User Manual

10 ~23 dBm Wide Band Consumer Boosters

MADE IN HUAPTEC

Preface

This user manual describes design, installation, commissioning and maintenance of wide band consumer boosters.

Please read user manual carefully before installing and maintaining the boosters.

The information in this manual is subject to change without prior notice. Opinions are welcomed about the manual improvement.

Note: This User Manual is about standard consumer booster selection. Other models can be obtained upon request.

Safety Warnings

Users must follow the principles stated below:

Booster should follow system requirements of mobile signal enhancement equipment, assure good grounding and lightning protection.

Booster's power supply voltage should meet the standards of security requirements; any operation should 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. In this way the equipment can be damaged and you can even get an electric shock.

Do not open the booster, touch the module of booster, or open the cover of module to touch the electronic component. The components will be damaged due to electrostatic.

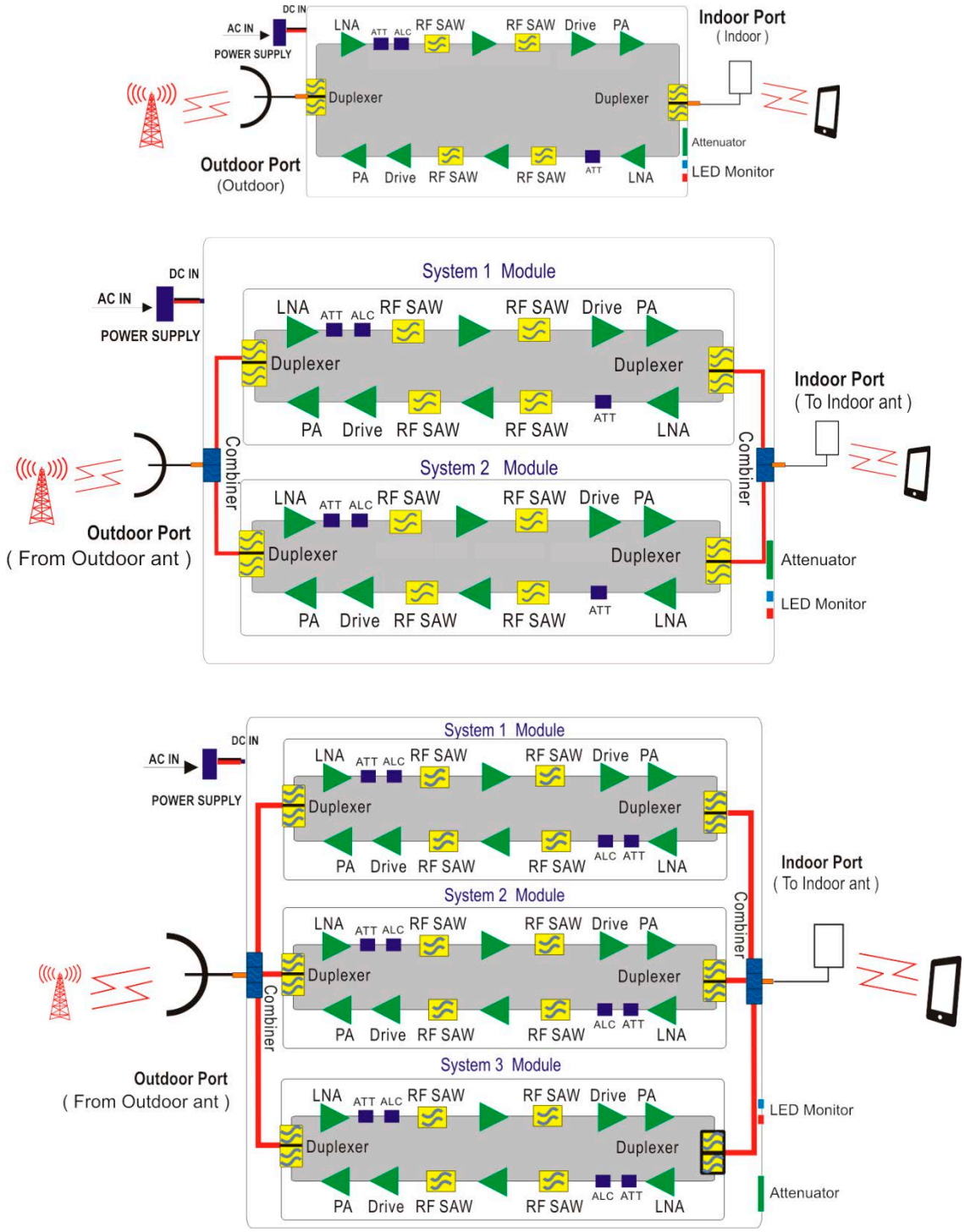
Keep away from heating equipment, because the booster will dissipate heat during working. And do not cover booster with anything that influences heat-dissipation.

Overview

Wide band consumer boosters are designed to help mobile users to amplify weak cell phone signal.

The devices are bi-directional. The outdoor antenna receives the signal from the cell tower and transmits it to the signal booster, the booster amplifies the signal and the indoor antenna sends it to your mobile device. Visa versa, the signal produced by your phone is also received by the indoor antenna, amplified by the booster and then sent back to the cell tower through the outdoor antenna.

Table of Content



Triple Band Booster Diagram

Glossary of Terms

Item	Definition
900	Available on EGSM900(880~890MHz/925~935MHz) and PGSM900(890~915MHz/935~960MHz), WCDMA/UMTS900(880~915MHz/925~960MHz) networks
1800	Available on GSM/LTE1800(1710~1785MHz/1805~1880MHz) networks
2100	Available on 3G(WCDMA/UMTS2100) (1920~1980MHz/2110~2170MHz) networks
RF	Radio Frequency
ALC	Automatic Level Control
AGC	Automatic Gain Control
MGC	Manual Gain Control
ISO	Isolation
LNA	Low Noise Amplifier
PA	Power Amplifier
dB	Decibel
dBm	Decibels relative to 1 milliwatt
UL	Uplink
DL	Downlink
Hz	Hertz
MHz	Megahertz
NF	Noise Figure

Package Contents

Single Band Packing List

No.	Name		Description	Quantity
1	Single band consumer booster			1
2	Adapter		5V/3A	1
3	Installation accessories for 120mm size shell	Plastic expansion bolt	Φ6	5
		Tapping screw	M4*25	4
		Hanging folder	51*68*1.5mm H5.5mm	1
	Installation accessories for 250mm size shell	Plastic expansion bolt	Φ8	5
		Tapping screw	M6*50	4
4	User Manual			1

120mm shell size

250mm shell size

Dual Band Packing List

No.	Name		Description	Quantity
1	Dual band consumer booster		N-female	1
2	Adapter		12V/3A	1
3	Installation accessories for 120mm size shell	Plastic expansion bolt	Φ6	5
		Tapping screw	M4*25	4
		Hanging folder	51*68*1.5mm H5.5mm	1
	Installation accessories for 250mm size shell	Plastic expansion bolt	Φ8	5
		Tapping screw	M6*50	4
4	User Manual			1

120mm shell size

250mm shell size

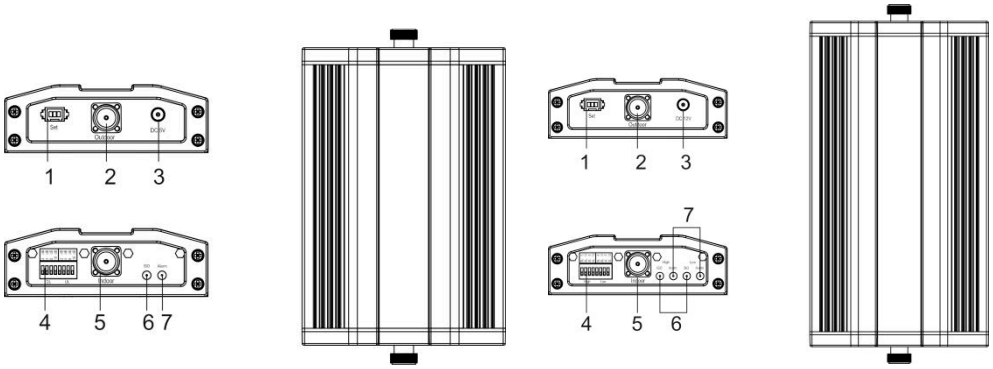
Triple Band Packing List

No.	Name	Description	Quantity
1	Triple band consumer booster	N-female	1
2	Adapter	12V/7A	1
3	Plastic expansion bolt	Φ8	5
4	Tapping screw	M6*50	4
5	User manual		1

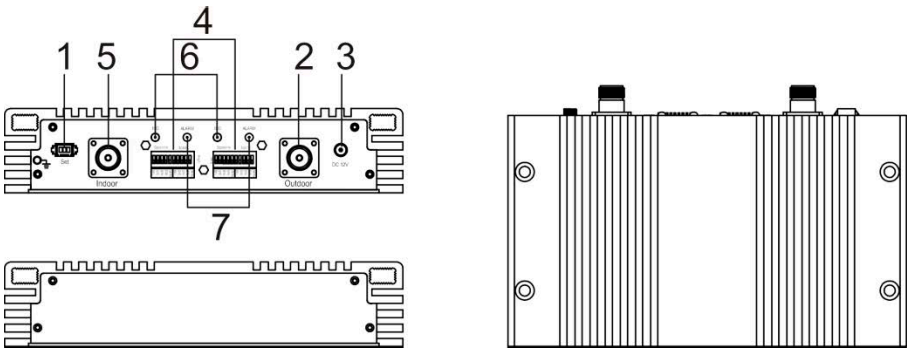
Features

- Embedded CPU, self-adaptive intelligent system very easy to use and install, better performance is guaranteed even under complicated and constantly changing RF environment conditions.
- ISO: Intelligent isolation processing to avoid self-oscillation, quite wide adjusting range to stabilize the signal strength/quality for clearer voice/ higher data speed and avoid interference with mobile networks.
- ALC: Intelligent automatic level control, quite wide adjusting range to stabilize the output power and improve the signal quality for clearer voice and higher data download speed.
- LED Display: Displays ISO status and Alarm status which makes booster installation and troubleshooting much easier.
- MGC: DIP switches to adjust the gain for both uplink and downlink independently, 15dB, 30dB, or 31dB range.
- Excellent RF performance, larger coverage area, clearer voice and higher data download speeds.
- Elegant design, compact size, very low power consumption to minimize operation cost, low heat dissipation.

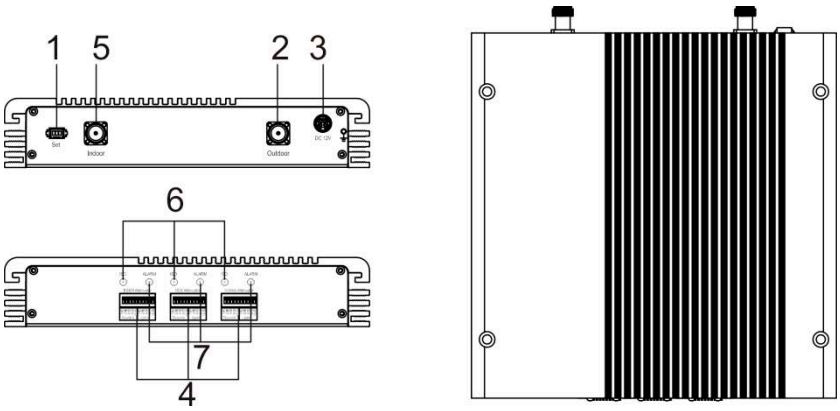
Booster's Port Description



120mm shell size for single band 120mm shell size for dual band



250mm shell size for dual band



280mm shell size for triple band

1. Set 2. Outdoor antenna port 3.Power connector

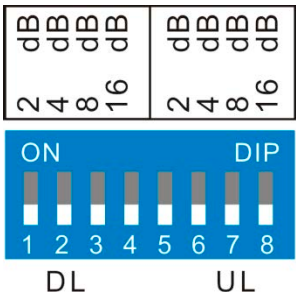
4. DIP switches 5. Indoor antenna port 6.ISO LED 7.Alarm LED

Manual Gain Control (MGC)

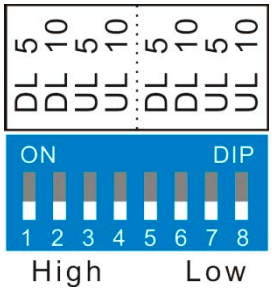
Since the booster has intelligent self-adjusting software system, MGC attenuation is not needed, except for the cases when you don't feel comfortable about LED flashing, or in some extreme cases you might need to attenuate gain value.

There are three types of DIP switches.

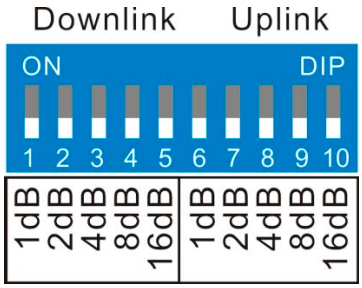
1) 30dB /2dB Step DIP switches for 120mm shell size single band.



2) The second one is 15dB /5dB Step DIP switches for 120mm dual band.



3) The third one is 31dB /1dB Step DIP switches for 250mm shell size single, dual band and 280mm shell triple band.



31dB/1dB Step DIP switches as example shown on the below.

Switches 1-5 represent downlink and 6-10 represent uplink. When it is necessary to adjust the gain by DIP switches, firstly adjust downlink gain according to receiving signal level, then adjust uplink gain according to downlink gain.

The DIP Switches have default 'OFF' status; push relevant switches to "ON" position if a certain attenuation value needs to be achieved.

- **DIP switches 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 switches 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						

Note: In case you need to adjust gain, ensure uplink gain to be equal or 5dB less than downlink gain. Uplink gain shouldn't be more than downlink gain in order to avoid interference with mobile network.

Install Booster System

Before You Install

• Make sure you have sufficient cable length between the outdoor/indoor

antennas and the booster in case you have not a standard kit

• Make sure the place where you install the booster is near to one existing electrical outlet. It should also be well ventilated, away from excessive heat, moisture, and direct sunlight.

Installation tools and accessories for 120mm single and dual band:

No.	Name	Specification	Quantity	Remark
1	Plastic expansion bolt	Ø6	5	Standard accessories
2	Tapping screw	M4*25	4	Standard accessories
3	Hanging folder	51*68*1.5mm H5.5mm	1	Standard accessories
4	Reciprocating drill		1	Provided by engineer
5	Shot bit	Ø6	1	Provided by engineer

Installation tools and accessories for 250mm shell size single and dual band:

No.	Name	Specification	Quantity	Remark
1	Plastic expansion bolt	Φ8	5	Standard accessories
2	Tapping screw	M6*50	4	Standard accessories
3	Reciprocating drill		1	Provided by engineer
4	Shot bit	Ø8	1	Provided by engineer

Installation tools and accessories for triple band:

No.	Name	Specification	Quantity	Remark
1	Plastic expansion bolt	Φ8	5	Standard accessories
2	Tapping screw	M6*50	4	Standard accessories
3	Reciprocating drill		1	Provided by engineer
4	Shot bit	Ø8	1	Provided by engineer

Installation Overview

Installation is easy to perform even without professional assistance in 4 simple steps:

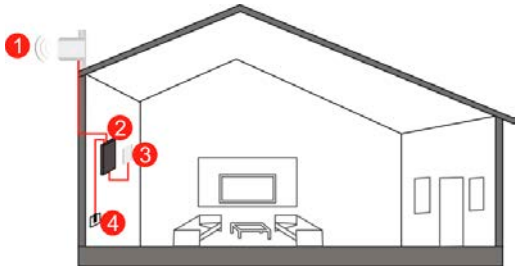
Step1. Fix the outdoor antenna in some high point outside your house where you can gain best signal reception (e.g. on the roof, outside the window, etc.).

Step2. Mount the indoor antenna where you need to improve poor signal.

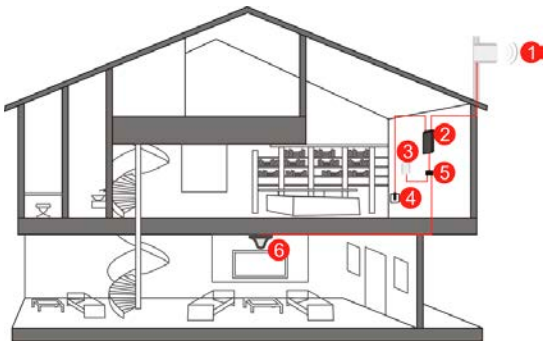
Step3. Install the booster inside your area and connect it to the antennas through the cables.

Step4. Plug in the booster to a power supply and self-adaptive system will automatically adjust best performance in 30 seconds. ***(NB! Before you plug it in, make sure all the cables are connected firmly!).*** For more details refer to "**Booster Commissioning**".

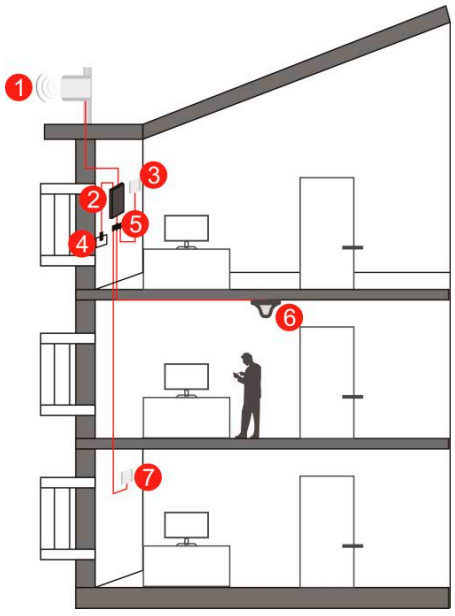
Booster System Installation Examples



Studio apartment



Duplex house



Multi-storey building

1. Outdoor Antenna2.Booster 3.Indoor Panel Antenna4.Power Supply

5.Splitter 6. Omni CeilingAntenna7.Indoor Panel Antenna

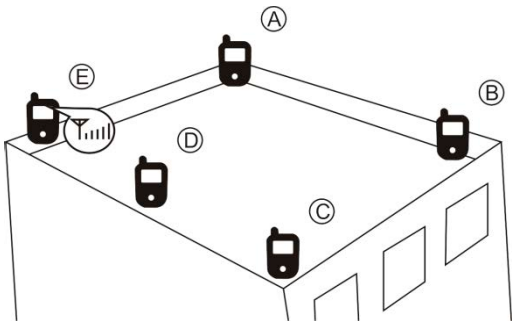
Step 1. Install Outdoor Antenna

1.1 How to find the place with the strongest receiving signal

The booster's main function is to improve weak RF signal inside a house, office or any other indoor area. The receiving strength of the outdoor antenna and the strength of the signal reception outdoors directly affect the efficiency of indoor coverage. That's why it's crucially important to install the outdoor antenna in the point where signal reception is the strongest.

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

You can use telephone to test signal strength near the window or on the top of the building. The number of bars on network indicator will define approximate strength of the received signal. Normally the roof of the building is the best place to receive the strongest signal. As shown on the graph below, you need to test the signal in points from A to E, and select a place with best signal strength for outdoor installation. It is recommended to use mobile app that can display signal level, since it is more accurate than checking signal bars.



More tips: Please try to pick up signal from cell towers that are not so busy, which can be estimated by the population density in the area served by this tower. It's also recommended to avoid a cell tower near a supermarket, shopping mall, stadium and any other public place visited by many people regularly. This will help on successful phone call connections or higher speed data services.

1.2 Install Outdoor Antenna

In most cases, the panel antenna is the best choice. You can also choose wide band YAGI antenna as an option.

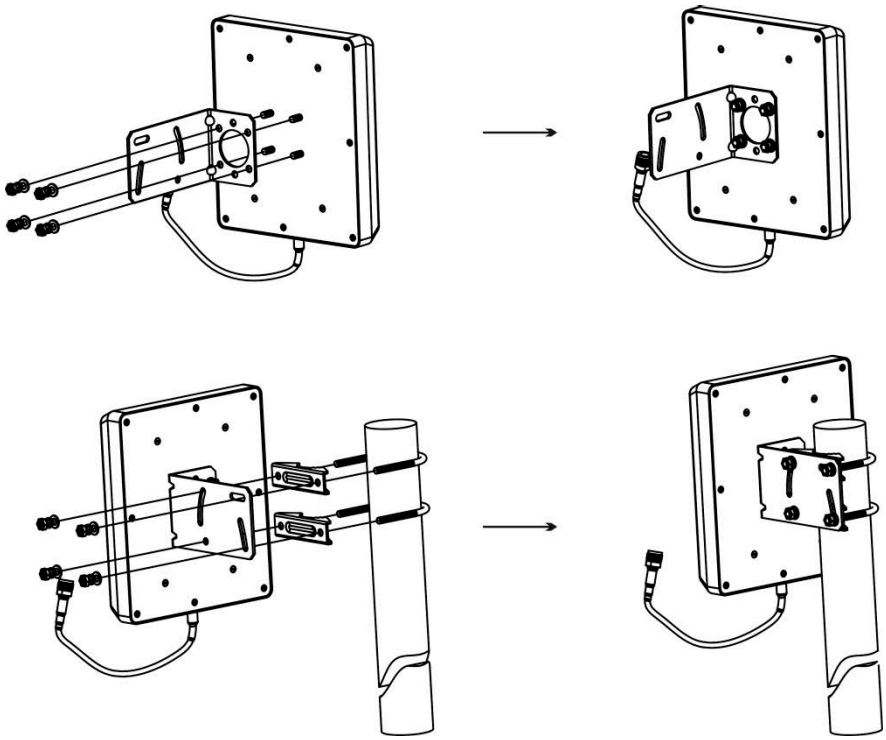
Pole mount is recommended for your convenience:

Step1: Find an existing pole or obtain a pole of 1 to 2 inches in diameter, Install the pole in the desired location.

Step2: Unscrew nuts from antenna base with hands, or wrench, if needed. Mount horizontal plate of the L-bracket on the antenna base with screws.

Step3: Unscrew nuts, washers from U-bolt, slide both brackets onto U-bolt. Tighten nuts and washers set onto U-bolt.

Step4: Fit the assembly onto the pole in your desired location by sliding the second half of the bracket onto the U-bolt and securing it with the washers and nuts provided. Be sure the cradle is at the desired height and rotated toward the strongest cellular signal before tightening the nuts. Do not over tighten.



Note: Wrap waterproof tape around the connectors between outdoor antenna and feeder line to avoid water or other kind of damage.

Step 2.Install Indoor Antenna

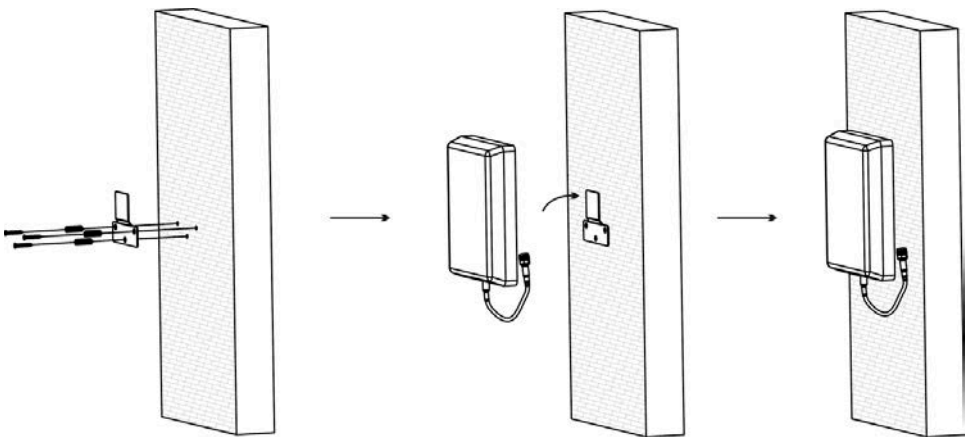
According to the requirement of practical application, please select indoor panel antenna or omni-ceiling antenna as indoor antenna for coverage

Install the indoor panel antenna as shown on the graph below.

Step1: Select a place on a wall projecting the area where you want reception.

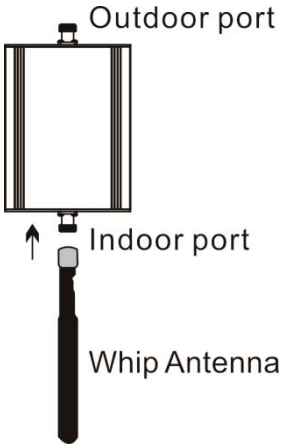
Step2: Mount the bracket on the wall after drilling the screw to the wall.

Step3: Put the panel antenna on the bracket.



If you have an indoor omni ceiling antenna or whip antenna, the best place to install it is the center of your house.

Fix the whip antenna as shown on the graph below.

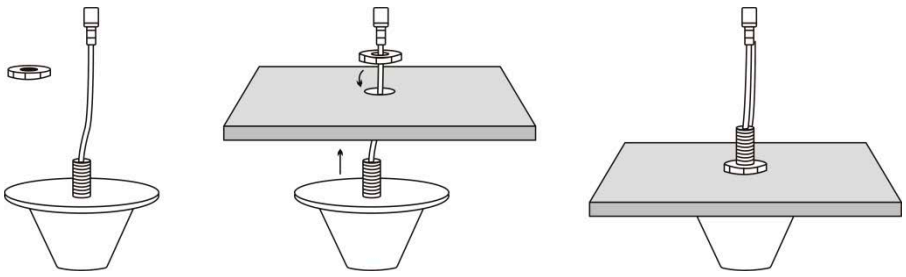


Install the omni ceiling antenna as shown on the graph below.

Step 1: Drill a hole in the ceiling.
Step 2: Unscrew fixing nut from the antenna. Pass the antenna cable through the hole. Screw the fixing nut back onto the antenna, leaving the cable in the ceiling crawl space, and fasten.

Step3: Connect N-female cable to the cable connector of the omni ceiling antenna.

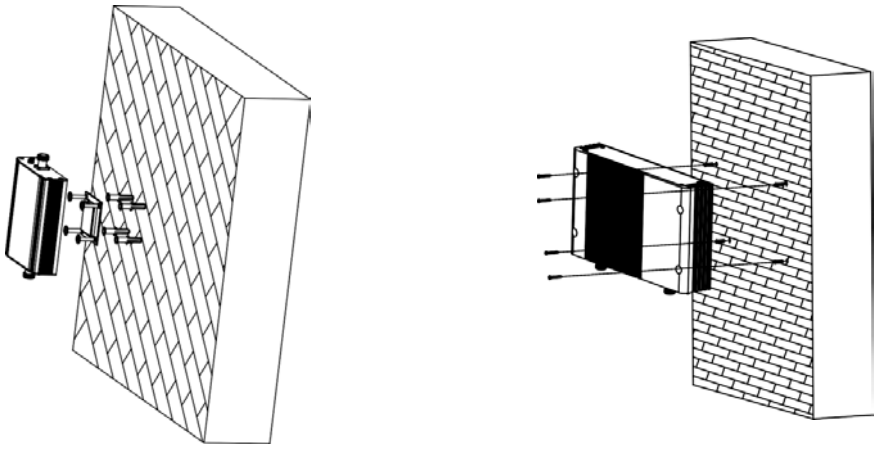
Step 4: Tighten the fixing nut to secure antenna. Do not over tighten.



Step 3.Install Signal Booster

1. Select the location near a power supply on a wall.

2. Mount the booster with the screws included into the kit as shown on the graph below.

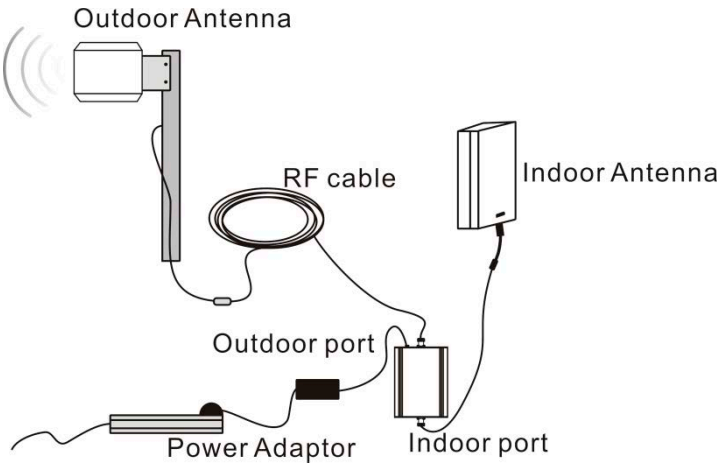


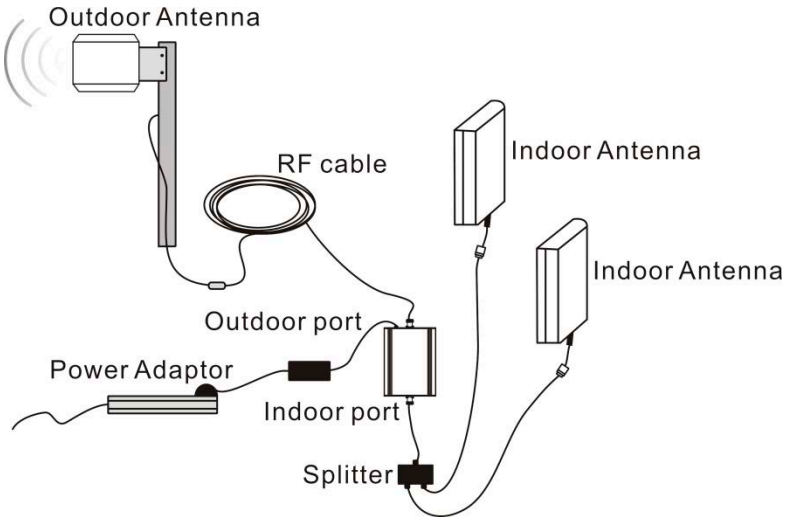
3. Connect the outdoor antenna cable to booster connector marked as “outdoor”. Tighten the connection by hand or with a wrench.

4. Connect the indoor antenna cables to booster connector marked as “indoor”. Tighten the connection by hand or with a wrench.

   (If it’s necessary to install multiple indoor antennas, connect the indoor antenna cables to the outdoor connectors of the splitter. Then connect the indoor connector of the splitter and booster connector marked as “indoor” through a short jumper cable.)

5. Connect AC power cord to the signal booster, then connect the plug to the electrical outlet to power on the booster.





Step 4.Booster Commissioning

Overview: The booster has an intelligent startup system, booster commissioning is an automatic process able to guarantee system optimal performance.

As soon as you finish booster system installation, plug it in a power supply to power on the booster. It will immediately start working and checking receiving signal and the isolation to ensure system best performance. Automatic adjustment will take about 3-5 seconds.

After the booster starts, check whether the coverage is improved or not. If it is good, the booster commissioning is completed.

In case the coverage is not enough, please check ISO LED and Alarm LED colors.

- **ISO LED** indicates if the booster has enough isolation between outdoor and indoor antennas in order to avoid loop back or so-called self-oscillation. Thanks to intelligent software, the booster is fully protected from interference with operator mobile networks. ISO LED flashing means that ISO function is working great and the self-oscillation has been eliminated. ISO LED shall remain "Green" or "Slow Flashing Green".

Remark: ISO won't increase the coverage, but it is mandatory to avoid interference with mobile networks according to Telecom regulations.

LED	Status	Meaning	Solution methods
ISO LED	Green	No loop back or no self-oscillation	NO action is needed
	Slow Flashing Green	Slight loop back or self-oscillation	NO action is needed
	Quick Flashing Green	Deep loop back or self-oscillation	Not working properly. Check coverage, leave it as it is if it's good; actions must be taken if coverage is not good or you don't feel comfortable about ISO LED flashing green.
	Quick Flashing Red	Severe loop back or self-oscillation	Not working properly, actions must be taken
	OFF	The booster auto shuts off for protection due to very severe self-oscillation.	

Measures: One of below mentioned actions are recommended to eliminate ISO problems. Please note that actions are the same to reach "Quick Flashing Green", "Quick Flashing Red" and "OFF" status.

1. Adjust antennas' direction or location or enlarge the distance between them.
2. Add vertical or horizontal distance between outdoor antenna and indoor antenna.
3. Use some barrier like walls to increase the isolation.
4. Point indoor antenna and outdoor antenna into opposite directions.

4. Change the indoor antenna (indoor antenna can be changed for other antenna type which has better directional antenna pattern.)
5. Reduce the booster's downlink gain by DIP switches. Keep the uplink attenuation value and downlink attenuation value the same then restart the booster.

Remark: Uplink gain must be equal to or 5dB less than downlink gain. It shouldn't be more in order to avoid interference with mobile networks.

Purpose: ISO LED should stay in "Green" or "Slow Flashing Green" status.

- **Alarm LED** indicates the strength of booster receiving signal. Flashing Alarm LED means that the booster has strong receiving power. Alarm LED should stay "Green" or "Slow Flashing Green". And slow flashing green is the perfect working status, it means the booster has full output power to provide optimal coverage.

LED	Status	Meaning	Solve methods
Alarm LED	Green	Output power is not full	Check coverage, if it is good, leave it; if coverage is not good, please increase receiving signal level
	Slow Flashing Green	Full output power	Working properly
	Quick Flashing Green	Output power is over rated	Not working properly. Check coverage, leave it as it is if it's good; actions must be taken if coverage is not good or you don't feel comfortable about Alarm LED quick flashing green.
	Quick Flashing Red	The booster auto shuts off for protection due to much over rated output power	Not working properly, actions must be taken

Measures: Below actions are recommended to eliminate "Quick Flashing Green" and "Quick Flashing Red".

1. Adjust the antennas' directions or locations to decrease receiving signal level.
2. Add the attenuation by DIP switches.
3. Reduce booster's gain by external attenuator or replace with lower gain antenna if the above methods don't work.

Purpose: Alarm LED should stay "Green" or "Slow Flashing Green". Please note that "Green" LED may lead to lower coverage. It should be improved by adjusting the outdoor antenna to get stronger receiving signal.

After all LEDs work fine, check whether the coverage is good or not. If it is good, the booster system installation is completed successfully.

If coverage is not good below mentioned actions should be taken.

1) If signals in most of the area have not been improved, take the following actions:

- Weak receiving signal leads to low output signal level. Change the direction of outdoor antenna or its installation position. Or replace outdoor antenna with higher gain antenna to increase receiving signal level.
- Check whether it is necessary to add more indoors antennas since barriers block signal penetration, also check whether the repeater's power is enough. Install more indoor antennas or replace your repeater with another one of higher power level.

2) If the signals in some part of the area have not been improved, take the following actions:

- Check whether the indoor antenna is installed correctly or not, try to change the antenna location to improve coverage.

- Check if it is necessary to adjust the direction of the indoor antenna.
- Check whether it is necessary to add one or more antenna to enhance the coverage in specific areas.

Remark:

✧ **Reduce attenuation values***--- at the same time must ensure the isolation.

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

Notes: Slow flashing ISO and Alarm status indicate that ISO and ALC functions are working properly, and the problems of self-oscillation and strong signal are fixed. In most cases, there is no need to take any measures, except for deep self-oscillation or too strong receiving signals. So your actions are not mandatory, since self-adaptive booster system automatically resolves the problems.

Main Specifications

RF Parameter		UL	DL
Frequency Range	900	880~915MHz	925~960MHz
	1800	1710~1785MHz	1805~1880MHz
	2100	1920~1980MHz	2110~2170MHz
Max. Gain	F13	60dB	65dB
	F17	65dB	65dB
	F20	65 dB	70dB
	F23	70dB	75dB
Max. output power	F13	17dBm	13dBm
	F17	17dBm	17dBm
	F20	17dBm	20dBm
	F23	17dBm	23dBm
MGC (Step Attenuation)		≥31dB/1dB step	
Intelligent AGC*	ALC	≥51dB	
	ISO	≥51dB	
Gain Flatness	Typical	≤ 5dB(p-p)	
Noise Figure @ Max. System Gain		Typical≤ 5dB	
V.S.W.R		Typical≤ 2	
Group Delay		≤1μs	
Frequency Stability		≤0.01ppm	

Electrical Parameter		
Power Supply	Single band	Input AC100~240V.50/60Hz, Output DC5V/3A
	Dual band	Input AC100~240V.50/60Hz, Output DC12V/3A
	Triple band	Input AC100~240V.50/60Hz, Output DC12V/7A
Power Consumption	Single/ Dual/ Triple band	≤5W/≤10W≤32W
Input & Output Impedance		50 ohm
Mechanical Parameter		
I /O Port Type		N-Female
Dimensions	Single band	120*155*34mm; 218*135*50mm
	Dual band	120*198*34mm; 218*135*50mm
	Triple band	280*280*53mm
Weights	Single band	≤0.7 Kg; ≤1 Kg
	Dual band	≤1 Kg; ≤1.2 Kg
	Triple band	≤4 Kg
Environment Parameter		
Operating Temperature		-10ºC~+55ºC
Storage Temperature		-10ºC~+80ºC
Relative Humidity		5% - 95%
Barometric Pressure		55 kPa -106 kPa
Environment Conditions		IP40

Troubleshooting

Problem	Solution
The signal booster has no power.	Check that the AC outlet is working.
The booster's power is on but the phone is not connected to the network and still cannot communicate with the signal.	Try to fasten the connections between the different parts of the system. Change the direction of the indoor antenna or its installation position.
Good downlink signal with poor communication quality	Check whether there's interference. Consult the operator whether the signal source base station works well.
The power is on but the coverage is not good.	Firstly check "ISO", "Alarm" indications. Take actions mentioned in Booster Commissioning chapter (pages 18-21).

Product Warranty

30-Day Money-Back Guarantee

All Hiboost products are protected by 30-day money-back guarantee. If for any reason the performance of the received product is not acceptable, the client can return the product within 30-day period and get spent money back.

2-Year Warranty

Hiboost signal boosters are covered with2-year warranty. Huaptec offers two options for the products under warranty: repair or replace.

This warranty does not apply to HiBoost signal boosters or kits that have been subjected to misuse, abuse, neglect or mishandling and that have its physical or electronic properties altered or damaged. Failure to use surge protected AC power strip with at least a 1000 Joule rating will void your warranty.

All Hiboost products that are packaged with Hiboost accessory products are intended for use and resale as a single unit, and such product kits are required to be sold to the end users or subsequent reseller as packaged.

For any questions or suggestions do not hesitate to contact Huaptec Support Team on the phone**044-20-32395808** or by e-mail **sales@huaptec.eu**.

Huaptec Contact Details

Huaptec CN	Huaptec EU	Huaptec US
Phone/Fax: 086-0755-29921615 Address: 5th FL, E BLDG, Sogood Science Park, Hangkong Road, Xixiang, Bao'an, Shenzhen, China 518102 E-mail: tech@huaptec.com Website: www.huaptec.com	Phone/Fax: (44)20 3239 5808 Address: Benno-Strauß-Street 7, 90763 Fürth, Germany E-mail: sales@huaptec.eu Website: www.huaptec.eu	Phone/Fax: (972) 870-5666 Address: 6210 N Belt Line Rd., Ste. 110, Irving, TX 75063 E-mail: info@huaptecus.com Website: www.huaptecus.com