EPOCH-H (HP/HC) USER MANUAL

Version 1.5

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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's Repeater Operation and Management System
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
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
iDEN	Integrated Digital Enhanced Network
IF	Intermediate Frequency
LNA	Low Noise Amplifier
MS	Mobile Station
PLL	Phased Locked Loop
PS	Power Supply
RF	Radio Frequency
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

Version 1.5 (Modified December 7, 2009)

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Revision History for Manual

Version	Author	Description	Date
1.0	G.T Kim	First Generation.	February 2007
1.1	G.T Kim	User GUI Upgrade	May 4, 2007
1.2	G.T Kim	UDC Module Upgrade	December 17, 2008
1.3	K.Y Lee	Changed UDC, Changed Digital Board, Change Manual Update	October 2008
1.4	K.Y Lee	Added Ethernet	March 27, 2009
1.5	Sun Kim	Address Change	December 7, 2009

Revision History for Hardware

Version	Author	Description	Date
1.0	Digital Part	First Generation.	February 2007
	RF Hardware	First Generation.	
2.0	Digital Part	Added Watch Dog	May 4, 2007
	RF Hardware	UDC Module Upgrade	
3.0	Digital Part	Upgrade for Internal Block	October 2008
	RF Hardware	Changed UDC, Changed Digital Board, Change Manual Update	
3.2	Digital Part	Added EVDO Detector for Input	November 2008
	RF Hardware	-	
4.0	Digital Part	Added Ethernet	March 5, 2009
	RF Hardware	-	

Revision History for Firmware

Version	Author	Description	Date
1.00	Software Team	First Generation.	February 2007
1.12		User GUI Upgrade	May 4, 2007
1.13		Added GSM Function.	
2.01		Added Watch Dog	
2.04		Added Back up Battery	
3.00.15		Firmware Unification Phase 1	February 20, 2009
3.00.16		Added GSM Function.	February 24, 2009
4.00.36		Added Ethernet	March 13, 2009

Table of Contents

Epoch−H (HP/HC) RF Repeater
User Manual V1.5

1. Introduction of Epoch-H

1.1 Introduction

Epoch-H series repeaters enhance outdoor wireless coverage in the most effective and cost efficient way. For its intelligent design and versatility, Epoch-H series repeaters are the ideal choice for wireless coverage problems outdoors.

In many large scale in-building applications, Epoch-H series repeaters can also be used (e.g. malls, campuses, stadiums, etc.) with passive antennas instead of a DAS (distributed antenna system) and offer significant cost savings.

**Using ADRF's 'High Isolation Antennas', will allow for enhanced performance by creating higher isolation. Please contact ADRF Sales for more information.

1.1.1 Highlights
EPOCH-HP
• Covers the 65 MHz PCS band, including G band
• Down Link 37, 40 or 43dBm Composite Output Power
• Up Link 27dBm max Composite Output Power
• 95 dB gain
• 30 dB AGC Range @ 0.5 dB Step
• Can Set AGC Output Power Level
• Automated installation
• Web GUI via DHCP
• Band Selectable via Web GUI
• Can Support Non-Contiguous Bands
• Supports Embedded Wireless Modem
• Supports Network Management Monitoring System via SNMP

EPOCH-HC
• Covers the 25 MHz Cellular band (AF/BF)
• Down Link 37, 40 or 43dBm Composite Output Power
• Up Link 27dBm max Composite Output Power
• 95 dB gain
• 30 dB AGC Range @ 0.5 dB Step
• Can Set AGC Output Power Level
• Band Selectable via Software
• Supports Embedded Wireless Modem
• Supports Network Management Monitoring System via SNMP

** Special band combinations are also supported in all the models.
** Please contact ADRF Sales for any special band combination request.

1.1.2 Available Models

Product ID	Description
Epoch-HP-05W	Down Link: 5 W (37dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Up Link: 0.5W (27dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Supports up to Two (2) non-contiguous band combinations (5/10 + 5/15MHz)
Epoch-HP-10W	Down Link: 10 W (40dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Up Link: 0.5W (27dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Supports up to Two (2) non-contiguous band combinations (5/10 + 5/15MHz)
Epoch-HP-20W	Down Link: 20 W (43 dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Up Link: 0.5W (27dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Supports up to Two (2) non-contiguous band combinations (5/10 + 5/15MHz)

Table 1 – Epoch-HP Models

Product ID	Description
Epoch-HC-05W	Down Link: 5 W (37dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Up Link: 0.5W (27dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Supports either AF/BF, GUI Selectable
Epoch-HC-10W	Down Link: 10 W (40dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Up Link: 0.5W (27dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Supports either AF/BF, GUI Selectable
Epoch-HC-20W	Down Link: 20 W (43 dBm) composite output power with 95 dB of gain (30 dB dynamic AGC range). Up Link: 0.5W (27dBm) composite Output Power with 95 dB of gain (30 dB dynamic AGC range). Supports either AF/BF, GUI Selectable

Table 2 – Epoch-HC Models

1.1.3 Parts List

Quantity	Description
1	Repeater
1	Ethernet Cable
1	Ground Cable
1 Set	Anchor Bolts
2 Sets	Keys
1	Documentation CD*

Table 3 – Parts List

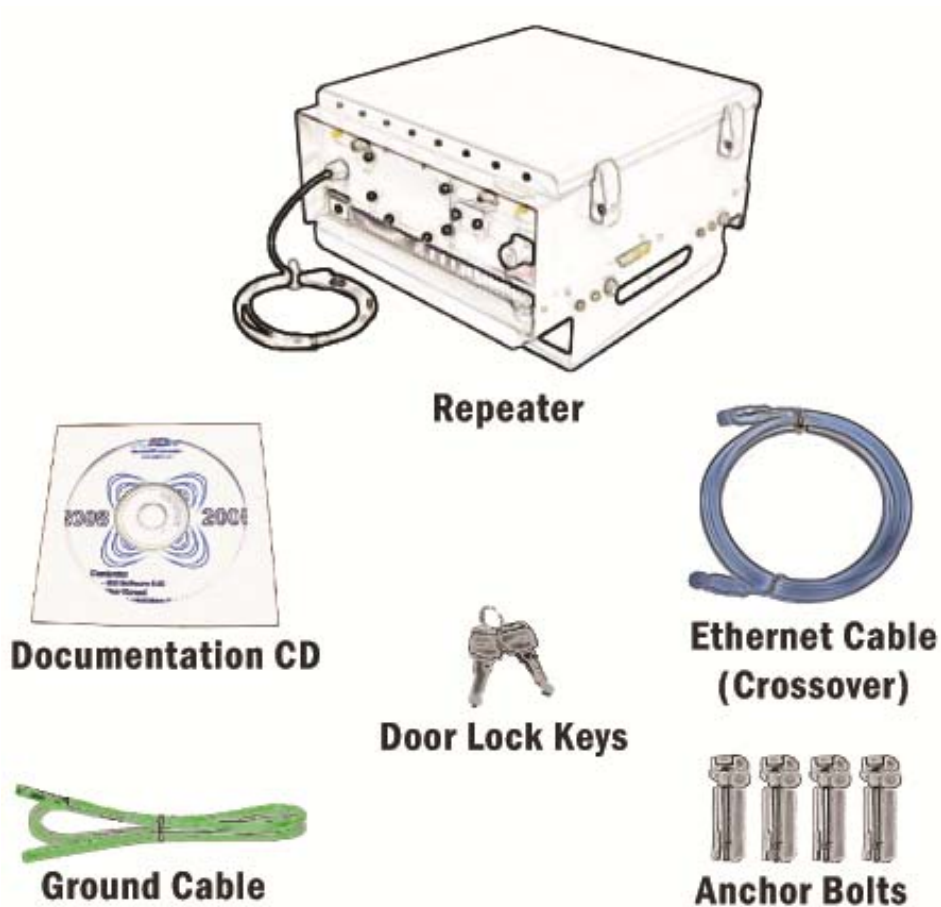
Figure 1 – Epoch-H Repeater Parts List

* CD includes: User Manual, Quick Start Guide, and Troubleshooting Guide
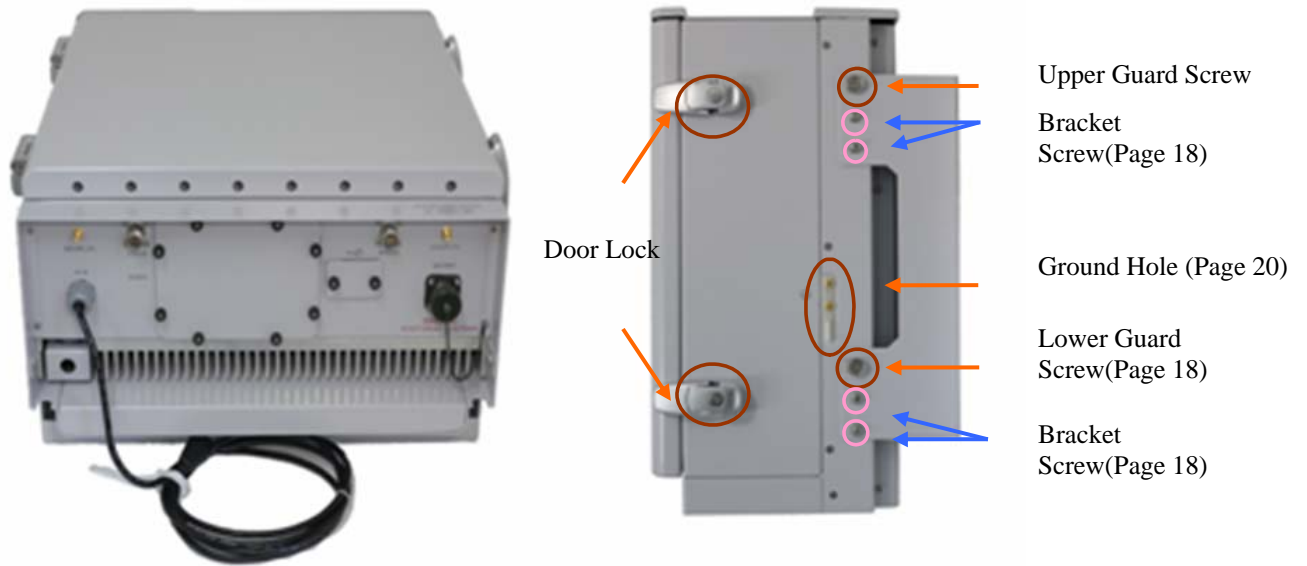
1.1.4 Repeater Quick View

Door Lock

Upper Guard Screw

Bracket Screw(Page 18)

Ground Hole (Page 20)

Lower Guard Screw(Page 18)

Bracket Screw(Page 18)

Figure 2 – EPOCH-H Front & Side Views

Server CPL Port (Page 17)   Donor Antenna Port (Page 17)

Server Antenna Port (Page 18)   Donor CPL Port (Page 17)

Modem (Page 17)

Wall Mounting Bracket (Page 18)   Anchor Bolt Hole (Page 18)

AC Power   Ethernet Port (Page 16)   Back Up Battery Port (Page 16)
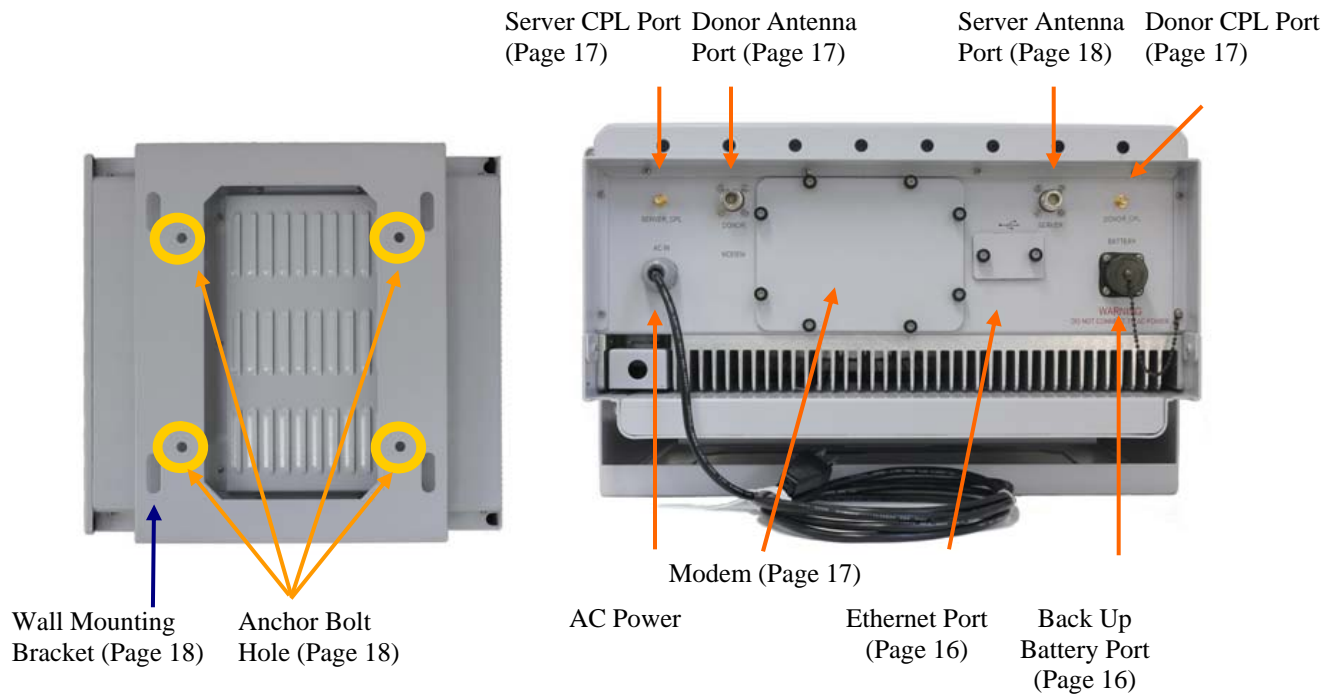
Figure 3 – Epoch-H Back, Bottom, & Top Views

Figure 4 – Epoch-H Inside Views

Back Up Battery
Switch (Page 16)

LED Display
(Page 15)

Power Switch
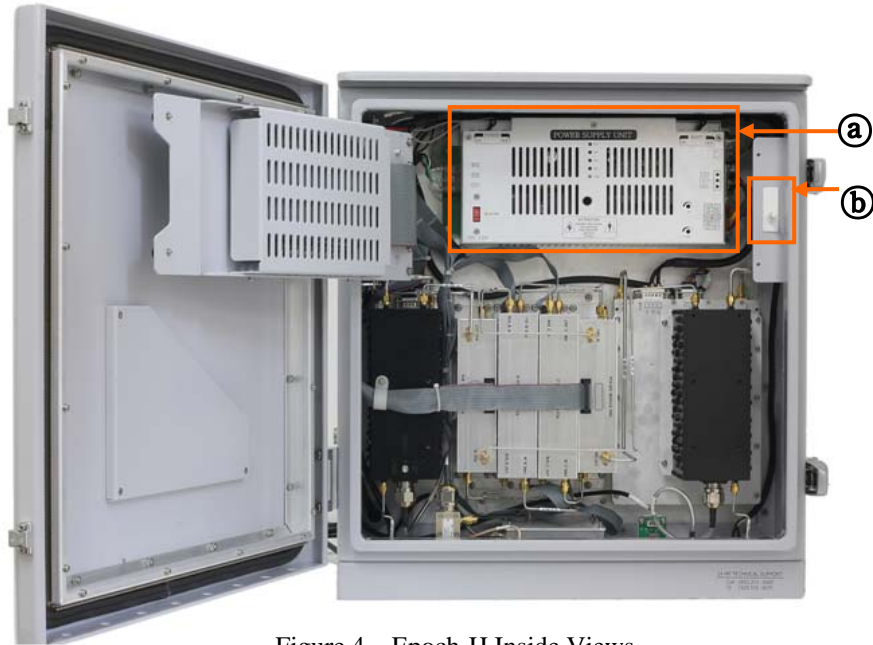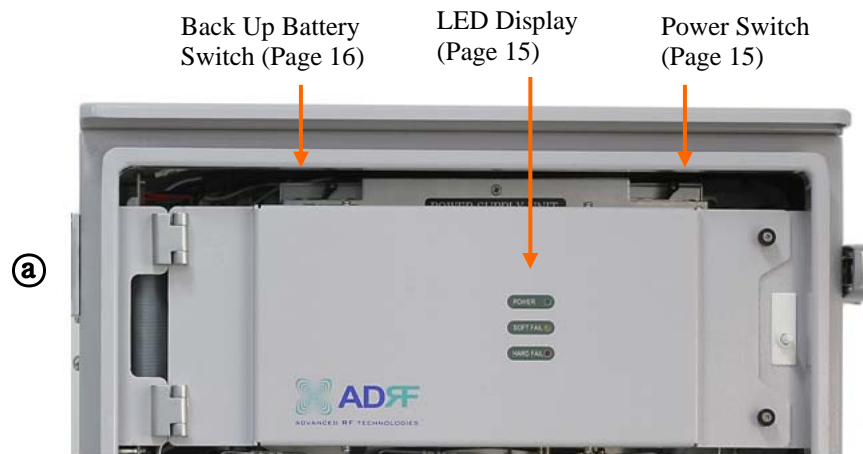(Page 15)

Figure 5 – Epoch-H Inner Door Views

Figure 6 – Epoch-H Door Switch

1.2 Warnings and Hazards

WARNING! ELECTRIC SHOCK

Opening the Epoch-H 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.
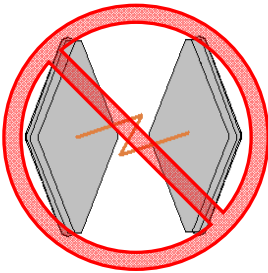
WARNING! DAMAGE TO REPEATER

Operating the Epoch-H 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 Epoch-H 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.

2. Epoch-H Overview

2.1 Switches & Indicators

2.1.1 LEDs

Epoch-H has three LEDs on the Inner Control Board panel of the repeater as shown below in Figure 7.

Figure 7 – Epoch-H Repeater LED View

POWER

If the LED is lit GREEN, it indicates that there is AC power to the repeater.

SOFT FAIL

If the LED is lit YELLOW, it indicates that there is a soft fail alarm in the system. The detailed alarm information can be viewed via the local User GUI. In the event of a soft fail alarm, the repeater will still function, but the alarm needs to be addressed promptly.

HARD FAIL

If the LED is lit RED, it indicates that there is a hard fail alarm in the system. The detailed alarm information can be viewed via the local Web GUI. In the event of a hard fail alarm, the repeater will not function and immediate attention is required.

2.1.2 AC Power Switch

Figure 8 – AC Power Switch

The AC Power on/off switch is located on the inside of repeater (Figure 8).
The switch should be powered on after the repeater has been installed properly.

2.1.3 Back Up Battery Switch & Battery Port

Figure 9 – Battery Switch & Battery Port

The Battery Switch can be used to provide power to the optional External
Backup Battery (Figure 9).

Before connecting the Battery Box to the Repeater, make sure that the
Repeater is powered OFF and that the AC Cable is not plugged into the outlet.
Likewise, the Battery Box's Circuit Protector Switch should always be turned
OFF.
 (WARNING: 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.)

2.1.4 Ethernet Port

Figure 10 shows the Ethernet port is used to interface with the unit via RJ-45 crossover cable. Please set your network card to Obtain IP Address automatically and the repeater will assign an IP Address via DHCP.
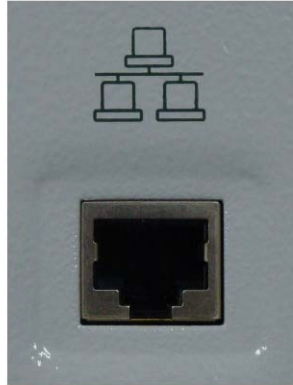

Figure 10 – Ethernet Port

2.1.5 Modem Module

Figure 11 shows the Modem Module that is used to interface with the unit via modem. The modem will allow for remote configuration and monitoring via SNMP.

Figure 11 – Modem Module

2.1.6 Other Ports

- **Donor Antenna Port**
  Connect Donor Antenna.

- **Donor CPL Port**
  You can check Donor output power.

- **Sever Antenna Port**
  Connect Sever Antenna.

- **Server CPL Port**
  You can check Donor output power.

2.2 Installation

2.2.1 Tools

No special tools or equipments are needed to install the Epoch-H

2.2.2 Procedure

Eight mounting holes are located on the wall-mounting bracket to attach it to the wall. The wall bracket must be securely attached to sufficiently carry the weight of the Epoch-H, which is bolted to the wall bracket through the four aligned mounting holes.

The following steps should be followed while mounting the repeater:

Installation Procedure

① Take the Epoch-H out of the box
② Using the six anchor bolts, mount the bracket on the wall
③ Make sure the bracket is securely mounted
④ Slightly tilt the repeater and mount the repeater onto the wall as shown in the picture. Hook the upper 2 guard screws first and then slide/push in the lower 2 guard screws into place.
⑤ Make sure the Epoch-H is securely placed onto the wall bracket
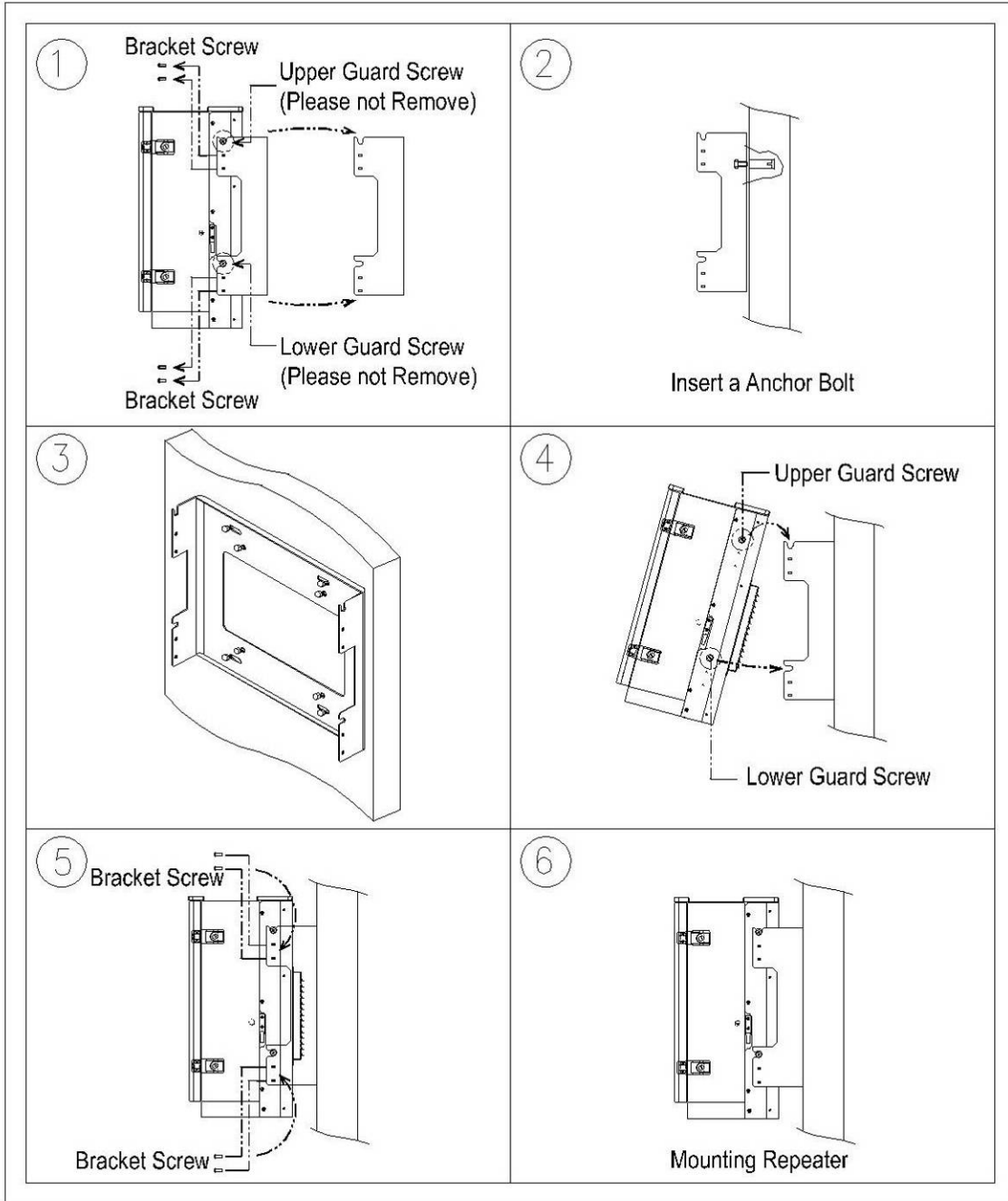⑥ Fasten the 8 bracket screws back properly
⑦ Inspect that everything is secure

Figure 12 – Repeater Mounting Instructions

2.2.3 Grounding

A ground cable is included in the packaging and should be properly connected to the repeater as shown below.

Figure 13 – Ground Cable Connection

2.3 Antenna Separation/Isolation

Separation between antennas is necessary to prevent oscillation. Oscillation occurs when the signal entering the system continually re-enters, 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.
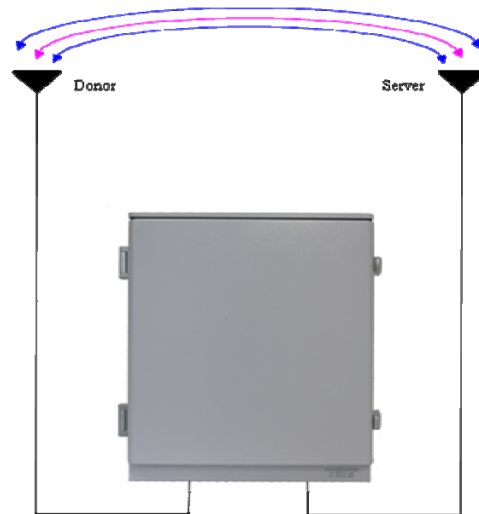
Figure 14 - RF Repeater Oscillation

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 Epoch-H has a maximum gain of 95 dB, it requires an isolation of at least 108 ~ 110 dB.

2.4 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.
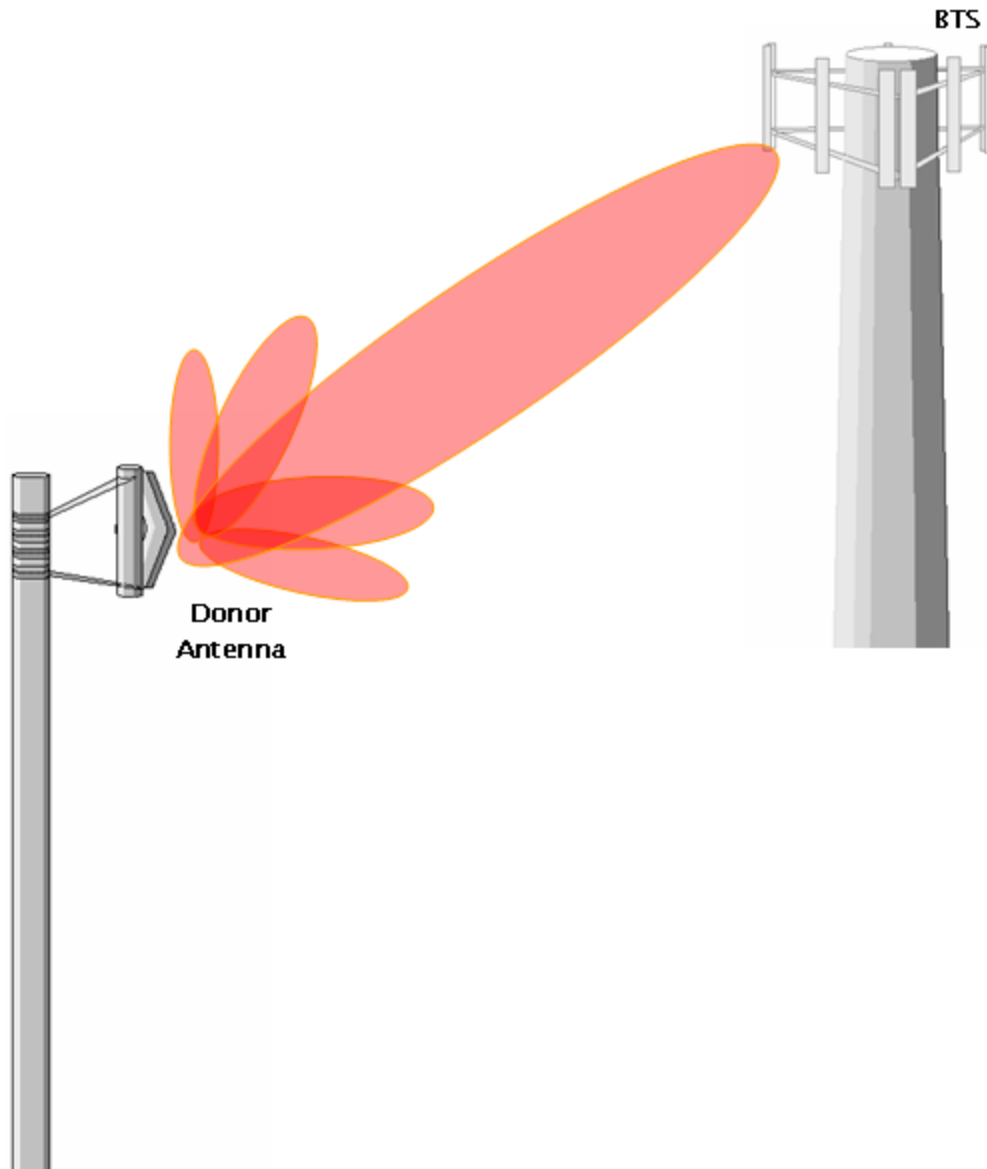
Figure 15 - Direct Line of Sight to the BTS

3. Epoch-H AROMS Setup

3.1 Repeater/PC Connection Using AROMS

i) Wait until the Power LED is lit in green. Connect the LAN cable between the laptop's Ethernet port and the repeater's Ethernet port.

Note: Under Local Area Connection in Network Settings, make sure to select **Obtain an IP address automatically** under Internet Protocol (TCP/IP) properties.
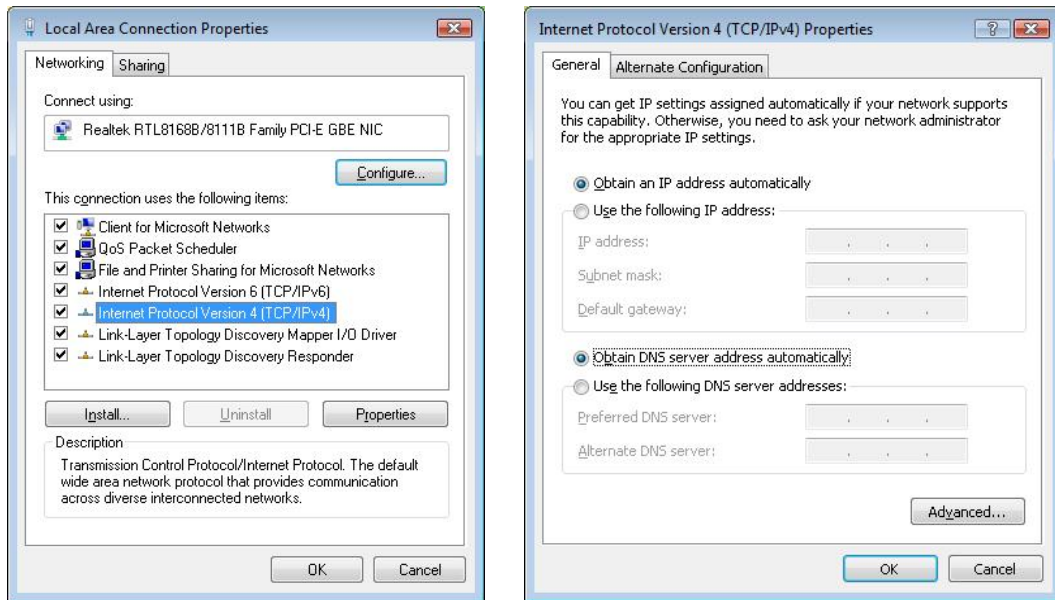
** Before proceeding to the next step, please close the cabinet door (do not lock) at this time in order to avoid inadvertent RF feedback going inside the repeater."

ii) Launch Microsoft Internet Explorer (Version 6.0)

Note: ADRF's Web GUI has not been tested for compatibility with any other web browsers (e.g. Netscape, Firefox, Mozilla, etc.).

iii) Please type the following IP address into the address bar of MS Internet Explorer:

http://192.168.63.1/home.asp

iv) The following login screen will appear:
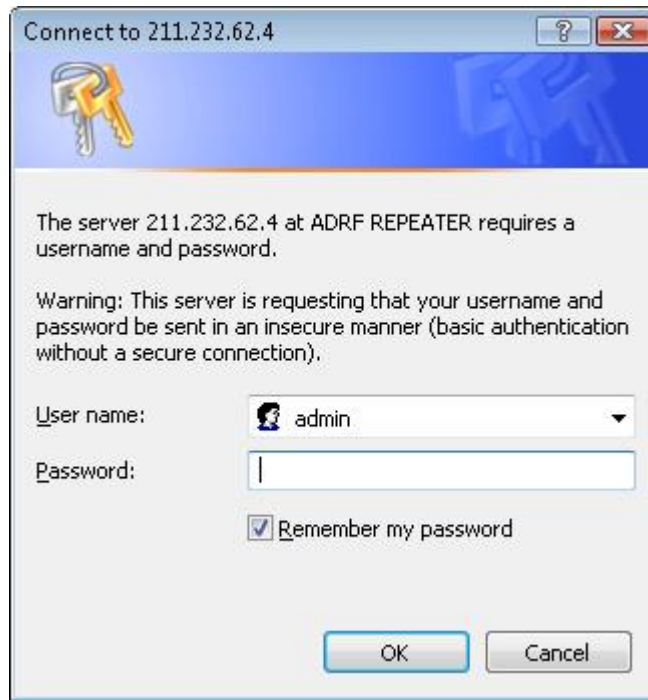
If you are not the Super-User, please type in your assigned username & password which you should have received from the Super-User.

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

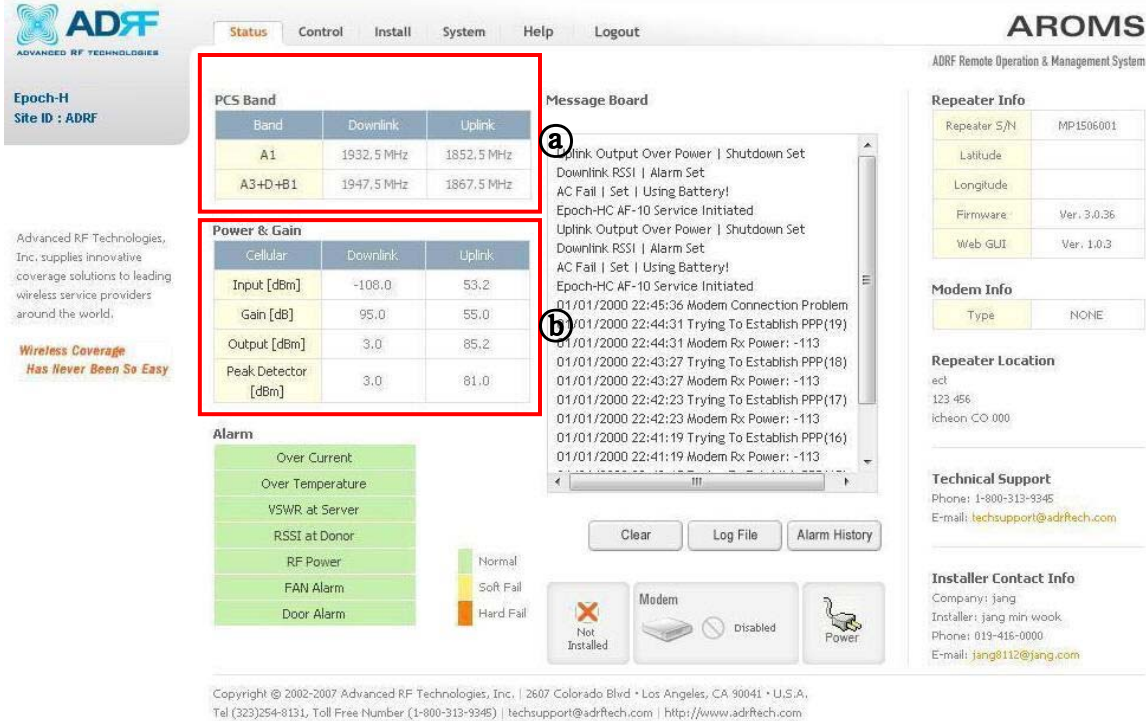If the username & password is typed in incorrectly, the following screen will appear:
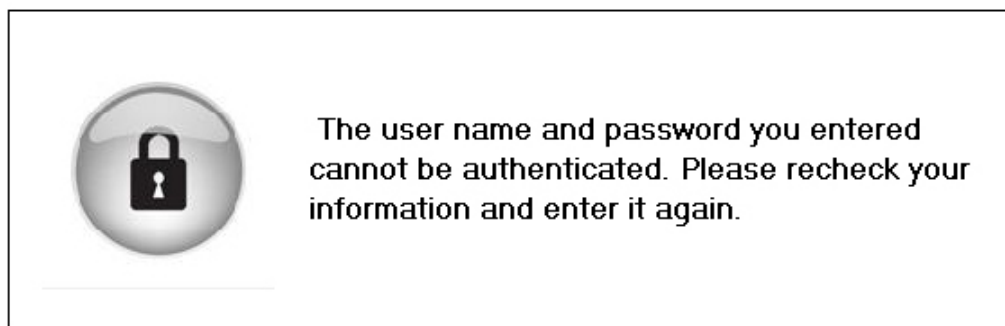
** If you cannot connect to the Web GUI, please see the LAN Connectivity Troubleshooting Guide on Page 36.

3.2 Repeater Status
3.2.1 Epoch-HP

If you click on Status tab, the following window will appear:

In this window, the user can view the following:

(To change any parameters, e.g., PCS Sub-Bands, Instantaneous Band Width, Gain Settings, AGC Level, etc., you must go to the **Install** or the **Control** window.)

- CDMA Band: Will display the center frequencies of the 1900 MHz spectrums on the downlink and uplink respectively.

- Power & Gain: Will display the repeater input, gain and output power on the downlink and uplink.

3.2.2 Epoch-HC

If you click on Status tab, the following window will appear

In this window, the user can view the following:
(To **change** any parameters, e.g., Instantaneous Band Width, Gain Settings, AGC Level, etc., you must go to the **Install** or the **Control** window.)

- **Cellular Band**: Will display the center frequencies of the 800 MHz spectrums on the downlink and uplink respectively.

ⓐ

Cellular Band

Band	Downlink	Uplink
A"+A	874.5 MHz	829.5 MHz
A'	890.75 MHz	845.75 MHz

- **Power & Gain:** Will display the repeater input, gain and output power on the downlink and uplink.

ⓑ
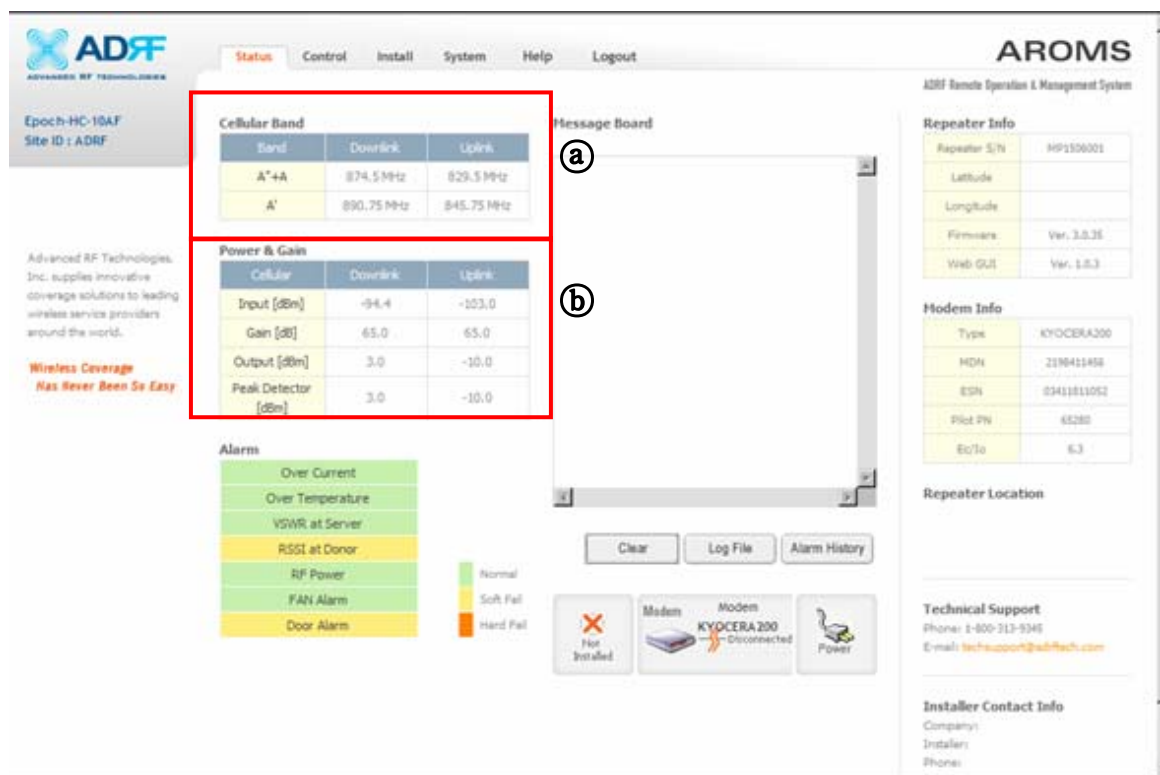
Power & Gain

Cellular	Downlink	Uplink
Input [dBm]	-93.6	-102.0
Gain [dB]	65.0	65.0
Output [dBm]	3.0	-10.0
Peak Detector [dBm]	3.0	-10.0

- **Alarm**: Will display seven alarms with three different status conditions (Normal, Soft Fail or Hard Fail). Door Open: Soft fail alarm
- **Message Board**: Will show up to recent 20 log messages (Alarms & Heartbeats).
- **Installation**: Will display repeater's installation status (Not Installed or Installed).
- **Repeater Info**: Will display repeater's serial number, and location information (latitude and longitude coordinates).
- **Repeater Location**: Will display the address where the repeater is installed
- **Technical Support**: Will display ADRF's technical support contact information.
- **Installer Contact Info**: Will display the installer's name, phone and e-mail address.
- **Modem** *(only applicable if a wireless modem is connected to the repeater)*
  The *Auto Connection* box needs to be checked when the wireless modem is installed inside the repeater. A wireless modem is used in order to send the alarms and the heartbeat over the air to the Wireless Provider's NOC.

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

3.3 Repeater Control

If you click on **Control** tab, the following window will appear:
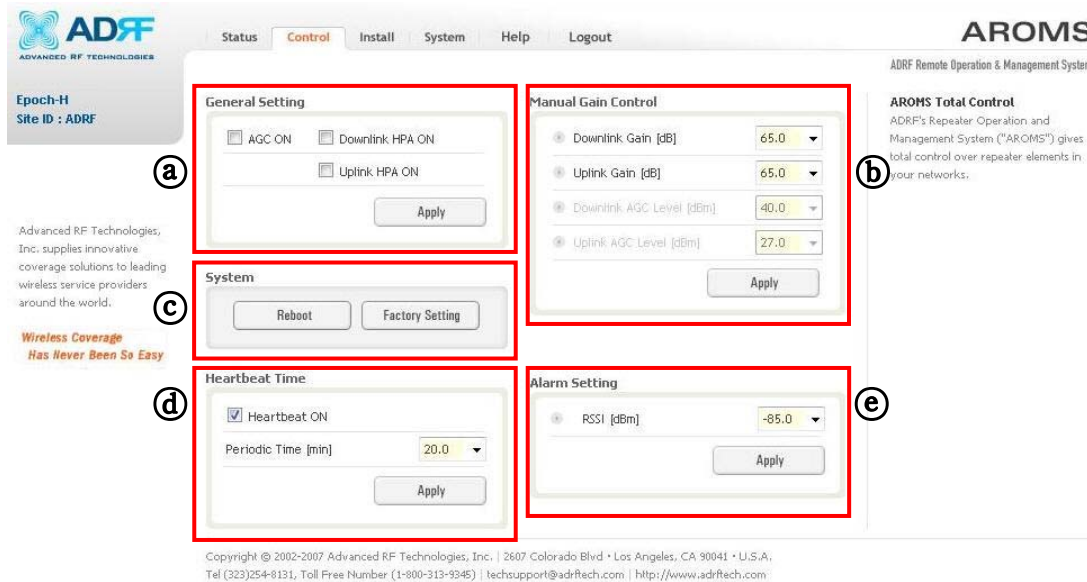
In this window, the user can adjust the following parameters:

ⓐ General Setting

- Automatic Gain Control (Default mode is Off)
- Downlink HPA on/off (Default mode is Off)
- Uplink HPA on/off (Default mode is Off)

AGC Mode
AGC (Auto Gain Control) adjusts the variable gain of the repeater to ensure a constant specified output power of 37, 40 or 43 dBm (depending on the Epoch-H model). The functionality of the AGC feature is assured under the condition that the input BTS signal is within the specified AGC range and that sufficient isolation exists between antennas.   By default, the *AGC ON* box is checked. To manually change the gains in both the links, *AGC ON* must be unchecked.

ⓑ **Manual Gain Control**

➔ - Downlink Gain Control (65 to 95 dB @ 0.5 dB step)

➔ - Uplink Gain Control (65 to 95 dB @ 0.5 dB step)

➔ - Downlink AGC Level
   Epoch-H-5W: 10 to 37 dBm @ 0.5 dB step, default value: 37 dBm
   Epoch-H-10W: 13 to 40 dBm @ 0.5 dB step, default value: 40 dBm
   Epoch-H-20W: 16 to 43 dBm @ 0.5 dB step, default value: 43 dBm

➔ - Uplink AGC Level
   Epoch-H-5 / 10 / 20W: 0 to 27 dBm @ 0.5 dB step, default value: 27 dBm

ⓒ **System**
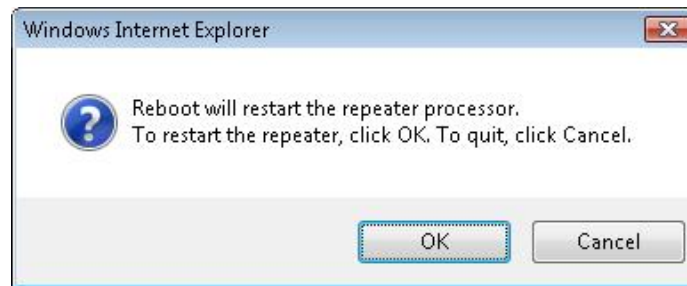- If you click the **Reboot** button, the following message box will appear:
When the system reboots, the latest settings will be saved.
Please wait approximately 30 seconds to 1 minute for the system to reboot.

- If you click the **Factory Setting** button, the following message box will appear:
Factory setting will erase the saved settings by the user and change all the
parameters to the factory default settings.
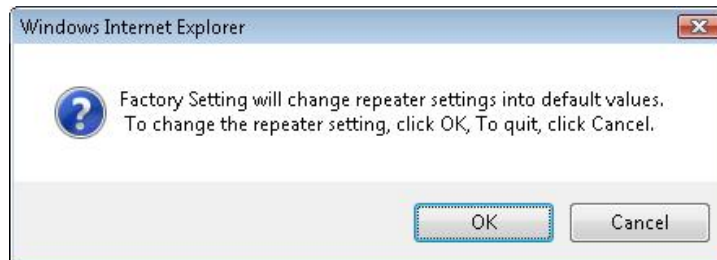
ⓓ **Heartbeat Time**

- Heartbeat on and off (Default mode is On)
- Heartbeat periodic time (Range: 1 to 59 min @ 1 min step, default period is 20 min)

Control Item	Action	Setting Value
Heartbeat ON/OFF	Set Heartbeat Mode	ON/OFF
Periodic Time	Set Heartbeat Time	1 ~ 20 min @ 1 min step
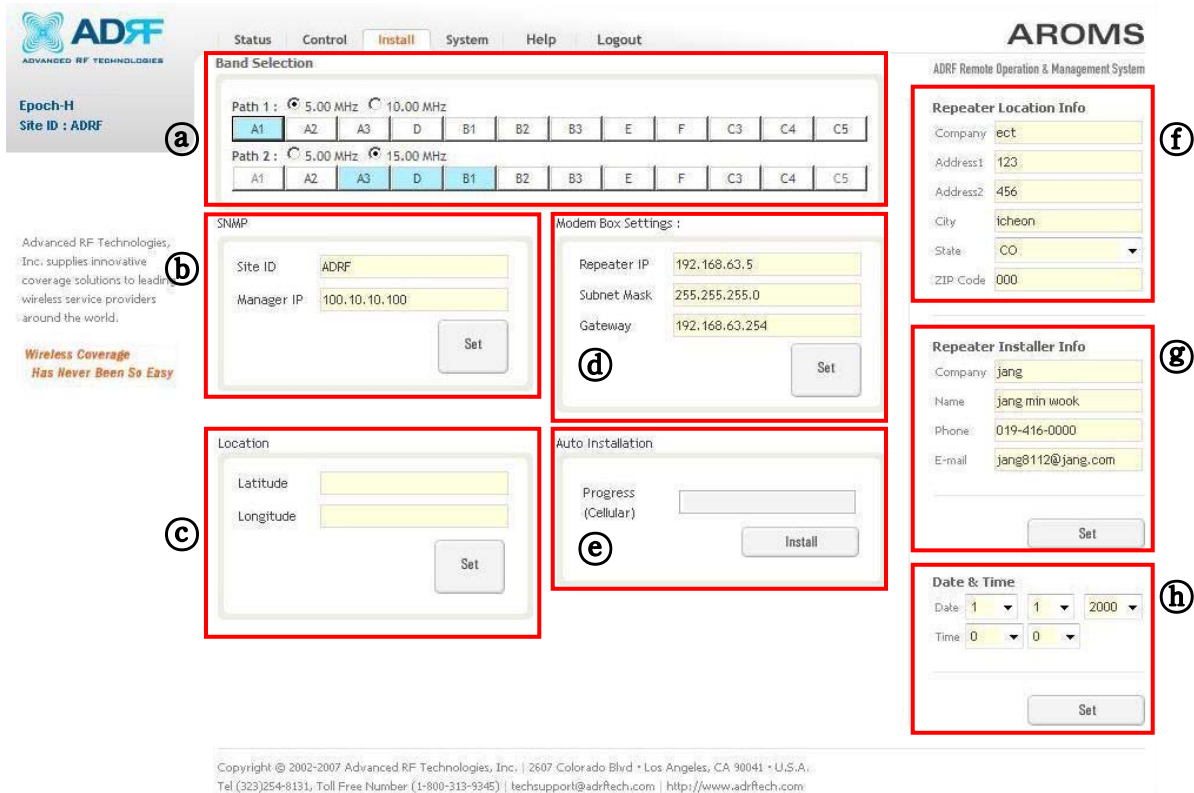
ⓔ **Alarm Setting**

- RSSI Alarm at Donor (-100 ~ -50 dBm @ 0.5 dB step, default value: -85 dBm)
- The RSSI alarm is the minimum RSSI value that the Epoch-HP requires to ensure optimal coverage. The RSSI alarm will go off when the RSSI is lower than the threshold value (refer to the RSSI value in the Alarm Setting Window).
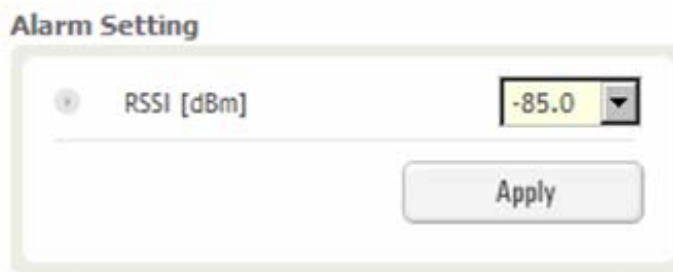
3.4 Repeater Install
   3.4.1 Epoch-HP

If you click on the **Install** tab, the following window will appear:

ⓐ **Band Selection**

Simply click on the desired operating bandwidth.

The Epoch-HP has two independent RF paths: Path 1 and Path 2. Path 1 supports 5 MHz bandwidth or 10MHz bandwidth. Path 2 supports 5 or 15 MHz bandwidths.
One can use only one Path (single band: Path 1 or Path 2), any of the two Paths (two contiguous or non-contiguous sub-bands: Path 1 and Path 2), or both paths
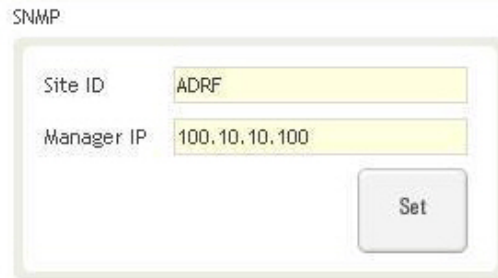
(two contiguous or non-contiguous sub-bands: Path1and Path 2).   Therefore, the instantaneous bandwidth that the Epoch-HP supports is 5, 10, 15, 20 or 25MHz.

ⓑ **SNMP**

Type in the assigned Site/Cascade ID and Manager IP Address.
Default Site ID is ADRF.
Default Manager IP address 100.10.10.100

ⓒ **Repeater Location**

Please type in the physical address where the repeater is installed.
Ex) Latitude: E/W (Upper Case) 034.123456
      Longitude: N/S (Upper Case) 034.123456

ⓓ **Repeater Static IP**: Will display the Repeater's Static IP Address, Subnet Mask, and Gateway. This information is necessary when using the Repeater in conjunction with the External Modem Box. Default values are:
   Repeater IP: 192.168.63.5
   Subnet Mask: 255.255.255.0
   Gateway: 192.168.63.254

ⓔ **Auto Installation**

Click the Install button to automatically setup the repeater.
It may take up to 3 minutes to complete the process. You will see a gradual progress bar display. After the process is completed, a pop-up window will display "*Installation Successfully Completed*" message.

Click on Status tab, the Installation box now changes from "Not Installed" to "Installed."

If the Epoch-HP detects a problem during the installation process, it will show a prompt message, e.g., "Modem is not detected." Please follow the instructions and address the problem to finish the installation process.
If the problem persists, please contact our technical support.

Auto Installation

Progress
(Cellular)
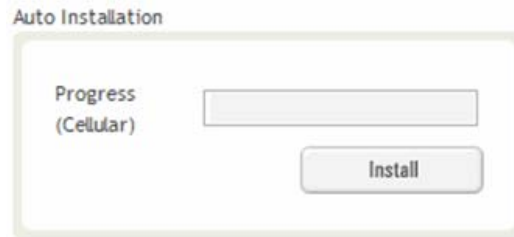
Install

ⓕ **Repeater Location Info**
Please type in the physical address where the repeater is installed.

Repeater Location Info

Company
Address1
Address2
City
State   Select one
ZIP Code

ⓖ **Repeater Installer Info**
Please type in the installer's name, phone number and e-mail address for technical support.

Repeater Installer Info

Company
Name
Phone
E-mail

Set

ⓗ **Date and Time**: Sets the date and time for the internal clock (required for Log Messages)

3.4.2 Epoch-HC

If you click on the **Install** tab, the following window will appear:
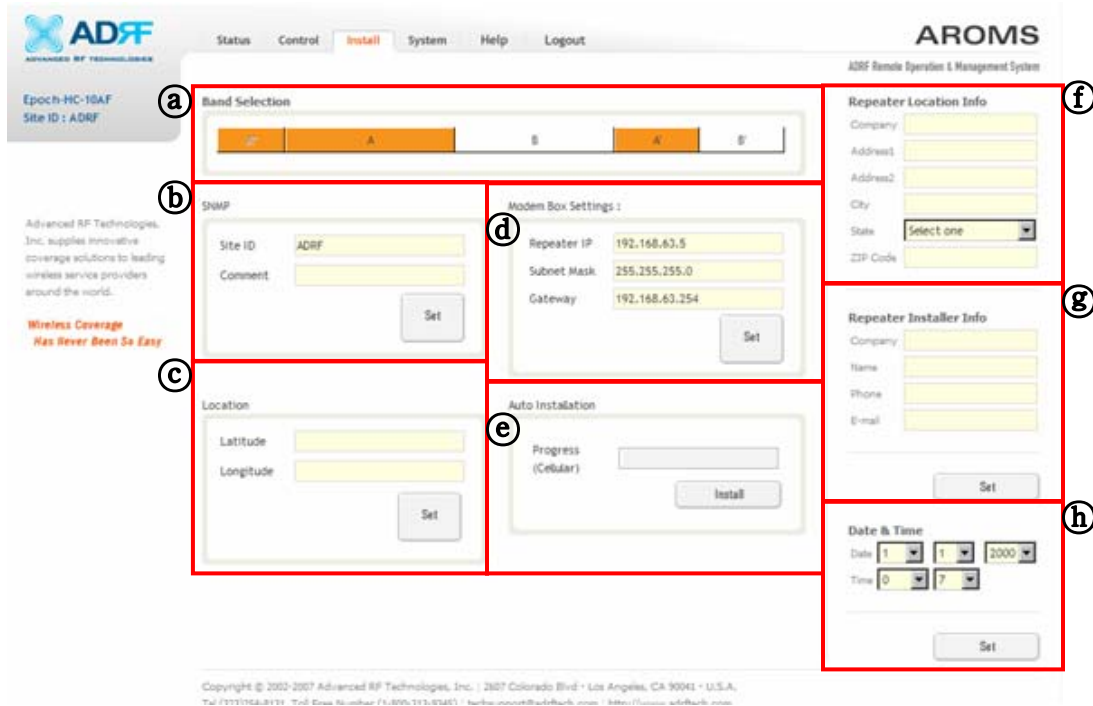
ⓐ **Band Selection**

Simply click on the desired operating bandwidth. The selected band will be highlighted in orange. To de-select, click again on the undesired band. The de-selected band will turn back white. Please see below Band Selection screen shot.

Path 1 supports A"+A +A' bandwidth;

Path 2 supports B+B' bandwidths; Band Selection

ⓑ **SNMP**

Type in the assigned Site/Cascade ID and Manager IP Address.
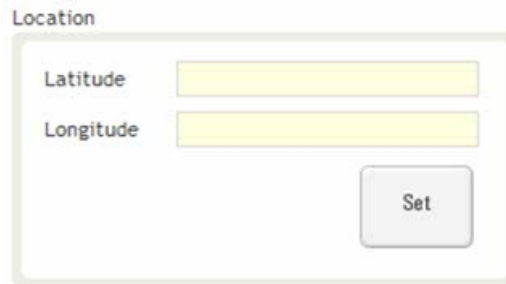Default Site ID is ADRF.
Default Manager IP address is 100.10.10.100

ⓒ **Location**

Please type in the physical address where the repeater is installed.
Ex) Latitude: E/W (Upper Case) 034.123456
Longitude: N/S (Upper Case) 034.123456

ⓓ **Repeater Static IP**

Will display the Repeater's Static IP Address, Subnet Mask, and Gateway.
This information is necessary when using the Repeater in conjunction with the
External Modem Box. Default values are:
Repeater IP: 192.168.63.5
**Subnet Mask**: 255.255.255.0
Gateway: 192.168.63.254

ⓔ **Auto Installation**

Click the Install button to automatically setup the repeater.
It may take up to 3 minutes to complete the process. You will see a gradual
progress bar display. After the process is completed, a pop-up window will
display "*Installation Successfully Completed*" message.
Click on Status tab, the Installation box now changes from "Not Installed" to
"Installed."
If the Epoch-HC detects a problem during the installation process, it will show
a prompt message, e.g., "Modem is not detected." Please follow the
instructions and address the problem to finish the installation process.
If the problem persists, please contact our technical support

ⓕ **Repeater Location Info**

Please type in the physical address where the repeater is installed.

ⓖ **Repeater Installer Info**

Please type in the installer's name, phone number and e-mail address for
technical support.

ⓗ **Date & Time**

Sets the date and time for the internal clock (required for Log Messages)

3.5 Repeater System

If you click on the **System** tab, the following window will appear:

Note: If you are the Super-User, you will see account management section under the System Window. If you are a general user, you will not be able to see the account management portion.

Only the Super-User can add, delete and modify a user. The following window illustrates how a new user can be added by simply clicking on New Account.
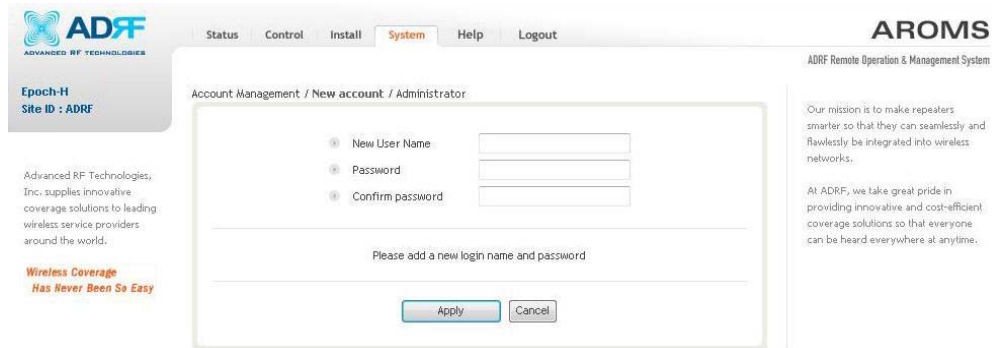
The following window illustrates how the administrator can be changed by simply clicking on Administrator.
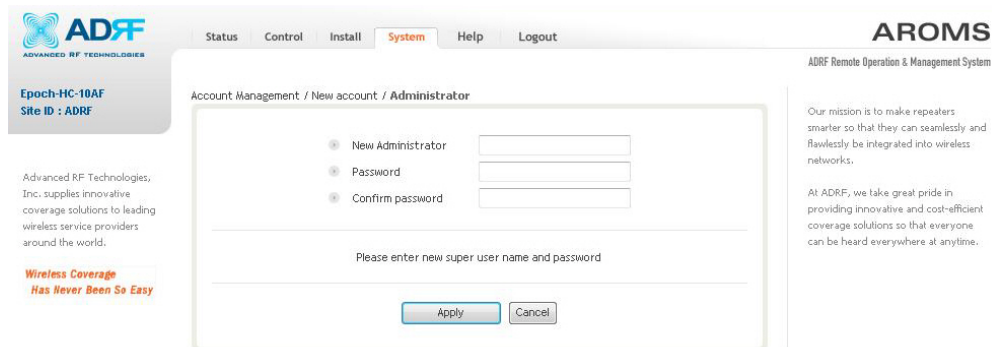
Firmware Upgrade

If you click on Firmware Upgrade, the following window will appear. You can browse through your PC and locate the firmware file. Once it's selected, simply click on Update and it'll upload the latest firmware automatically and close the session. You will need to re-login again.
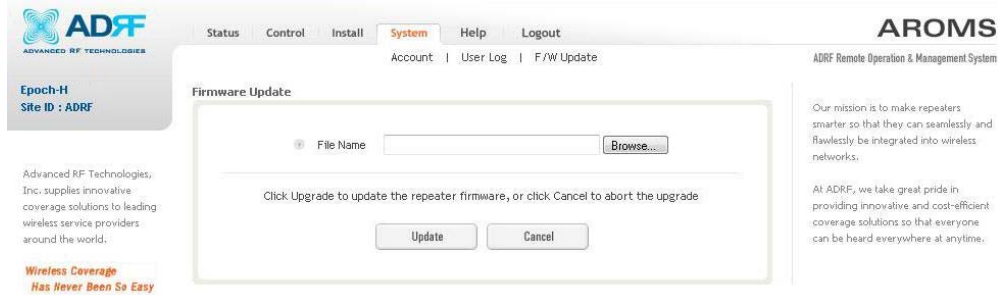
After the firmware update process in done, you will see the following pop-up window
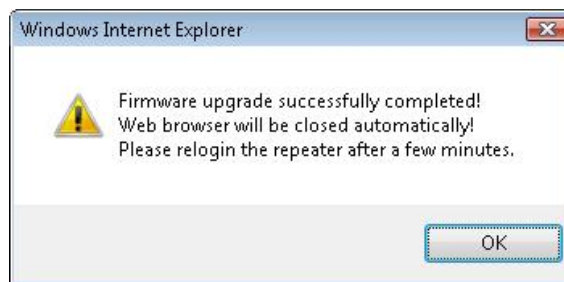
4. Maintenance Guide for Epoch-H

4.1 Periodic Inspection Checklist
    4.1.1 Check for loose connections between the repeater and antennas. If connections are loose, make sure that all connections are tightly fastened properly.
    4.1.2 Cables and connectors are in good condition.
    4.1.3 Ensure that the repeater brackets are in good condition and that the repeater is securely fastened.

4.2 Preventive Measures for Optimal Operation

    4.2.1 Recommendations
- Perform the Periodic Inspection Checklist quarterly or semiannually.

    4.2.2 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.

5. Epoch-H Series Troubleshooting Guide

5.1 Connectivity Guide for LAN
∴ If you cannot connect to the Web GUI, please follow the steps listed below:

i) If you see the icon below (Figure 16)

Figure-16

- Check the Power Line to see whether or not the repeater is being powered correctly.
- Use the Cross-over Cable that came with the repeater to connect the repeater to your laptop. If you still cannot connect, replace the cross-over cable with another one.
- If unsuccessful, power the repeater down and wait for at least 5-10 seconds for it to electrically discharge, then power the repeater back up. Wait for the PWR LED to light up before attempting the IP address in browser again. (When the repeater powers up, you will hear a faint click)

ii) If you see the icon in Figure 17, then the computer is in the process of obtaining an IP Address and you will not be able to connect to the unit. Once you see the icon in Figure 18 then you can attempt to connect to the unit.

Figure-17

Figure-18

- If unsuccessful: Go to Start ->Control Panel or Start ->Settings ->Control Panel.

Double-Click Network Connections-> Right-Click Local Area Connection ->Left-Click Properties ->Scroll down to the bottom of the list ->Double-Click Internet Protocol (TCP/IP)

Instead of "Obtain an IP address automatically", please select "Use the following IP address" and input the following values:

IP address: 192.168.63.2
Subnet mask: 255.255.255.0

iii) If you see the icon in Figure 19, then the IP Address has been obtained. If you see this icon and still cannot connect to the unit, then please follow the steps listed below.

Figure-19

Verify HOST/REMOTE switch is set to the HOST mode.
- When the unit is set to Host Mode, the IP address for the unit is 192.168.63.1
- When the unit is set to Remote Mode, the IP address for the unit is 192.168.63.5
Please note the only time 'REMOTE' mode is utilized is for modem box monitoring.

iv) Use Microsoft Internet Explorer (Version 6.0 or above) to log into Web GUI

Note: ADRF's Web GUI is not compatible with other web browsers such as Netscape, Firefox, Mozilla, Opera, etc.
Please type the following IP address into the address bar of MS Internet Explorer:
http://192.168.63.1/home.asp or http://192.168.63.1/

- The following login screen will appear:

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

The user name and password you entered cannot be authenticated. Please recheck your information and enter it again.
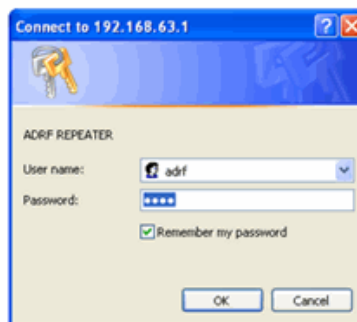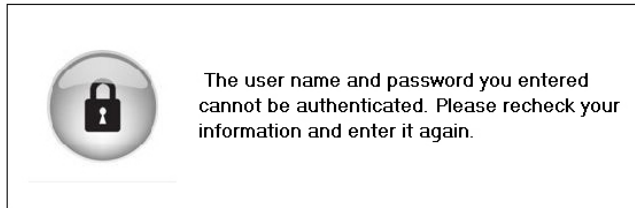
Login

v) If the steps above do not remedy the situation and you still cannot connect to the Web GUI, then follow these steps:

a. Verify that the switch is set to Host

b. Switch the network adapter back to "Obtain IP Address Automatically", which can be done by going to the Start Menu ->Control Panel -> Double-click Network Connections ->Right-click Local Area Connection ->Left-click Properties ->Scroll down to the bottom of the list ->Double-click Internet Protocol ->Select "Obtain an IP address automatically"-> click OK

c. Power down the repeater and wait at least 10 seconds

d. Power down the laptop and wait at least 10 seconds

e. Verify that a cross-over network cable is connected to the unit and laptop

f. Power up the repeater and wait 30 seconds

g. Power up your laptop

h. Launch Internet Explorer and in the address bar input http://192.168.63.1/

5.2 Troubleshooting Guide for Repeater

Alarm	Status	Parameter				Troubleshooting
VSWR	Hard Fail	VSWR Over 3:1				1. Make sure connectors are tight at each port. Sweep lines. 2. Use a 50 Ω dummy load, connect it to the Alarming Port to check whether the repeater is faulty. (e.g. if the Down Link is alarming, connect the dummy to the Server Port.) 3. If multiple Server Antennas are connected, connect only one antenna and recheck the Alarm. If the Alarm clears, faulty connectors like combiners/ splitters in the serving line and lightning arrestors (polyphasers) may be causing the problem.
Over Power	Soft Fail	UL/DL	Epoch-H(5Watt)	37dBm~38dBm	>Max Output Power+1dB	1. Check Input/Gain/Output values in the 'Status Page' 2. Check Input Level (If the input exceeds the max rated power, add an Attenuator to the input/ Donor port) 3. Check whether AGC is On (In the case of UL Shutdown, make sure that Tracking is OFF) 4. Factory Setting & Reboot
			Epoch-H(10Watt)	40dBm~41dBm		
			Epoch-H(20Watt)	43dBm~44dBm		
	Hard Fail	UL/DL	Epoch-H(5Watt)	37dBm~39dBm	>Max Output Power+2dB	
			Epoch-H(10Watt)	40dBm~42dBm		
			Epoch-H(20Watt)	43dBm~45dBm		
RF Power	Soft Fail	Invalid Output Level of Gain				1. Check whether Input/Gain/Output are invalid. 2. From the Control page, check the Alarm Settings.

			(Default 6dB) 3. Go under 'Control' tab and turn off AGC and change gain manually to verify BDA is responding to changes. Recheck the measured values.
Low Incoming RSSI	Soft Fail	Downlink Input Value is less than threshold: PCS/ Cell: -95dBm minimum	1. Ensure proper ports are connected (Donor/ Server). 2. Verify the Donor antenna is pointed toward the correct cell site. 3. Verify the selected band(s) and be sure it is the right band(s) for the area. 4. Please be aware that our bdas typically require well above -85dBm (threshold) of incoming RSSI on the DL side.
Under/Over Current	Soft Fail Hard Fail	Current falls out of the permitted range	1. Factory Setting & Reboot 2. Recheck, if continues, contact Tech Support.
Over Temperature	Soft Fail Hard Fail	Repeater's internal temperature exceeds the permitted range	1. Factory Setting & Reboot 2. Recheck, if continues, contact Tech Support.
Input Overload	Hard Fail	Input Signal Level increases beyond the set range: PCS/ Cell: -30dBm max input	1. Add attenuator to donor/server antenna (Applicable to DAS) 2. Factory Setting & Reboot
Low Isolation Oscillation		Antennas are located too close to one another, causing RF output to feed input.	1. Check Input Level. (fluctuates drastically) 2. We recommend 13~15dB + max gain of repeater between the donor and the server antenna as an isolation value. 3. Check antenna direction (make sure that the Donor and Server antennas are not facing one another) 4. Placing an attenuator before the nearest serving antenna can also help to increase isolation.

No Heartbeats		Internal Modem not sending out heartbeats.	1. Go to 'Control' menu, click 'Alarm Setting' and verify 'Heartbeat ON' is checked and the appropriate time of 20 min. (the 20min mark can be lowered down to 1min in order to observe the alarm quicker) 2. Go to 'Install' menu and verify 'Auto Connection' under 'Modem' is checked. Then click 'Disconnect' and click 'Connect'. Then go to the 'Status' page to see if any modem activity has taken place. 3. If unsuccessful, go to 'Control' menu, click 'Gain Setting' and click 'Reboot'. 4. Then go to 'Status' menu and verify in Message Board is any modem activity has taken place. (Warning: clicking on 'Reboot' can potentially cause a temporary loss of service to the facility.) · If all of the above methods do not yield any results, please contact tech support to verify the provisioning of the modem.

Connectivity Issue		Unable to Interface to repeater with GUI Software.	1. Please verify under 'Device Manager' of Windows that the necessary drivers for the USB to serial adapter are installed. 2. Be sure to use the GUI software from the CD that came with the repeater. 3. If for some reason the CD is not available, contact 24HR tech support to acquire the appropriate one. 4. In the event of using a USB-to-serial converter, you must be sure to the 'COM port' number on the 'STATUS PAGE' matches the COM port number of the usb to- serial adapter in your 'Device Manager' of Windows. 5. If the GUI software at any time reports a missing file error such as "component missing", please be sure to contact our tech support staff directly at the number provided below. 6. Connectivity is accomplished successfully when both TX/RX lights are blinking green in the lower right-hand corner of the GUI software.
Connecting to DAS		All our PCS as well as Cellular BDAs can have the 'AGC' function enabled and the 'Downlink AGC Level' set from 0dBm to whichever value is specified by the manufacturer for common DAS applications. <center>PCS: lowest DL AGC value 0dBm</center>	To get output power on the Downlink side of the BDA even lower to plug into a DAS system, the use of 5dB or 10dB attenuators/pads with the proper tolerance of wattage is recommended.
For any other issues, contact ADRF Tech Support at 1-800-313-9345 or 1-323-514-9070			

6. Warranty and Repair Policy

6.1 General Warranty

The Epoch-H 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.

Appendix A: Epoch-HP Specifications

A.1 Electrical Specifications

Parameters		Specifications		Comments
Frequency Range	Downlink	1930~1995 MHz		
	Uplink	1850~1915 MHz		
Frequency Error		≤ ± 0.05 ppm		
Band Selection		5/10 MHz + 5/15 MHz		
Gain Flatness	Full band	≤ ±1 dB		
	Each band	≤ ±2.5 dB		
Gain	Maximum	95 dB		
	Step	0.5 dB		
	Range DL/UL	Epoch-HP5W / 10W / 20W	30 dB	
	Tolerance	≤ ±1 dB		
Composite Output Power (Down Link)	Epoch-HP 5W	+37 dBm		
	Epoch-HP 10W	+40 dBm		
	Epoch-HP 20W	+43 dBm		
Output Power (Up Link)		+27 dBm		
AGC Error		≤ ±0.5 dB		
Inband Spurious emissions		≥ 29 dBc/30 kHz @ Fc ± 885 KHz (3FA)		30kHz RBW
		≥ 39 dBc/30 kHz @ Fc ± 1.98 MHz (3FA)		
		≤ -13 dBm/1 MHz @ Fc ± 2.25 MHz (1FA)		1MHz RBW
Outband Spurious emissions		9KHz ~ 150KHz ≤ -36dBm / 1KHz		1kHz RBW
		150KHz ~ 30MHz ≤ -36dBm / 10KHz		10kHz RBW
		30MHz ~ 1GHz ≤ -36dBm / 100KHz		100kHz RBW
		1GHz ~ 12.75GHz ≤ -30dBm / 1MHz		1MHz RBW
Roll offs		> 50 dBc @1 MHz outside passband		
Noise Figure (Up link)		≤ 5.0 dB@ Max gain		
		≤ 7.0 dB@ Min gain		
Delay		≤ 5 us		
VSWR		≤ 1.5:1		

A.2 Mechanical Drawing

Parameters		Specifications	Comments
Dimension	Epoch-HP Series	17.89 x 19.76 x 111.45 Inches	W x H x D Bracket excluded
Weight	Epoch-HP Series	83.8lbs	Bracket excluded
RF Ports		N-Type (F)	Donor & Server Antenna Ports
Local Interface		RJ45 (DHCP)	
Cooling		External Convection/ Forced Air Cooling	12V FAN 2EA
NEMA		NEMA 4, IP55	Outdoor Type

A.3 Power Specifications

Parameters		Specifications	Comments
AC Power		110 V AC	Select Switch Type
AC Frequency		45 ~ 65 Hz	
AC Supply Protection		Fuse	
Power Consumption	Epoch-HP5W	≤ 250 W	
	Epoch-HP10W	≤ 360 W	
	Epoch-HP 20W	≤ 500 W	
Ground		External Threaded Stud	

A.4 Environmental Specifications

Parameters	Specifications	Comments
Operating Temperature	-30 ~ +50 ℃	Ambient
Relative Humidity	5 ~ 95 %, (Non-Condensing)	
Dust	Industrial Dust Per Telcordia GR63 Core	

A.5 Other Specifications

Parameters	Specifications	Comments
MTBF	> 100,000 Hours	
Certificates	UL 60950, FCC Part 15, 24	
Warranty	3 Years	

Appendix B: Epoch-HC Specifications

B.1 Electrical Specifications

Parameters		Specifications	Remarks
Frequency Range	Downlink	869~894MHz	
	Uplink	824~849MHz	
Frequency Error		≤ ±0.1ppm	
Band Selection		AF/BF	
Band Reconfiguration	Downlink	AF(A-869~880 MHz,A'-890~891.5MHz)	GUI Selectable
		BF(B-880~890 MHz,B'-892~894MHz)	
	Uplink	AF(A-824~835 MHz,A'-845~846.5MHz)	
		BF(B-835~845 MHz,B'-847~849 MHz)	
Gain Flatness	Full band	≤ ±1.5 dB	
	Each band	≤ ±1.5 dB	
Gain	Maximum	95dB	
	Step	0.5dB	
	Range	30dB	
	Tolerance	≤ ±2.0dB	
Output	Downlink	05W(37 dBm),10W(40 dBm),20W(43dBm)	Composite power
	Uplink	27 dBm	
AGC Control Error		AGC ± 0.5 dB	
Spurious emissions		≤ -15 dBm	
OIP3		≥ 45 dBm	
Inter modulation		≤ -105 dBm	
Roll offs		> 45dBc @ 1MHz outside Pass band	
Delay		≤ 5 us	
Noise Figure		≤ 5.0 dB @max gain	
VSWR		≤ 1.5:1	

B.2 Mechanical Specifications

Parameters		Specifications	Remarks
Cabinet		Wall Mounting	
Casing Class		NEMA4 Minimum	Outdoor Type
Weight		70.5 lbs	
Size		17.89 x 19.76 x 9.26 Inches	
Color		PAKMEL PP#7414B	
Connector Type	Input/output	N Female	
	Ethernet	RJ45 Female	
	Frame ground	Brass Screw(M5x2)	
Cooling		External fan	DC12V

B.3 Environmental Specifications

| Parameters	Specifications	Remarks
Operating Temperature	-30 ~ +50℃	Ambient
Relative humidity	5~95%, non-condensing	
Dust	Industrial dust per Telcordia GR63 core	

B.4 Power Specifications

Parameters	Specifications	Remark
AC Power	100~130 VAC	UL 60950
AC Frequency	45~65 Hz	
AC Supply Protection	Fuse	
Back Up Battery option	+24V	8 Hours
Ground	External threaded stud	

B.5 Other Specifications

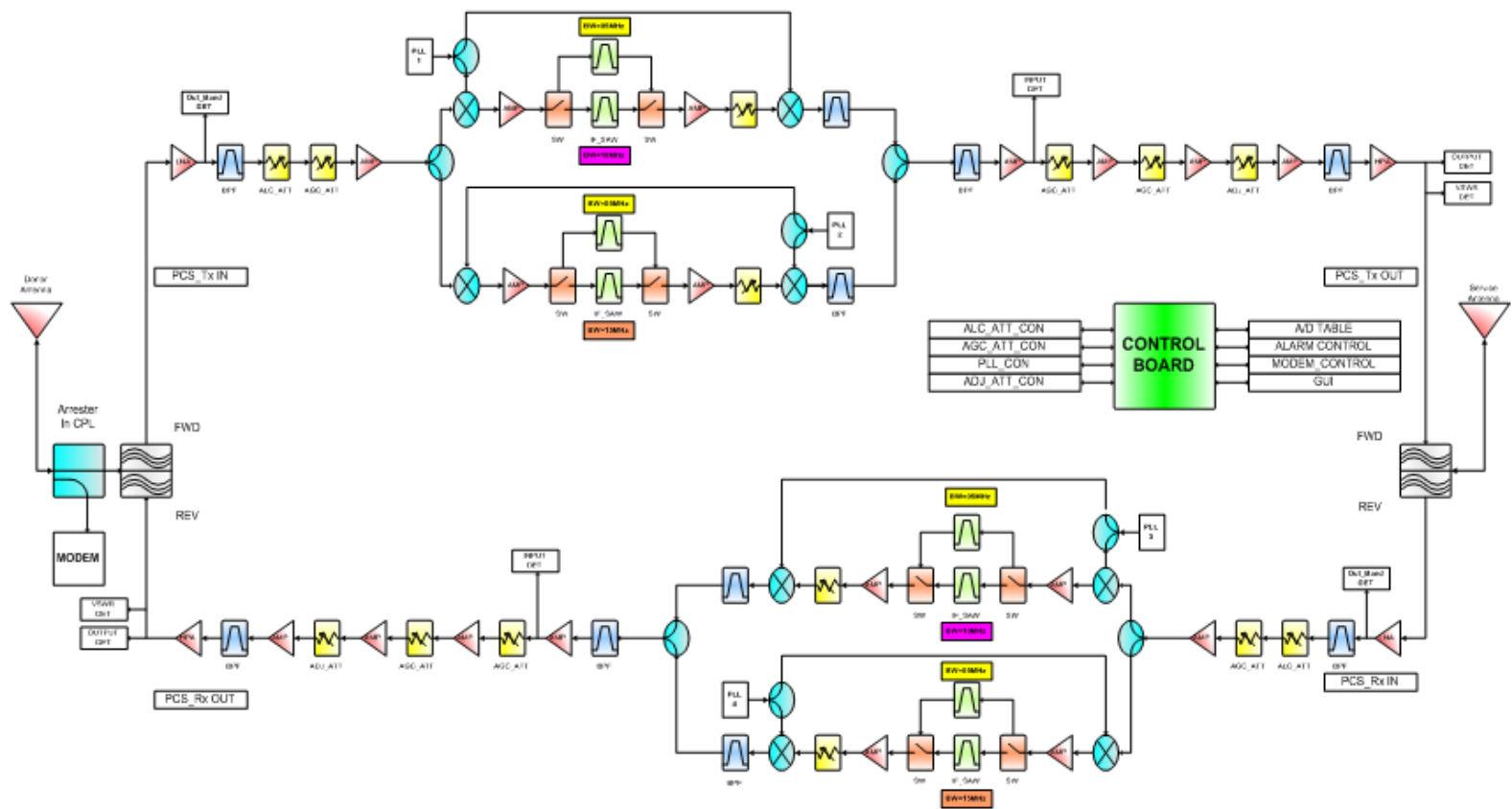| Parameters	Specifications	Remarks
MTBF	> 50,000 hours	
Certificates	UL 60950	
	FCC CFR47 part 15	
Warranty	3 Years	

Appendix C: Epoch-H Mechanical Drawing
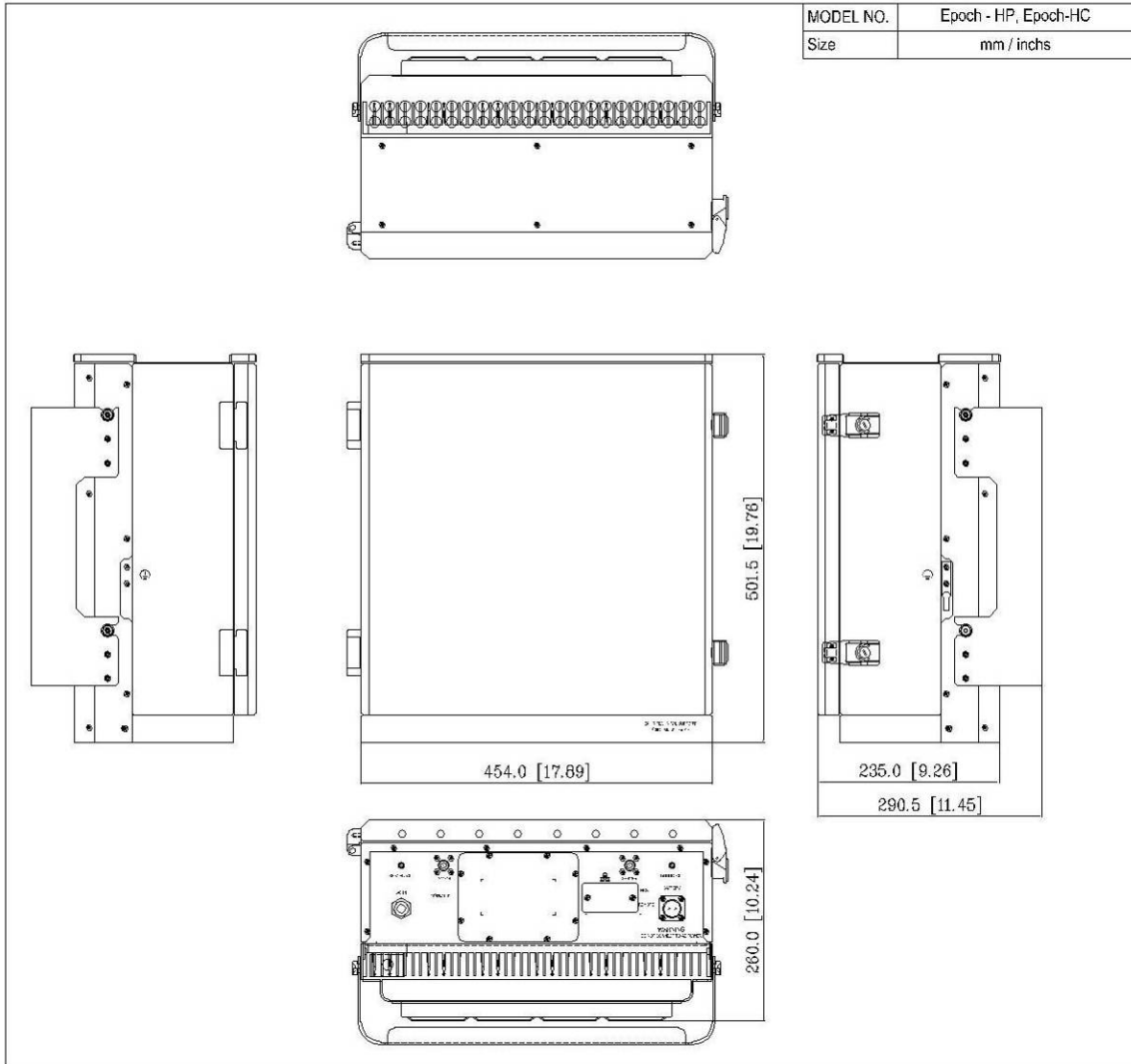
Appendix D: Epoch-HP Overview

D.1 Black Diagram

US-PCS REPEATER

D.2 Components

Epoch-HP 5W / 10W / 20W

Epoch-HP Internal Components
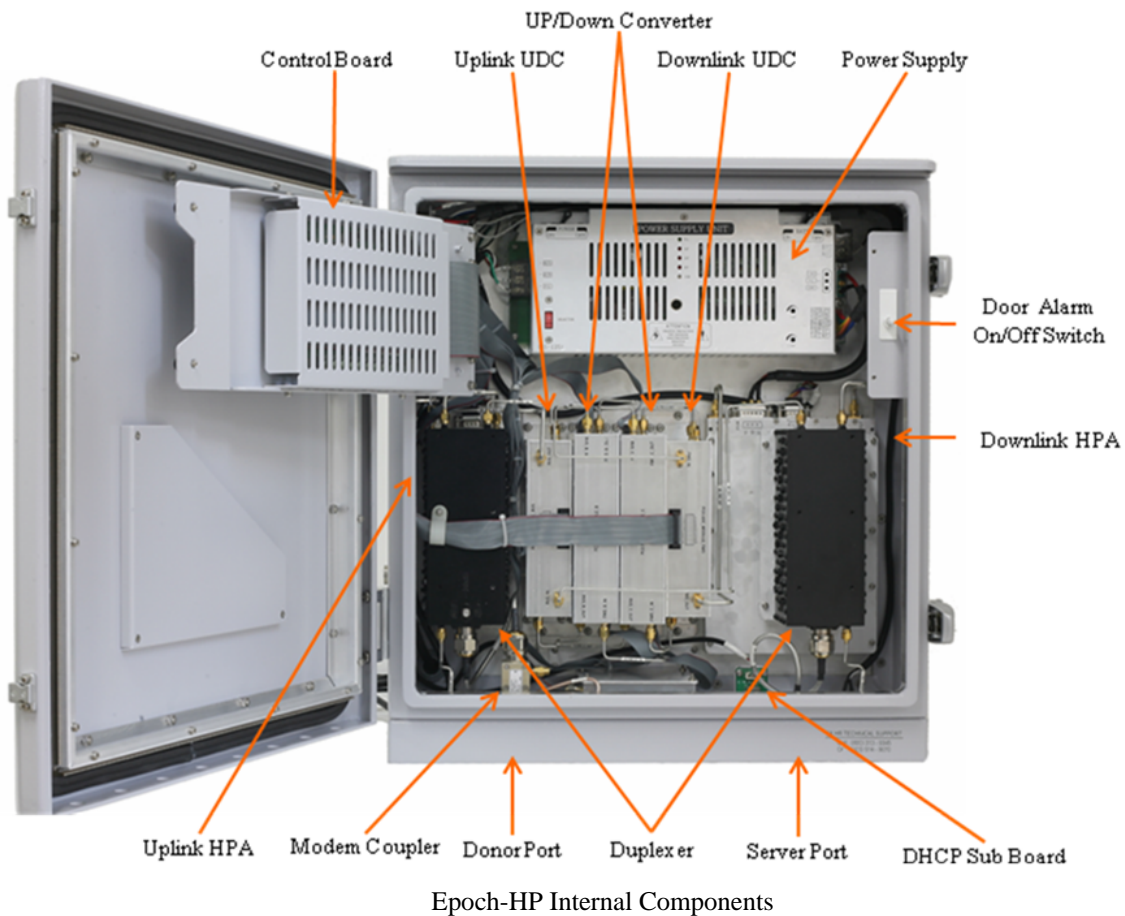
Power Supply

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. Also it interfaces with PC through Ethernet port.

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.

Up Converter Module

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

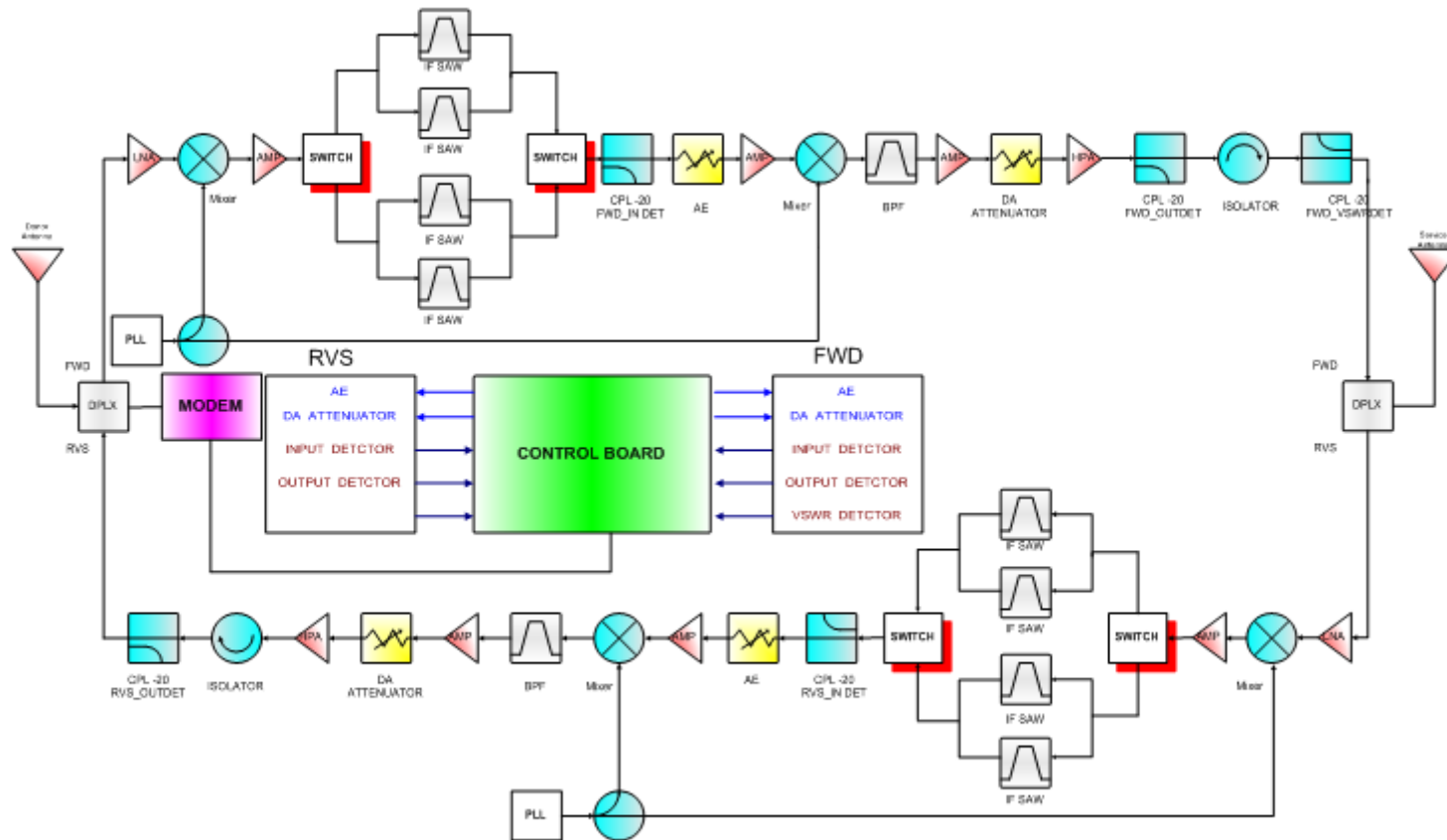**Duplexer**

It consists of two BPFs (band-pass filters): PCS TX (1930 ~ 1995 MHz) & RX (1850 ~ 1915 MHz)

HPA

It receives the output signal from the Up / Down converter module and amplifies the signal to the repeater's rated maximum power level.
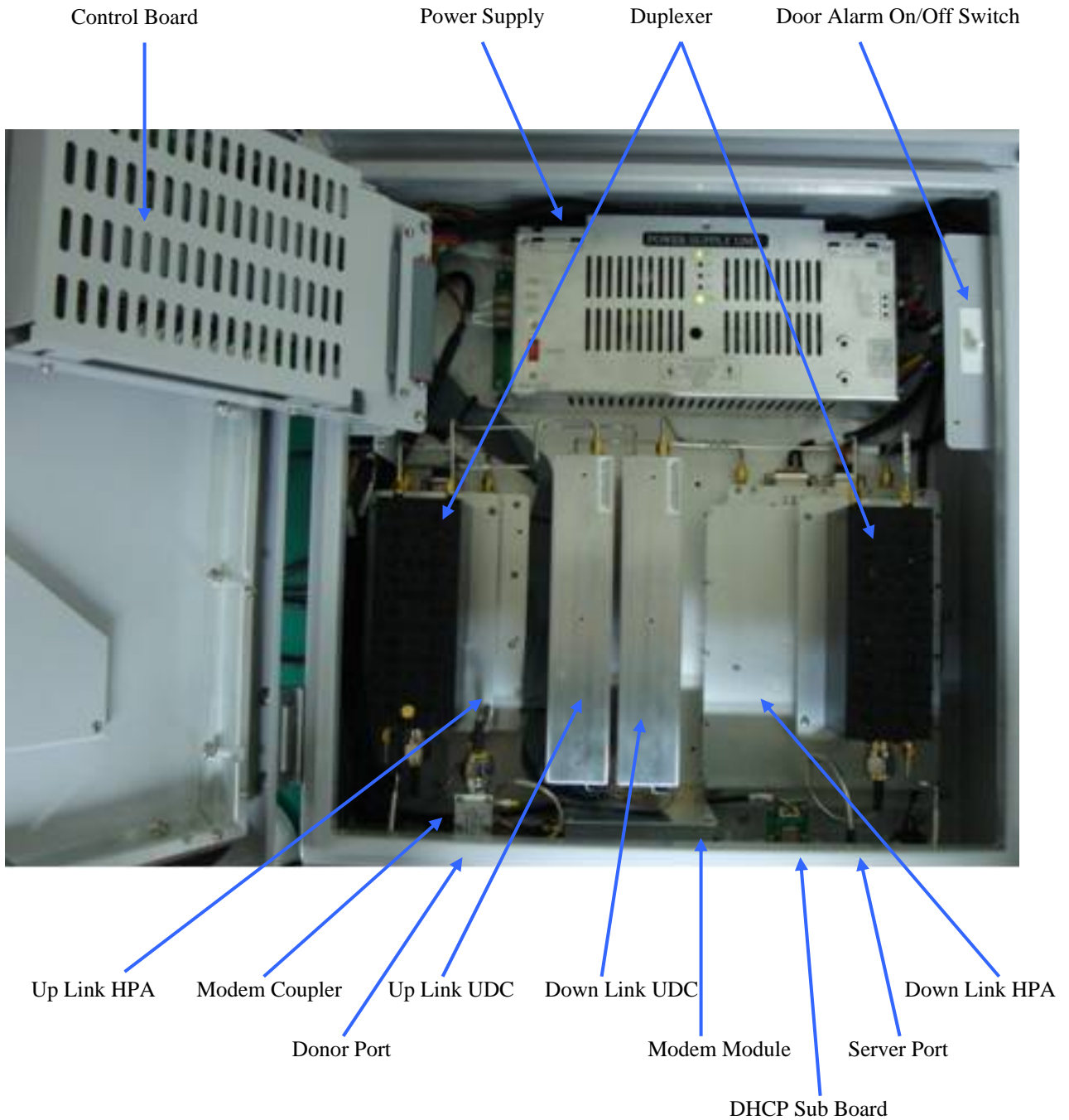
Appendix E: Epoch-HC Overview

E.1 Block Diagram

E.2 Components

Epoch-HC 5W / 10W / 20W

Control Board   Power Supply   Duplexer   Door Alarm On/Off Switch

Up Link HPA   Modem Coupler   Up Link UDC   Down Link UDC   Down Link HPA

Donor Port   Modem Module   Server Port

DHCP Sub Board

Power Supply

It provides DC power to each module within the repeater.

Control Board

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

Down Link UDC

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.

Up Link UDC

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

Duplexer

It consists of two BPFs (band-pass filters): Cellular TX (869 ~ 894 MHz) & RX (824 ~ 849 MHz)

Up/Down Link HPA

It receives the output signal from the Up/Down converter module and amplifies the signal to the repeater's rated maximum power level.

Modem Module

 Modem Module

Door Alarm Switch

Modem Coupler
Coupler for modem

DHCP Sub Board
RJ45 for Web GUI