AXM700-9543 User Manual

VERSION 0.1

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REVISION HISTORY

Version	Author	Descriptions	Date
0.1	YHKO	Initial Release	6/1/12
0.2	Sun Kim	Updated illustrations	6/12/12

CHANGE LIST

Version	Change list	Contents
0.2	Single band 관련 수정	1.1 Highlight, 5 Web, 8.1 Spec(6/22/12)

Terms and Abbreviations

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
BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CFR	Crest Factor Reduction
CP	Cyclic Prefix
CW	Continuous Wave (un-modulated signal)
DAS	Distributed Antenna System
DL	Downlink
eNode-B	Evolved Node B which is the element in E-UTRA of LTE that is the evolution of the element Node B in UTRA of UMTS
HPA	High Power Amplifier
HW	Hardware
IF	Intermediate Frequency
LNA	Low Noise Amplifier
LTE	Long Term Evolution
MS	Mobile Station
OFDM	Orthogonal Frequency-Division Multiplexing
OFDMA	Orthogonal Frequency-Division Multiple Access
PAR (PAPR)	Peak to Average Power Ratio (Crest Factor)
PLL	Phase Locked Loop
PSU	Power Supply Unit
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shit Keying
RB	Resource Block
RF	Radio Frequency
SC-FDMA	Single Carrier-Frequency Division Multiple Access
SQE	Signal Quality Estimate
SW	Software
eUE	LTE User Equipment (LTE Mobile Station)
UL	Uplink
VSWR	Voltage Standing Wave Ratio

1. INTRODUCTION

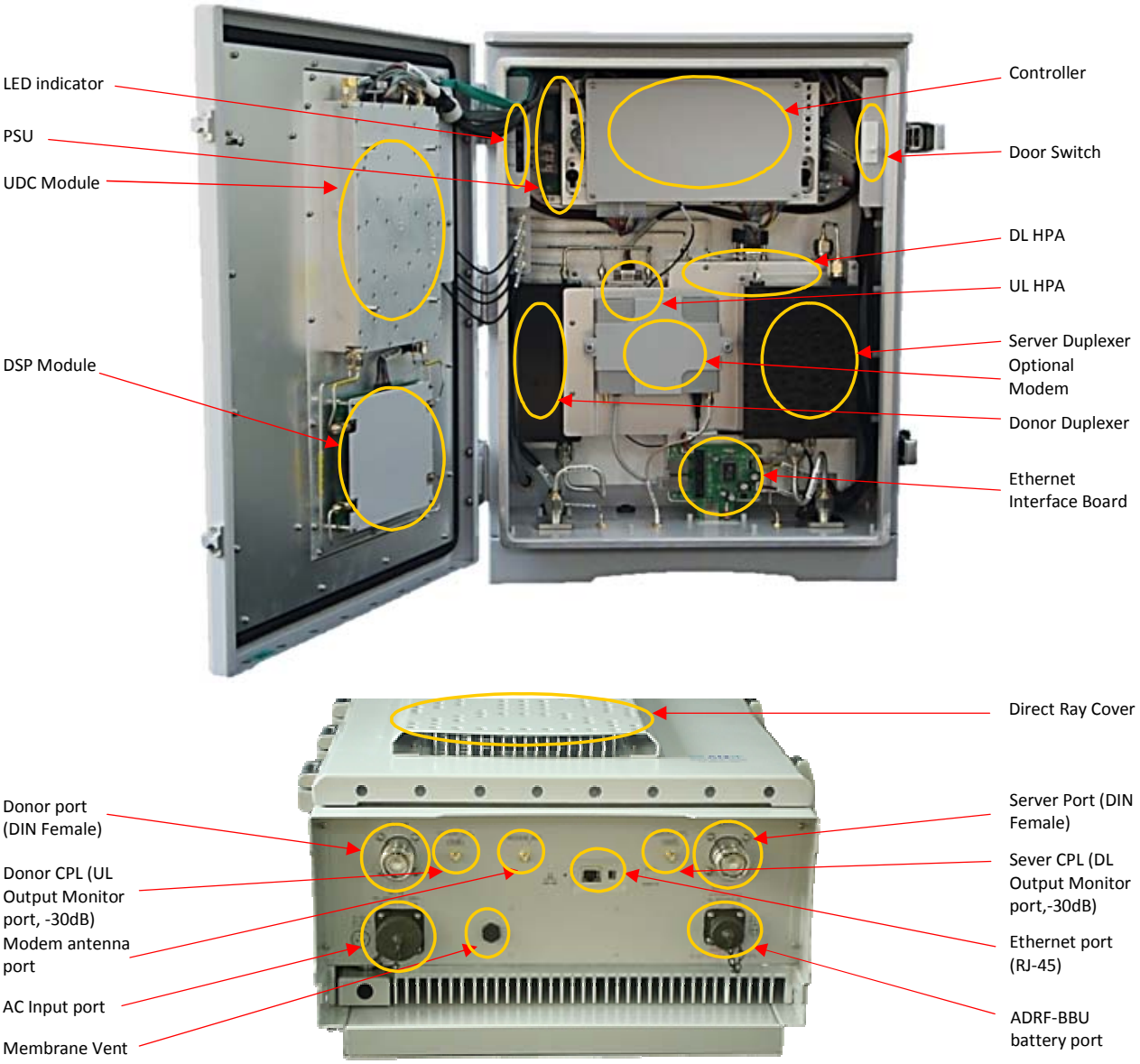
The AXM700-9543 is an over-the-air high power repeater.

1.1 Highlights

- Band Selectable (Lower A, Lower B, Lower A + Lower B, Upper C)
- Digital filtering with sharp roll-off (>50 dBc @ + 1 MHz from sub-band edge)
- Remote monitoring and control capability using our Web-based GUI
- 95dB on the downlink and about 82dB on the uplink of max gain and 43dBm Composite power
- LED panel provide signal strength and alarm status
- Support optional internal modem box for remote access and alarming
- Configurable network setting in order to interface with 3rd party external modem boxes
- Adjustable AGC Output Power Level
- Supports Network Management Monitoring System via SNMP
- Incremental Automatic Shutdown/Resumption Time: AXM700-9543 gradually increases the time span between automatic shutdown and resumption before it permanently shuts itself down
- Versatility and Usability: AXM700-9543 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
- Adjustable center frequencies by 1kHz step
- Direct ray cover on heat-sink to prevent direct light (Front door)
- Membrane vent to prevent moisture by condensation

** CD includes: User Manual, Quick-Start Guide, and Troubleshooting Guide*

1.3 Repeater Quick View



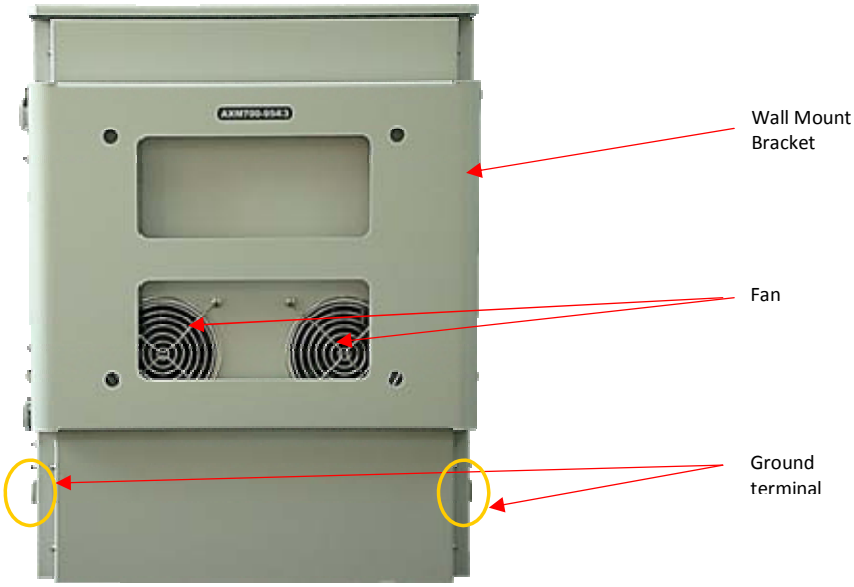


Figure 1-2 Repeater Quick View

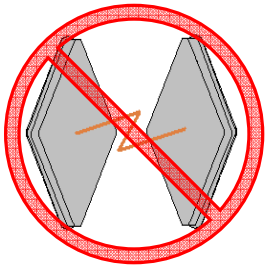
1.4 Warnings and Hazards

WARNING! ELECTRIC SHOCK

Opening the AXM700-9543 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 AXM700-9543 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 50 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 AXM700-9543 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.

CAUTION

Double Pole/Neutral Fusing.

2. OVERVIEW

2.1 LED

AXM700-9543 has LEDs in the upper left corner as shown below in figure below.

Figure 2-1 LED panel

Table 2-1 RF Module LED Specifications

LED Indicator		Specifications
Power	Solid Green	System power is ON
Soft Fail	Solid Yellow	Soft Fail alarm exist in the system
	OFF	No Soft Fail alarm are present in the system
Hard Fail	Solid Red	Hard Fail alarm exist in the system
	OFF	No Hard Fail alarms are present in the system
RSSI	Input < -85dBm	Zero (0) bar On
	Input < -75dBm	One (1) bar On
	Input < -65dBm	Two (2) bars On
	Input < -55dBm	Three (3) bars On
	Input < -45dBm	Four (4) bars On
	Input >= -45dBm	Five (5) bars On

2.2 Ethernet Port and Host/Remote Switch

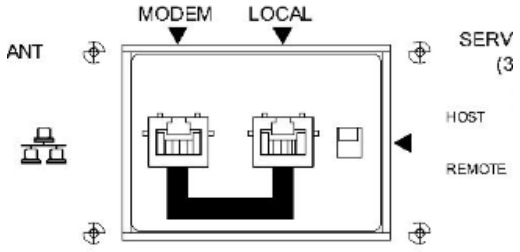


Figure 2-2 Ethernet Port and Host/Remote Switch

2.2.1 Ethernet Ports

- **Modem** – The Modem port is to only be used when the optional internal modem box (Digi Transport-WR21) is used with the repeater. This port directly connects to the Ethernet port of the internal modem box. If a Digi Transport WR-21 is being used with the repeater, used the included RJ-45 jumper cable to connect the Local and Modem ports together and then flip the Host/Remote switch to the Remote position.

- **Local** – The Local port can be used to communicate directly with the AXM700-9543 using a RJ-45 crossover cable or can also be used to connect the AXM700-9543 to an external modem box or the optional internal Digi Transport WR-21.

2.2.2 Host/Remote Switch

The Host/Remote Switch allows the user to switch the default Repeater IP, Subnet Mask, and Gateway of the repeater to an alternative setup. These settings can be adjusted by logging into the repeater in HOST mode and configuring the settings under the Modem Box Setting section on the Install Page (section 5.4.4).

Once the settings are set, flipping the switch to the REMOTE position will reboot the repeater with the new alternate settings. *Please note that when the repeater is set to the REMOTE position, DHCP is disabled and the repeater will not automatically assign an IP address to any device that connects directly to the repeater.*

- Host IP: 192.168.63.1 (Fixed IP, unable to modify this IP address)
- Remote IP: 192.168.63.5 (Default IP, but can be modified in Host mode)

2.2.3 AC Power

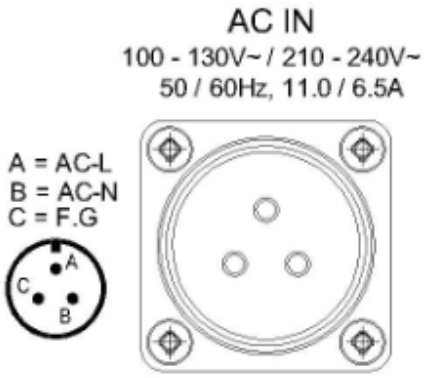


Figure 2-3 AC Input Port

AC port is located at bottom of system.

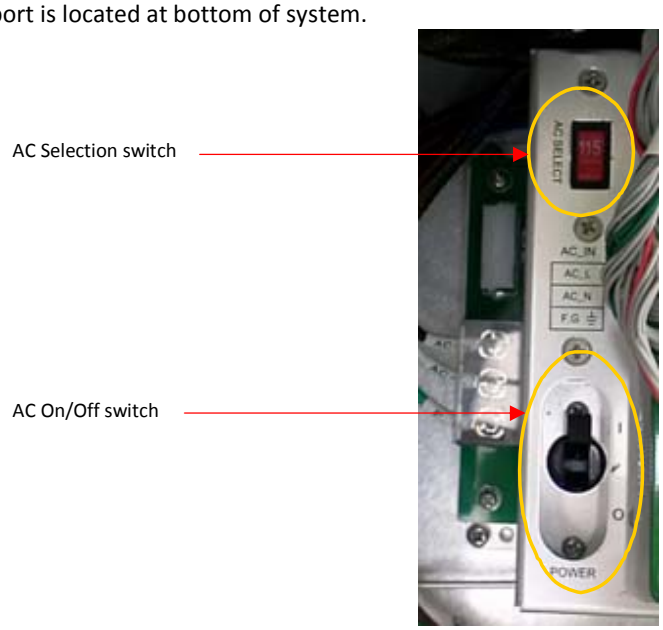


Figure 2-4 AC On/Off Switch and AC Selection

The AC Power on/off switch and AC selection switch are located at left of PSU. The AXM700-9543 PSU can operate at 110V AC and 220V AC. The user should verify that the AC input voltage selection switch is set to the correct voltage before powering on the AXM700-9543.

2.2.4 Back Up Battery Port

Figure 2-5 Battery Backup Port

The AXM700-9543 can be connected to an ADRF-BBU (ADRF Battery Backup) to provide power during a power failure. If an ADRF-BBU is utilized, connect the ADRF-BBU to the AXM700-9543 via the external battery port.

(WARNING: The circuit switch on the ADRF-BBU must be set to OFF before connecting the ADRF-BBU to the AXM700-9543 to prevent damage to the repeater or the ADRF-BBU and personal injury.)

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

2.3 RF Ports

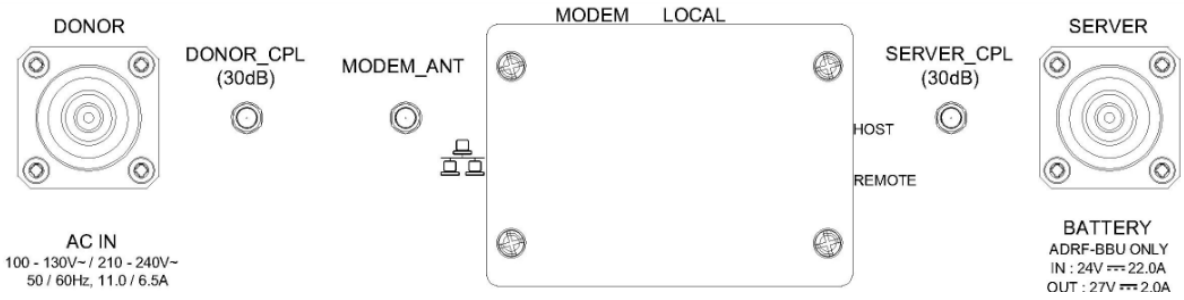


Figure 2-6 RFU RF port

2.3.1 RF Ports

- **DONOR** – DIN female which is used to connect the donor antenna
- **DONOR_CPL (30dB)** – SMA female 30 dB coupling port which is used to monitor the amplified UL signal
- **MODEM_ANT** – SMA female port which is used to provide RF signal to the optional internal modem box
- **SERVER_CPL (30dB)** – SMA female 30 dB coupling port which is used to monitor the amplified DL signal
- **SERVER** – DIN female which is used to connect the server antenna

3. ALARMS

3.1 Message Board Alarms and Notification

Table 3-1 Message Board Alarms and Notification

Parameters	Remark
AC Fail	Power supply is not operating within specs
DC Fail	Power supply is not operating within specs
Fan[1/2] Fail	System has detected an issue with the fan1 and fan2
Temperature	Module is above the normal operating temperature
Current	Power supply is not operating within specs
System Halt	System is in a shutdown state due to a hard fail alarm
DSP Fault	System has detected an issue with the internal DSP chip
OSC	Oscillation detected
DL Signal not detected	DL signal is below the specified level
DL Signal Low	DL signal is below the specified level
Input Overload	Incoming in-band DL or UL signal is too strong
Out of band Overload	Incoming out-band DL or UL signal is too strong
Synthesizer Lock Fail	Issue with internal PLL
DL RF Power	Input + gain does not match the output level (above delta of 6 dB)
Overpower	Output level is above the max output levels
VSWR	Power is being reflected back to the repeater
Heartbeat	Heartbeat
Reboot	Reboot
Factory setting	Factory setting
Door	Door alarm set/clear.

3.2 Alarms

Table 3-2 Alarms Threshold

Parameters	Remark
AC Fail	Power supply is not operating within specs. (4 seconds)
DC Fail	Power supply is not operating within specs. (4 seconds)
Fan1, Fan2 Fail	System has detected an issue with each fan. (4 seconds)
Temperature	Module is above the normal operating temperature. (4 seconds) Over Temperature [Soft: 80~87 C, Hard: Above 87 C]
Current	Power supply is not operating within specs. (4 Second) Over Current [Hard: Above 20A]
System Halt	System is in a shutdown state due to a hard fail alarm. (10 times)
DSP Fault	System has detected an issue with the internal DSP chip. (Cannot communication with DSP)
OSC	Oscillation detected. Alarm is only present when one-time oscillation check is performed.
DL Signal not detected	DL signal is below the specified level. (default: -90dBm, 4 seconds)
DL Signal Low	DL signal is below the specified level. (default: -85dBm, 4 seconds)
Input Overload	Input signal is above the threshold. (4 seconds) (Soft: DL -10dBm/UL -12dBm, Hard: DL -8dBm/UL -10dBm)
Out of band Overload	Out of band signal is above the threshold. (4 seconds) (Soft: DL -10dBm/UL -12dBm, Hard: DL -8dBm/UL -10dBm)
Synthesizer Lock Fail	Issue with internal PLL(4 seconds)
DL RF Power	Input + gain does not match the output level (default delta of 6 dB)
Overpower	Output level is above the max output levels AGC On case(Soft: AGC Level+ 1~2dB, Hard: AGC Level + >2dB) AGC Off case(Soft: max output level+ 1~2dB, Hard: max output level + >2dB)
VSWR	Power is being reflected back to the repeater. Threshold = output power - 8dB. For example, if the repeater is outputting 24dBm, then if the system detects 16dBm of return power, then the VSWR will be triggered.(Triggered in case of over +15dBm output power)
Door	Door alarm set : Door open Door alarm clear : Door close

4. INSTALLATION

4.1 Installation Procedures

4.1.1 Wall Mount Procedure

- Verify that the AXM700-9543 and mounting hole are in good condition
- Place the AXM700-9543 mounting template up against the wall and mark of mount holes
- Mount the AXM700-9543 to wall use the six (6) mounting hole on the wall mount bracket
- Connect the GND cable
- Connect the Antenna cable
- Connect the Power cable

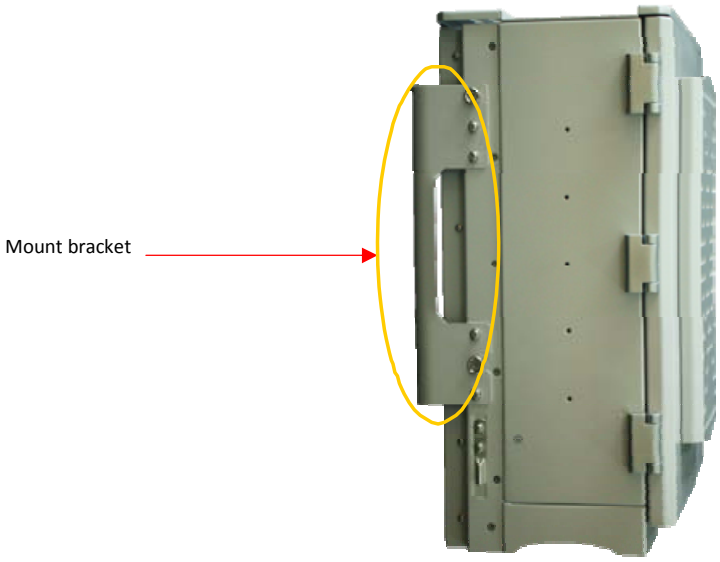


Figure 4-1 AXM700-9543 Wall Mount

4.2 Grounding

Install the ground cable that is included in the package at the back of the repeater as show in the figure below.

Figure 4-2 Ground Cable Connection

- Round ground terminals are located on the side of the repeater.

4.3 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.

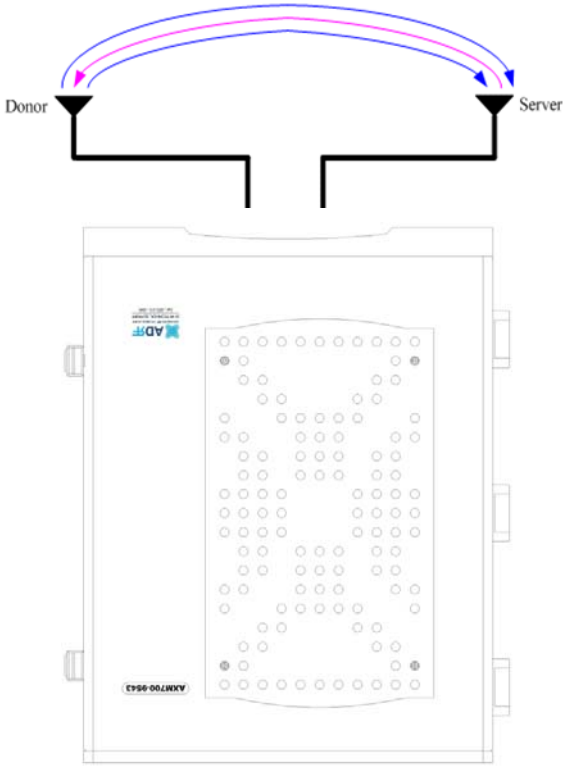


Figure 4-3 RF Repeater Oscillation

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 15 ~ 20dB greater than the maximum gain of the repeater. For example, if the gain of the repeater is 50 dB, then an isolation of 65 ~ 70dB or greater is required. In the same manner, because the AXM700-9543 has a maximum gain of 95dB in case of AXM700-9543, it requires isolation of at least 110 ~ 115dB.

4.4 Line of Sight

The donor antenna which points towards the eNode-B typically has a narrow beam antenna pattern. As a result, a slight deviation away from the direction of the eNode-B can lead to less than optimum results. In addition, obstacles between the repeater and the eNode-B may impair the repeater from obtaining any eNode-B signal. As a result, the repeater cannot transmit signal to the coverage area. Therefore, a direct line of sight to the eNode-B 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.

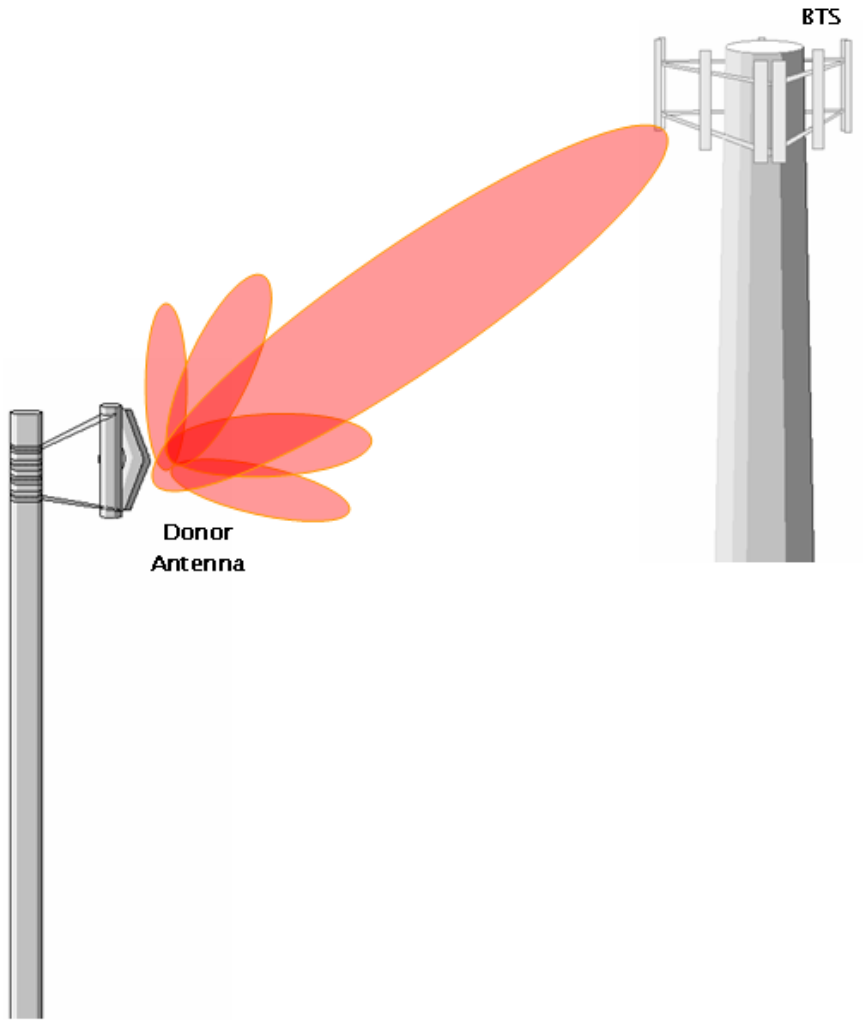


Figure 4-4 Line of Sight to the eNode-B

5 System

The System tab allows the user to perform firmware updates, upload closeout packages, view any changes to the system, backup existing configuration, and add/remove user accounts, and change the login credentials of the Administrator.

5.1 System: Account

System: Account- Account Management

The Account Management section allows 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.

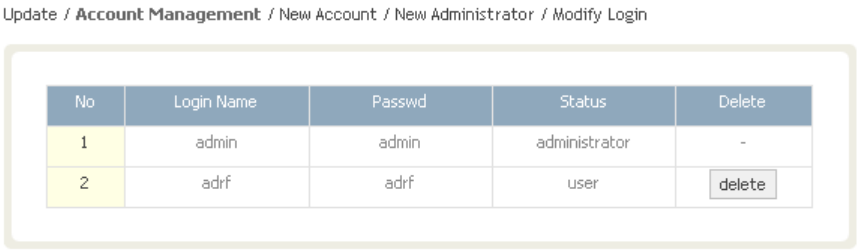


Figure 5-28 System: Account- Account Management

System: Account- 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.

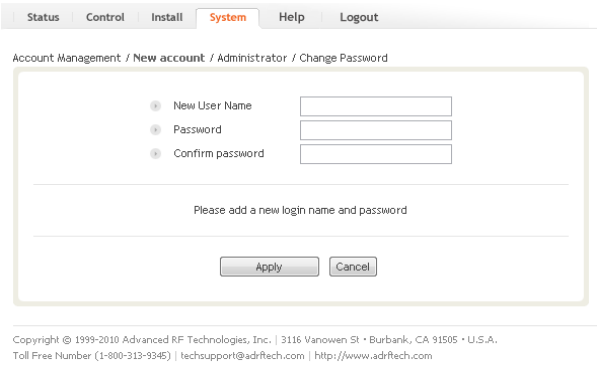


Figure 5-29 System: Account- New Account

System: Account- Administrator

The Administrator section allows the Administrator to create additional Administrator accounts. Please note that the Administrator section is only available if you are logged into the system as the Administrator.

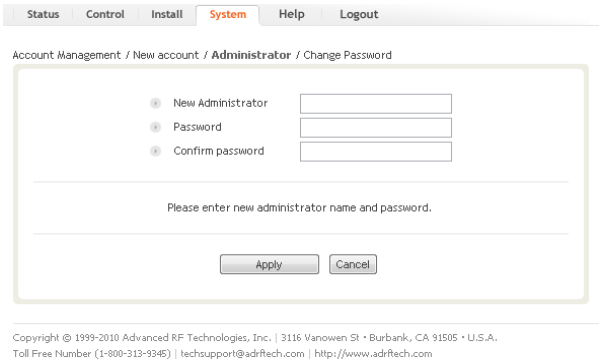


Figure 5-30 System: Account- Administrator

System: Account- Change Password

The Change Password section allows the current user who is logged into the system to change their login credentials.

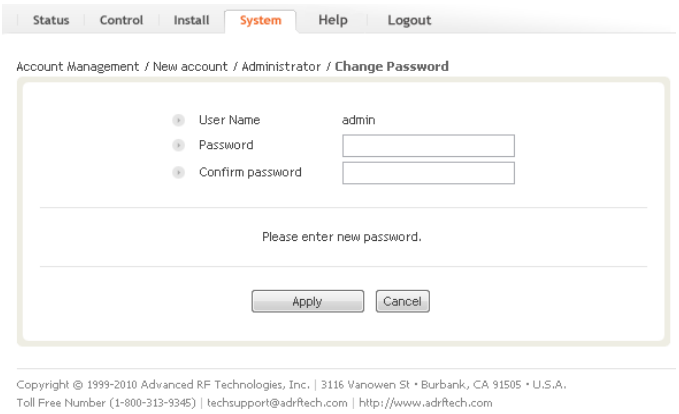


Figure 5-31 System: Account- Change Password

5.2 System- Closeout Package

The closeout package section will allow the user to upload documents to the module. The maximum file size for each upload is limited to 10 MB. The total amount of space available for uploading document is 100 MB. Please do not use this section as the primary storage location of your documents. Documents may become unavailable if the system goes down.

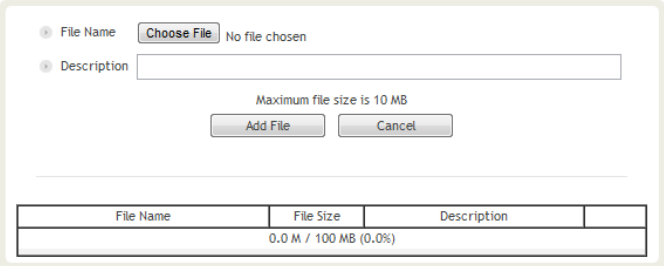


Figure 5-32 System- Closeout Package

To upload documents to the module, click on the "Choose File" or "Browse" button and locate the file that you would like to upload, then enter in a Description of the file being uploaded. Afterwards, click on the "Add File" button to upload the file. Below is what you will see after the file upload. To delete the file, click on the delete button located in the last column.

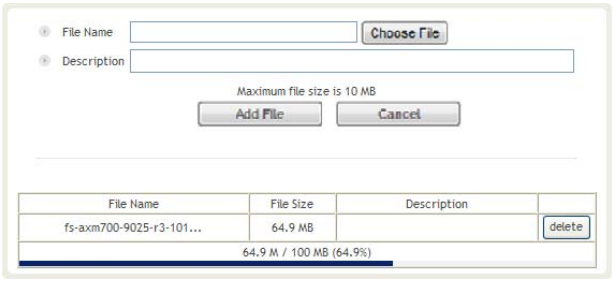


Figure 5-33 System- Closeout Package after the file upload

5.3 System- User Log

This section displays system events that have taken place. The User Log displays who has made the changes, the time and date of when the event took place, and what changes were made to the system.

User Log

Number	Date	Username	Log Message
1	06/07/2012 19:50:29	adrf	UL HPA Set On
2	06/07/2012 19:50:29	adrf	DL HPA Set On
3	06/07/2012 19:50:29	adrf	AGC Set Off
4	06/07/2012 19:49:04	adrf	Set 1st Band : 10.00 MHz(734.000 MHz/704.000 MHz)
5	06/07/2012 19:38:54	adrf	Logged-In
6	06/01/2012 11:43:49	adrf	Logged-In
7	05/29/2012 10:02:24	adrf	Logged-In
8	05/25/2012 16:05:25	adrf	Oscillation Check End
9	05/25/2012 16:03:22	adrf	Oscillation Check Start
10	05/25/2012 16:03:13	adrf	DL/UL Gain Balance Set On
11	05/25/2012 16:03:13	adrf	DL Output ALC Offset Set 7
12	05/25/2012 16:03:13	adrf	DL Output ALC Level Set 43
13	05/25/2012 16:03:13	adrf	UL Gain Set 95

Figure 5-34 System – User Log

5.4 System: Update

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

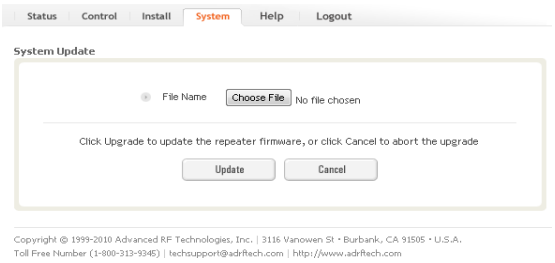


Figure 5-35 System – Update

- Click on the Choose File… 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:

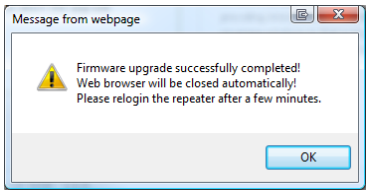


Figure 5-36 Pop-up message after System update is complete

5.5 System- Backup

The backup section allows the user to save the settings of the module. To perform the backup, click on the Backup button and you will be prompted to save the backup file. To restore the settings to the system, perform an update using this file.

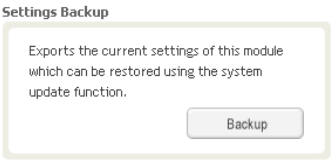


Figure 5-37 System Backup

5.6 Help

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

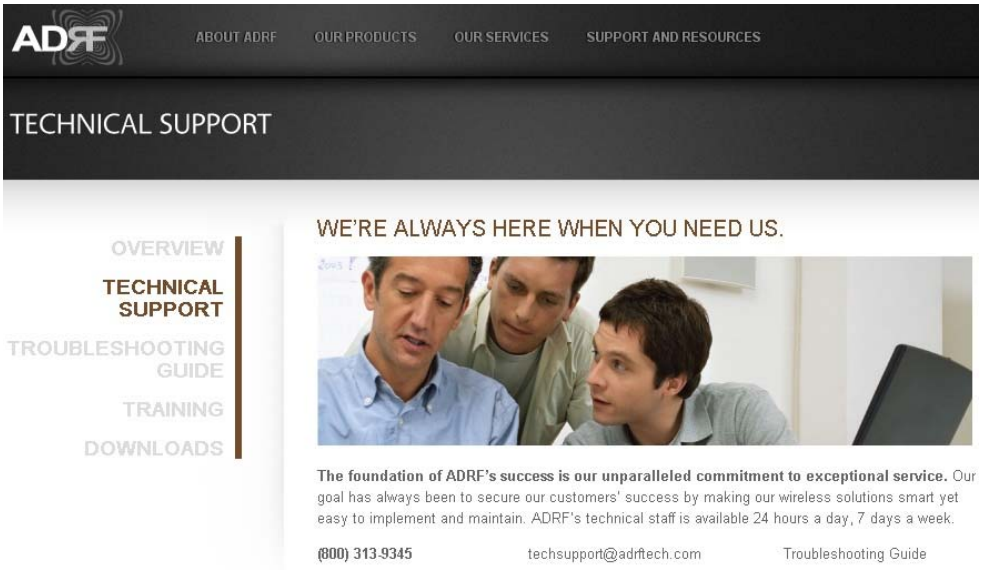


Figure 5-38 Help

5.7 Logout

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

6. MAINTENANCE GUIDE FOR AXM700-9543 REPEATER

6.1 Periodic Inspection Checklist

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

6.2 Preventive Measures for Optimal Operation

6.2.1 Recommendations

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

6.2.2 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.

7. WARRANTY AND REPAIR POLICY

7.1 General Warranty

The AXM700-9543 carries a Standard Warranty period of two (2) years unless indicated otherwise on the package or in the acknowledgment of the purchase order.

7.2 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.

7.3 Limitation of Damages

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

7.4 No Consequential Damages

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

7.5 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.

7.6 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.

y. APPENDIX

y01 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 off its HPAs permanently until a reset is performed or factory set is executed.

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 400 cm during normal operation. The gain of the antenna is 16.0 dBi. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.