Axiom Repeater
USER MANUAL
Version 0.3

3116 Vanowen St.
Burbank, CA 91505
Tel: 818-840-8131
Fax: 818-840-8138
www.adrftech.com

Glossary

The following is a list of abbreviations and terms used throughout this document.

Abbreviation/Term	Definition
AGC	Automatic Gain Control
ALC	Automatic Level Control
AROMS	ADRF' Repeater Operation and Management System
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CFE	Compact Front End
CW	Continuous Wave (un-modulated signal)
DAS	Distributed Antenna System
DL	Downlink
Downlink	The path covered from the Base Transceiver Station (BTS) to the subscribers service area via the repeater
HPA	High Power Amplifier
HW	Hardware
IF	Intermediate Frequency
LNA	Low Noise Amplifier
LTE	Long Term Evolution
MS	Mobile Station
PLL	Phased Locked Loop
PS	Power Supply
RF	Radio Frequency
SQE	Signal Quality Estimate
SW	Software
UL	Uplink
Uplink	The path covered from the subscribers service area to the Base Transceiver Station(BTS) via the repeater
VSWR	Voltage Standing Wave Ratio

Released version: 0.3

Please send comments to:

E-Mail: info@adrftech.com

Phone: (818) 840-8131
(800) 313-9345
Fax: (818) 840-8138

Address:Advanced RF Technologies, Inc.
Attention: Technical Publications Department
3116 Vanowen St.
Burbank, CA 91505
USA
www.adrftech.com

Revision History

Version	Author	Description	Date
0.1	YH Ko	Initial Release	Dec 29, 2009
0.3	Sun Kim	Format and content updates	Feb 9, 2010

TABLE OF CONTENTS

1. Axiom Repeater

1.1 Introduction

Four technologies in one body: Axiom is an over-the-air repeater system that can incorporate up to 4 technologies in one body. Current supported technologies are LTE, Cellular, PCS and AWS band.

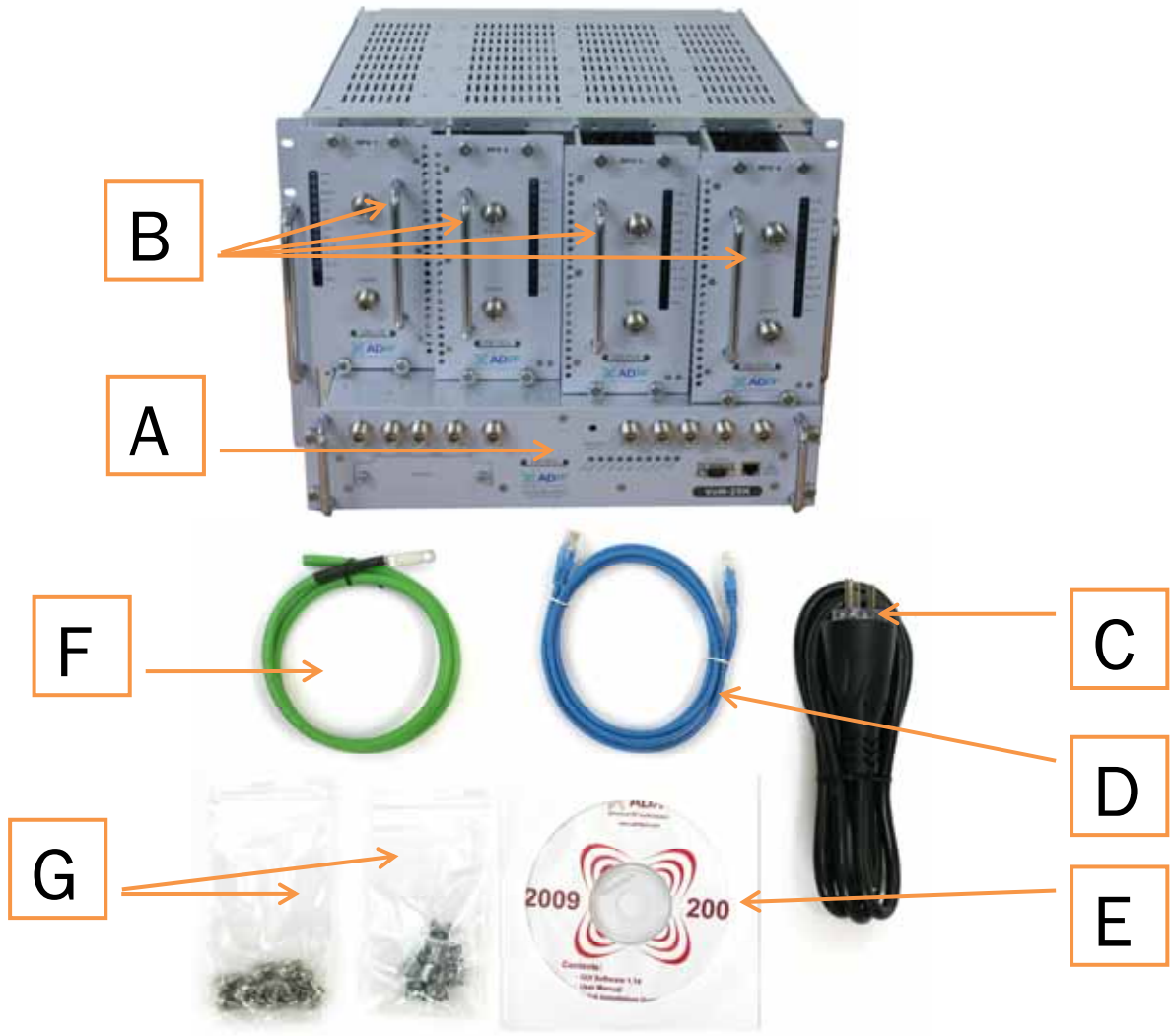
1.1.1 Highlights

- Can utilize up to 4 technologies simultaneously
  - Covers the LTE band
    - *10MHz upper C block, 5MHz lower A block and 5MHz lower B block (Add Lower A+B)*
  - Covers the 60 MHz PCS band
    - *Three independent RF PCS channels, each channel supports 1.25 MHz to 18.75 MHz bandwidth*
  - Covers the 25MHz Cellular band
  - Covers the 45 MHz AWS band
- 25K/100K/Large Composite Output Power [24/30/43 dBm]
- 30 dB AGC Range @ 0.5 dB Step
- Adjustable AGC Output Power Level
- Band Selectable via Web-GUI
- Can Support Non-Contiguous Bands
- Supports Embedded Wireless Modem
- Supports Network Management Monitoring System via SNMP
- Adjustable FA (3 channels)
- Digital filtering
- Incremental Automatic Shutdown/Resumption Time: Axiom gradually increases the time span between automatic shutdown and resumption before it permanently shuts itself down
- AI compatible: Axiom is fully compatible with Applied Innovation's monitoring system.
- Versatility and Usability: Axiom gives total control to the user. Most of the control parameters, e.g., gain, output power, alarm threshold, etc. can be changed using the Web-GUI so that the user can adjust the system perfectly to the given RF environment
- Web-GUI connectivity via DHCP
- Supports DHCP; No 3rd party GUI software required
- Automated installation

1.1.2 Parts List

Label	Quantity	Description
A	1	Axiom Network Management System (NMS)
B	Up to 4*	Optional Axiom Modules*
C	1	AC Power Cable
D	1	Ethernet Cable (Crossover)
E	1	Documentation CD**
F	1	Ground Cable
G	8	Rack Mount Bolt/Nut

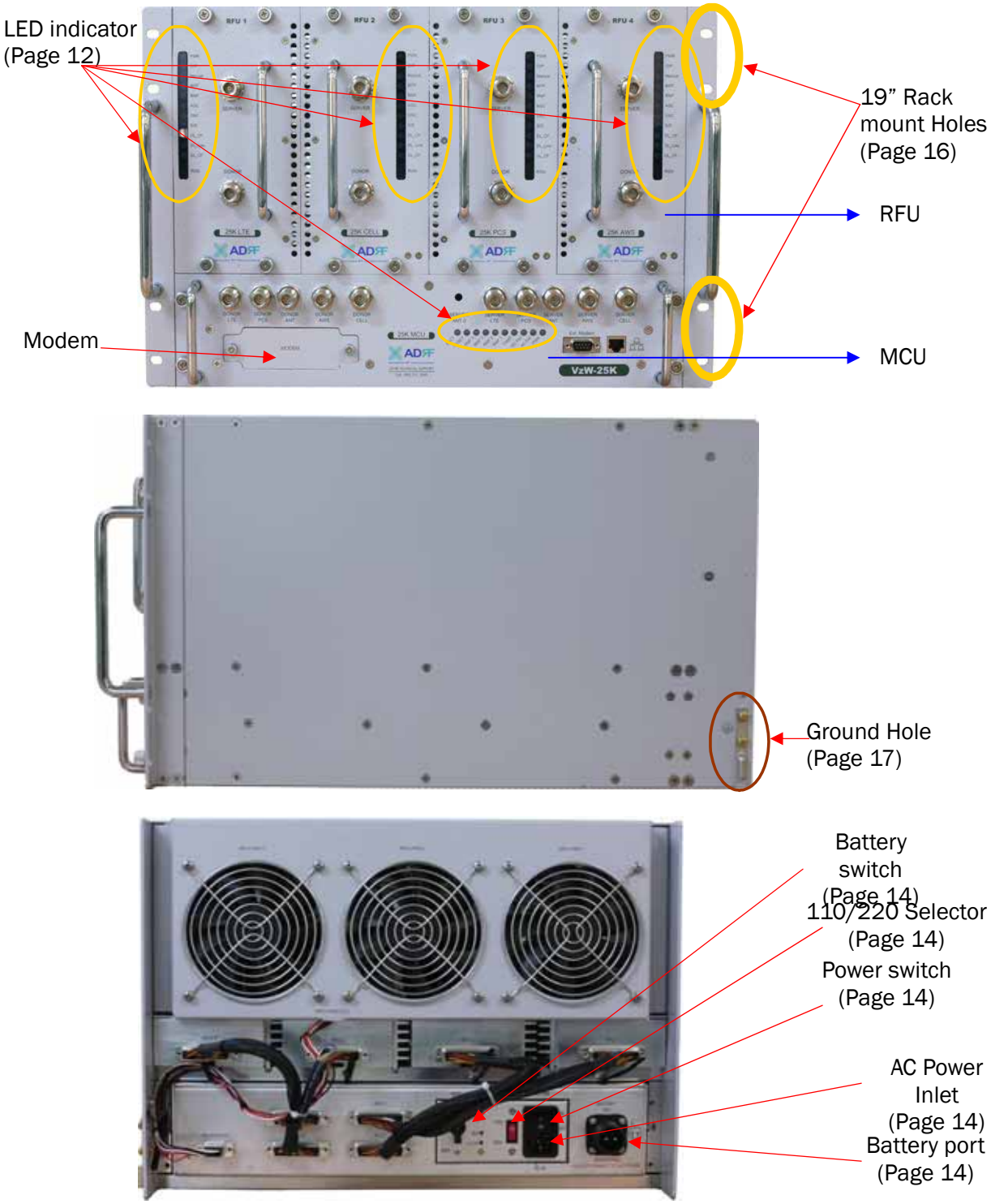
Table 1 – Parts List



** At least 1 module must be present in order to use Axiom*
*** CD includes: User Manual, Quick-Start Guide, and Troubleshooting Guide*

Figure A – Axiom Repeater Parts List

1.1.3 Repeater Quick View



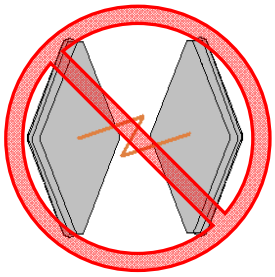
2. Warnings and Hazards

WARNING! ELECTRIC SHOCK

Opening the Axiom 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 Axiom 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 Axiom will void all warranties.

Lithium Battery: CAUTION. RISK OF EXPLOSION IF BATTERY IS REPLACED BY INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO INSTRUCTIONS.

Ethernet Instructions: This equipment is for indoor use only. All cabling should be limited to inside the building.

FCC Part 15 Class A

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

3. Axiom Overview

3.1 Switches & Fault Indicators

3.1.1 MCU LEDs

Figure 1: MCU LED

- PWR(POWER)

Parameters		Specifications
LED	Repeater On	Solid Green LED On
	Repeater Off	LED Off

- AC Fail

Parameters		Specifications
LED	Normal	LED Off
	Hard fail	Solid Red LED On
Condition for Alarm Activation		AC fail

- DC Fail

Parameters		Specifications
LED	Normal	LED Off
	Hard fail	Solid Red LED on
Condition for Alarm Activation		DC fail
After Alarm Activation		Full Spectrum shutdown

- TAMP (Tamper detected)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Soft fail	Solid Red LED On
Condition for Alarm Activation		Controlling Key parameter in normal operation
Alarm Clear		Cleared by an authorized user

- RMF 1,2,3,4 (Replaceable module failure)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Hard fail	Solid Red LED On
Condition for indication		RFU Module failure per band

- RESET (Reset engaged)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Soft fail	Solid Red LED On
Condition for Alarm Activation		Control of Software Reset
Alarm Clear		Cleared by an authorized user

- BATT(Battery)

Parameters		Specifications
LED	Charging	Solid Red LED On
	Full charged	Solid Green LED On
	Batt S/W off or non- connection	LED Off

3.1.2 RFU LEDs

Axiom has LEDs on the front panel of the repeater as shown below in Figure 2.

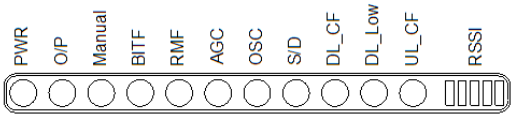


Figure 2: RFU LED

- PWR (RFU Power)

Parameters		Specifications
LED	Normal	Blinking Green LED
	Alarm	Solid Red LED on
Condition for Alarm Activation		Power fail

- O/P (Over Power)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Soft fail	Blinking Red LED
	Hard fail	Solid Red LED On
Condition for Alarm Activation	Soft fail	Max power +1 <measured output < max power+2
	Hard fail	measured output > max power + 2
Following Alarm Activation	Soft fail	Only the alarm is activated and the repeater operates as normal
	Hard fail	The function associated with the alarm shutdown, and the shutdown process goes into effect

- Manual

Parameters		Specifications
LED	Manually HPA Off/On	PCS (Cellular) Green LED On
	Factory set or Reboot	PCS (Cellular) Green LED Off

- BITF (Built-in test failure)

Parameters		Specifications
LED	Normal	Solid Green LED on
	Hard fail	Solid Red LED on
Condition for indication		RFU Module built-in test failure

- RMF (Replaceable module failure)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Hard fail	Solid Red LED On
Condition for indication		RFU Module failure

- AGC (AGC active)

Parameters		Specifications
LED	AGC On	Solid Green LED On
	AGC Off	LED Off

- OSC (Oscillation detected)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Hard fail	Solid Red LED On

Condition for Alarm Activation	Repeater goes into oscillation
Following Alarm Activation	The portion associated with the oscillation shuts down, and at time of oscillation the defined procedure goes into effect

- S/D (Shutdown)

Parameters		Specifications
LED	Normal	Solid Green LED on
	Hard fail	Solid Red LED on
Condition for Alarm Activation		Overpower, Oscillation

- DL_CF (Donor circuitry failure)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Hard fail	Solid Red LED On
Condition for indication		RFU Module Donor circuitry failure

- DL_Low (Donor power too low)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Hard fail	Solid Red LED On
Condition for indication		Donor input level under threshold

- UL_CF (Coverage circuitry failure)

Parameters		Specifications
LED	Normal	Solid Green LED On
	Hard fail	Solid Red LED On
Condition for indication		RFU Module coverage circuitry failure

- RSSI (DL RSSI LED bar)

Parameters		Specifications
LED	Input < -95dBm	Zero (0) bar On
	Input < -85dBm	One (1) bar On
	Input < -75dBm	Two (2) bars On
	Input < -65dBm	Three (3) bars On
	Input < -55dBm	Four (4) bars On
	Input > -55dBm	Five (5) bars On

3.1.3 Alarms

Parameters	Remark
Tamper	Temper detected
AC fail	Power supply out of range
DC fail	Power supply out of range
Communication failure	Internal Communication failure
RMF	Field replaceable module failure
RESET	Reset alarm
Heartbeat	Heartbeat
OSC	Oscillation detected
UL RSSI fail	Power at coverage port too high
UL PLL fail	UL Synthesizer failure
H/W fail	Hardware failure
S/W fail	Software failure
UL Emission fail	UL Out-of-band emissions out of spec
DL RSSI fail	Donor Power too high/low

ISO fail	Low isolation
DL PLL fail	DL Synthesizer failure
DL Spur fail	DL Spurious emissions out of spec
Interfere	Interferer power exceeded

3.2 Switches and Ports

3.2.1 Power Switch

The AC Power on/off switch is located at the back panel of repeater. The switch should be powered on after the repeater has been installed properly.

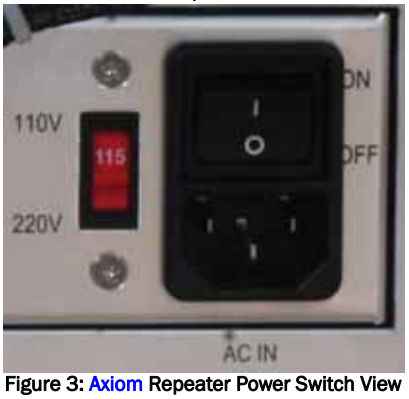


Figure 3: Axiom Repeater Power Switch View

3.2.2 Back Up Battery Switch & Battery Port

Figure 4: Battery Switch & Battery Port

The Battery Switch can be used to provide power to the optional External Backup Battery.
If a backup battery is utilized, please connect the battery to the unit via the external battery port as shown in Figure 4.
(WARINING: If the Circuit Protector Switch is not turned OFF there may be a risk of damage or electric shock)

Note: Please contact ADRF Technical Support for assistance if you are unfamiliar with the installation procedure of our battery box.

3.2.3 External Modem and Ethernet Port

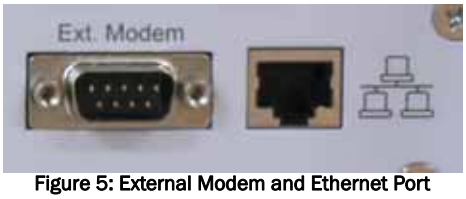


Figure 5: External Modem and Ethernet Port

3.2.4 RF Ports

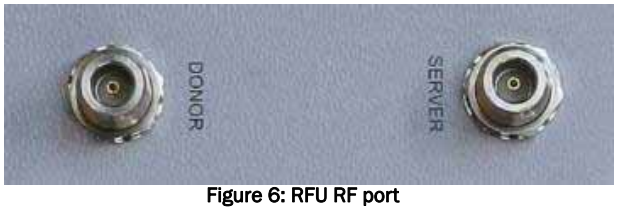


Figure 6: RFU RF port

Figure 7: Donor Combiner RF port

Figure 8: Server Combiner RF port

- Donor(RFU):
  - DL input port/UL output port, connected to Donor Antenna or Combiner's Donor port (Donor Combiner is optional)

- Server(RFU)
  - UL input port/DL output port, connected to Server Antenna or Combiner's Server port (Server Combiner is optional)

- Server ANT 2
  - For use with an auxiliary Server Antenna. Signal is attenuated by -15dB compared to Server Combiner's Server port.

- Donor Combiner's Donor port
  - Application for multi-band combining to 1 Ant Donor port.

- Sever Combiner's Sever port
  - Application for multi-band combining to 1 Ant Server port.

3.3 Modular concept

3.3.1 System modular concept

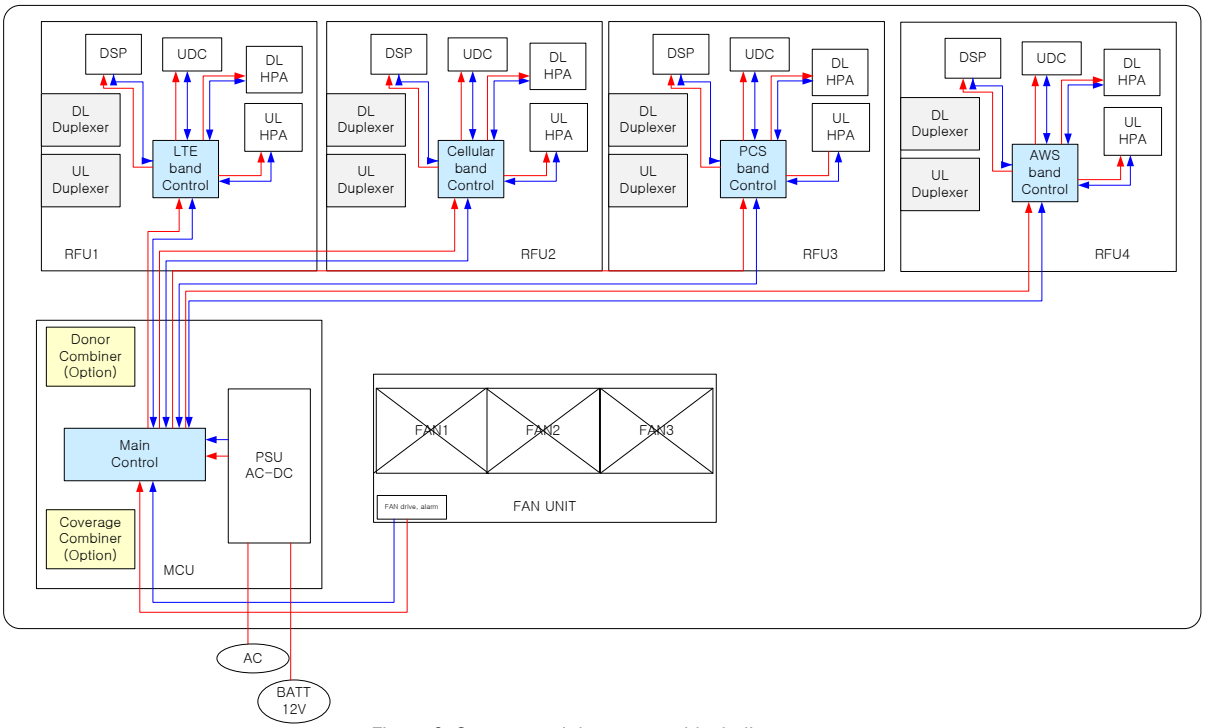


Figure 9: System modular concept block diagram

3.3.2 Band (RFU) modular concept

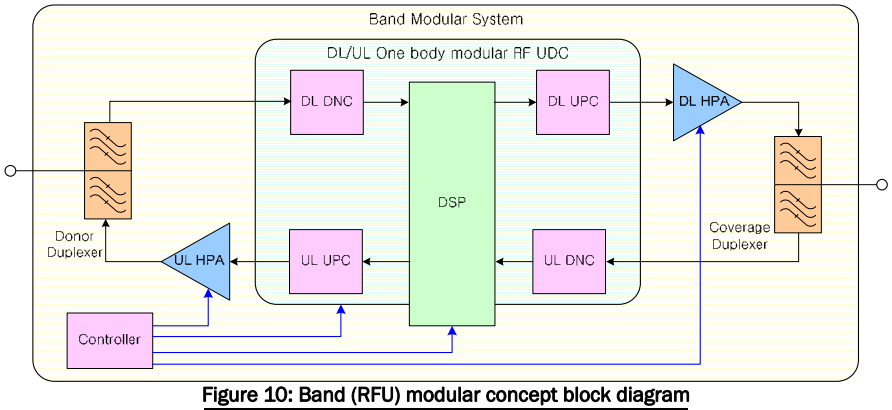


Figure 10: Band (RFU) modular concept block diagram

Part Name	BAND
RFU 1	LTE
RFU 2	Cellular
RFU 3	PCS
RFU 4	AWS

3.3.3 Combining method of the various optional configuration

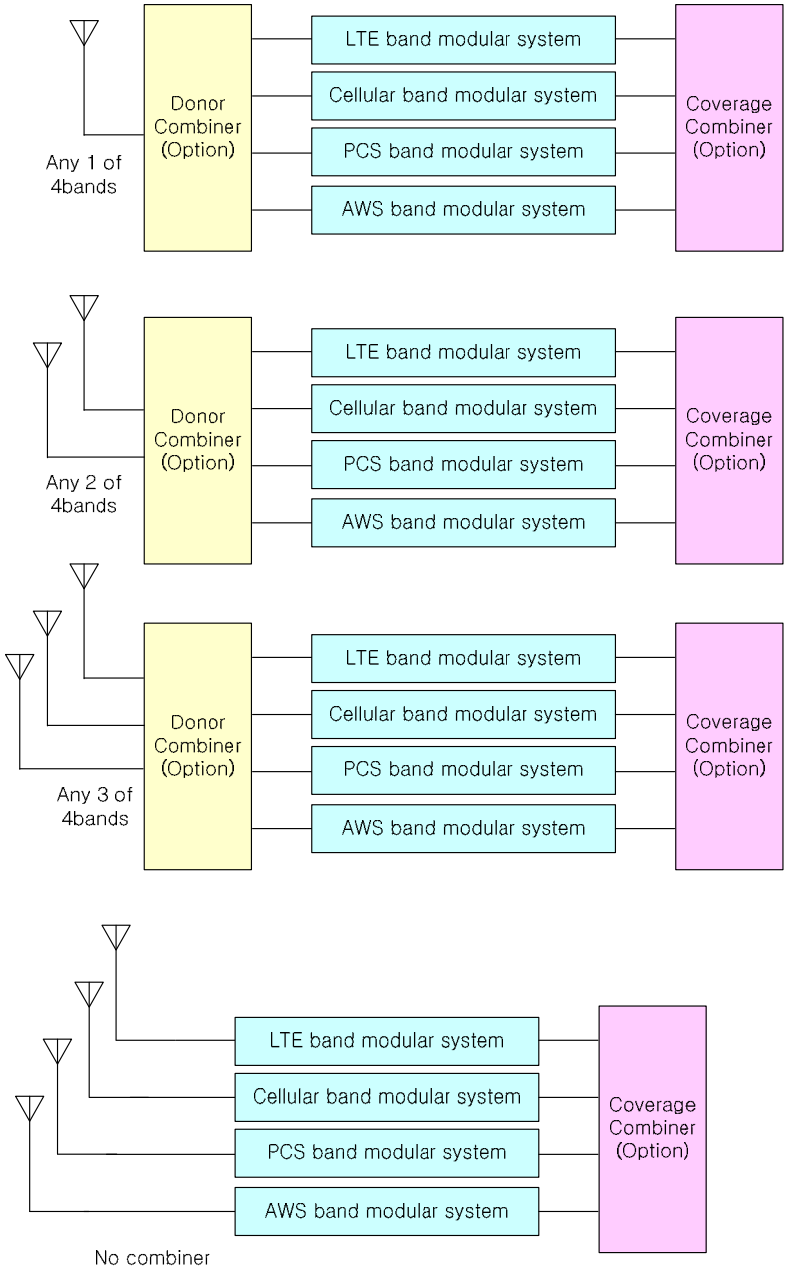


Figure 11: Donor combining method by selection of various optional donor combiner

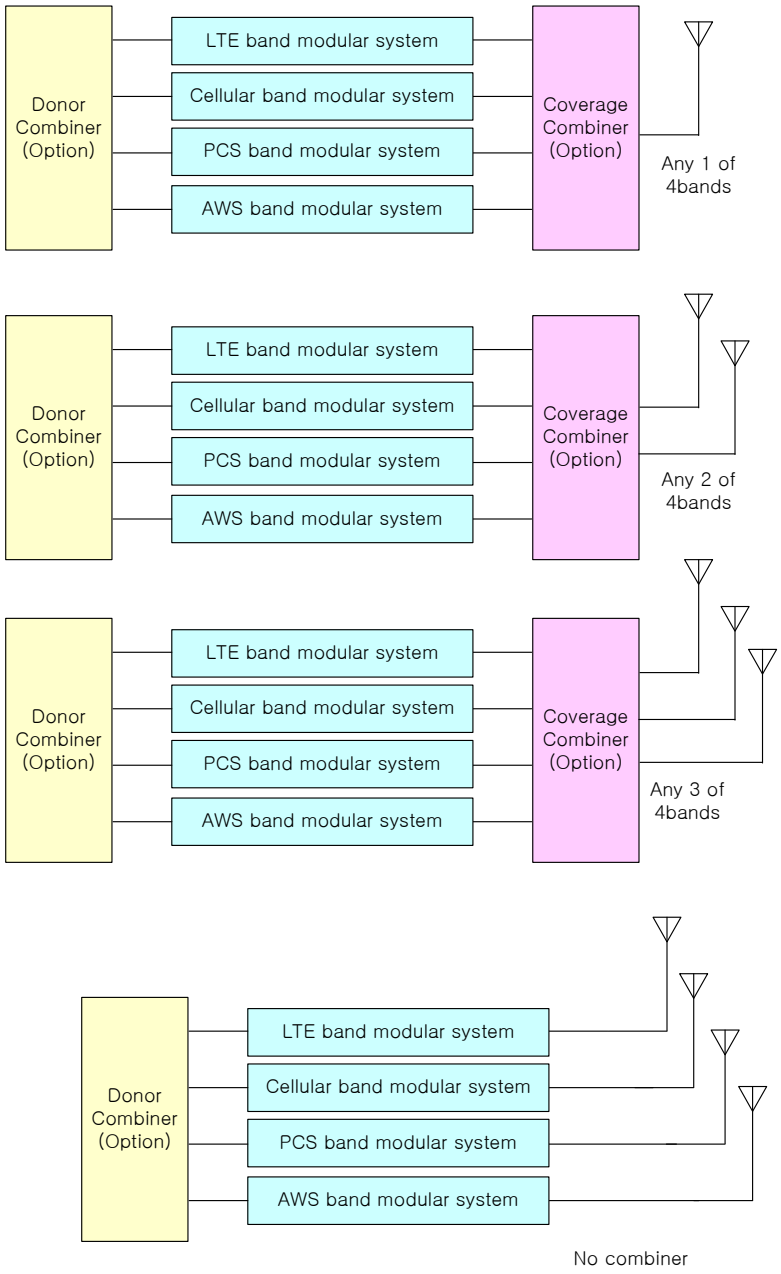


Figure 12: Coverage combining method by selection of various optional coverage combiner

3.4 Power supply architecture

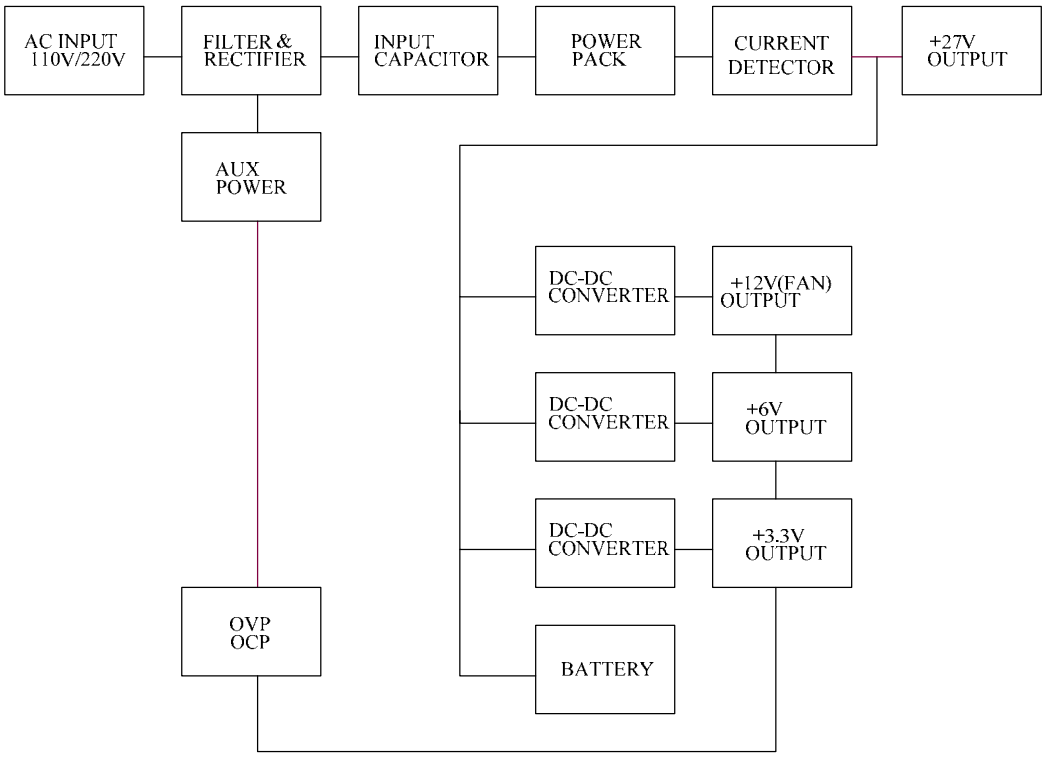


Figure 13: Power supply architecture

3.5 Installation

3.5.1 Procedure

Eight mounting holes are located on 4 corners of repeater to attach it to the 19" rack. The repeater must be securely attached to a rack mount system that can sufficiently carry the weight of the Axiom.

The following steps should be followed while mounting the repeater:

Installation Procedure

① Verify that the repeater and mounting hole are in good condition.
② Align the repeater to the mounting holes of the rack mount system.
③ Screw the repeater to the rack using 8 mounting screws.
④ Make sure the Repeater is securely attached.
⑤ Connect the GND cable.
⑥ Connect the Antenna cable.
⑦ Connect the Power.
⑧ Using a laptop, install the Repeater.

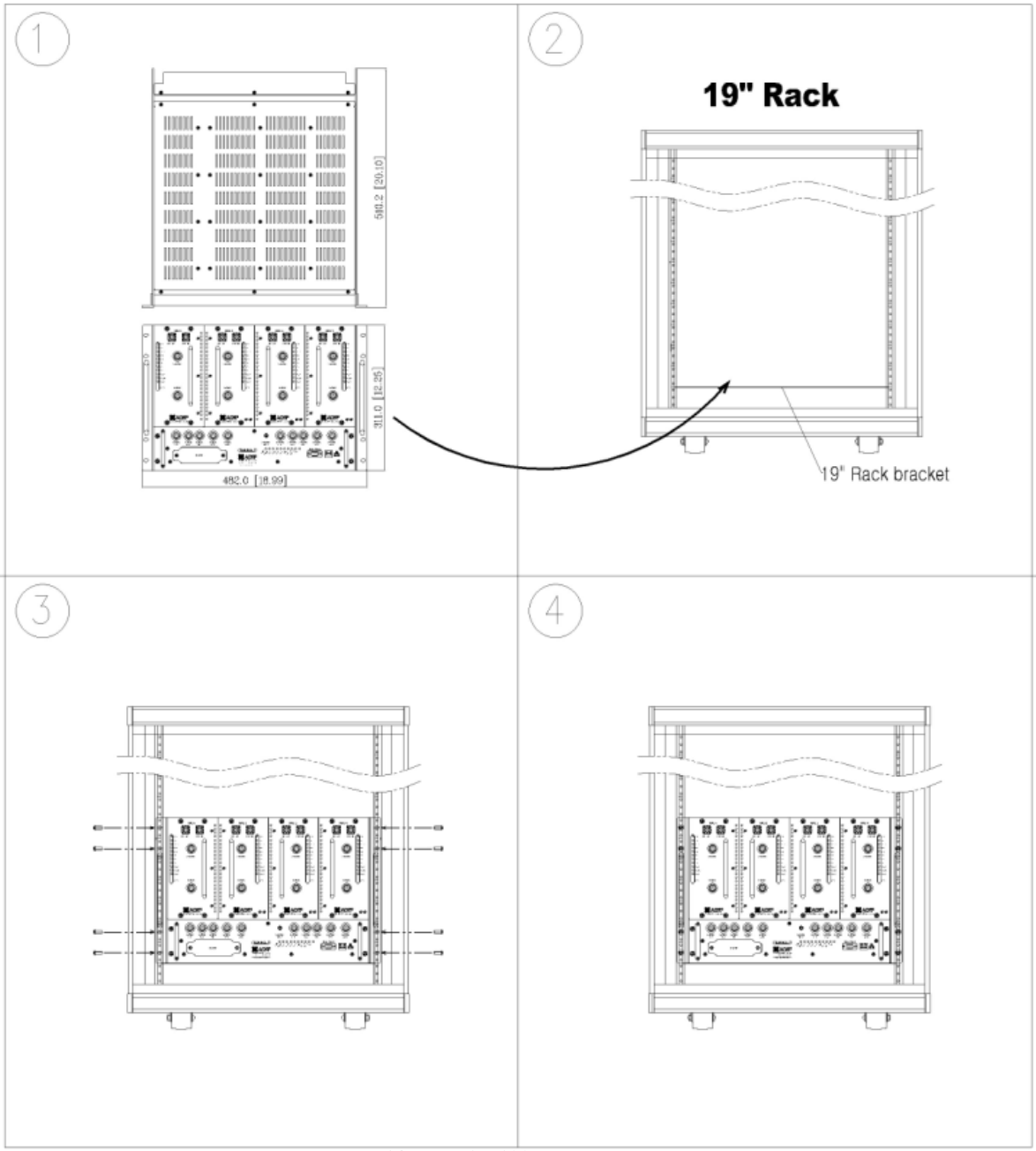


Figure 14: Axiom-25/100 Mounting Instructions

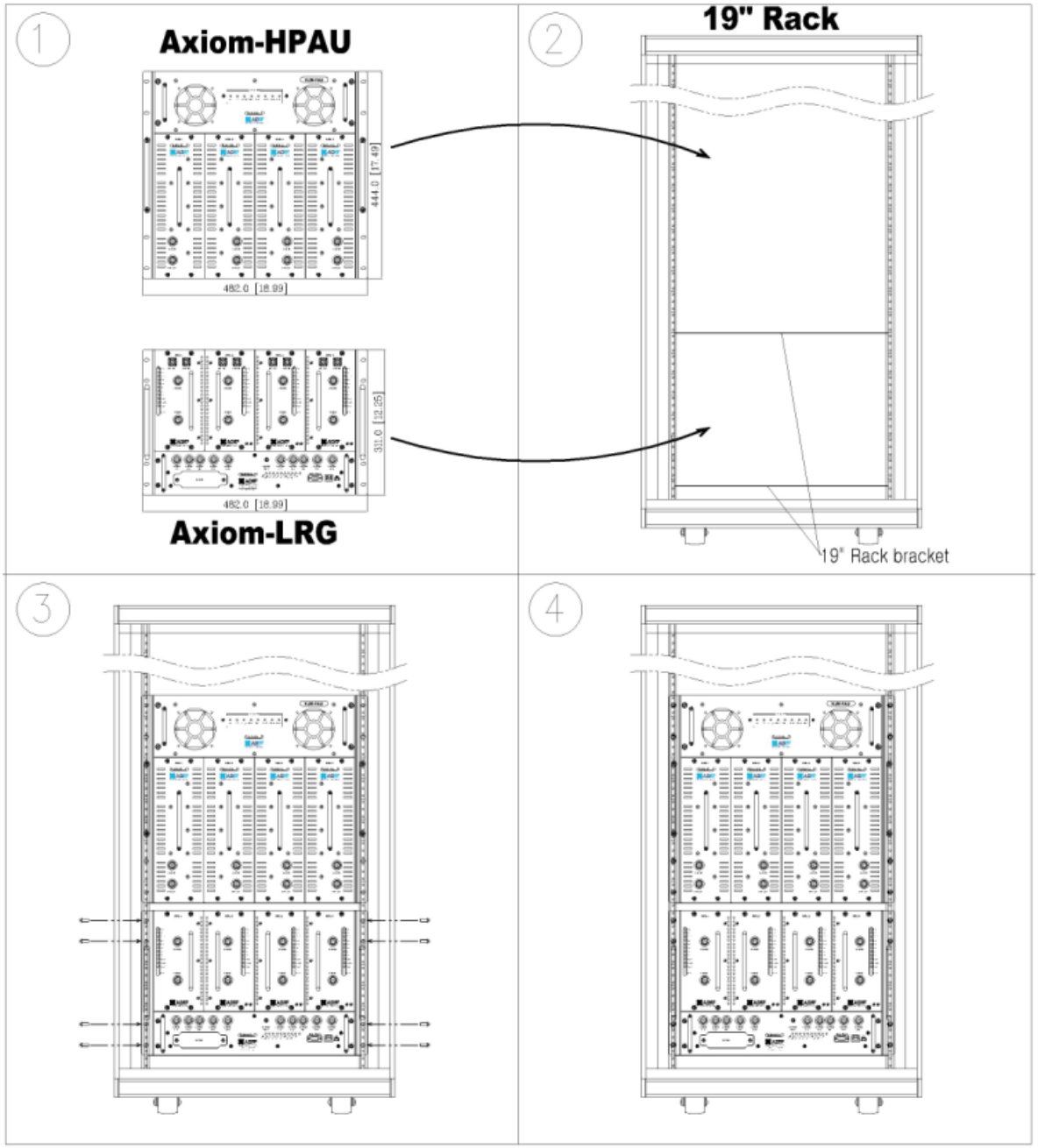


Figure 15: Axiom-LRG Mounting Instructions

3.5.2 Grounding

A ground cable is included in the box. The ground cable should be connected to the Right side of Axiom before the repeater is turned on.

Figure 16: Ground Cable Connection

3.5.3 Antenna Separation/Isolation

Separation between the antennas is necessary to prevent oscillation. Oscillation occurs when the signal entering the system continually reenters, due to the lack of separation between the donor and server antennas. In other words, the signal is being fed back into the system. This creates a constant amplification of the same signal. As a result, the noise level rises above the signal level.

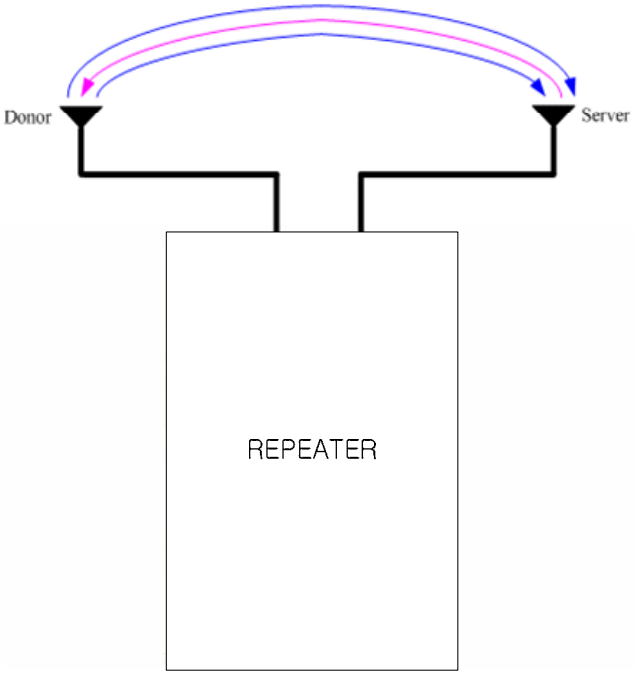


Figure 17: RF Repeater Oscillation

To prevent feedback, the donor and server antennas must be separated by an appropriate distance to provide sufficient isolation. Isolation is attained by separating antennas a sufficient distance so that the output of one antenna does not reach the input of the other. This distance is dependent on the gain of the repeater.

A sufficient isolation value is 13 ~ 15 dB greater than the maximum gain of the repeater. For example, if the gain of the repeater is 50 dB, then an isolation of 63 ~ 65 dB or greater is required. In the same manner, because the Axiom has a maximum gain of 80 dB in case of Axiom 25K, it requires an isolation of at least 93 ~ 95 dB.

3.5.4 Line of Sight

The donor antenna which points towards the base station typically has a narrow beam antenna pattern. As a result, a slight deviation away from the direction of the BTS can lead to less than optimum results. In addition, obstacles between the repeater and the BTS may impair the repeater from obtaining any BTS signal. As a result, the repeater cannot transmit signal to the coverage area. Therefore, a direct line of sight to the BTS for the donor antenna is vital to the function of a repeater. For the same reason, placing the server antenna in direct line of sight of the coverage area is also necessary.

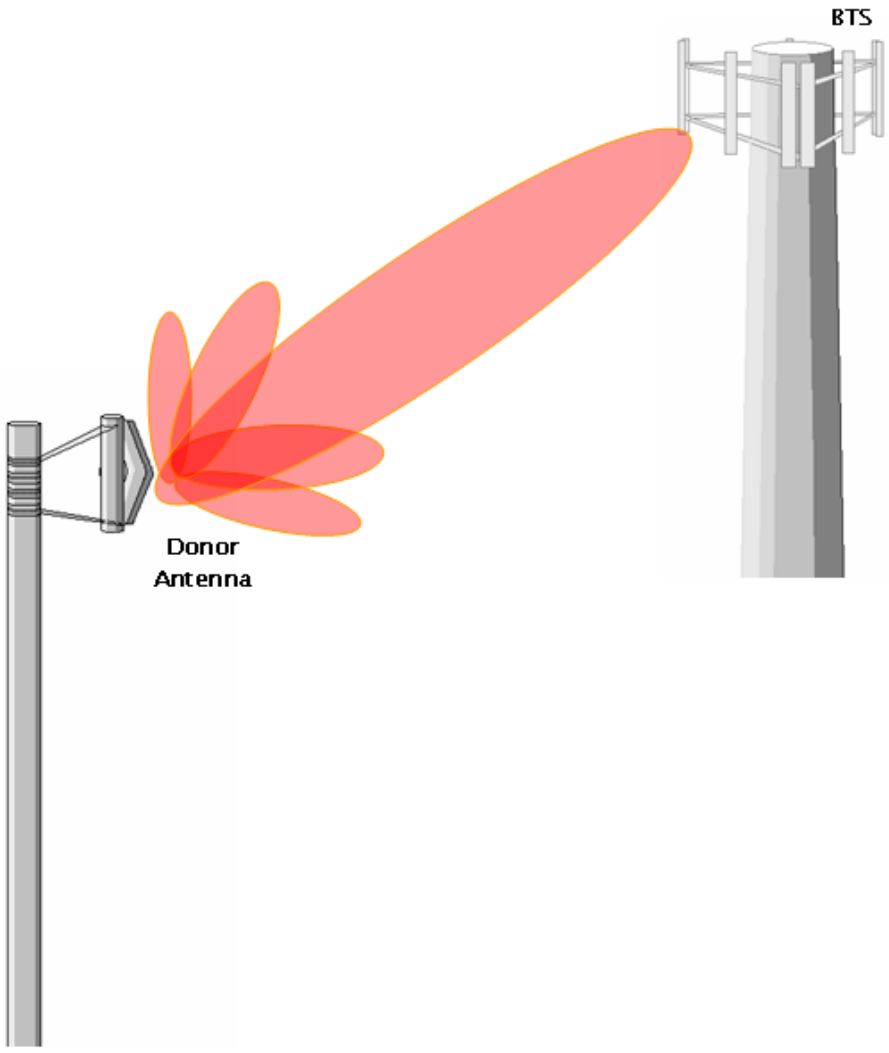


Figure 17 - Direct Line of Sight to the BTS

4. Axiom Web-GUI Setup

The Web-GUI allows the user to communicate with the repeater either locally or remotely. To connect to the repeater locally, you will need a laptop with an Ethernet port and a RJ-45 crossover cable. To connect to the repeater remotely, you will need to have an active internet connection and the repeater must have either an internal modem or an Omnibox (ADRF Modem Box) connected to the repeater.

4.1 Repeater/PC Connection Using Web-GUI

A. Verify that your Local Area Connection is set to Obtain an IP address automatically under the Internet Protocol (TCP/IP) properties
   - If you are connecting to the unit remotely, then skip steps A and B.

B. Connect the RJ-45 crossover cable between the laptop's Ethernet port and the repeater's Ethernet port

C. Launch Microsoft Internet Explorer (Version 7.0 or below)

D. Type the following IP address into the address bar of Microsoft Internet Explorer: http://192.168.63.1
   - If you are connecting to the unit remotely, then type the IP address of the modem to connect to the unit

E. The following login screen will appear:

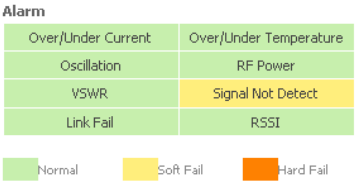
If you are not the Administrator, please type in your assigned username & password which you should have received from the Administrator.

The default username and password for the General User is adrf & adrf, respectively.

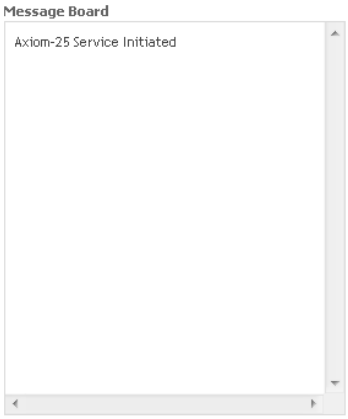
If the username & password is typed in incorrectly, the following screen will appear:

4.2 Status Tab

- **Band**: Displays the bands that are currently being utilized
- **Power & Gain**: Displays the Input, Gain, and Output for both Downlink and Uplink
- **Alarm**: Displays eight (8) alarms with three different status conditions (Normal, Soft Fail or Hard Fail).



- **Message Board**: Displays the 20 most recent events.

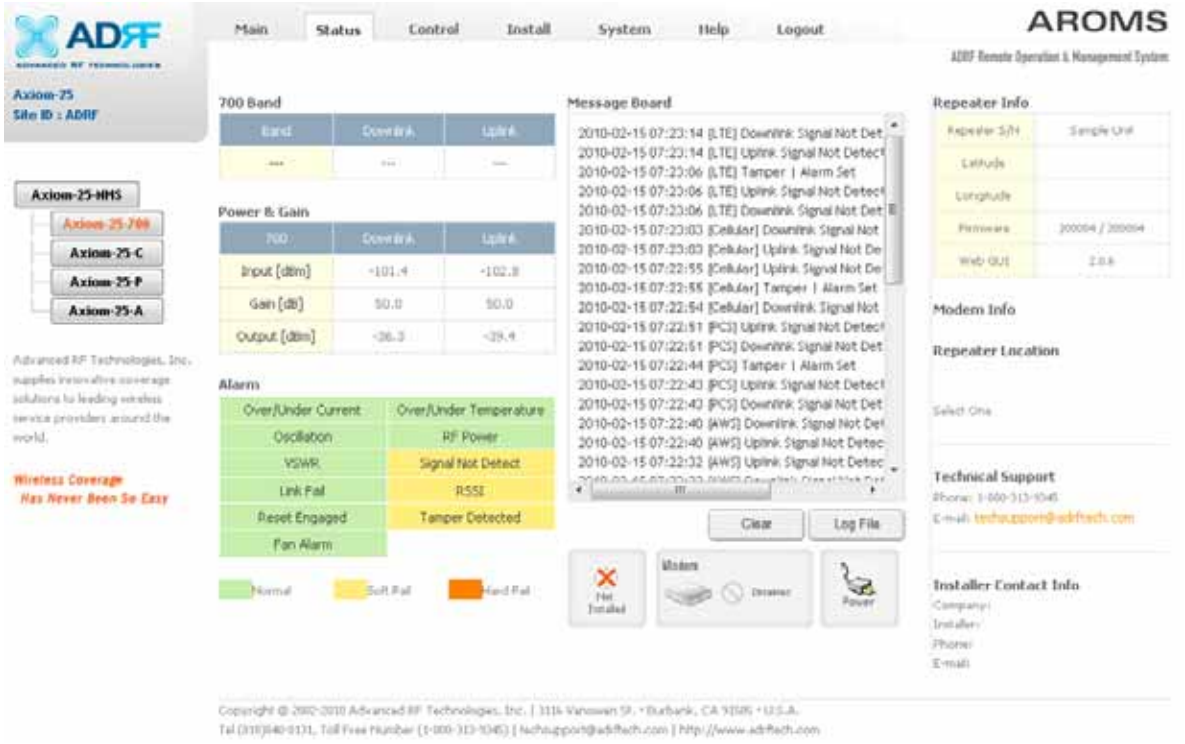


- **Clear**: Clears the content that is currently being displayed on the Message Board
- **Log File**: Downloads the system Log File (events and alarms) to your computer
- **Alarm History**: Downloads the Alarm History log (alarms only) to your computer
- **Installation**: Displays whether or not the installation routine has been run (Not Installed or Installed)
- **Modem**: Displays the status of the modem
  - Disabled- No internal modem is present
  - Not Connected- Internal modem is detected, but no connection to the network has been established
  - Connected- Internal modem is detected and a connection to the network has been established
- **Repeater Info**: Displays the serial number, latitude, longitude, firmware version, Web-GUI version
- **Modem Info**: Displays the ESN (DEC), MDN, and IP Address of the internal modem
- **Repeater Location**: Displays the address where the repeater is installed
- **Technical Support**: Displays ADRF's Technical Support contact information

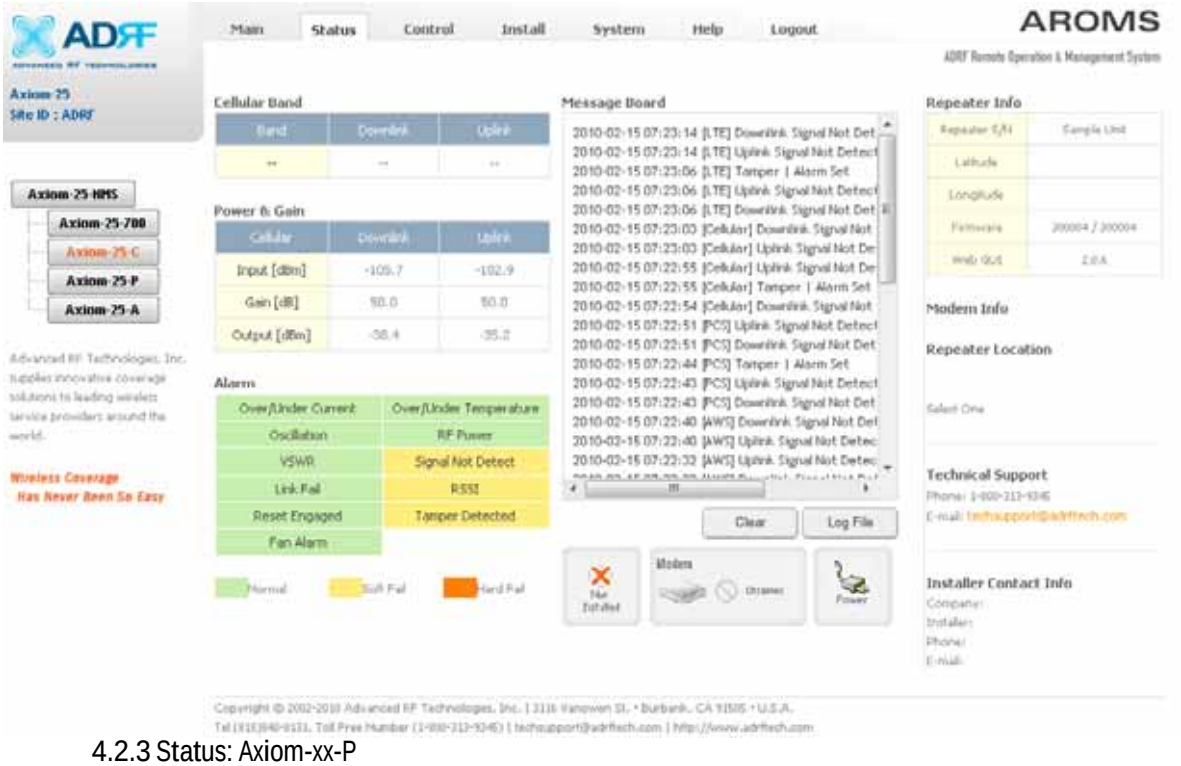
- **Installer Contact Info**: Displays the installer's name, phone and e-mail address

Note: Once successfully logged in, the repeater model name and the site/cascade ID will be displayed on the top of all the windows (except for the Main Window).

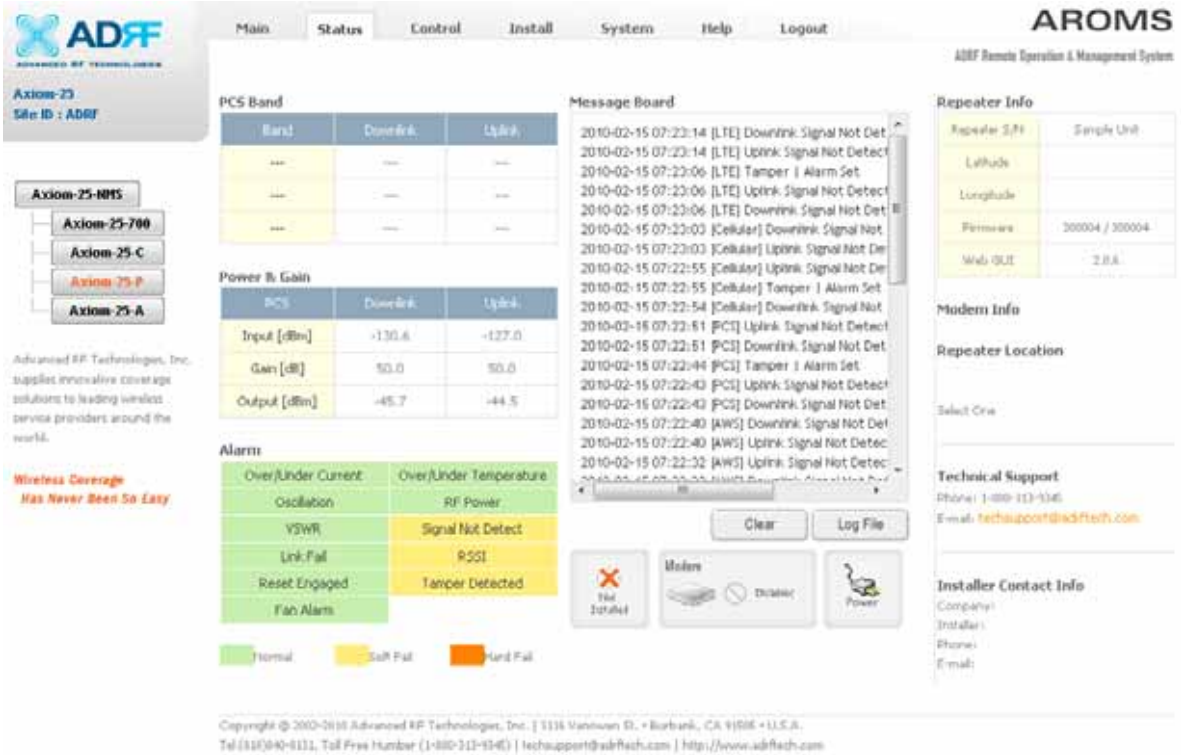
4.2.1 Status: Axiom-xx-700



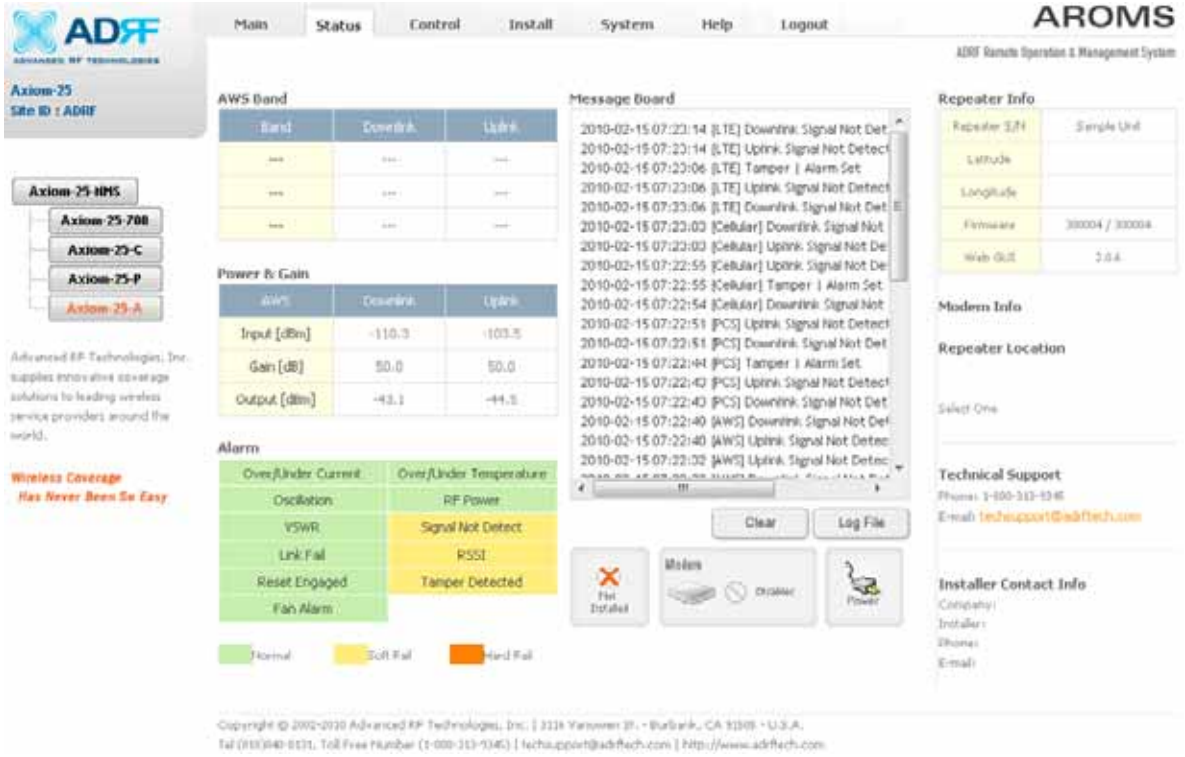
4.2.2 Status: Axiom-xx-C



4.2.3 Status: Axiom-xx-P

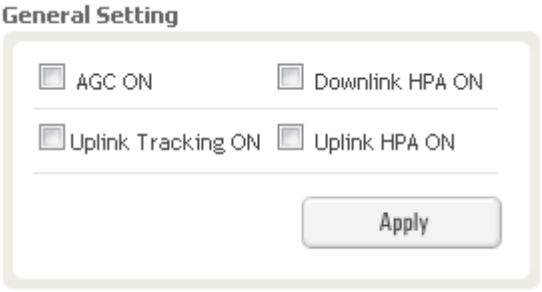


4.2.4 Status: Axiom-xx-A



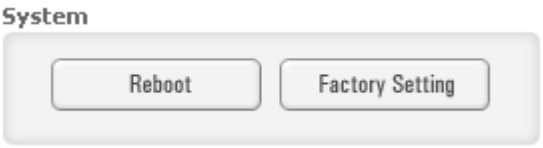
4.3 Control Tab

- **General Setting**

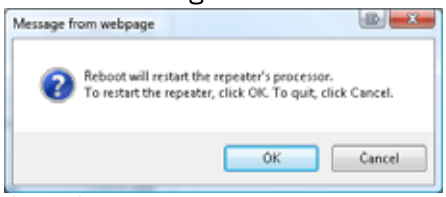


  - **AGC ON**: Enables or disables AGC (Automatic Gain Control)
  - **Uplink Tracking ON**: Enables or disables the Uplink Tracking Feature
    - Uplink Tracking adjusts the Uplink Gain to meet the Uplink Tracking Offset value
  - **Downlink HPA ON**: Enables or disables the DL HPA
  - **Uplink HPA ON**: Enables or disabled the UL HPA

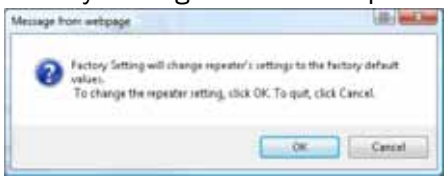
- **System**



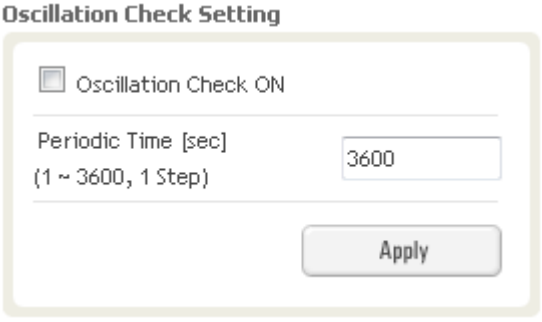
  - Reboot: Clicking the reboot button will have the following popup show up:



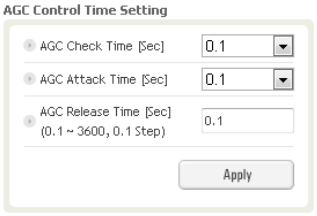
    Click OK to reboot the repeater or click Cancel to exit out
  - Factory Setting: Resets the repeater to the original factory settings



- **Oscillation Check Setting**



  - **Oscillation Check ON**: Enables or disables oscillation check
  - **Periodic Time**: Allows the use to specify how often the repeater runs the oscillation check
- **AGC Control Time Setting**



  - **AGC Check Time**: The frequency at which the system checks the AGC level
  - **AGC Attack Time**: Time it takes to lower the gain to match the AGC level
  - **AGC Release Time**: Time it takes to raise the gain to match the AGC level

- **Manual Gain Control**

  - **Downlink Gain**: Allows the DL gain to be adjusted manually when AGC is OFF
  - **Uplink Gain**: Allows the UL gain to be adjusted manually when AGC is OFF
  - **Downlink AGC Level**: Allows the user to set the DL gain when AGC is enabled
  - **Uplink AGC Level**: Allows the user to set the UL gain when AGC is enabled
  - **Uplink Tracking Offset**: This offset value determines how many dB lower the uplink gain value will be relative to the downlink gain value

- **Main Gain Control Range**

Control	Modules	25K	100K	Large	Note
Downlink Gain	-	50~80	60~90	65~95	0.5dB step, default: Minimum Level
Uplink Gain	-	50~80	60~90	65~95	0.5dB step, default: Minimum Level
Downlink AGC Level	LTE & CELL	15 ~ -14	25 ~ -4	38 ~ 8	0.5dB step, default: Maximum Level
	PCS & AWS	20 ~ -9	30 ~ 0	43 ~ 13	0.5dB step, default: Maximum Level
Uplink AGC Level	LTE & CELL	15 ~ -14	25 ~ -4	25 ~ -4	0.5dB step, default: Maximum Level
	PCS & AWS	20 ~ -9	30 ~ 0	30 ~ 0	0.5dB step, default: Maximum Level
Uplink Tracking Offset	-	10 ~ 0	10 ~ 0	10 ~ 0	0.5dB step, default: 3dB

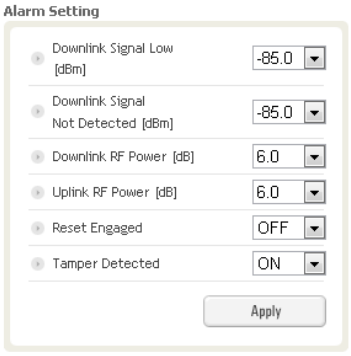
- **Oscillation & AGC time Control Range**

Control	Modules	25K	100K	Large	Note
Oscillation Period time	-	1~3600sec	1~3600sec	1~3600sec	1sec step, default: 3600sec
AGC Check Time	-	0.1 ~ 1 sec	0.1 ~ 1 sec	0.1 ~ 1 sec	Not use
AGC Attack Time	-	0.1 ~ 1 sec	0.1 ~ 1 sec	0.1 ~ 1 sec	Not use
AGC Release Time	-	0.1 ~ 3600sec	0.1 ~ 3600sec	0.1 ~ 3600sec	0.1 sec step, default: 0.1 sec

- **Alarm Control Range**

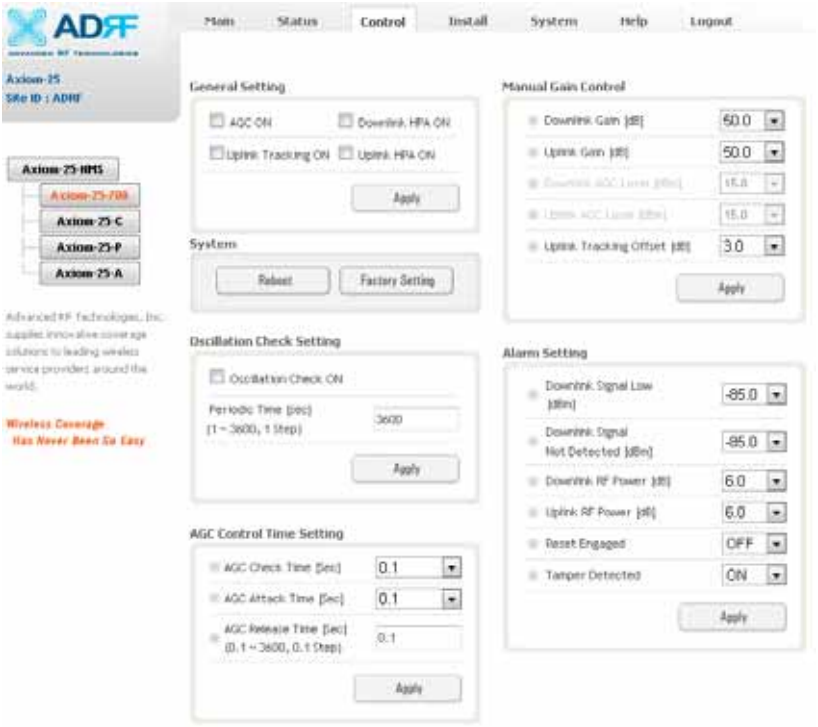
Control	Modules	25K	100K	Large	Note
Downlink Signal Low Alarm	-	-30~-90	-30~-90	-30~-90	0.5dB step, default: -85dB
Downlink Signal not Detect Alarm	-	-80~-110	-80~-110	-80~-110	0.5dB step, default: -85dB
Downlink RF Power Alarm	-	0 ~ 10	0 ~ 10	0 ~ 10	0.5dB step, default: 6dB
Uplink RF Power Alarm	-	0 ~ 10	0 ~ 10	0 ~ 10	0.5dB step, default: 6dB

- **Alarm Setting**

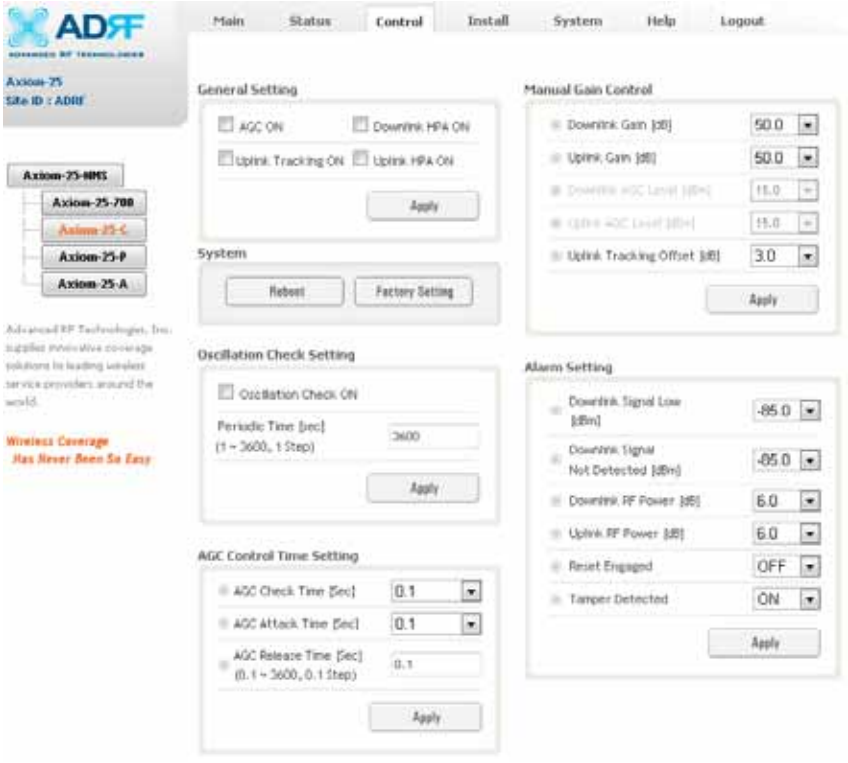


  - **Downlink Signal Low**: Allows the user to specify how weak the signal can be before triggering a "Downlink Signal Low" soft-fail alarm
  - **Downlink Signal Not Detected**: Allows the user to specify the how weak the signal can be before triggering a "Signal Not Detected" soft-fail alarm
  - **Downlink RF Power**: Allows the user to set a maximum deviation value for the downlink RF power
    - For example, if the input signal is -50 dBm and the gain is set to 60 dB, the expected output power should be 10 dBm. If the Downlink RF Power alarm value is set to 6dB, then if the output power is below 4 dBm, then this will trigger a soft-fail alarm
  - **Uplink RF Power**: Allows the user to set a maximum deviation value for the uplink RF power
    - For example, if the input signal is -50 dBm and the gain is set to 60 dB, the expected output power should be 10 dBm. If the Uplink RF Power alarm value is set to 6dB, then if the output power is below 4 dBm, then this will trigger a soft-fail alarm
  - **Reset Engaged**: Allows the Reset Engaged functioned to be enabled or disabled
  - **Tamper Detected**: Allows the tamper detection feature to be enabled or disabled

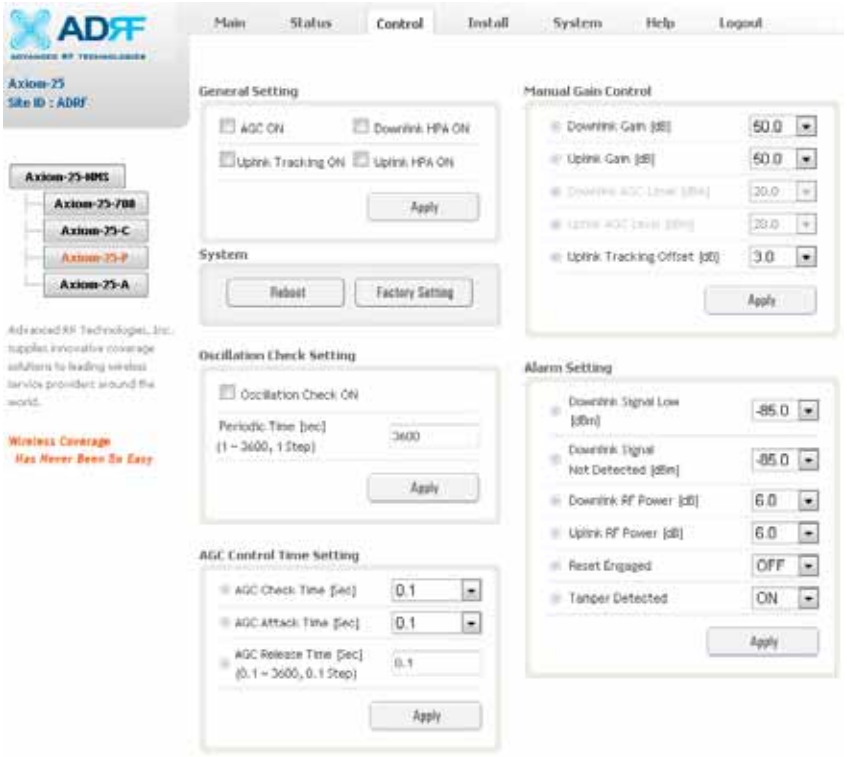
4.3.1 Control: Axiom-xx-700



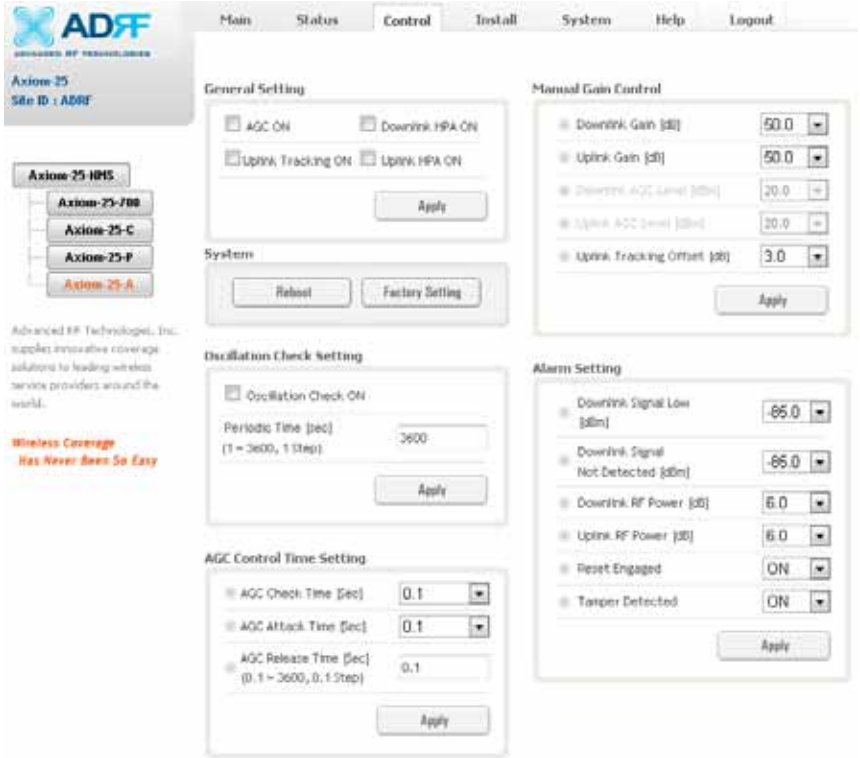
4.3.2 Control: Axiom-xx-C



4.3.3 Control: Axiom-xx-P

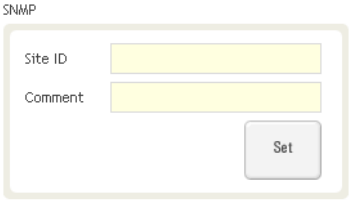


4.3.4 Control: Axiom-xx-A



4.4 Install Tab

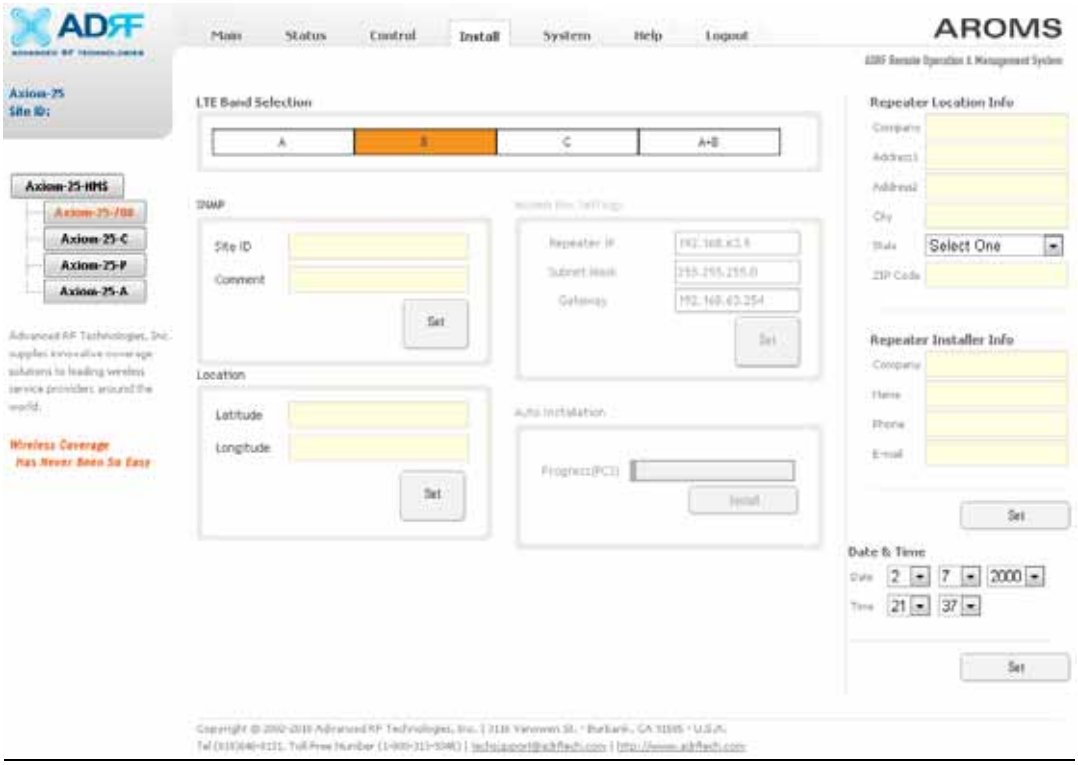
- Band Selection: Allows the user to select the band(s) they would like to utilize
- SNMP: Type in the assigned site/cascade ID and manager IP address. Default Site ID and Manager IP address are ADRF and 100.10.10.100, respectively.



- Location: Displays the physical address where the repeater is installed

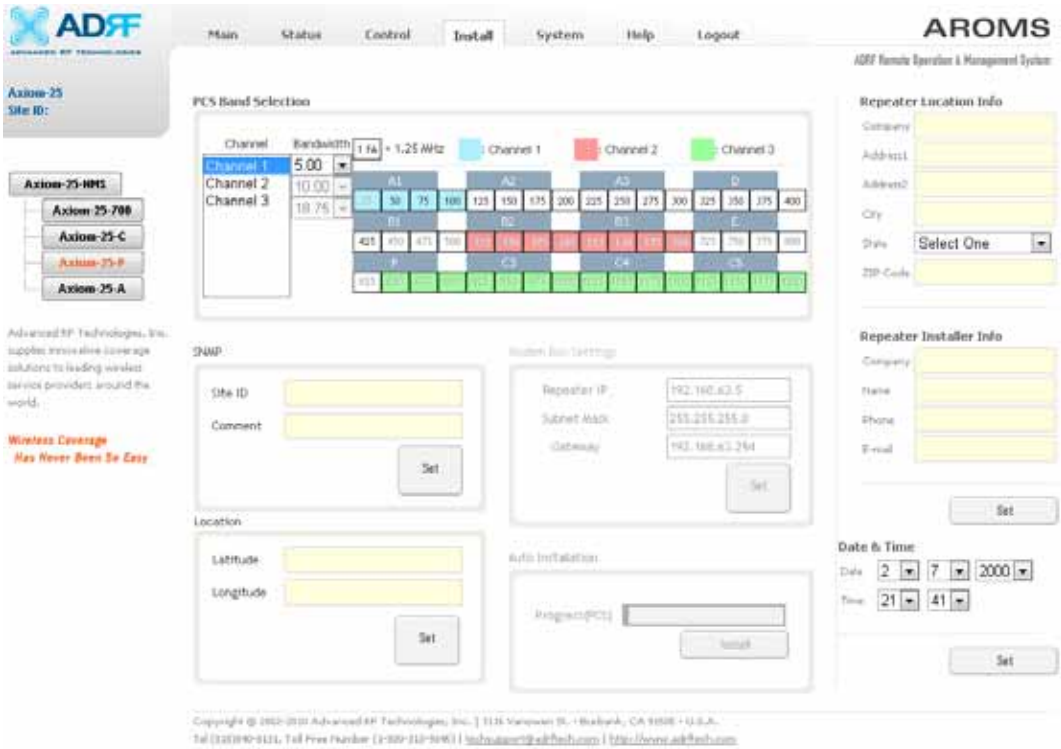
- Auto Installation: Runs the automated installation routine that will run basic checks to ensure that the repeater can function in the environment

4.4.1 Install: Axiom-xx-700

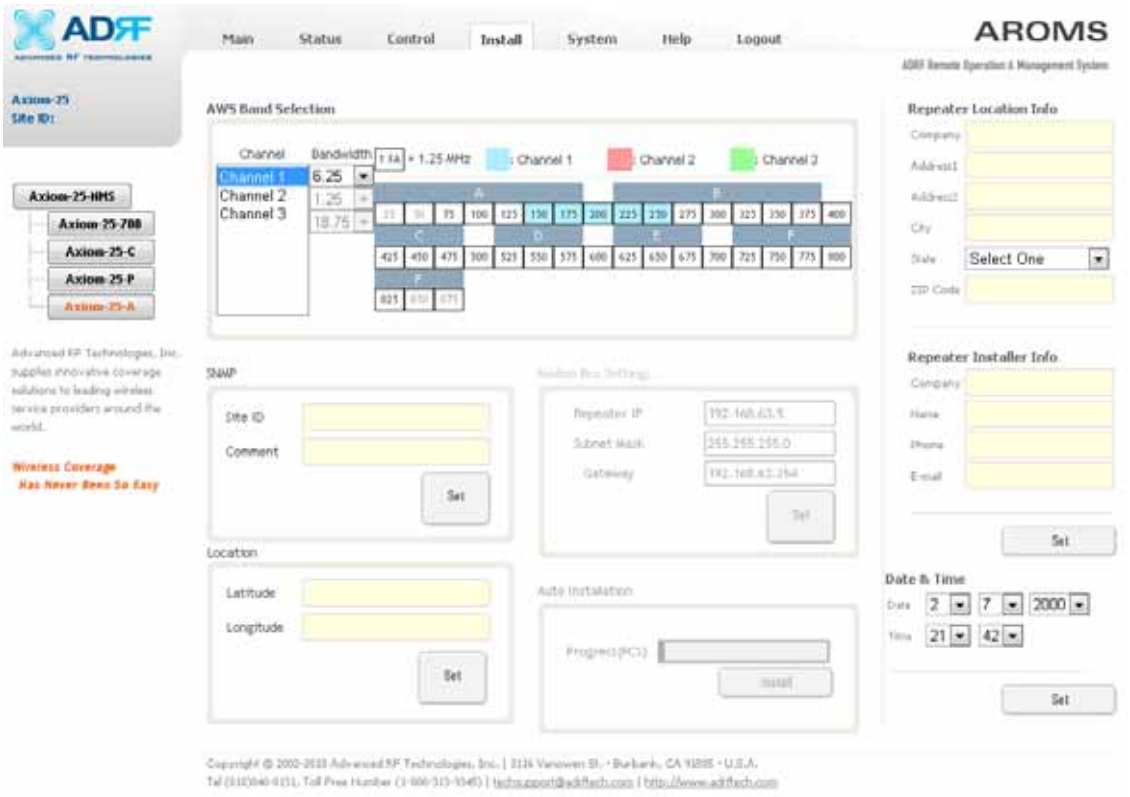


4.4.2 Install: Axiom-xx-C

4.4.3 Install: Axiom-xx-P



4.4.4 Install: Axiom-xx-A

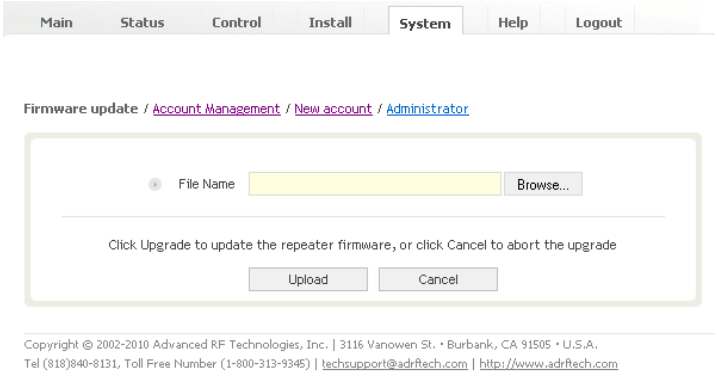


4.5 System

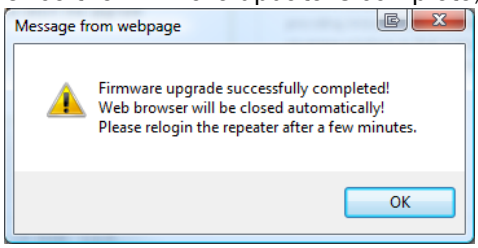
The System tab allows the user to perform firmware updates, add/remove user accounts, and change the login credentials of the Administrator.

4.5.1 System: Firmware Update

- To perform a firmware update, click on the System tab and the following screen will show up.

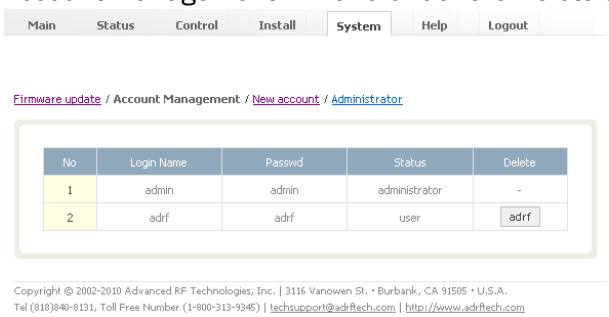


- Click on the Browse… button and locate the firmware file
- Click on the Upload button to perform the firmware update
- Once the firmware update is complete, the following popup message will appear:



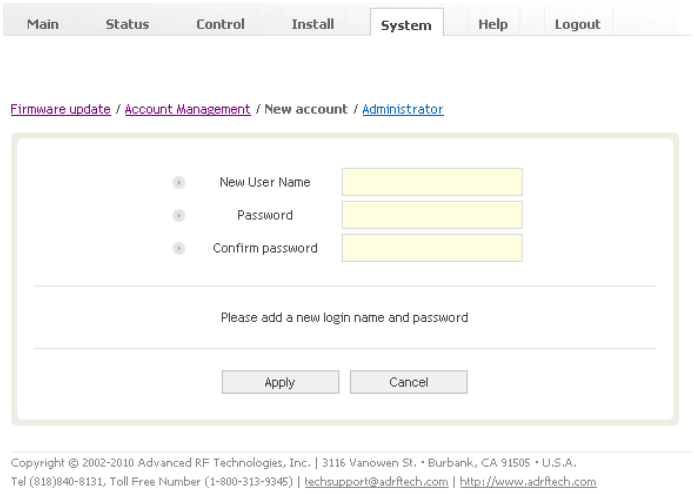
4.5.2 System: Account Management

The Account Management section will allow the Administrator to delete any user account. Please note that the Account Management section is only available if you are logged into the system as the Administrator. To delete a user account click on the Account Management link and under the Delete column, click on the delete button.



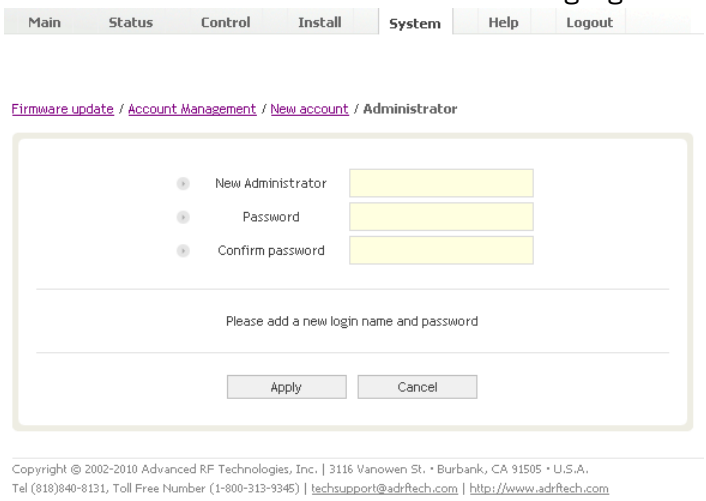
4.5.3 System: New Account

The New account section allows the Administrator to create a new user account. Please note that the New account section is only available if you are logged into the system as the Administrator. To create a new user account click on the New account link and fill in the fields highlighted in yellow as shown below.



4.5.4 System: Administrator

The Administrator section allows the Administrator to change their login credentials. Please note that the Administrator section is only available if you are logged into the system as the Administrator. To change the login/password of the administrator, click on the Administrator link and fill in the sections highlighted in yellow as shown below.



4.6 Help

If an internet connection is available, clicking on the Help Tab will redirect the user to our Technical Support page.

4.7 Logout

Clicking the Logout button will log the current user off the system.

5. Maintenance Guide for Axiom Repeater

5.1 Periodic Inspection Checklist

a) Check for loose connections between the repeater and antennas. If connections are loose, make sure that all connections are tightly fastened properly.
b) Cables and connectors are in good condition.
c) Ensure that the repeater brackets are in good. condition and that the repeater is securely fastened

5.2 Preventive Measures for Optimal Operation

5.2.1 Recommendations

- Perform the *Periodic Inspection Checklist* quarterly or semi-annually.

5.2.2 Precautions

- Do not operate the repeater with the antennas in extremely close proximity to one another as this may cause damage to the repeater.
- Do not change the parameters unless instructed to do so by an authorized supervisor.
- Do not move the repeater unless instructed to do so by an authorized supervisor.
- Do not detach any cables to the repeater unless repair of respective components is necessary.

6. Warranty and Repair Policy

6.1 General Warranty

The Axiom carries a Standard Warranty period of two (2) years unless indicated otherwise on the package or in the acknowledgment of the purchase order.

6.2 Limitations of Warranty

Your exclusive remedy for any defective product is limited to the repair or replacement of the defective product. Advanced RF Technologies, Inc. may elect which remedy or combination of remedies to provide in its sole discretion. Advanced RF Technologies, Inc. shall have a reasonable time after determining that a defective product exists to repair or replace the problem unit. Advanced RF Technologies, Inc. warranty applies to repaired or replaced products for the balance of the applicable period of the original warranty or ninety days from the date of shipment of a repaired or replaced product, whichever is longer.

6.3 Limitation of Damages

The liability for any defective product shall in no event exceed the purchase price for the defective product.

6.4 No Consequential Damages

Advanced RF Technologies, Inc. has no liability for general, consequential, incidental or special damages.

6.5 Additional Limitation on Warranty

Advanced RF Technologies, Inc. standard warranty does not cover products which have been received improperly packaged, altered, or physically damaged. For example, broken warranty seal, labels exhibiting tampering, physically abused enclosure, broken pins on connectors, any modifications made without Advanced RF Technologies, Inc. authorization, will void all warranty.

6.6 Return Material Authorization (RMA)

No product may be returned directly to Advanced RF Technologies, Inc. without first getting an approval from Advanced RF Technologies, Inc. If it is determined that the product may be defective, you will be given an RMA number and instructions in how to return the product. An unauthorized return, i.e., one for which an RMA number has not been issued, will be returned to you at your expense. Authorized returns are to be shipped to the address on the RMA in an approved shipping container. You will be given our courier information. It is suggested that the original box and packaging materials should be kept if an occasion arises where a defective product needs to be shipped back to Advanced RF Technologies, Inc. To request an RMA, please call (800) 313-9345 or send an email to techsupport@adrftech.com.

7. Appendix A: Specifications

Electrical Specifications

Item		Specification			Remark
Frequency	700MHz	Upper C	DL : 746~757MHz UL : 776~787MHz		
		Lower A	DL : 728~734MHz UL : 698~704MHz		
		Lower B	DL : 734~740MHz UL : 704~710MHz		
	Cellular	DL : 869~894MHz UL : 824~849MHz			
	PCS	DL : 1930~1990MHz UL : 1850~1910MHz			
	AWS	DL : 2110~2155MHz UL : 1710~1755MHz			
		25K	**100K**	**Large**	
Output Power	PCS, AWS	20dBm	30dBm	43(DL)/30(UL)dBm	
	700MHz, CELL	15dBm	25dBm	38(DL)/25(UL)dBm	
Gain	DL	80dB	90dB	95dB	
	UL	80dB	90dB	95dB	
Gain control range		30dB(0.5dB step)			
Input Power	DL	-65~-35dBm	-65~-35dBm	-57~-27dBm	LTE& CELL
	UL	-65~-35dBm	-65~-35dBm	-57~-27dBm	
	DL	-60~-30dBm	-60~-30dBm	-52~-22dBm	PCS& AWS
	UL	-60~-30dBm	-60~-30dBm	-52~-22dBm	
Ripple		≤ ±3dB	≤ ±3dB	≤ ±3dB	
Spurious	700MHz	Meet, FCC			
	Cellular	≤-46dBc/30KHz@±750KHz ≤-55dBc/30KHz@±1.98MHz ≥-13dBm/1MHz@±3.125MHz			
	PCS	≤-45dBc/30KHz@±885KHz ≤-50dBc/30KHz@±1.98MHz ≥-13dBm/1MHz@±2.25MHz			
	AWS	≤-45dBc/30kHz @±885KHz ≤-50dBc/30kHz @±1.98MHz ≥-13dBm/1MHz @±2.25MHz			
NF		≤ 6dB	≤ 6dB	≤ 6dB	
Delay		≤ 6us	≤ 6us	≤ 6us	
MIMO Port Isolation		30dBc			
Frequency	700MHz	150Hz			

Stability	Cellular	150Hz			
	PCS	300Hz			
	AWS	300Hz			
Input VSWR	DL	≤ 1:1.5			
	UL	≤ 1:1.5			
EVM		≤ 12.5%			
Filter Roll-Off	700MHz	50dBc @±1MHz			
	Cellular	30dBc @±0.5MHz, 50dBc @±1MHz			
	PCS	50dBc @±1MHz			
	AWS	50dBc @±1MHz			
Power Source		110V/220V AC			
Operating Temperature		-5~50°C			
Operating Humidity		5~90%RH			
Size		12.2" x 19" x 20" inches	12.2" x 19" x 20" inches	12.2" x 19" x 20" inches	
				17.5" x 19" x 20" inches	Large Only
Weight		130 lbs	130 lbs	130 lbs	
				130 lbs	Large Only
Power Consume		60 W @ Per Band Max	130 W @Per Band Max	430 W @ Per Band Max	
		250 W / Total Band Max	500 W / Total Band Max	1650 W / Total Band Max	

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
[2] 3GPP2 C.S0011-C Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations
[3] 3GPP2 C.S0010-C Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations
[4] 3GPP TS 36.104 3rd Generation Partnership Project; Technical Specification Group Radio Access Network;
Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception Title 47, primarily sections 27 and 90, Title 47 section 27.53 part g
[5] 3GPP2 C.S0051.0 “Minimum Performance Standards for cdma2000 Repeaters” or latest version.

Appendix B: Mechanical Drawing

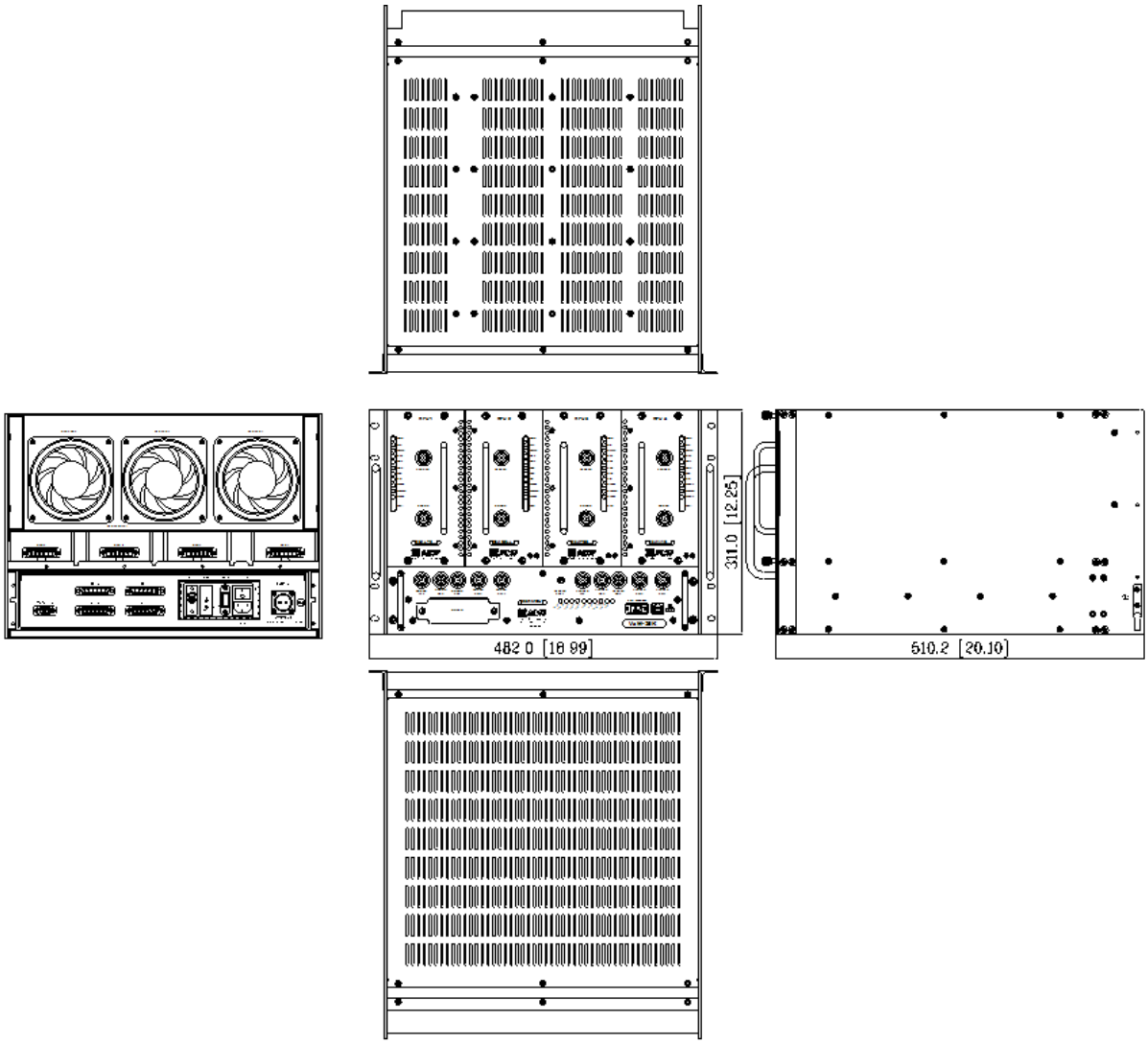


Figure 18: Axiom mechanical drawing

Appendix C: Axiom Overview

C.1 System Block Diagram

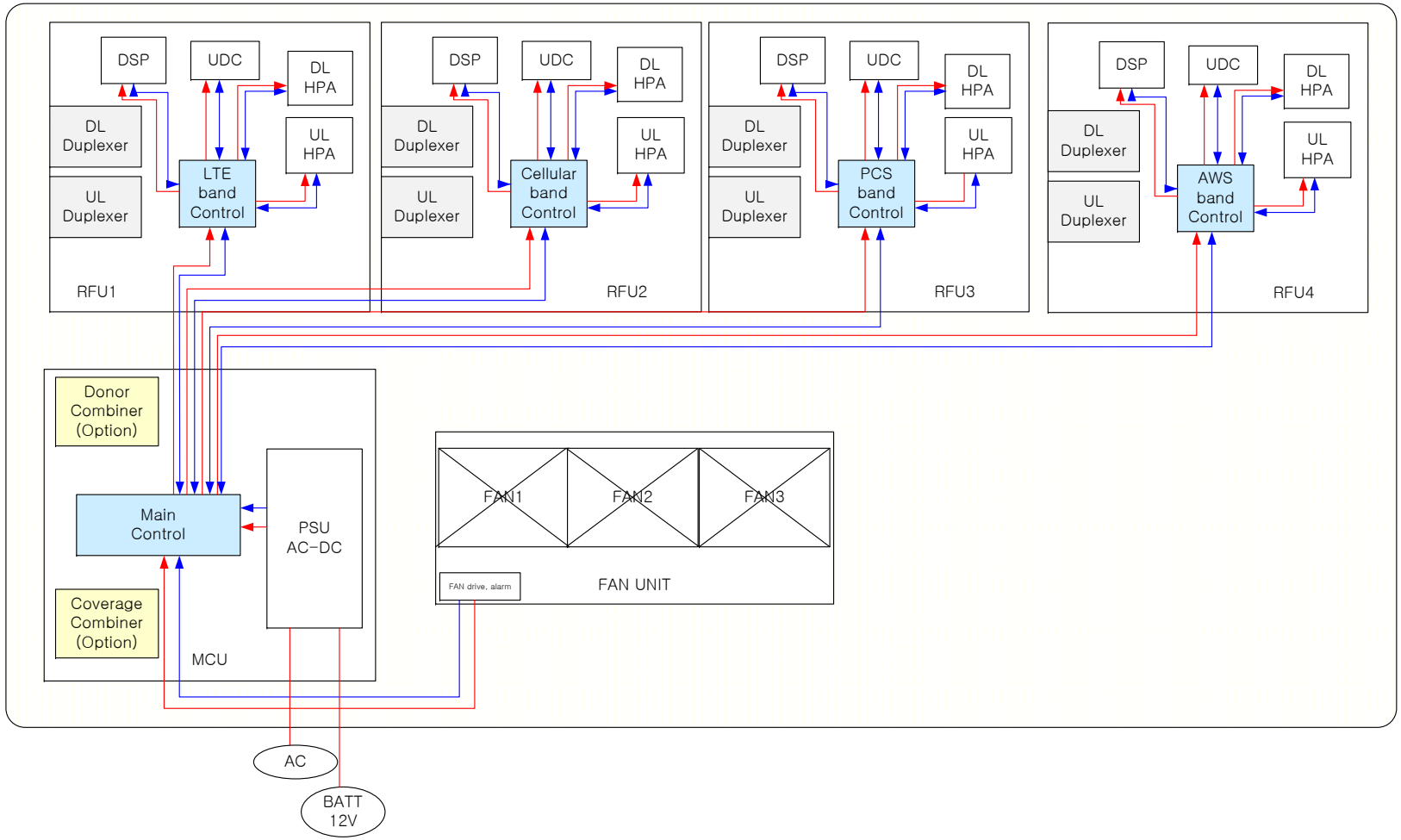


Figure 19: System block diagram

C.2 Components

Figure 20: RFU 1, 2, 3, 4

Figure 21: MCU

Power Supply

It provides DC power to each module within the repeater.

Controller

It is responsible for monitoring the status of each module and controls the parameters.

PCS Up / Down Converter Module

The downlink RF signal that enters through the cavity filter is converted to IF frequency, which is later converted back to RF frequency through SAW filtering.

Cellular Up / Down Converter Module

The downlink RF signal that enters through the cavity filter is converted to IF frequency, which is later converted back to RF frequency through SAW filtering.

PCS Duplexer

It consists of two BPFs (band-pass filters): PCS TX (1930 ~ 1990 MHz) & RX (1850 ~ 1910 MHz)

Triplexer

Combines Cellular and PCS signals. It consists of three BPFs (band-pass filters): PCS and Cellular TX and RX.

Modem Module

Contains the CDMA 2000 modem (Kyocera M200).

Appendix D: Shutdown Retry Logic

The function of the built-in shutdown routine is to protect the repeater from any further damage from a hard-fail that the system may be experiencing.

Within 5 seconds of a hard-fail alarm being detected, the repeater will start the shutdown routine. The repeater will shut down by powering of the HPAs (high-powered amplifiers) for 30 seconds.

After 30 seconds have elapsed, the repeater will power on the HPAs and check to see if the hard-fail alarm still exist. If the hard-fail alarm still exists, then the repeater will shut down for 1 minute (double the time of the previous shutdown time).

After 1 minute has elapsed, the repeater will power on the HPAs and check to see if the hard-fail alarm still exist. If the hard-fail alarm still exists, then the repeater will shut down for 2 minutes (double the time of the previous shutdown time).

The shutdown routine will repeat itself a total of 10 times. If the hard-fail alarm still exists after the 10th retry, then the repeater will turn on its HPAs permanently until a reset is performed.