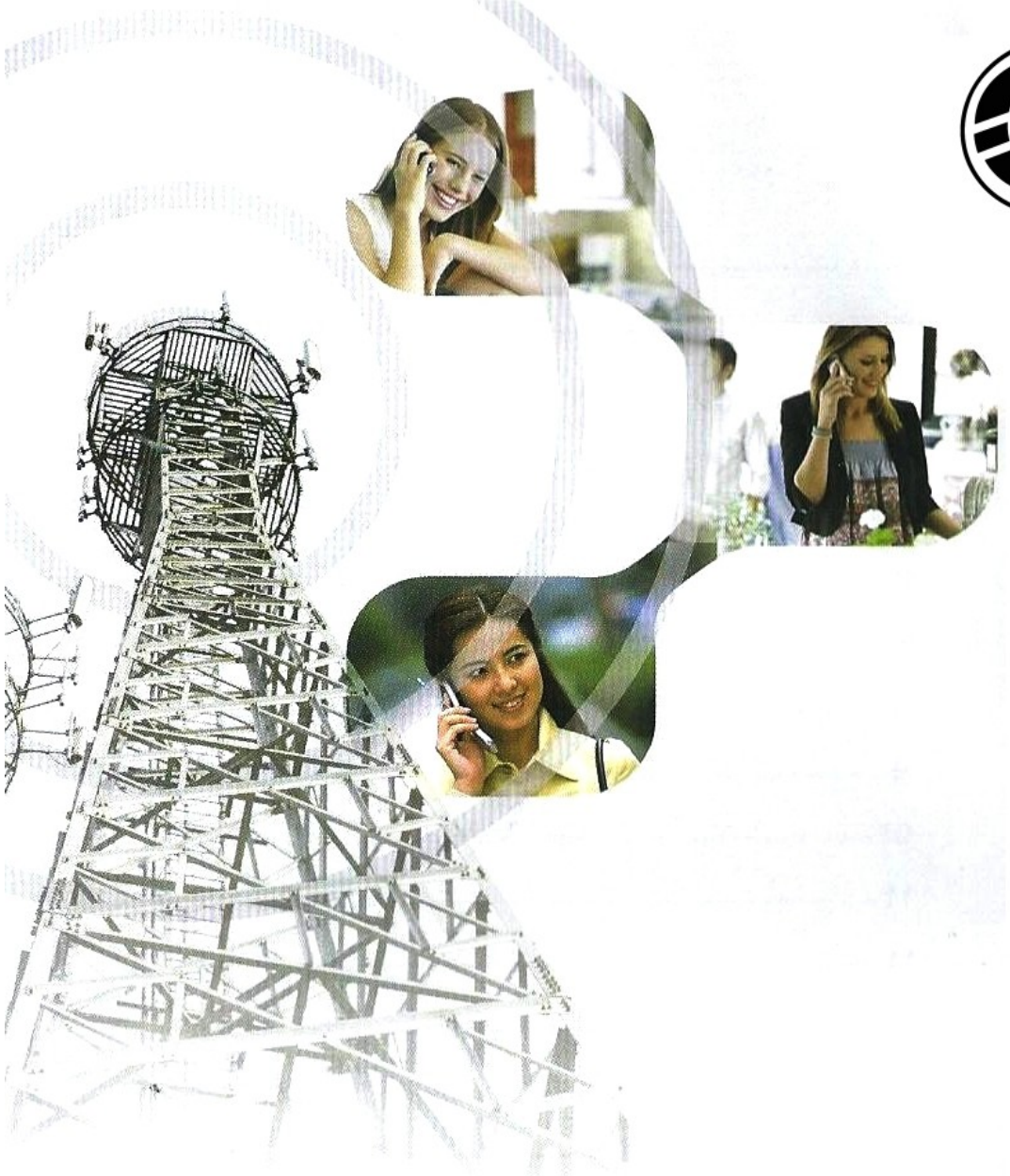


cablematic

User's Manual

CONTENTS

PREFACE

This user's manual describes the installation, operation and maintenance of the consumer repeaters.

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

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

1. SAFETY WARNINGS


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.

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.

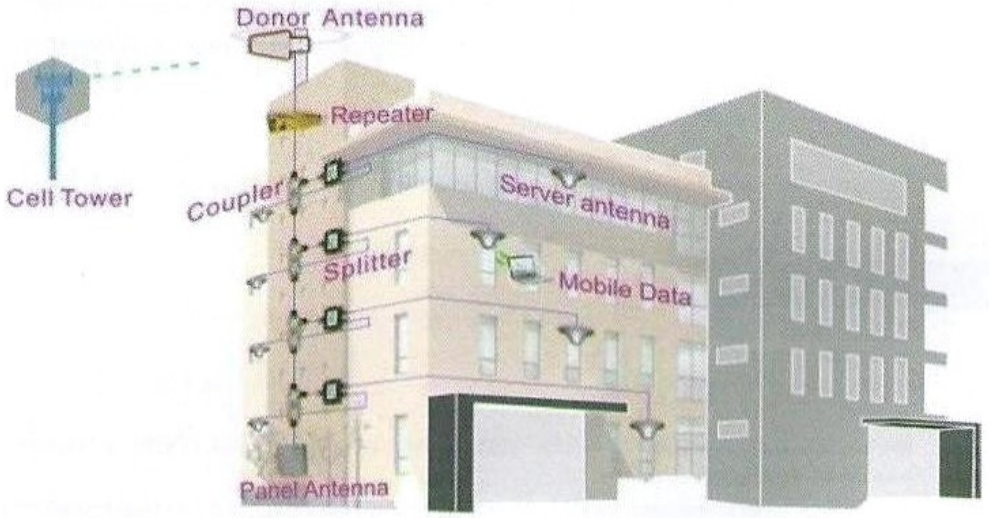
(3) Elevators and basements are well-known for blind areas.

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, therefore a booster is a quite good option.

2.2. Solution

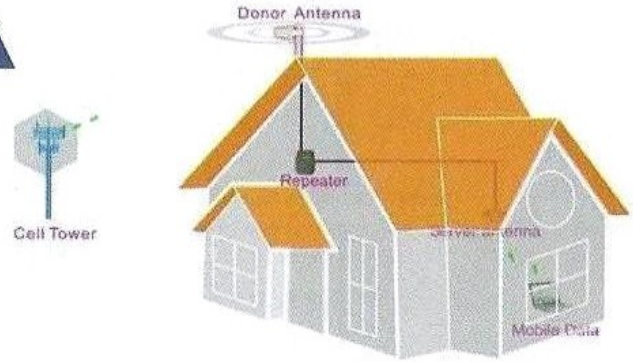
Our consumer repeater is the perfect solution for providing a wireless improvement in the cellular reception of a home, office, restaurant, VIP Room, apartment, building or shopping mall, in the quickest time possibly. One repeater covers 300 to 2000 square meters.

Below diagram shows how simple and fast for the repeater system is installed and works effectively.
One Yagi antenna, as Outdoor antenna, is installed at the top of the roof to pick up good mobile signals from outside, and send through coaxial cable to repeater to amplify the signals significantly, then the output signals are divided into two signals by one 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 within the area.



Cell Phone Signal Coverage Solution

3. THE REPEATER SYSTEM



Below Pictures Shows Some Typical Products' Photos

Connect to Outdoor Antenna

Connect to Indoor Antenna

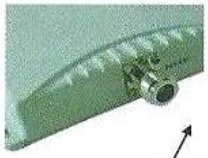
I

Connect to Outdoor Antenna

Connect to Indoor Antenna

II

Connect to Outdoor Antenna

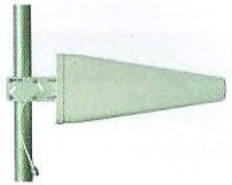


Connect to Indoor Antenna

III

Typical Outdoor Antennas

1. Outdoor Directional Yagi Antenna



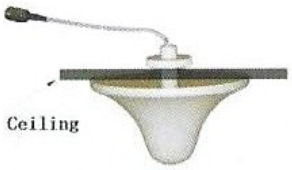
2. Outdoor Log-periodic Antenna

3. Outdoor Fiberglass Antenna

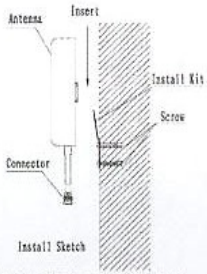
4. Wide band Omni antenna

Function: Pick up open 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 effect. Outdoor antenna also transmits the uplink signals from the repeater to cell tower.

Typical Indoor Antennas



1. Indoor Ceiling Antenna



2. Indoor Panel Antenna

3. Direct Connection Whip Antenna

Note:

3dBi Indoor Omni ceiling or 9dBi Indoor panel are recommended, whip antenna is also good for simple installation, however the coverage size will be limited by the case.

Omni antenna (Indoor ceiling Omni antenna or whip antenna), 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: RG58, LMR 300 or 400, 3D, 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.

4. Installation

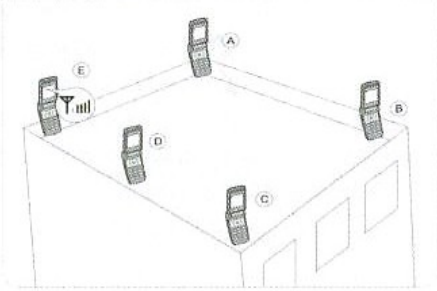
The repeaters should be used to cover the Indoor area. Humidity and temperature of working environment can affect the reliability of repeater. So, temperature, humidity, dust, interference, power, space requirements and other factors should be considered during installation of repeater.

4.1. 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.

4.2. Installation of Outdoor 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 Outdoor antenna location in order to get the best signals.

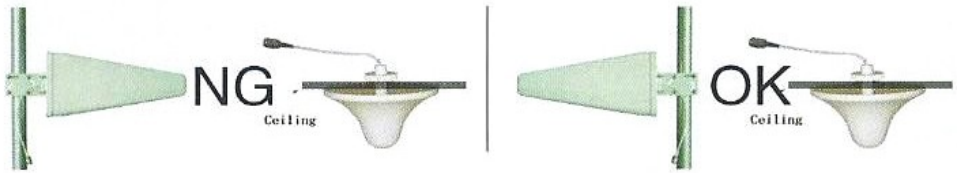


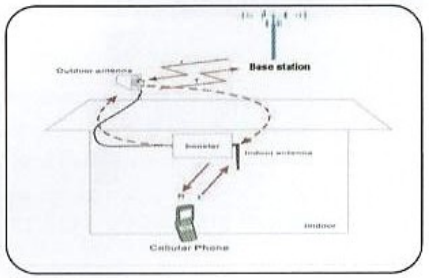
- Testing the signal strength received from Outdoor antenna mounted in site by mobile phone:

- Please select the top of building to install the Outdoor 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 Outdoor 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 Outdoor antenna is installed
- The phone calls or data transmission shall be smooth and stable by 3 times testing in location where the Outdoor 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 Outdoor antenna.

- Selecting the installation direction of Outdoor antenna.
  - The Outdoor 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 Outdoor antenna and indoor antennas. If Outdoor and Indoor 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 Outdoor antenna or change its position in order to obtain the best calling effect.
  - The wide band repeater supports all mobile operators or different mobile systems, so please adjust the Outdoor antenna direction to have balance between signals of different mobile operators or various mobile systems.
- Outdoor antenna installation ---Notes:
  - Do not install the Outdoor antenna during the rainy day with lightning.
  - Please follow the instructions to install the outdoor antenna.
  - It is a must that the waterproof shall be done to connectors of outdoor antenna and feeder lines.
  - In order to avoid interference, please note that the Outdoor antenna should be far away from the following objects of metal, high-voltage line, and RF antenna and high-voltage transformer.
  - Repeater is a two-way signal amplifier. So proper isolation between Outdoor antenna and Indoor 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.
- The minimum distance between Outdoor antenna and Indoor antenna shall be more than 10 meters; again the direction of Outdoor and Indoor antennas shall be opposite.

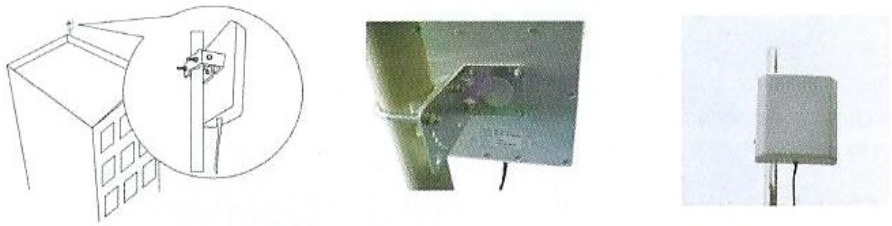
As shown in the below illustration, the booster amplifies the downlink signal r from the tower and send to the Indoor antenna hereafter. If the distance between Outdoor antenna and Indoor antenna is less than the required distance, the amplified signal R will go back from Indoor antenna to Outdoor antenna.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



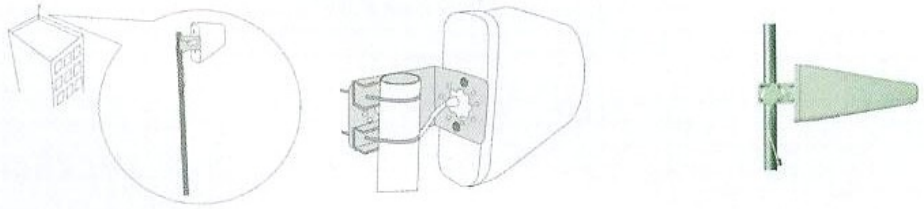


If isolation can't be achieved by the limited distance, the roof of the building or any other barriers can be used in between to increase isolation.

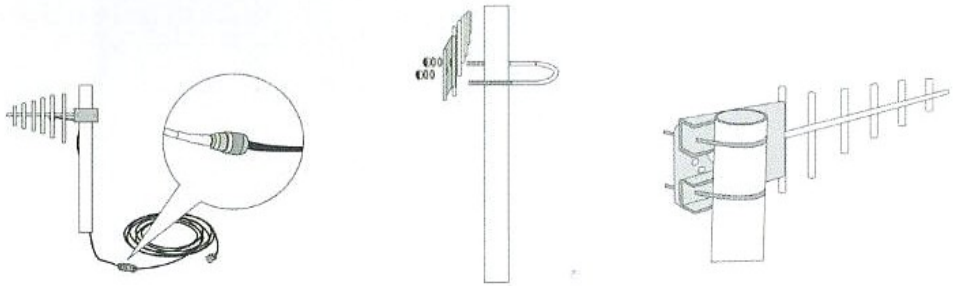
Installation Of Panel Antenna As Outdoor Antenna



Installation Of Wide Directional Antenna As Outdoor Antenna

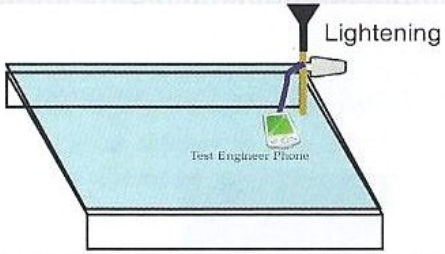


Installation Of Yagi Antenna As Outdoor Antenna



Installation Of Omni-directional Antenna

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



Fix the Outdoor 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.

4.3.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:

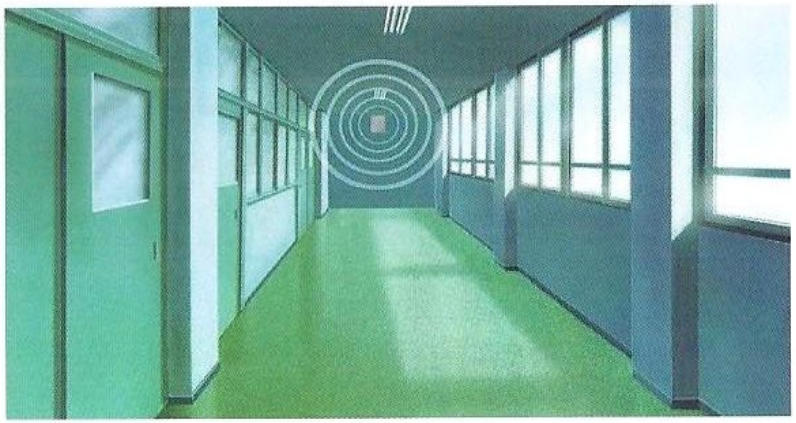
- Keep the same redundant cable length and keep the length of stripped cables to agree with the corresponding connectors.
- Use a proper force to cut the jacket layer or insulation layer and avoid damaging the braid shielded net and cores.
- Weld cores firmly and smoothly with a proper amount of solder, 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.

5. Indoor antenna installation

Proper antennas shall be selected according to the site conditions and the requirement. And more than one antenna can be used with the repeater, especially for repeaters equal with or over 20dBm, and 30dBm can be connected with up to 10 antennas in order to send the signals to larger areas or distribute the signals equally. Please consult our professional engineers about the solution if you want to connect more than one antenna.

(1) Indoor ceiling Omni antenna is suitable to be installed in the center and radiate all directions.

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



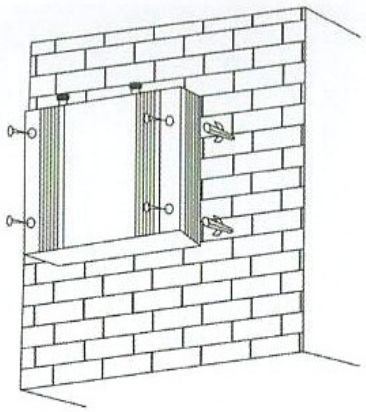
3) The small whip antenna is suitable to be installed use for small room or apartment. It is very convenient for simple use with a good result.

5.1. Repeater Installation

5.1.1. Installation Steps

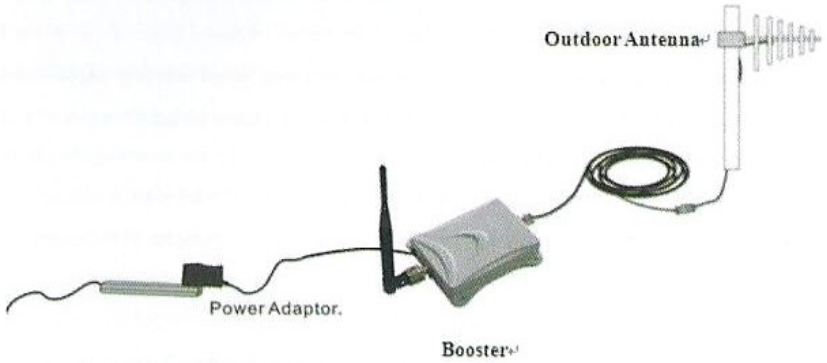
The Repeater shall be installed in Indoor areas only

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.



5.1.2. Repeater's ports description

1) Outdoor Port: connected with the outdoor antenna by cable.
2) Indoor Port: connected with indoor antenna directly or by cable.
3) DC Port: connected with power supply.



5.1.3. 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 GSM900, so all the accessories must support the GSM900 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.

5.1.4. 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

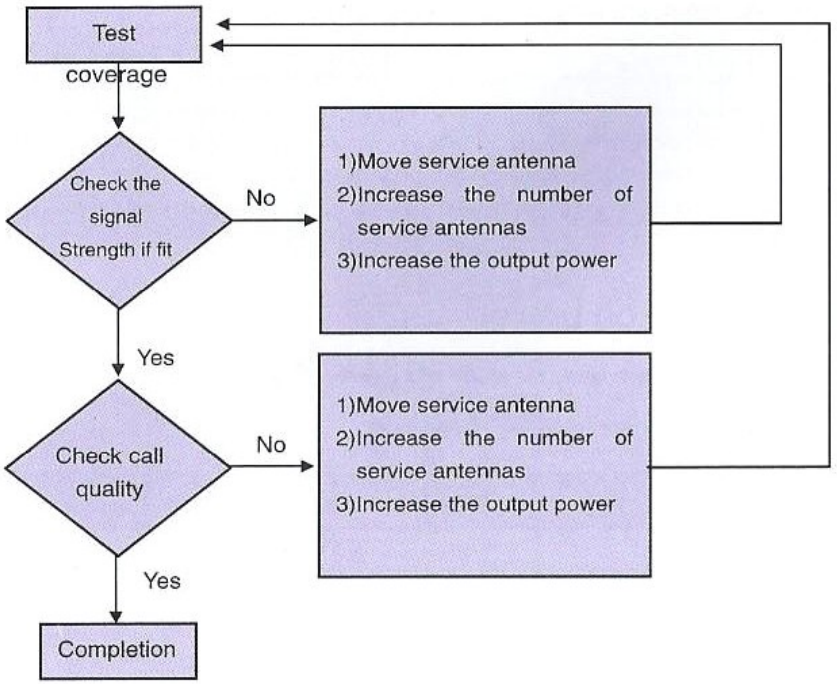
5.1.5. Check whether the coverage is good

(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 Outdoor antenna or its installation position or replace Outdoor antenna with higher gain antenna to increase input signal power level.
- Check whether it is necessary to add more Indoor antennas since barriers block the signal penetration, also check whether the repeater' s powes enough; please install more Indoor 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:

Increase the output power* ---recommended ways: adjust the Outdoor antenna direction / location, or replace with higher gain antenna to increase input signal strength.

5.16Repeater does not communicate in Power-ON status

(1)The power is on but can not to call the phones.

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

Please take below measures:

★ Firstly check whether the connection is correct.

★ Secondly adjust the antennas' directions or locations or enlarge the distance between them.

★ Thirdly replace a lower gain repeater if you have one backup.

The following measures can also be tried:

★ Use the roof of the building to enlarge the isolation (Please try to place the Outdoor antenna and Indoor 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 cannot 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 Outdoor 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 Outdoor 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.