Verizon Wireless ADRF-25K
USER MANUAL

Version 0.3

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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' 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
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

First released version :

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Revision History

Version	Author	Description	Date
0.1	CHUL		July 16, 2007
0.2	Alex Jovel	Changes for newer model	April 15, 2008
0.3	Louis	Changes for newer model	April 21, 2008

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1. ADRF-25K

1.1 Introduction

Dual bands in one body: ADRF-25K is an over-the-air repeater system that operates in both the Cellular (824 - 894 MHz) and PCS (1850 – 1990 MHz) frequencies. It has one input and one output port.

1.1.1 Highlights

- Dual band Repeater
- Covers the 60 MHz PCS band
- Covers the 25MHz Cellular band [A Band or B Band]
- Three switchable SAW filters: You can select any contiguous 5, 10, or 15 MHz bandwidth anywhere within the full 60MHz PCS spectrum.
- . Total out-of-the-box solution: ADRF-25K has all the necessary parts that you need.The system includes dual band repeater, donor antennas, server antennas, cables and accessories.
- EVDO Rev. A: ADRF-25K is fully compatible with EVDO Rev. A
- Ec/Io: In order to ensure proper system installation, in addition to the RSSI indicator on the ADRF-25K's front panel, you can also read Ec/Io values via the user interface program.
- Incremental Automatic Shutdown/Resumption Time: ADRF-25K gradually increases the time span between automatic shutdown and resumption before it permanently shuts itself down
- AI compatible: ADRF-25K is fully compatible with Applied Innovation's monitoring system.
- Versatility and Usability: ADRF-25K gives total control to the user. Most of the control parameters, e.g., gain, output power, alarm threshold, etc. can be changed using the user interface so that the user can adjust the system perfectly to the given RF environment. At the same time, due to its intuitive user interface, the user won't even need to read the manual to get a grip of the system.
- 81 ± 2 dB gain @ PCS, 72 ± 2 dB gain @ Cellular
- 30 dB AGC Range @ 0.5 dB Step
- Sharp out-of-band rejection; 50 dBc @ ±1.5 MHz from the Cellular Sub-band edge , 50 dBc @ ±1 MHz from the PCS Sub-band edge
- Supports DHCP; No 3rd party GUI software required
- Automated installation

1.1.2 Parts List

Label	Qty	Description
A	1	ADRF-25K Repeater
B	1	AC Power Cable
C	1	Ethernet Cable (Crossover)
D	1	Ground Cable
E	4	Anchor Bolts & Mount Screw
F	1	CD
G	1	Diplexer Module
H	1	PCS Donor Antenna
I	1	Cellular Donor Antenna
J	1	Dual OMNI Antenna
----	4	RF Coaxial Cable

Table 1 – Parts List

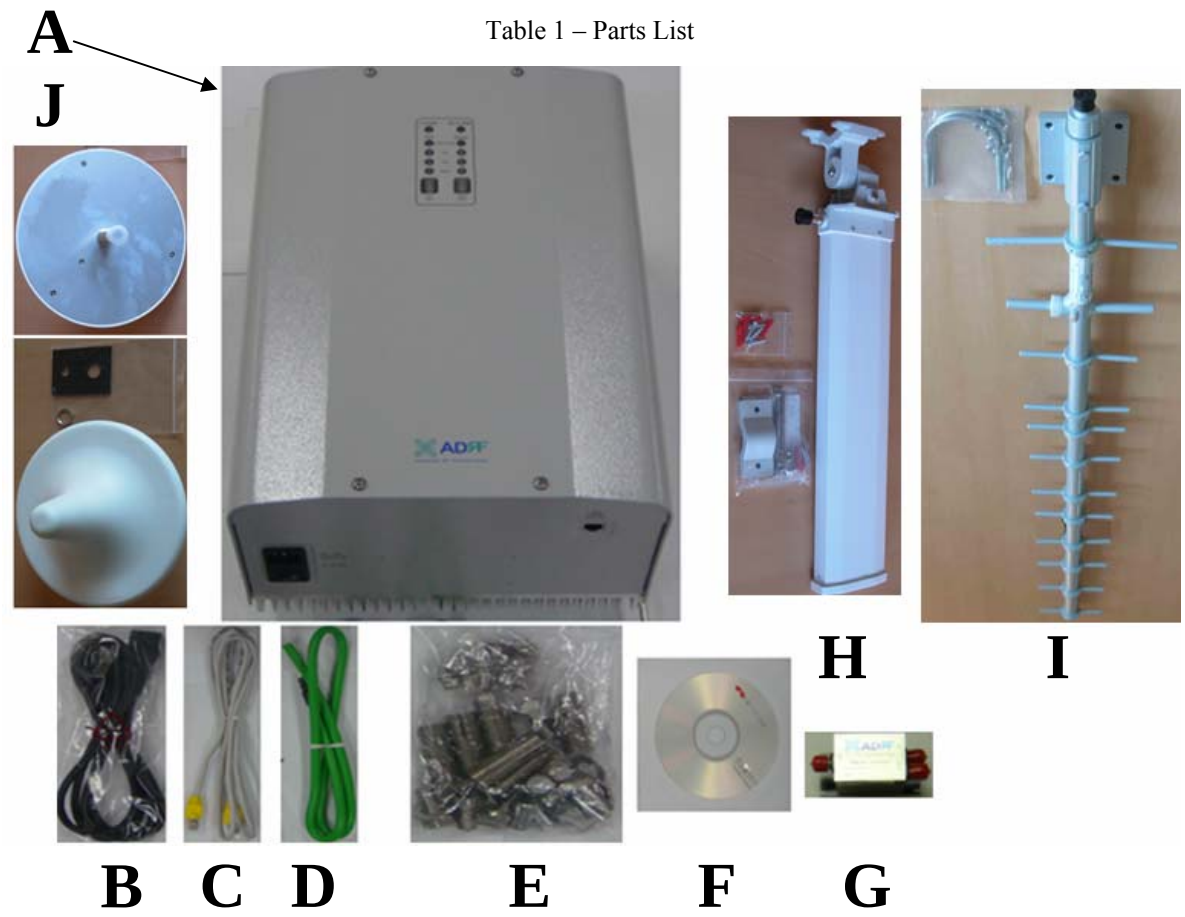


Figure 1 – ADRF-25K Repeater Parts List

***** CD also included: (1)ADRF-25K User Manual & (1)ADRF-25K Quick Start Guide***

1.1.3 Repeater Quick View

Figure 2 ADRF-25K Front & Side Views

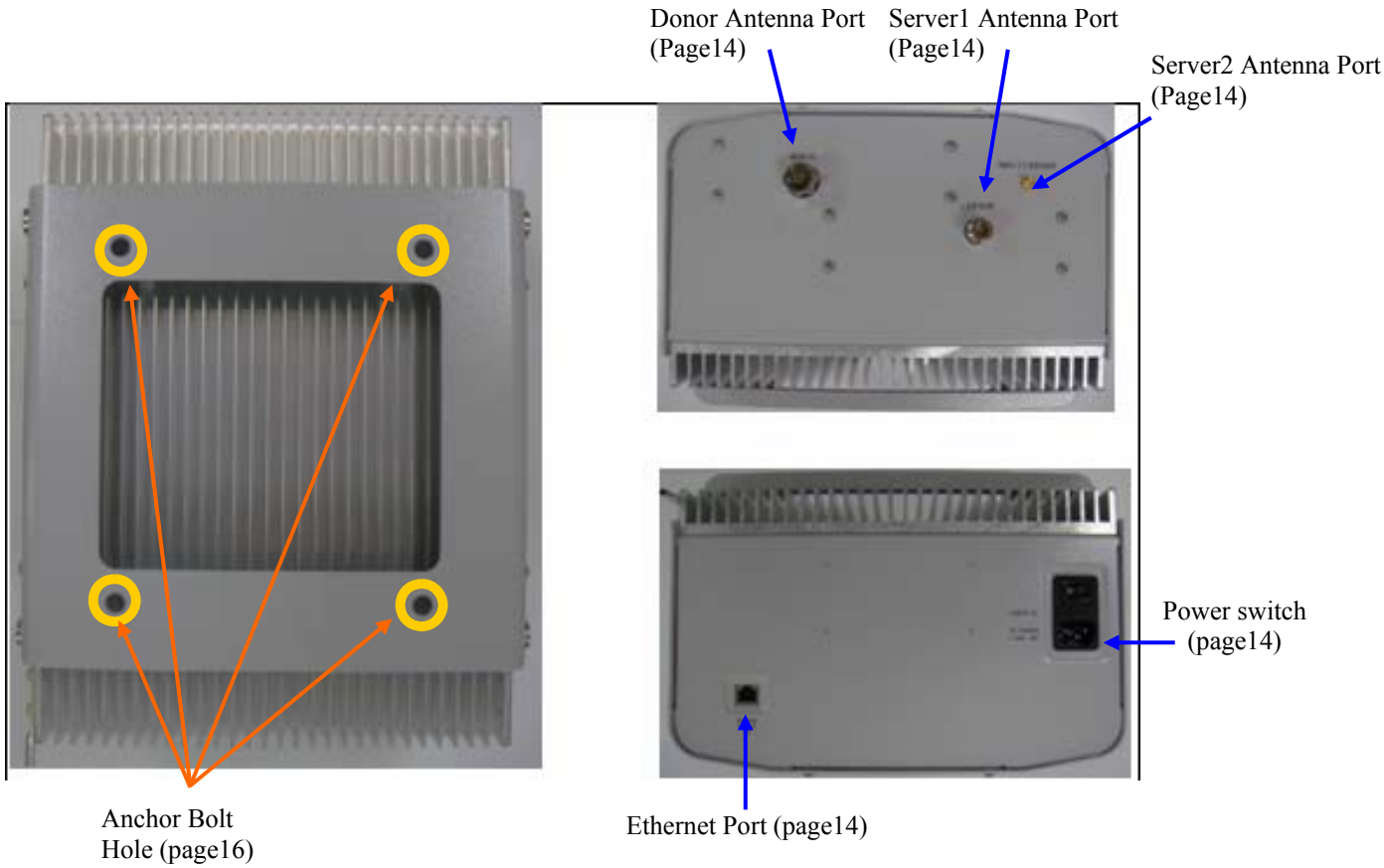


Figure 3 – ADRF-25K Back & Bottom Views

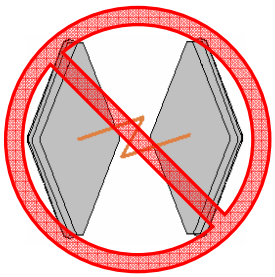
1.2 Warnings and Hazards

WARNING! ELECTRIC SHOCK

Opening the ADRF-25K 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 ADRF-25K 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 ADRF-25K 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 his own expense.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (E.I.R.P.) is not more than that permitted for successful communication.

This device has been designed to operate with antennas having a maximum gain of 18 dBi. Antennas having a gain greater than 18 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

2. ADRF-25K Overview

2.1 Operation Modes

2.1.1 Local Web GUI

Turn on the power switch of the ADRF-25K. Wait until the Power LED on the front panel is lit in green. Simply connect one end of the Ethernet cable on one of the three repeater monitor Ethernet ports and the other end on the PC's LAN port. Launch the Microsoft Internet Browser (Internet Explorer) and type in the IP address (**http://192.168.63.1**). The Local Web GUI will be launched. *For more detailed instructions on how to connect your laptop to the ADRF-25K, go to Chapter 3.*

2.1.2 Remote NMS (Modem Option)

A CDMA wireless modem can be integrated within the ADRF-25K repeater. With this wireless modem, the user can remotely log into the repeater for monitoring purposes.

2.2 Switches & Indicators

2.2.1 LEDs

ADRF-25K has LEDs on the front panel of the repeater as shown below in Figure 4.

Figure 4 – ADRF25K Repeater LED View

- POWER LED

Parameters		Specifications
LED	Repeater On	Green LED on
	Repeater Off	Green LED off

- DC-ALARM LED

Parameters		Specifications
LED	Normal	Red LED off
	Soft fail	Green LED on
	Hard fail	Red LED on
Condition for Alarm Activation		Current > 9A (Hard Fail) Current < 2A (Soft Fail)
After Alarm Activation		Full Spectrum (PCS/Cellular) shutdown

- OVER POWER LED

Parameters		Specifications
LED	Normal	LED off
	Soft fail	PCS(Cellular) Green LED on
	Hard fail	PCS(Cellular) 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 shuts down, and the shutdown process goes into effect

- AGC LED

Parameters		Specifications
LED	AGC On	PCS(Cellular) Green LED On
	AGC Off	PCS(Cellular) Green LED Off

- OSC LED

Parameters		Specifications
LED	Normal	Red LED off
	Hard fail	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

- MANUAL LED

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

- RSSI LED BAR

Parameters		Specifications
LED	Input < -95dBm	PCS(Cellular) All LED Off
	Input < -85dBm	PCS(Cellular) one LED On
	Input < -75dBm	PCS(Cellular) two LED On
	Input < -65dBm	PCS(Cellular) three LED On
	Input < -55dBm	PCS(Cellular) four LED On
	Input > -55dBm	PCS(Cellular) five LED On

2.2.2 Power Switch

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

Figure 5 – ADRF-25K Repeater Power Switch View

2.2.3 Ethernet Port

Figure 6 – Ethernet Port

2.2.4 RF Port

- Donor:
  Connect the COM port of the diplexer

- Server 1
  Connect the Server antenna

- Server 2
  For use with an auxiliary server antenna. Signal is attenuated by -15dBm compared to Server1.

2.3 Installation

2.3.1 Tools

No special tools or equipment are needed to install the ADRF-25K.

2.3.2 Procedure

Four 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 ADRF-25K, 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 Verify that the Repeater and Mounting Bracket are in good condition.
② Drill holes in the installation surface and insert the anchor bolts.
③ Set the mounting bracket against the wall.
④ Using the Hooks on top, set the Repeater against the mounting bracket.
⑤ Using the anchor bolts attach the Repeater to the Bracket.
⑥ Make sure the Repeater is securely attached.
⑦ Connect the GND cable.
⑧ Connect the Antenna cable.
⑨ Connect the Power.
⑩ Using a laptop, install the Repeater.

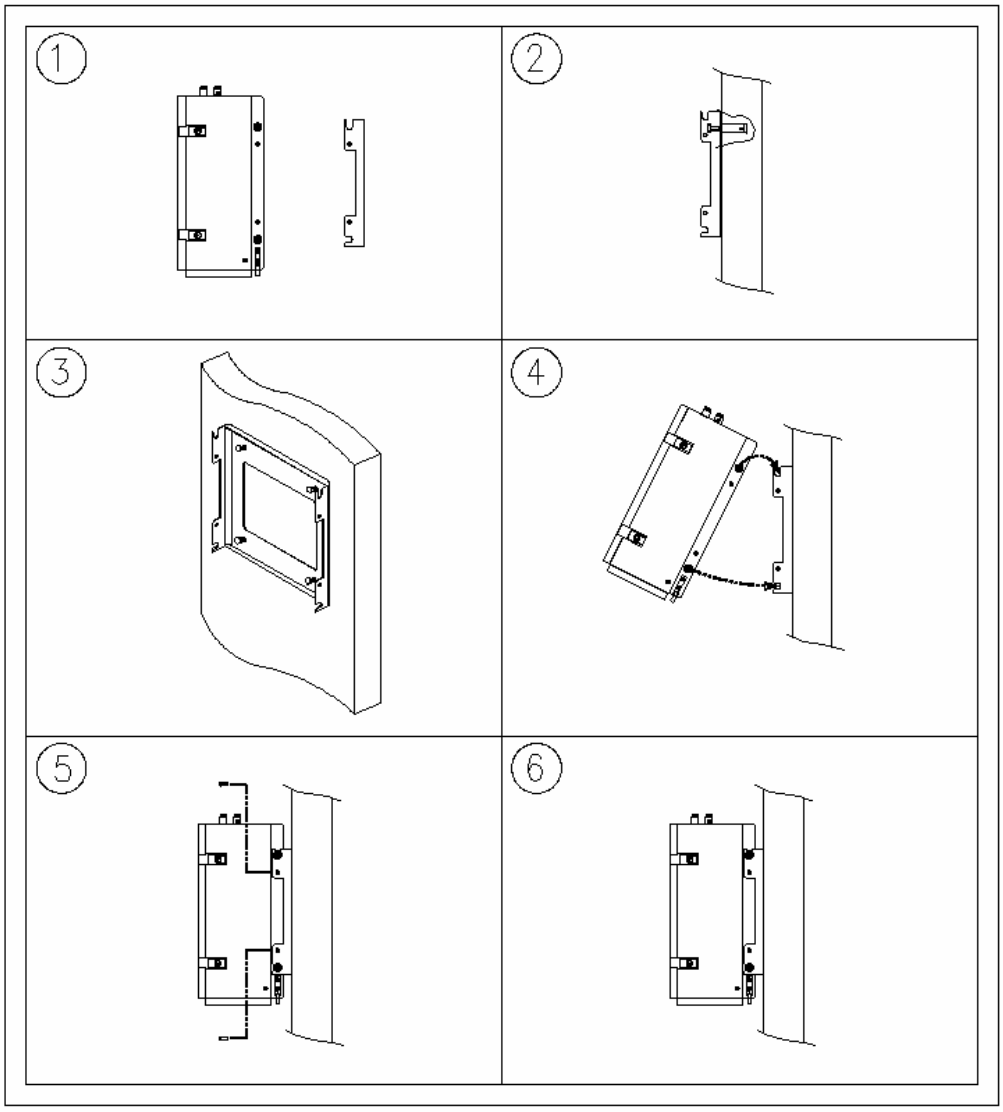


Figure 7 – Repeater Mounting Instructions

2.3.3 Grounding

A ground cable is included in the box. The ground cable should be connected to the ADRF-25K before the repeater is turned on.

Figure 8 – Ground Cable Connection

2.3.4 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.

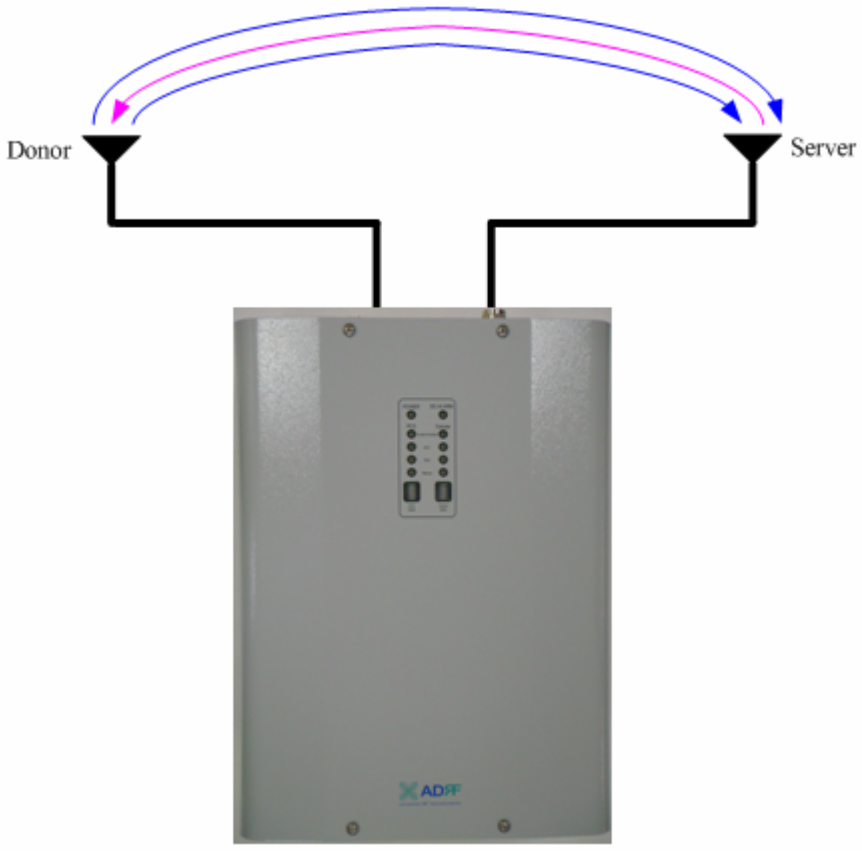


Figure 9 - RF Repeater Oscillation

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 ADRF-25K has a maximum gain of 80 dB, it requires an isolation of at least 93 ~ 95 dB.

2.3.5 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.

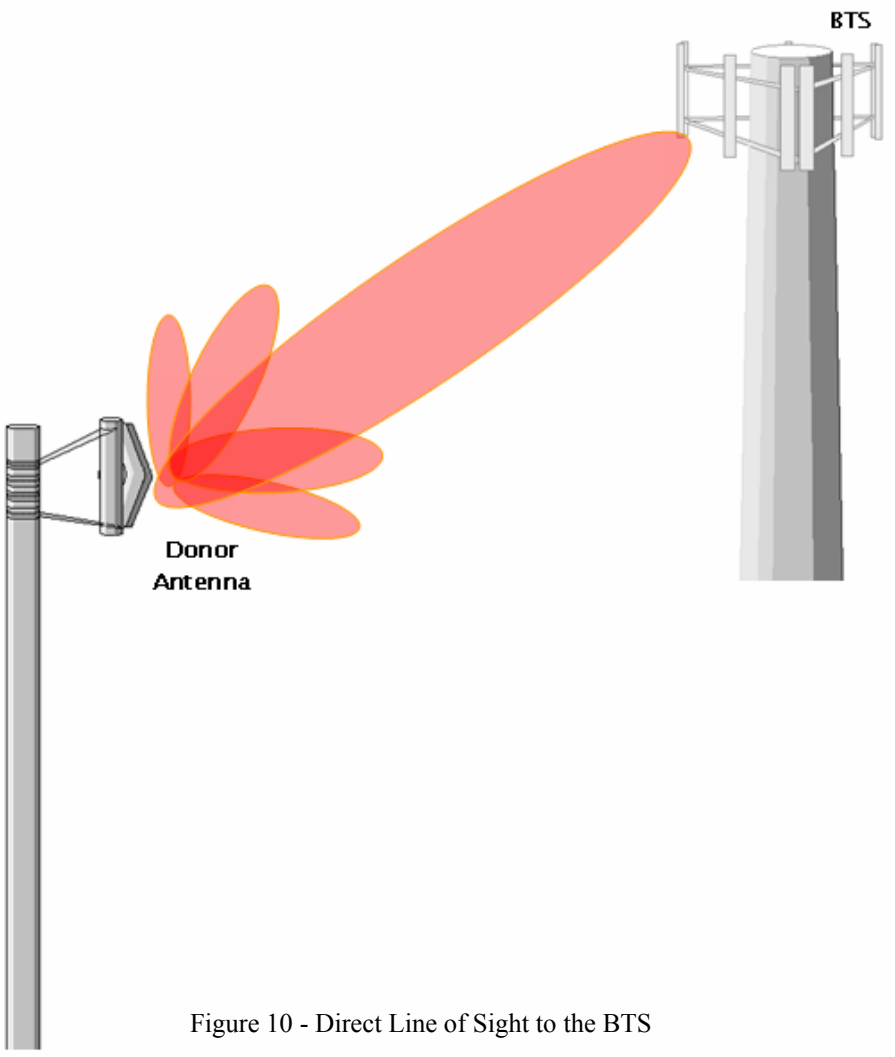


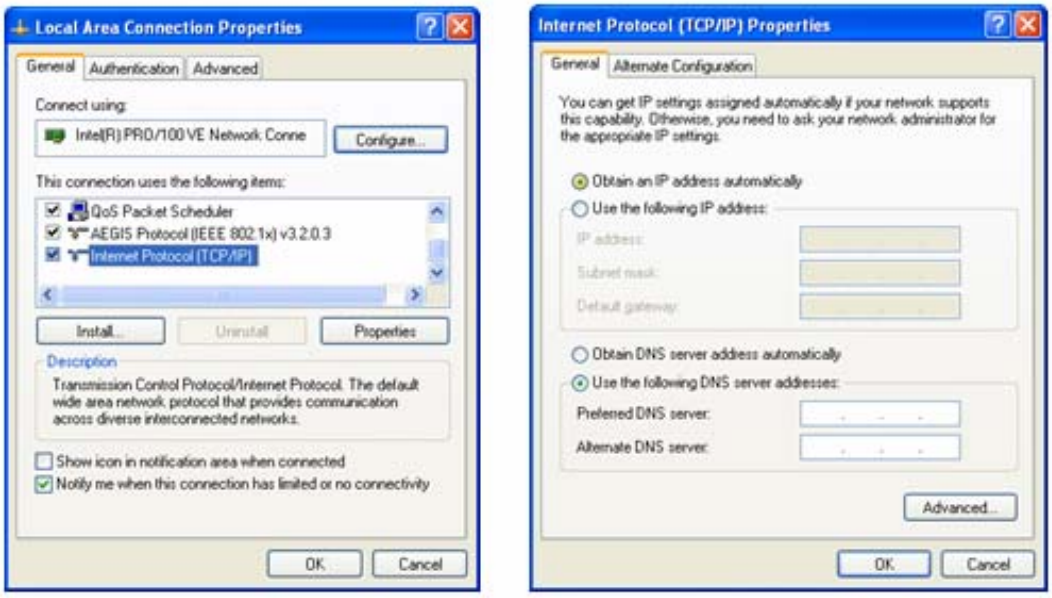
Figure 10 - Direct Line of Sight to the BTS

3. ADRF-25K 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.



ii) Launch MS Internet Explorer (Version 6.0 or higher)

Note: ADRF's Web GUI is not compatible 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:

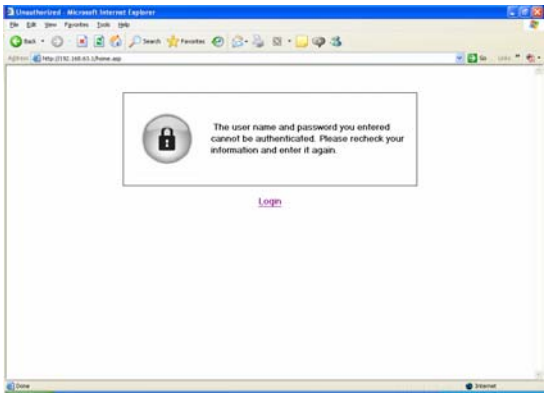
http://192.168.63.1

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.

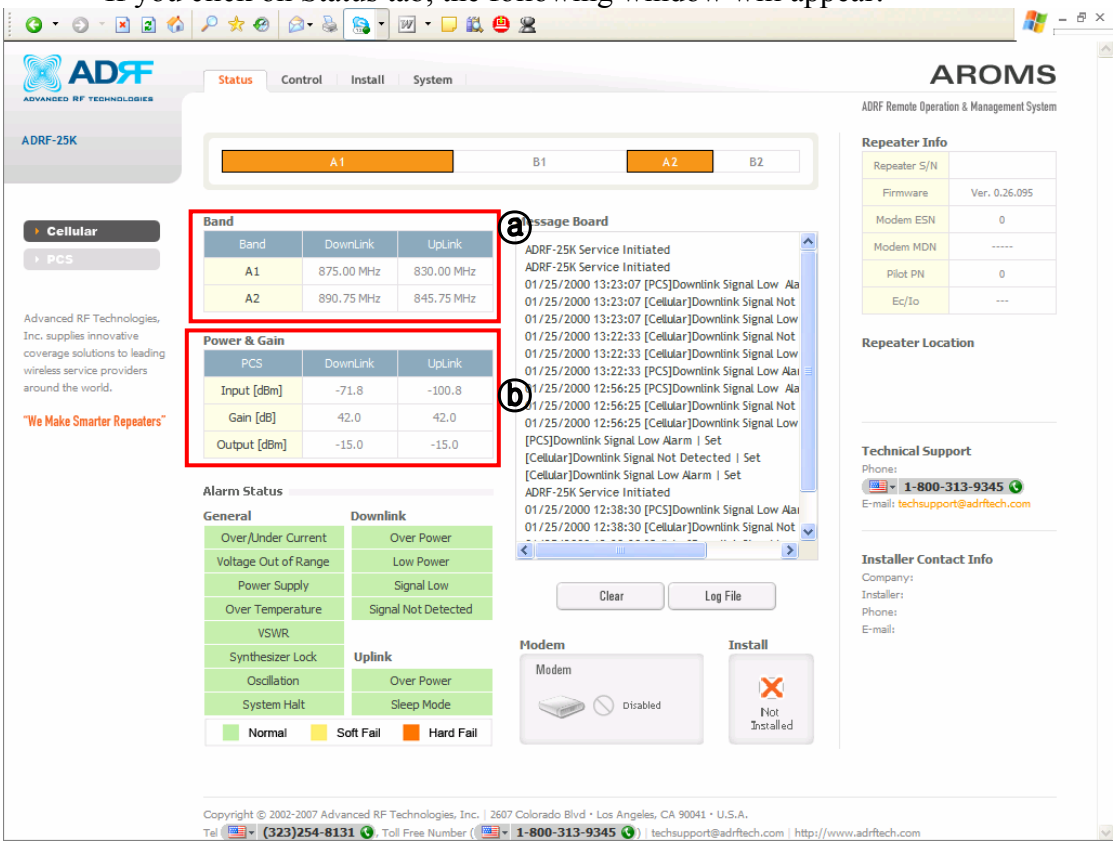
If the username & password is typed in incorrectly, the following screen will appear:



3.2 Repeater Status

3.2.1 Cellular Repeater Status

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., Cellular Band, Gain Settings, you will need to go to the Install or Control Menu.)

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

ⓐ **Band**

Band	DownLink	UpLink
A1	875.00 MHz	830.00 MHz
A2	890.75 MHz	845.75 MHz

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

ⓑ **Power & Gain**

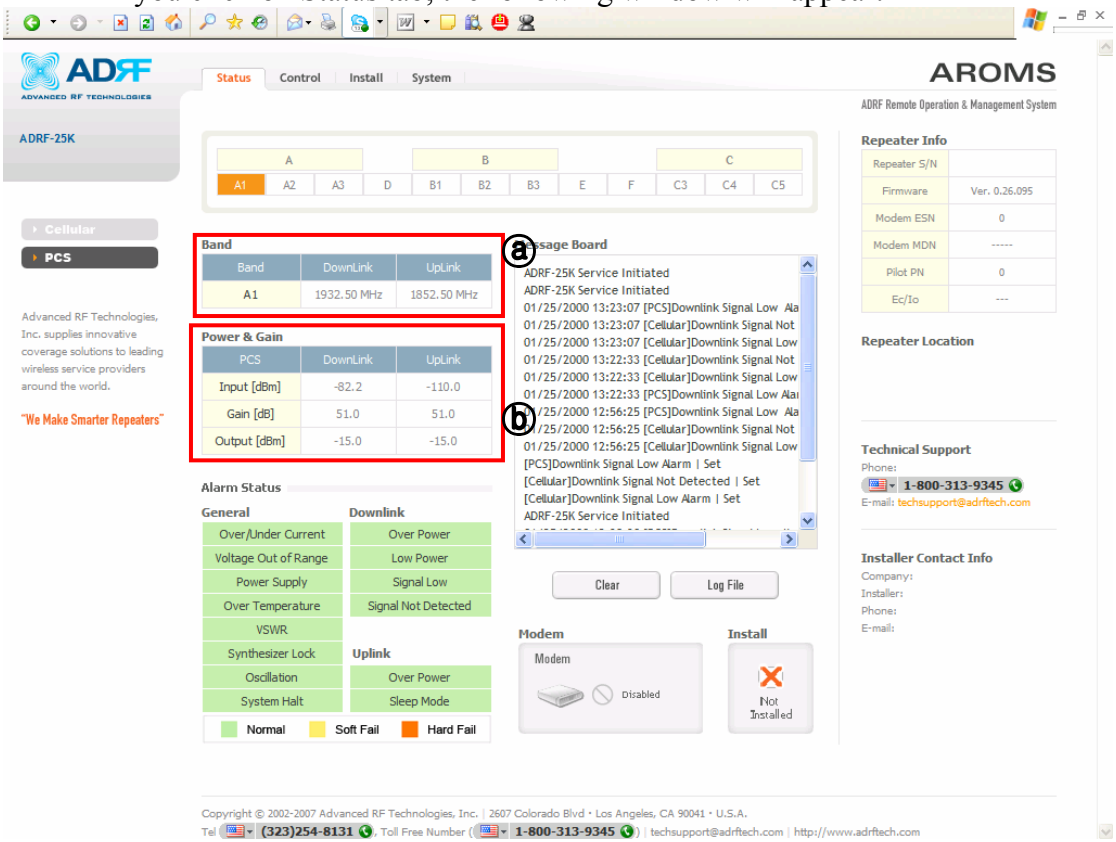
PCS	DownLink	UpLink
Input [dBm]	-71.8	-100.8
Gain [dB]	42.0	42.0
Output [dBm]	-15.0	-15.0

- **Alarm**: Will display eleven alarms with three different status conditions (Normal, Soft Fail or Hard Fail).
- **Message Board**: Will show up to recent 20 log messages (Alarms & Heartbeats).
- **Modem**: Will display the status of the mode (e.g. Disabled, Not Connected or Connected)
- **Installation**: Will display repeater's installation status (Not Installed or Installed).
- **Repeater Info**: Will display repeater's serial number, modem ESN and MDN.
- **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.

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).

3.2.2 PCS Repeater Status

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 Band, Gain Settings, you will need to go to the Install or Control Menu.)

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

ⓐ

Band

Band	DownLink	UpLink
A1	1932.50 MHz	1852.50 MHz

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

ⓑ

Power & Gain

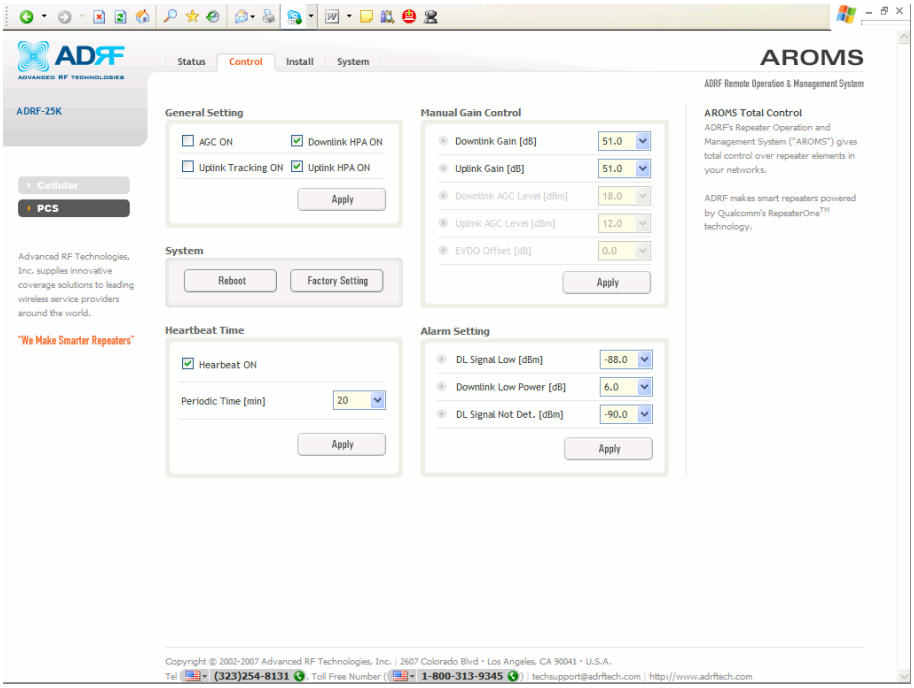
PCS	DownLink	UpLink
Input [dBm]	-82.2	-110.0
Gain [dB]	51.0	51.0
Output [dBm]	-15.0	-15.0

- **Alarm**: Will display eleven alarms with three different status conditions (Normal, Soft Fail or Hard Fail).
- **Message Board**: Will show up to recent 20 log messages (Alarms & Heartbeats).
- **Modem**: Will display the status of the mode (e.g. Disabled, Not Connected or Connected)
- **Installation**: Will display repeater's installation status (Not Installed or Installed).
- **Repeater Info**: Will display repeater's serial number, modem ESN and MDN.
- **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.

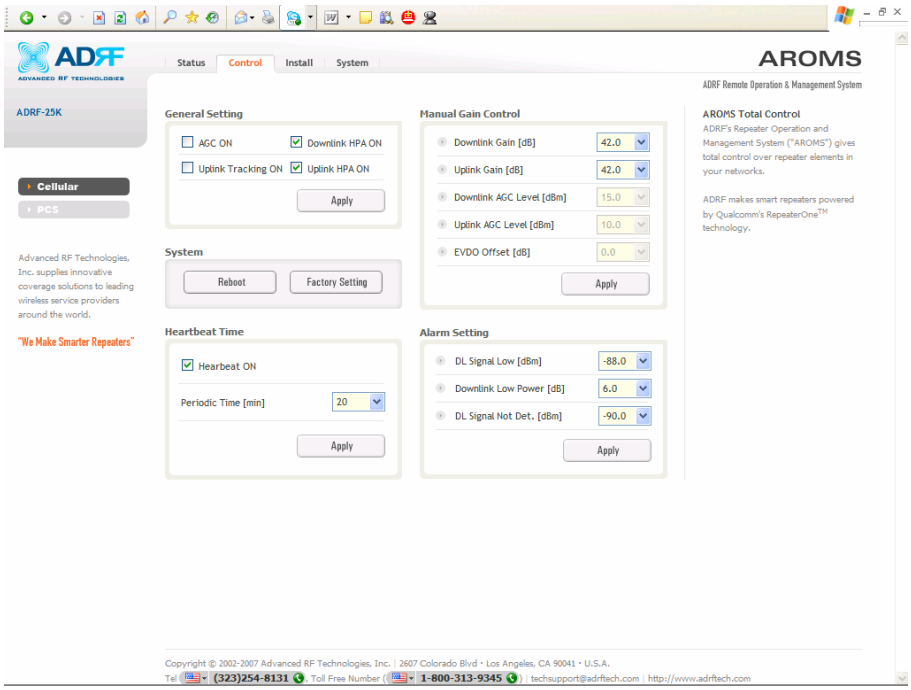
Note: Once successfully logged in, the repeater model name and the site/cascade ID will be displayed on the top of all the windows (except for the Main Window).

3.3 Repeater Control

If you click on **Control** window at PCS, the following window will appear



If you click on **Control** window at Cellular, the following window will appear



In this window, the user can adjust the following parameters:

General Setting
- **Automatic Gain Control** (Default mode is On)
- **Downlink HPA on/off** (Default mode is On)
- **Uplink HPA on/off** (Default mode is On)
- **Uplink Tracking mode on/off** (Default mode is Off)

Manual Gain Control
- **Downlink Gain Control**
Cellular: 42 to 72 dB @ 0.5 dB step, default value: 72 dB
PCS: 51 to 81 dB @ 0.5 dB step, default value: 81 dB

- **Uplink Gain Control**
Cellular: 42 to 72 dB @ 0.5 dB step, default value: 72 dB
PCS: 51 to 81 dB @ 0.5 dB step, default value: 81 dB

- **Downlink AGC Level**
Cellular: -5 to 15 dBm @ 0.5 dB step, default value: 15 dBm
PCS: 1 to 21 dBm @ 0.5 dB step, default value: 21 dBm

- **Uplink AGC Level**
Cellular: -12 to 8 dBm @ 0.5 dB step, default value: 8 dBm
PCS: -12 to 8 dBm @ 0.5 dB step, default value: 8 dBm

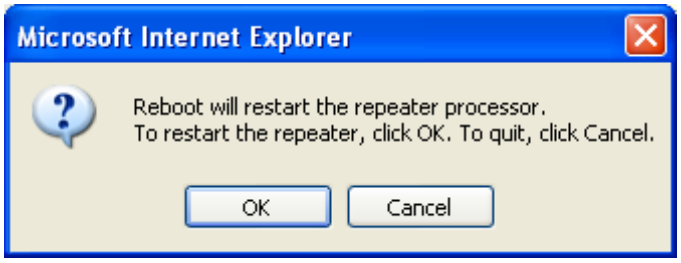
- **EVDO Offset**
-3 to +3 dB @ 0.5 dB step, default value: 0 dB

When Uplink Tracking is off, the EVDO Offset value is applied and with AGC ON, the maximum permissible Gain of the Uplink Gain Range is Downlink Gain + EVDO Offset. However, the gain cannot exceed the standard Max Gain.

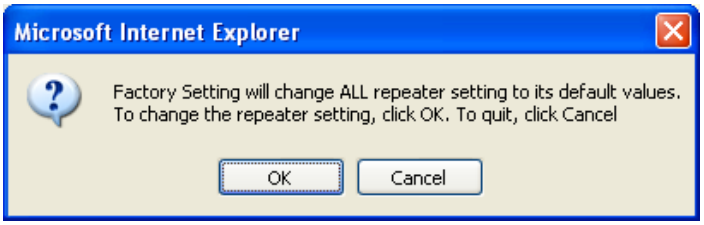
When Uplink Tracking is ON, the Tracking Offset is applied and with AGC ON, the Uplink Gain is the Downlink Gain + EVDO Offset. As expected, the gain cannot exceed the standard Max Gain.

System

-If you click the **Reboot** button, the following message box will appear:
(When the system reboots, the latest settings will be saved)



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



Heartbeat Time

- **Heartbeat on and off** (Default mode is Off)
- **Heartbeat periodic time** (Range: 1 to 59 min @ 1 min step – Default time is 20 min)

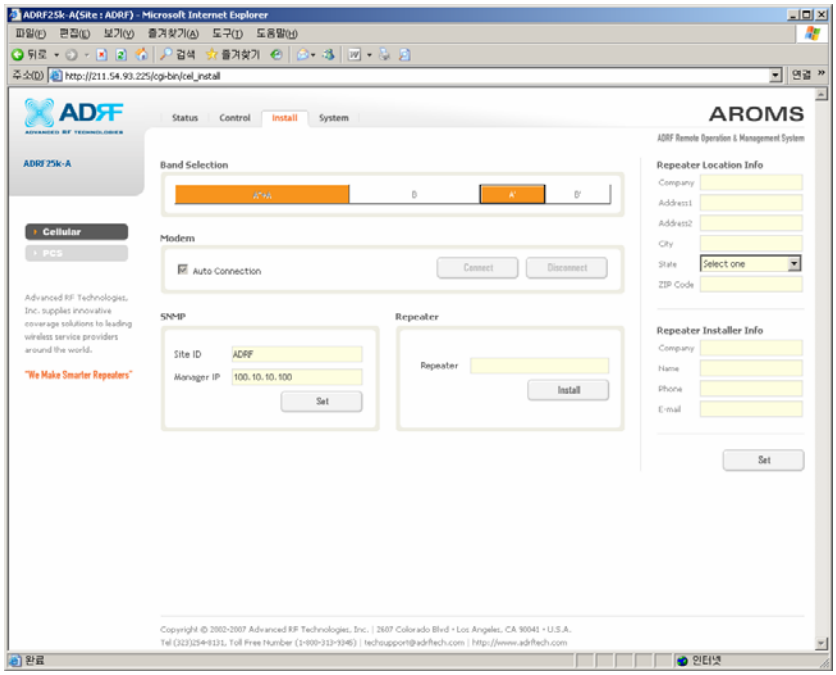
Alarm Setting

- **Downlink RSSI Alarm** (-110 ~ -30 dBm @ 0.5 dB step – Default value is -95 dBm)
- **Low Power Alarm** (2 ~ 10 dB @ 0.5 dB step – Default value is 6 dB)

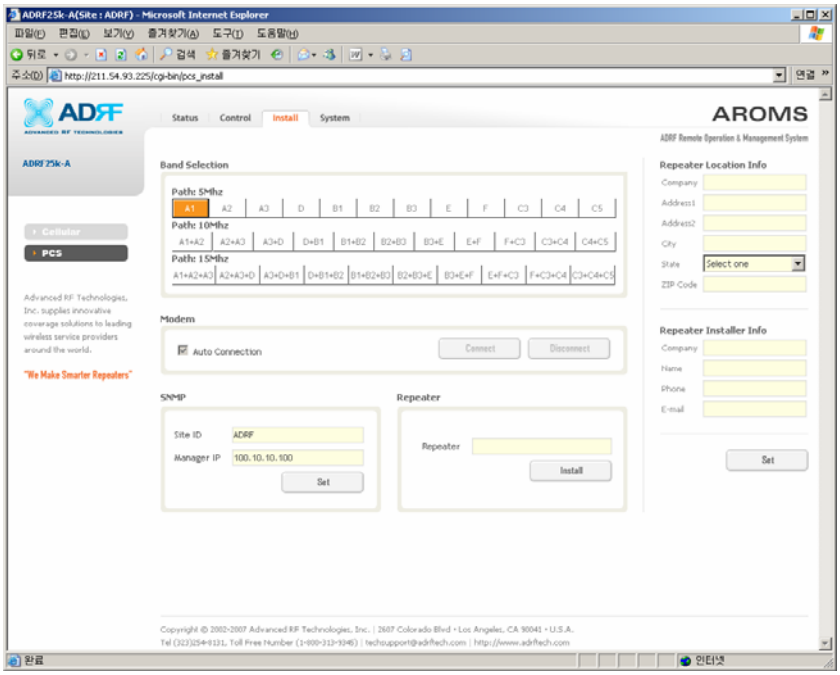
3.4 Repeater Installation

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

- Cellular Installation Window



- PCS Installation Window

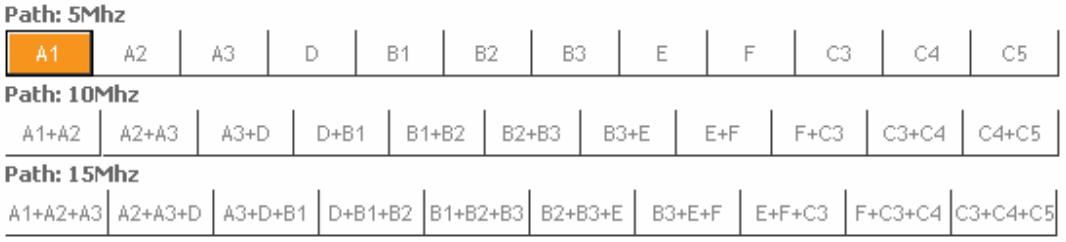


- **Band Selection**: Simply click on the desired operating bandwidth.
Cellular: Simply select the desired Band. The Main Band (A+A" or B) must be selected and cannot be switched ON/OFF.

PCS: Simply select the desired Band Width and corresponding Band(s).

- Cellular Band Selection

- PCS Band Selection



- **Modem**: By default, auto-connection box is checked so that the modem will connect automatically once sufficient donor signal is present. Minimum RSSI of -85dBm is recommended.

- **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.

- **Repeater**: Click Install button to automatically setup the repeater. It may take up to 3 minutes to complete the process…

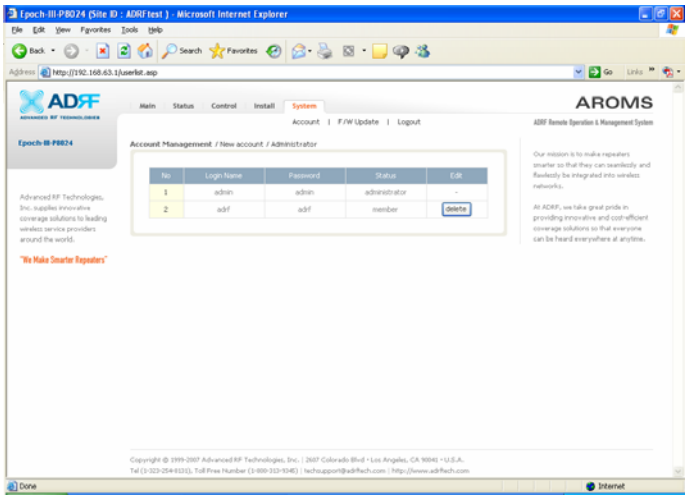
- **Repeater Location**: Will display the physical address where the repeater is installed

- **Repeater Installer Info**: Will display the installer's name, phone and e-mail Address for technical support.

3.5 System

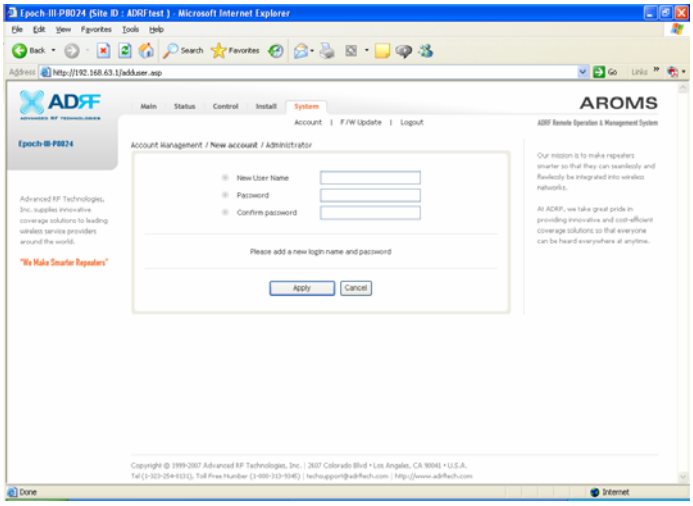
3.5.1 Account

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



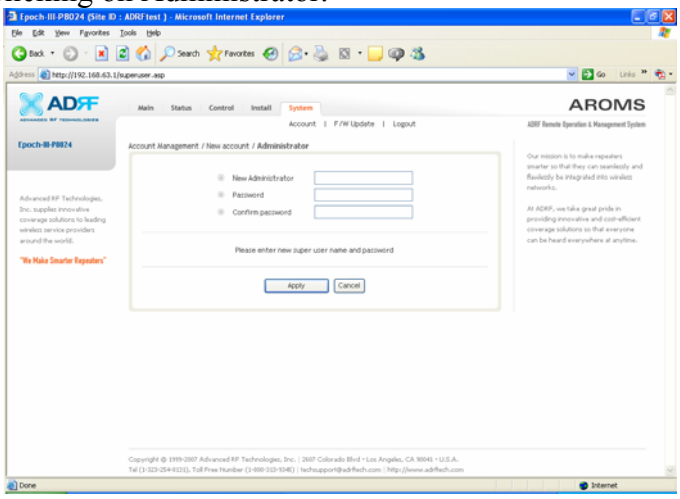
Note: If you are the Super User, you will see account management section under the System Window. If you are a local user, you will not be able to see the account management portion.

Super-User
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



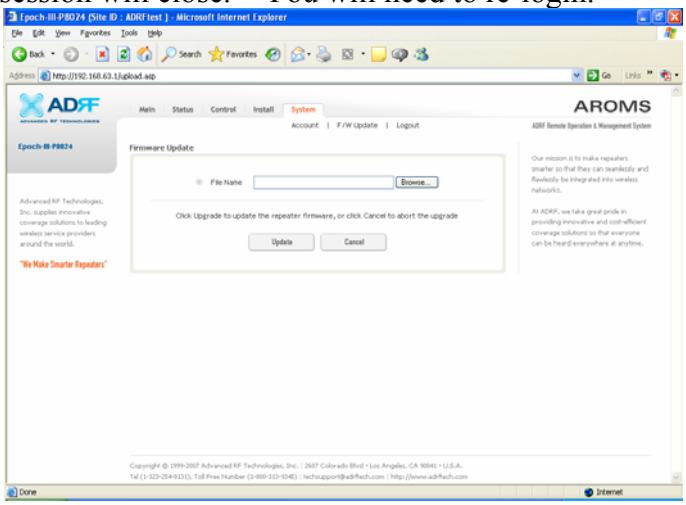
Administrator

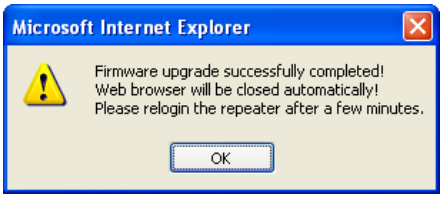
The following window illustrates how a new administrator can be added by simply clicking on Administrator.



3.5.2 Firmware Upgrade

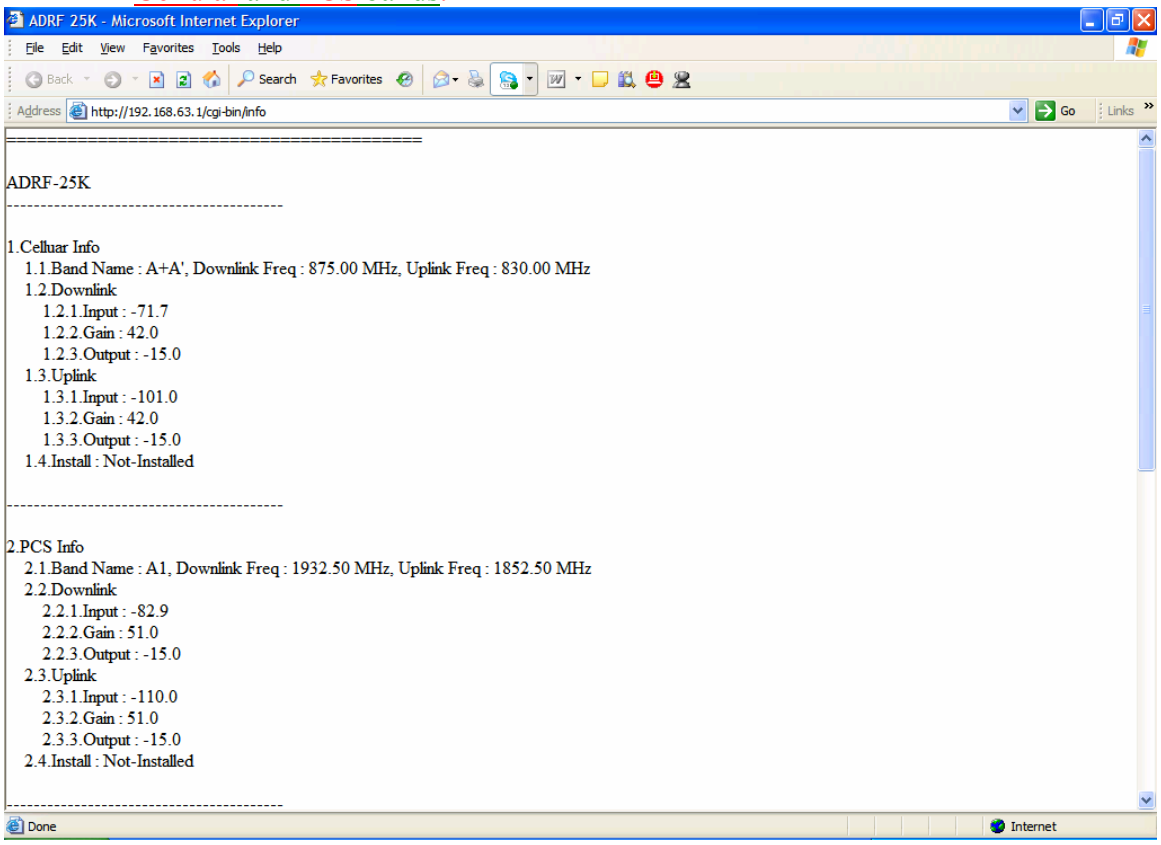
If you click on Firmware Upgrade, the following window will appear. You can browse through your PC and locate the firmware file. Once it is selected, simply click on Update and the latest firmware will be automatically uploaded and the session will close. You will need to re-login.





3.5.3 System Info

Displays the system info in a simple text format.
Displays the Input/Output/Gain, Alarm status, and Modem status of both the Cellular and PCS bands.



4. Maintenance Guide for ADRF-25K

4.1 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.

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. Warranty and Repair Policy

5.1 General Warranty

The ADRF-25K carries a Standard Warranty period of three years unless indicated otherwise on the package or in the acknowledgment of the purchase order.
All antennas (PCS Yagi, Cellular Yagi, Dual Band Omni), cables and diplexer all carry a Standard Warranty period of ten years under normal operating conditions.

5.2 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.

5.3 Limitation of Damages

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

5.4 No Consequential Damages

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

5.5 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.

5.6 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 (323) 254-8131 or send an email to techsupport@adrftech.com.

Appendix A: Specifications

A.1 Electrical Specifications

Parameters		Specifications		Remark
		Downlink	Uplink	
Frequency	Cellular A band [(A+A")=A+A']	869.0~880.0 MHz 890.0~891.5 MHz	824.0~835.0 MHz, 845.0~846.5 MHz	Configurable
	Cellular B band (B+B')	880.0~890.0 MHz 891.5~894.0 MHz	835.0~845.0 MHz, 846.5~849.0 MHz	
	PCS	1930.0~1990.0 MHz	1850.0~1910.0 MHz	
Sub Band Filtering	Cellular	A(A+A") + A' or B + B' (Configurable)		A' or B' spectrum on/off
	PCS	5, 10 or 15 MHz BW (Tunable)		contiguous band
Roll off	Cellular	>45dBc@±2MHz from the sub-band edge		A,B
	PCS	>45dBc@±1.5MHz from the sub-band edge.		
Spurious Emissions		3.6 and 4.5 of [1], 3.8 and 4.4 of [2]		
Radiated Spurious Emissions		Part15.109, part 22.917, part24.238		
Out of band emissions [3]	Cellular	43+10log(p)dB or 26dB (greater of the two) P : Maximum Output(W)		RBW 100 KHz or 1% of Emission BW
	PCS	43+10log(p)dB or 26dB (greater of the two) P : Maximum Output (W)		RBW 1 MHz or 1% of Emission BW
Input	Downlink	-105~-55dBm(EIRP)		
	Uplink			
Output	Cellular	≤ +20 dBm	≤ +17 dBm	EIRP
	PCS	≤ +20 dBm	≤ +17 dBm	
	Cellular	≤ +15 dBm	≤ +10 dBm	Repeater Only
	PCS	≤ +18 dBm	≤ +12 dBm	
Gain	Cellular	72 ± 2 dB	72 ± 2 dB	Repeater Only
	PCS	81 ± 2 dB	81 ± 2 dB	
Gain flatness		≤ ±1.5dB across the Cellular and PCS bands		Typ: ±1.25
		≤ ±2dB at all temperature range		

Gain Control Range	Cellular	≥ 30 dB		
	PCS	≥ 30 dB		
AGC Setting Range	Cellular	- 5 ~ + 15 dBm	- 10 ~ + 10 dBm	Repeater Only
	PCS	- 2 ~ + 18 dBm	- 8 ~ + 12 dBm	
EVDO Gain Offset		-3 ~ +3dB, @ 0.5 dB Step		
Noise Figure	Cellular	≤ 8.5dB @ Max Gain ≤ 9.5dB @ Min Gain	≤ 7.0dB @ Max Gain ≤ 8.0dB @ Min Gain	Repeater Only
	PCS	≤ 7.5dB @ Max Gain ≤ 8.5dB @ Min Gain	≤ 7.0dB @ Max Gain ≤ 8.0dB @ Min Gain	Repeater Only
Delay	PCS	≤ 5 us		
	Cellular	≤ 5 us		
Signal Quality	Phase error	3° RMS		
	Frequency error	± 300 Hz for Cellular, ± 150 Hz for PCS		
	Magnitude error	< 5%		
	Rho factor	> 0.912		
	IQ imbalance	< 0.35%		
VSWR		<1:1.5		Input ports

[1] TIA/EIA-98-F, "Recommended Minimum Performance Standards for CDMA2000 Spread Spectrum Mobile Stations"
[2] TIA/EIA-97-F, "Recommended Minimum Performance Standards for CDMA2000 Spread Spectrum Base Stations"
[3] FCC CFR Title 47, part22 for Cellular, part24 for PCS

A.2 General Specifications

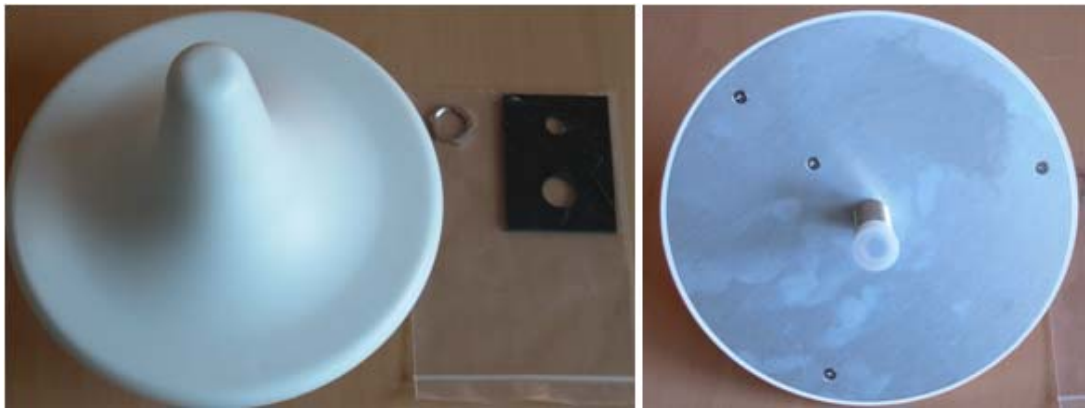
Parameters		Specifications		Remark
Dimension (W × D × H)		304×410×193mm (11.98 × 16.15 × 7.6 inches)		
Weight(lbs)		18.5 Kg (40.78 lbs)		
Temperature	Storage	-4 ~ 158°F	-20 ~ +70°C	
	Operating	14 ~ 122°F	-10 ~ +50°C	
Humidity		5 ~ 85%, non condensing		
AC power		100~120 VAC, 50~60 Hz		
Power Consumption		≤ 90 W (PCS + Cellular)		
Water		IP40		
Wireless Modem		3G Modem		
NMS	Local	RJ45 (DHCP)		
	Remote	SNMP		

A.3 Power Supply Specifications

Input	
Voltage	100 to 250VAC, ±10%
Line Frequency	47 to 63Hz
Current	2.0A max at 90VAC Input
Protection	Internal Primary Current Fuse Inrush Limiting
Power Factor Correction	Complies with EN61000-3-2 and EN61000-3-3
Configuration	Inlet Type: IEC320-C14, C18
Output	
Combined Line and Load Voltage Regulation	±1% (excluding cord)
Ripple	1% Vp-p max.
Transient Response	0.5ms for 50% load change Typ.
Hold-up Time	16ms min. Over entire input range
Protection	Foldback Over current Short Circuit Protection
Safety Approvals	
Agency Listings	UL60950-1. TUV/IEC EN60950-1
	EMC:EN55022/55024/61000, K60950-1

A.4 Antenna Specifications

A.4.1 Server Antenna



- Electrical Specifications

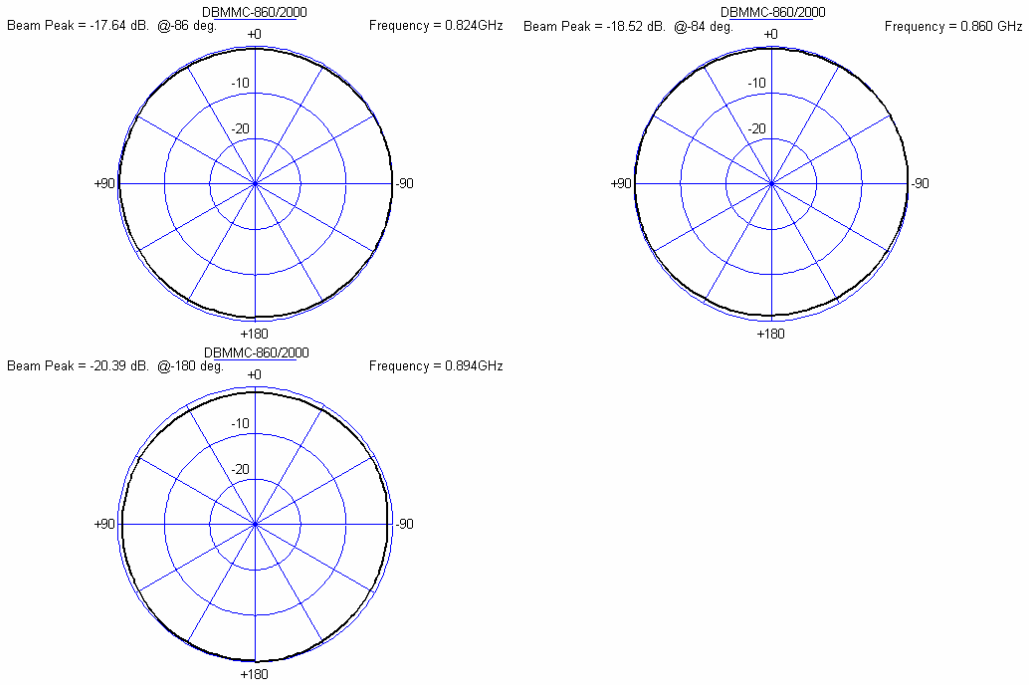
Parameters	Specifications		Remarks
Frequency Range	824 ~ 894 MHz ,	1920 ~ 2170 MHz	
Gain	2 dBi (Min)	4 dBi (Min)	
VSWR	≤ 2:1		
Hori, Beam Width	Omni		
Polarity	Vertical		
IMD	≥ 165 dBc		
Connector	N type, Female		
Maximum Power Rating	20 Watt		
Impedance	50 Ohms		

- Mechanical Specifications

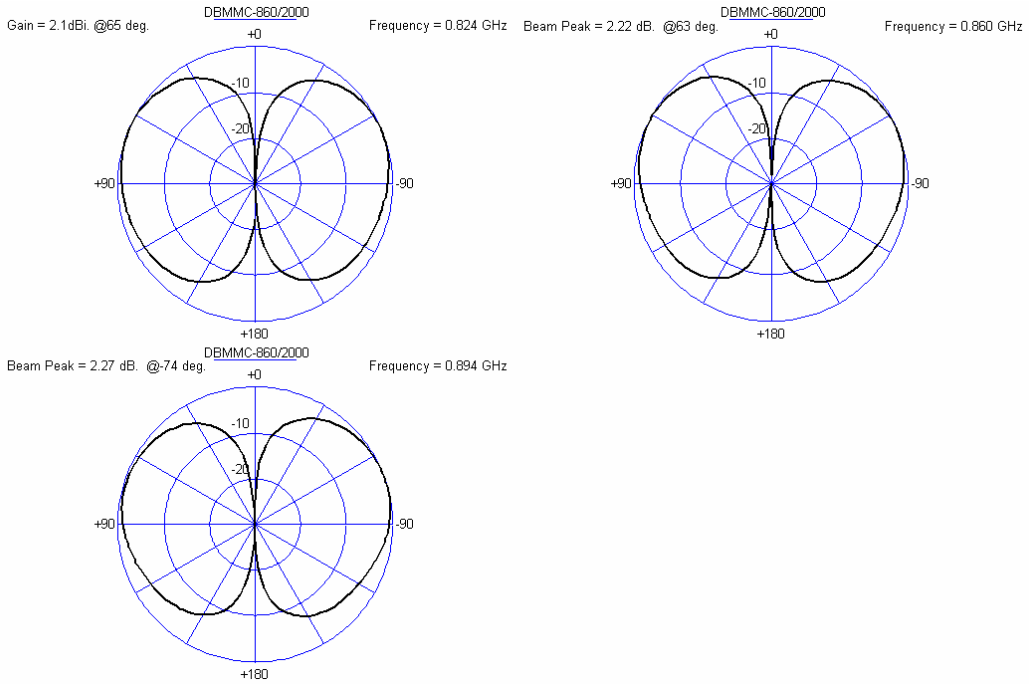
Parameters		Specifications	Remarks
Dimension	Diameter	7.244 inches (184 mm)	
	Height	4.134 inches (105 mm)	
Weight		0.85 lbs (390 g)	
Color		White	
Radome		ASA Plastic	
Polarity		Vertical	
Connector		N type, Female	
Maximum Power Rating		20 Watt	
Impedance		50 Ohms	

- Beam Patterns

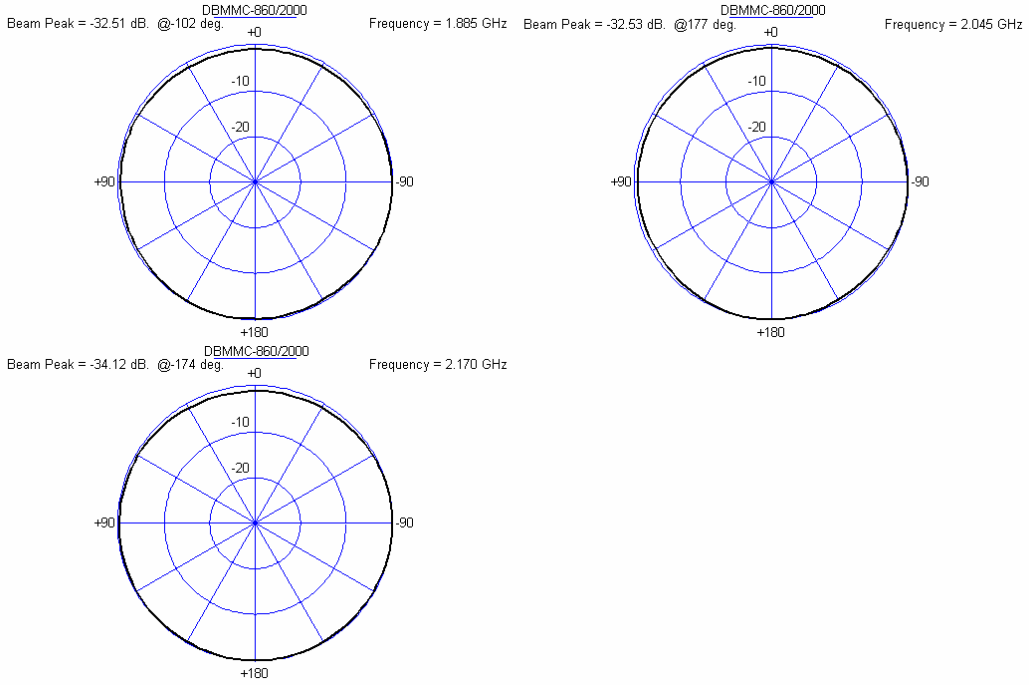
- CDMA Horizontal Beam Pattern



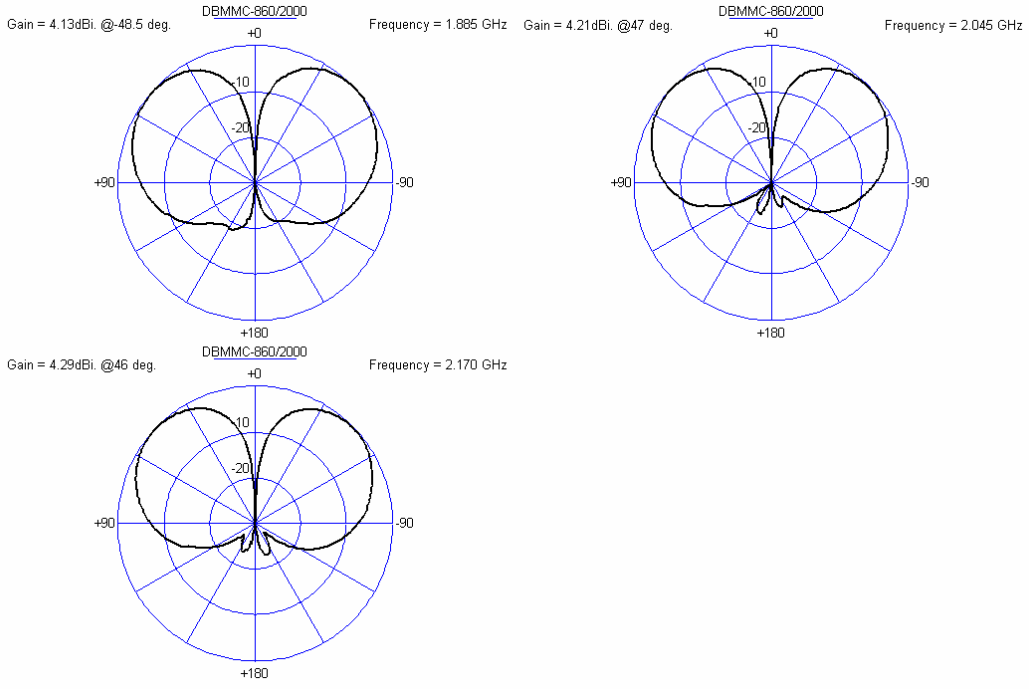
- CDMA Vertical Beam Pattern



- PCS Horizontal Beam Pattern



- PCS Vertical Beam Pattern



A.4.2 PCS Donor Yagi Antenna

- Electrical Specifications

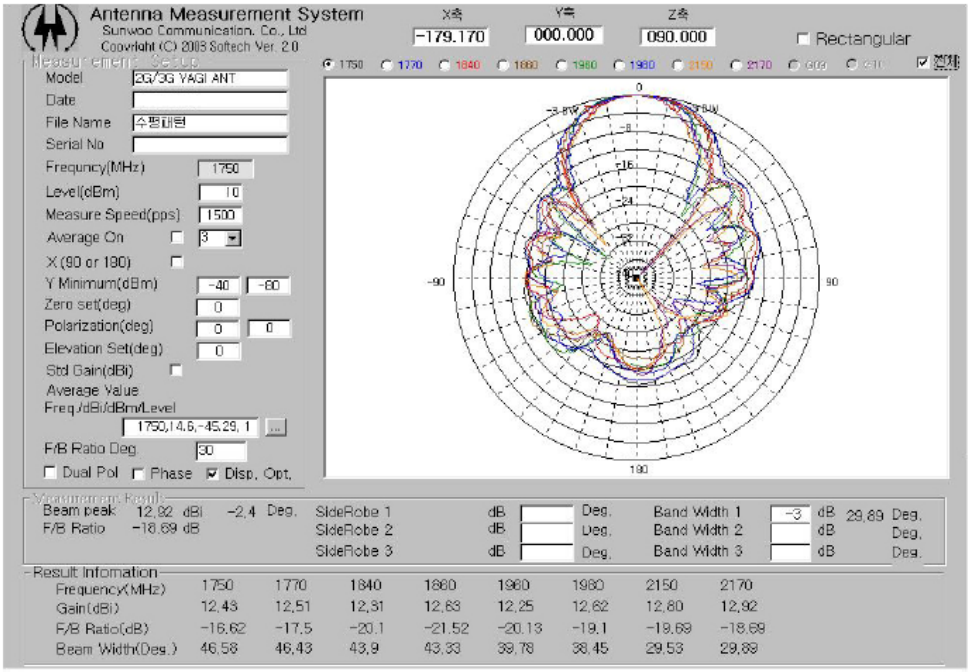
Parameters		Specifications	Remarks
Frequency Range		1750 ~ 2170 MHz	
Gain		≥ 12 dBi (Min)	
VSWR		≤ 1.3:1	
Beam Width	H	≥ 28°	29~46
	V	≥ 34°	34~37
F-B Ratio		≥ 15 dB	
IMD		≥ 165 dBc	
Maximum Power Rating		50 Watt	
Impedance		50 Ohms	

- Mechanical Specifications

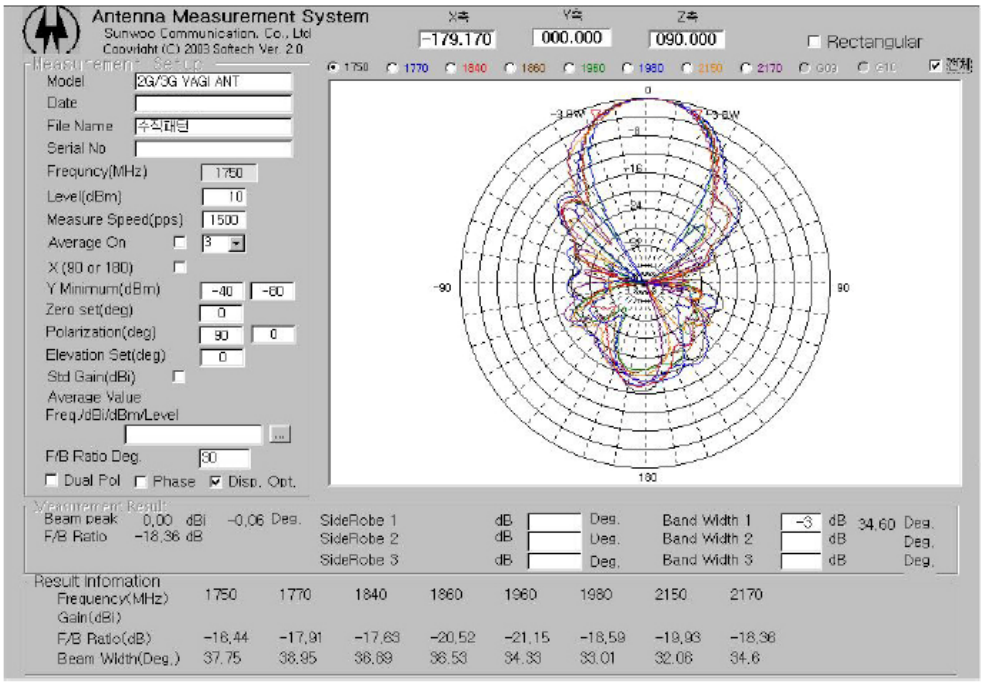
Parameters	Specifications	Remarks
Dimension	4.212 × 3.228 × 19.685 inches (107 × 82 × 500 mm)	
Weight	3.307 lbs (1.5 Kg)	
Radome	Copper Al, PCB, ASA	
Connector	N type, Female	

- Test Results

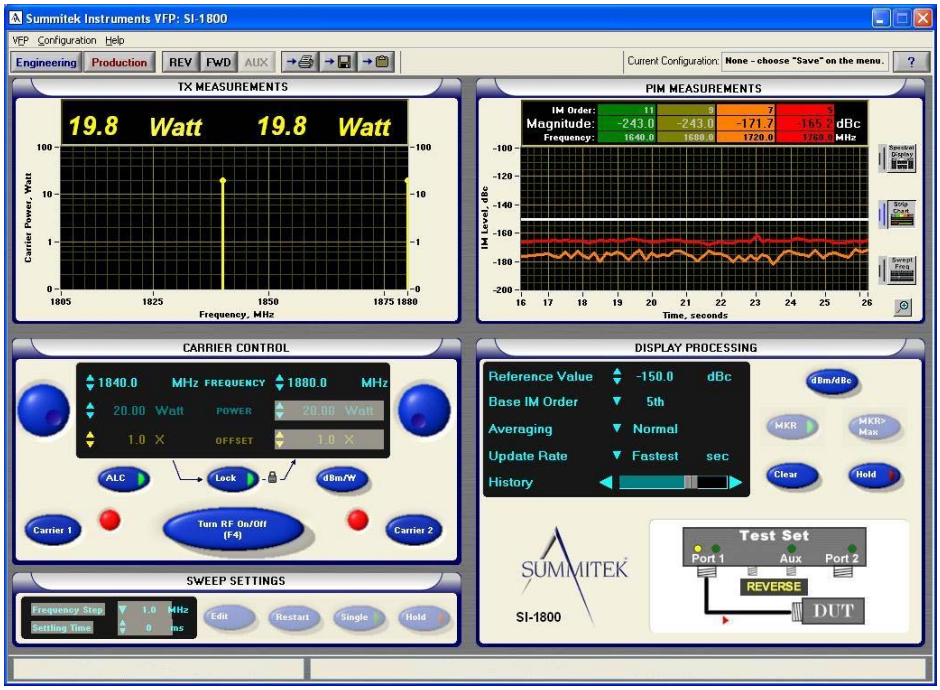
- PCS Horizontal Beam Pattern



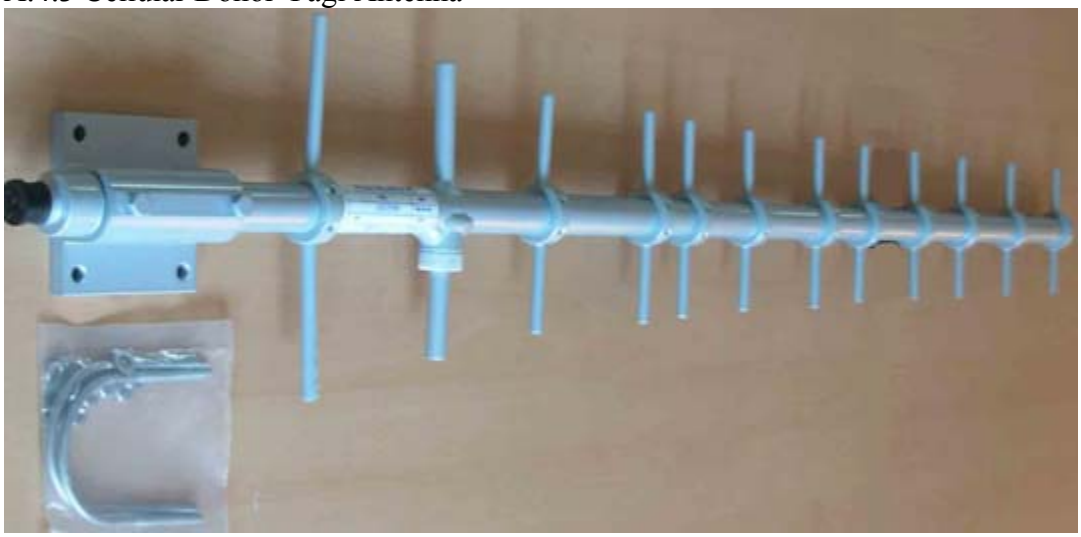
- PCS Vertical Beam Pattern



- PCS IMD Test


Summitek Instruments VFP: SI-1800
VFP Configuration Help
Engineering
Production
REV
FWD
AUX
Current Configuration:
None - choose "Save" on the menu.
TX MEASUREMENTS
19.8 Watt
19.8 Watt
Carrier Power, Watt
Frequency, MHz
PIM MEASUREMENTS
IM Order:
Magnitude:
Frequency:
dBc
MHz
IM Level, dBc
Time, seconds
CARRIER CONTROL
1840.0 MHz FREQUENCY 1880.0 MHz
20.00 Watt POWER 20.00 Watt
1.0 X OFFSET 1.0 X
ALC
Lock
dBm/W
Carrier 1
Turn RF On/Off (F4)
Carrier 2
DISPLAY PROCESSING
Reference Value -150.0 dBc
Base IM Order 5th
Averaging Normal
Update Rate Fastest sec
History
dBm/dBc
MKR
MKR> Max
Clear
Hold
SWEEP SETTINGS
Frequency Step 1.0 MHz
Settling Time 0 ms
Edit
Restart
Single
Hold
SUMMITEK
SI-1800
Test Set
Port 1
Aux
Port 2
REVERSE
DUT

A.4.3 Cellular Donor Yagi Antenna



- Electrical Specifications

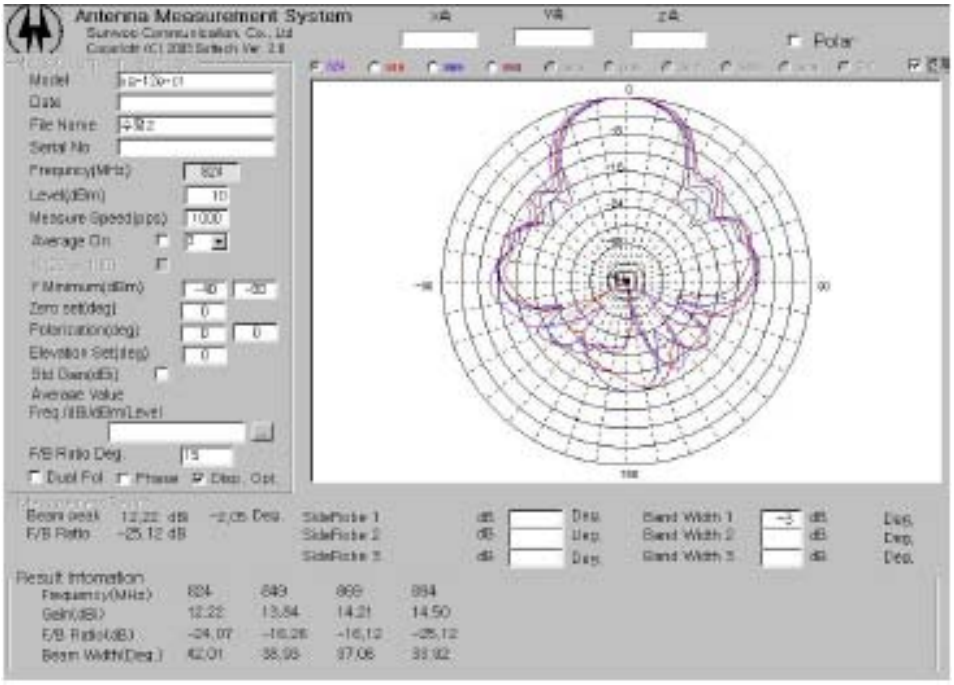
Parameters		**Specifications**	**Remarks**
Frequency Range		824 ~ 894 MHz	
Gain		≥ 12 dBi (Min)	
VSWR		≤ 1.3:1	
Beam Width	H	≥ 35°	33~42
	V	≥ 32°	33~40
F-B Ratio		≥ 15 dB	
Maximum Power Rating		50 Watt	
Impedance		50 Ohms	

- Mechanical Specifications

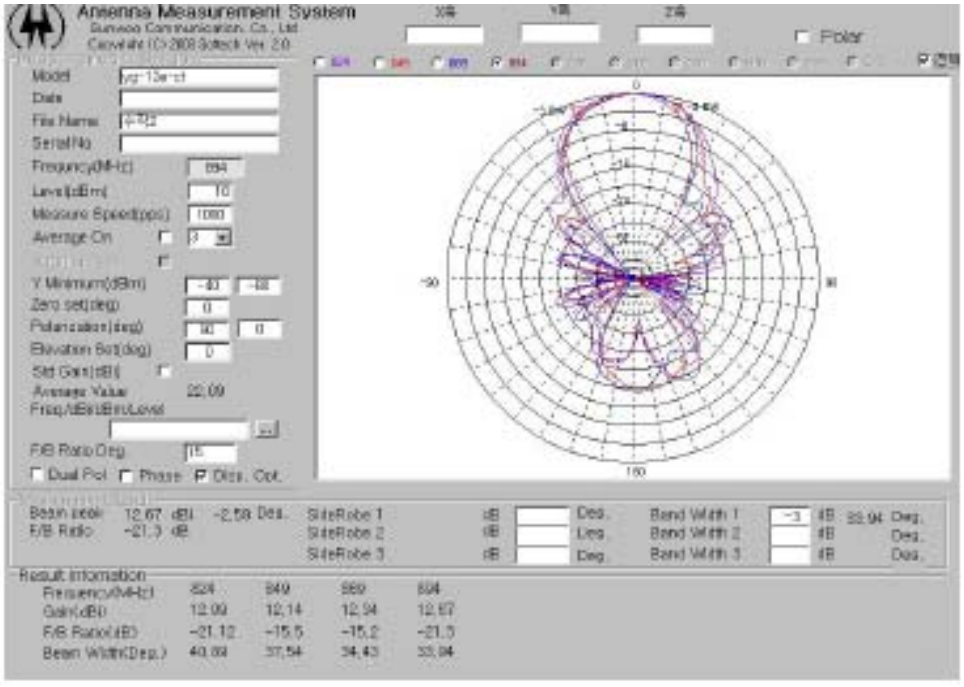
Parameters	**Specifications**	**Remarks**
Dimension(length)	49.217 inches (1250 mm)	
Weight	2.511 lbs (2.5 Kg)	
Connector	N type, Female	

- Beam Patterns

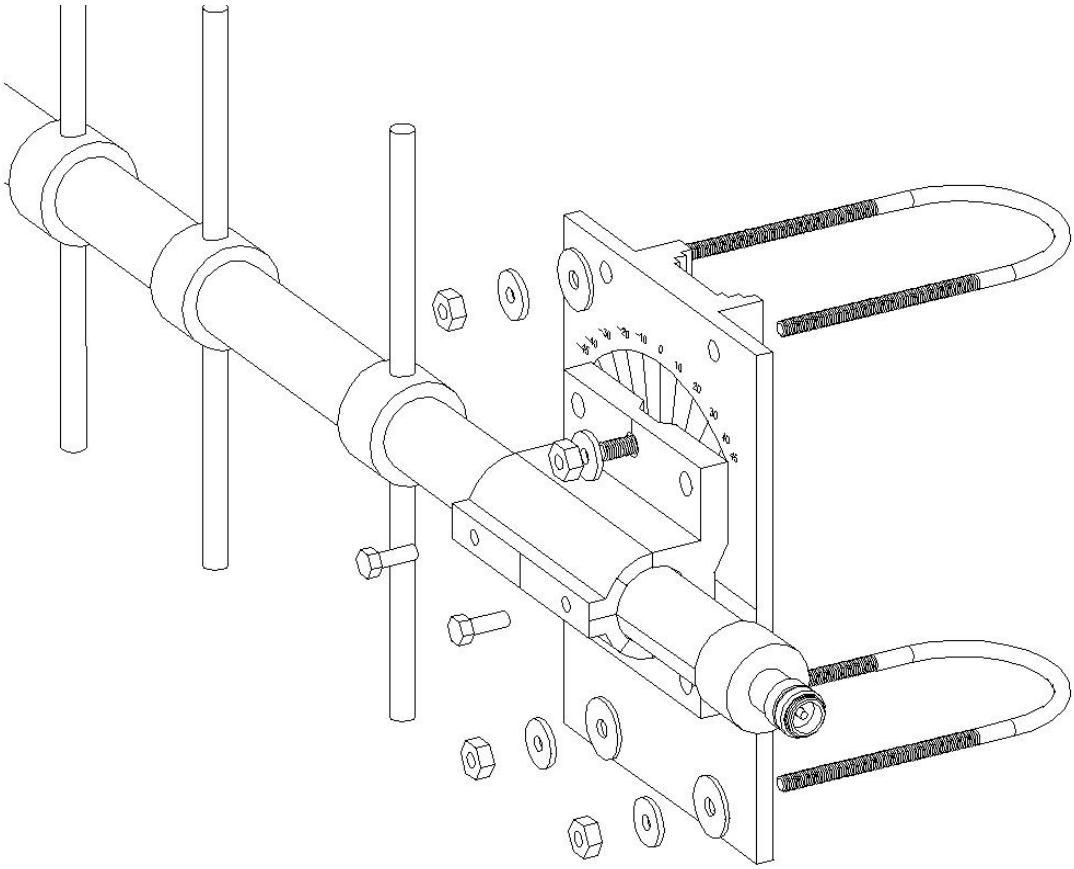
- Cellular Horizontal Beam Pattern



- Cellular Vertical Beam Pattern



- Tilt Bracket for Cellular Yagi Antenna

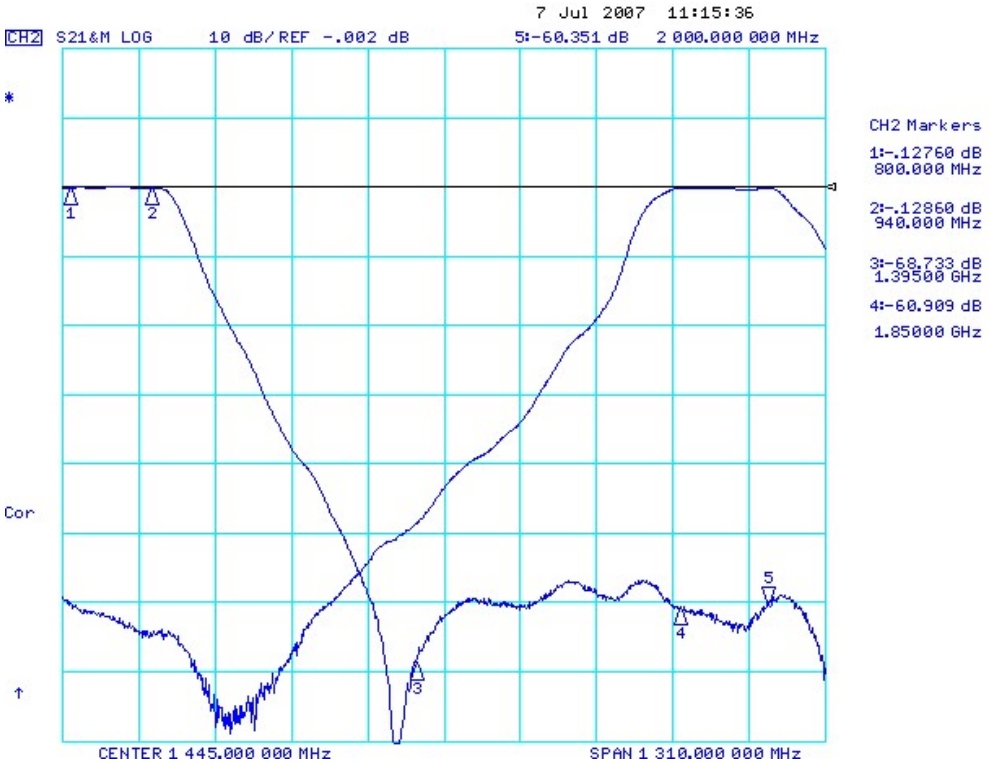


A.5 Diplexer Module Specifications

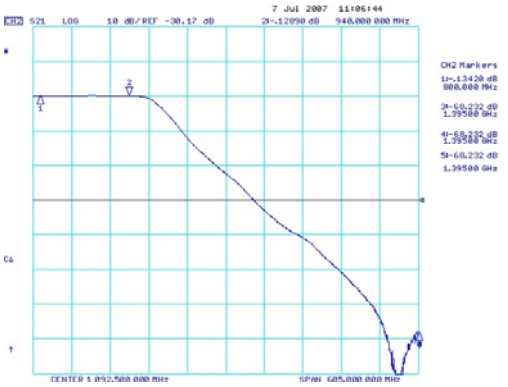
- Electrical Specifications

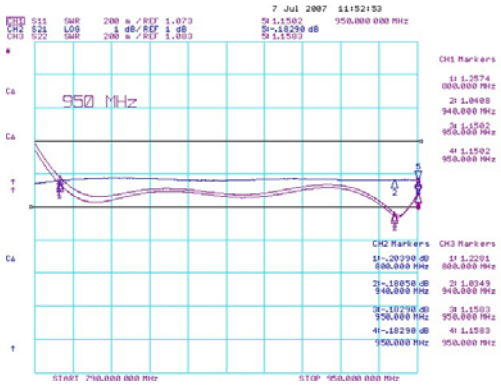
Type	Cellular (Low Port)	PCS (High Port)
Frequency	800 ~ 940MHz	1.84 ~ 2GHz
Ripple	≤ -0.5dB	
Loss	≤ -1.0 dB	
VSWR	≤ 1.4 : 1	
Impedance	50 Ohms	
Isolation	≥ -55 dB	
Maximum Power Rating	50 Watt	
Dimension	1.96*3.93*2.55 inches (50*100*65 mm)	

- Full Band

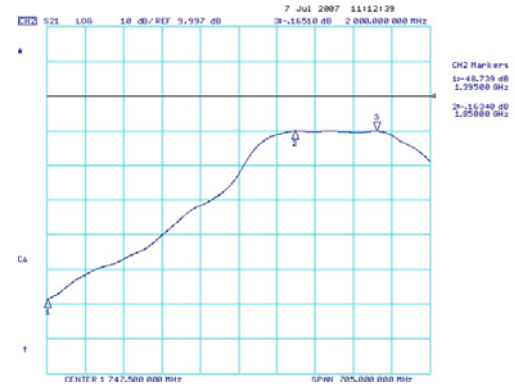


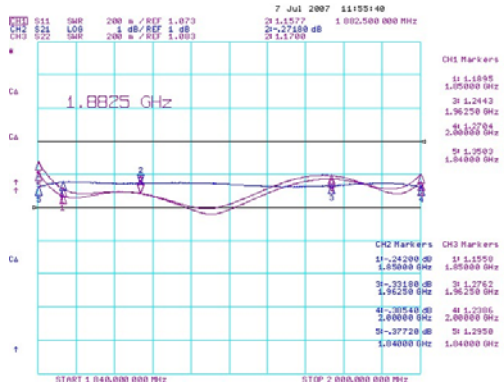
- Cellular



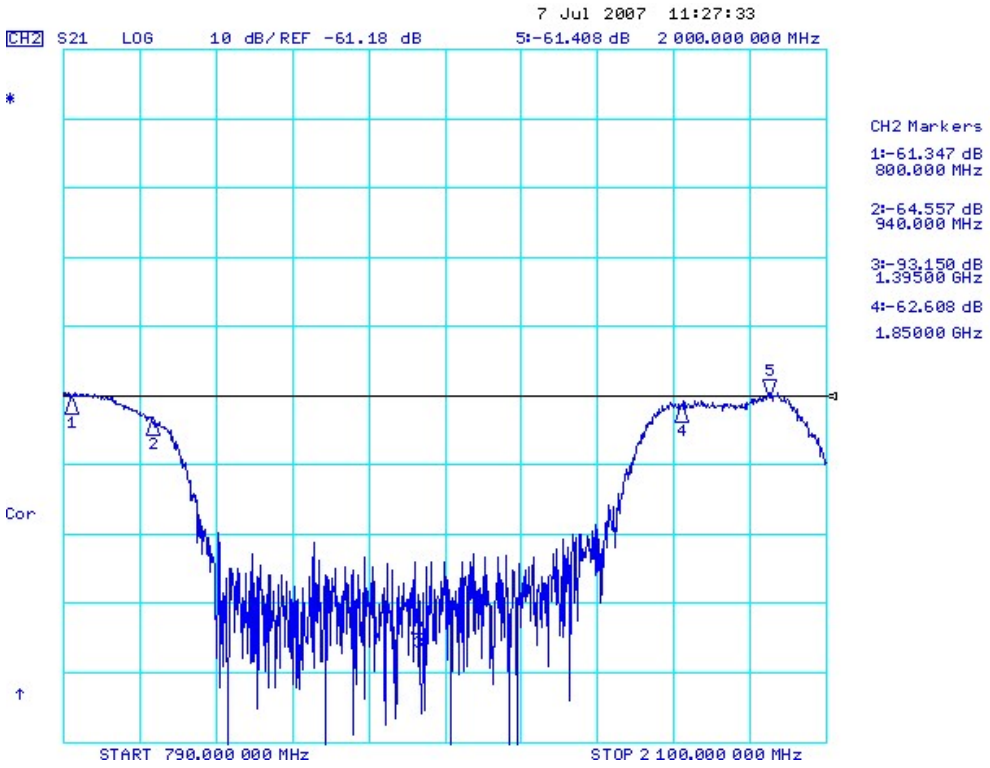


- PCS





- Port Isolation



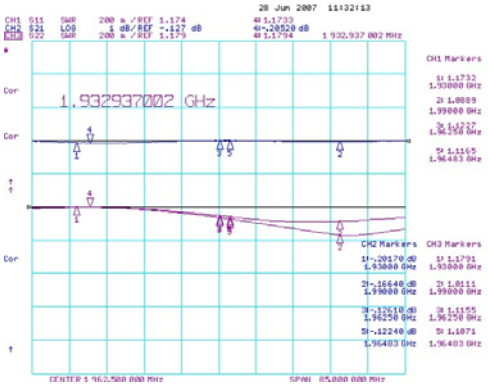
A.6 Cable Specifications

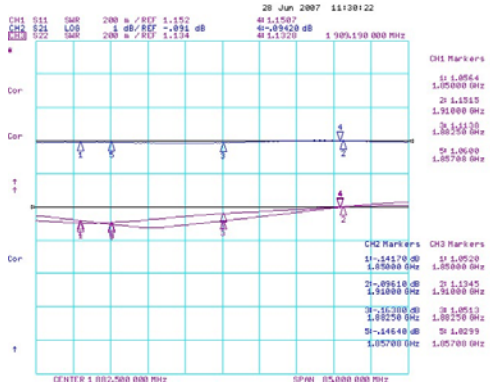
- Coaxial Cable Specifications

Length	Loss		Weight	Connector	Remark
	Cellular	PCS			
3 ft (1M)	≤ 0.2 dB	≤ 0.3 dB	≤0.485 lb (220g) / EA	N-M To N-M	Donor To Diplexer
150 ft (45.71M)	≤ 4 dB	≤ 5.5 dB	≤22.31 lb (10.12 Kg) / EA	N-M To N-F	Diplexer To Repeater
30 ft (9.14M)	≤ 1.2 dB	≤ 1 dB	≤4.60 lb (2.09 Kg) / EA	N-M To N-M	Server To Repeater

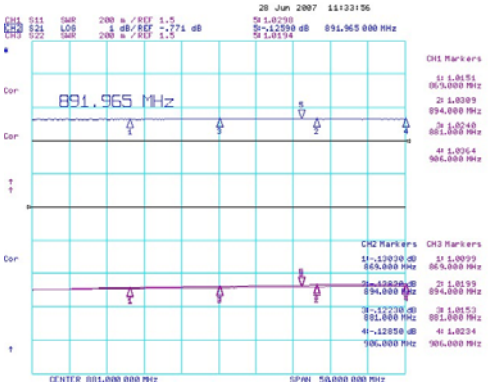
- Test Results for 3 ft (1M) Cable

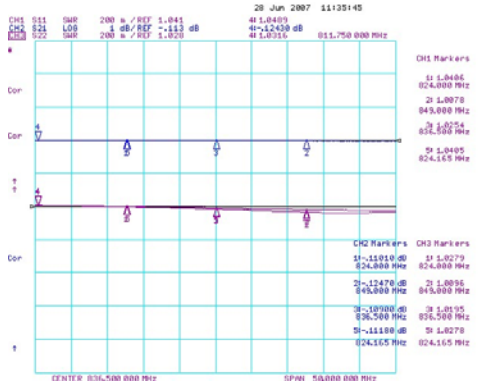
– PCS





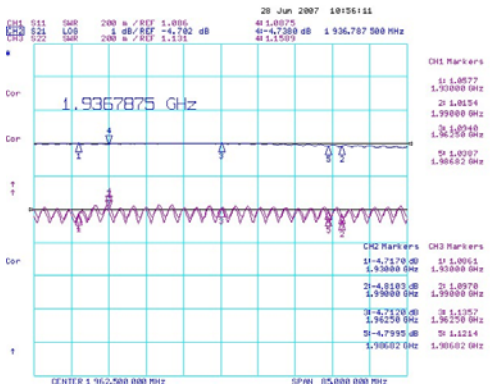
– Cellular

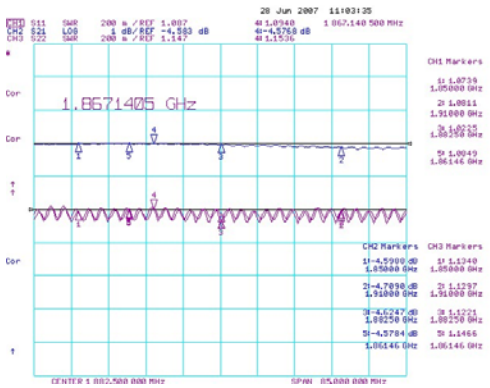




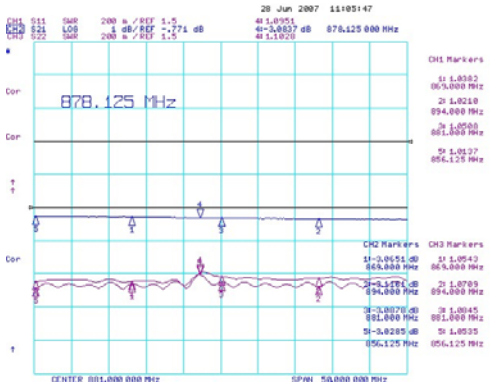
- Test Results for 30 ft (9.14M) Cable

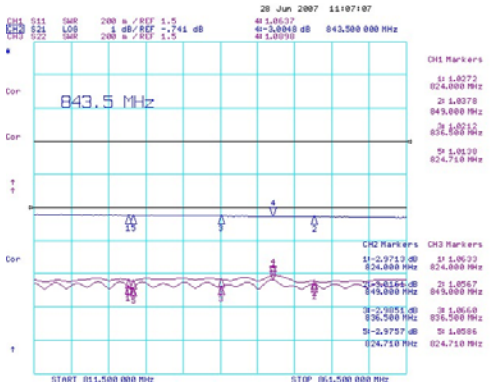
– PCS





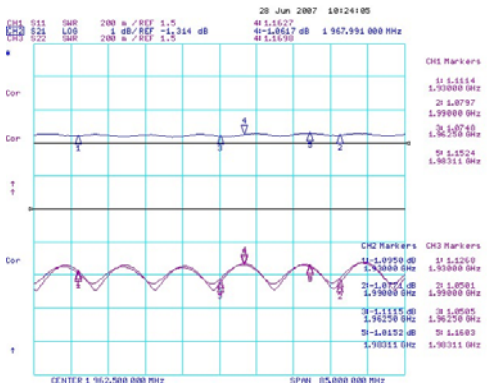
– Cellular

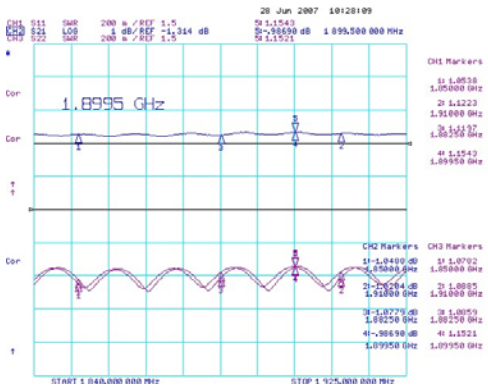




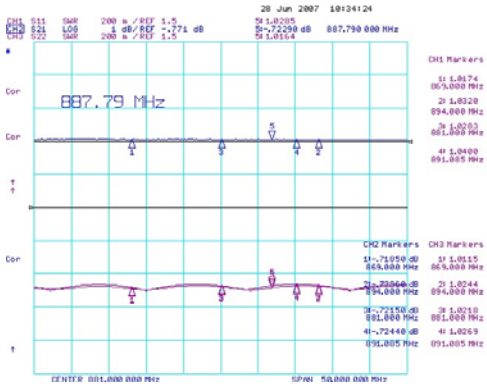
- Test Results for 150 ft (45.71M) Cable

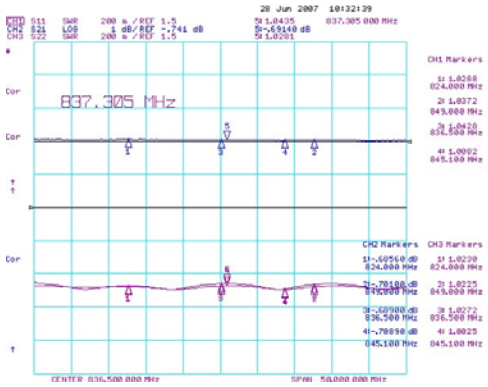
– PCS



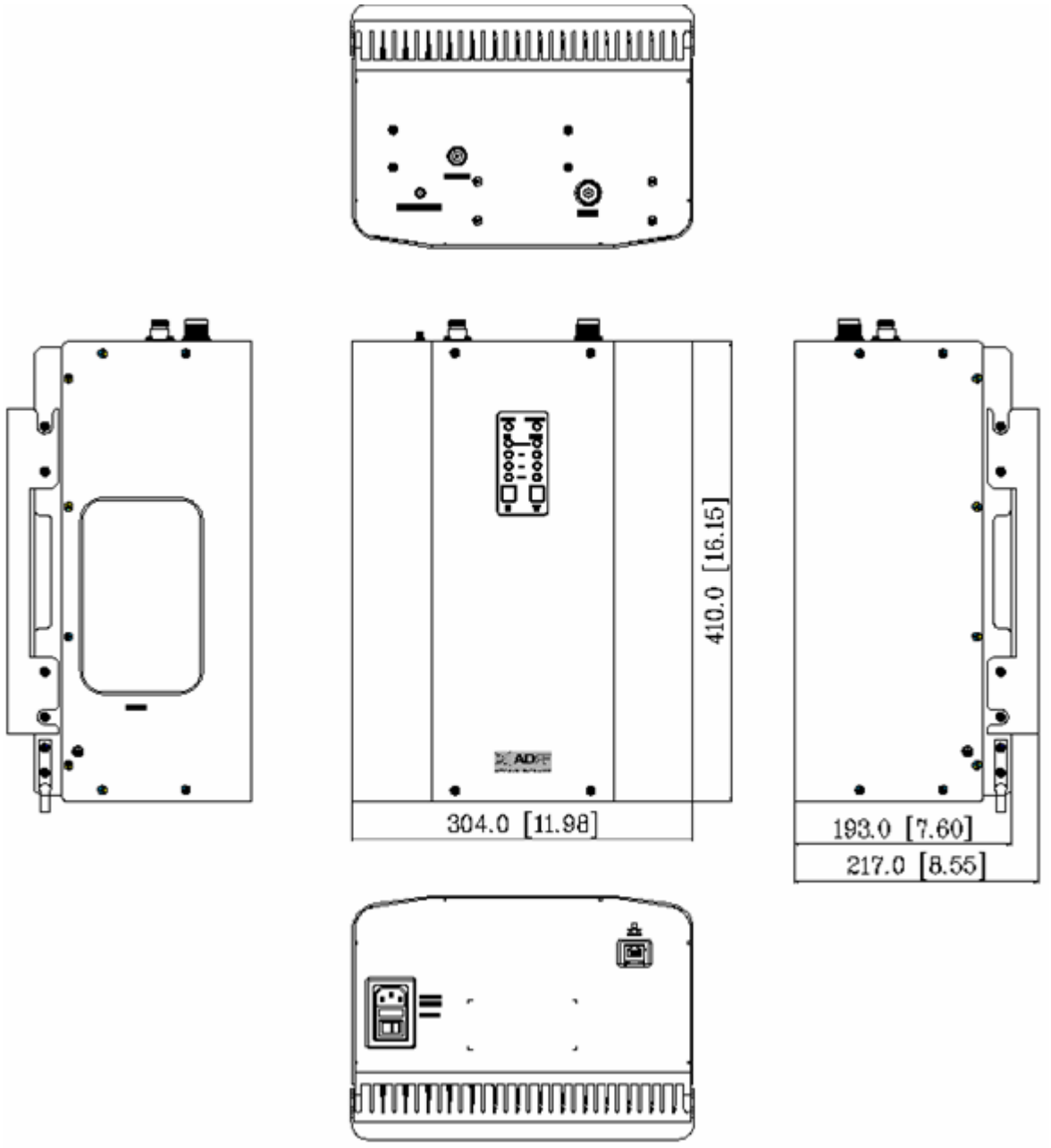


– Cellular



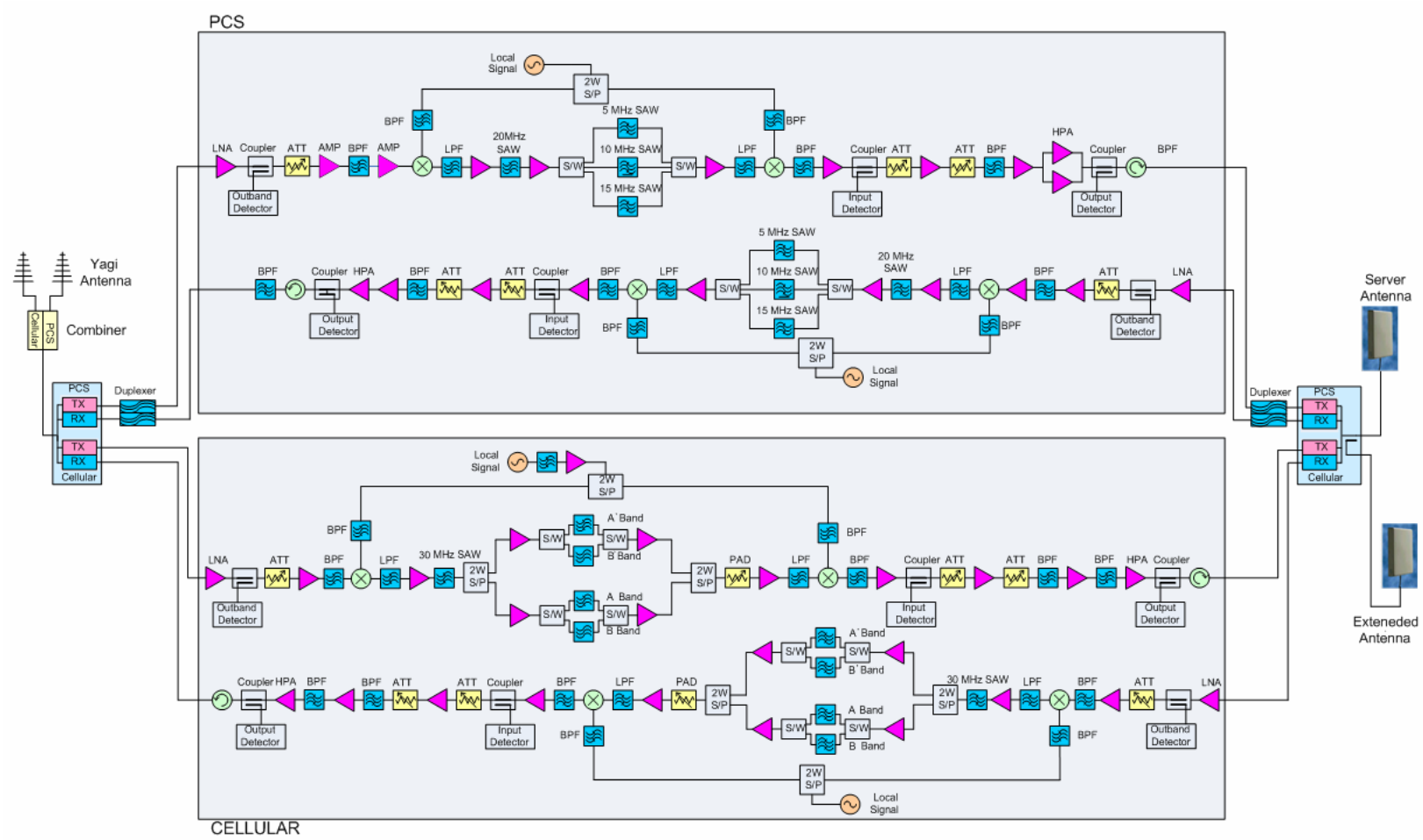


Appendix B: Mechanical Drawing

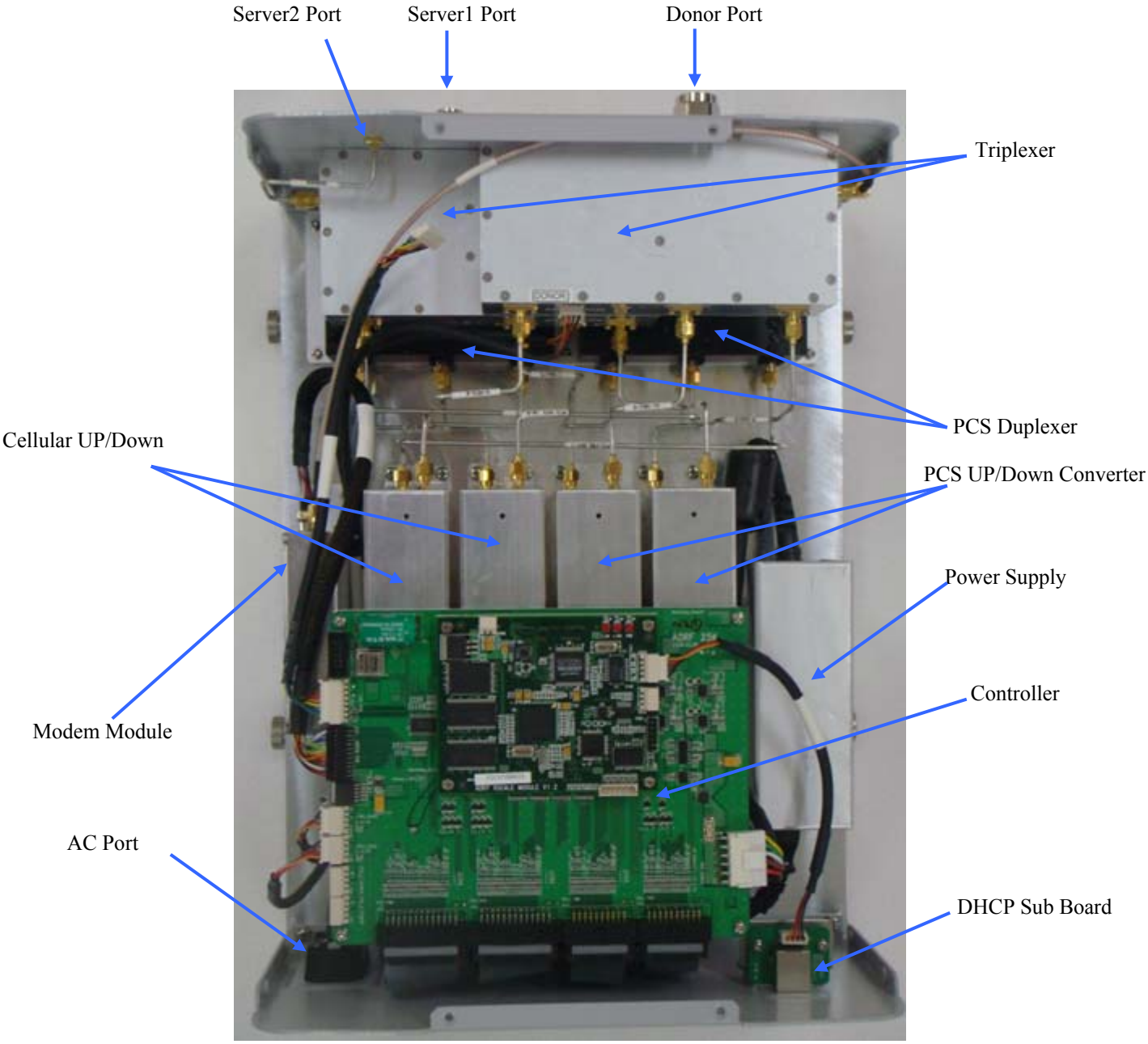


Appendix C: ADRF-25K Overview

C.1 Block Diagram



C.1 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.

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).