

User Manual

LTE/4G 2600M 27dBm Repeater



2013 January

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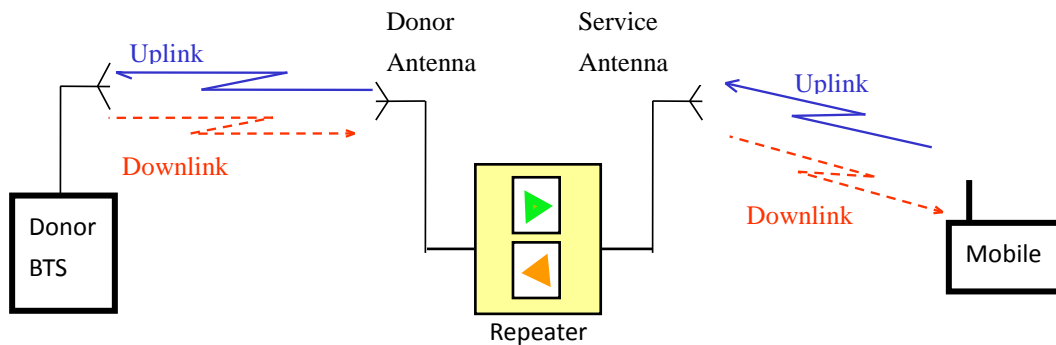
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NOTICE:

**SWITCH AC POWER OFF BEFORE DONOR AND
SERVICE ANTENNA CONNECTS TO REPEATER.**

1 Overview

Repeater is a device that receives, amplifies and transmits the radiated or conducted RF carrier both in the down-link direction (**DL**, from the base station to the mobile area) and in the up-link direction (**UL**, from the mobile to the base station).



The wide band repeater is a bi-directional amplifier used to enhance signals between a mobile and a base station. This repeater type is used for digital telecommunication system:

- 1) -It picks up the strongest signal from BTS via the Donor Antenna,
- 2) -Linearly amplifies the signal and then retransmits it via the Indoor Signal Distribution System to the weak/blind coverage area.
- 3) -And the mobile signal is also amplified and retransmitted to the BTS via the opposite direction.

It features with customized frequency band, flexible installation, cost-effectiveness and ideal coverage solution.

It is applied to small, medium-size areas such as **medium office**, **bus station**, **factory** and **oil field** etc.

This model booster is commonly used in situations where large numbers of frequency carriers are to be repeated or when base station synthesized frequency hopping is used.

2 Product Features

- High system **gain>75dB**, High system output **power 27dBm**

- Light weight, small dimensions, easy to install
- Smart Automatic Level Control (**ALC**) to reduce interference to BTS
- Easy set DL/UL gain via local **PIN switch** manually
- Linear** power amplification to effectively suppress inter-modulation and spurious emission
- An alarm interface with unique **color LEDs** to indicate power supply and signal level of uplink and downlink
- Simple installation with external **AC/DC adapter**
- Dual ports and full duplex design

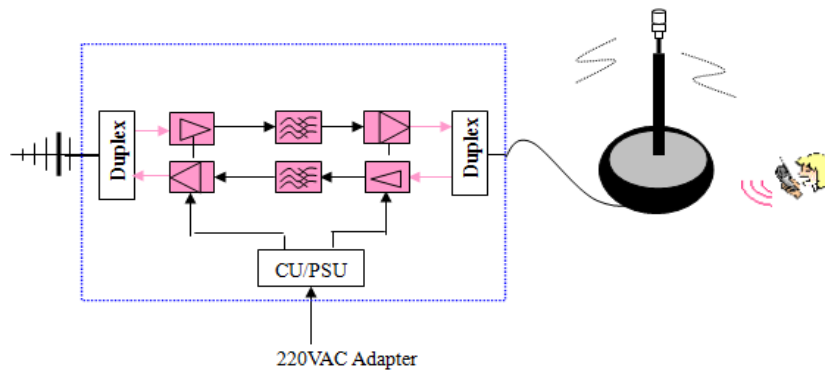
3 Technical Specifications

Items	Specification	
	Uplink	Downlink
Frequency (Customized)	2500-2570 MHz	2620-2690 MHz
Gain	≥ 70dB	≥75 dB
Output Power	20dBm	27dBm
ALC Scope	≥ 20dB	
In-Band Ripple	≤8dB	
I/O Impedance	50 Ω	
VSWR	≤2	
Noise Figure	≤ 8 dB	
Inter-modulation Attenuation	-40dBc	
Spurious Emission	≤-36dBm(9KHz ~ 1GHz) ≤-30dBm(1 ~ 12.75GHz)	
System Delay	≤ 0.5μs	
Max Input Power Level(1minute)	-10dBm	
RF Connector	N-Type (Female)	
Operating Temperature	-15~ +55 °C	
Power Supply(Customized)	AC100~240VAC , DC+9V/4A	
Dimension (mm)	60mm 170*268*50	
Weight(kg)	3.0kg	

4 System Diagram

The RF link (donor) towards the base station is typically fed from an outdoor antenna while the coverage area is fed by an indoor antenna

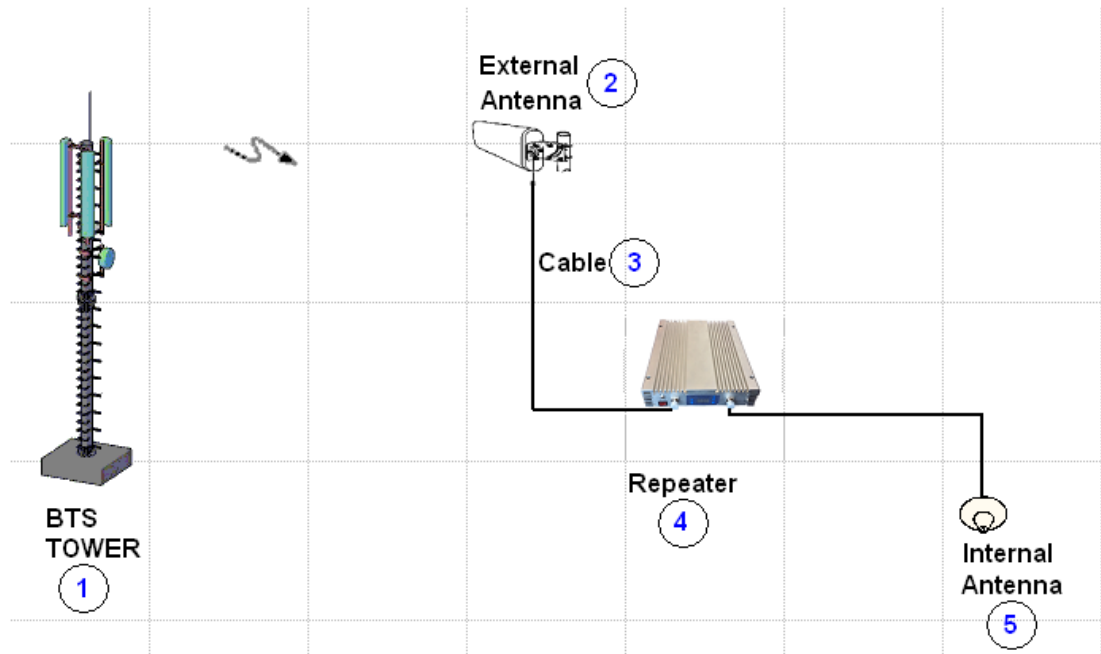
The RF link (donor) towards the base station is typically fed from an outdoor antenna while the coverage area is fed by an indoor antenna or connected to mobile antenna directly.



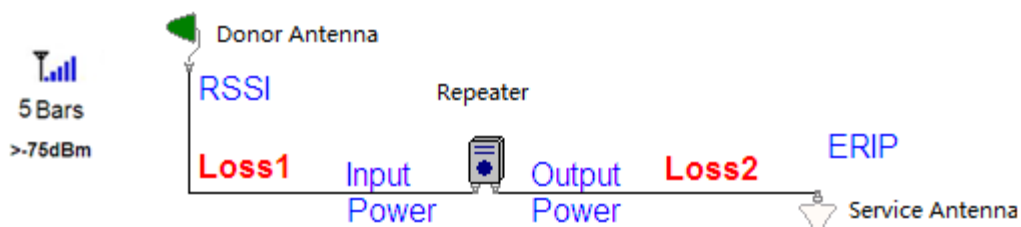
The signal from the base station is received via directly antenna, then forwarded through a duplex filter, is amplified in a low noise amplifier (LNA), enters the RF filter for wideband selective, and then amplified in the power amplifier.

The output signal passes a duplex filter, before it is fed to mobile or indoor antenna which retransmits the signal to the aim areas.

5 Applications Example



No.	Item	Usage	Note
①	BTS Tower(operator base station tower)	Donor site, provide 2G/3G signal by operator	Ex. Vodafone, Orange
②	External Antenna(Outdoor antenna)	Donor antenna , Receive signal from BTS tower	Ex. Log period antenna, Yagi antenna
③	Cable	Connection between antenna and repeater	Ex. LMR400,LMR600, 50-5D
④	Repeater	Amplifies Signal from BTS via donor antenna	Ex. Single band, dual band, triband
⑤	Internal Antenna(Indoor Antenna)	Service antenna, transmit the signal to coverage area after repeater	Ex. Whip antenna, omni antenna, panel antenna.



$$\text{RSSI} = \text{Min Reception Signal Level} + \text{Donor Antenna Gain} \quad (1)$$

$$\text{Input Power} = \text{RSSI} - \text{Loss1} \quad (2)$$

$$\text{Output Power} = \text{Input Power} + \text{Repeater Gain} \quad (3)$$

$$\text{ERIP} = \text{Output Power} - \text{Loss2} + \text{Service Antenna Gain} \quad (4)$$

5.1 Minimum Signal Levels

It requires a minimum signal level in the place where install the donor antenna. Failure to provide sufficient input signal will only result in a poor coverage inside the building for this repeater system.

To check signal levels, use the phones in the place where antenna be install (on the roof) and observe the signal bars on the phone. The Donor (outside) antenna should be placed in the location where you get the most signal.

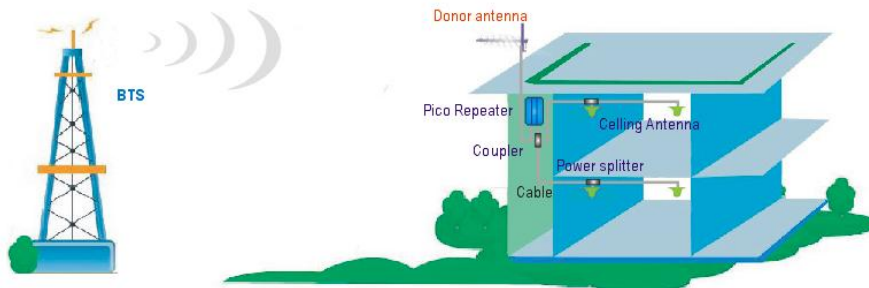


Notices:

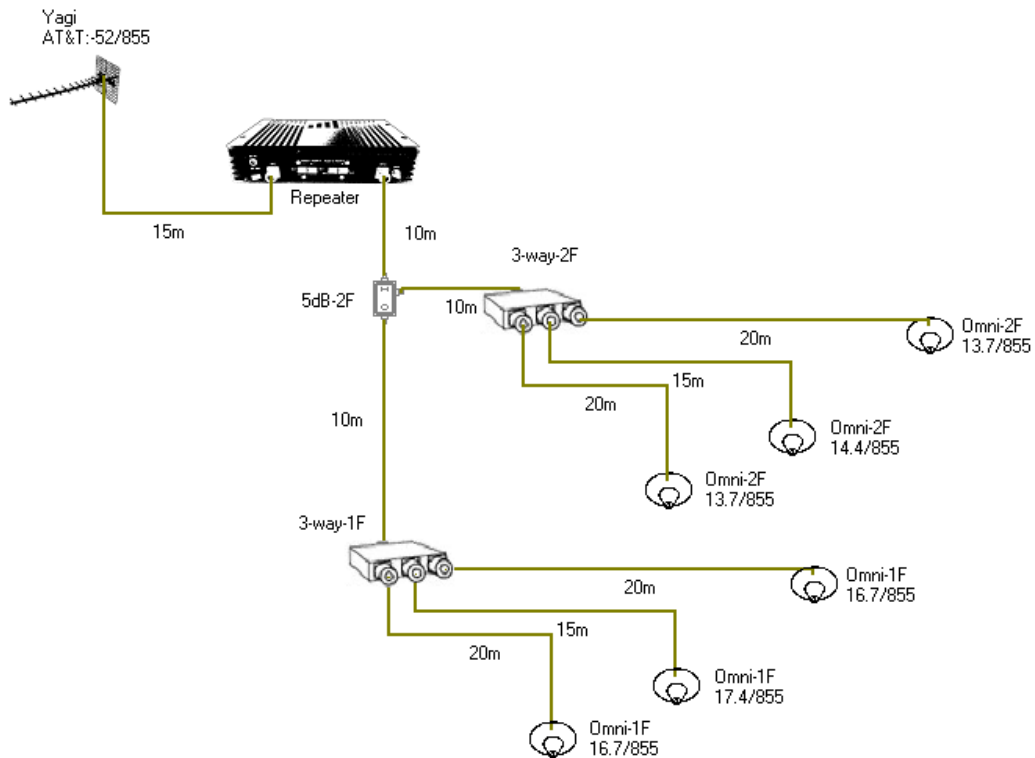
- 1) The donor antenna should have line of sight (LOS) with the BTS antenna. If the signal strength is adequate, LOS may in some cases not be necessary.
- 2) Donor antenna gains are typically 9 to 14 dB, and have a horizontal and vertical beam width of less than 30° to correctly select the donor BTS.

5.2 Custom Applications

If building is made of concrete, steel, steel roof, copper roof, brick, aluminum siding, concrete roofing tiles, metal roofing tiles or any other signal stopping material, a repeater is usually the ideal solution for your situation.



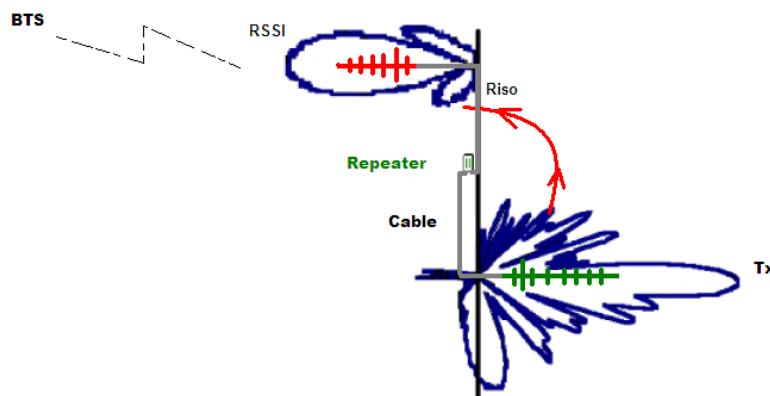
Most homes or buildings are easily covered by one repeater systems. Some buildings are larger or have multiple areas inside that need coverage.



It may need longer cables, more than 2 coverage antennas or other items in order to fully cover your building. We can make (almost) any cable length and can help design a system that fits your application.

5.3 Isolation and Separation

Isolation refers to the proper distance or separation needed to keep the Donor antenna signal pattern and the Coverage antenna signal pattern away from each other.



Isolation becomes particularly problematic when Omni-directional antennas are used for both the Donor and the Coverage antennas. Since these antennas transmit in a circle (or more accurately a sphere) it is very easy for these spheres to overlap and thus negate the repeater system.

The screenshot shows the 'Antenna Isolation' software interface. It features a menu bar with 'Definitions', 'Antenna Pattern', 'Horizontal Isolation', 'Vertical Isolation', 'Slant Isolation', and 'Application'. The main area displays a diagram of a repeater system. On the left is the 'Donor Antenna' with a Gain of 10dB and Rx of -90dBm. In the center is the 'REPEATER' block, which includes an amplifier with an ATT of 0dB and a Repeater Gain of 95dB. The repeater has a Feedback Rx of 20dBm and a Feedback Tx of 105dBm. On the right is the 'Service Antenna' with an unknown Gain. The system is set to an Isolation of 85dB. A legend indicates that a red dot represents an 'Isolation Problem' and a green dot represents 'Isolation OK'. The diagram shows a red dot at the top, indicating a problem, and a green dot at the bottom, indicating OK. Below the diagram, there is explanatory text about preventing oscillation and the effect of reflections.

In order to prevent oscillation of the system, the feedback must be lower than the amplifier gain. This loss in the feedback path is called the Antenna Isolation. It must be 15 dB higher than the repeater gain to guarantee an adequate protection against self-oscillation of the repeater.

The waves transmitted by antennas are reflected by surfaces, depending on the materials. If there is a reflection from a building towards the pole with the mounted antennas, this can decrease the antenna isolation by more than 10 dB.



1. For outdoor application, the distance between donor and service antenna must be > 20 meters in horizontal direction and 3 meters in vertical direction, otherwise the repeater will be broke because repeater oscillation. or install donor and service antenna between block wall/rooftop to reduce distance requirement; As following project.



2. Donor antenna direction should be toward to donor BTS and received signal level > -60 dBm;
3. Before switch electrical power on, the donor and service antenna **must be connected to repeater**, otherwise the repeater will be broke because repeater oscillation.
4. Repeater frequency must meet with the operator's frequency. Different network coverage need to select repeater with assigned frequency by operators.

6 Production Operation

6.1 Notices

Follow below safety items carefully before installation, implementation, maintenance and operation for this product

- ☞ BS and MS port must be connected to donor antenna and service antenna when powers supply on; otherwise the equipment will be damage for long term use.
- ☞ When use repeater for outdoor, the distance between donor antenna and service antenna must be >20metes, otherwise the repeater will be damage because isolation problem for long term use.
- ☞ Donor antenna need to be lighting proof and lighting rod need to be install for donor antenna installation pole outside
- ☞ Check input power, require input power less than maximum input power of repeater, otherwise the repeater cannot work well.
- ☞ Keep clear for label and indicator on surface of repeater to be identified.

6.2 Installation

Step 1: Start by taking phone up to the roof or other location outside to find where the signal is strongest.

Step 2: Temporarily mount the Donor (outside) antenna in that location. It may need to adjust and move the antenna later.

Step 3: Run coaxial cable into the building to a convenient location where you can also get standard 220VAC power for the repeater.

Step 4: Place the repeater in that location and connect the coaxial cable to the Donor Side of the repeater and the donor antenna.

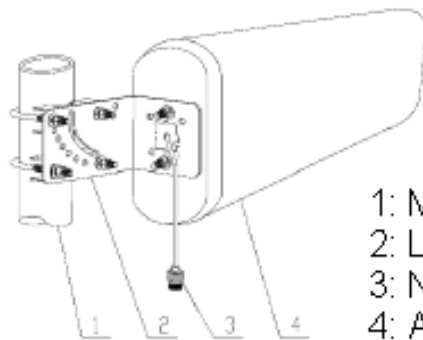
Step 5: Mount coverage (inside) antenna in a productive location. It may need to adjust or move the antenna later.

Step 6: Connect coaxial cable between the coverage antenna and the repeater output port.

Step 7: Power up the system and check for signal inside the building. If needed, tune system by moving and or pointing the Donor and Coverage antennas until get the most signal possible.

Step 8: Secure all antennas and cables, securely mount the repeater and clean up the installation

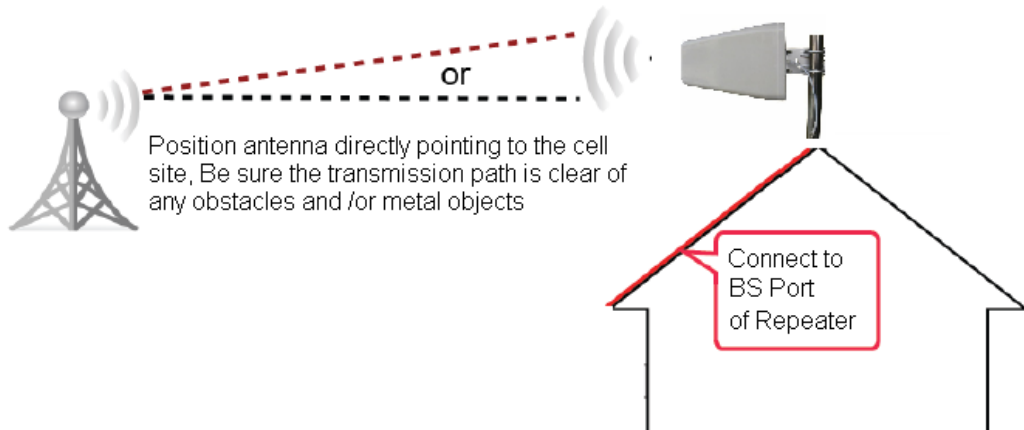
6.3 Donor Antenna Installation



- 1: Mounted Pole
- 2: L-Type Mounted Bracket
- 3: N Connector
- 4: Antenna Radome

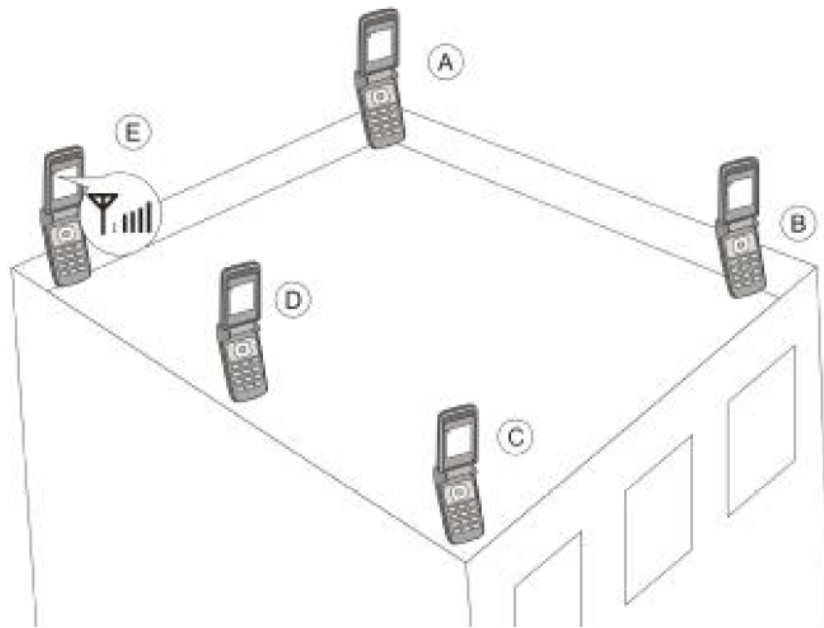


- ⊕ Find a good spot to mount the antenna, such as a chimney or rooftop, to avoid trees, building, and any metal objects.



- ⊕ Find the location and best angle for getting the strongest signal from the base station. The antenna must be directed towards the nearest base station.
- ⊕ It requires a minimum signal level in the place where install the donor antenna. Failure to provide sufficient input signal will only result in a poor coverage inside the building for this repeater system. To check signal levels, use the phones in the place where antenna be install (on the roof) and observe the signal bars on the phone. The Donor (outside) antenna should be placed in the location where you get the most signal.

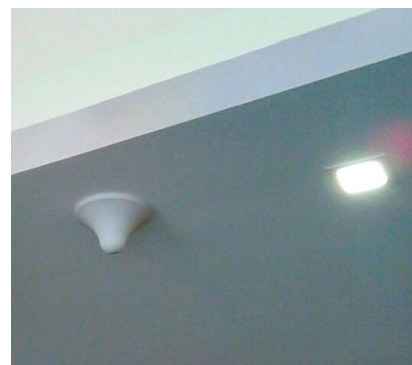
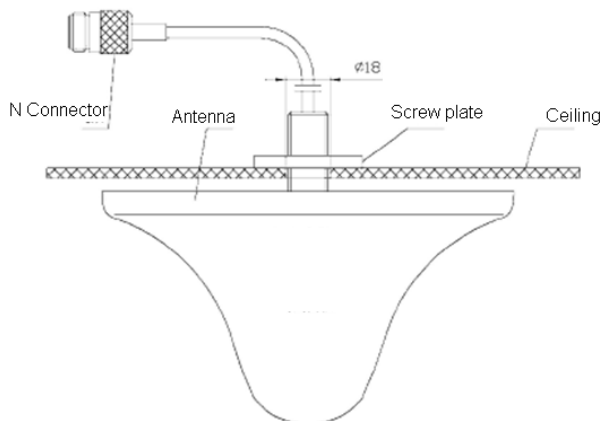




⊕ Temporarily mount the Donor (outside) antenna in that location. It may need to adjust and move the antenna later.

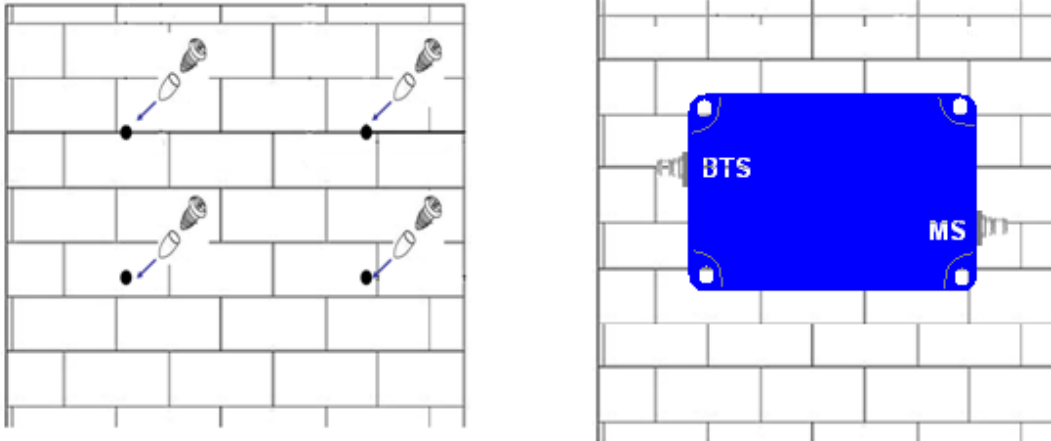
- **Fine-tuning the antenna orientation (in horizontal/vertical position or 45 degree angle position) to have the best signal strength (after repeater on)**

6.4 Service Antenna Installation



- ⊕ The Omni antenna is install in center of coverage area and radiate all directions.
- ⊕ It requires not be install close to window.
- ⊕ Mount coverage (inside) antenna in a productive location. It may need to adjust or move the antenna later.

6.5 Repeater Installation



6.6 Cable layout

- ⊕ Run one coaxial cable into the building to repeater location where you can also get standard 220/110VAC power for the repeater. Connect coaxial cable between the outdoor antenna and the repeater BTS port.



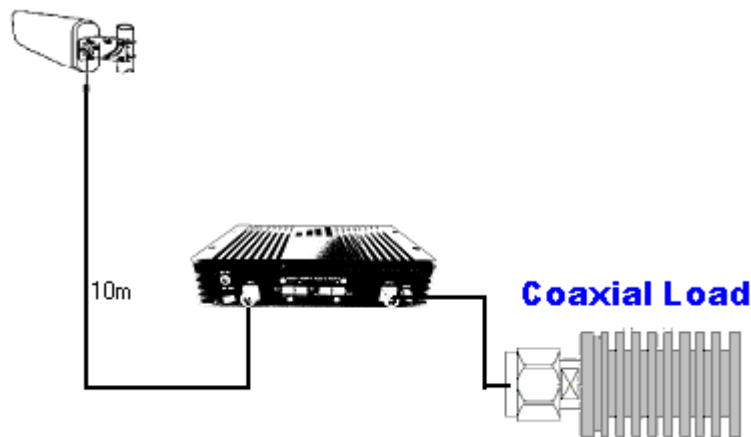
Cable layout through walls – “U” Dripping bend

- ⊕ Run one coaxial cable inside the building. Connect the coaxial cable between the indoor antenna and the repeater MS port.
- ⊕ RF connectors should be link tighten;
- ⊕ Cable bending radium meets technical requirement

6.7 Commissioning

Power	220V Power supply switch on	
Sys-1	260M, Alarm when output power is higher than max output power	Push Button Select to change current system
Sys-2	No used in single band system	
Sys-3	No used in single band system	
+	Increase UL/DL Gain	Notice: Press Gain Button to light gain value LED, then Press Button SEL to select system
-	Decrease UL/DL Gain	

- Put one load to MS port as below diagram



- Power switch ON.
-
- Select system via Button “SEL” in monitor board.
- Decrease Band 2600M gain(Downlink) until sys1 not alarm if BTS signal is too strong
- Set uplink gain=downlink gain-5 for each band. (UL PA module)
- Remove load and connect MS port to indoor antennas system.
- **Check LED status, if LED RED ON, it means there is antenna isolation problem, in this case, we do:**
 - Move indoor antenna far from external antenna.
 - Reduce repeater gain according to BAND LED .

