Mobile WiMAX
ICS Repeater

<Interference Cancellation System for Mobile WiMAX 20 Watt>

2008. 11

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1. Operating Description

The JI43-W2.5G-U/L is designed to amplify between multiple UEs and BTS in a WiMAX System. The Unit consists of a filter and amplifier chain in the downlink and a filter and amplifier chains in the uplink. The uplink and downlink paths are connected via a band pass filter on both ends of each path.

1.1. Down Link

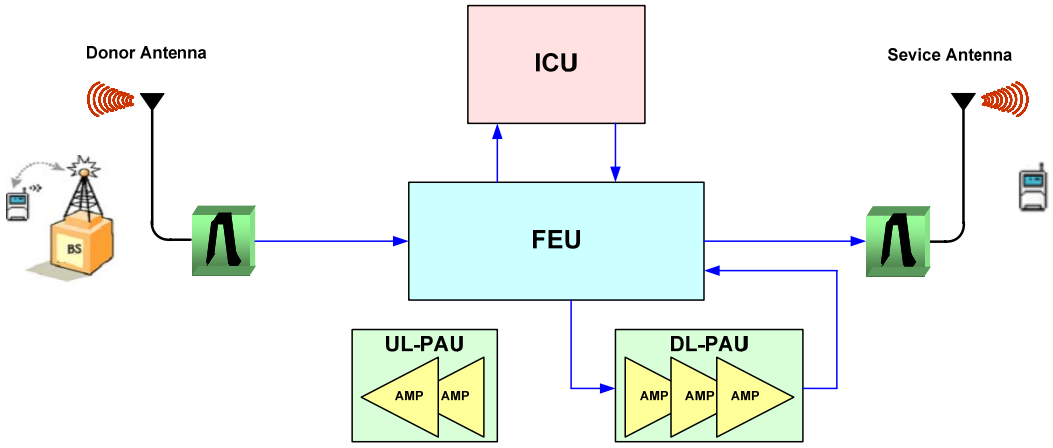


figure 1- 1 Downlink path

In the downlink path, a signal originating from the BTS is separated from the uplink signal in the FEU(Front End Unit) switch by switching controller. It is forwarded to the ICU(interference cancellation unit) by FEU switch. The ICU down-converts the signal to base-band, digital filters it amplifies it and the up-converts it. In addition the interference cancellation system algorithm (ICS algorithm) is implemented in the ICU.

Finally, the signal is sent to the final amplifier by FEU switch and is separated from the uplink input signal in the FEU switch.

1.2. Up Link

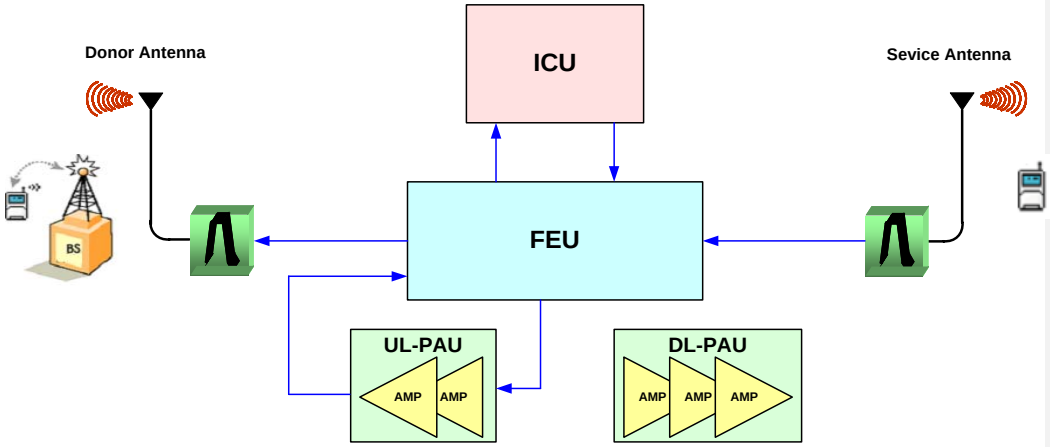


figure 1- 2 Uplink path

In the uplink path, a signal originating from the UE is separated from the downlink signal via the FEU(Front end Unit) switch by switching controller. It is forwarded to the ICU(interference cancellation unit) by FEU switch. The ICU down-converts the signal to base-band, digital filters it amplifies it and the up-converts it. In addition the interference cancellation system algorithm (ICS algorithm) is implemented in the ICU.

Finally, the signal is sent to the final amplifier by FEU switch and is separated from the downlink input signal in the FEU switch.

2. ICS Application

2.1. ICS Repeater Application

The following figure illustrates the ICS repeater application.

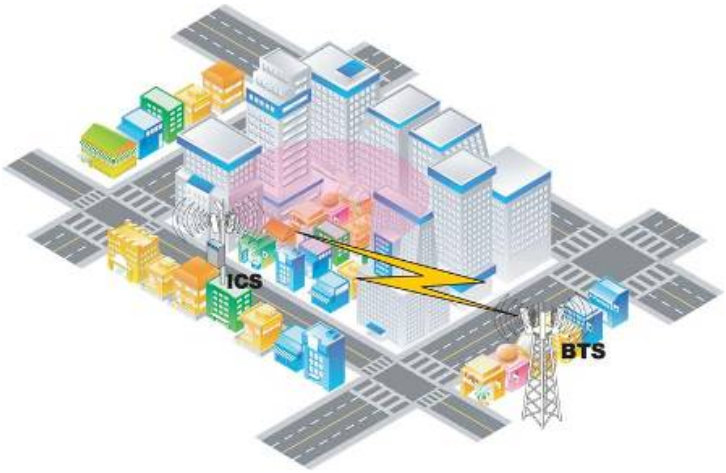


figure 2- 1 Shadow areas caused by tall buildings

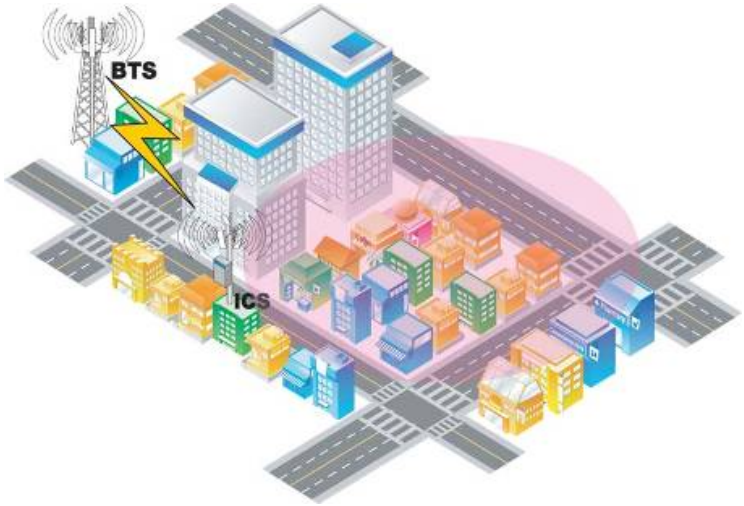


figure 2- 2 Shadow areas caused by construction of new buildings

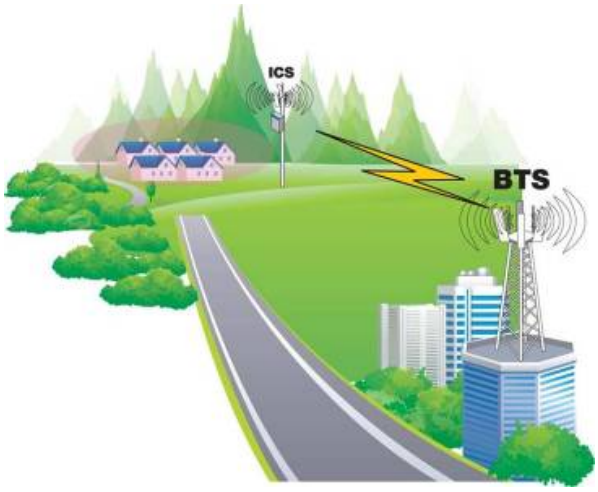


figure 2- 3 Coverage expansion in the low traffic rural area

Wireless communication systems provide a two-way information transfer (voice and data) between a base station and multiple mobiles (UE) within a given area.
Environmental variables such as physical structures both man-made (buildings) and natural (mountains) attenuate signals in the transmission path, which reduce the transport signal's strength. This attenuation leads to a reduction in quality and data rate and eventually prohibits the system's use entirely. JI43-W2.5G-U/L is specifically designed to extend coverage, enhance quality, and increase air-interface capacity.

In the downlink (DL), JI43-W2.5G-U/L picks up signals coming from the Base Station, filters them, amplifies them, and retransmits them to the UE. In the uplink (UL), it picks up signals from the UE, filters them, amplifies them, and retransmits them to the Node B. JI43-W2.5G-U/L constantly monitors the quality of the signals passing through it, while simultaneously electronically decreasing isolation requirements.

2.2.

3. System Specifications

3.1. Electrical Specifications

Description		Unit	JI-43W2.5G-L	JI-43W2.5G-U
Frequency Band		MHz	2502MHz ~ 2568MHz	2624MHz ~ 2690MHz
Bandwidth	Total BW	MHz	66MHz	66MHz
	Signal Processing BW	MHz	9.2MHz	9.2MHz
DL Power Out (Per Band)		dBm	43dBm (20W)	43dBm (20W)
UL Power Out (Per Band)		dBm	33dBm (2W)	33dBm (2W)
Gain		dB	DL = 100dB / UL = 95dB	DL = 100dB / UL = 95dB
Gain Range		dB	35dB(DL: 100~65, UL: 95~60)	35dB(DL: 100~65, UL: 95~60)
Ripple		dB	≤ ±1.5	≤ ±1.5
AGC Range		dB	35 dB	35 dB
Noise Figure		dB	Max Gain: ≤5dB / Max Gain: ≤12dB	Max Gain: ≤5dB / Max Gain: ≤12dB
Total System Delay		us	≤ 5	≤ 5
VSWR			1.5 : 1	1.5 : 1
Antenna Port Impedance		Ohms	50	50
DL Input Range		dBm	-75~ -22	-75~ -22
UL Input Range		dBm	-90 ~ -30	-90 ~ -30
Number of FA			1FA	1FA
OOBE (from 1FA Center)		dBm	11 MHz @ 1 MHz BW (≤ -13 dBm)	11 MHz @ 1 MHz BW (≤ -13 dBm)
		dBm	8.5 MHz @ 1MHz BW (≤-13 dBm)	8.5 MHz @ 1MHz BW (≤-13 dBm)
		dBm	6.5 MHz @ 1MHz BW (≤ -13 dBm)	6.5 MHz @ 1MHz BW (≤ -13 dBm)
		dBm	5.05 MHz @ 100 kHz BW (≤ -13 dBm)	5.05 MHz @ 100 kHz BW (≤ -13 dBm)
Out of Band Rejection		dBm	≤2495MHz(-37dBm/MHz)	≤2495MHz(-37dBm/MHz)
sound level max @ 1 meter		dBA	≤ 55dBA	≤ 55dBA
Input Voltage(AC)		V	115VAC ~ 240VAC ±10%	115VAC ~ 240VAC ± 10%
Power Consumption		W	< 400W	< 400W

table 3- 1 Electrical Specifications

3.2. Cancellation Performance

Description		Specifications	Comments
Feedback Signal Detec t ing Range	DL	0 ~ 6us	
	UL	0 ~ 6us	
Static Feedback Cancellation Capacity		Gain = Isolation + 8dB	Direct Feedback
Dynamic Feedback Cancellation Capacity		Gain = Isolation + 5dB	Doppler Frquency = 5Hz

* JI-43W2.5G-U/L 공통 적용사항

table 3- 2 Cancellation Performance

3.3. Mechanical Specifications

Description	Specifications	Comments
Size	430X 625 X 330	
Weight	44kg	
Mounting	Wall or Pole	
RF Connector	7/16” DIN Female	
CDMA Modem Port	N-Type Female	
Power Connector	MS 3102A-22-2P	
Battery Connector	MS 3102A-20-23S	

* JI-43W2.5G-U/L 공통 적용사항

table 3- 3 Mechanical Specification

3.4. Environmental Specifications

Description	Specifications	Comments
Operating Temperature	-40~ +55 ℃	
Humidity	**5 ~ 95%**	
Ingress Protection	IP55	

* JI-43W2.5G-U/L 공통 적용사항

table 3- 4 Environmental Specification

4. System Description

4.1. Gerneral Appearance

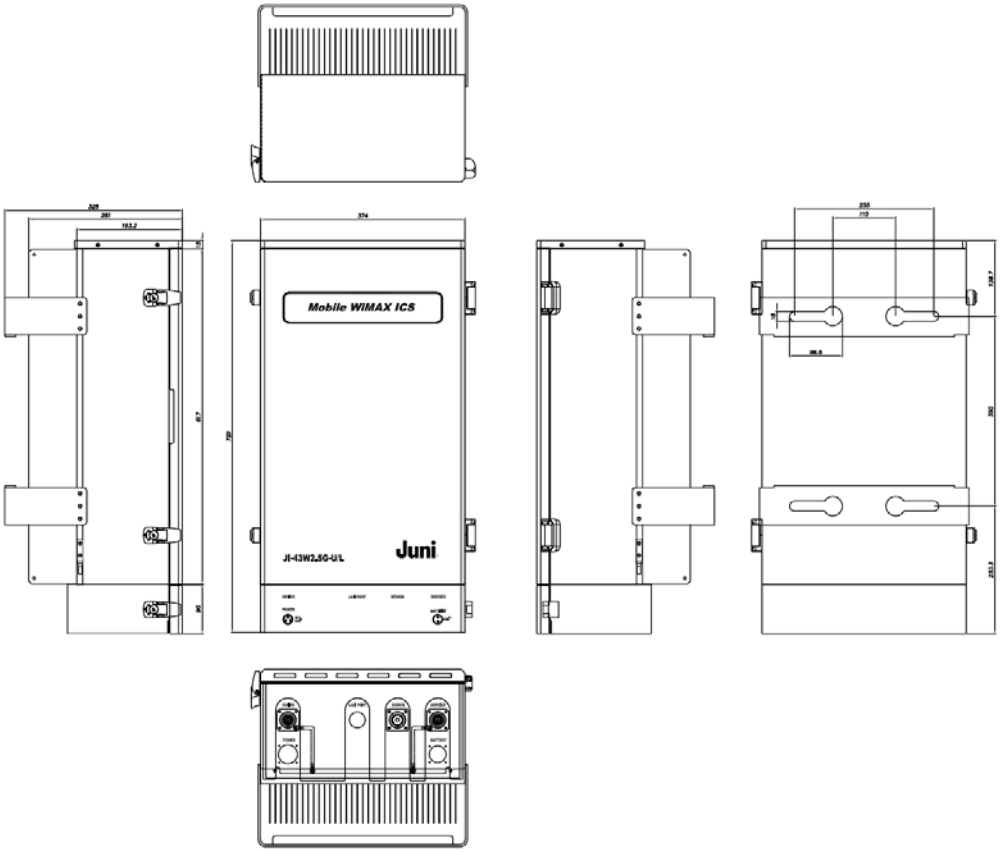


figure 4- 1 General Appearance of the Repeater (Front, Side, Top, Bottom)

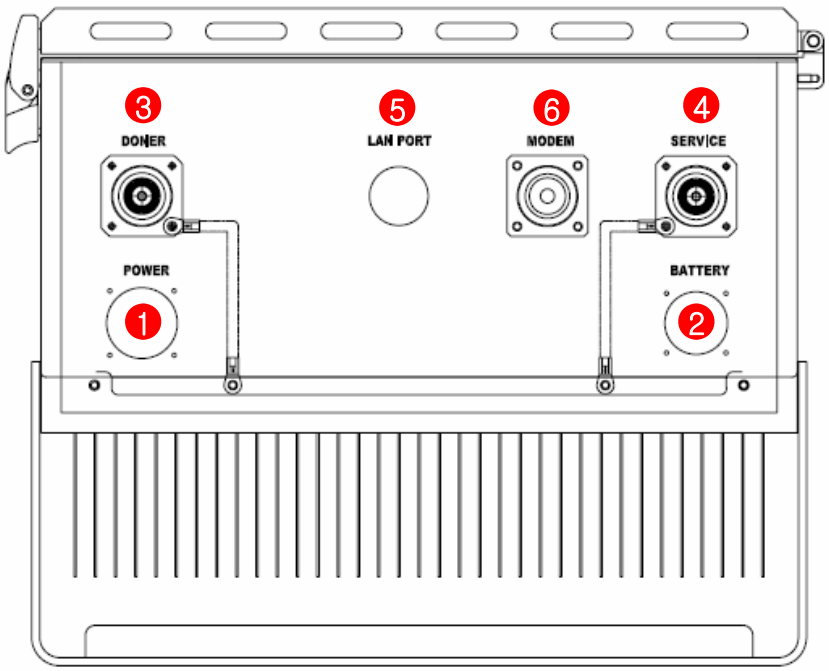
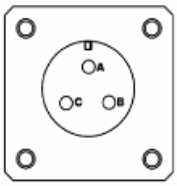
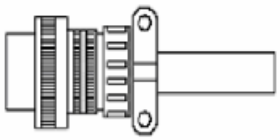
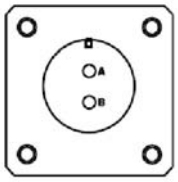
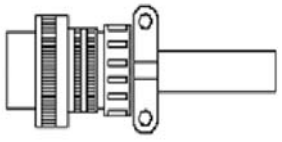


figure 4- 2 Bottom view of the repeater

No.	Name	Function
1	POWER (AC 120V)	  A : AC_L, B : AC_N, C : GND
2	BATTERY (DC 27V)	  A: +27V, B: GND
3	DONOR	Connects to the Donor Ant. (DIN Type female connector)

4	SERVICE	Connects to the Service Ant. (DIN Type female connector)
5	LAN PORT	Connects to the External LAN port (RJ-45 Type)
6	MODEM	Connects to the Modem Ant. (N Type female connector)

table 4- 1 Port description

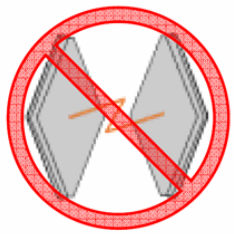
4.2. Warnings and Harzards

WARNING! ELECTRIC SHOCK

Opening the JI43-W2.5G-U/L could result in electric shock and may cause severe injury.

WARNING! EXPOSURE TO RF

Working with the repeater while in operation, may expose the technician to RF electromagnetic fields that exceed FCC rules for human exposure. Visit the FCC website at www.fcc.gov/oet/rfsafety to learn more about the effects of exposure to RF electromagnetic fields.



WARNING! DAMAGE TO REPEATER

Operating the JI43-W2.5G-U/L with antennas in very close proximity facing each other could lead to severe damage to the repeater.

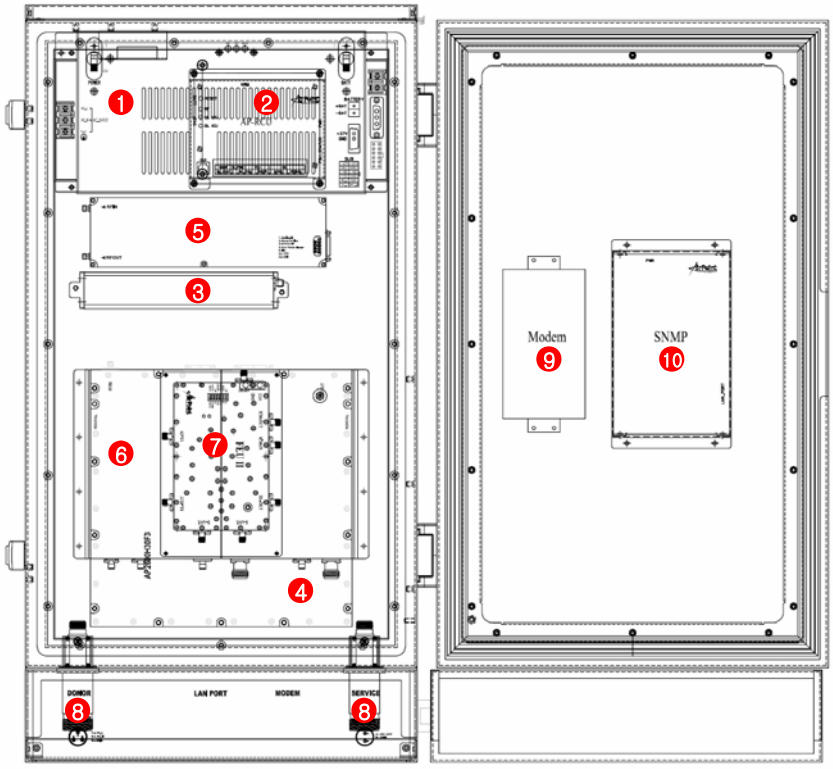
RF EXPOSURE & ANTENNA PLACEMENT Guidelines

Actual separation distance is determined upon gain of antenna used.
Please maintain a minimum safe distance of at least 20 cm while operating near the donor and the server antennas.
Also, the donor antenna needs to be mounted outdoors on a permanent structure.

WARRANTY

Opening or tampering the JI43-W2.5G-U/L will void all warranties.

4.3. Components of the Repeater



1 PSU
2 RCU
3 ICU
4 Downlink PAU
5 Uplink PAU
6 Cavity Filter
7 FEU
8 Donor/Server Arrestor
9 Modem
10 SNMP

figure 4- 3 System Arrangement Plan

4.3.1. Power Supply Unit(PSU)

The power supply unit transforms mains power into a predefined DC Voltage.

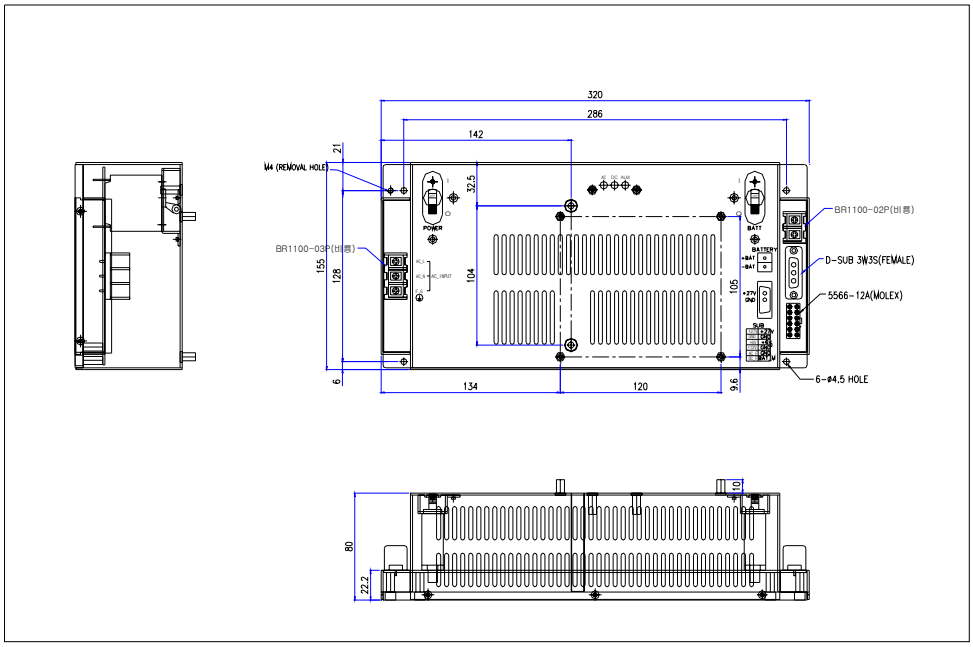


figure 4- 4 PSU

4.3.2. Remote Control Unit (RCU)

The remote control unit (RCU) is responsible for communication and control for the entire unit.

figure 4- 5 RCU

4.3.3. Interference Cancellation Unit (ICU)

The task of the interference cancellation unit (ICU) is to filter and amplify any signals passing

through it. In main function, it performs the interference cancellation algorithms, which eliminate the normal problems associated with isolation.

figure 4- 6 ICU

4.3.4. Downlink Power Amplifier Unit(DL PAU)

The downlink path is amplified by a final amplifier for very high output power(30 Watt). In the JI43-W2.5G-U/L, power amplifier unit has a very high output power while maintaining superior inter-modulation and linearity performance.

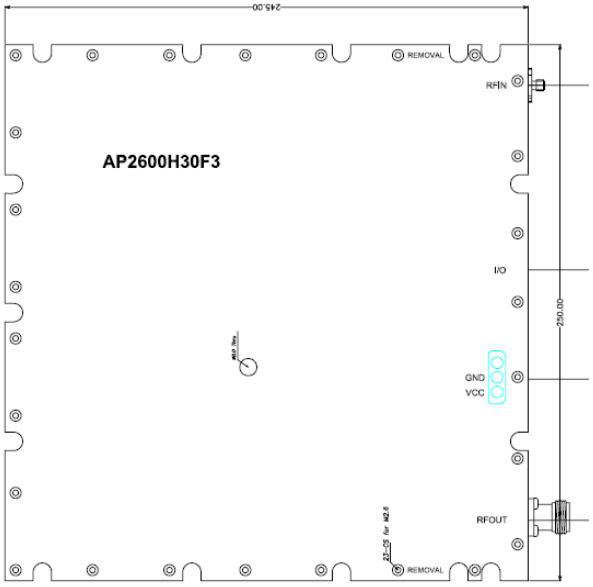


figure 4- 7 Downlink PAU

4.3.5. Uplink Power Amplifier Unit(UL PAU)

The uplink path is amplified by a final amplifier for high output power. In the JI43-W2.5G-U/L, 33dBm(2W) average power final amplifier is used.

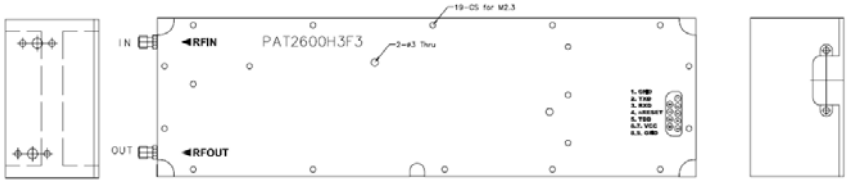


figure 4- 8 Uplink PAU

4.3.6. Cavity Filter

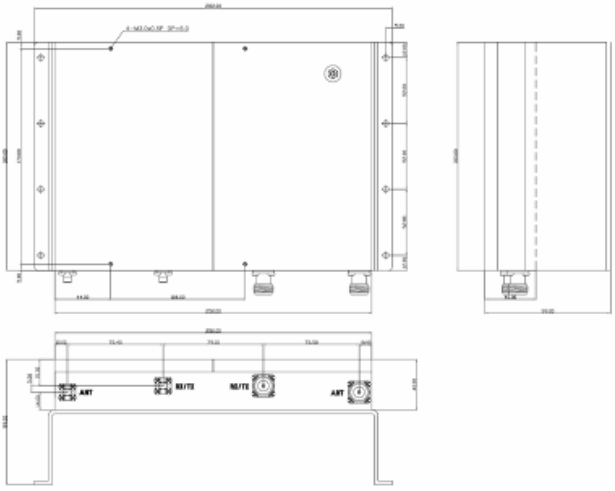


figure 4- 9 Cavity Filter

4.3.7. Front End Unit(FEU)

figure 4- 10 FEU

4.3.8. Arrestor

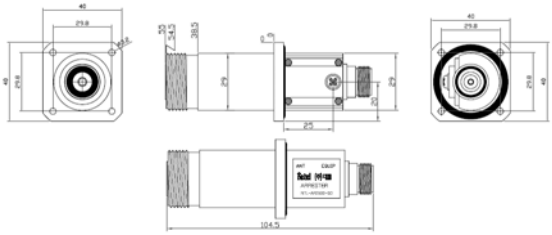


figure 4- 11 Arrestor

4.3.9. Modem

800MHz North American Cellular Modem

figure 4- 12 Modem

4.3.10. Simple Network Management Protocol board(SNMP)

figure 4- 13 SNMP

5. Feature & Function

5.1. ICS Technology

5.1.1. Comparison of Analog RF repeater with ICS repeater

서식 있음: 글머리 기호 및 번호 매기기

A few general repeater concepts are as follows :

- Traditional repeater requires Gain + 20dB of antenna isolation to operate confidently without oscillations. Therefore, a 100dB gain repeater requires 120dB of antenna isolation to operate properly, which is very difficult to achieve.
- Outdoor installations with traditional repeaters require multiple repeaters for antenna placements or separate poles with considerable distance in between antennas to achieve isolation to allow for desired RF outputs.
- Antenna isolation is dynamic. Antenna isolation is affected by movement of trees, cars, trucks, doors and windows. This dynamic affect will cause jitter in analog RF repeaters.

The following figure show comparison of analog RF repeater with ICS repeater.

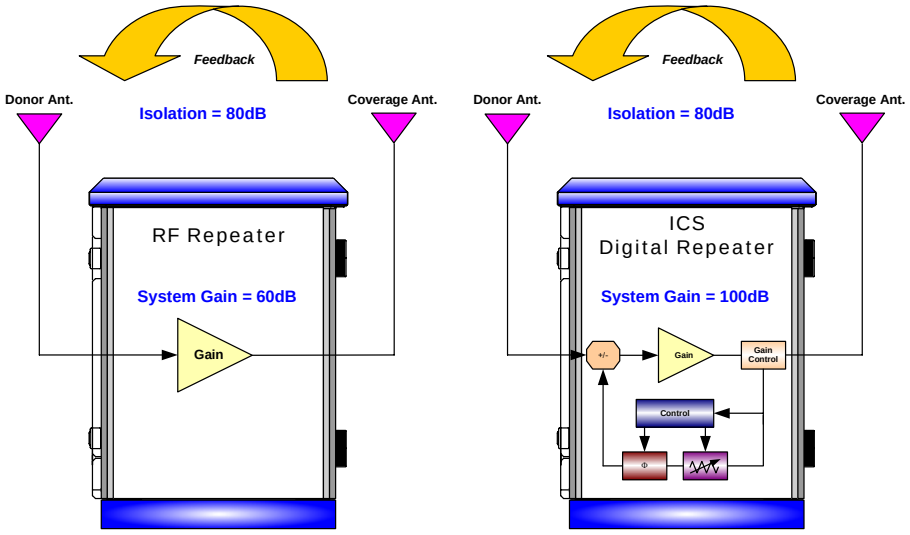


figure 5- 1 comparison to analog RF repeater to ICS repeater

5.1.2. ICS Technology

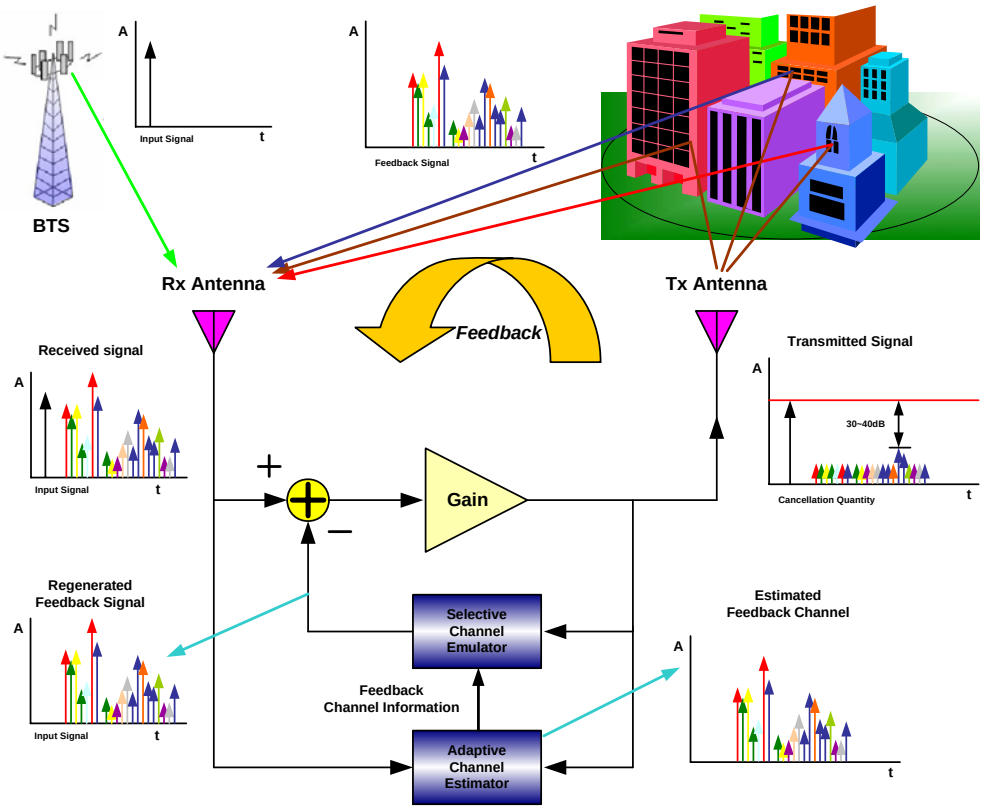


figure 5- 2 ICS Repeater operations

- ICS technology uses Digital Feedback Analysis that allows for ~~an~~ 6 micro-second cancellation time window and an unlimited number of interfering signals. ICS technology allows for cancellation of reflections greater than 0.9km away.

5.1.3. Advantages of ICS

- Max. Repeater Gain = Antenna Isolation + 10dB, this is 40dB more than analog RF repeaters
- Interference Cancellation Range of 6 us – Repeater cancels feedback signals from up to 0.9km away.
- Parallel and Multiple digital signal processing – This provides super fast and accurate interface cancellation, resulting in real time automatic gain adjustments during change of feedback behavior in multi-path environments.

- Unlimited number of feedback signals can be cancelled at the same time.
- ICS repeater maintains high signal qualities even at maximum gains.

6. Installation

6.1. Transportation of the Repeater

- While transporting the repeater unit, it is advised to pack the repeater in its original packaging supplied by manufacturer.
- The Unit is considerably heavy. Make sure that a suitable mounting surface is used. Ensure there is adequate manpower to handle the weight of the system.
- It is important to prevent any shock applied to the repeater units while loading/unloading to/from the vehicle.
- During transportation, it is advised to prevent or minimize the movement of the packed repeater units.

6.2. Handling of the Repeater

- The user should prevent any defect caused by an accident, misuse, abuse, insect infestations, improper installation or operation, lack of reasonable care, unauthorized modification, loss of parts, tampering or any repair by a person not authorized by FID.
- To avoid accident, risk of fire or electric shock, do not expose the repeater to rain or any other wet condition.

6.3. Installation conditions

- The Surrounding temperature should be in the range of -40°C ~ +55°C.
- Ground connections should be attached to all metal cabinets for safety.
- Avoid any vibration or impact from any external source.
- AC power source should be 120V. (Range : 100V ~ 240V)
- The cable loss between antenna and the repeater unit shouldn't be greater than 5dB. (Preferred but not essential).
- Check the VSWR of the cable that connects antenna to the repeater is less than 1:1.5.

6.4. Inspection before Installing the Repeater

- Check if there is any physical damage on the repeater cabinet. If any damage is found, it is advised to perform close inspection on the operating features and RF signal tests to verify the repeater performance.
- Check if there's any part of the cabinet exposed to water or other liquid substances.
- Before installing the repeater, check the serial number of the unit to be installed.

- Check if the correct accessories have been supplied.

6.5. Mounting of the Repeater

6.5.1. Pole Mounting

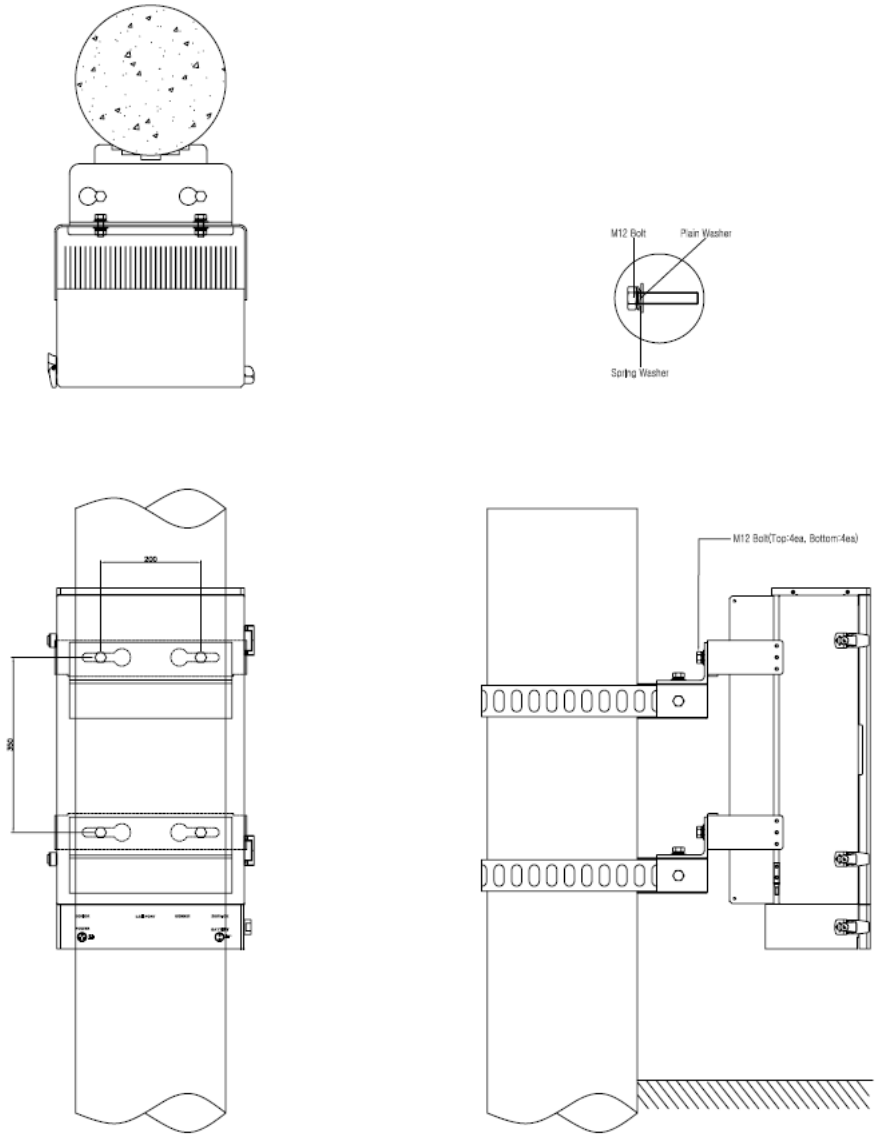


figure 6- 1 Poll Mounting

6.5.2. Wall mounting

추후 기입

6.5.3. Repeater Cable connection

As the installation conditions will be site dependent, the JI43-W2.5G-U/L includes only the connectors required for connection to the Repeater.
The following Connector cables will be supplied:
- AC Connector (cable length 2 meters)
- DC Connector (cable length 2 meters)

The Connectors will be military standard type shown below. The other end of the cable will be “bare” to allow easy installation into the site source.

Note: It will be the installer/operator’s responsibility to provide safe and stable connection of the “bare” ends to the site source.

figure 6- 2 Military Standard Connector

figure 6- 3 AC cable

figure 6- 4 DC cable

6.6. Installation Procedure

6.6.1. Essential inspection prior to operation

1. Power on the JI43-W2.5G-U/L system only after confirming that the AC Terminal is operating normally. Verify that the power LED is ON. (Power supply unit : Green LED = Normal operation)
2. Verify that the antenna connection is correct.
   - Confirm the connection of the antennas to the correct ports.
   - Confirm the connection is waterproof.

The following figures depict cable connection of antennas and AC Terminal.

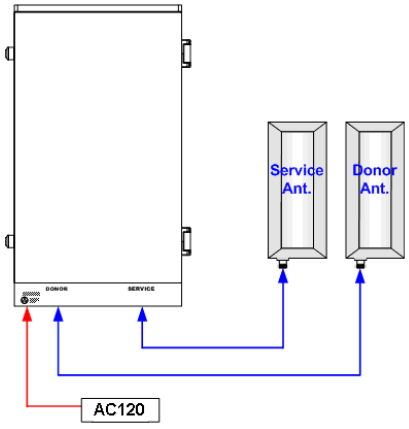


figure 6- 3 Cable connection

6.6.2. Earth Terminal

- Attach individual ground of the arrestor to the back of the repeater. Ground the earth connection to the side of the equipment.
- The description of the earth terminal is as follows.

figure 6- 4 Earth Terminal

7. Operation

7.1. Introduction

The JI43 can be controlled by either the *LMT (Local Maintenance Terminal)* or remotely via the *Web GUI* application. Controlling the JI43 using the LMT requires a PC with an Ethernet cable for the link between the PC and the Repeater System. To control the Repeater using the Web GUI, the user requires a PC with an internet connection.

The LMT and Web GUI allow the user to monitor the status of the JI43 system and control all aspects of the system with a user-friendly Graphical User Interface (GUI).

7.2. Establishing LMT Connection

The JI43 LMT can be accessed in three ways:

(a) Local access via Ethernet direct to the Repeater

(b) Remote access via the internet using the Web GUI application

7.2.1. LMT Connection direct to the Repeater

The user can access the LMT by connecting a cable directly to the Repeater. This method requires the user to open the Repeater cabinet door to access the 4 ports HUB

1) Open the Repeater cabinet door to gain internal access.
2) Connect an Ethernet cable from the PC to the one of LAN port of the HUB. (HUB has 4 LAN port and one is assigned to the Modem and Operator is able to use one of three ports)
3) Ensure the Repeater is powered ON.

figure 7- 1 4port HUB in SNMP Module

4) Open a new Web Browser (such as Microsoft Internet Explorer) window on the PC.

5) In the address bar of the browser, enter the following address **http://192.168.1.110:80**

6) If the address was entered correctly, the login screen will be displayed. Log in to the LMT by entering a valid “Id” and “Password”.

7) ID: ad01

Password: 0000

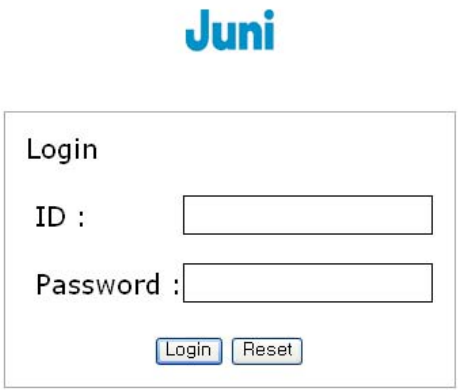


figure 7- 2 Login Screen

7.2.2. Remote LMT Connection using Web GUI

The JI43 LMT can also be accessed remotely using the Juni Web GUI application. The Juni Web GUI allows the user to access the Repeater from anywhere there is an internet connection.

1) Ensure the PC is connected to the internet.
2) Open a new Web Browser (such as Microsoft Internet Explorer) window on the PC.
3) In the address bar of the browser, enter the applicable IP address of the Repeater to be accessed. This address is obtained from the Network Operator.
4) If the address was entered correctly, the login screen will be displayed. Log in to the LMT by entering a valid “Id” and “Password”.

NOTE

The screenshots in this section are from a standard notebook PC running the Windows XP Professional operating system. These screenshots may vary slightly depending on the user’s PC and browser configuration.

7.3. LMT Operation

7.3.1. Information and Menu items

After successful login, the “Status” screen will be displayed by default. The user can navigate to different screens of the LMT by using the menu buttons located on the top of the screen. All screens in the menu items display a set of static parameters that contain basic system information of the Repeater.

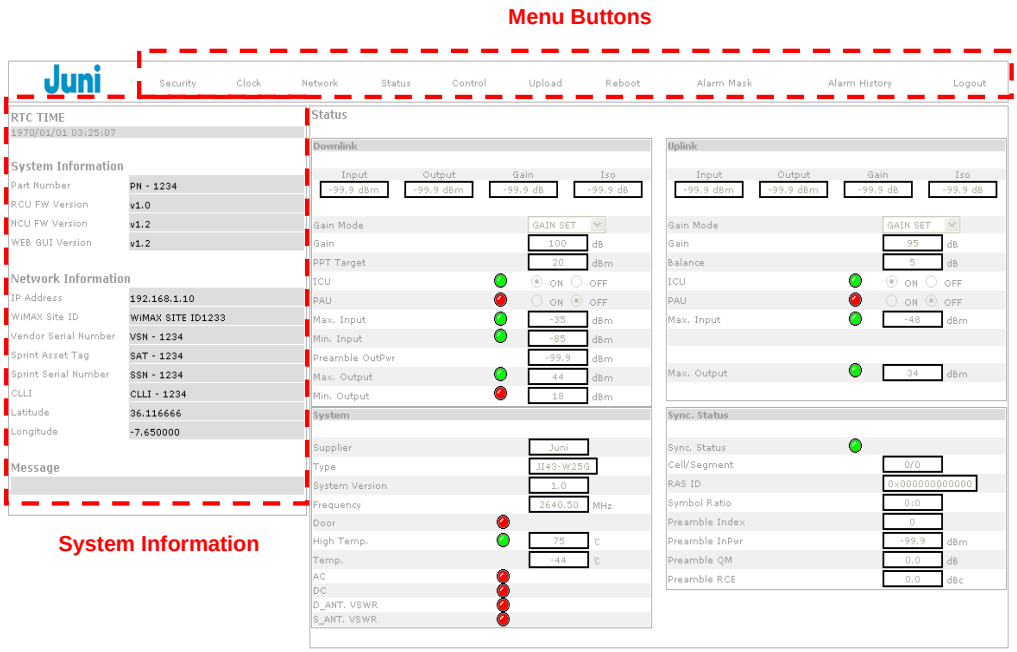


figure 7- 3 Default LMT Screen

System Information

- **Menu Buttons**

Item	Description
Security	Setup/modify account user ID and passwords.
Clock	Setup/modify system date and time.
Network	Setup/modify network configuration parameters such as IP addresses.
Status	Display the current status of Repeater
Control	Setup/modify Repeater parameters.
Upload	Upgrade the Repeater's firmware.
Reboot	Reboot the Repeater system.
Alarm Mask	Setup/modify alarm masks.
Alarm History	View generated alarms
Logout	Log out of the Web GUI application.

table 7- 1 LMT Menu Buttons

- **System Information**

Item	Description
RTC Time	Displays the date and time of the Repeater system.
System Information	
Part Number	Displays the part number of the system.
RCU FW Version	Displays the RCU firmware version of the system.
NCU FW Version	Displays the NCU firmware version of the system.
Web GUI Version	Displays the Web GUI version.
Network Information	
IP Address	Displays the IP address of the Repeater system.
WiMAX Site ID	Displays the site ID of the Repeater system.
Vendor Serial Number	Displays the Juni serial number of the Repeater.
Sprint Asset Tag	Displays the Sprint Asset Tag number.
Sprint Serial Number	Displays the Sprint serial number of the Repeater.
CLLI	Displays the CLLI code of the Repeater.
Latitude	Displays the latitude of the Repeater site.
Longitude	Displays the longitude of the Repeater site.
Message	Displays any miscellaneous messages for the Repeater.

table 7- 2 System Information Items

7.3.2. Security Screen

The “Security” screen allows the user to setup and modify the ID and passwords of registered users of the system.

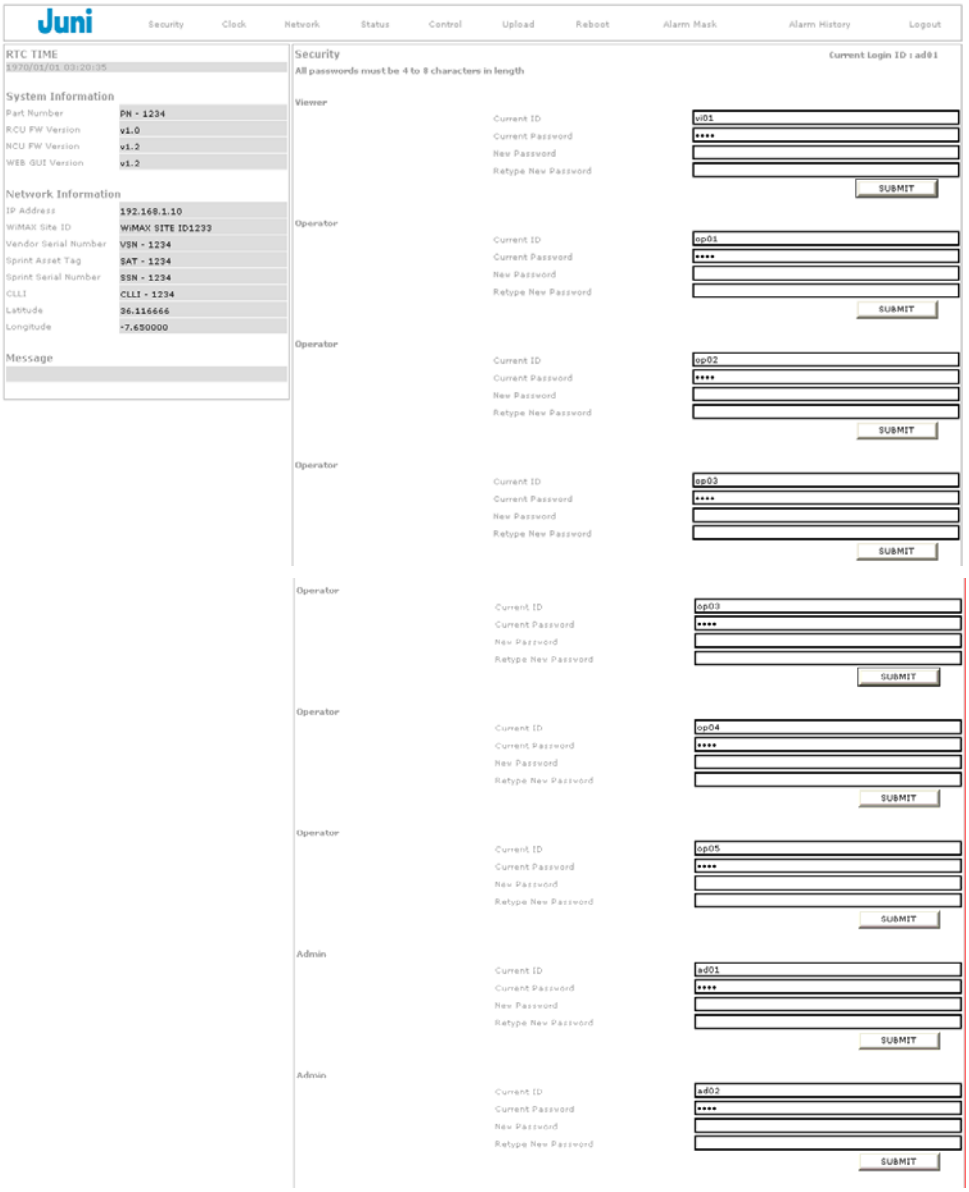


figure 7- 4 Security Screen

Security Menu shows the number of users implemented such as 1 Viewer user, 5 Operator users and 2 Admin users.

To setup or modify the parameters in the “Security” screen:

1) Enter the current User ID and Password.
2) In cases of a password change, put new password and re-type the new Password.
3) Click [SUBMIT] to confirm the modification.

7.3.3. Clock Screen

The “Clock” screen allows the user to set the date and time of the Repeater system. To change the date and time, enter the desired values in the fields and click [Set Date/Time].

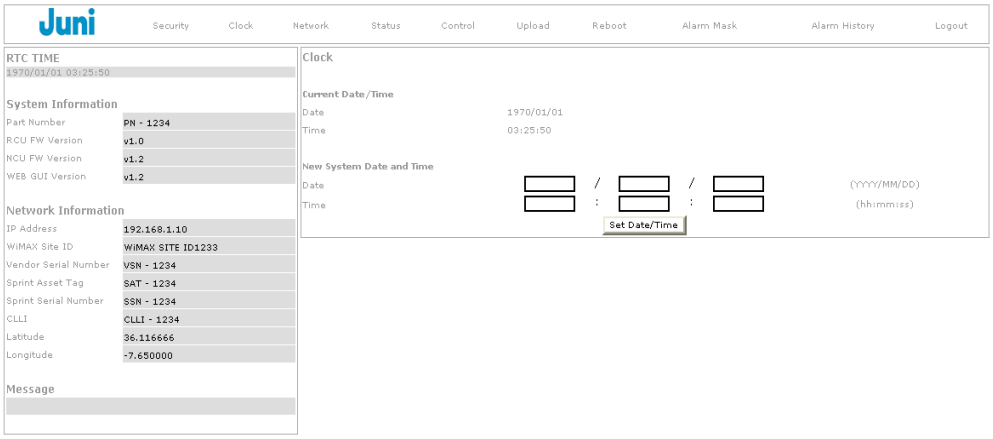


figure 7- 5 Clock Screen

7.3.4. Network Screen

The “Network” screen of the LMT allows the user to setup and modify the network parameters of the system, such as IP addresses and Gateway information.
A summary of this page is also always displayed on the left side of the LMT screen.

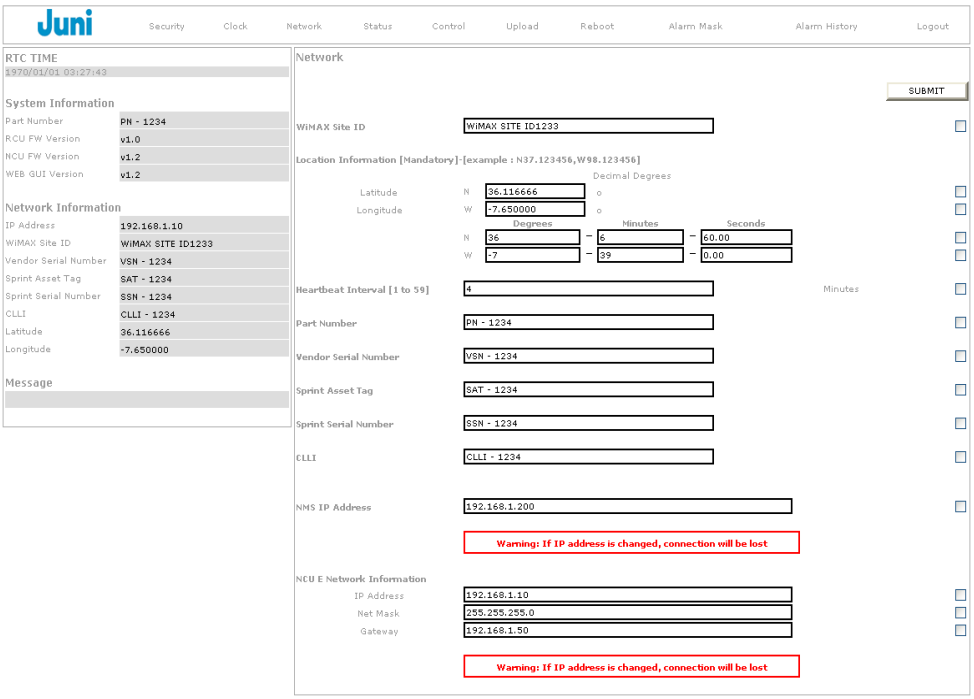


figure 7- 6 Network Screen

To change the parameters, enter the desired value in the fields provided and check the checkbox then click [SUBMIT] to confirm the change. Note that changing the IP address parameters will result in the connection being lost.

- Network Screen Parameters

Item	Description
WiMAX Site ID	View/modify the WiMAX site ID code.
Latitude	View/modify the latitude of the site location. Can be entered in decimal degrees or in degrees, minutes and seconds format.
Longitude	View/modify the longitude of the site location. Can be entered in decimal degrees or in degrees, minutes and seconds format.
Heartbeat Interval	View/modify the heartbeat interval.
Part Number	View/modify the heartbeat interval.
Vendor Serial Number	View/modify the Juni serial number of the Repeater.
Sprint Asset Tag	View/modify the Sprint Asset Tag number.
Sprint Serial Number	View/modify the Sprint serial number of the Repeater.
CLLI	View/modify the CLLI code of the Repeater.
NMS IP Address	View/modify the IP Address of the Repeater CTRL Board.
	NCU E Network Information
IP Address	View/modify the IP Address of the NCU E Network.
Net Mask	View/modify the net mask of the NCU E Network.
Gateway	View/modify the gateway IP address of the NCU E Network.

table 7- 3 Network Screen Parameters

7.3.5. Status Screen

The “Status” screen of the LMT allows the user to monitor the current status of Repeater.
The Status window displays the following information:

- Downlink
- Uplink
- System
- Sync. Status

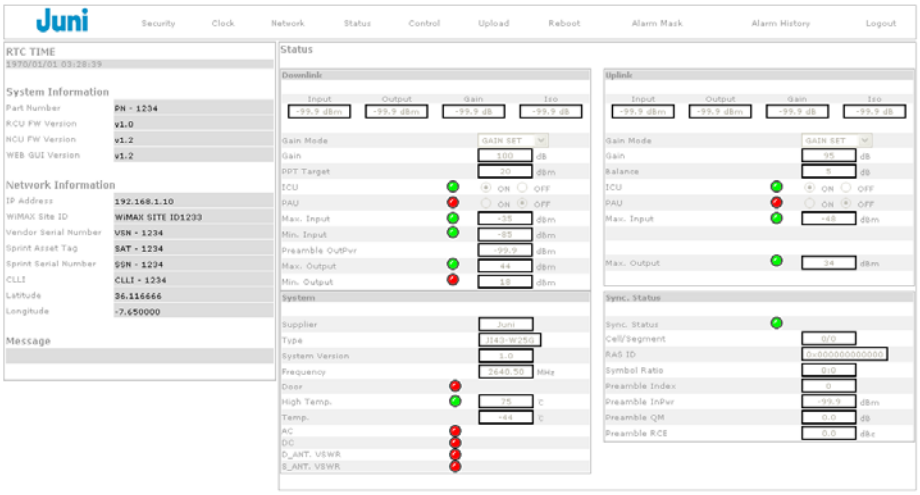


figure 7- 7 Status Screen

7.3.5.1. Downlink Screen

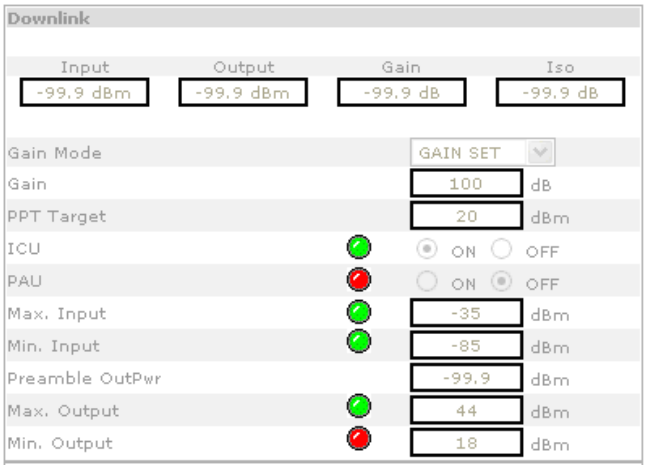


figure 7- 8 Downlink Status Screen

Items		Description	Remark
Power	Input	Displays the level of Input power to Donor ANT.	dBm
	Output	Displays the level of Output power from Service ANT.	dBm
Gain	Gain	Displays the current Gain of Repeater	dB
Isolation	Iso	Displays the isolation between the Donor ANT. and Service ANT.	dB

Items		Description	Remark
Gain	Gain	Displays the current Gain	dB
	PPT Target	Displays the target level of Preamble Pilot Tracking Target Output Power	dBm
ICU		Displays the current state (On/Off) of ICU	On: Green Off: Red
PAU		Displays the current state (On/Off) of PAU	On: Green Off: Red

Power	Max. Input	Displays the Upper limit of Input Power to Donor ANT.	(Changeable in Control Window)
	Max. Input Alarm	Displays the alarm status of Max. Input Power to Donor ANT.	Alarm: Red (Over the upper limit) Normal: Green
	Min. Input	Displays the Lower limit of Input Power to Donor ANT.	(Changeable in Control Window)
	Min. Input Alarm	Displays the alarm status of Min. Input Power to Donor ANT.	Alarm: Red (Below the lower limit) Normal: Green
	Max. Output	Displays the Upper limit of Output Power from Service ANT.	(Changeable in Control Window)
	Max. Output Alarm	Displays the alarm status of Max. Output Power from Service ANT.	Alarm: Red (Over the upper limit) Normal: Green
	Min. Output	Displays the Lower limit of Output Power from Service ANT.	(Changeable in Control Window)
	Min. Output Alarm	Displays the alarm status of Min. Output Power from Service ANT.	Alarm: Red (Below the lower limit) Normal: Green
Preamble OutPwr		Displays the current Preamble Output Power	dBm

table 7- 4 Downlink Status Screen parameters

7.3.5.2. Uplink Screen

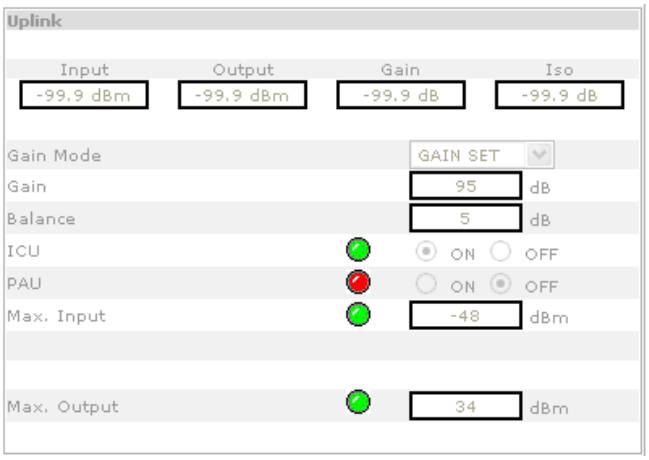


figure 7- 9 Uplink Status Screen

Items		Description	Remark
Power	Input	Displays the level of Input power to Service ANT.	dBm
	Output	Displays the level of Output power from Donor ANT.	dBm
Gain	Gain	Displays the current Gain of Repeater	dB
Isolation	Iso	Displays the isolation between the Donor ANT. and Service ANT.	dB

Items		Description	Remark
Gain	Gain	Displays the current Gain	dB
	Balance	Displays the offset value for Uplink gain compared to Downlink gain	dBm
ICU		Displays the current state (On/Off) of ICU	On: Green Off: Red
PAU		Displays the current state (On/Off) of PAU	On: Green Off: Red

Power	Max. Input	Displays the Upper limit of Input Power to Service ANT.	(Changeable in Control Window)
	Max. Input Alarm	Displays the alarm status of Max. Input Power to Service ANT.	Alarm: Red (Over the upper limit) Normal: Green
	Max. Output	Displays the Upper limit of Output Power from Donor ANT.	(Changeable in Control Window)
	Max. Output Alarm	Displays the alarm status of Max. Output Power from Donor ANT.	Alarm: Red (Over the upper limit) Normal: Green

table 7- 5 Uplink Status Screen parameters

7.3.5.3. System Status Screen

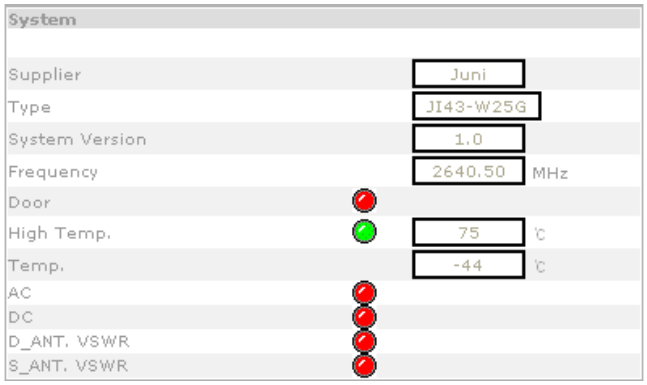


figure 7- 10 System Status Screen

Items		Description	Remark
Common Information	Supplier	Displays System Supplier	
	Type	Displays the Product Type	
	System Version	Displays System Version	
	Frequency	Displays the current operating frequency	
	Door	Displays the Status of Door	Alarm: Red (Open) Normal: Green (Close)
	AC	Displays the status of AC	Alarm: Red Normal: Green
	DC	Displays the status of DC	Alarm: Red Normal: Green
	High Temp.	Displays the Upper limit of Temperature	Unit : oC
	High Temp. Alarm	Displays the alarm status of High Temp.	Alarm: Red Normal: Green
	Temperature	Displays the current internal Temperature of Repeater	Unit : oC
	D_ANT. VSWR	Displays the current Donor port status Whether or not Donor port is Open	Alarm: Red Normal: Green
	S_ANT. VSWR	Displays the current Service port status Whether or not Service port is Open	Alarm: Red Normal: Green

table 7- 6 System Status Screen parameters

7.3.5.4. Sync. Status Screen

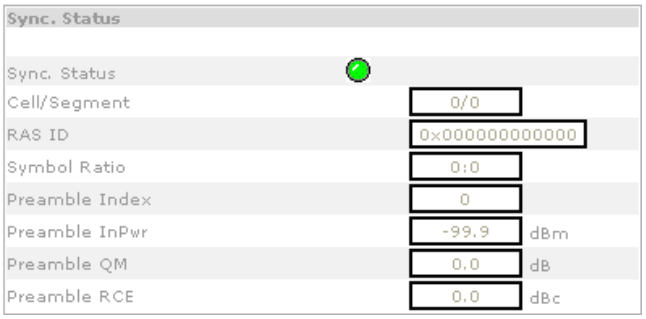


figure 7- 11 Sync. Status Screen

Items		Description	Remark
Common Information	Sync. Status	Displays Sync. Detection Status	Alarm: Red (Lock) Normal: Green (Unlock)
	Cell/Segment	Displays the BTS information	
	RAS ID	Displays the BTS information	
	Symbol Ratio	Displays the Symbol Ratio	DL Symbol. : UL Symbol
	Preamble Index	Dislays the BTS information	
	Preamble InPwr	Displays the current Preamble input power	
	Preamble QM	Displays the Quality of Input signal Installation guideline : Qm < 3	Required parameter for field installation
	Preamble RCE	Displays the Preamble RCE	Required parameter for field installation

table 7- 7 Sync. Status Screen parameters

7.3.6. Control Screen

The “Control” screen is displayed by default when the user logs in to the LMT. The “Control” screen allows the user to monitor and control the RF and the environmental parameters of the Repeater system, such as setting the gain of the Repeater or turning the LPA (amplifier) ON/OFF.

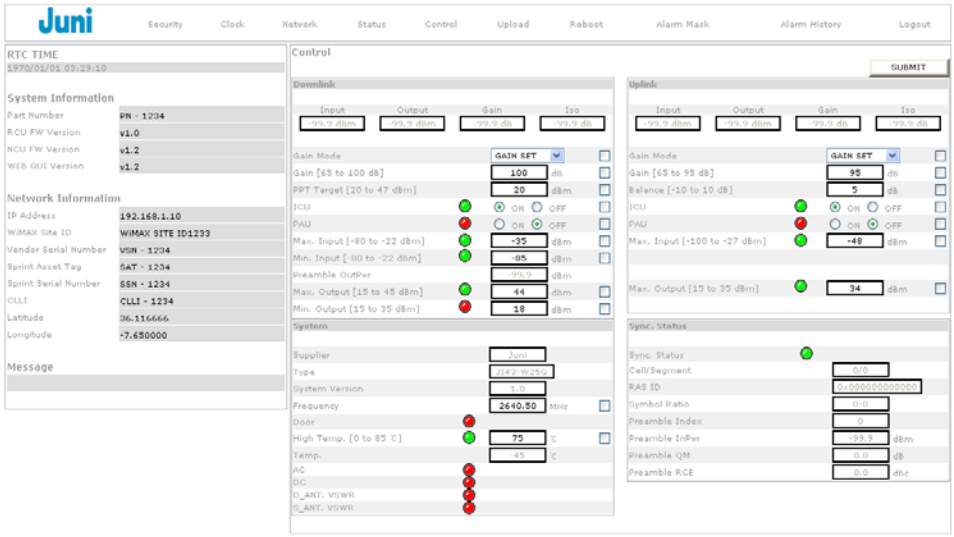


figure 7- 12 Control Screen

All parameters that include “Down” arrow keys, radio buttons or ON/OFF buttons can be modified by the user. The screen also has an “ALARM” section that displays the alarm status of the Repeaters at a glance. The LED colors adjacent to the alarm items represent its current state – Green for normal and Red for alarm state.

To setup or modify the parameters in the “Control” screen:

a. Use the Down arrow keys to select a Gain Mode.
b. Click [SUBMIT] to confirm the setting, or;
c. Enter an analog value directly into the field using the keyboard.
d. Click [SUBMIT] to confirm the setting, or;
e. Click on the ON/OFF button adjacent to the parameter to be changed.
f. Once the correct button has been pressed, click [SUBMIT] to confirm the setting, or;
g. Select the Radio button adjacent to the desired parameter value.

h. Click [SUBMIT] to confirm the setting.

7.3.6.1. Downlink Control Screen

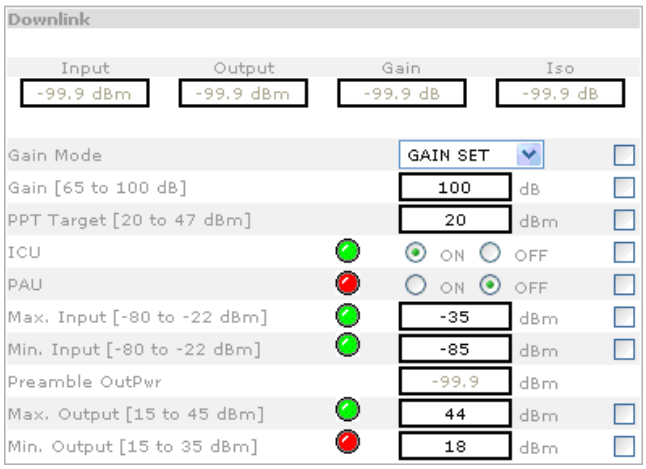


figure 7- 13 Downlink Control Screen

Items		Description	Remark
Gain Mode	Gain	If the setting mode of ICU is GAIN SET, Gain can be set.	Range: 65 ~ 100 dB
	PPT Target	If the setting mode of ICU is PPT AGC, Preamble Power Tracking mode can be set. [Default Mode]	Range: 20 ~ 47 dBm
ICU		Displays the current state (On/Off) of ICU	On: Green Off: Red
PAU		Displays the current state (On/Off) of PAU	On: Green Off: Red
Power	Max. Input	Sets the Upper limit of Input Power to Donor ANT.	Range : -80 ~ -22dBm
	Min. Input	Sets the Lower limit of Input Power to Donor ANT.	Range : -80 ~ -22dBm
	Max. Output	Sets the Upper limit of Output Power from Service ANT.	Range : 15 ~ 45dBm

	Min. Output	Sets the Lower limit of Output Power from Service ANT.	Range : 15 ~ 35dBm

table 7- 8 Downlink Control Screen parameters

Note: Gain Mode

- GAIN SET MODE: The output power is dependent on the Gain. When the input power varies, the output Power will change depending on the set gain.

- PPT AGC MODE: This mode is used to ensure consistent output power. This output power is determined by the Preamble Target Power setting. Output power will remain at this power regardless of variations in input powers.

7.3.6.2. Uplink Control Screen

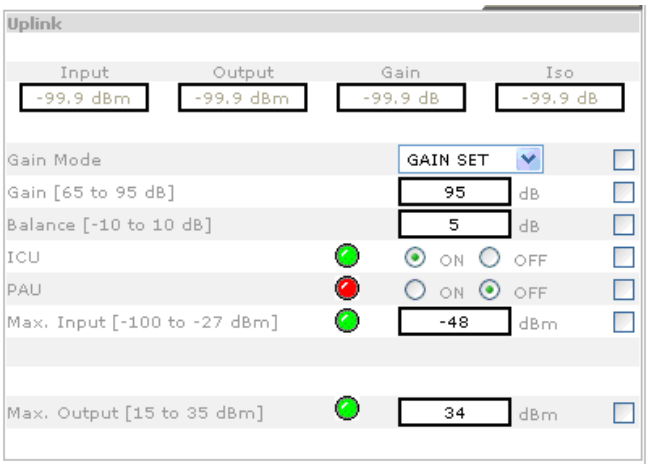


figure 7- 14 Uplink Control Screen

Items		Description	Remark
Gain	Gain	If the setting mode of ICU is GAIN SET, Gain can be set.	Range: 65 ~ 95 dB
	Balance	If the setting mode of ICU is Balance, Output Balance can be set. [Default Mode]	Range: -10 ~ +10 dB
ICU	ICU	Sets the On/Off of ICU	On: Green Off: Red

PAU	PAU ON/OFF	Sets the On/Off of PAU	On: Green Off: Red
Power	Max. Input	Sets the Upper limit of Input Power to Service ANT.	Range : -100 ~ -27dBm
	Max. Output	Sets the Upper limit of Output Power from Donor ANT.	Range : +15 ~ +35dBm

table 7- 9 Uplink Control Screen parameters

7.3.6.3. System Control Screen

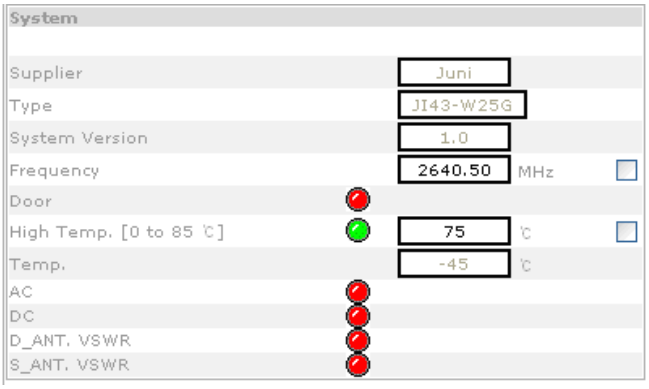


figure 7- 15 System Control Screen

Items		Description	Remark
Frequency		Sets the Center frequency	Range: Lower Band : 2507MHz ~ 2563MHz Upper Band : 2629MHz ~ 2685MHz
Temp.	High Temp.	Sets the upper limit of Temperature	Range: 0°C ~ +80°C

table 7- 10 System Control Screen parameters

7.3.7. Upload Screen

The “Upload” screen allows the user to change the Repeater system’s firmware. The firmware of the Repeater may require an upgrade to support additional features.

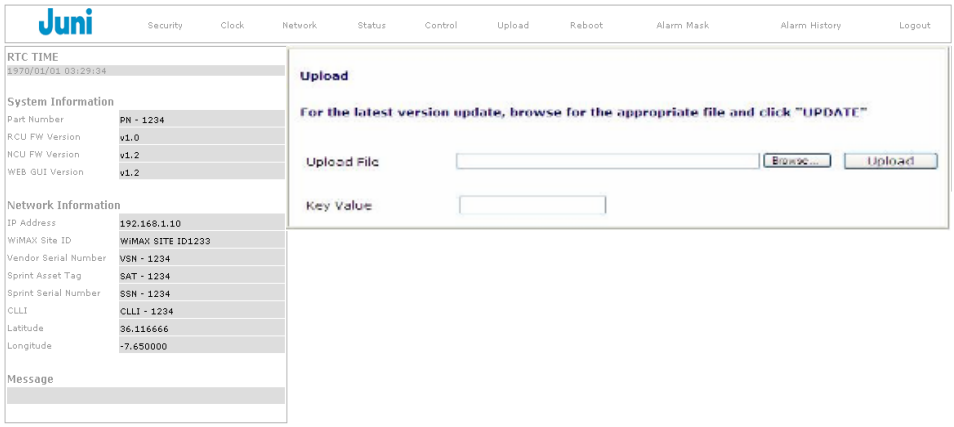


figure 7- 16 Upload Screen

To upload a new firmware to the Repeater:

1) Click [Browse] to locate and select the desired firmware file.
2) Confirm the correct file has been selected.
3) Insert the Key Value located within the file name. [It is a 4 digit alphanumeric value]
4) Click [Upload] to commence firmware upgrade.
5) Screen will reload several times and then refresh back to the log in page.
6) Do not log in yet until you have noticed that the LAN has been disconnected and then reconnected.
7) Once the whole process is complete, you will need to re-log-in. If the firmware version has been changed, then the upload has been successfully applied.

WARNING

The upload process requires a reboot of the Repeater system. This will cause an outage of service for a brief period while the Repeater system re-initiates itself.

- Upload Screen Parameters

Alarm / Parameter	Description
Upload File	Displays the selected file to be uploaded to the Repeater system.
Key Value	Error Check Value for Repeater firmware file.
[Browse] Button	Click to search and select the desired firmware file.
[Upload] Button	Click to begin upload process.

table 7- 11 Upload Screen Parameters

7.3.8. Reboot Screen

The “Reboot” screen is used to manually reboot the Repeater system. Click [Reboot System] to perform this function.

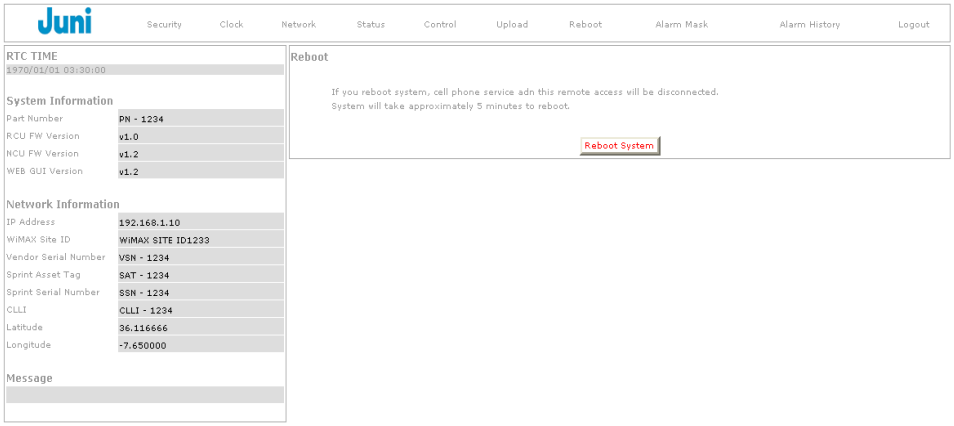


table 7- 12 Reboot Screen

WARNING

Rebooting the system will result in service outage. Only perform this function if service outage is planned.

7.3.9. Alarm Mask Screen

The “Alarm Mask” screen allows the user to mask certain alarm items. Alarm masking may be desired to prevent repeated known and acknowledged alarms from being generated.

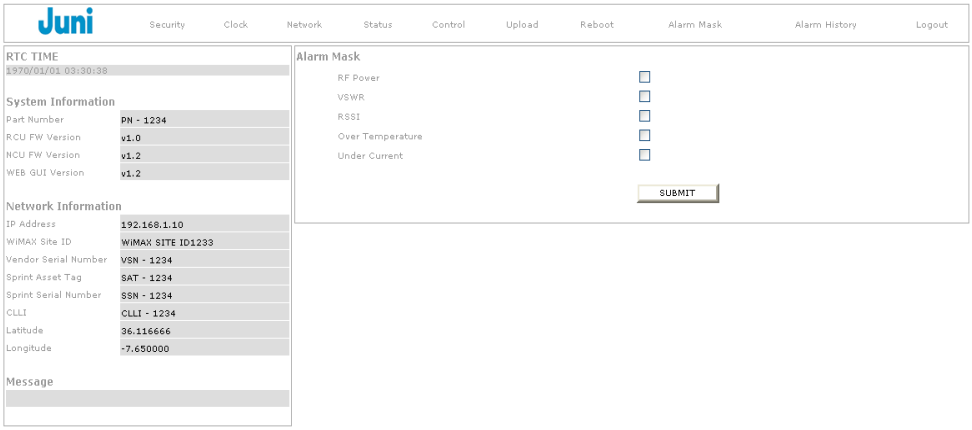


figure 7- 17 Alarm Mask Screen

To mask an alarm:

1) Check the checkbox adjacent to the alarms to be masked.

2) Click [SUBMIT] to confirm alarm masking.

- Alarm Mask Screen Parameters

Alarm / Parameter	Description
RF Power	View/set masking status of “RF Power” alarm.
VSWR	View/set masking status of “VSWR” alarm.
RSSI	View/set masking status of “RSSI” alarm.
Over Temperature	View/set masking status of “Over Temperature” alarm.
Under Current	View/set masking status of “Under Current” alarm.

table 7- 13 Alarm Mask Screen Parameters

7.3.10. Alarm History Screen

The “Alarm History” screen allows the user to view and obtain the history log for all alarms generated by the Repeater system. Clicking the [GET HISTORY] button will display a list of all generated alarms for the Repeater.

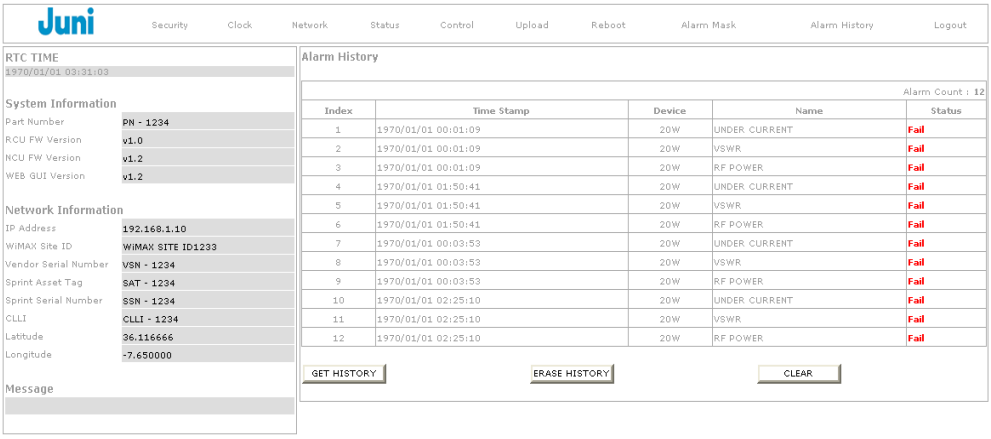


figure 7- 18 Alarm History Screen

- Alarm History Screen Parameters

Alarm / Parameter	Description
Alarm Count	Displays the total number of alarms in the log.
Index	Item reference number.
Time Stamp	Displays the time of alarm generation.
Device	Displays the type of device generating the alarm.
Name	Displays the name of the alarm generated.
Status	Displays the status of the alarm generated – Fail or Normal.
[GET HISTORY]	Obtain the list of alarms saved in the Repeater system.
[ERASE HISTORY]	Delete all saved alarms form the Repeater system.

[CLEAR]	Clear the current list.

table 7- 14 Alarm History Screen Parameters

8. FCC Compliance Statements

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operated the equipment under FCC rules.