

**SpotCell2331Xf  
SpotCell3331Xf  
Digital Repeater  
User's Manual**

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## Preface

This user's manual describes the installation, commissioning and maintenance of digital repeaters.







Please do read the user manual carefully before installing and maintaining digital repeaters.

The information in this manual is subject to change without prior notice.

Opinions are welcomed about the manual improvement.

## 1 Safety Warnings

### Users must follow the below principles:

-  Repeater should follow system requirement of communication equipment, assure good groundings and lightning protection.
-  The power supply voltage of repeater should meet the standards of security requirement; any operation shall be carried out only after cutting off power in advance. Only the professional is authorized for the operation.
-  Do not dismantle machine, maintain or displace accessories by yourself, because in this way, the equipment may be damaged or even get an electric shock.
-  Do not open the repeater; touch the module of repeater, or to open the cover of module to touch the electronic component, the components will be damaged due to electrostatic.
-  Please keep away from heating-equipment, because the repeater will dissipate heat during operation. And do not cover booster with anything that influences heat-dissipation.
-  Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.



● **WARNING.** This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$ 100,100 for each continuing violation.



● **WARNING.** For antenna and accessories, there are many brand or similar items, if clients need to use such items, please compare the specifications carefully and consult the professional manufacture if it's suitable to use. The usage of the unqualified antennas, cables or coupling device may result in the improper work of boosters and even damage the device. Please double check before changing these items.

## 2 Why repeater

### 2.1 Reason 1

- 1) Blind or weak signal areas are formed if the buildings are too far away from BTS, or the buildings themselves shield or absorb the signals.
- 2) There are too many complicated signals in the higher part of the buildings, therefore ping-pong switching effect has been formed and the signals fluctuate a lot, there are annoying noises during phone calls and there are dropped phone calls accordingly.
- 3) Elevators and basements are well-known blind areas.
- 4) Downtown areas of the cities, congested with many high-rise buildings are usually the weak or blind areas.

### 2.2 Reason 2

The remote villages, mountains, hills, valleys, etc are mostly scarcely populated areas with quite few mobile users, so the main target is to send coverage to these areas, and it will not be cost effect to install a BTS tower, therefore a booster is a quite good option.

Can we not use mobile phones? The answer is definitely NO. But it might be much more miserable that the communication can't be achieved due to no or weak signals though there is a mobile phone.

## How to solve the problems?

### Best Solution:

**Plug & play: Purchase a set of booster solution and install it, and plug on the power and immediately you would be able to enjoy the full bar and high quality signals!**

---

### Question: Will booster increase the RF radiation?

A: No, it will decrease instead.

As it can be searched easily through internet, the tower would “order” the mobile phone to increase its output power, in order to ensure successful connection when the mobile signal bar is few, there will be stronger mobile output power level when the mobile signal bar is less and the strongest one can reach 2W (GSM); moreover, the mobile phone is usually as near as less than 5cm to human body when people are in phone calls. Not only it influences badly the human bodies, but also run out of the battery power much more quickly; usually the mobile phone gets hot in such status.

The maximum power level of digital repeater is 0.2W, and it decreases to be maximum 0.006W when reaching server antenna. And since the server antenna is installed over the ceiling or onto the wall, there is usually more than 3 meter away from the human body, 3meter away means at least 40dB propagation loss, or 10000 times less, 0.000006W, and therefore it is too weak to influence human bodies though it is still a very good signal for mobile phones.

And when a booster is installed, it improves the mobile signals in the coverage, and the successful phone call can be connected easily with a much less power level of the mobile phone, thus it will reduce tremendously the RF radiation.

## 3 Introduction

Digital repeater full duplex mobile communications repeater is the perfect solution for providing a wireless improvement in the cellular reception, in the quickest time possible. One repeater covers 2000 to 2500 square meters.

It is designed to improve the call quality of an area by receiving, amplifying and re-transmitting signals of the base station into a specified area via the server antenna of the repeater.

This repeater has Manual Gain Control (MGC) feature that enables engineers to reduce the gain of the repeater manually if oscillation is detected or too strong input power level during installation, this will help to get the best coverage effect without any interference back to mobile network.

And to maintain safe and specific output signal levels during the repeater's operation, this repeater has a built-in signal oscillation detection circuit to adjust the gain automatically so as to avoid interference to the cellular network, also it gets color changing LED's indicate its environmental status: the Alarm LED's located inside the housing of the unit will change color from OFF to red, (depending on the input power level) if the system detects signal oscillation in either band or, if the input signal is beyond a safe limit.

Below diagram shows how simple and fast digital repeater system is installed and works effectively.

One donor antenna, has been installed at the top of the roof to pick up good mobile signals from outside, and send through a 5D-FB cable to a digital repeater to be amplified significantly, then the output signals are divided into two signals by a 2way splitter, sent to two indoor omni antennas and finally transmitted into the coverage area. Very clear phone call or high speed mobile data services are immediately affected within the area.



## 4 System Characteristics

### 4.1 Features

- Excellent out of band rejection
- Wide power supply range and low power consumption

- High-integration (One board to contain low-noise amplifier, frequency selection module, power amplifier module)
- Manual gain control provides a variety of applications
- Support multi-system, multi-band, band selectable and adjustable

## 4.2 Appearance of digital repeaters

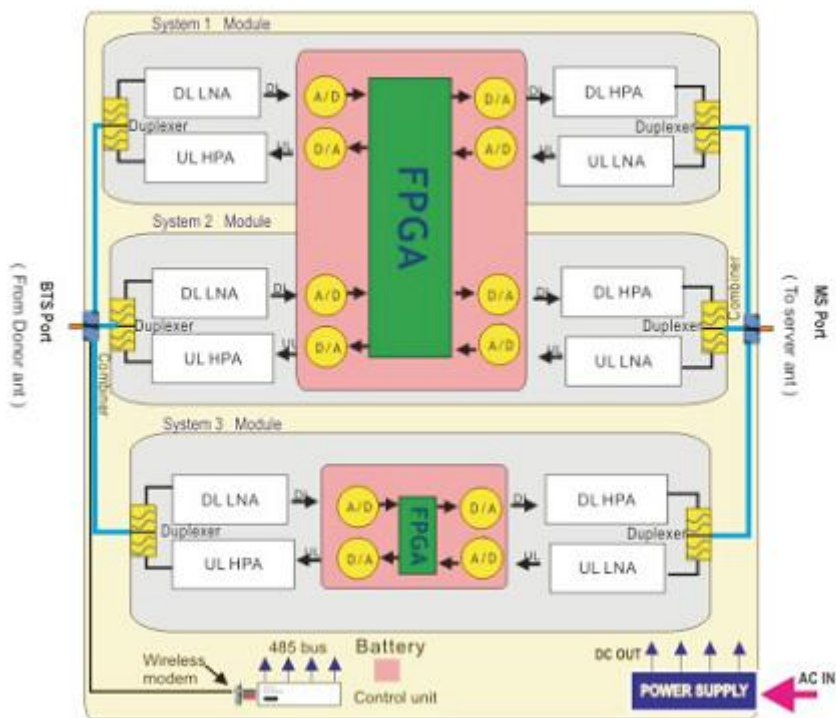


Figure 1 the front view (colors may differ from real products).

## 5 Block diagram and work principle

Digital repeater is basically a bi-directional amplifier, the downlink signals are received by the repeater from BTS by the donor antenna, filtered by its internal duplexers and FPGA module, amplified by low noise amplifier (LNA) and downlink PA unit, and then sent via the server antenna to the coverage area. The bandwidth is operators' working frequency only.

The uplink signal of mobile terminal from the coverage area is input via the server antenna, then filtered by duplexers and FPGA module, amplified by the uplink low noise amplifier (LNA) and the uplink PA unit and finally sent via the donor antenna to the BTS.

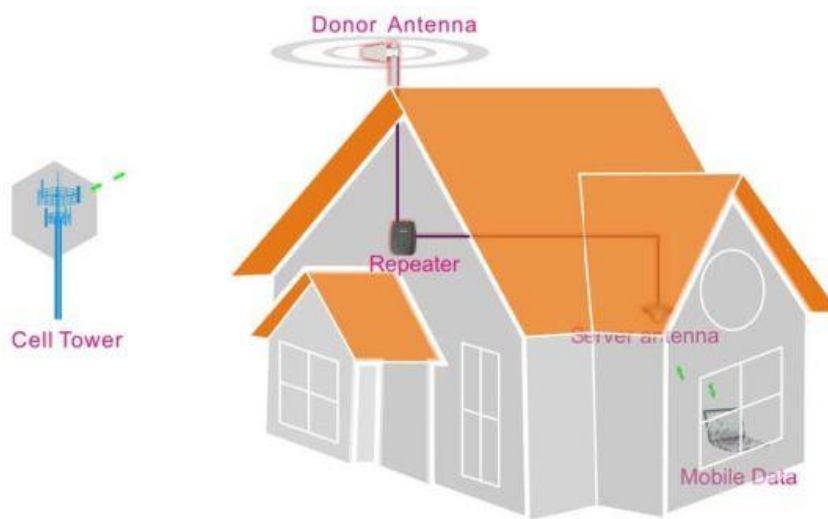


### Modules in the system diagram:

- **Combiner:** The main purpose of combiner is to combine two system to share the same antennas.
- **Duplexer:** The main purpose of duplexer is to combine downlink and uplink to share the same antennas, the duplexer is composed of one pair of band pass filter that can not only reject the spurious interference, but also increase the isolation of Uplink and Downlink.
- **LNA:** LNA is the first active sub system of the repeater, of which low noise and high linearity is requested under strong input signals. LNA is the major sub system that determines the noise figure of the repeater system.
- **FPGA:** Field–Programmable Gate Array, FPGA module is to process the digital signal transferred from analog signal and filter the signal out of selective band.
- **PA:** The power amplifier sub system helps the repeater to reach its targeted output power, linearity of which decides the linearity of the repeater.
- **Power supply** is to supply power electricity to all repeaters' modules.



## 6 The repeater system



- **Donor Antenna:**

- 5~7dbi outdoor panel or 7~9dBi wide band Yagi are recommended as donor antenna.
- Function: Pick up donor signals from the BTS and send to the repeater by cable; the received signals' power level and quality influence a lot on the coverage effect. Donor antenna also transmits the uplink signals from the repeater to BTS.

- **Server Antenna:**

- 2~3dBi indoor omni ceiling or 5~7dBi indoor panel are recommended.
- Omni antenna (Indoor ceiling omni antenna or whip antenna), suitable to installed in the center and radiate all direction; It is better to use a directional panel antenna or Yagi when the coverage shape is long and narrow (corridors, long row of houses in two sides, tunnels or elevators or rural open space).

- **Cables:** LMR 300 or 400, 5D or 8D –FB coax cables are recommended.

- **Splitters or couplers:** when the building structure is too complicated or there is big loss due to thick walls, etc., splitters or couplers shall be used so that more antennas can be installed in more areas to distribute the signals to each corner of the coverage area.

- **Power Box** including electricity meter, air switch and groundings, some sites might need surge arrestors.

## 7 Installation

Digital repeater should be used to cover the area indoor and the humidity and temperature of working can affect the reliability of repeater. So, temperature, humidity, dust, interference, power, space requirements and other factors should be considered during installation of repeater.

## 7.1 Installation Location Requirement

- 1) It is appreciated that the repeater is installed in a cool, dry and ventilated room without erosive gas and smoke and without leakage on its roof.
- 2) Besides above, a cool and ventilated wall of which sun-proof and waterproof is expected.
- 3) Besides above, common wall, tower or high pole is ok.
- 4) Installation height should be easy for RF cable wiring, heat dissipation, security and maintenance.
- 5) Have a set of independent and stable power supply.
- 6) Have lightning conductor in the building, tower or high pole with enough strength or stability.

## 7.2 Power requirement

Generally it is AC power supply, and the requirement of AC is 100~264VAC/55±5Hz.

## 7.3 Installation tools and accessories

No.	Name	Specification	Quantity	Remark
1	Expansion screw	M10*100	4	Standard accessories
2	Expansion screw	M6*35	8	Standard accessories
3	Grounding screw	M6*22	1	Standard accessories
4	reciprocating drill		1	Engineering-owned, punch the wall
5	Shot bit	M6	1	Engineering-owned, punch the wall

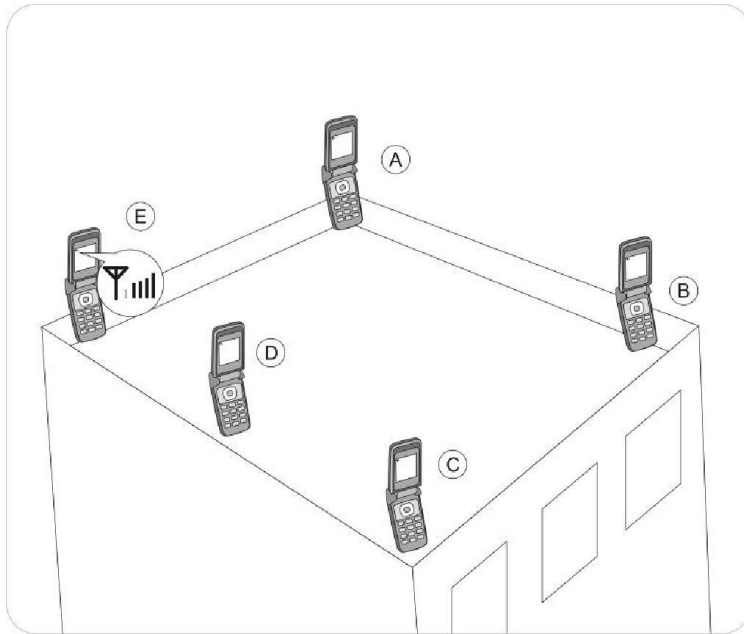
Recommend Splitter:

	Frequency(MHz)	Gain for Each Frequency		
		824-869	1710-1990	2110-2170
Splitter	2-Way Splitter	-3.5	-3.6	-3.8
	3-Way Splitter	-4.9	-5.2	-5.4

## 7.4 Installation of donor antenna

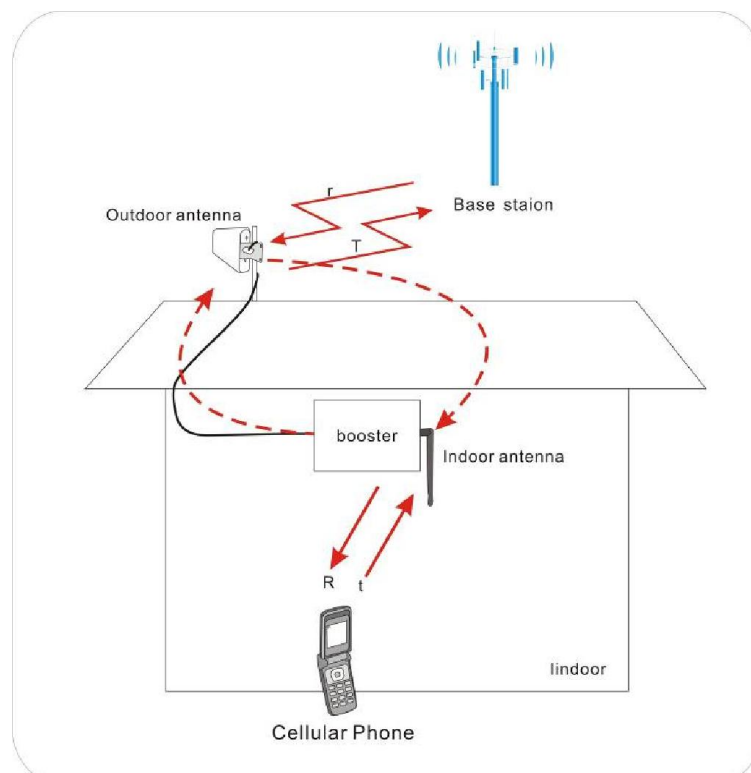
The repeater's main function is to improve weak RF signals to an area. A simple formula: Input power+ Gain= Output power. The signal strength from the outdoor antenna directly affects the efficiency of the indoor coverage. It is very important to choose the location of the outdoor antenna carefully. With this in mind, it is not

recommended the donor antenna to be installed in an attic.



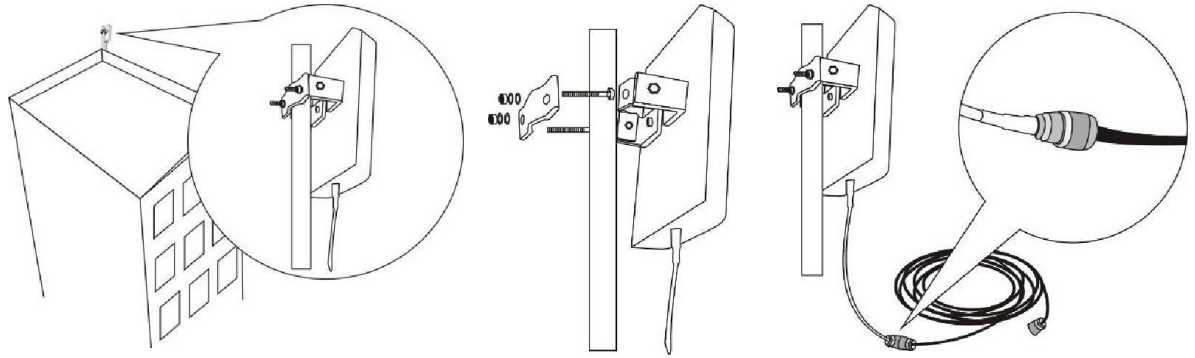
- Testing the signal strength received from donor antenna mounted in site by mobile phone:
  - Please select the top of the building to install the donor antenna if the total floors are less than 7, and must select a place like balcony or platform lower than 7th floor for the donor antenna if the buildings are over 7 floors.
  - The mobile phone shall display full bar signals in location where the donor antenna is installed
  - The phone calls or data transmission are smooth and stable by 3 times testing in location where the donor antenna is to be installed.
  - As shown from the above illustration, testing the signals from A to E, and select a best place that displays full bar signals to install the donor antenna.
- Selection the installation direction of donor antenna.
  - The donor antenna shall point to the direction of the tower, and it would be much better to keep line of sight.
  - Please select the opposite directions for donor antenna and server antenna. If donor and server antennas have to be installed in the same direction, please install them only after the signal quality is tested and the self-oscillation is avoided. If the directional antenna is selected, the main directional angle should point to the tower antenna.
  - If the performance is poor due to weak signals or poor phone call quality after installation, please adjust the direction of donor antenna or change its installation position in order to obtain the best calling effect.
- Donor antenna installation ---Notes:
  - Do not install the donor antenna during the rainy day with lightning.
  - Please follow the instructions to install the donor antenna.
  - It is a must that the waterproof shall be done to connectors of donor antenna and feeder lines.

- In order to avoid interference, please note that the donor antenna should be far away from the following objects.
    - ✧ Metal
    - ✧ High-voltage line
    - ✧ RF antenna
    - ✧ High-voltage transformer
  - Repeater is a two-way signal amplifier. So proper isolation between donor antenna and server antenna is necessary in order to avoid self-oscillation. About the definition for self-oscillation, take MIC and loudspeaker for example; if it is too close for each other, it could make big noise. So the repeater can run smoothly if the isolation between donor antenna and server antenna is 15 dB higher than the gain of booster. For example, if the booster gain is 60 dB, then the isolation between donor antenna and server antenna should be 75 decibel.
  - The donor antenna used for the AWS band must be installed at a height less than 10 meter above ground.
  - The minimum distance between donor antenna and server antenna is 10 meters; again the direction of donor and server antennas shall be opposite.
- As shown in the below illustration, the booster amplifies the signal R and signal T from the tower at the same time. If the distance between donor antenna and server antenna is less than the required distance, then the amplified signal R (T) will back to server antenna (donor antenna). So it will lead to self-oscillation and reduce the coverage area, also the bad calling quality could happen at the same time.

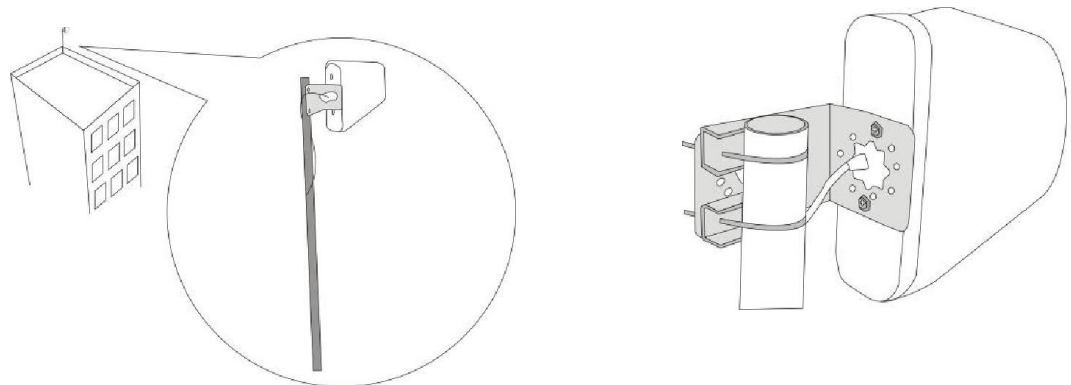


If isolation can't be achieved by the limited distance, the roof of the building or other barriers can be used to increase isolation.

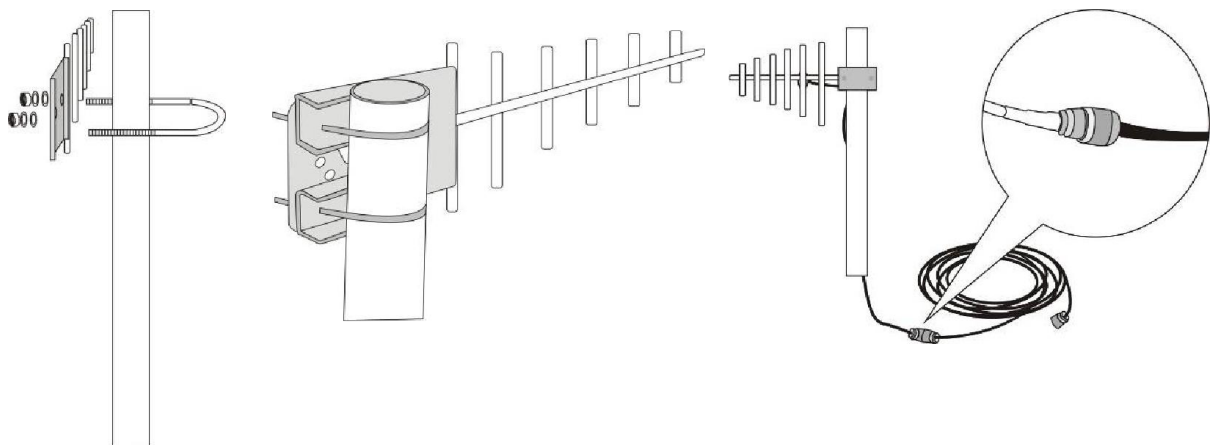
■ Installation of panel antenna as donor antenna



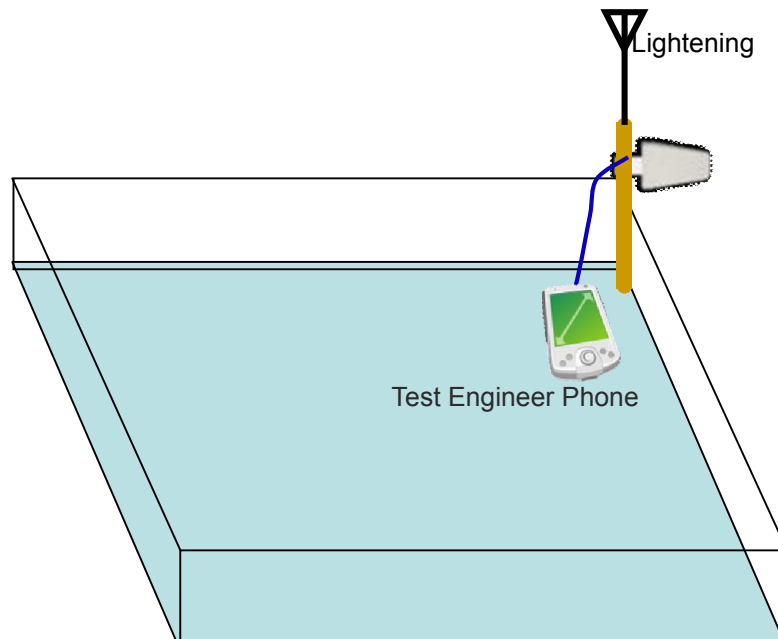
■ Installation of wide directional antenna as donor antenna



■ Installation of YAGI antenna as donor antenna



- Test the call quality of donor antenna



Fix the donor antenna after selecting the best position, and adjust slightly its height or angles in order to get the signals with suitable input power level and calling Quality.

#### Cable layout and connector assembly:

- 1) Keep the type, specifications, routing direction, location, and curvature radius of cables in compliance with the design requirement. Place cables in good order, bend them smoothly, and protect the outer skin against any damage.
- 2) Bind cables in good order when laying them on cable racks. Keep cables within cable troughs, without any cross, when you do not bind them. When leading cables in or out of troughs, use a hole-opener to open cable troughs and then install PVC lock-nuts to protect them.
- 3) Keep horizontal cables straight and fasten them stably with a fixing clip every 1 to 1.5 meters, with a proper stress.
- 4) Bind and fasten vertical cables every two to three meters to avoid damaging cables or connectors owing to their own heavy weight. Take back the cables and re-lay them when you have difficulty in pulling them, and avoid using a strong force to pull them.
- 5) Separate RF cables from power cables. Take proper isolation measures if they have to be placed on the same cable racks owing to the site condition restriction.
- 6) Correctly fasten all connection parts of the whole system, from the antenna to active interfaces to passive interfaces, and keep electrical interfaces well contacted. Give waterproof treatment to outdoor connection parts.
- 7) Take lightning protection measures for the antenna and feeder system in accordance with the design

requirement. Avoid deforming the antenna feeder where grounding clips are placed, and give waterproof treatment to the feeder.

8) Keep exposed indoor cables in good order. Install PVC troughs or tubes if the exposed cables are more than 1 meter long. Place small passive RF parts such as power splitter in cable troughs.

9) Process both ends of RF coaxial cables as follows:

Keep the same redundant cable length and keep the length of stripped cables to agree with the corresponding connectors.

Use a proper force to cut the jacket layer or insulation layer and avoid damaging the braid shielded net and cores.

Weld cores firmly and smoothly with a proper amount of solder, without solder projections or nodules. Assemble coaxial cables strictly in accordance with the installation specifications.

Keep a moderate length of heat-shrinkable tubes and heat-shrink the tubes evenly when adding heat-shrinkable tubes to the end of cables.

Protect the ends of cables against water and dampness. Use waterproof tape to give waterproof treatment to exposed cable ends. Cut off the end if it is dampened or water-soaked.

Recommend Donor antenna:

	Frequency(MHz)	Gain for Each Frequency		
		824-869	1710-1990	2110-2170
Outdoor Antenna	Yagi 11dbi - Gain (dBi)	10	11	10
	Panel 10dbi - Gain (dBi)	6.5	9.4	9.4
	Yagi 9db - Gain (dBi)	8	9.5	9.5
	Omni 9dBi - Gain (dBi)	9	9	9

## 7.5 Indoor antenna installation

Proper antennas shall be selected according to the site conditions and the requirement.

1) Omni antenna (Indoor ceiling omni antenna or whip antenna), suitable to installed in the center and radiate all directions.



- 2) It is better to use a directional panel antenna or Yagi when the coverage shape is long and narrow (corridors, long row of houses in two sides, tunnels or elevators or rural open space).



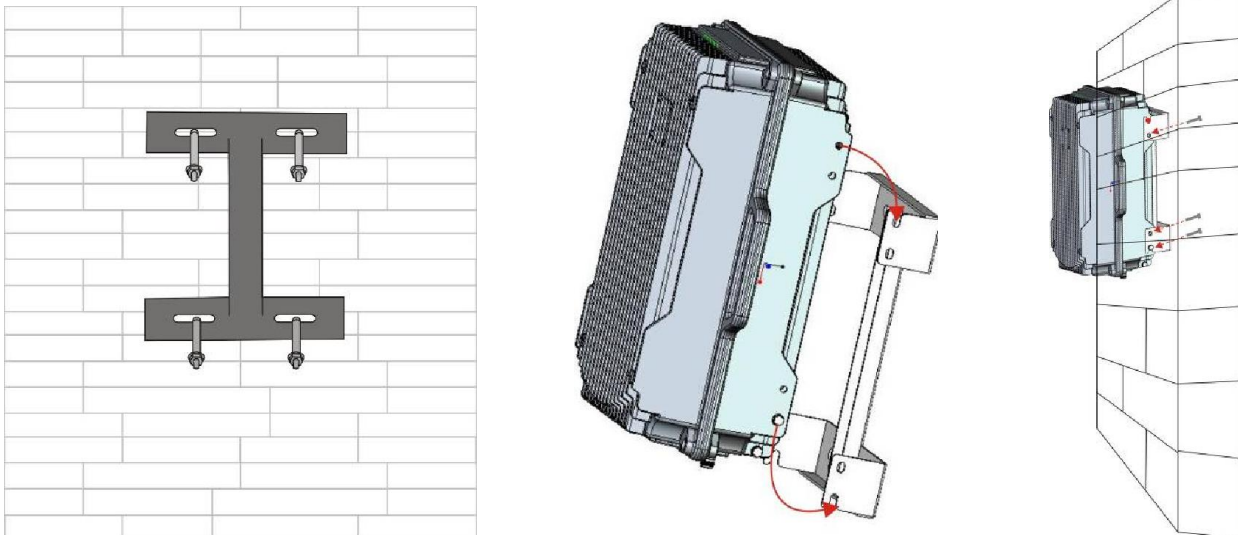
Recommend Sever antenna:

	Frequency(MHz)	Gain for Each Frequency		
		824-869	1710-1990	2110-2170
Indoor Antenna	Whip 5dbi - Gain (dBi)	5	5	5
	Panel 10dbi - Gain (dBi)	8	9.4	9.5
	Omni 3dBi - Gain (dBi)	3	3	3



## 7.6 Repeater Installation

### Installation Steps



Installation block diagram

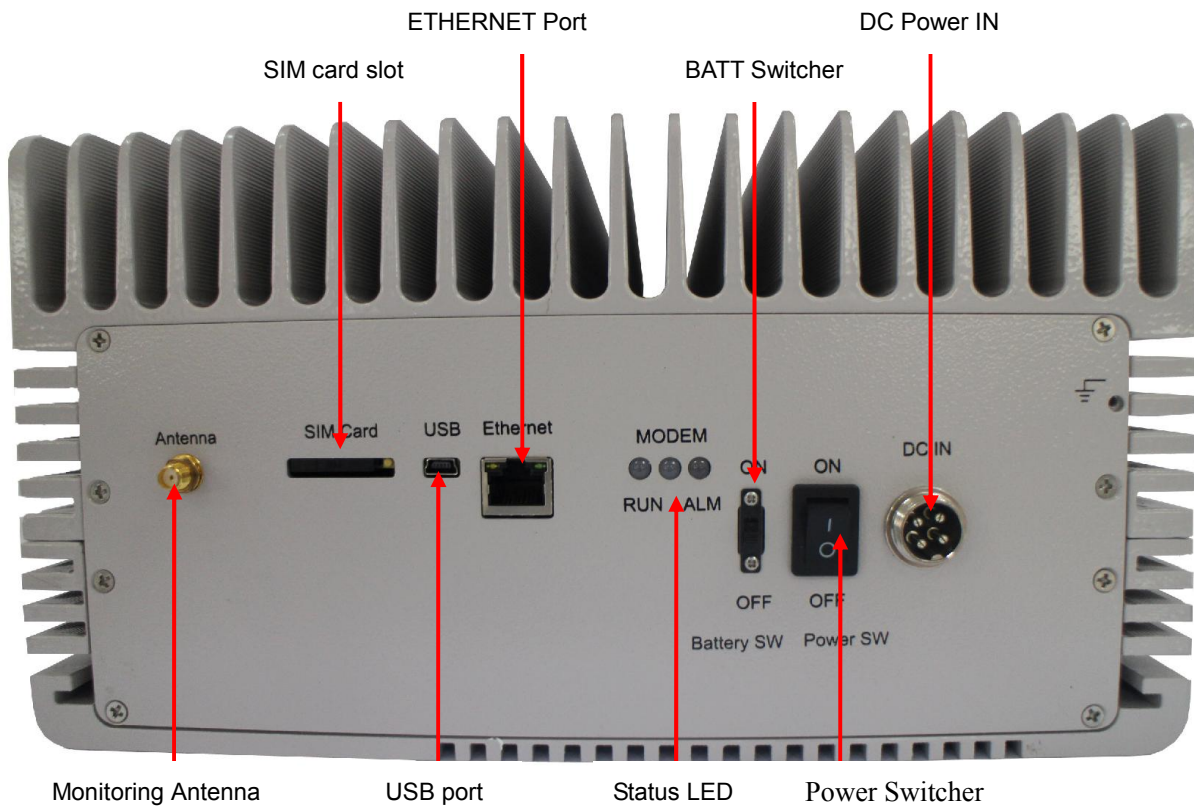
Installation procedure:

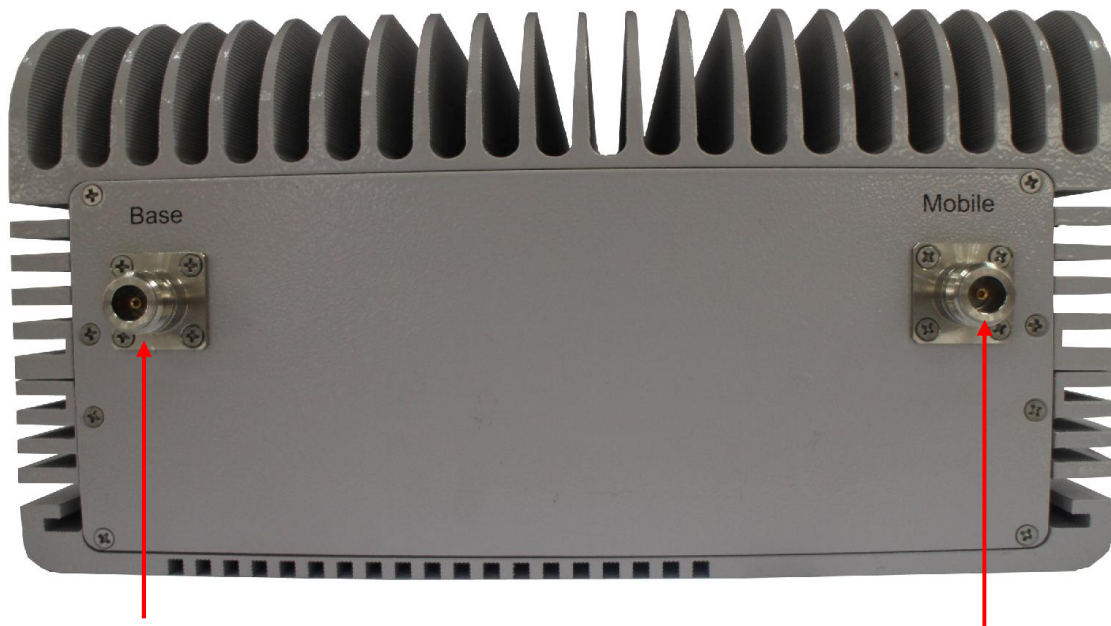
- 1) According to dimension of bracket, drill 4 \*M10 holes on the wall, assembly 4 pieces expansion screws.
- 2) Put the rack onto the 4 expansion screws, to fix it on the wall with nuts.
- 3) The repeater hang along the hole on mounting bracket, then install eight hex screws through the holes from mounting bracket and fixing nut rod of host, tightening screws and fix the host onto the mounting bracket.
- 4) Ensure the firm and correct installation.

### 7.6.2 Repeater's ports description

- 1) DC IN: input port to connect with power supply.
- 2) Power SW: the switcher to turn on or off the repeater
- 3) Battery SW: the switcher to turn on or off the battery inside
- 4) Status LEDs: show the working status of repeater
- 5) ETHERNET port: connected with PC for control and monitoring.
- 6) USB port: connect USB cable to operate OMT
- 7) SIM Card Slot: inserted SIM card for remote monitoring

- 8) Antenna: transfer wireless signal of monitoring information
- 9) Base port: connected with the donor antenna by cable.
- 10) Mobile port: connected with server antenna directly or by cable.





Connect the Donor Antenna

Connect the Server Antenna

### 7.6.3 Accessories selection

Please pay attention to the two points of “frequency” and “impedance” during the selection of the accessories. All accessories shall support the repeater’s frequencies from feeder line, antenna and splitter to combiners etc. For example, the repeater’s frequency is CDMA850, so all the accessories must support the CDMA850 frequency. And the repeater’s impedance is 50ohm, so the accessories shall all be 50ohm. To use any other impedance of coax will put an extra load on your repeater, shorten its life span and decrease the system performance.

## 7.7 Repeater Settings

Please check very carefully all cable connections are correct and firm before running operation test and then carry out following tests

### 7.7.1 Switch on power

After power is on, check firstly the RUN LEDs.

- Status and definition of RUN indicators:

Status	Definition
<b>Green</b>	Normal
<b>Blinking</b>	Running state
<b>Off</b>	RF shutdown automatically

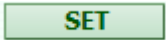
- Status and Definition of ALM indicators,

Status	Definition
<b>Off</b>	It is working in linearity
<b>Red</b>	Repeater has alarm
<b>Blinking slowly</b>	Repeater’s gain is reduced by AGC
<b>Blinking rapidly</b>	RF shutdown by oscillation

- Status and Definition of Modem indicators,

Status	Definition
<b>Off</b>	Repeater doesn’t have modem or modem doesn’t run
<b>Blinking</b>	Register online successfully

### 7.7.2 Manual Gain Control (MGC)

Use the WEB OMT software to change the attenuation to adjust the output power. To adjust the attenuation, input a new system ul/dl att in OMT software “**System: Query and Set**” table and click  button to change the attenuation.

<input type="checkbox"/>	1184	RF switch	Open	▼	---	2007-01-01 00:04:10
<input type="checkbox"/>	1191	System ul att	0		dB	2014-03-22 14:25:31
<input type="checkbox"/>	1192	System dl att	0		dB	2014-03-22 14:19:21

The user can also modify the attenuation of each sub band by changing the value of “Band 1~N UL/DL att” in “**System: Query and Set**” table.

<input type="checkbox"/>	2432	Band 1 UL att	0		dB	2014-03-22 15:13:03
<input type="checkbox"/>	2433	Band 1 DL att	0		dB	2014-03-22 15:13:03
<input type="checkbox"/>	2434	Band 2 UL att	0		dB	2014-03-22 14:27:23
<input type="checkbox"/>	2435	Band 2 DL att	0		dB	2014-03-22 15:13:03

Please read OMT user manual for more information.

### 7.7.3 Frequency Setting

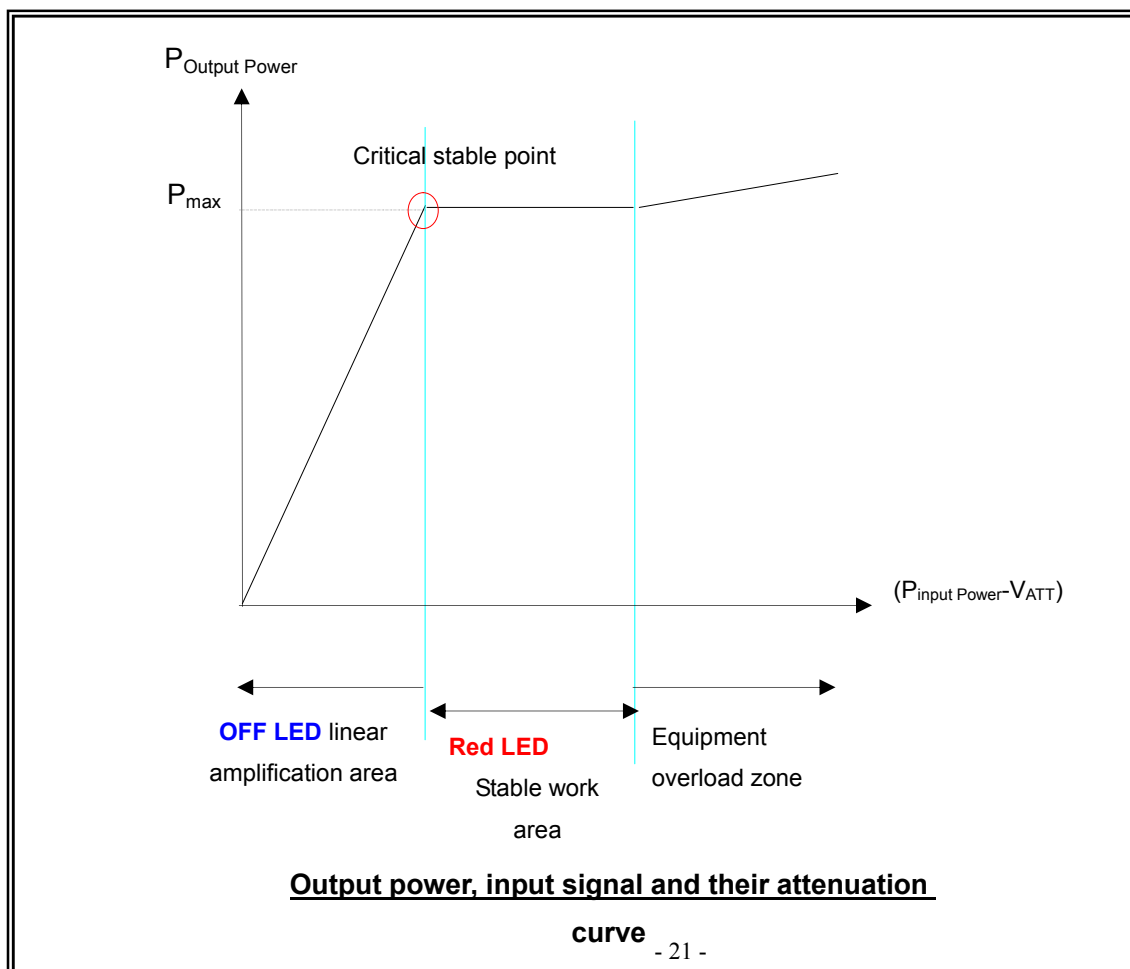
The user can modify the frequency and bandwidth setting of the sub bands. To change the frequency setting, Login the OMT and go to “**System: Query and Set**” page, input the uplink start frequency in “Band 1 UL sub-band start frequency” cell and the uplink stop frequency in “Band 1 UL sub-band stop frequency” cell and click “**SET**” to set the new frequency, the frequency of the sub band will be changed according to the new value. Please read WEB OMT user manual for more information. The system may have more than one sub-band to be configured, which display as Band1, Band 2, Band 3…….

<input type="checkbox"/>	2112	Band 1 UL sub-band start frequency	824	MHz	2007-01-01 00:14:36
<input type="checkbox"/>	2113	Band 1 UL sub-band stop frequency	839	MHz	2007-01-01 00:08:04
<input type="checkbox"/>	2114	Band 2 UL sub-band start frequency	844	MHz	2007-01-01 00:08:04
<input type="checkbox"/>	2115	Band 2 UL sub-band stop frequency	849	MHz	2007-01-01 00:15:28

Please read OMT user manual for more information.

### 7.7.4 Repeater Commissioning

- **The curve about device working status**



$P_{\text{Output Power}}$ : Output Power

$P_{\text{input Power}}$ : Input Power

$V_{\text{ATT}}$ : Attenuation value of attenuator

$P_{\text{input Power}} - V_{\text{ATT}}$ : Input Power—Attenuation value of attenuator

$P_{\text{max}}$ : Rate output power

### ● **Downlink gain setting**

There are three factors to be followed to set DL gain of indoor repeater:

Meet with isolation requirement of  $G1 = \text{LISO} - 10\text{dB}$ .

The repeater's gain shall be less than "Isolation I -10dB", and if it allows, the gain shall be less than "Isolation I -15dB"

Meet with UL noise Gnoise

The UL noise from the repeater shall be less than the thermal noise floor when reaching BTS tower.

The DL gain  $G2$  shall be set so that the repeater can reach its full downlink output power

Finally to set the gain  $GDL = \text{MIN} (G1, \text{Gnoise} + 8\text{dB}, G2)$

UL Gain  $GUL = \text{MIN} (G1, \text{Gnoise}, G2)$

Downlink gain setting procedures:

Use engineering mobile phone to test the input signal strength at the repeater's BTS port, in order to get the exact values of PBTS PORT BCCH (PCS)

The gain to meet the targeted output power

PCS system

Set  $G2 = \text{PDL MAX} - \text{PBTS PORT BCCH}$

The Downlink maximum gain  $GDL \leq \text{MIN} (G2, \text{Gnoise} + 8\text{dB}, \text{LISO} - 10\text{dB})$ , usually the value shall be the equal value, but if the coverage size is not big, please reduce the gain to some degree.

"Gnoise +8dB" explanation: The downlink gain can be maximum 8dB higher than uplink gain in indoor repeater solutions

The attenuation should be less than 30 dB when you set the downlink gain of the repeater and it would be the best to attenuate less than 15dB range, and in case more than 15dB attenuation is needed, please use external attenuator.

### ● **Uplink gain setting**

#### **Standard: uplink attenuation values =downlink attenuation values**

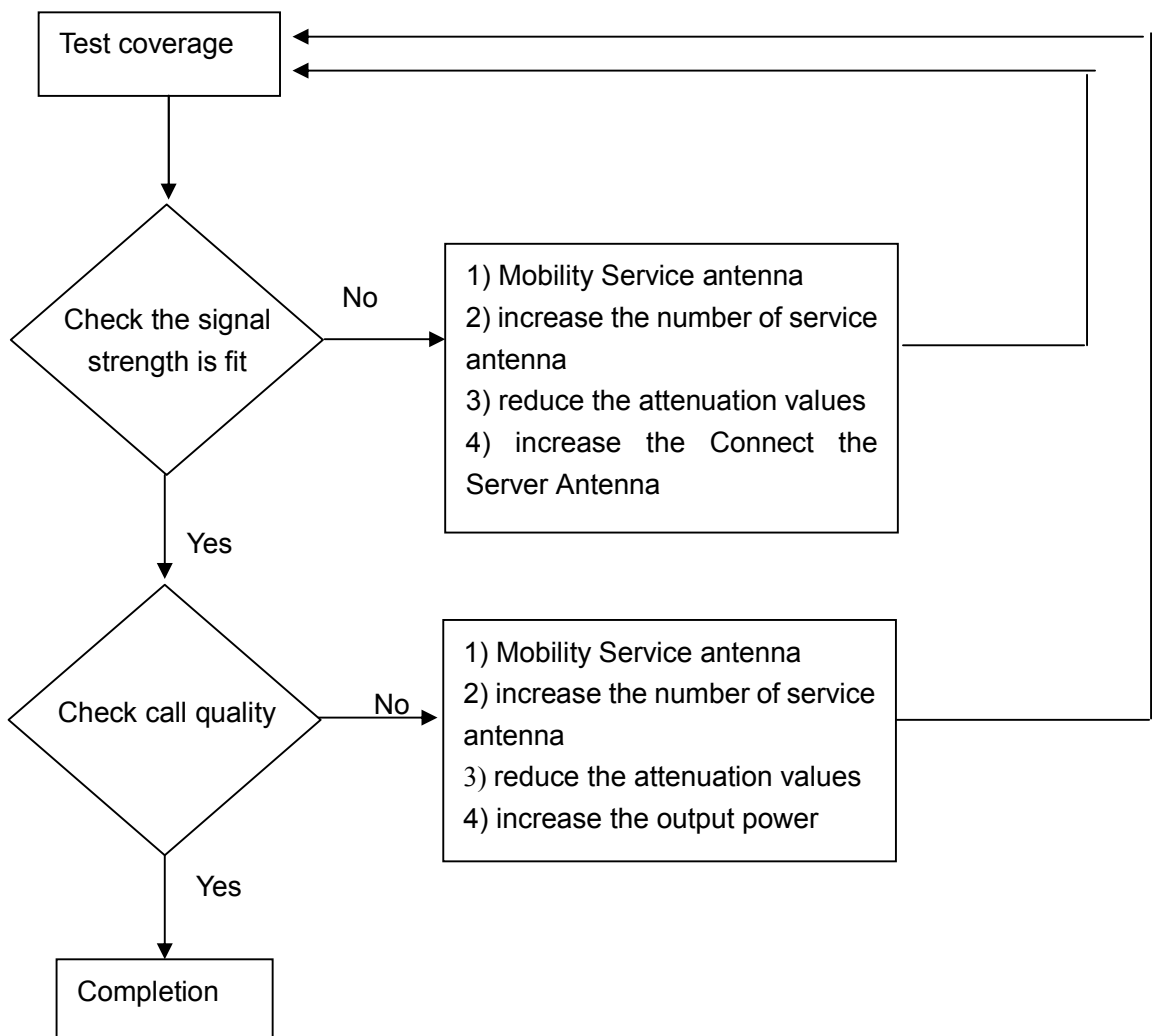
Remark: Keep in mind that you do not want to have more than a 5dB difference between the uplink and downlink values for optimum system performance, and it is better to keep the same attenuation value of

Uplink with that of Downlink.

## 7.8 System Test

### 7.8.1 Check whether the coverage is good

- 1) Have a test with mobile phone or data card (engineering mobile phone is preferred). If the signals in most areas have not been improved, please check below again:
  - ◆ The weak input signal leads to the low output power. Change the direction of donor antenna or its installation position or replace donor antenna with higher gain to increase input signal power level.
  - ◆ Check whether it is necessary to add more server antennas due to barriers, whether the repeater's
  - ◆ Power is enough; please install more server antennas or change with a repeater with higher power level.
- 2) If the signals in small part of the areas have not been improved, please check below:
  - ◆ Check whether the service antenna is installed correctly or not, you may try to move the antenna location improve coverage.
  - ◆ Check if it is necessary to use a directional antenna.
  - ◆ Check whether it is necessary to add one or more antenna to enhance the coverage of special areas.



◆ Remark:

- ✧ **Reduce the attenuation values**---at the same time must ensure the isolation.
- ✧ **Increase the output power** ---recommended ways: adjust the donor antenna; increased input signal strength.

## 7.8.2 Repeater can not communicate in Power-ON status

### The power is on but there is signal fluctuation

- 1) The power is on but it has a signal fluctuation or a flash signal. The phone call can not achieve.

It shall be caused by the insufficient isolation between donor antenna and serve antenna.

**Please take below measures:**

- Firstly check whether the alarm LED becomes red. The red light shows the insufficient isolation.



- Secondly adjust the antenna directions or locations or enlarge the distance between them.
  - Thirdly reduce the repeater's gain by ATT DIP if the above methods don't work.
- The best minimum distance between donor antenna and serve antenna should be more than 10 meters.

**The following measures can also be tried:**

- Use the roof of the building to enlarge the isolation (Please try to place the donor antenna and server antenna in different floors).
  - Use some obstacles.(Such as wall ).
- 2) The repeater's power is on but the phone is not connected into the network and still can not communicate.
- **Reason 1:** There are loose or wrong connections in the repeater system.
    - ✧ **Solution:** Please try to fasten the connections between the different parts of the system.
  - **Reason 2:** The signals received by donor antenna of other operators nearby are too strong. (For example, the other operators' signals are 10 dB stronger than the needed signals.)
    - ✧ **Solution 1:** Change the direction of donor antenna or its installation position, so that the gap of signal strength between operators is reduced.
    - ✧ **Solution 2:** Use barriers (like buildings) to block signals of other operators.

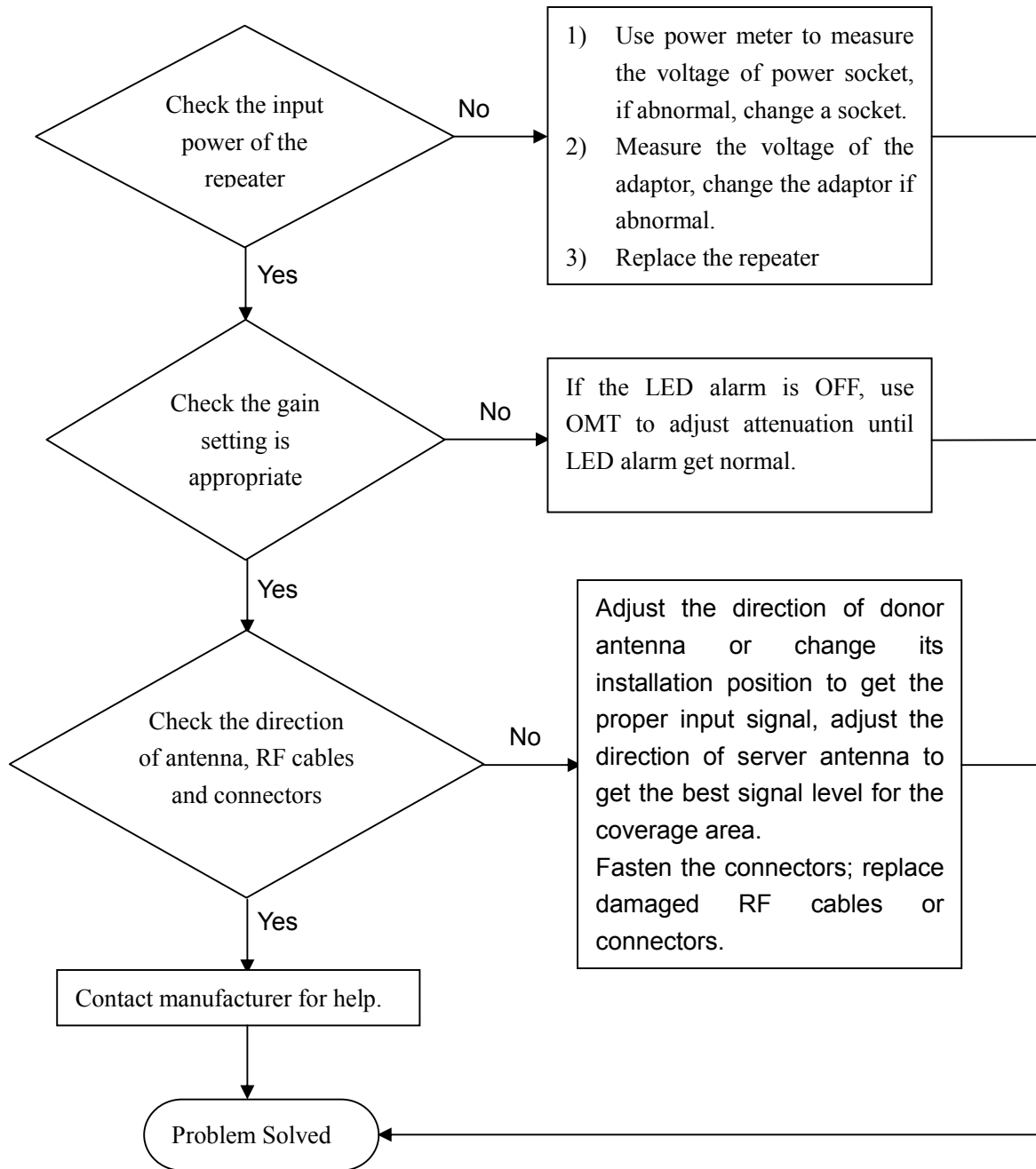
## 8 Maintenance

### 8.1 Routine maintenance

- 1) When the repeater is in running, please do not power off the repeater if unnecessary. Make sure the repeater is working under the proper environment and keep ventilation.
- 2) Do not touch or move RF cables of the repeater to avoid loose connection. If problem is found, inform the qualified engineer to fix the problem. Do not dismantle or change any component of the repeater.

### 8.2 Troubleshooting

If the repeater does not have output power or output power level is abnormal, please follow the following steps to fix the problem:



## 9 FCC/IC STATEMENT

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The Manufacturer's rated output power of this equipment is for single carrier operation.

For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

## 10 FCC/IC Radiation Exposure Statement

The antenna(s) used for this transmitter must be installed to provide separation distance of at least 25 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

L'antenne (s) utilisée pour ce transmetteur doit être installée pour assurer une distance de séparation d'au moins 25cm de toute personne et ne doit pas être co-localisées ou opérant en conjonction avec tout autre antenne ou transmetteur .

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instruction for satisfying RF exposure compliance.

## 11 Technical Parameters

(a) The nominal passband gain(dB):

SpotCell2331Xf :Uplink $\geq$ 65dB,Downlink $\geq$ 70dB

SpotCell3331Xf : Uplink & downlink $\geq$ 80dB

(a) Le gain de bande passante nominale (dB):

SpotCell2331Xf :Uplink $\geq$ 65dB,Downlink $\geq$ 70dB

SpotCell3331Xf : Uplink & downlink  $\geq 80$ dB

(b) The nominal bandwidth:

SpotCell2331Xf & SpotCell3331Xf :

Band width (-3dB)	CELL 25MHz, PCS 60MHz, AWS 45MHz,
	CELL support 2 sub-bands, 0-15MHz adjustable.
	PCS support 3 sub-bands, 0-25MHz adjustable.
	AWS support 3 sub-bands, two 0-25MHz adjustable, one 0-15MHz adjustable .

(b)La largeur de bande nominale:

SpotCell2331Xf & SpotCell3331Xf :

Largeur de bande (-3 dB)	CELL 25MHz, PCS 60MHz, AWS 45MHz,
	CELLsupport deux sous-bandes, 0-15MHz réglable.
	PCS Support 3 sous-bandes, 0-25MHz réglables.
	AWS support 3 sous-bandes, deux 0-25MHz réglables, une 0-15MHz réglable.

(c) The rated mean output power;

SpotCell2331Xf :20dBm,

SpotCell3331Xf : 24dBm

(c) La puissance moyenne de sortie nominale;

SpotCell2331Xf :20dBm,

SpotCell3331Xf : 24dBm

(d) The input and output impedances, and;

SpotCell2331Xf & SpotCell3331Xf :50 ohm

(d) Les impédances d'entrée et de sortie, et;

SpotCell2331Xf & SpotCell3331Xf :50 ohm

(e) The following notice: "The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or

gain reduction and not by an attenuator at the output of the device."

(e) L'avis suivant: « nominale la puissance de sortie du fabricant de cet équipement est unique pour le fonctionnement de la porteuse. Pour des situations où les signaux porteurs multiples sont présents, la note aurait être réduit de 3,5 dB, en particulier lorsque le signal de sortie est ré-émise et peut causer interférence aux utilisateurs de bande adjacente. Cette réduction de puissance est d'être au moyen d'une puissance d'entrée ou la réduction de gain et non par un atténuateur à la sortie de l'appareil ".

-----End-----