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RAS2141 Installation Manual

Ver 1.0.0

Corporate Headquarters

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Revision History

Version	Date	Author/Editor	Comment
0.0.1	2010-03-16	SE, S/W, H/W	Editorial revision based on RAS2141.
0.5.0	2010-03-24	Sunghwan Hyun	Initial draft version.
1.0.0	2010-03-31	Sunghwan Hyun	First release version.

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Preface

Purpose of the Manual

This document provides basic installation guide for RAS2141 system, a base station in mobile WiMAX (WiBro in Korea) system.

"RAS2141 system" will be referred to as "RAS" or "RAS2141" for the sake of convenience in this document, otherwise when a distinction is required, it will be referred to as "RAS2141 System".

Please refer to the following documentations for more detailed description on operation and application of RAS systems:

- RAS2141 Operation Manual.
- RAS2141 System Description.

Amendments

The installation manual is being updated continuously in order to effectively reflect the actual system. However, there may be some minor differences due to the continued upgrades and modifications to the system. Please contact us to clarify any confusion arising from such differences.

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Contact

Please contact us for more detailed information on any items described in this installation manual.

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Caution and Other Marks

Notes

Provides supplementary information on system operation or assistance.

Caution

Provides explanation on matters to be cautious and appropriate measures.

1 Overview

1.1 System Specifications

1.1.1 System Form

Picture 1. RAS2141 Exterior

1.1.2 Capacity and Expansion

RAS2141 system can support 1FA/Omni service. Depending on the number of subscribers and call traffic, three RAS2141 systems can be combined to support 1FA/3Sector service.

Picture 2. 3Sector Configuration (Poll Mount)

1.1.3 Power

RAS2141 system requires AC Free-voltage input, which is then converted internally to the voltage requirement of each internal unit. Optional -48VDC input is also available. The system does not support battery backup port.

Section	Standard	
System Input Power Voltage (AC or -48VDC)	-42 ~ -58VDC	
	88VAC ~ 264VAC, Single Phase	
Frequency	50/60Hz (47Hz~63Hz)	
Maximum Power Consumption	Average 165Watts	Operating Temperature -5 ~ 55C°
	Peak 210Watts	
	Average 395Watts	Operating Temperature -40 ~ 55C°
	Peak 440Watts	

Table 1. Power Voltage Requirements

1.1.4 Size and Weight

Section	Standard
Size (mm)	250 x 500 x 220
Weight (Kg)	Max 24Kg

Table 2. Size and Weight

1.1.5 Environmental Requirements

The environmental requirements (temperature, humidity, altitude, vibration, noise, electromagnetic wave) for flawless operation of RAS system are as follows:

Section	Range	Standard
Operating Temperature	-40 ~ 50°C (without Solar Cover) -40 ~ 55°C (with Solar Cover)	GR-63-CORE Sec.4.1.1
Storage Temperature	-40 ~ 70°C	GR-63-CORE Sec.4.1.1
Humidity	10% to 95% up to 32°C and not to exceed 0.024Kg dry air	GR-63-CORE Sec.4.1.2
Altitude	-60~3000m (-196.85~9,842.72ft)	GR-63-CORE Sec.4.1.3

Vibration/Earthquake	Less than height of 1m, Dist. 1.5m 65dB	GR-63-CORE Sec.4.4 GR-63-CORE Sec.5.4
Acoustic	Less than height of 1m, Dist. 1.5m 65dB	GR-63-CORE Sec.4.6 GR-487-CORE Sec. 3.2.9
Particle Density	0~50ug/m3	GR-63-CORE Sec.4.5
EMI		Class A for KN22 (EN55022, CISPR22)
IP Rating	IP65	

227 **Table 3. Environmental Requirements**

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229 ## 1.1.6 EMC Standard

Section	Standard	Test Levels
FCC Part15, Class A		
Conducted Emissions		
Radiated Emissions		
EMC Tests		
Emission Measurements for Enclosure & Ancillary Equipment	EN55022 Radiated emission	ETSI EN 301 489-01, 4.
Emission Measurements for AC Power Input/Output Port	EN55022 Conducted emission	ETSI EN 301 489-01, 4.
Harmonic Current Emissions (AC Mains Input Current)	EN 61000-3-2	ETSI EN 301 489-01, 4.
Voltage Fluctuations and Flicker (AC Mains Input Port)	EN 61000-3-3	ETSI EN 301 489-01, 4.
RF Electromagnetic Field (80 MHz - 1000 MHz and 1400-2000 MHz)	EN 61000-4-3 Radiated Immunity	ETSI EN 301 489-01, 4.
Electrostatic Discharge	EN 61000-4-2 Electrostatic Discharge (ESD)	ETSI EN 301 489-01, 4.
Fast Transient Common Mode	EN 61000-4-4 Electrical Fast Transients (EFT)	ETSI EN 301 489-01, 4.
RF common Mode (0.15 MHz – 80 MHz)	EN 61000-4-6 Conducted Immunity	ETSI EN 301 489-01, 4.

Voltage DIPS and Interruptions	EN 61000-4-11	ETSI EN 301 489-01, 4.
Surges, Common and Differential mode	EN 61000-4-5 Power line Surge	ETSI EN 301 489-01, 4.

Table 4. EMC Specifications

1.1.7 Physical Interface

1.1.7.1 Interface Description

Picture 3. Bottom View

1) DC IN: -48VDC power input port at -48VDC option. Blank Panel at AC option.
2) AC_IN/ALM: AC power input port at AC option. Ethernet port for receiving external Rectifier alarm at -48VDC option.
3) ETH DBG: This port is utilized for RAS2141 debugging purpose. The port allows the operator to access the unit's detailed operating information or to manage and setup RAS2141. It can be set to RS232 or 10/100Base-T. Verify your options
4) ETH B/H: Interface to support 100/1000Base-T connected to ACR.

5) OPTIC DAISY: Interface to support 1000Base-X connected to another RAS2141. Verify your ordering options.

6) OPTIC B/H: Interface to support 1000BASE-X connected to ACR. Verify your ordering options.

7) GPS: In RAS2141-M, input port to connect cable from GPS Antenna.

8) ANT0: Port to connect RF Antenna 0.

9) Tx0 MON: Port to monitor ANT0 port. Outputs signal decreased by 40dB compared to the ANT0 port (ANT0 Port: 40dB±1dB).

10) 10MHz: 10MHz signal output port for synchronizing the external equipment or spectrum analyzer system.

11) TDD: TDD signal output port for synchronizing the external equipment or spectrum analyzer system.

12) ANT1: Port to connect RF Antenna 1.

13) Tx1 MON: Port to monitor ANT1 port. Outputs signal decreased by 40dB compared to the ANT1 port (ANT1 Port: 40dB±1dB).

14) B/T: Port for wireless debug by Bluetooth protocol. Small Omni Antenna can be attached to this port.

1.1.7.2 Detailed Definition of Interface

No	Name	Connector Type	To/From	Descriptions
1	DC IN	D/MS3102A 20-23PRG – Receptacle (DDK)	Rectifier	@-48VDC Option Cable Side P/N (DDK): D/MS3106A 20-23S (D190)–Straight Plug (A: -48, B: GND)
		Blank Panel	/	@AC Option
2	AC IN/ALM	Connectors 250V P/N (Harting): 0946 245 3410	UPS	@AC Option Cable Side P/N (Harting) 0946 145 3410
		PushPull RJ45 (V4) P/N (Harting): 0945 245 1102	Operator	@-48VDC Option Cable Side P/N (Harting): 0945 145 1500
3	ETH DBG	PushPull RJ45 (V4) P/N (Harting): 0945 245 1102	Craft Terminal	10/100Base-T Cable Side P/N (Harting): 0945 145 1500 It can be set RS232 or Ethernet. Must verify your ordering option.

4	ETH B/H	PushPull RJ45 (V4) P/N (Harting): 0945 245 1102	ASN-GW Link	10/100/1000Base-T Cable Side P/N (Harting): 0945 145 1500
5	OPTIC DAISY	PushPull LC duplex (V4) P/N (Harting): 0957 442 0503	Another RAS2141	1000BASE-X Cable Side P/N (Harting): 0957 441 0501
6	OPTIC B/H	PushPull LC duplex (V4) P/N (Harting): 0957 442 0503	ASN-GW Link	1000BASE-X Cable Side P/N (Harting): 0957 441 0501
7	GPS	N(F)	GPS Antenna /GPS Arrestor	GPS Ant/GPS Arrestor @RAS2141-M Not connected @RAS2141-S
8	ANT0	N(F)	RF Antenna /RF Arrestor	
9	TX0 MON	SMA(F)	Measuring Instrument	
10	10MHz	SMA(F)	Measuring Instrument	
11	TDD	SMA(F)	Measuring Instrument	
12	ANT1	N(F)	RF Antenna /RF Arrestor	
13	TX1 MON	SMA(F)	Measuring Instrument	
14	B/T	SMA(F)	Bluetooth Antenna	

Table 5. Detailed Definition of Interface

Unauthorized amendment of the documentation may result in limitation to the user's operating rights.

CAUTION

Please keep at least 200Cm distance under normal operation in order not to exceed the safe wireless frequency range suggested by the FCC.

1.2 Abbreviations and Acronyms

Abbreviation	Definition

ACR	Access Control Router
ADC	Analog to Digital Converter
ASN-GW	Access Service Network Gateway
CFR	Crest Factor Reduction
CLI	Command Line Interface
DPD	Digital Pre-Distortion
EMS	Element Management System
FEU	Front End Unit
GRE	Generic Routing Encapsulation
IFM	Intermediate Frequency Module
IO-MIMO	Inter-operable Option Multiple Input Multiple Output
MRC	Maximum Ratio Combining
MU	Main Unit
NE	Network Element
NMS	Network Management System
NWG	Network Working Group in WiMAX Forum
OAM	Operations and Maintenance
OFDMA	Orthogonal Frequency Division Multiple Access
PAU	Power Amplifier Unit
PTP	Precision Time Protocol
PSU	Power Supply Unit
RAS	Radio Access Station
SGM	Synchronization GPS Module
SIM	Synchronization IEEE 1588 Module
SNMP	Simple Network Management Protocol
TDD	Time Division Duplex
TRU	TRansceiver Unit
WiMAX	World Interoperability for Microwave Access

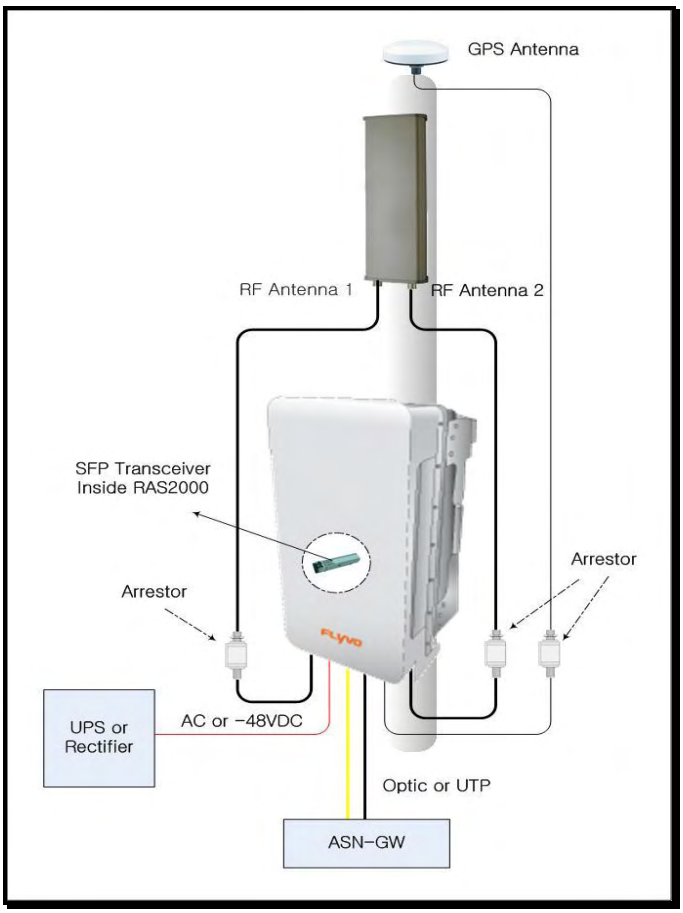
2 System Form and Composition

Installation Material

All equipments and materials other than RAS2141, such as GPS Antenna, RF Antenna, GPS Arrestor, RF Arrestor, SFP Transceiver and other external Cable, are considered “Installation Material”. Sourcing and composition of all Installation Materials are the responsibility of operator.

2.1 Single Cell Configuration

General configuration method of 1FA Omni is as follows:



Picture 4. Configuration of Single Cell

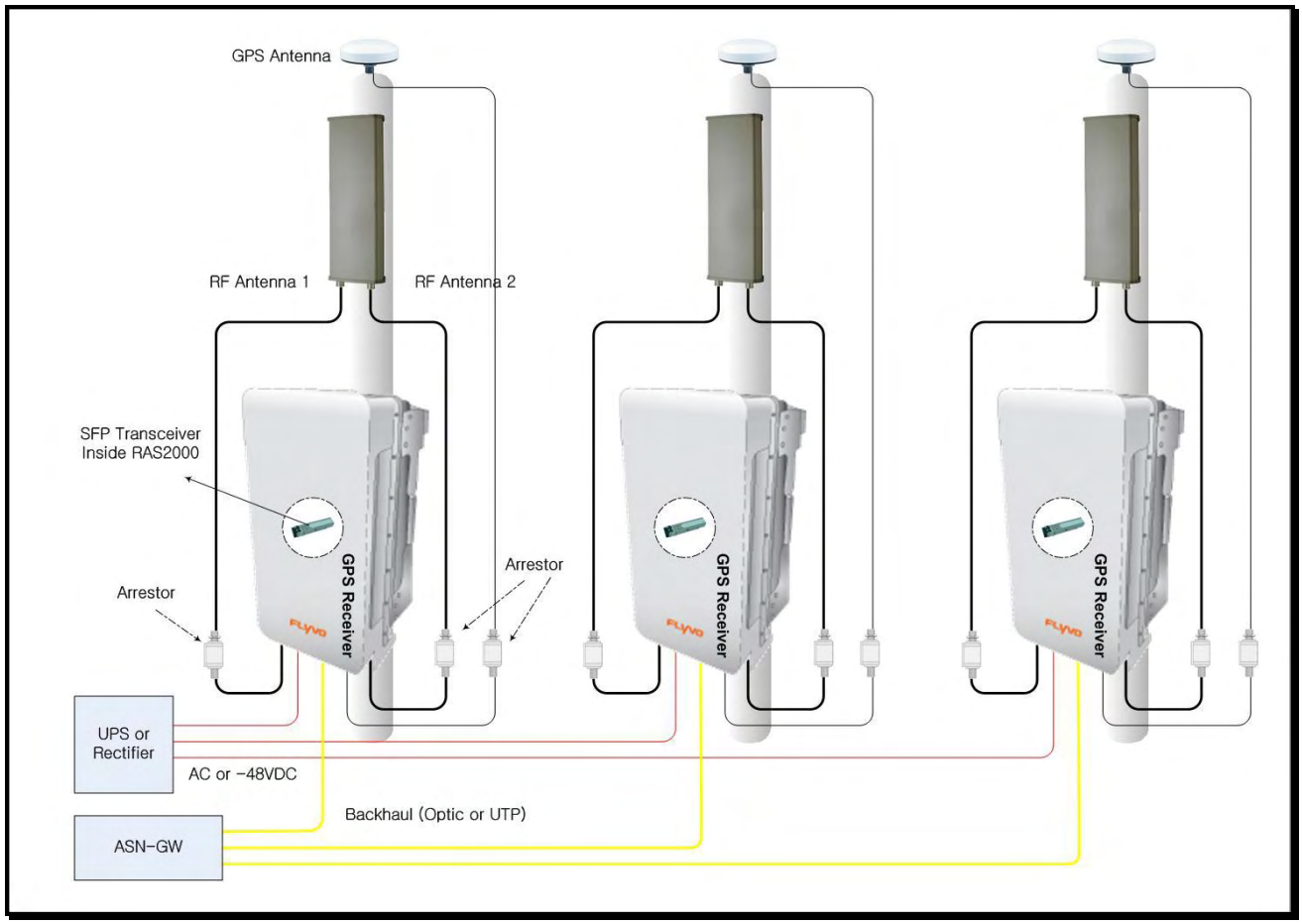
2.2 Multi Cell Configuration

2.2.1 ASN-GW Link by Star

For Multi Cell configuration, same number of Link for ASN-GW as the number of cells is required.

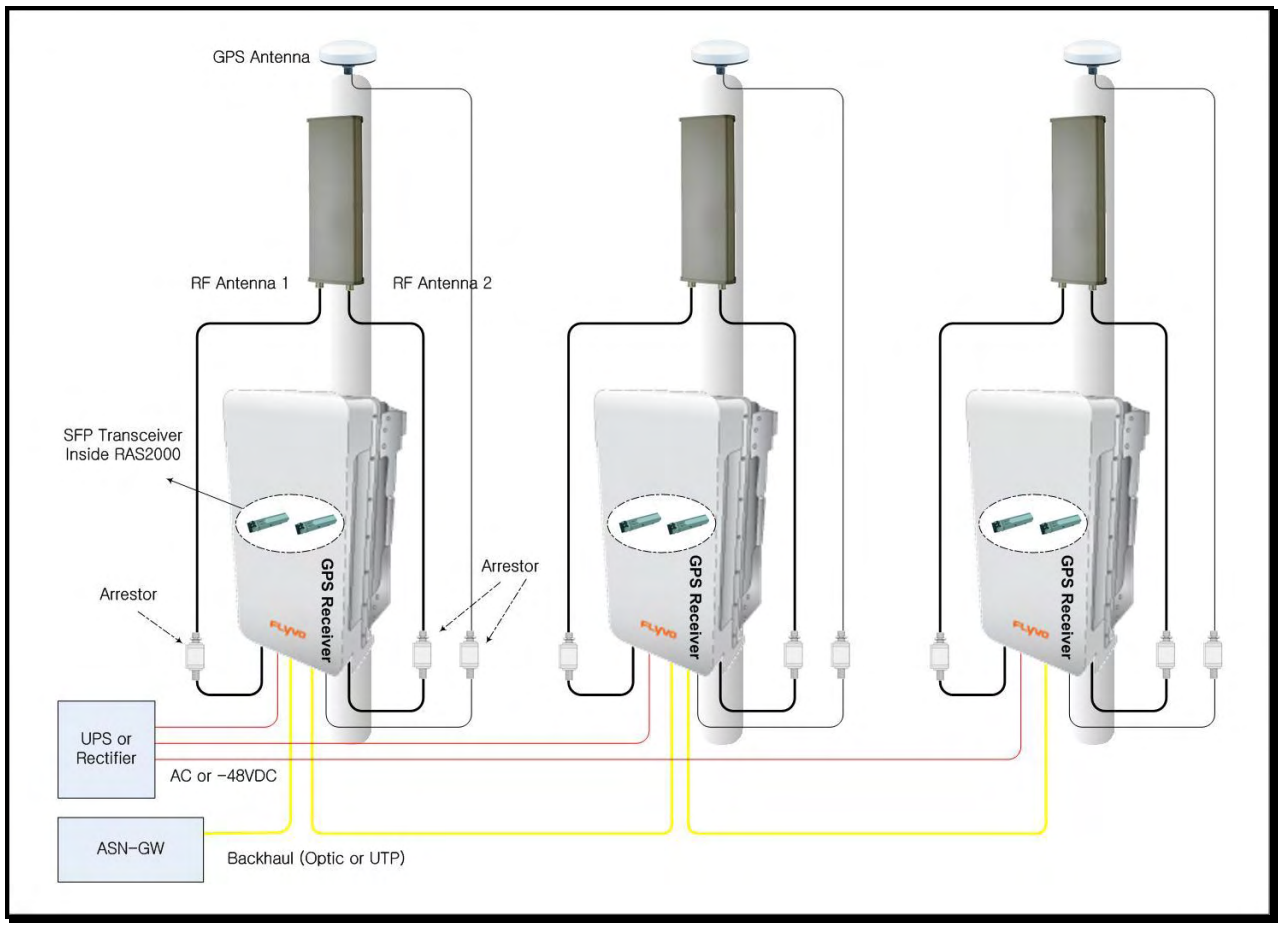
In other words, total three optical cable at the site is required for a 1FA 3Sector configuration.

Moreover, each Sector requires a separate power input for operation.



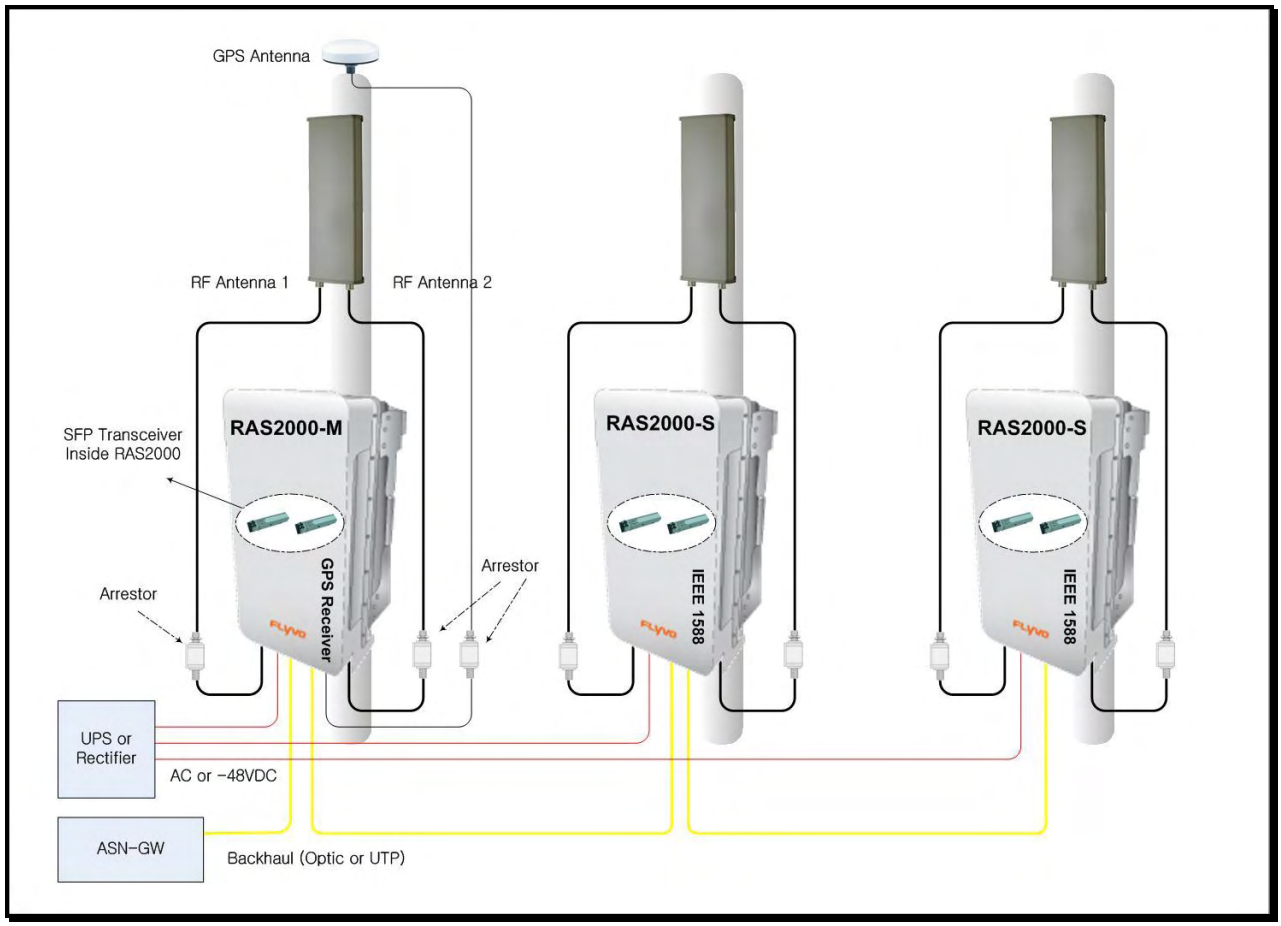
Picture 5. Multi Cell Configuration - ASN-GW Link by Star

2.2.2 ASN-GW Link by Daisy-chain



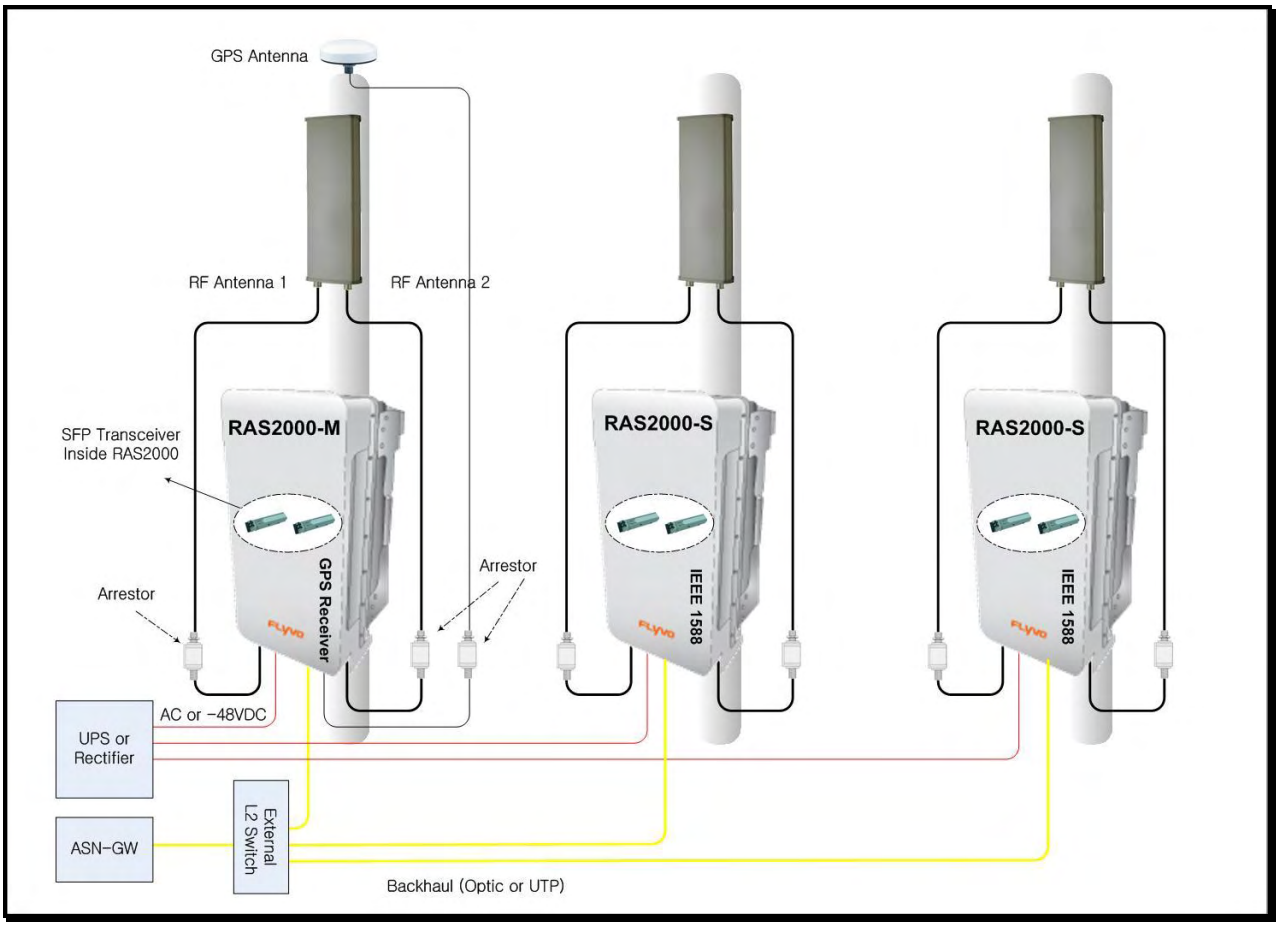
Picture 6. Multi Cell Configuration – ASN-GW Link by Daisy-chain

2.2.3 ASN-GW Link by Daisy-chain, IEEE1588 Instead of GPS



Picture 7. Multi Cell Configuration – ASN-GW Link by Daisy-chain, IEEE1588 instead of GPS

2.2.4 ASN-GW Link by Star, IEEE1588 Instead of GPS



Picture 8. Multi Cell Configuration – ASN-GW Link by Star, IEEE1588 instead of GPS

3 Getting Started

3.1 Safety Precautions

Installed within a restricted area

Should be installed within a restricted area to prevent unauthorized access. Refer servicing to qualified personnel.

Hot Surface

Indicate that the marked item can be hot and should not be touched without taking care.

3.1.1 Safety Precautions during Installation

Please follow the instruction below during installation to prevent accidents:

- Please attach warning signs or designate as off limits area where potential accidents may happen.
- Please make sure to confirm the grounding status prior to installing equipments.
- Please make sure to disconnect power during installation to prevent electric shock accidents. When installing in night time, please utilize appropriate lighting to prevent accidents from happening.
- Please make sure to wear appropriate protective gear when drilling holes in walls or ceilings.
- When working with Lift equipment or cranes, please have support staff other than the lift or crane operator in attendance to prevent potential falling accidents.
- Please make sure not to exceed the load limits on the Lift equipment or cranes.
- Please refrain from wearing metallic accessories, such as watches and rings, to prevent electric shock accidents during installation.

- Please check the locations and handling instructions of fire alarms, fire extinguishers, and emergency exits.
- All installation activities should not be performed alone.

3.1.2 Precautions for Static Electricity

Please make sure not to damage electrical contacts when handling equipments sensitive to static electricity as follows:

- Always wear a wrist strap and ground the equipments during handling process.
- All Units should be isolated from plastic, acrylic products, papers, and Styrofoam that may easily generate static electricity.
- All Units should be stored in anti-static vinyl bags or storage.
- Unit storage should maintain 40~70% humidity to minimize static electricity from generating.

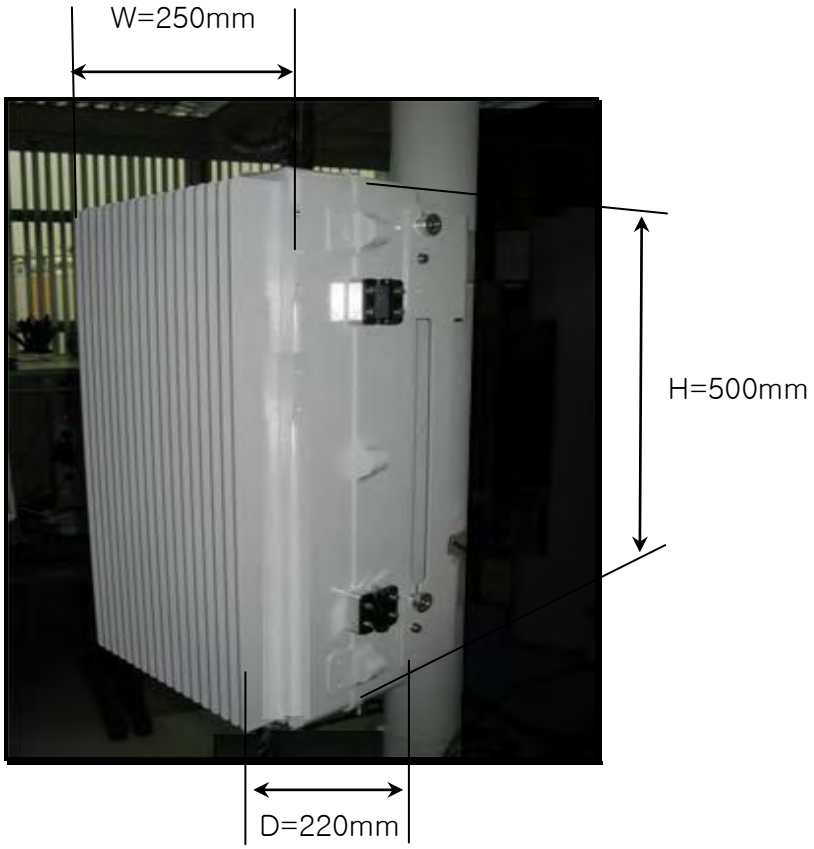
Damage voltage for electrical contacts is as follows:

Electrical Contact	Damage Voltage(V)
MOSFET	100 ~ 200
JFET	240 ~ 10,000
CMOS	250 ~ 2,000
TTL	250 ~ 2,000
Bipolar TR	300 ~ 2,500
ECL	Greater than 500
SCR	680 ~ 1,000

Table 6. Damage Voltage for Electrical Contacts

3.2 Installation and Working Environment

RAS system requires minimum operating space as follows:



Picture 9. Exterior Size

In general, RAS2141 should be placed in 50Cm~1M higher than ground and the door of RAS2141 must not be opened in field.

Make sure to consider locations and operating space requirement of other nearby equipments.

3.3 Site visit

3.3.1 Site Visit Checklist

Service provider operating RAS2141 equipments and installation personnel should perform site visit prior to actual installation process.

During site visit, make sure to acquire blue print of the installation site and confirm physical issues, electrical linings, antenna installation point, and other potential issues in person as follows:

- Confirm appropriateness of installation space and installation site.
- Confirm transportation route and method to the installation site.
- Confirm the equipment installation space and direction.
- Confirm existence of appropriate lighting for installation.
- Confirm status of external interface.
- Confirm power voltage capacity and electrical lining status.
- Confirm possibility of system expansion.
- Confirm location for antenna installation (Tower or Wall) and lining method.
- Confirm supplementary equipment status (rectifier, battery, etc.).
- Check for environmental issues that may potentially harm the installation personnel.
- Confirm location to dispose of packaging materials.

Please refer to the site visit checklist for details.

3.3.2 Documents to be Prepared

Please prepare the following documents after performing site visits:

- Floor Plan

- External interface method and issues
- Job Drawing
- Cable Enclosure installation plan
- Power lining plan
- Grounding Cable lining plan
- GPS and RF Arrestor installation plan
- Electrical cable and GPS Cable lining plan

3.4 Foundation Work

3.4.1 Flooring

In general, RAS2141 equipments are installed indoors or on rooftops and outdoors, and require appropriate flooring work, grounding work, equipment fixation work prior to installation.

3.4.2 Grounding

Grounding prevents potential damage to systems and injury of operators from lightning, serge voltage, high frequency voltage and current, and provides electric discharge route for static electricity.

It is suggested that the grounding cable be thick and within short distance from the earth. Please refer to major requirements below for grounding:

- Lay grounding cable 75 Cm or more underground
- Earth resistance level
  - RAS: 5ohm or less
  - Thunderbolt arrester Grounding: 10ohm or less

Refer to 4.2.1.2 Ground Connections.

Grounding Precautions

Grounding is the most important method to protect system and operator from electrical shock. Please make sure of successful grounding after grounding work has been completed.

3.5 Moving Equipments

3.5.1 Caution

When transporting or moving Enclosures or materials, please follow the instructions on the external packaging. Make sure not to handle Enclosures upside down when Up/Down is specifically marked in the external packaging.

Please make sure to minimize physical shock to the equipment during transportation. Allowable shock range for the equipment is as follows:

- Equipments in Packaging

Weight (kg)	Fall Height (mm)
320 or below	300

Table 7. Allowable Falling Range for Equipments in Packaging

- Unit and supplementary materials without Packaging

Weight (kg)	Fall Height (mm)
0~10	100
10~25	75
25~50	50
50 or more	25

Table 8. Allowable Falling Range for Equipments without Packaging

- Vibration during Transportation

Please fix the equipments firmly during transportation to minimize vibration within the allowable range of 1~500Hz.

3.5.2 Preparation for Enclosure Return

- Please confirm the following items prior to installing and dismantling Enclosure.
- Please make sure that the material, quantity, and standards conform to the installation plan and check for any breakage, so that the installation work can progress as planned.
- Please use standardized AC power cable, DC power cable, switch, and electrical lining pipes for system and lighting installation.
- Please take appropriate measures in advance to allow installation personnel to enter the work site.
- Please consult the related enforcement divisions and operation divisions in advance for interface with existing systems.

3.5.3 Transportation Procedure

- When carrying in the materials, please check the width and height of the entrances and exits in transportation route in advance considering the size and weight of the materials.
- Please make sure not to damage entrances and doors, walls, pillars, and floors when carrying in the materials.
- Please transport the materials in their packaging. Remove the packaging at the time of installation.

3.6 Removing Packaging

3.6.1 Caution

- Please do not remove the equipments from its packaging prior to arrival at the installation site.
- Please assort and place the equipments based on job specification so that they will not interfere with each other.
- Please install the Enclosure immediately after removing its packaging material. If installation will not take place immediately, please temporarily store the Enclosure where it is to be installed taking precautions not to place Enclosures too close to each other so that they may result in series of fall.
- Please remove the external packaging material and place the equipment where it is to be installed prior to removing internal packaging materials.
- Please safely store work by-products in a designated place and return them to operating division at a later time.

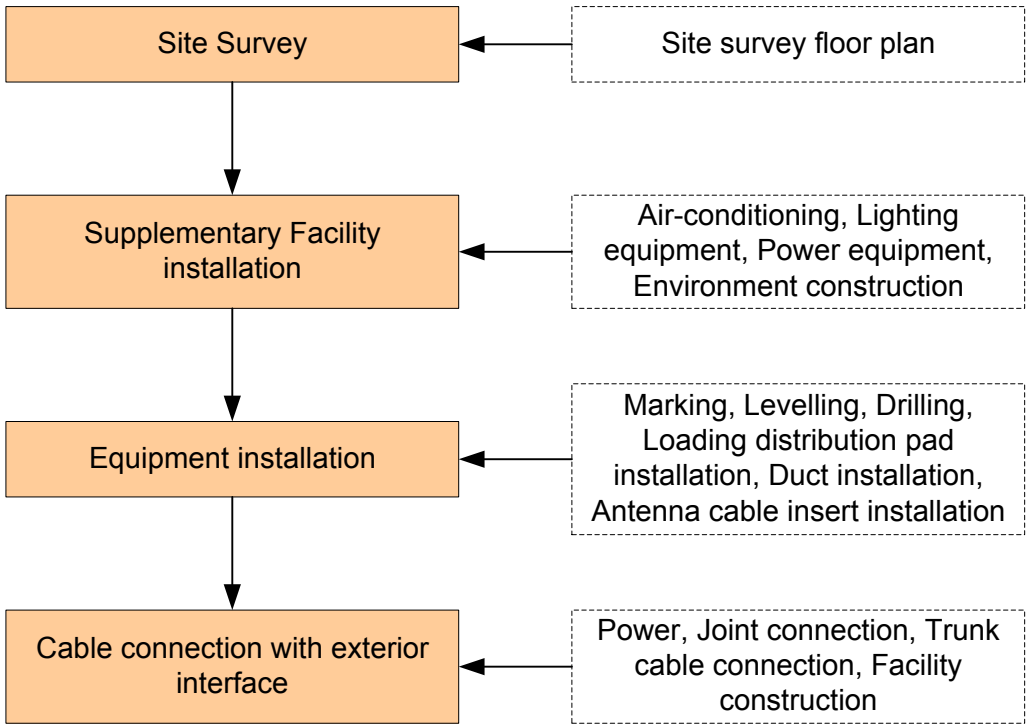
4 System Installation

This chapter describes actual installation steps of RAS2141 after base construction is completed and the equipment is unpacked.

4.1 Whole Process

RAS system installation steps are as follows;

On-the-spot inspection (floor plan, etc.) → Incidental facilities installation (air-conditioner, lightning equipment, electric works, environment works, etc.) → Equipment installation (marking, leveling, etc.) → Cable link to external interface (power, ground link, trunk cable link, etc.)



Picture 10. Installation Steps

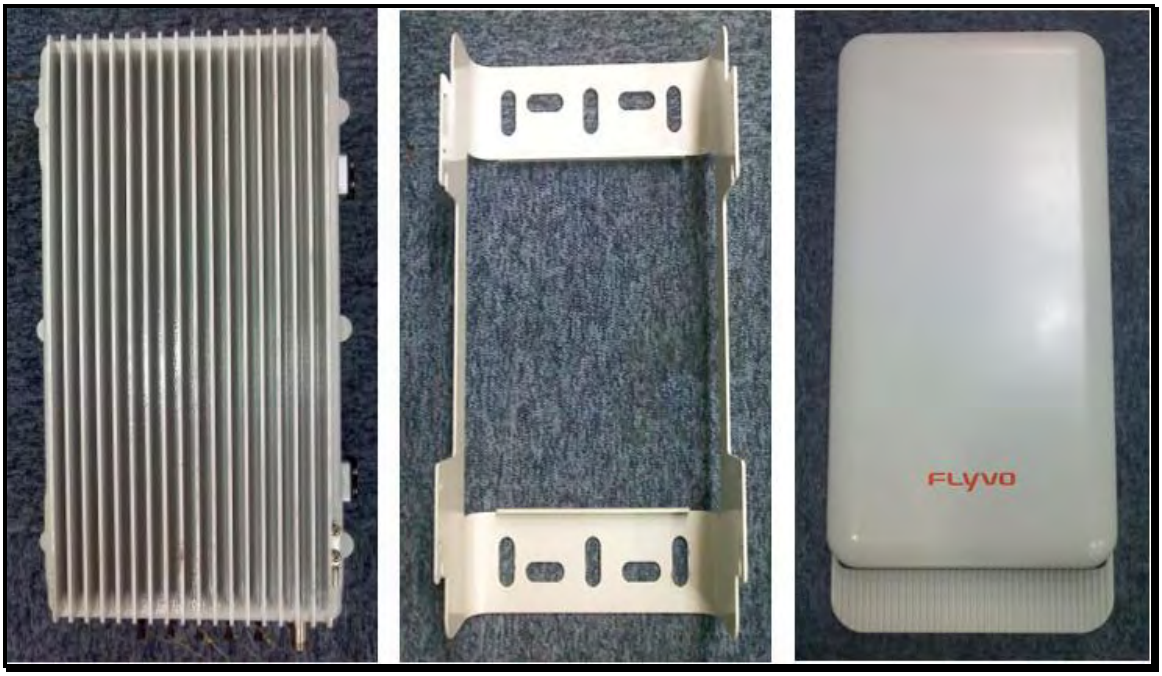
Caution when system installation and operation

Do not press vertically with more than 100N power when the door of RAS2141 completely opens.

4.2 Detailed Installation Steps

4.2.1 Enclosure Installation

Prior to the installation of RAS2141, Bracket should be equipped on wall or pole corresponded in installation environment.



A) RAS2141 Main Mechanical B) Brackets C) Solar Cover (Optional)

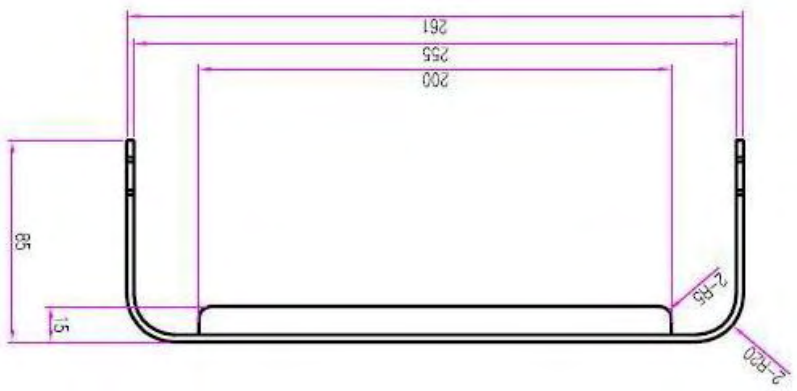
Picture 11. Compositions of RAS2141 Mechanical

Outline of solar cover will be changed

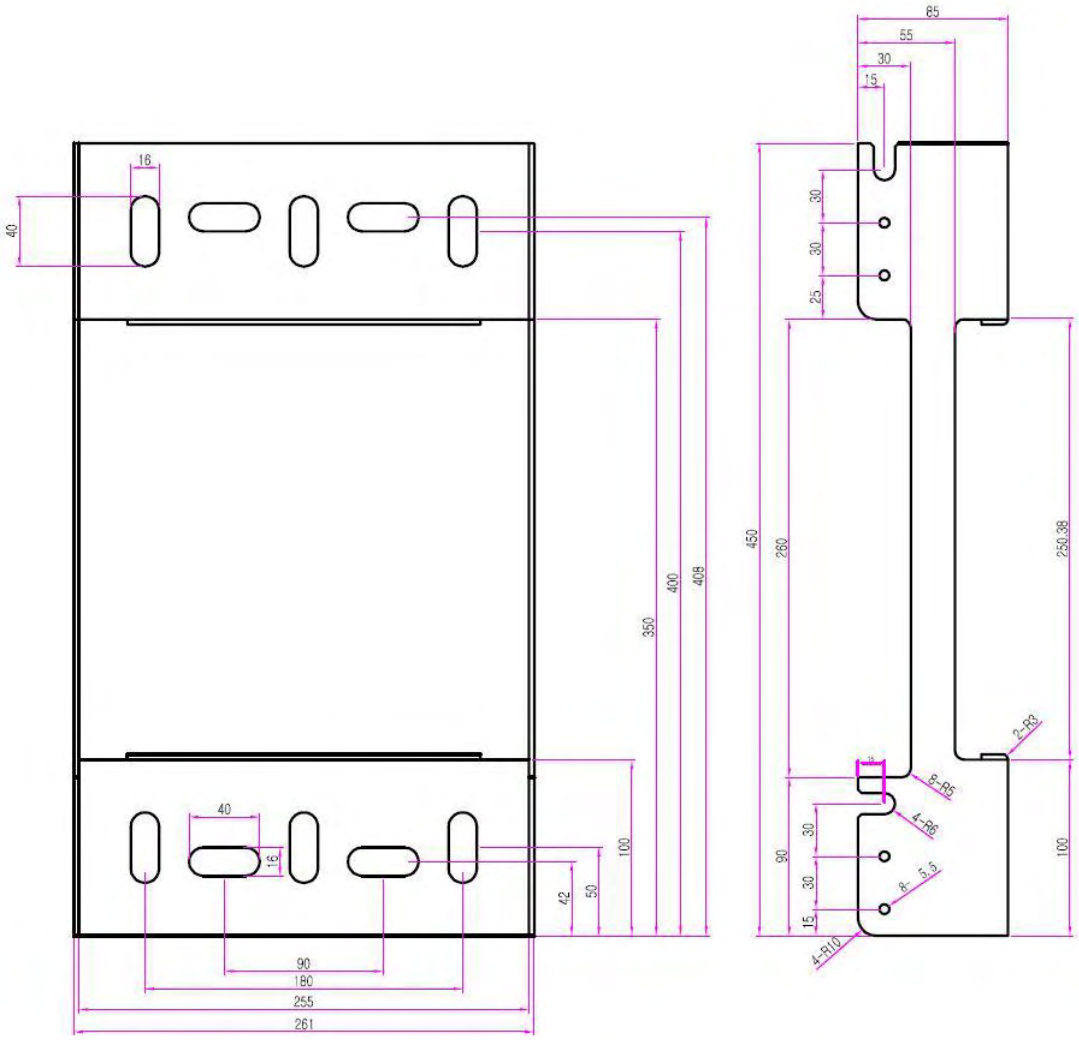
4.2.1.1 Bracket Installation

RAS2141 provides Bracket where Wall Mount and Poll Mount are possible.

Install Bracket on Wall or Poll. Poll Mount in case, Poll diameter must be selected by confirming Brackets Hole size and a coordinate.



Picture 12. Bracket Plan (upper surface)

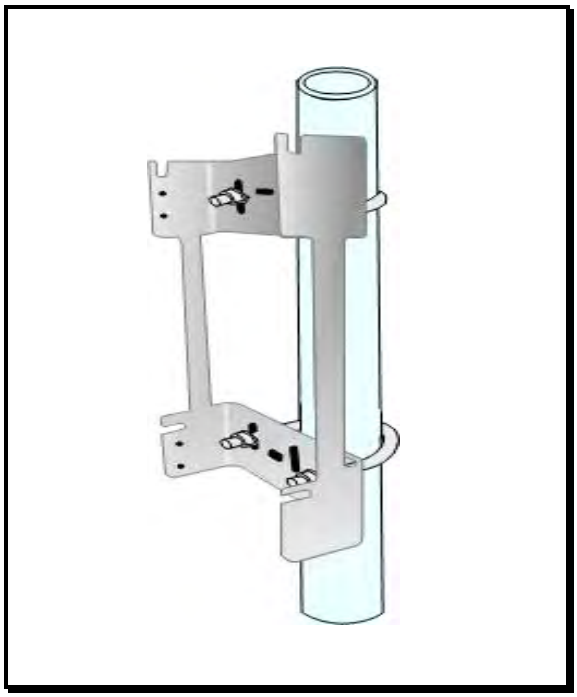


Picture 13. Bracket Plan (the front and side)

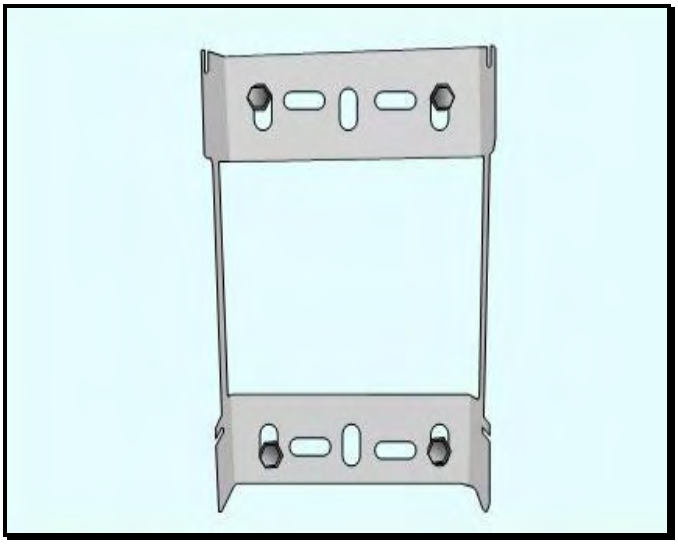
4.2.1.2 Bracket and RAS2141 Assemblies

Installation of Bracket

Poll or Wall Bracket assembles with the following method.

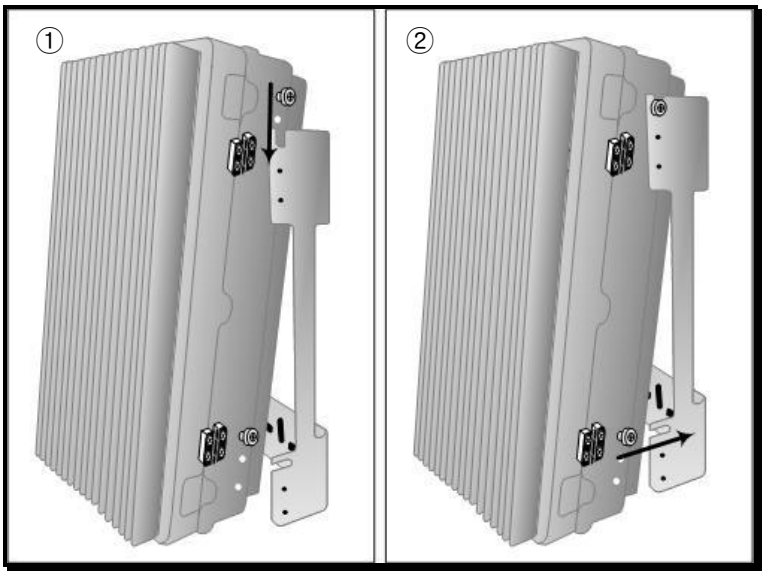


Picture 14. Bracket Installation Example (Poll Mount)



Picture 15. Bracket Installation Example (Wall Mount)

In Bracket RAS2141 Fixations



Picture 16. Assembly Order

Advance an assembly in the next order.

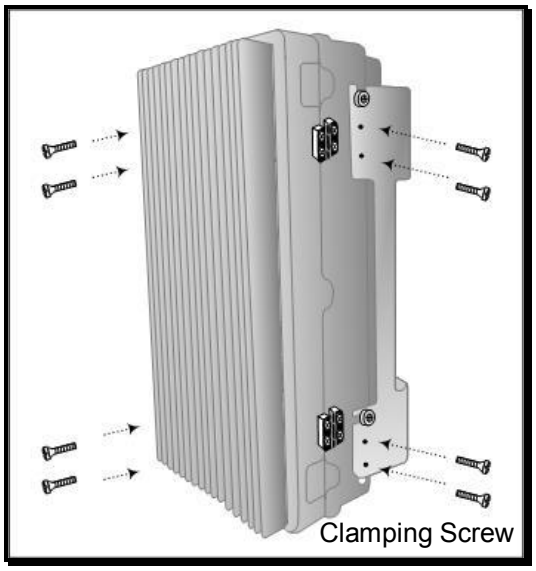
1) RAS2141 enters and inserts the hasp top first in the hasp groove of top of bracket.

2) The hasp of RAS2141 lower parts puts in naturally inside the hasp groove.

Picture 17. Completed Assemblies

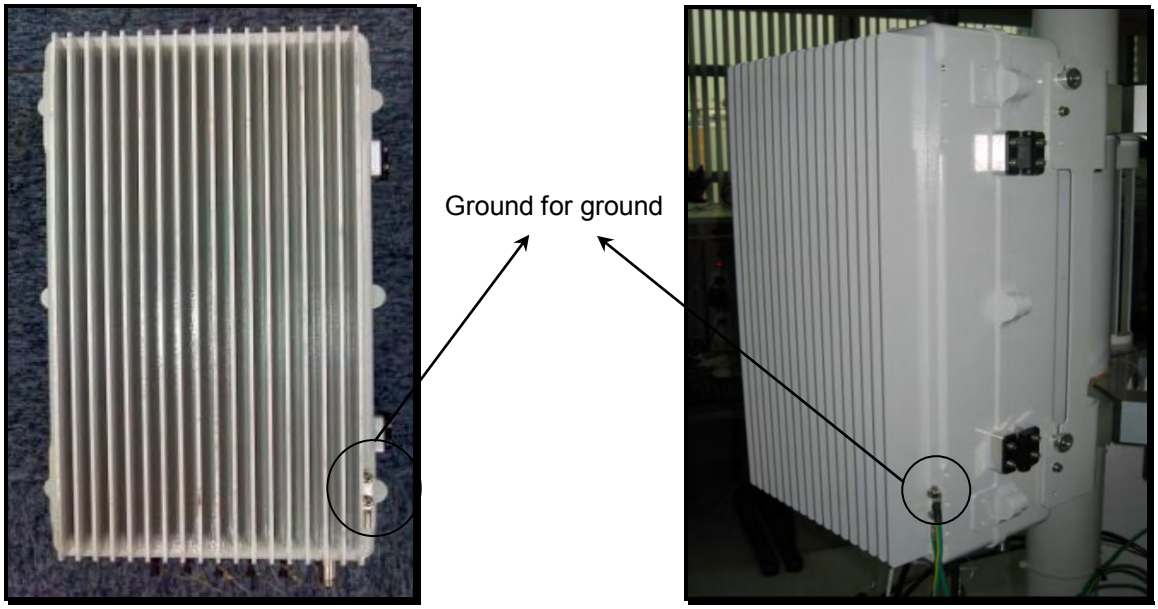
After combining RAS2141 and Bracket, the screw must be combined completely.

Top of RAS2141 after 4 hasps of low right and left inserting in Bracket hasp grooves, bracket and only fixes RAS2141 with the screw which is designated. All must fix the total 8 places of the right and left as a matter of lower part of bracket.



Picture 18. Assembly of RAS2141 and Bracket

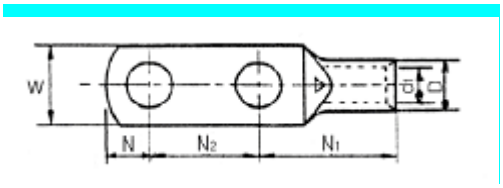
Ground Connection



Picture 19. Ground location and Connection

Ground line standards which are used are as follows:

- Cable Radius: 10 ~ 12 AWG



	Wire Range	Stud Size	Dimension (mm)						
Cable Lugs	AWG	M5	W	N	N1	N2	d1	D	
	12~10	M5	8.5	7.0	24	22	4.0	5.5	

Table 9. Ground line standards

CAUTION	Round terminals located on the side of a 0.75 mm2 (18 AWG) or more wires Using permanently connected to earth.

CAUTION	A readily accessible disconnect device shall be incorporated external to the equipment.

Cables of outside RAS2141 Installations

Refer to the Chapter 4.2.6.

Assembly of Solar Cover (Optional)

Picture 20. Assembly of Solar Cover

4.2.2 SFP Transceiver Installation

SFP TRANSCEIVER is used for following IO Interface.

- Optic LINK to ASN-GW
- Daisy-chain Link to other RAS

Because SFP Transceiver has been affixed in RAS and is delivered, the requirement in advance should be discussed before RAS starting about. In case which is not discussed, the basic configured product is as follows:

Picture 21. SFP Transceiver

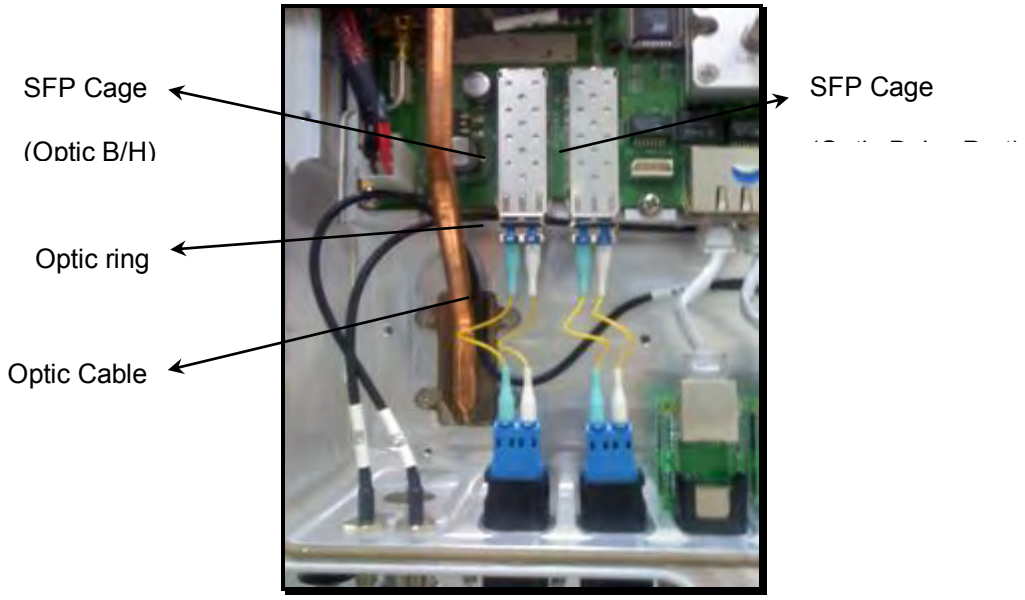
Application	Gigabit Ethernet (1000BASE-LX)
Data Rate	1.25G
Reach	10Km
Form Factor	SFP
Package	Duplexer
Connector	LC

Table 10. SFP Transceiver Spec.

After confirming SFP has been affixed at the door open of RAS2141, if not, SFP Transceiver where is appropriate in network plan of the business owner must be affixed.

SFP Transceiver Configuration Confirmation

After door opens, confirm whether SFP Transceiver has been affixed normally in left lower parts of RAS2141 or not. Confirm carefully because SFP Transceiver could separate from SFP Cage in case of shock when products move.



Picture 22. Confirmation of SFP Transceiver Configuration

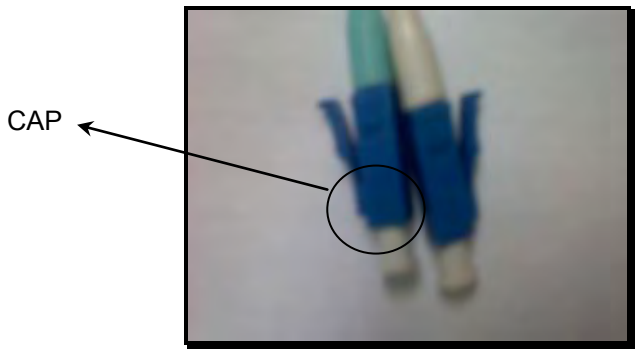
SFP Transceiver Separation

1) Press upper buttons of Optic Cable first and separate Optic Cable from SFP Transceiver.
2) Push SFP Transceiver's rings in lower part and separate Transceiver from Cage.

SFP Transceiver Configuration

Affix SFP Transceiver in opposition order of separation.

If SFP Module is not affixed, peel Optic Cable CAP in order to affix.



Picture 23. Separation of Optic Cable Cab

SFP Transceiver Configuration

CAUTION

Because SFP Transceiver has been affixed in RAS and is delivered, the requirement in advance must be discussed before RAS starting about.

568

SFP Transceiver Shift

In order to shift SFP Transceiver from, various Cable must be separated first from RAS2141 connector.

569

SFP Transceiver Configuration Confirmation

Because SFP Transceiver could be separated abnormally in case of shock when products move, confirm whether normal configuration is maintained or not.

570

571 ## 4.2.3 Arrestor Establishment

572 Arrestor must be established in between Antenna and RAS in order from lightning bolt to protect

573 the equipment essentially.

574

575 ### Arrestor Establishment Location

576 Arrestor could be established in following location.

577 - Specified panels for Arrestor installation which the business owner provides.
578 - Feeder connection after installing directly in RAS IO Interface Connector.

579

580 ### 4.2.3.1 RF Arrestor

581 RF Arrestor must observe the general standard as below.

Parameter	Specification	Remark
Frequency Range	2496 ~ 2700 MHz	
VSWR (Max)	1.1	
Impedance	50ohm	
Insertion Loss (Max)	0.5	
Surge Current (Max)	10kA, 8/20us	
Power Rating	600Watt	

PIMD (43dBM, 2tone)	> 160dBC	
Connector Type (RAS Side)	N Type (F)	When Arrestor is directly connected to RAS

582 **Table 11. RF Arrestor Specifications**

583

584 #### 4.2.3.2 GPS Arrestor

585 GPS Arrestor uses GPS signal specific Arrestor. Below standard must be observed generally.

Parameter	Specification	Remark
Frequency Range	1565~1585MHz	
VSWR (Max)	1.3	
Insertion Loss (Max)	0.5	
Residual Pulse Voltage(Max)	15 [4kV/2ohm(8/20us)]	Line-Line
	12 [4kV/12ohm(8/20us)]	Line-Earth
Connector Type (RAS Side)	N Type (F)	Direct link of Arrestor to RAS

586 **Table 12. GPS Arrestor Spec**

587

588 ### 4.2.4 RF Antenna Establishments

589 The Antenna must be established as follows:

590 - Omni antennae: Omni antennae must be established in order for the vertical
591 establishment condition to maintain ±1°.
592 - Sector antennae: Sector antennae in order to maintain within Sector star ±3°, regulate a
593 direction.

594

595 The number of RF antenna by antenna form is as follows:

Antenna Form		The number of RAS2141	The number of Antenna
1FA/Omni	1-Branch	1	2 antennas / site
	2-Branch (Dual Polarization Antenna)		1 antenna / site

1FA/3 Sector	1-Branch	3	2 antennas / Sector, (i.e. 3 Sector configuration requires total 6 antennas)
	2-Branch (Dual Polarization Antenna)		1 antenna / Sector, (i.e. 3 Sector configuration requires total 3 antennas

Table 13. The number of RF antenna by antenna form

When installing the antenna, the fact to be considered is as follows:

- As the antenna is precise material, pay attention in order for the defect or form change not to happen.
- When transport the antenna, use the tool of right standard and the transportation equipment of right standard which is minimum 200% or more than the antenna in weight for the safety.
- Do not inflict the unreasonable force in the antenna.
- Stop the work of connecting the feeder and the antenna at the time of raining.
- Use the zinc galvanizing materials as a metal for connecting the antenna.
- Process after accurately controlling the direction of the antenna.
- Follow the antenna arrangement standard as to the distance between the steel tower and the antenna and the distance between transmitting and receiving antennas.
- The antenna must be attached in the place indicated in the design drawing.
- The antenna must be fixed after being attached in the front or in the corner of the steel tower.

How to install sector antenna is as follows:

- Build the antenna pillar.
- Insert the sector antenna in the antenna pillar by using the clamp.
- Fix the clamp.
- Control the antenna considering the level of strength of the electric wave within of the maximum 20° in the upper and lower direction.

RF antennas are installed per the sector (or Cell); One Dual ANT or Two Single ANT. Among them, transmitting and receiving parts exist together in one Path and ANT and the reception department (the course diversity) exists only in the other Path and ANT.

When using Single ANT, a minimum physical interval is needed in order for isolation or course diversity between 2 antennas. The formula is as follows:

Isolation = 22 + 20log(S/λ)-(G1+G2)

S : Isolated distance between antennas

λ: Wave length

G1 : Interferer's Front Back Ration Gain

G2 : Interference Receiver's Front Back Ration Gain

Formula 1. Isolation

The related quality of base station antenna is as follows:

- Isolation = 20dB
- G1 & G2 = 8dB

Considering above factors, from the frequency which uses from WiMAX, minimum isolated distances between two antennas are as follows:

- 2.3GHz: 65cm
- 2.5GHz: 60cm

4.2.5 GPS Antenna Installation

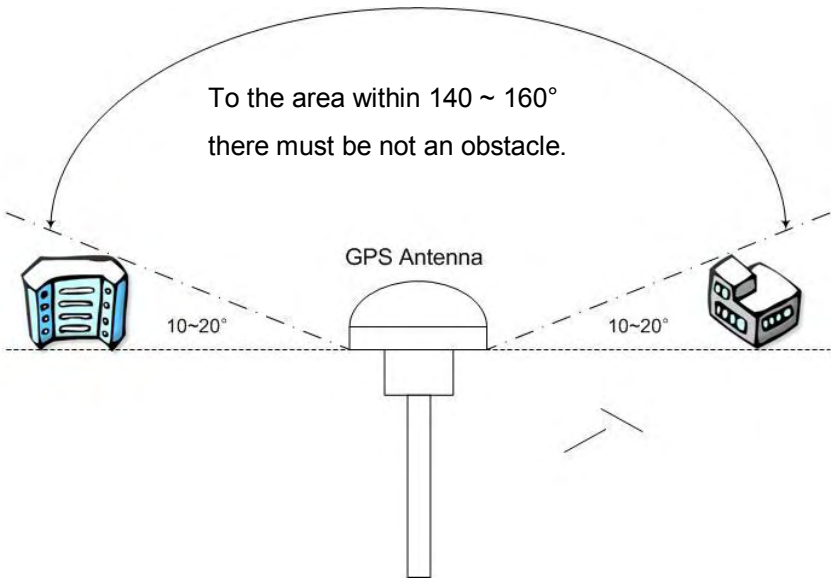
Antenna must be installed as follows:

- GPS Antenna: GPS Antenna must be installed horizontally in order for the satellite reception to be possible.

The number of GPS antenna by antenna form is as follows:

Antenna form	The number of RAS2141	Daisy-chain Option	The number of antenna
GPS antenna	1	N/A	1 antenna / site
	3	NO	1 antenna / Sector, (i.e. 3 sector configuration requires 3 antennas)
		YES	1 antenna / site, (i.e. 3 sector configuration requires 1 antenna)

Table 14. Required Number of GPS Antenna



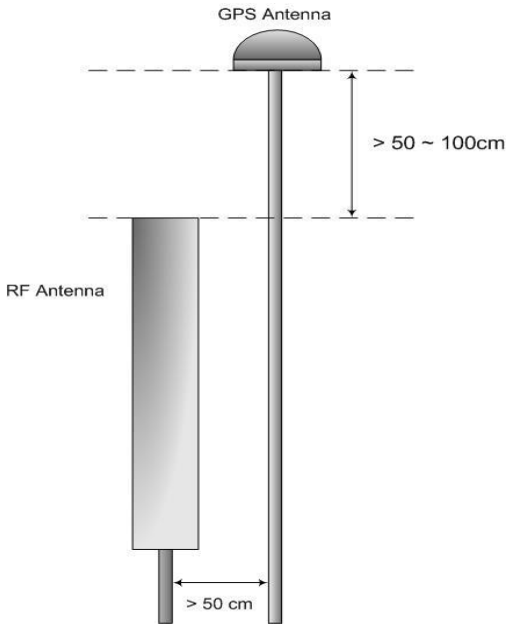
Picture 24. GPS Antenna Installation Condition

GPS antennae like the up picture must form the axis over 10 degree from earth's surface in order for a signal to be receivable from the satellite and there must be not an obstacle that will be able to intercept to that between electric wave.

GPS Antenna Installation Condition

GPS antenna must be installed in the area over 10 degree from earth's surface with no obstacles in order to be possible to receive a signal from the satellite.

In case of installing together with RF Antenna, like the picture, it must be installed internally isolated over 50cm from RF Antenna and about 50cm higher than RF Antenna. Like this, when installing GPS Antenna, GPS Antenna must be installed in the place that could protect the antenna from lightning because GPS Antenna is comparatively higher than RF Antenna so that it can be easily exposed to lightning. For example, if the height of steel tower is 7m, GPS Antenna must be located internally on one rectilinear between the observer and lightning conductor when the observer sees the lightning conductor in the position that is 15m away from the steel tower, and must be able to be protected from lightning by the installation of GPS Arrestor.



Picture 25. GPS Antenna Installation Example

GPS Antenna lightning Prevention

When the lightning conductor is installed together with RF Antenna of the steel tower, it must be isolated more than 50cm from GPS Antenna and 50cm higher than GPS Antenna.

When installing GPS antenna, please consider the followings.

LNA that generally has the profit of 36dB degree had been built-in GPS antenna insides and when two antennas are located within 1mter, the interferences may possibly paralyze the function, so please pay attention.

- Because GPS antenna receives the power of +5VDC from GPSR, cable short (flooding, when Cable defective etc.) could make GPRS out of order, please pay attention.
- The length of cable if possible must not go over 90m. When it goes over 90m, ask GPS Antenna provider and must use in-line Amplifier.
- If the signal is input above of receiving sensitivity of RAS2141, there must be a possibility which there will be a problem to signal of the satellite so that Cable loss or length of Cables must be able to guarantee a minimum distance.
  - Minimum Cable Loss > 3dB
  - When using LMR400: More than 40m
- Because GPS is the equipment receiving very low level of signal, it must be isolated as far as possible from the source of electric wave (e.g. RF Antenna).
- When installing Antenna, the installation near the building ground terminal or the other conductor makes a signal power diminish.
- If there is metal material (silver paper, metal wrapping paper) on GPS antenna, a signal power will diminish.
- GPS antenna must maintain horizontality always.
- GPS antenna connector must need waterproofing by using Insulation Tube.

4.2.6 Cable Installation

Cables consist of Enclosure internal cable and Enclosure external cable. Because Enclosure internal cable has been already installed when the equipment ships, this chapter describes as to the installation of Enclosure external cables only.

Enclosure external cable is as follows:

- Power Input Cable
- ASN-GW Link Cable
- RF Feeder Cable
- GPS Feeder Cable
- (Option) 1FA 3Sector
  - Daisy-chain Cable between equipment (RAS2141)
- Other Facility related Cable

RAS2141 Physical Interface

In order to install cable, please refer RAS2141 Bottom View picture and description (paragraph 1.1.7) necessarily.

4.2.6.1 Installing Electrical Wires

AC Input Power Option

The standards for AC Input electrical wire are as follows:

- AC (110/220V) Input Power Cable
- Cable radius: Minimum 8 AWG

DC -48V Power Option

The standards for DC Input electrical wire are as follows:

- DC (-48V) Input Power Cable
- Cable radius: Minimum 10 AWG
- Connector Type: To be defined
- Connector Pin Map: A (Line), B (Neut.), C (Power GND)

Double Pole/Neutral fusing

Fusing

Power Suppy Unit in the RAS2141, has a fuse on neutral line. Fuse is used to protect equipment. so while over current or short circuit, circuits to be disconnected before equipment.

Overvoltage

This power of this system shall be supplied through wiring installed in a normal building. If powered directly from the mains distribution system, it shall be used additional protection, such as overvoltage protection device.

Power switch

RAS2141 does not have a power switch. In order to provide electricity to the system, use the power switch on the power supply equipment or an external power switch.

Plug Connection Check

Insert the plug until a clicking sound is heard. (Otherwise, electrical shortage may occur with water leakage).

In case of AC Input Power Option

With AC input power option, DC In Port will be disabled. AC Input/ALM Port is used for AC power input.

DC-48V Input Power Option

With DC-48V Input power option, AC Input/ALM Port is used for collating the alarms from supplementary rectifiers.

4.2.6.2 Installing ASN-GW Link Cable

Fast Ethernet and Optic Link Interface is supported as ASN-GW Link cable. Therefore, operators should make judgments to choose between Fast Ethernet and Optic for link to ASN-GW. Once the choice has been made, connect the cables to RJ-45 or to the IO Interface of the RAS2141 that supports SFP.

To	Cable Connector Type	Cable Type	Max Length	Cable Length	Comments
ETH B/H		UTP Cable: CAT5E/6E and shield (Recommend)	>100m	User Defined	Refer to the Appendix
OPTI C B/H		Optic Cable : Single Mode Optic Fiber (Recommend)	Related SFP Transceiver, >10Km	User Defined	Refer to the Appendix

Table 15. Selected cable connector type per port

4.2.6.3 Installing GPS ANT and RF ANT Feeder Cable

Examination on the Path

Examine the path of electrical lining in the following order:

1) Examine the path from tower antenna to transmitter/receiver.
2) Select the path that minimizes the length of RF cable.
3) Select the path where RF cable can be easily installed and damage to RF cable is unlikely.

Cutting

When preparing RF cable, perform prior examination on the path of the electrical lining to determine the required length and use a hacksaw or relevant tools to cut the wires.

Please take following precautions when preparing power cable:

- Prepare the RF cable to the exact required length.
- Mark where the wires are to be cut, and cut the wires in a perpendicular fashion.
- When cutting the wires, take precautions such that humidity, metal/lead objects, dust, or dirt don't contact the cut area.
- When cutting the RF cable, please use haksaw or file.
- Clean the cut area with solvent.
- Use a brush to clean off the edge of the cut area.

Laying RF Cables

Following describes the method to lay RF cable:

1) Make connection from the tower antenna to the arrestor.
2) Ground the arrestor to MGB, and connect the power cable from arrestor to RAS Cable connector.
3) When connecting antenna RF cable to indoor equipments, utilize the common electrical lining duct. If there is no common electrical lining duct, please make the connection using available windows.

Please take following precautions when laying RF cable:

- Please place a protective plate on the floor so that RF cable surface is not damaged during the process. If the surface of RF cable is damaged, lay after cutting off the damaged section.

- After connecting antenna and RF cable, use contraction tube at the contraction pipe connecting point.
- Attach recognition tab at the ends of power cable to easily identify power cable.
- When fixating power cable using clamp, the distance between the ram clamps should be 1.5m.
- When connecting rack, antenna, arrestor, etc. to power cable, make sure to connect them firmly so that Reflected Wave is not generated.
- Use Jumper Cables when connecting Rack, Arrestor, and antenna to 7/8” power cable, and make sure the jumper lines are not tangled.
- The minimum curvature radius should be observed.
- Please place the power cable considering not interfering with people’s activities.
- Please connect the connector in a straight line, and make sure not to inflict strong force once the connection has been made.
- Please cover any exposed areas of the connector with electrical vinyl tape or heat shrink tube to prevent contact with water.
- At the connecting sections of the connector, please do the following: 1) wrap with electrical vinyl tape at least twice, 2) wrap with self-adhesive rubber tape at least three times, and 3) cover with heat shrink tube.
- When connecting 1/2” with 7/8”, please wrap the 1/2” section with electrical vinyl tape such that the thickness of the connecting section matches each other, and cover with heat shrink tube.

GPS Cable Usage Considering Overall Gain

Antenna and cable should be installed on the inner side of the GPS receiver, and, therefore, 15~34dB external gain should be considered for the cable.

- Overall Gain

Overall Gain is the total gain in signal from GPS antenna to GPS receiver. Following is the equation for Overall Gain calculation.

Overall Gain(dB) = GPS Antenna Gain – Cable Attenuation – Connector Insertion Loss + Accessory Gain

Formula 2. Overall gain

Overall Gain should be between 15dB ~ 35dB. In general, Overall Gain of 25dB is used. GPS Antenna Gain value is the sum of LNA gain within the antenna and the Patch Antenna Gain.

Cable Attenuation indicates the loss of signal strength and differs by cable type. Such cable attenuation should be considered when selecting GPS cables.

Connector Insertion Loss indicates the loss of signal strength at the connectors.

Accessory Gain indicates the gain generated from GPS accessories, such as GPS In-line amplifier.

- Cable Attenuation

Cable attenuation differs depending on the type of cables and the manufacturers. This value indicates the signal attenuating ratio per meter of cable.

Cable Type	Attenuation in 1.57542GHz
RC8	0.31 dB/m
RG58	0.63 dB/m
RG213	0.35 dB/m

RG214	0.328 dB/m
LMR400	0.203 dB/m

Table 16. RF Cable Attenuation

GPS Cable Design Example

Following is an example of GPS antenna (HAG-240) design plan:

- Use the Overall Gain equation described above.
- The gain for GPS antenna (HAG-240) is 40~45dB.
- Assume 0 for Insertion Loss and Accessory Gain.
- Therefore, Cable attenuation should be between 10~25dB range.
- When using RG213 cable, Cable attenuation should be 0.3~0.35dB/m. Therefore, this cable can be used for connection extending from 30m to 71m.
- When using LMR 400 cable, Cable attenuation should be 0.2dB/m. Therefore, this cable can be used for connection extending from 50m to 125m.

Antenna RF cable Connection

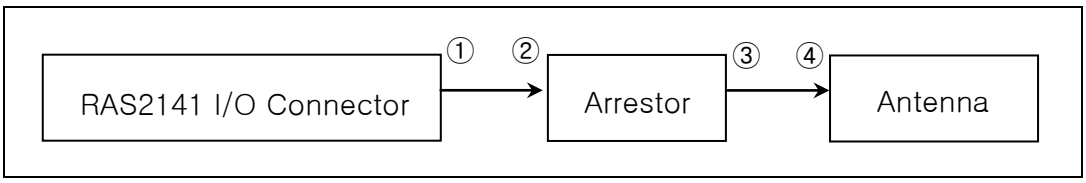
Connect the Antenna RF cable as follows:

- The curvature radius should be 250mm or more when over 7/8”, and 510mm or more when 1 5/8” or more.
- RF cable should be fixed using Lam clamp. If power cable is to be laid or tied within walls, make sure the external appearance is finished neatly.
- Make sure to connect arrestor to RF cable and GPS cable to prevent system damage from lightning.

Checking power cable Connection

After assembling RF cable, make sure to perform passage test and RF cable Return Loss Test to determine whether it has been properly assembled and measure VSWR for antenna and power cable.

VSWR measurement sections are as follows:



Picture 26. VSWR measurement sections

1) Measure sections ①~④.
2) The VSWR should be below 1.5. If the VSWR measurement exceeds 1.5, disconnect and measure each sections separately and take appropriate measures to fix the problem.
3) Measure sections ③~④.
4) If the VSWR exceeds 1.15:1, re-assemble the connector or re-lay the power cable.

Recognition tabs

Attach recognition tabs as below on the antenna side of the power cable.

Category	Description
Location	Attach recognition tabs at the two ends of the antenna.
Material	Recognition tabs should be made of aluminum with external vinyl coating.
Attaching Method	Fasten the power cable in the holes at the two ends of the antenna with a black tie wrap.

Table 17. Recognition descriptions

4.2.7 Cable Arrangement and Finishing

Once all cables are properly installed, use cable ties to fasten the cables together in order.

4.2.8 Power Connection

Once system installation is completed, connect power to the system.

- Since RAS2141 is not equipped with a power switch, switch on an external power switch that supplies power to the system.
- When turning off the system, switch off in the reverse order.

5 System Access

To use of direct connection of the RAS2141 system for using CLI instead of the EMS command, two methods are typically provided for system access as follows. The first method is to access the system using Ethernet debug port or UART debug port. In the second method, Bluetooth port is used to access the system with Bluetooth capabilities using Bluetooth protocol.

Using ETH DBG Port and Bluetooth Protocol

The ETH DBG Port is configured and fixed to only one type among Ethernet Debug Port, UART Debug Port or Supplementary Equipment Alarm Collating Port at the time of shipping. Please confirm that the system is equipped with Bluetooth option.

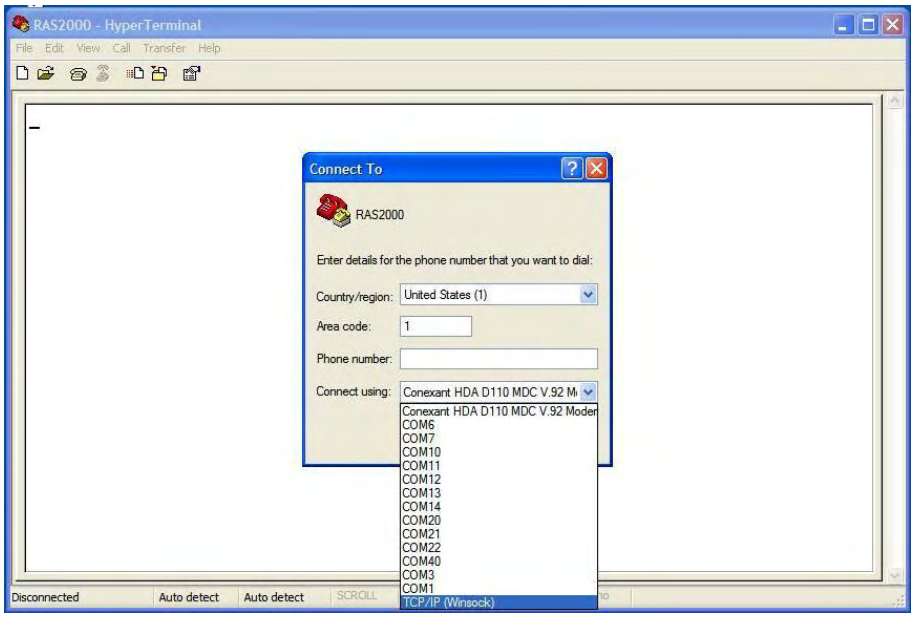
5.1 System Access using Ethernet Debug Port

If the Ethernet Debug Port (ETH DBG) is being used for collating Alarms from supplementary equipments (rectifier, etc.), the Ethernet Debug Port cannot be used for accessing the system. In such circumstances, consider accessing the system through Bluetooth Protocol as described in section 5.2.

Picture 27. System Access using Ethernet Debug Port

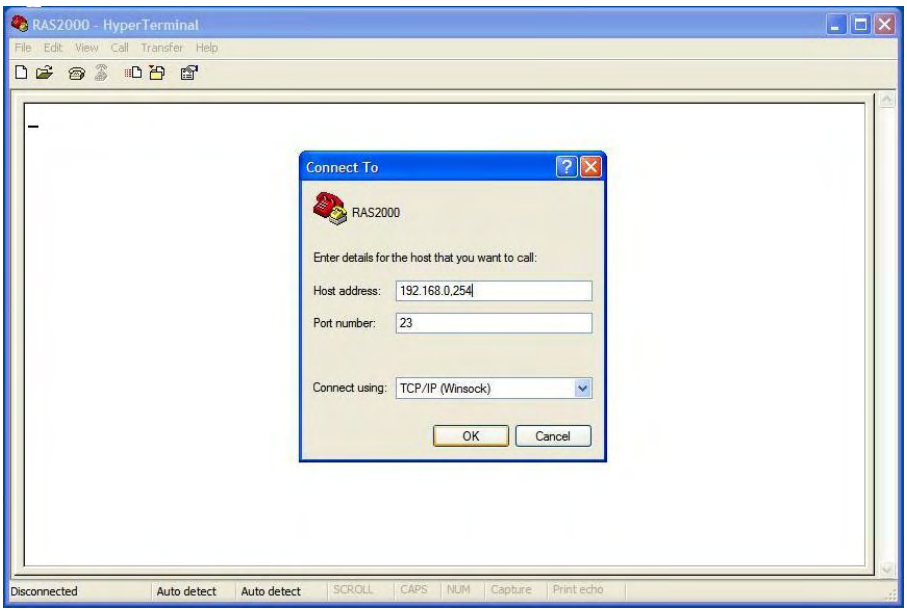
The procedures of system access using Ethernet debug port are as follows:

1) Enable the communication emulator to access RAS2141 system in Windows.



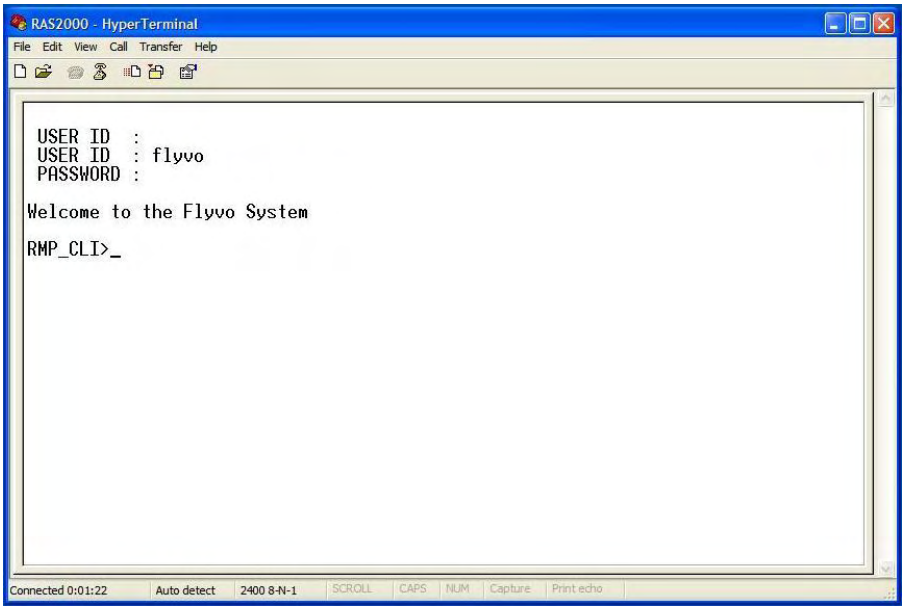
Picture 28. Setup of Terminal Emulator

2) Type the host address with predefined IP address of RAS2141 and select TCP/IP on the s election menu.



Picture 29. Setup of Host Address

3) After making new connection, verify user id and password and confirm „RMP_CLI>' prompt in the terminal.



881

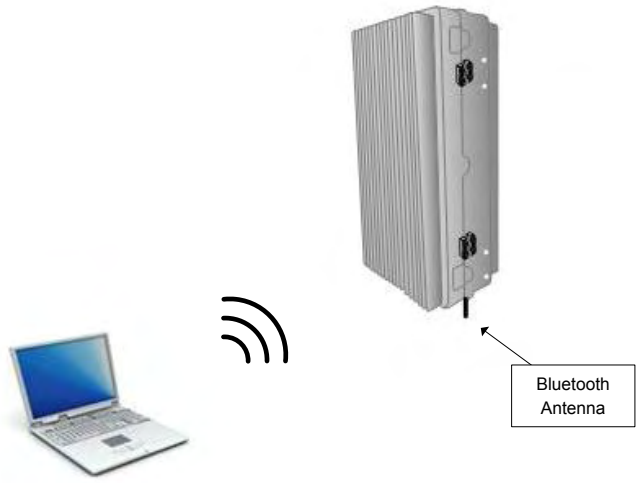
882 **Picture 30. Complete System Access**

883

> CAUTION
>
> If Ethernet Debug Port is used to collect alarm information of peripheral devices such as a rectifier, the port can not be used as Ethernet debug port for system access. In this case an operator (or Installer) should use Bluetooth device or EMS command (or CLI) to access RAS2141 system.

884

885 ## 5.2 System Access using Bluetooth Protocol



886

887 **Picture 31. System Access using Bluetooth Protocol**

888

If RAS2141 system is equipped with Bluetooth capabilities, it can be used to access the system using Bluetooth Protocol. And an Operator (or Installer) should check Bluetooth ID and password for RAS2141 system.

The procedures of system access using Bluetooth protocol are as follows:

If your computer (or laptop computer) does not have Bluetooth modem, you should prepare Bluetooth USB adapter with its driver software.

1) Make sure your PC have Bluetooth function or have Bluetooth adaptor to enable Bluetooth function. And check Bluetooth icon in Windows system tray.

Picture 32. Bluetooth Icon in Windows

2) Select Bluetooth icon in Windows and then click on the icon with the right mouse button.

Picture 33. Menu for Bluetooth connection

3) Select „Add New Connection' menu to use Bluetooth connection.

906

907 **Picture 34. Setting for Bluetooth connection**

908

909 4) Press Bluetooth device name on the selection menu to connect RAS2141 system.

910

911 **Picture 35. Bluetooth device selection**

912

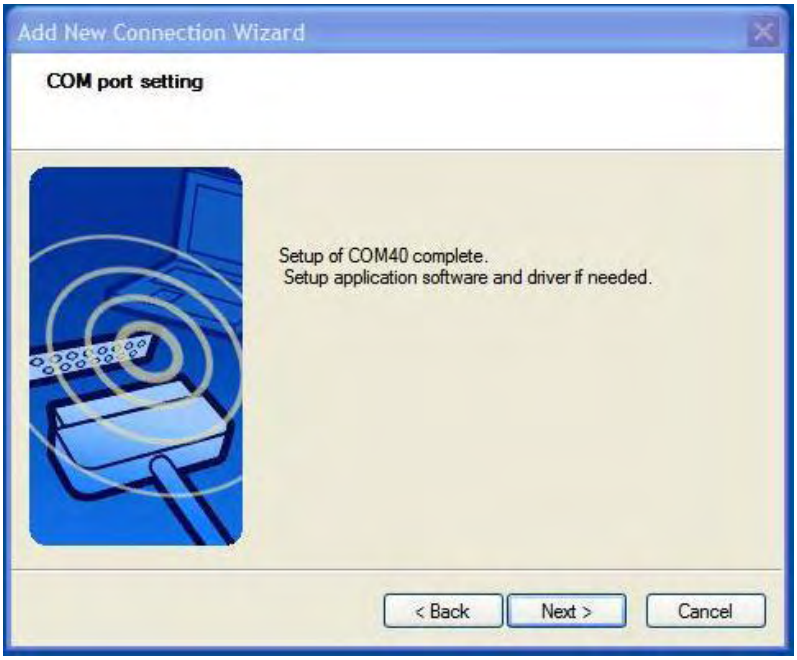
913 5) Type Bluetooth Passkey using predefined password on the Bluetooth Security menu.

914

915 **Picture 36. Bluetooth Security**

916

917 6) After setting of COM port, click on „Next' button to finish the procedure of Bluetooth setup.



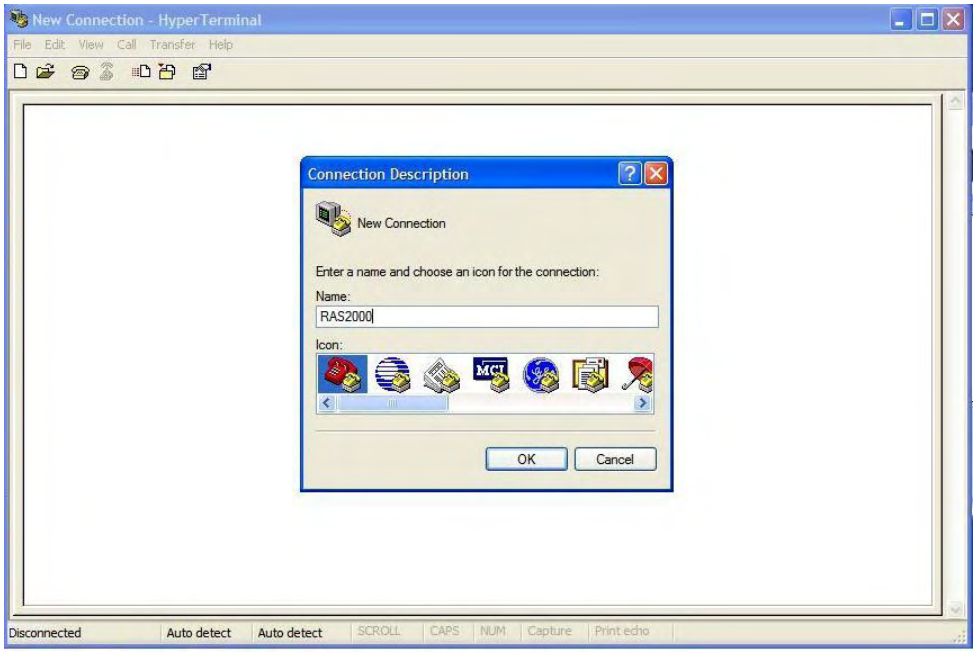
918

919 **Picture 37. Setup of COM port complete**

920

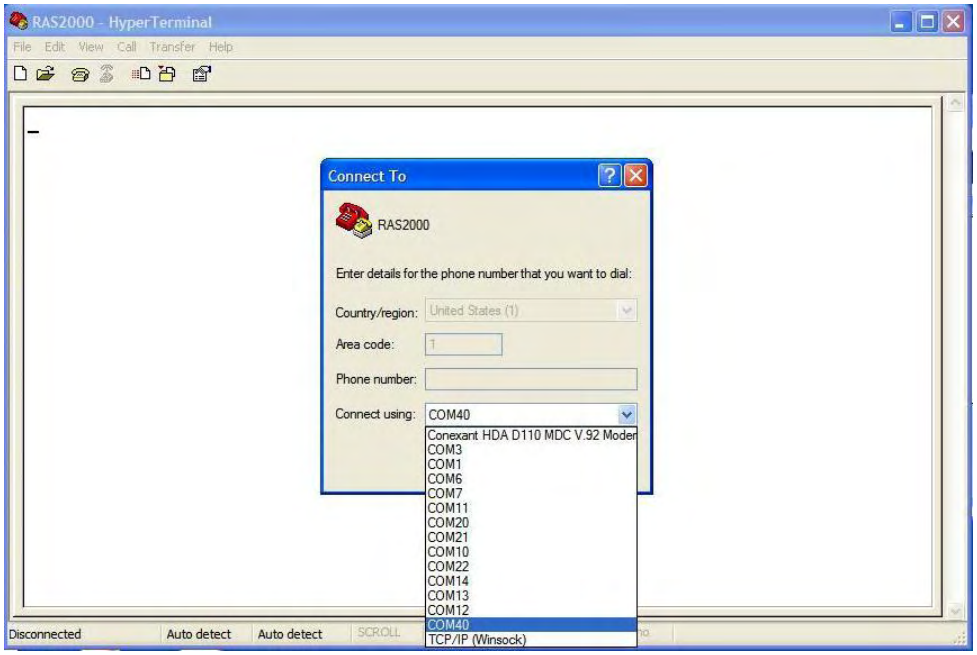
921 7) After making new connection, enable the communication emulator to access RAS2141

922 system.



Picture 38. Setup of Terminal Emulator

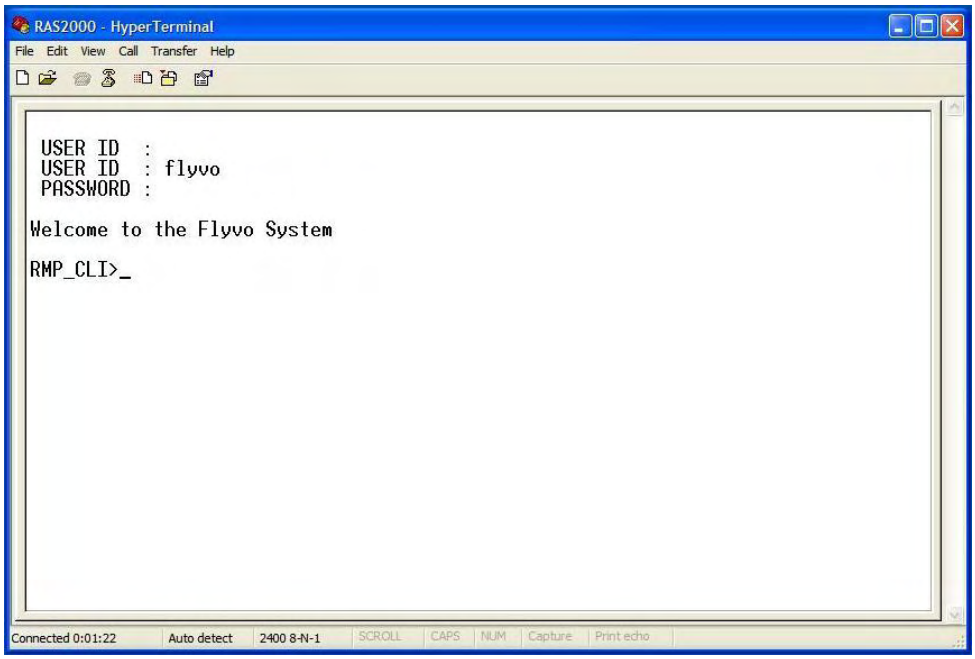
8) Select the same number of COM port as the number in the procedure 6).



Picture 39. Setup of COM port

The number of COM port is variable.

9) After making new connection, verify user id and password and confirm „RMP_CLI>' prompt in the terminal.



Picture 40. Complete System Access

6 System configurations and verifications of normal operation using CLI

RAS system operates as a linked system with ASN-GW and EMS rather than by itself, and therefore, requires appropriate settings to connect with such equipments.

For such connection settings, please refer to the “RAS2141 Operation Manual” described in the Preface.

6.1 Logged Screen during Normal Booting Procedure

After initial setting of RAS2141 system successfully, the captured booting screen is shown as follows:

```
Starting at 0x100000...

Target Name: vxTarget
Attaching interface lo0... done
0x3fff9d50 (tRootTask): MAC 00:15:7d:01:09:44
0x3fff9d50 (tRootTask): MAC 00:15:7d:01:09:45
0x3fff9d50 (tRootTask): MAC 00:15:7d:01:09:46
0x3fff9d50 (tRootTask): MAC 00:00:00:00:00:00
Attached IPv4 interface to mottsec unit 1

Adding 14986 symbols for standalone.
wdbCommDevInit: Could not find device tffs=0,0, unit 1 !
ERR [KERN] if_add.c:100: ipAttach() failed for fei1

CPU: Freescale CDS MPC8548E - Security Engine.  Processor #0.
Memory Size: 0x3fffa000.  BSP version 1.0/0.
Created: Nov  3 2009, 17:27:39
ED&R Policy Mode: deployed
WDB Comm Type: WDB_COMM_END
WDB: Ready.
Attaching to TFFS        : DONE
Check EDR Log ...Done

************************************************************
* Copyright POSDATA co., 2004-2008
* Version: 3.6.1(S/W), 0.1.0(H/W)
************************************************************

Starting tmu initialization...
```

```
System reset reason: reset by S/W
System clock source: 1588 1IP
Initializing the FPGA Module....DONE

Initializing the SPI Module.....DONE
Initializing the TMU PLL.....DONE
Initializing the IF Module.....DONE
PHY driver $Revision: 1.11 $ for Nov  2 2009 18:50:40
TMU RF Control Config. Set.....DONE

PM Parser.....DONE
Low MAC.....DONE
SDU Reconstruction.....DONE
Rx ARQ.....DONE
PDU Construction.....DONE
Scheduler.....DONE
BPM,BWR.....DONE
QMS.....DONE
Tx ARQ.....DONE
Convergence sublayer.....DONE
Data plane simulator.....DONE
TLV.....DONE
RNG.....DONE
Control Plane.....DONE
Core MAC task.....DONE
taskMacTxEnd.....DONE
taskMacRxEnd.....DONE
Management module.....DONE
HVT.....DONE
audit/trace.....DONE
timer task.....DONE

Waiting CPM response...
Configuration Callback Function Registration DONE.
Ethernet Driver Enable DONE.
System Initialized DONE ..

POSLOG.....DONE
RMP Task Monitoring Task Spawn.....DONE
rmpExcHookInit.....DONE
RLDB Main Task.....DONE
Rldb Main Task Spawn.....DONE
tLdTimer Task Spawn.....DONE
Reading  /tffs0/RASConf.....DONE
PLD Version OLD(0.10.3), NEW(0.10.3)
CheckSum for config : 0x9d7a96(10320534)
Current fa(1) sect(1) Model(28)
Generating Neighbor Configuration.....DONE
Time Zone: LOCAL_TIME_OFFSET    32400.....DONE
Default RAS Time  1970/01/01 00:00:41.....DONE
D16 TLV Library Init.....DONE
cBuffer Library Init.....DONE
cWMI Library Init.....DONE
rasWMI Library Init.....DONE
rasCPI Library Init.....DONE
tRcmbMain task spawn.....DONE
tOLCheck Spawn.....DONE
tKeepAlive(rn,acr) Task Spawn.....DONE
tIndAlm(alarm) Spawn.....DONE
```

```
tTmuHwAlarm Spawn.....DONE
RSFB Status & Mmc Spawn.....DONE
tStatTimer Task Spawn.....DONE
STAT Loaded.....DONE
tRemb Task Spawn.....DONE
tRgpb Task Spawn.....DONE
tRdtb task Spawn.....DONE
tSwBlockDiag Task Spawn.....DONE
TimerLibrary Load.....DONE
rrcTimerLibrary.....DONE
RRC(Radio Resource Controller).....DONE
CAC(Call Admission Control).....DONE
RAS Init.....DONE
RAS-SNMP swLoadMngInit.....DONE


Set Frequency -> 2550000 kHz.. SUCCESS
MIMO UL CSM turned off
Ieee1588SlaveInit...Done..
vlanTagIfIngressTypeSet OK(2)
vlanTagIfEgressTypeSet OK(1)
Device ID     : 0x105
Base Reg Addr : 0x0
No of Ports   : 6
CPU Ports     : 2
LED Init      : Eth-1 Done
Optic Init    : Eth-5 Equip (1000base-X)
Network Configuration initialization : DONE

todDrv Not Open or Error. Configuration Change(cnt=1)...DONE
[ 1588 ] IEEE1588 UDP(319) bind OK!(11)
[ 1588 ] IEEE1588 UDP(320) bind OK!(12)
####
################################################################################
#### Start 1588_Slave_Uart_Task() : ttyS2(__fd_uart=19)  : acib_max_fd=19
####
################################################################################
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
Becuase of Previous RF Alarm, DL MIMO will be off! (txAPath Alarm : 1, txBPath Alarm: 1)
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
Becuase of Previous RF Alarm, DL MIMO will be off! (txAPath Alarm : 1, txBPath Alarm: 1)
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...


User Access Verification
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
Becuase of Previous RF Alarm, DL MIMO will be off! (txAPath Alarm : 1, txBPath Alarm: 1)
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
```

```
Becuase of Previous RF Alarm, DL MIMO will be off! (txAPath Alarm : 1, txBPath Alarm: 1)
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
Becuase of Previous RF Alarm, DL MIMO will be off! (txAPath Alarm : 1, txBPath Alarm: 1)
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
Becuase of Previous RF Alarm, DL MIMO will be off! (txAPath Alarm : 1, txBPath Alarm: 1)
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
...GPS LOCK(0)...
...GPS LOCK(1)...
Wait for GPS ACTIVE set...
...GPS LOCK(2)...
...GPS LOCK(3)...
TMU RF Control Tasks (Temp, Alc, Vswr) spawned
Frequency Range Set (2300.00) ~ (2700.00)
Initializing the RF Module......rf: indoor detected.
ad9352DcOffsetCallInit Main(b1=10, b2=10)
ad9352DcOffsetCallInit Success(dir=0)!!.
ad9352DcOffsetCallInit Div(b1=10, b2=10)
ad9352DcOffsetCallInit Success(dir=1)!!.
```

```
rf: indoor was successfully initialized.
DONE
PC203 detected x 2
PC203 dev 0 successfully loaded.(/tffs0/FPGAIMG/dev0_10M_R1000.pa)
Processing: /tffs0/FPGAIMG/dev0_10M_R1000.pa (dev #0)...Verify Device #0: Success!
PC203 dev 1 successfully loaded.(/tffs0/FPGAIMG/dev1_10M_R1000.pa)
Processing: /tffs0/FPGAIMG/dev1_10M_R1000.pa (dev #1)...Verify Device #1: Success!
PC203 devices started
current state = API_IDLE next state = API_PARAM
phyInterruptThread started
phyDriverRxThread started
current state = API_PARAM next state = API_CONFIG
current state = API_CONFIG next state = API_START
current state = API_START next state = API_RUNNING
CPM Send OK
[BBP(0) =>RMP] : MSG_RN_CFG_CMPLT_RPT
Set Frequency -> 2550000 kHz.. SUCCESS
USER ID  : flyvo
PASSWORD :
Welcome to the Flyvo System

RMP_CLI>
```

6.2 Network Connectivity and RAS Configuration

To verify network connectivity, follow next steps.

1) Login to RMP through console port.

```
Login:rmp
Password: ********
```

2) Set ACR IP address.

```
RMP_CLI>set network acr ip xxx.xxx.xxx.xxx
```

Please, make inquiries about IP Address of RAS and ACR to network manager.

ACR IP Address : xxx.xxx.xxx.xxx

3) Set Authenticaticator IP address.

```
RMP_CLI>set network acr ip xxx.xxx.xxx.xxx
```

960

Please, make inquiries about IP Address of RAS and ACR to network manager.

Authenticator IP Address : xxx.xxx.xxx.xxx

961

962 4) Set 1588 master IP address (@ RAS2141-S).

```
RMP_CLI>set network 1588_master ip xxx.xxx.xxx.xxx
```

963

Please, make inquiries about IP Address of RAS and ACR to network manager.

1588 master IP Address : xxx.xxx.xxx.xxx

964

965 5) Set RAS IP address.

```
RMP_CLI>set network ras ip x.x.x.x subset 255.255.255.0 router y.y.y.y
```

966

Please, make inquiries about IP Address of RAS and ACR to network manager.

RAS IP Address : x.x.x.x

Default Router Address : y.y.y.y

967

968 6) Set ACR ID.

```
RMP_CLI>set ras info acrid xx
```

969

ACR ID : xx

970

971 7) Set ASN-GW Type.

```
RMP_CLI>set ras info asn-gwType x
```

ASN-GW type : x – 0 (AGW20000), 1 (Apollo), 2 (Wichorus)

8) Set RAS ID.

```
RMP_CLI>set ras info rasid xx
```

RAS ID : xx

9) Set clock mode (@ RAS2141-M).

```
RMP_CLI>set ras info clockMode mode
```

Clock mode : 0 (GPS Only), 1 (1588 Master)

10) Verify the network configuration.

```
RMP_CLI>sh network
 ACRIP          : 203.238.222.101
 RASIP          : 10.10.226.101
 SUBNET  Mask   : 255.255.255.0
 Default Router    : 10.10.226.254
 Active  EMS IP    : 0.0.0.0
 Standby EMS IP    : 0.0.0.0
 Ntp Server  IP    : 0.0.0.0
 DP Mode         : per-SF
 PC  IP          : 0.0.0.0
 1588 Master  IP  : 0.0.0.0
 Authenticator IP   : 0.0.0.0
```

11) Confirm RAS configuration.

```
RMP_CLI>sh ras
 OP Id      : 00:00:00
 ACR Id     : 22
 RAS Id     : 102
 RAS MODEL  : 2711-1(2711-R0M1A22C10F25500)
```

```
Sect Num   : 1
FA   Num   : 1
Clock Mode : GPS and 1588 Master Mode
Clock Info     : 1588 Master or GPS Mode
ASN-GW Type: AGW20000(0)

RESULT : OK
COMPLETED
```

983

984 12) Verify the connection with ACR using ping.

```
RMP_CLI>ping 203.238.222.101
PING 203.238.222.101 (84=20+8+56 bytes)
64 bytes from 203.238.222.101: icmp_seq=0. time=0. ms
64 bytes from 203.238.222.101: icmp_seq=1. time=0. ms
64 bytes from 203.238.222.101: icmp_seq=2. time=0. ms
----203.238.222.101 PING Statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 0/0/0

RESULT : OK
COMPLETED
```

985

986 13) Verify ACR link status.

```
RMP_CLI>sh link sts
 ACR   LNK1   :   UP (Copper)
 Daisy-chain SFP: DOWN
 ACR Status   :   NOR

 RESULT : OK
 COMPLETED
```

987

988 14) Verify whether card status is normal.

```
RMP_CLI>sh card sts
  CARD INFO  STATUS
 ...................
     RMP      NOR
     BBP 0    NOR
     TRP 0    NOR
     PAP 0    NOR
     PAP 1    NOR
     GPS      NOR

 RESULT : OK
 COMPLETED
```

6.3 Software Image Download and Verifications

If the software version is not final, download final image and reboot system. Follow next steps.

1) Verify the current software version.

```
RMP_CLI>sh sw version rmp

Block Type    size    blkname    LD_STS    Flash_Ver/Rmp_Run_Ver    Loading Time    Compile
Time
0    4460704  rmp-rlib     LD_INIT     3.4.7(     3.4.7)   2009/10/12 15:37:56   2009/10/12
11:09:16
1    650685   RASConf      LD_INIT      0.10.3          2009/10/21 09:28:16      0000/00/00
00:00:00
8     0       gpp-rgcb       LD_INIT       0.0.0                              ----------
10    5653248   rmp-oamb     LD_INIT    3.4.7(     3.4.7)    2009/10/12 15:44:06       2009/10/12
11:09:16
11   5079852   rmp-rccb      LD_INIT   3.4.7(     3.4.7)     2009/10/07 16:27:42       2009/10/07
15:38:43
12  6724904    rmp-os       LD_INIT   3.4.7(     3.4.7)      2009/10/12 15:35:18       2009/10/12
11:13:09

 TCU F/W Version : 1.2.4
 TIU F/W Version : 1.4.0

 RESULT : OK
 COMPLETED
```

2) If the SW version is different with the final, load the final version images including rmp-oam b, rmp-rlib, rmp-rccb, rmp-os.

```
RMP_CLI>load block img ftp type ip dir id password blk_name blk_ver img_type
 type : 0(DOWN load),1(UP load)
 ip: Server IP address which contains image file
 dir: directory that the image file resides
 id: Login ID
 password: Password for login ID
 blk_name: image name
 blk_ver: image version
 img_type : 0(RMP_RLIB),1(CONF),2(BBP),3(TRP),4(RDP)
        5(REP),6(RPP),8(GPP),9(RIP)
       10(RMP_OAMB),11(RMP_RCCB),12(RMP_OS)
       14(DTRU)
```

A. S/W download and flash write 1) rmp-os-3.4.9.img.

```
RMP_CLI>load block img ftp 0 10.10.232.5  /R3.4.9/ user3 ***** rmp-os-3.4.9.img 3.4.9 12
[EMS=>RMP] Downloading Start(filename:rmp-os-3.4.9.img)

 RESULT : OK
 COMPLETED
[100%]
ImgType(12) ImgHwType(20) RasModel(21) rmpHwId(0x0) BoadType(16)

Downloading Completed(filename:rmp-os-3.4.9.img, size:6726296)
Saving downloaded image file(/tffs0/rmp-os.new)
 - \
Flash Save : my_checkusum 8beab5 img_checksum 8beab5
moving file /tffs0/rmp-os -> /tffs0/rmp-os.backup
moving file /tffs0/rmp-os.new -> /tffs0/rmp-os
 rmp-os=>version 3.4.9(3.4.9)

Downloading end
```

B. S/W download and flash write 2) rmp-rlib-3.4.9.img.

```
RMP_CLI>load block img ftp 0 10.10.232.5  /R3.4.9/ user3 ***** rmp-rlib-3.4.9.img 3.4.9 0
[EMS=>RMP] Downloading Start(filename:rmp-rlib-3.4.9.img)

 RESULT : OK
 COMPLETED

 [  100 % ]
memory:my_checkusum 8c6f0f img_checksum 8c6f0f

ImgType(0) ImgHwType(20) RasModel(21) rmpHwId(0x0) BoadType(16)

Downloading Completed(filename:rmp-rlib-3.4.9.img, size:4461556)
Saving downloaded image file(/tffs0/rmp-rlib.new)
- \ | /
Flash Save : my_checkusum 8c6f0f img_checksum 8c6f0f
moving file /tffs0/rmp-rlib -> /tffs0/rmp-rlib.backup
moving file /tffs0/rmp-rlib.new -> /tffs0/rmp-rlib
 rmp-rlib=>version 3.4.9(3.4.9)

Downloading end
```

C. S/W download and flash write 3) rmp-oamb-3.4.9.img.

```
RMP_CLI>load block img ftp 0 10.10.232.5  /R3.4.9/ user3 ***** rmp-oamb-3.4.9.img 3.4.9 10
[EMS=>RMP] Downloading Start(filename:rmp-oamb-3.4.9.img)

 RESULT : OK
 COMPLETED
```

```
 [  100 % ]
memory:my_checkusum 43ac30 img_checksum 43ac30

ImgType(10) ImgHwType(20) RasModel(21) rmpHwId(0x0) BoadType(16)

Downloading Completed(filename:rmp-oamb-3.4.9.img, size:5655016)
Saving downloaded image file(/tffs0/rmp-oamb.new)
 - \
Flash Save : my_checkusum 43ac30 img_checksum 43ac30
moving file /tffs0/rmp-oamb -> /tffs0/rmp-oamb.backup
moving file /tffs0/rmp-oamb.new -> /tffs0/rmp-oamb
 rmp-oamb=>version 3.4.9(3.4.9)

Downloading end
```

1003

1004 D. S/W download and flash write 4) rmp-rccb-3.4.9.img.

```
RMP_CLI>load block img ftp 0 10.10.232.5  /R3.4.9/ user3 ***** rmp-rccb-3.4.9.img 3.4.9 11
[EMS=>RMP] Downloading Start(filename:rmp-rccb-3.4.9.img)

 RESULT : OK
 COMPLETED


 [  100 % ]
memory:my_checkusum bc0e55 img_checksum bc0e55

ImgType(11) ImgHwType(20) RasModel(21) rmpHwId(0x0) BoadType(16)

Downloading Completed(filename:rmp-rccb-3.4.9.img, size:5136736)
Saving downloaded image file(/tffs0/rmp-rccb.new)
 - \ |
Flash Save : my_checkusum bc0e55 img_checksum bc0e55
moving file /tffs0/rmp-rccb -> /tffs0/rmp-rccb.backup
moving file /tffs0/rmp-rccb.new -> /tffs0/rmp-rccb
 rmp-rccb=>version 3.4.9(3.4.9)

Downloading end
```

1005

1006 3) Verify the updated software version in the Flash.

```
RMP_CLI>sh sw version rmp

Block Type    size    blkname    LD_STS    Flash_Ver/Rmp_Run_Ver    Loading Time
Compile Time
0     4461556    rmp-rlib   LD_CMPLT   3.4.9(    3.4.7)     2009/10/21 12:47:20 2009/10/30
15:54:40
1      650685   RASConf  LD_INIT     0.10.3              2009/10/21 09:28:16 0000/00/00
00:00:00
8         0    gpp-rgcb   LD_INIT      0.0.0                    --------------------
10    5655016    rmp-oamb    LD_CMPLT    3.4.9(    3.4.7)     2009/10/21 12:53:58 2009/10/30
15:54:40
```

```
11   5136736  rmp-rccb   LD_CMPLT    3.4.9(    3.4.7)    2009/10/21 12:59:04 2009/10/30
15:54:40
12   6726296  rmp-os     LD_CMPLT    3.4.9(    3.4.7)    2009/10/21 12:43:10 2009/10/30
16:05:19

 TCU F/W Version : 1.2.4
 TIU F/W Version : 1.4.0

 RESULT : OK
 COMPLETED
```

4) Reboot RAS to apply updated S/W version.

```
RMP_CLI>load reset card rmp 1
```

5) Wait until GPS is locking.

6) Confirm the running S/W version.

```
RMP_CLI>sh sw version rmp

 Block Type       size       blkname      LD_STS   Flash_Ver/Rmp_Run_Ver    Loading Time
Compile Time
       0     4461556       rmp-rlib     LD_INIT     3.4.9(    3.4.9)    2009/10/21 12:47:20
2009/10/30 15:54:40
       1      650685        RASConf     LD_INIT     0.10.3              2009/10/21 09:28:16
0000/00/00 00:00:00
       8           0       gpp-rgcb     LD_INIT     0.0.0                ----------
      10     5655016       rmp-oamb     LD_INIT     3.4.9(    3.4.9)    2009/10/21 12:53:58
2009/10/30 15:54:40
      11     5136736       rmp-rccb     LD_INIT     3.4.9(    3.4.9)    2009/10/21 12:59:04
2009/10/30 15:54:40
      12     6726296         rmp-os     LD_INIT     3.4.9(    3.4.9)    2009/10/21 12:43:10
2009/10/30 16:05:19

 TCU F/W Version : 1.2.4
 TIU F/W Version : 1.4.0

 RESULT : OK
 COMPLETED
```

7) Check network connectivity and RAS configuration as in “Network Connectivity and RAS Configuration” section.

6.4 Check Basic Operations

To check whether the system operates well, follow next steps.

1) Verify center frequency and other physical configuration of the system.

```
RMP_CLI>sh dl info
 LOC : FA00 SECT00
-------------------------------------------------
 CCC                              :    11
 BS EIRP                          :    24 dBm
 TTG                              :   296 PSs
 RTG                              :   168 PSs
 EIRxP                            :   -88 dBm
 Frequency                        : 2560000 khz
 BSID                             : 00:00:00:16:06:60(OP:0 NSP:0 ACR:22 RAS:102 FA:0 SECT:0)
 Mac Version                      :     6
 HO type Support                  :     1
 HO Add_Threshold                 :     3 dB
 HO Del_Threshold                 :     3 dB
 Default RSSI and CINR Avg Parameter  :  0x0
 ASR slot length and switching period :  0x25
 Paging Group Id                  :  0,0,0,0
 DL AMC Allocated Physical Bands      :  0x00 00 00 ff ff ff
 Hysteresis Magin                 :     0 dB
 Time-trigger Duration            :   100 ms
 Default HO RSSI & CINR Avg Parameter :  0x2255
 maximum Retransmission           :     3
 TRIGGER INFO
 ID TYPE FUNCTION ACTION VALUE DURATION  EQUIP
 00  0x0     0x1   0x2  0x06   0x64    0x1
 01  0x0     0x0   0x0  0x00   0x00    0x0
 02  0x0     0x0   0x0  0x00   0x00    0x0
 03  0x0     0x0   0x0  0x00   0x00    0x0
 04  0x0     0x0   0x0  0x00   0x00    0x0
 05  0x0     0x0   0x0  0x00   0x00    0x0
 06  0x0     0x0   0x0  0x00   0x00    0x0
 07  0x0     0x0   0x0  0x00   0x00    0x0
 08  0x0     0x0   0x0  0x00   0x00    0x0
 09  0x0     0x0   0x0  0x00   0x00    0x0
 10  0x0     0x0   0x0  0x00   0x00    0x0
 11  0x0     0x0   0x0  0x00   0x00    0x0

 RESULT : OK
 COMPLETED
```

2) Go to the CLI mode in TMU.

```
RMP_CLI>telnet dccu 0

EXIT CLI MAIN process..

Password: (Enter)
tmu-1(x.x.x)$ g d

Password: (Enter)
exit.....
```

3) Confirm that frame number increases.

```
tmu-1(x.x.x)#sh sched framenum
37270
```

```
tmu-1(x.x.x)#sh sched framenum
37498
```

4) Confirm that HW interrupts increase.

```
tmu-1(x.x.x)#sh ints

 rxIntEth           = 438
 txIntEth           = 121
 ulinkIntPicoCnt    = 377943
 basicIntPicoCnt    = 37770
 ulinkIntDMACnt     = 340159
 dlinkBasicIntDMACnt  = 113314
```

```
tmu-1(x.x.x)#sh ints

 rxIntEth           = 440
 txIntEth           = 122
 ulinkIntPicoCnt    = 379664
 basicIntPicoCnt    = 37942
 ulinkIntDMACnt     = 341708
 dlinkBasicIntDMACnt  = 113830
```

```
tmu-1(x.x.x)#sh ints

 rxIntEth           = 442
 txIntEth           = 122
 ulinkIntPicoCnt    = 381035
 basicIntPicoCnt    = 38079
 ulinkIntDMACnt     = 342942
 dlinkBasicIntDMACnt  = 114241
```

1029

1030 5) Connect MS and verify entry of the MS.

```
tmu-1(x.x.x)#sh gds

[MULTICAST] 00:ff:ff:ff:00:00
          sfid     0 cid     0
[PSS000001] 00:21:07:00:63:63
   basic    sfid     0 cid     1
   primary  sfid     0 cid  1025
   uplink   sfid 12300 cid  7169
   downlink sfid 12312 cid 11265
[MULTICAST] 00:ff:ff:ff:ff:fb
          sfid     0 cid 65531
[MULTICAST] 00:ff:ff:ff:ff:fc
          sfid     0 cid 65532
[MULTICAST] 00:ff:ff:ff:ff:fd
          sfid     0 cid 65533
[MULTICAST] 00:ff:ff:ff:ff:ff
          sfid     0 cid 65535

 1 PSS(s) and 5 Multicast Entries
```

1031

1032 6) Send ping message to check packet transmission at MS.

```
ping xxx.xxx.xxx.xxx –t
```

1033

External IP address : xxx.xxx.xxx.xxx

1034

1035 # 6.5 Hardware Normality check

1036 ## 6.5.1 Check Rectifier Normality

1037 Since input voltage of RAS2141 has -42~-58VDC range (refer to 1.1.3), directly check input
1038 voltage of RAS2141 which is output of rectifier.

```
RMP_CLI>show rep sts

  AC VOLTAGE          :  20000
  AC CURRENT          :  100
  DC VOLTAGE          :  270
  DC CURRENT          :  900

  RESULT : OK
  COMPLETED
```

AC VOLTAGE : 20000 -> 200.0V

AC CURRENT : 100 -> 10.0A

DC VOLTAGE : 270 -> 27.0V

DC CURRENT : 900 -> 90.0A

6.5.2 Verify RF Output Power

After completing setting of network configuration of RAS and ACR, the RAS2141 is normally alive.

```
tmu-1(x.x.x)#sc ocns on vertical 1 28 7
```

1) Verify normality of RF output power using the spectrum analyzer.

   i. If RF output power may be 37dBm ± 2dB after above operating CLI command, it is passed.

2) Check output power level and normality of the RAS2141 system.

   i. If RF output power may be37dBm ± 4dB after above operating CLI command, it is passed.

6.5.3 Check Alarm Status of Hardware

Check alarm status of Hardware. Where, OFF informs that alarm is not happened and ON informs that the relevant alarm is happened. For example, if AMP shutdown is ON, it show that AMP output is limited or the related Hardware is in unusual state. In this case, one should check the network configurations (where ACR operates normally or not, lock status of 1588 slave) or AMP output, etc.

```
RMP_CLI>show tmu rf alarm

TMU RF Alarm Info (Main/Diversity) --
```

```
PAB Alarm;
  AMP Shutdown     :  ON /  ON
  Over Power       : OFF / OFF
  Over Power Warn  : OFF / OFF
  Vswr Fail        : OFF / OFF
  Over Temp        : OFF / OFF

TRP Alarm;
  if pll(tifm pll) : OFF
  rf pll(ttru pll) : OFF
  adc overflow A   : OFF
  adc overflow B   : OFF
  trp High temp    : OFF
  trp Low  temp    : OFF
  fb adc overflow  :  ON
  cfr  ff          :  ON
  dpd ff           :  ON
```

6.5.4 Verify Status of synchronization (GPS)

In case synchronization of the RAS2141 system through receiving GPS does not yet acquire, messages of booting procedures are shown as follows. If the status of GPS wait (GPS lock) is maintained over 15 minutes, the installation of a chain of GPS antenna should be rechecked.

```
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
Wait for GPS ACTIVE set...
Set Frequency -> 2550000 kHz.. SUCCESS
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Configuration Change(cnt=1)...DONE
[BPM] loaded Normalized C/N override 2 table of UCD from RMP
MIMO UL CSM turned on
Wait for GPS ACTIVE set...
```

To check the chain of GPS antenna, follows the next CLI commands.

1) RAS2141-M

```
RMP_CLI>show gps sts
FW Version          : 10014
GPS Lock            :   Lock
Satellite Count     : 7
Satellite Track[1]  : Not Tracking
 ……
…….
…….
Satellite Track[32]  : Being Tracking
Antenna Delay       : 0
TFOM                : 3
FFOM                : 1
TEMP                : 55
 EFC Range          : -2
 IDN                : INNOS,GCGM-MP,INGYB00020,v100.23-01
 Channel Bw         :    10MHz
 Hold Over Time     : 0

 RESULT : OK
 COMPLETED
```

GPS Lock

If the chain of GPS antenna is installed correctly, status of GPS is changed to Lock state within 15 minutes in condition that satellite count is over 4 numbers.

Satellite Count

If the chain of GPS antenna is installed correctly, satellite count is normally over 4 numbers. If it is not, the installation of a chain of GPS antenna should be rechecked.

2) RAS2141-S

```
RMP_CLI>show 1588 info

 1588 Slave Status
 1588 Slave Lock            :   Lock
 1588 Slave Clock Output      : Clock ON
 1588 Slave Clock Running Time : 1259
 1588 Slave Operation Mode    :    Lock
 1588 Slave Pll Mode          : 5
 1588 Slave Time Diffeerence   : 75
 1588 Slave Oneway Delay Sec   : 0
 1588 Slave Oneway Delay Nano  : 36262
```

```
1588 Slave Offset          : 0

RESULT : OK
COMPLETED
```

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1588 Slave Lock

If the network between RAS2141-M and RAS2141-S is set correctly after power-on RAS2141-S, you can check which Slave Lock of RAS2141-S is aquired or not within 10 minutes.

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APPENDIX

RAS2141 Outer Cable Descriptions

No	To	Connector Type	From	Cable Type	Cable Length	Comments
1	DC IN	Blank Panel	/	/	/	@AC Option
		P/N (DDK): D/MS3106A 20-23 (D190)-Straight Plug (A: -48V, B: GND)	Rectifier	User Defined	User Defined	@-48VDC Option
2	AC IN/ ALM	Connectors 250V P/N (Harting): 0946 145 3410 	UPS	User Defined	User Defined	@AC Option
		PushPull RJ45 (V4) P/N (Harting): 0945 145 1500 	External Equipment (ex: Rectifier)	User Defined	User Defined	@-48VDC Option
3	ETH DBG	PushPull RJ45 (V4) P/N (Harting): 0945 145 1500 	Craft Terminal	User Defined	User Defined	@RS232
			Craft Terminal	User Defined	User Defined	@10/100Base-T
4	ETH B/H		ASN-GW Link	User Defined	User Defined	
5	OPTIC DAISY	PushPull LC duplex (V4) P/N (Harting): 0957 441 0501 	Another RAS2141	User Defined	User Defined	
6	OPTIC B/H		ASN-GW Link	User Defined	User Defined	
7	GPS	N(F)	GPS Antenna	User	User	

			/GPS Arrestor	Defined	Defined	
8	ANT0	N(F)	RF Antenna /RF Arrestor	User Defined	User Defined	
9	TX0 MON	SMA(F)	Measuring Instrument	User Defined	User Defined	
10	10MHz	SMA(F)	Measuring Instrument	User Defined	User Defined	
11	TDD	SMA(F)	Measuring Instrument	User Defined	User Defined	
12	ANT1	N(F)	RF Antenna /RF Arrestor	User Defined	User Defined	
13	TX1 MON	SMA(F)	Measuring Instrument	User Defined	User Defined	
14	B/T	SMA(F)	Bluethooth Antenna	/	/	RF Antenna

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MPE Information

	Warning: Exposure to Radio Frequency Radiation The radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna should not be less than 300cm during normal operation. The gain of the antenna is 17 dBi. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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