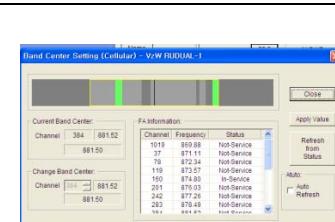
Group	Description
	<ul style="list-style-type: none"> ⇒ Version: Firmware Versoin ⇒ Type: Repeater unit type ⇒ Name: ID of MHU for the communication ⇒ Gain Setting <ul style="list-style-type: none"> ■ TX: sets ATT to have 35dBm of output at the RU ANT Port ■ RX: sets ATT to have 40dB gain of Rx path ■ Tx/Rx Gain setting function carries out Tx/Rx gain setting including automatic optical loss compensation.
	<ul style="list-style-type: none"> ⇒ 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)
	<ul style="list-style-type: none"> ⇒ Install: This sets up the RU to communicate with MHU. Even when an RU is connected to MHU physically by optic cable, the RU cannot communicate with MHU if RU is not installed logically by GUI.
	<ul style="list-style-type: none"> ⇒ LD Power: Transmitted optical power level to RU ⇒ LD Lower: Lower limit level of the LD power ⇒ PD Power: Received optical power level from RU ⇒ PD Lower: Lower limit level of the PD power ⇒ 1900 Tx Input: Tx level input from 1900MHz BTS ⇒ 1900 Tx Upper: Upper limit of Tx input level ⇒ 1900 Tx Lower: Lower limit of Tx input level ⇒ 1900 Rx output: Rx level output to 1900MHz BTS ⇒ 1900 Rx Upper: Upper limit of Rx output level ⇒ 850 Tx Input: Tx level input from 850MHz BTS ⇒ 850 Tx Upper: Upper limit of Tx input level ⇒ 850 Tx Lower: Lower limit of Tx input level ⇒ 850 Rx output: Rx level output to 850MHz BTS ⇒ 850 Rx Upper: Upper limit of Rx output level ⇒ RU install: display the RU installation status

6.8.4. STR250D01C RU Status Retrieval and Control

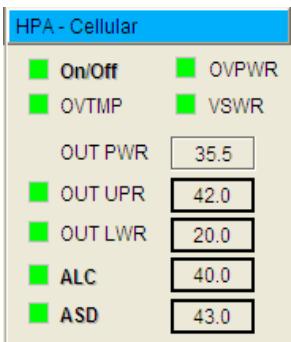


Group	Description
General Version: 2.0.0.1 Type: VzW DUAL-RU Name	⇒ Version: Firmware version ⇒ Type: Type of repeater ⇒ Name: Set the Name, ID, Serial No. of repeater RU
Environment User Connect PSU TMPCUR: 26 TMPUPR: 80	⇒ User Connect: Connection status of COM port of repeater ⇒ PSU: Status of PSU ⇒ TMPCUR: Current temperature in repeater RU ⇒ TMPUPR: Value/control of upper threshold of temperature (button) and alarm status (LED)

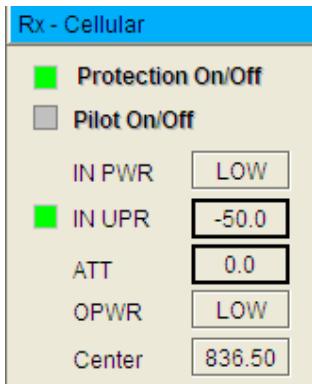
	<ul style="list-style-type: none"> ⇒ LDPWR: Value of LD power (box) and status of LD (LED) ⇒ LDLWR: Value/control of lower threshold of LD power (button) and lower alarm status of LD power (LED) ⇒ PDPWR: Value of PD power (box) and status of PD (LED) ⇒ PDLWR: Value/control of lower threshold of PD power (button) and lower alarm status (LED)
	<ul style="list-style-type: none"> ⇒ RU parameters for PCS/Cellular band are displayed by the tab selection. Each band has the identical items which can be monitored and controlled.
	<ul style="list-style-type: none"> ⇒ 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.
	<ul style="list-style-type: none"> ⇒ 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 values 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 detected



- ⇒ **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.

6.8.5. 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 → Select Donor Windows or Remote Windows

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

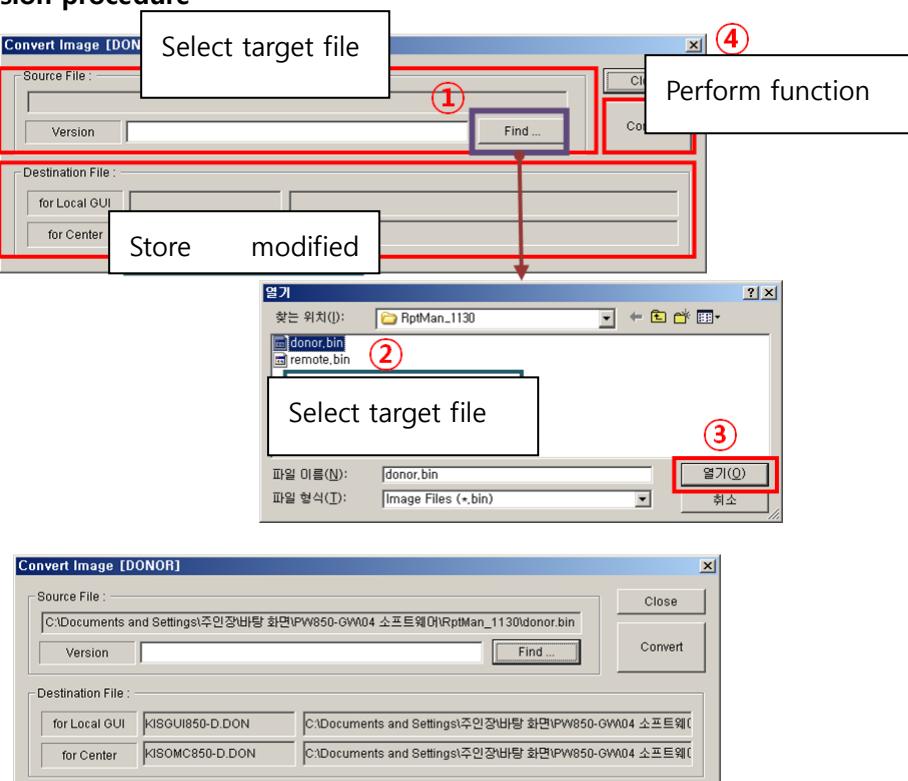
- ③ Download firmware to the target equipment.

Step 1) Main menu Action → select Image Download menu

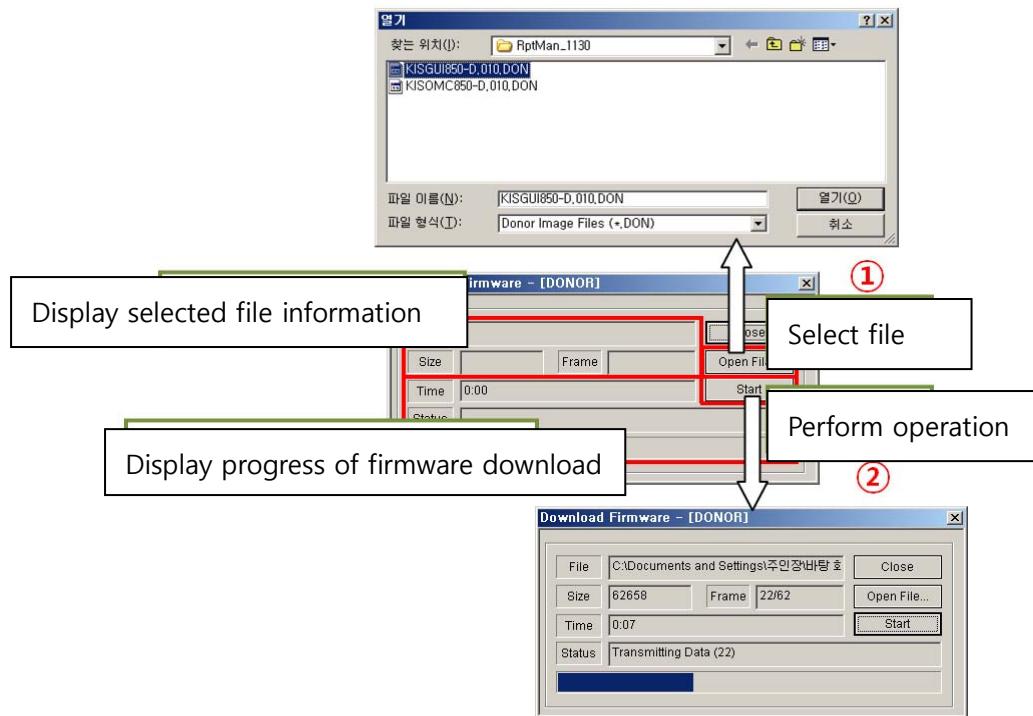
Step 2) In toolbar, select  for MHU, and select  for RU

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

File conversion procedure



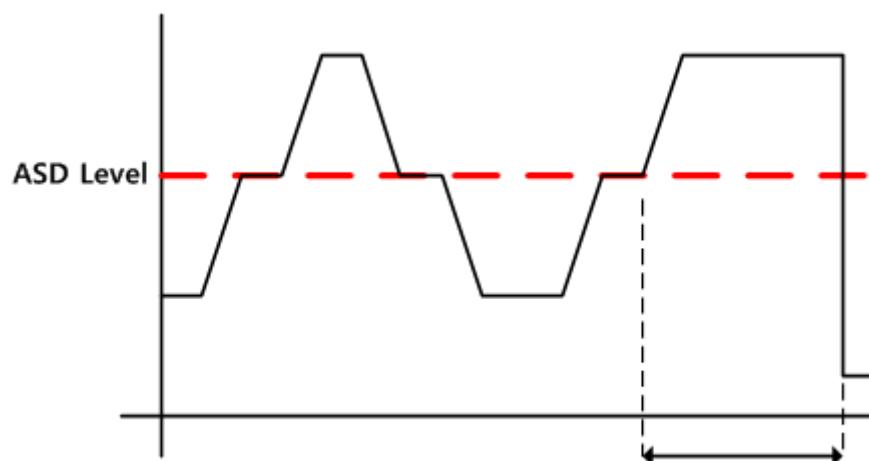
Download procedure



6.9. Additional features

6.9.1. ASD (Auto Shutdown) Function

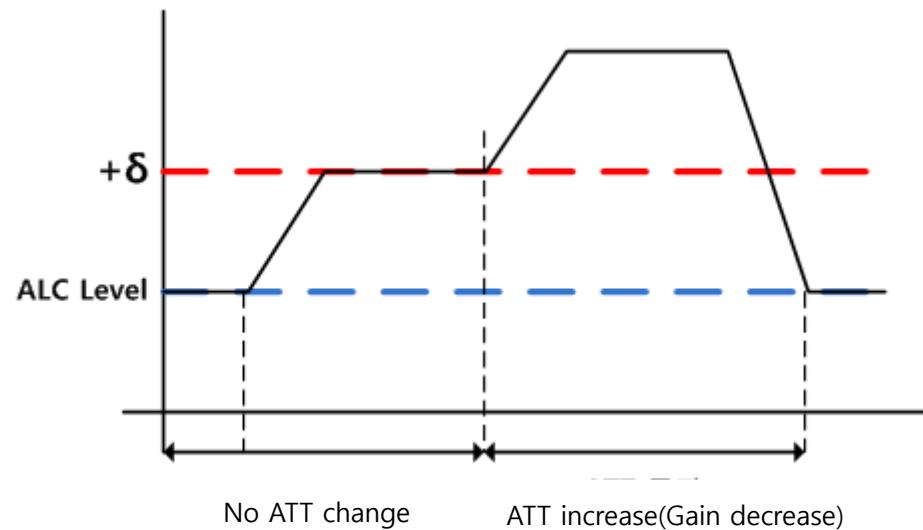
1. If the power level is above the shut down level for longer than 1 second, turn off HPA.
2. During shutdown state, monitor RU input power. If the level is below 5dB from shut down level, turn on HPA automatically.
3. Monitor HPA output power in normal operation, and monitor RU input power during shut 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. By storing the existing ATT value, the ATT value before ALC can be reused even when the power is reduced.



Appendix A Factory setting value for each equipment

MHU		RU	
Item	Value	Item	Value
MHU TEMP UPR	80	RU TEMP UPR	80
1900/850MHz Tx IN UPR	1	RFBS, RFCHS ATT	30
1900/850MHz Tx IN LWR	-11	Hidden ATT	N.A
1900/850MHz Rx OUT UPR	0	PLL	N.A
Optic LD LWR	0	-	N.A
Optic PD LWR	-10	HPA-850, HPA-1900 On/off	Off
		HPA-850, HPA-1900 OUT UPR	42
		HPA-850, HPA-1900 OUT LWR	20
		HPA-850, HPA-1900 ALC Level	40
		HPA-850, HPA-1900 ALC On/Off	ON
		HPA-850, HPA-1900 ASD Level	43
		HPA-850, HPA-1900 ASD On/Off	ON
		RRBS, RRCHS ASD	ON
		RRBS, RRCHS IN UPR	-50
		RRBS, RRCHS ATT	30
		RRBS, RRCHS PLL	N.A
		Optic LD LWR	0
		Optic PD LWR	-10

Appendix B Cellular CDMA Frequency Map

Sub-Band	Channel #	DL (MHz)
A1	1019	869.88
	37	871.11
	78	872.34
	119	873.57
	160	874.8
	201	876.03
	242	877.26
	283	878.49
B1	384	881.52
	425	882.75
	466	883.98
	507	885.21
	548	886.44
	589	887.67
	630	888.9
	691	890.73
B2	777	893.31

Appendix C PCS CDMA Frequency Map

Sub-Band	Channel #	DL (MHz)
A	25	1931.25
	75	1933.75
	100	1935.00
	125	1936.25
	150	1937.50
	175	1938.75
	200	1940.00
	225	1941.25
	250	1942.50
	275	1943.75
D	325	1946.25
	350	1947.50
	375	1948.75
B	425	1951.25
	450	1952.50
	475	1953.75
	500	1955.00
	525	1956.25
	550	1957.50
	575	1958.75
	600	1960.00
	625	1961.25
	650	1962.50
	675	1963.75
	725	1966.25
	750	1967.50
	775	1968.75
E	825	1971.25
	850	1972.50

C1	875	1973.75
	925	1976.25
	950	1977.50
	975	1978.75
	1000	1980.00
	1025	1981.25
	1050	1982.50
	1075	1983.75
	1100	1985.00
	1125	1986.25
	1150	1987.50