3G-515

User's Manual

Preface

This user's manual describes the installation, commissioning and maintenance of 3G-515 repeater of single, dual and triple systems.

Please do read user manual carefully before installing and maintaining the 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 grounding 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 and you may even get an electric shock.
-  Do not open the repeater, touch the module of repeater, or 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 working. And do not cover booster with anything that influences heat-dissipation.

2. Why repeater

2.1. Reason

1) Blind or weak signal areas are formed if the buildings are too far away from CELL TOWER, or the buildings themselves shield or absorb 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 call drops accordingly.
3) Elevators and basements are well-known for blind areas.
4) Downtown areas of the cities, which congested with many high-rise buildings, are usually the weak or blind areas.
5) The remote villages, mountains, hills, valleys, etc. are mostly populated areas with quite few mobile users, so the main target is to send coverage to these areas, and it will not be worthy installing a CELL TOWER tower, therefore a booster is a quite good option.

2.2. Solution:

Can't we 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 signal or weak signals though there is a mobile phone.

Will your customers stay comfortable when there is no smooth communication in your shops or restaurants?

Will that be frustrating if your clients couldn't call you through due to weak signals in offices?

Will your life be influenced if your mobile is always "out of service" at home when your friends call you?

Then how to solve the problems?

Best Solution:

Plug & play: Purchase a set of repeater solution from us and install it, 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 is harmful to human bodies, but also runs out of the battery power much more quickly; usually the mobile phone gets hot in such status.

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 the RF radiation of the mobile phone tremendously.

Introduction

Our 3G-515 repeater is the perfect solution for providing a wireless improvement in the cellular reception of a home, office, restaurant, VIP Room, apartment, building or shopping mall, in the quickest time possibly. One repeater covers 300 to 500 square meters.

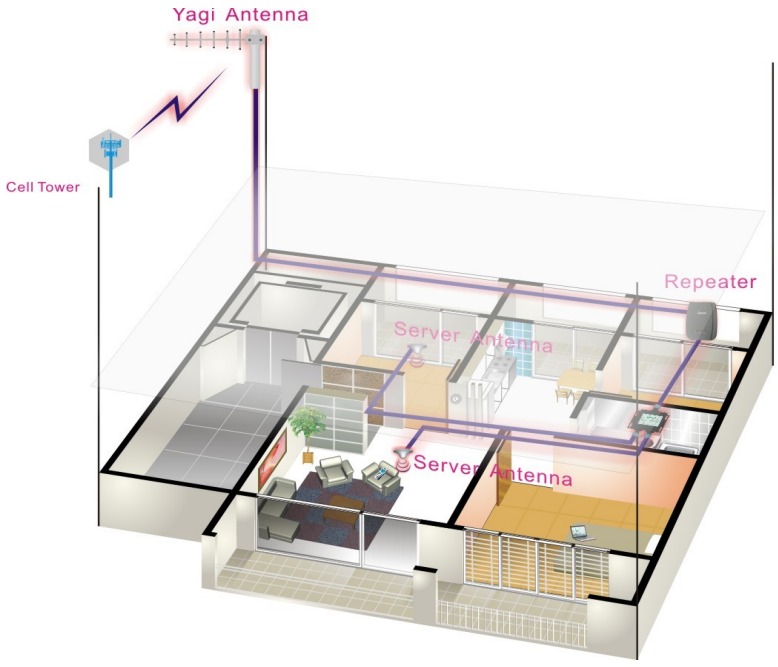
This repeater has Manual Gain Control (MGC) feature that enables engineers to reduce the gain of the repeater

manually if oscillation is detected or too strong input power level during installation, which will help to get the best coverage effect without any interference back to mobile network.

And in order to maintain safe and specific output signal levels, this repeater has 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 to indicate its environmental status: the Alarm LED's located on the front of the unit will change color from green to orange or 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.

Our repeaters also feature a Network Safe / MUTE feature that automatically shuts off the repeater to protect the cellular network if no adjustments are made to eliminate alarm readings on the repeater's LED's. You will want to make sure the LED remains green at all times for optimum system performance.

Below diagram shows how simple and fast the 3G-515 repeater system is installed and works effectively. One Yagi antenna, as donor antenna, is installed at the top of the roof to pick up good mobile signals from outside, and send through cable to 3G-515 repeater to amplify the signals significantly, then the output signals are divided into two signals by 2way splitter, sent to two indoor omni antennas and finally transmitted into area. Very clear phone call or high speed mobile data are immediately achieved in the area.



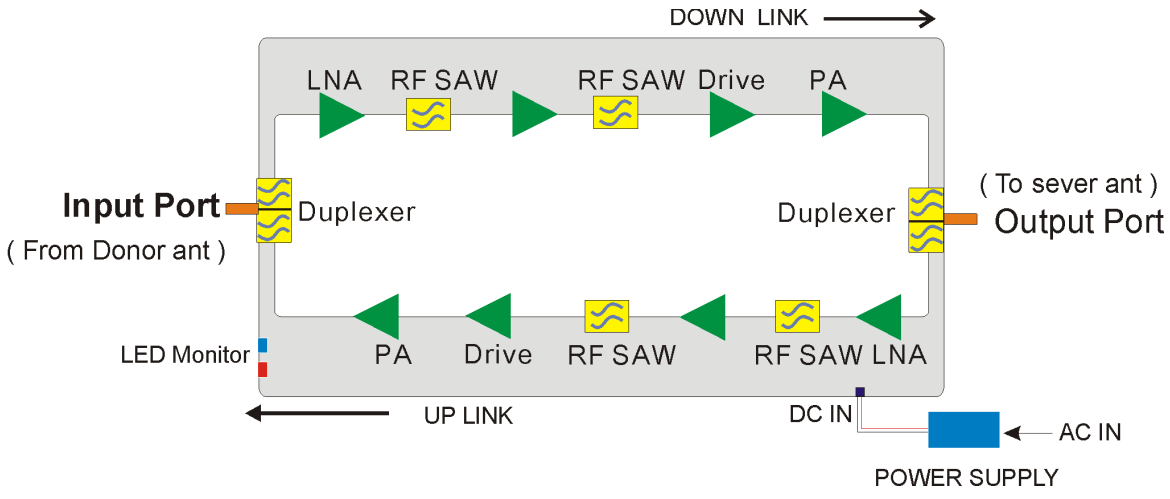
3. System Characteristics

- LCE Certified.
- Streamline shape.
- Band selective repeater to support signals of specific operators.
- High-integration (One board to contain low-noise amplifier, frequency selection module, power amplifier module, both uplink and downlink one for all).
- Manual gain control provides a variety of applications.
- Auto automatic gain control to stabilize the coverage and minimize the noises.
- Auto shut off function as final step to avoid severe interference with mobile network.L

4. Block diagram and work principle

3G-515 repeater is basically a bi-directional amplifier, the downlink signals are received by the repeater from cell tower by the donor antenna, filtered by its internal duplexers and FC unit, amplified by low noise amplifier (LNA) and downlink PA unit, and then sent via the server antenna to the area to improve mobile signals for mobile phones.

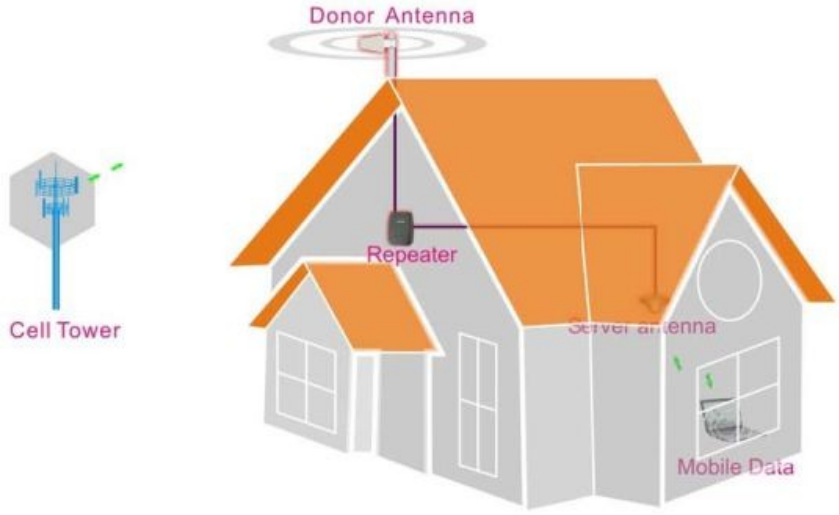
The uplink signal of mobile devices from the coverage area is input via the server antenna, then filtered by duplexers and FC unit, amplified by the uplink low noise amplifier (LNA) and the uplink PA unit and finally sent via the donor antenna to the cell tower.



Single

system repeater diagram

5. The repeater system



- **Donor Antenna：**
  - 7dbi outdoor panel or 9dBi wide band Yagi is recommended as donor antenna.
  - Function: Pick up donor signals from the cell tower and send to the repeater by cable; the power level and quality of the received signals influence a lot on the coverage effectively. Donor antenna also transmits the uplink signals from the repeater to cell tower.
- **Server Antenna:**
  - 3dBi indoor Omni ceiling or 7dBi indoor panel are recommended, whip antenna is also ok for 10dBm repeater, however the coverage size will be limited.
  - Omni antenna (Indoor ceiling omni antenna or whip antenna), is suitable to be installed in the center and radiate all direction; It is better to use a directional panel antenna or wide band 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, 3D, 5D or 8D – FB, Tri LAN240, Tri LAN 400 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.

6. 10dBm~20dBm Main technical specification

6.1. Mechanical specification

SN	Item	specification
1	Environment Conditions	IP40
2	Cooling mode	Nature cooling

6.2. Environment Conditions

SN	Item	specification
1	Operating Temperature	-25°C to +55°C
2	Storage Temperature	-40°C to +80°C
3	Humidity	5% to 85%

6.3. RF technical specification

Electrical specification		**Uplink**	**Downlink**
WCDMA		1920 ~ 1980 MHz	2110 ~ 2170 MHz
Max. Gain			
	15dBm	≧65dB	≧65dB
Max. Output power			
	15dBm	≧15dBm	≧15dBm
Band width (-3dB)		Bandwidth upon request	
MGC (Step Attenuation)		≧31dB / 1dB step	
Automatic Level Control		≧15dB auto shut off after 15dB	
Intermodulation	9KHz~1GHz	≦ -36dBm @ 3KHz	
	1GHz~12.75GHz	≦-30dBm @ 3KHz	
Spurious Emission	9KHz~1GHz	≦ -36dBm @ 3KHz	
	1GHz~12.75GHz	≦-30dBm @ 3KHz	
Noise Figure		≦ 5dB	
VSWR		≦2.0	
Group Delay		≦ 5.5μs	

LED Alarm		Standard
LED Alarm	LED 1	Power Indicator
	LED 2	(ALC 1~5dB,Grange;ALC 15~20dB,Red, then shut off automatically)

6.4. Requirements for adapters:

SN	Item	Minimum	Typical value	Maximum
1	Input Voltage Range	100 V	220 V	264 V
2	Output Voltage Range	47 Hz	50Hz	63 Hz

7. Installation

3G-515 repeaters should be used to cover the area indoor. Humidity and temperature of working environment 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 proof.
2) Or a cool and ventilated wall of which sun-proof and waterproof is expected.
3) Besides above, common wall, tower or high pole is Ok too.
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

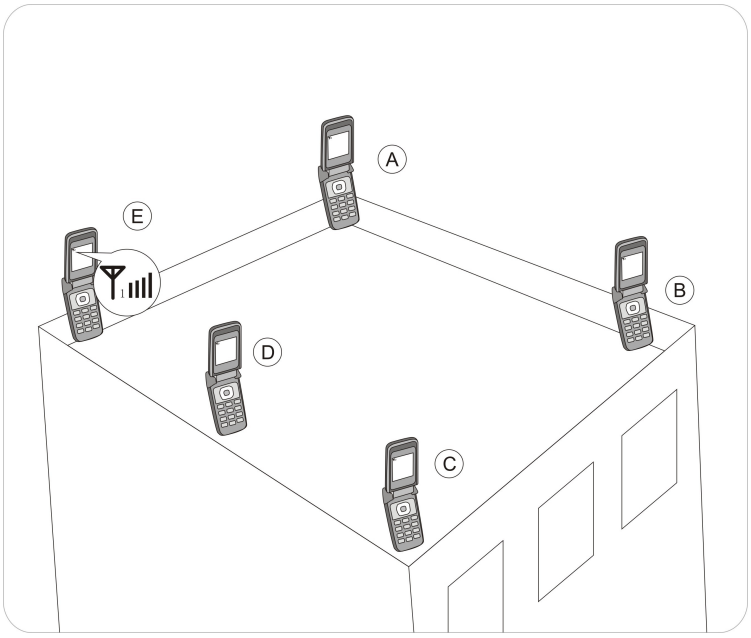
Generally it is AC power supply, and the requirement of AC is 100~264VAC / 50±5Hz

7.3. Installation tools and accessory

No.	Name	Specification	Quantity	Remark
1	Plastic Expansion Bolt	M5*24	6	Standard accessories
2	Tapping screw	M3*27	4	Standard accessories
3	Hanging folder		1	Standard accessories
4	reciprocating drill		1	Engineering-owned, punch the wall
5	Shot bit	M3	1	Engineering-owned, punch the wall

7.4. Installation of donor antenna

The repeater's main function is to improve weak RF signals of 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 donor antenna location in order to get the best signals.



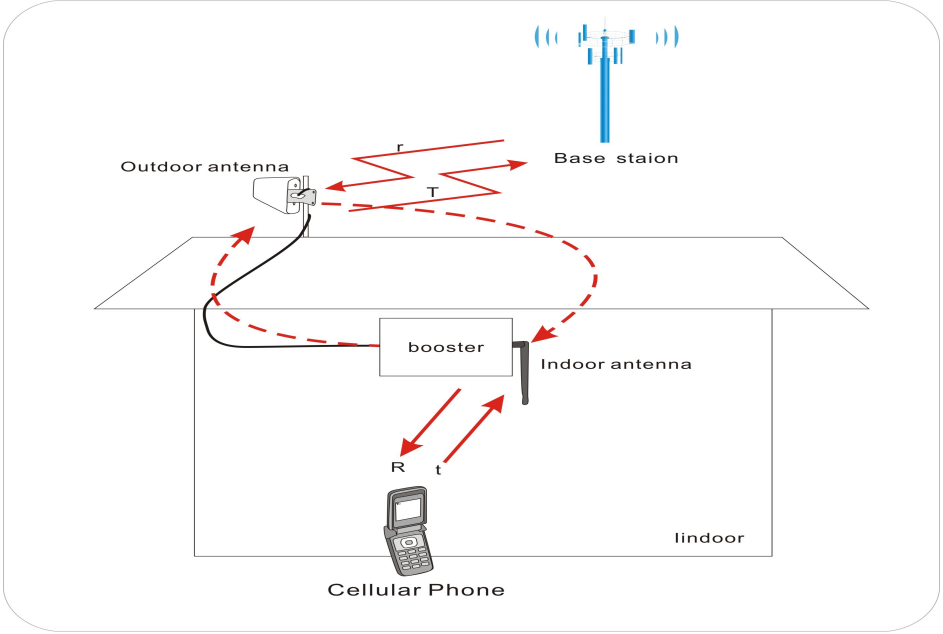
■ Testing the signal strength received from donor antenna mounted in site by mobile phone:

- Please select the top of building to install the donor antenna if total floors are less than 7 floors, and shall try your best to select places like balcony or platform lower than 7th floor for donor antenna if the buildings are over 7 floors, because the mobile signals are clean at less than 7th floor.
- The mobile phone shall display full bar signals in location where the donor antenna is installed
- The phone calls or data transmission shall be 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.

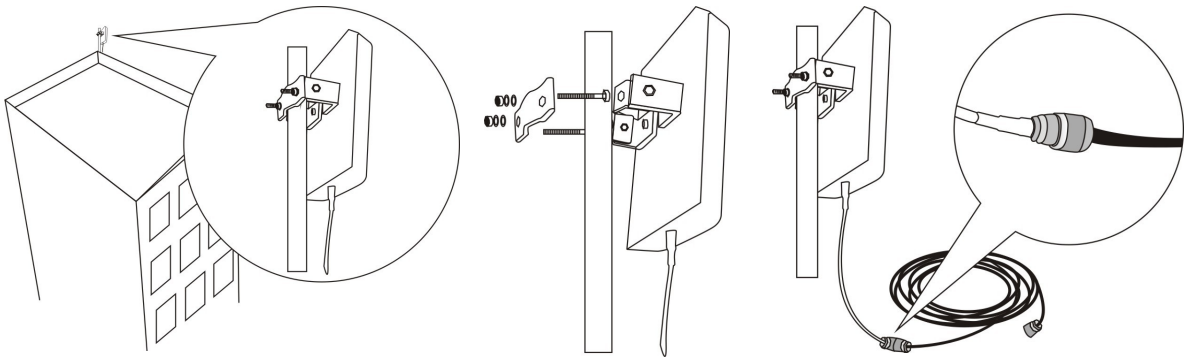
- Selecting the installation direction of donor antenna
  - The donor antenna shall point to the direction of the tower, and it would be much better to keep line of sight.
  - Please select the opposite directions for donor antenna and server antenna. If donor and server antennas have to be installed 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, please adjust the direction of donor antenna or change its position in order to obtain the best calling effect.
  - The band selective repeater supports specific operators, so please adjust the donor antenna direction to the BTS tower of specific mobile operator.
- 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 of metal, high-voltage line, RF antenna and 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 they are too close, it could make big noise. So the repeater can only run smoothly if alarm LED always remains GREEN color.
- The minimum distance between donor antenna and server antenna shall be more than 10 meters; and the direction of donor and server antennas shall be opposite.

As shown in the below illustration, the booster amplifies the downlink signal **r** from the tower and send to the indoor antenna hereafter. If the distance between outdoor antenna and indoor antenna is less than the required distance, the amplified signal **R** will go back from indoor antenna to outdoor antenna. So it will lead to self-oscillation and reduce the coverage area, also the bad calling quality could happen at the same time, and what the worse is that the mobile network could be influenced badly and the operators will finally come to shut off the repeater system.

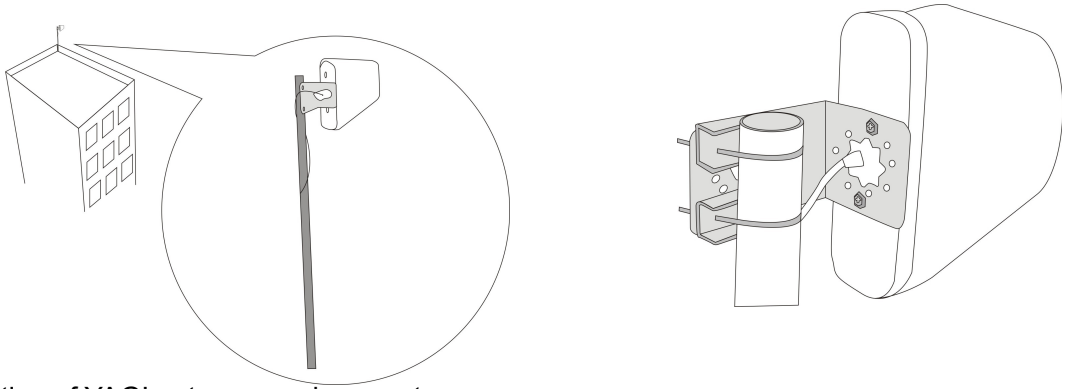


If isolation can't be achieved by the limited distance, the roof of the building or any other barriers can be used in between to increase isolation.

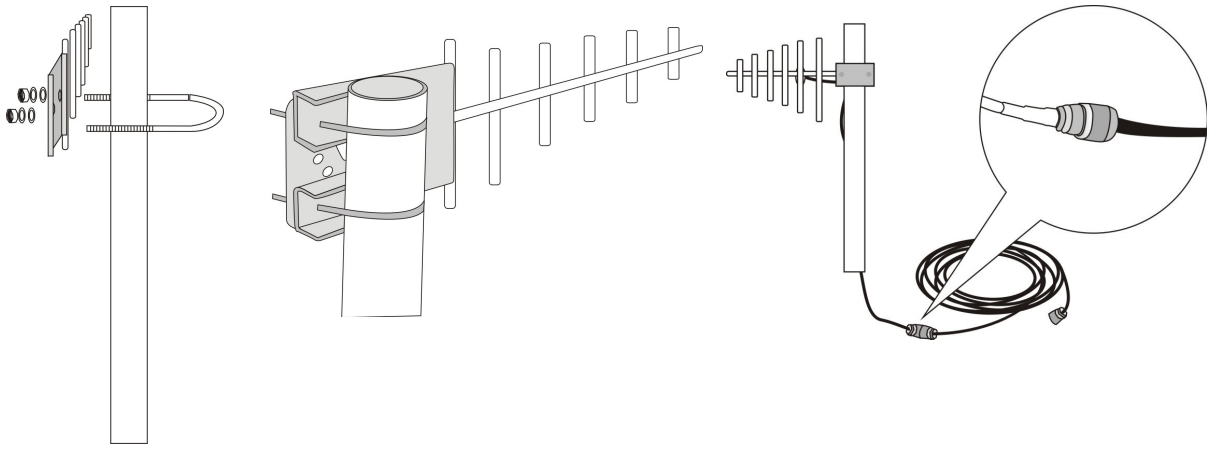
■ Installation of panel antenna as donor antenna



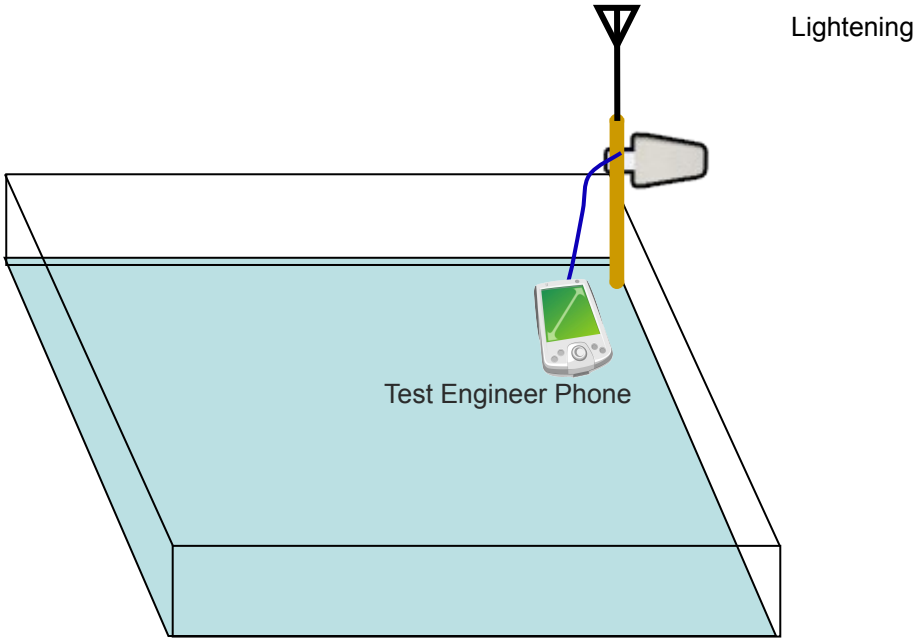
■ Installation of wide directional antenna as donor antenna



■ Installation of YAGI antenna as donor antenna



■ Test the call quality of donor antenna (for professional installation team only)



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

- **System Requirement of CDMA or WCDMA or AWS**
  1) The input power level shall be around -55 ~ -60dBm (it is less than GSM or DCS because of breathing effect), the lowest shall be more than –90dBm
  2) Test by mobile phone or data card by 3~5 times to make sure that Ec/Io is more than –7dB, and no handovers.
  3) Ec/Io of adjacent carrier shall be 8dB less than that of donor carrier to avoid soft handover. The active PN shall be only 1.

7.5. 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. 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.

8. 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), is suitable to be 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).

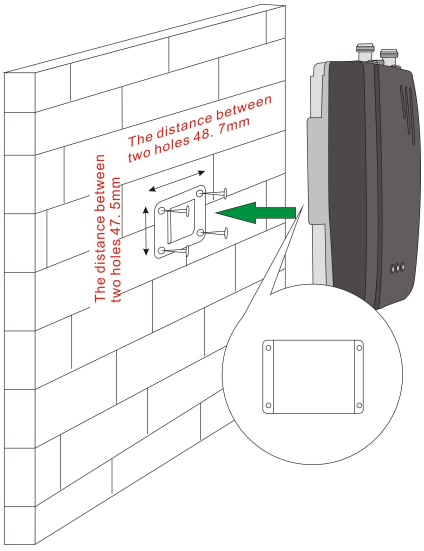
8.1 Repeater Installation

8.1.1. Installation Steps

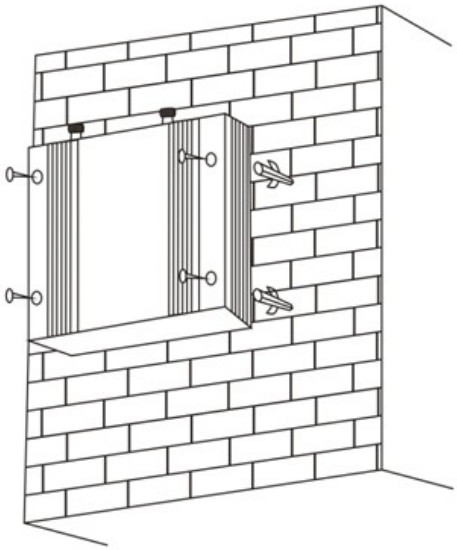
3G-515 shall be installed in indoor areas only

1) Connect the power supply and the cables properly to the repeater ports

2) Check again to make sure the repeater is installed firmly and repeater alarm LED must stay green.



For repeaters with plastic closet



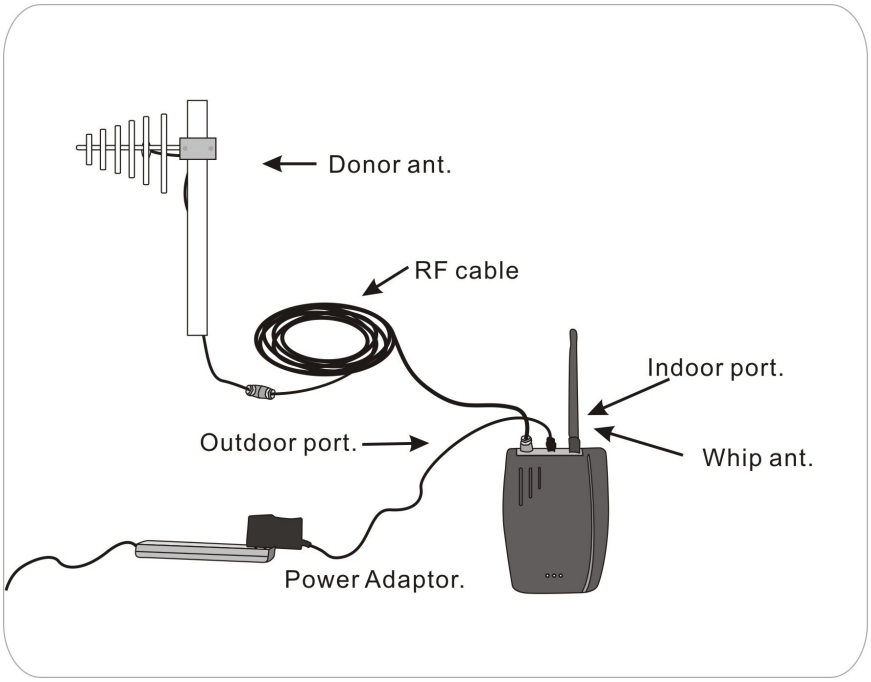
For repeaters with metal closet

8.1.2. Repeater's ports description

1) Outdoor port: connected with the donor antenna by cable

2) Indoor port: connected with server antenna directly or by cable

3) DC IN: connected with power supply.



8.2. Repeater Settings

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

8.2.1. Switch on power

After power is on, check firstly the alarm and power LEDs.

- Status and definition of POWER indicators:

Status	Definition
Green	Normal
Off	DC power problem

- Status and Definition of ALARM indicators; Alarm LED only works for downlink signals

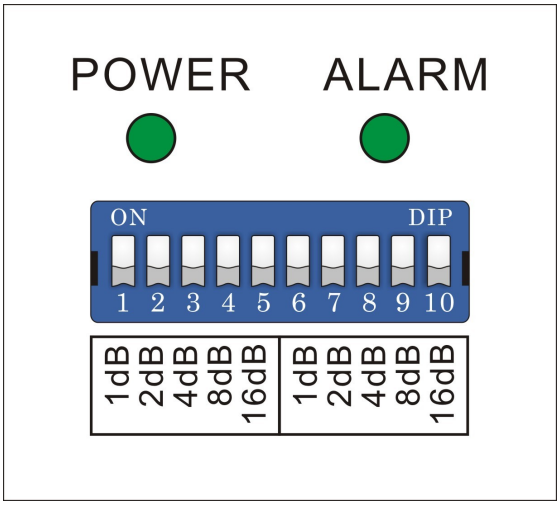
Status	ALARM

Green	It is working in linearity
	Warning: Input signals may be not enough, so please check on coverage effect, do not do anything if it is good; otherwise please adjust the repeater system to get better coverage.
Orange	A little bit stronger input signals or slight self oscillation have occurred.
	Solution: Please adjust antennas or use MGC to reduce the repeater gain, till you find “edge point” with green LED (I.E. the Alarm LED must stay at green color, and at the edge of turning Orange), and let the repeater work at this point. MGC is the last measure to take as it will influence on coverage.
Red	There are strong input signals or severe self oscillation, measures must be taken (please note that our repeaters have auto shut off function, so the red color status can only maintain 5 seconds).
Off	Repeater breaks down, or severe self oscillation leads to auto mute. Please re-plug in and check if alarm LED turns red, if it is, please take measures to keep alarm LED green; if it maintains off, it means the power break down.

Remark: Please note that Alarm LED works on repeater downlink signals only. I.E. the repeater input signals from CELL TOWER.

Single system repeater only has one set of power and alarm LEDs, while dual system have two sets of power and alarm LEDs, and three system repeaters have three sets of LEDs. Each system has own relevant LED and please refer to the correct LED for system performance evaluation.

8.2.2. Manual Gain Control (MGC)



Switches 1-5 represent Downlink and 6-10 represent Uplink. When it is necessary to adjust the gain by DIP switch, firstly please adjust Downlink gain according to input signals, secondly please adjust Uplink gain according to Downlink gain.

The DIP Switches have default ‘OFF’ status; please push relevant switches to “ON” position if certain attenuation value needs to be achieved.

- **DIP switch downlink attenuation setting:**

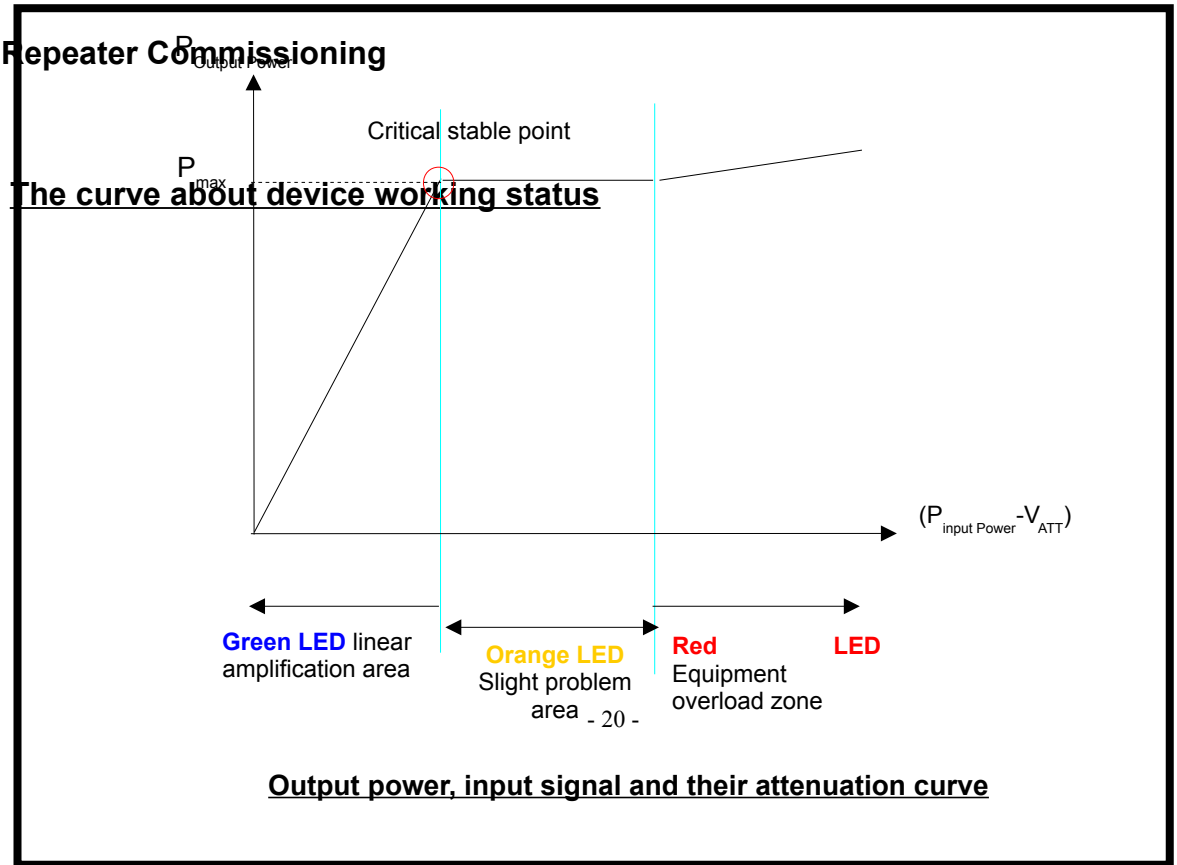
Att	1	2	3	4	5	Att.	1	2	3	4	5	Att.	1	2	3	4	5
0 dB	off	off	off	off	off	11dB	ON	ON	off	ON	off	22dB	off	ON	ON	off	ON
1 dB	ON	off	off	off	off	12dB	off	off	ON	ON	off	23dB	ON	ON	ON	off	ON
2 dB	off	ON	off	off	off	13dB	ON	off	ON	ON	off	24dB	off	off	off	ON	ON
3 dB	ON	ON	off	off	off	14dB	off	ON	ON	ON	off	25dB	ON	off	off	ON	ON
4 dB	off	off	ON	off	off	15dB	ON	ON	ON	ON	off	26dB	off	ON	off	ON	ON
5 dB	ON	off	ON	off	off	16dB	off	off	off	off	ON	27dB	ON	ON	off	ON	ON
6 dB	off	ON	ON	off	off	17dB	ON	off	off	off	ON	28dB	off	off	ON	ON	ON
7 dB	ON	ON	ON	off	off	18dB	off	ON	off	off	ON	29dB	ON	off	ON	ON	ON
8 dB	off	off	off	ON	off	19dB	ON	ON	off	off	ON	30dB	off	ON	ON	ON	ON
9 dB	ON	off	off	ON	off	20dB	off	off	ON	off	ON	31dB	ON	ON	ON	ON	ON
10 dB	off	ON	off	ON	off	21dB	ON	off	ON	off	ON						

- **DIP switch uplink attenuation setting:**

Att	6	7	8	9	10	Att.	6	7	8	9	10	Att.	6	7	8	9	10
0 dB	off	off	off	off	off	11dB	ON	ON	off	ON	off	22dB	off	ON	ON	off	ON
1 dB	ON	off	off	off	off	12dB	off	off	ON	ON	off	23dB	ON	ON	ON	off	ON
2 dB	off	ON	off	off	off	13dB	ON	off	ON	ON	off	24dB	off	off	off	ON	ON
3 dB	ON	ON	off	off	off	14dB	off	ON	ON	ON	off	25dB	ON	off	off	ON	ON
4 dB	off	off	ON	off	off	15dB	ON	ON	ON	ON	off	26dB	off	ON	off	ON	ON
5 dB	ON	off	ON	off	off	16dB	off	off	off	off	ON	27dB	ON	ON	off	ON	ON
6 dB	off	ON	ON	off	off	17dB	ON	off	off	off	ON	28dB	off	off	ON	ON	ON
7 dB	ON	ON	ON	off	off	18dB	off	ON	off	off	ON	29dB	ON	off	ON	ON	ON
8 dB	off	off	off	ON	off	19dB	ON	ON	off	off	ON	30dB	off	ON	ON	ON	ON
9 dB	ON	off	off	ON	off	20dB	off	off	ON	off	ON	31dB	ON	ON	ON	ON	ON
10 dB	off	ON	off	ON	off	21dB	ON	off	ON	off	ON						

8.2.3. Repeater Commissioning

- **The curve about device working status**



Output power, input signal and their attenuation curve

$P_{Output\ Power:}$ Output Power

$P_{input\ Power:}$ Input Power

$V_{ATT:}$ Attenuation value of attenuator

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

P_{max}: Rate output power

- **Downlink gain setting**

First the alarm LED only indicates the downlink input power level, here we use color of Alarm LED to adjust the gain of the repeater. Alarm LED color must remain green. As for the downlink working performance, it is a good working point that Alarm LED maintains “Green” color with the intention of turning orange; here we refer as “edge point”. At this time, downlink output power and coverage effect are stable.

And the equipment must be as far as possible away from overloading status of “red” (the equipment would hold higher interference and depression ability at this stage). So we shall try our best to set the equipment near “edge point” of green and intention of turning orange during engineering.

- **Setting of “edge point”:**

Switch on the power supply after connection with donor antenna and server antenna, and observe ALARM LED.

- If it shines “orange”, use 1dB as step to reduce the gain until “green” turns on, then increase the gain 1~3dB attenuation value until “orange” starts to turn on, then brings back 1~2dB till “green” is on, then fix the gain and the repeater’s downlink output power reaches the perfect status.
- If it shines “green” then,
  - Please check coverage effect firstly, if the coverage effect is good, the engineering has reached expecting target, thus there is no need to do anything.
  - To check whether the attenuation value has been set, if it is, use 1dB as step to increase gain until the “orange” turns on, then brings back 1~2dB till “green” is on again , then the repeater’s

downlink output power reaches the perfect status.

- But if attenuation has not been set, it indicates that the input power is not strong enough to let the repeater reach its good coverage.

If the coverage effect is not good, the donor antenna should be adjusted to get stronger input signal. It is recommended that one person shall check the coverage effect inside the building when the other person is trying to adjust the antenna or the repeater. At this stage, please make sure that "Orange" color will not be generated by self oscillation. Please take off the server antenna to check if it is self oscillation or not: if the Orange turns to be green, it is self oscillation; if it stays as Orange, it is not self oscillation. Please follow steps in other page to turn Orange to be Green.

- **Uplink gain setting**

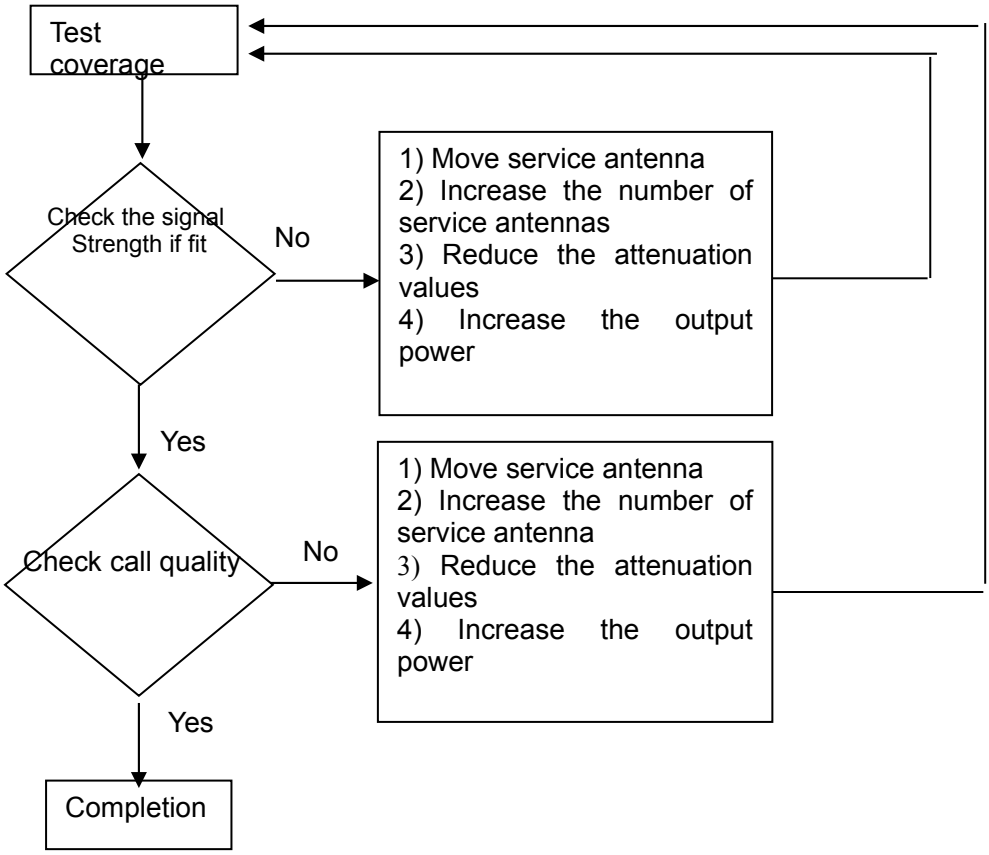
Standard: uplink attenuation values =downlink attenuation values

Remark: Avoid putting more than 5dB difference between the Uplink and Downlink. And Uplink gain must be equal to or less than DL gain, it can't be more in order to avoid interference with mobile network.

8.3. System Test

8.3.1. 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 antenna to increase input signal power level.
   - Check whether it is necessary to add more server antennas since barriers block the signal penetration, also check whether the repeater's power is enough; please install more server antennas or replace with a repeater of 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 to improve coverage.
   - Check if it is necessary to adjust the direction of the sever 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 direction / location, or replace with higher gain antenna to increase input signal strength.

8.3.2. Repeater can not communicate in Power-ON status

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

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

Please take below measures:

- Firstly check whether the alarm LED is orange. The orange light shows the insufficient isolation.
- Secondly adjust the antennas' 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 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 is reduced between operators.
  - **Solution 2:** Use barriers (like buildings) to block signals of other operators.

3) The repeater has alarm OFF status

- **Reason:** the repeater breaks down
  - **Solution:** Please check the power adaptor to see if it breaks down or not, then take off the plug and re-plug in, if alarm LED maintains off, the repeater break down is confirmed, then please consult local dealers for warranty.
- **Reason 2:** There is self oscillation if alarm LED turns red after re-plugging in.
  - **Solution 1:** Change the direction or location of donor or server antennas to enlarge the distance.
  - **Solution 2:** Use barriers (like buildings) to increase isolation.
  - **Solution 3:** Reduce the repeater gain by DIP switch.

----------End ----------