Signal Booster Installation Guide

Tri-Band 4G-V

Band 2,5,13 Adjustable Gain
700 / 800 / 1900 MHz
In-Building Wireless
Smart Technology II™
Signal Booster

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Appearance of device and accessories may vary.

Note: This manual contains important safety and operating information. Please read and follow the instructions in this manual. Failure to do so could be hazardous and result in damage to your Signal Booster.

Wilson® Electronics, Inc.

Installation Instructions for the Following Wilson Electronics Signal Booster:

Tri-Band 4G-V
Operates on Band 13 Adjustable Gain 700 / 800 / 1900 MHz
In-Building Wireless Smart Technology II™ Signal Booster
(Band 13 is 700 MHz Verizon™ LTE)
Model # 275165 FCC ID: PW0275165 IC: 4726A-275165

The term "IC" before the radio certification number only signifies that Industry Canada technical specifications were met.

How it Works

Wilson Electronics Signal Boosters are bi-directional devices that deliver service levels consistent with what would be expected in areas of high cell network coverage. They amplify a weak or shadowed signal in mobile, marine, M2M and in-building applications. When using a Wilson Electronics Signal Booster in conjunction with Wilson Electronics antennas, the Outside Antenna will collect the cell tower signal and send it through the cable to the Signal Booster. The signal is then amplified and re-transmitted through the Inside Antenna into the room. Cell phones and cellular data cards in that area then communicate with the improved signal. When a cell phone or cellular device transmits, the signal is received by the Inside Antenna, amplified by the Signal Booster and transmitted back to the cell tower through the Outside Antenna.

Inside this Package

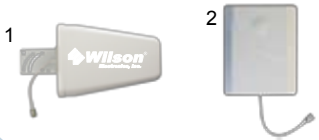
Note: *Kits may contain different accessories*

AC/DC Power Supply

Signal Booster

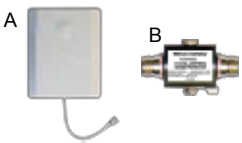
Outdoor Antenna Options

1. Wide Band Directional Antenna 700-2700 MHz (304411)
2. Pole Mount Panel Antenna 700-2700 MHz (304453)



Indoor Antenna Options & Accessories

A. Wide-Band Panel Antenna 700-2700 MHz (multiple mounting options)
B. 50 Ohm Lightning Surge Protector with N-Connector (859902)
Splitter options on page 8



Appearance of device and accessories may vary.
To purchase, call Wilson Electronics Sales Department at: 800-204-4104

Contact Wilson Electronics Technical Support Team with any questions at 866-294-1660 or email: tech@wilsonelectronics.com. Hours: 7 am to 6 pm MST.

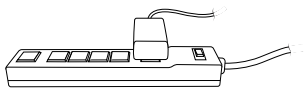
Quick Install Overview

See Installation Diagram on page 3. Contact Wilson Electronics Technical Support Team with any questions at 866-294-1660.

1. Select a location to install the Signal Booster that is away from excessive heat, direct sunlight, moisture and has proper ventilation. Do not place the Signal Booster in an air-tight enclosure.
2. Select a location on the roof of the building to install the Outside Antenna. Use a cell phone in test mode to find the strongest signal from the cell tower (see page 6). Visit *www.WilsonElectronics.com* to find test mode function for your particular cell phone.
3. Run the Outside Antenna cable to the Signal Booster and attach it to the connector labeled “Outside Antenna” on the Signal Booster. Run the Inside Antenna cable to the Signal Booster and attach it to the connector labeled “Inside Antenna” on the Signal Booster. For more information on running cable (see page 7). Lightning Surge Protection is recommended for all in-building installations (see page 6).
4. Select a location for the Inside Antenna, preferably in the center of where the signal needs to be amplified. A minimum separation distance of **20 vertical (within the null zone) or 50 horizontal** feet is necessary for proper operation. If the inside coverage is not sufficient you may need to increase the separation distance even further (see installation diagram on pages 3 & 4).
5. Before powering up the Signal Booster, verify that both the Outside Antenna and the Inside Antenna are connected and check that all connections are tight. ***Note:*** *Be careful when plugging the connectors in so as not to bend the center pins on the connectors* (see page 9).
6. The Signal Booster has been packaged with the gain control knobs adjusted to the highest gain position. If any of the lights are not green, please refer to pages 10-12.

⚠ ***Warning:*** Connecting the Signal Booster directly to a cell phone with use of an adapter will damage the cell phone and/or the Signal Booster.

IMPORTANT NOTICE



- It is very important to power your Signal Booster using a surge protected AC Power Strip with at least a **1000 Joule rating.**
- Failure to do this will void your warranty in the event of a power surge or lightning strike.

Installation Diagram

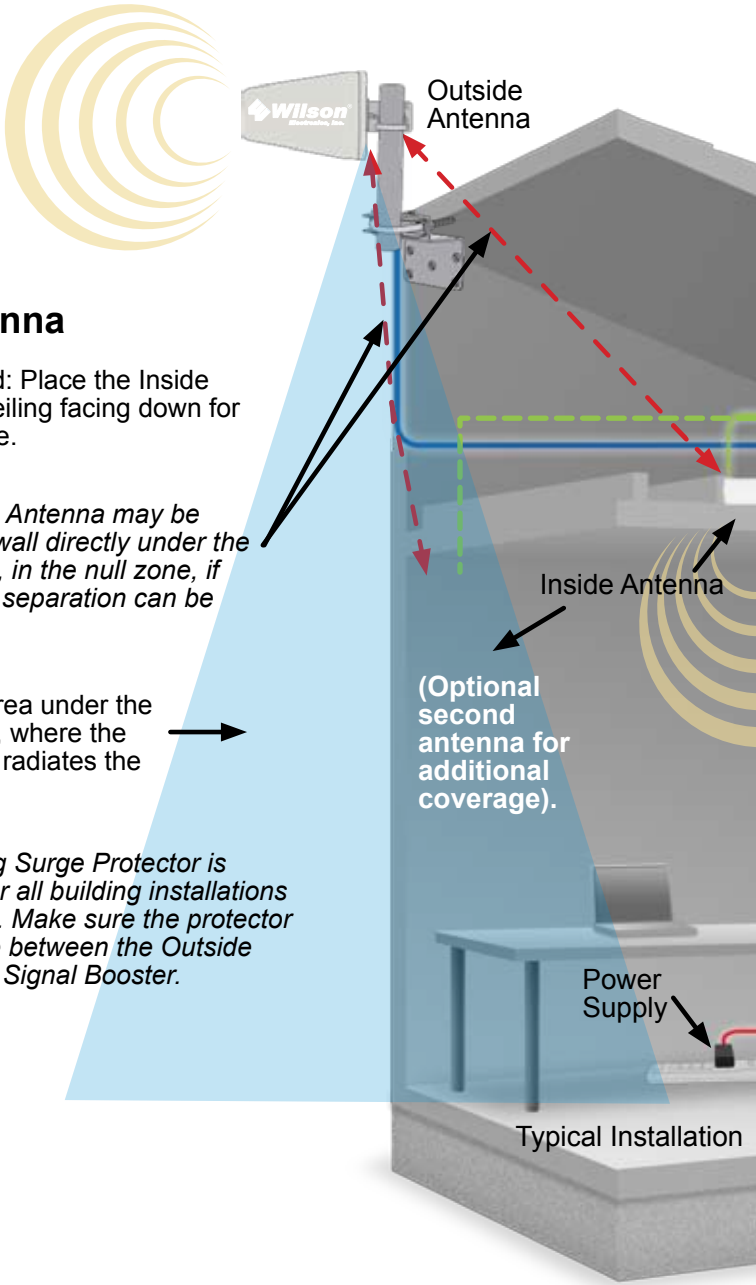
Inside Antenna

Preferred Method: Place the Inside Antenna in the ceiling facing down for the best coverage.

Note: *The Inside Antenna may be mounted on the wall directly under the Outside Antenna, in the null zone, if 20 feet of* ***vertical*** *separation can be maintained.*

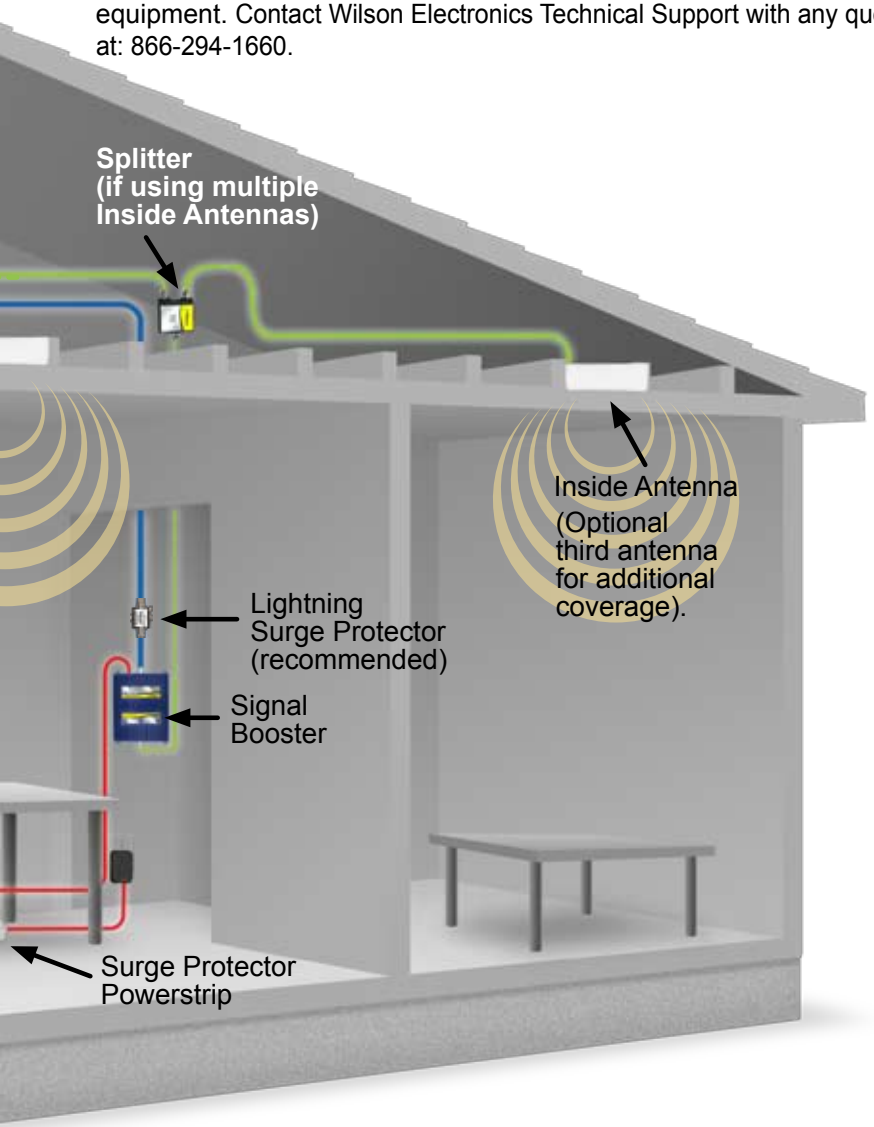
Null Zone: The area under the Outside Antenna, where the Outside Antenna radiates the least.

Note: *A Lightning Surge Protector is recommended for all building installations (sold separately). Make sure the protector is installed in line between the Outside Antenna and the Signal Booster.*



Before Getting Started

This guide will help you properly install your Wilson Electronics Signal Booster. **It is important to read through all of the installation steps for your particular application prior to installing any equipment.** Read through the instructions, visualize where all the equipment will need to be installed and do a soft installation before mounting any equipment. Contact Wilson Electronics Technical Support with any questions at: 866-294-1660.



Reasons for Weak Cellular Signals

Anyone who uses a cell phone or cellular data card knows the frustration of not being able to connect to or maintain a strong cellular signal. When this occurs, it is generally due to one of two reasons:

1. Location of the Nearest Cell Tower – Cell towers are situated to provide broad coverage; however, there are many areas in which signal strength may be reduced by topographic features or by local government restrictions on the height or placement of the towers themselves. Rural areas generally have fewer cell towers than urban regions.
2. Natural and Man-Made Obstructions – Signal strength can also be negatively affected by trees, hills, buildings, weather, and other obstructions. You may be relatively close to a cell tower but still unable to make a call. This often occurs in homes, offices and other buildings in which stucco, concrete or metal walls may block the signal.

The Signal Booster works with two antennas. The Inside Antenna communicates with your cell phone and the Outside Antenna communicates with the cell tower. The Outside Antenna receives the cell tower signal and sends it through the cable to the Signal Booster, where it is amplified and re-transmitted much stronger through the Inside Antenna into the room. When the Inside Antenna picks up a signal from your cellular device, the Signal Booster amplifies that signal and transmits it through the cable to the Outside Antenna and back to the cell tower.

Note: *The Signal Booster will only operate if there is an adequate signal to amplify.*

Outside Antenna Installation (part #304411 shown)

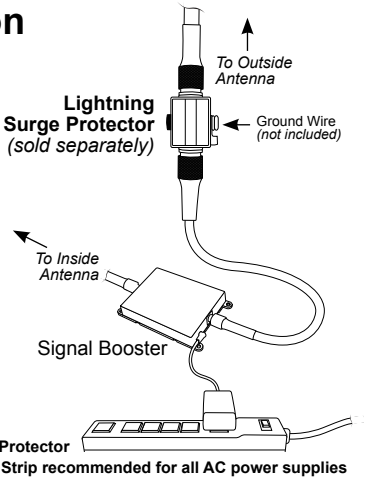
The antenna should be mounted as shown in the illustration above. The mounting bracket, included with antenna, is adjustable and will accommodate pipe diameters from 1.25” to 2” (pipe sold separately part# 901117). Mount the antenna so that there is at least 3 feet of clearance in all directions around it. Position the antenna so that it has an unobstructed line of sight to the cell tower’s strongest signal. Make sure the antenna is not pointing across your own roof or at the Inside Antenna as this will cause the oscillation protection circuitry to shut down the Signal Booster (see Figures 1 & 2 on page 10).

Warning: Lightning protection is recommended for all installations (sold separately part #859902). Take extreme care to ensure that neither you nor the antenna comes near any electric power lines.

Installing Lightning Protection

(sold separately)

Install the **Lightning Surge Protector** (LSP) close to the Signal Booster. Attach the cable from the Outside Antenna to the surge protector, using a short length of low loss cable; attach one end to the LSP and the other to the Outside Antenna connector on the Signal Booster. Ensure the LSP is properly grounded (ground wire not included). Visit *www.WilsonElectronics.com* or contact Wilson Electronics Sales Team at 800-204-4104.



Selecting a Direction for the Outside Antenna

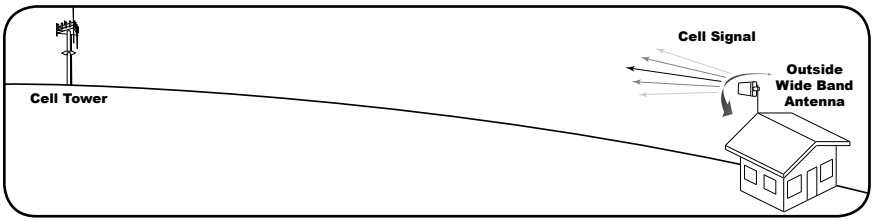
Select a location on the roof of the building to install the Outside Antenna. Use a cell phone in test mode to find the strongest signal from the cell tower (see below for more information). To get the strongest signal possible, it is very important to set up your Outside Antenna properly. The Inside and the Outside Antenna must be mounted in such a way that they are able to pick up the best possible cell signal on the outside of the building and provide the best possible signal on the inside of the building. Mount the Outside Antenna as high as possible facing the cell tower in an area with the best possible signal coverage.

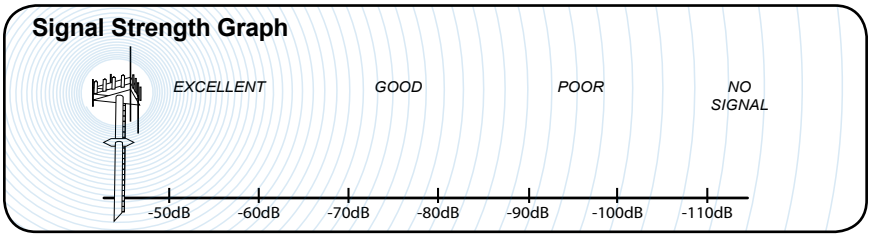
Note: *Never point the front of a Directional Antenna toward the Inside Antenna. See Figures 1 & 2 on page 10.*

Finding the Strongest Signal

When installing your Signal Booster's Outside Antenna, aiming it towards the best signal source from you service provider is important. The best way of getting the strongest signal is to have one person on the roof to rotate the Outside Antenna, which is connected to the Signal Booster. Turning the Outside Antenna about 45 degrees at a time, while the second person is watching the signal strength on the phone inside the building. This allows you to read the signal strength from the cell tower. It is preferable to have

the phone in the test mode so the actual signal strength can be read, as bars are not the most accurate. Go to *www.WilsonElectronics.com* for help in finding the test mode for your phone. Always make sure the person inside the building gives the signal time to arrive and register on the phone (between 10-30 seconds for phone to reset to the signal reading).





Signal readings usually appear as a negative number (for example, -86). The closer you get to zero the stronger the signal (see graph above).

Mounting Tips for Running Outside Antenna Cable

If you are mounting the Outside Antenna on the roof of your building, we have found that it is easiest to run your cable underneath the down side of your roof's flashing. If you have satellite TV service installed you may be able to follow the same route as the satellite TV cables that are already running from outside of your building to the inside.

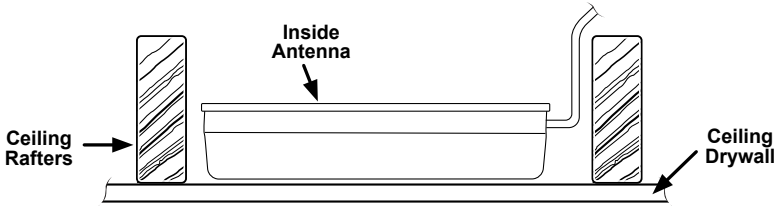
After routing the cable, we recommend sealing any areas where the cable passes into the building with cable bushings, silicone or other waterproof sealant to keep your installation from leaking. If you are mounting the Outside Antenna to the outside wall of your home or building, the simplest way is to run the cable on the outside of the wall and attach it to the exterior of your home or office. Then drill a hole through the wall where you want the cable to appear on the inside of the building. Before drilling, make sure that there are no electrical outlets, sewer or water pipes, or electrical wiring in the wall that you are about to drill through as this could potentially harm you or damage the building.

After drilling the required hole, run the cable through and seal it with cable bushings, silicone or other waterproof sealant to enclose the hole that you have created. In some instances, it may be possible to run the cable up into the fascia of the attic overhang. In this circumstance, the cable will be accessible in the attic for further routing.

Installing the Inside Antenna

(Instructions are for optional Panel Antenna)

Select a location for the Inside Antenna, preferably in the center of where the signal needs to be amplified. A minimum separation distance of 20 **vertical** feet is necessary for operation. If the inside coverage is not sufficient you may need as much as 75 feet of **horizontal** separation. See installation diagram on pages 3 & 4.



In some cases, multiple Inside Antennas may be required, for instance if you have multiple rooms with poor signal. A signal may be split by using a splitter (sold separately). If using more than one Inside Antenna, a separation up to 75 **horizontal** feet may be necessary between Inside Antennas. See configuration on pages 3 & 4.

⚠ ***Warning:*** An Inside Antenna must have a separation distance from all persons that is at least 15 inches for the Panel Antenna.

Optional Wide Band Inside Antenna (sold separately– multiple mounting options)

Splitter Options: (sold separately)

2-way **(859957)** 3-way **(859980)** 4-way **(859981)**

Installing a Wilson Electronics Signal Booster

Select a location to install the Signal Booster that is away from excessive heat, direct sunlight, moisture and that has proper ventilation. Do not place the Signal Booster in an air-tight enclosure. Recommended installation locations for in-building Signal Boosters are near a power outlet and in a closet or on a shelf.

Note: *It is important to have adequate air ventilation. Maintain at least 6 inches of clearance from surrounding objects. Be careful when plugging the connector in so as not to damage the center pins on the connectors.*

Run the Outside Antenna cable to the Signal Booster and attach it to the connector labeled “Outside Antenna” on the Signal Booster. Run the Inside Antenna cable to the Signal Booster and attach it to the connector labeled “Inside Antenna” on the Signal Booster.

Note: *For distances of 20 feet or more, use Wilson low loss cable.*

Powering up a Wilson Electronics Signal Booster

1. Never point the front of a Directional Outside Antenna toward the Inside Antenna. See Figures 1 & 2 on page 10.
2. Ensure that both the Outside Antenna cable and the Inside Antenna cable are connected to the Signal Booster ***and the connections are tight*** before powering up the Signal Booster.
3. Plug the power supply into the Signal Booster input marked “6V DC” (carefully, to avoid damaging the center pin). ***Note:*** *It is very important to power your Signal Booster using a surge protected AC Power Strip with at least a* ***1000 Joule rating.*** *Failure to do this will void your warranty in the event of a power surge or lightning strike.*
4. If the Signal Booster does not have a green light(s), refer to pages 10-12.
5. Using multiple Signal Boosters in one installation could cause interference to the cell tower (except for the In-Line Signal Booster).
6. Contact Wilson Electronics Technical Support Team with any questions at 866-294-1660 or email tech@wilsonelectronics.com. Technical Support hours are 7 am to 6 pm MST.

Figure 1

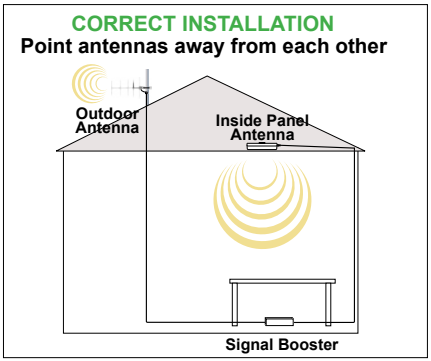
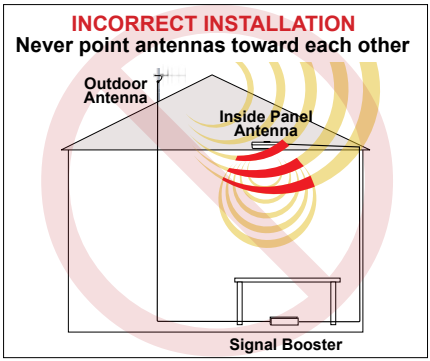


Figure 2



Understanding the Signal Booster Lights and Troubleshooting

During installation mode the Signal Booster is resetting itself very quickly to aid the installer. The Signal Booster is equipped with three indicator lights, one for each band. Within the first 15 minutes that the Signal Booster is plugged in, it is programed for a test and alignment period.

For the first 15 minutes the three indicator lights will do one of the following 4 things:

Note: *If after the initial 15 minutes you are not done with the installation, the Signal Booster can be reset and enter installation mode again by disconnecting and reconnecting the power supply from the Signal Booster.*

1. BLINKING GREEN

If the Signal Booster light is blinking green, the Signal Booster is operating properly. If you are happy with the coverage area in your building, then you are done. Blinking will stop after the 15 minute installation period.

2. BLINKING ORANGE

If the light on the Signal Booster is blinking orange, the Signal Booster is experiencing receiver (cell tower) overload. The Signal Booster has reduced the gain to prevent the disruption of cell towers. If the light is

blinking orange, this indicates that gain should be reduced due to close proximity to a cell tower. First, turn down the corresponding gain control until you get a blinking green light. The Signal Booster is now working with reduced gain. If the gain is not adequate for good coverage, you will need to turn the gain to maximum and then rotate the Outside Antenna until the light turns to blinking green, waiting 5 seconds between each adjustment for the Signal Booster to reset. If you do not get a green light, turn the gain down 5 dB and rotate the Outside Antenna. Continue to adjust the gain and the Outside Antenna position until the light turns blinking green. UL (uplink) and DL (downlink) gains are reduced equally. Contact Wilson Electronics Technical Support Team for assistance: 866-294-1660.

3. SOLID RED

A. A red light indicates that the booster has shut down to prevent an oscillation, most likely caused by the Inside and Outside Antennas being physically too close to each other. Without this patented protection, oscillations could be transmitted to the cell tower, blocking calls to and from the cell tower. Oscillation occurs just like in an audio system when you put a microphone next to a speaker and get a big squeal. When the Inside Antenna is too close to the Outside Antenna the same type of oscillation occurs. If the booster has a red light, the following procedure needs to be done for each affected band.

B. Either there is a problem with the Inside and Outside Antennas being too close together or there is a loose or bad cable (or possibly a defective booster). First, check the booster by unplugging the power cord, then removing the coax cables from the two connectors of the booster. Adjust the Gain to minimum and plug the booster back in. You should now have a green light, if not, call Wilson Electronics Technical Support. Next, unplug the booster, reconnect the coax cables to the booster and tighten all connections, and plug the booster back in.

C. Increase the Gain until you get a red light (for example, it may be at 50 dB for the red light). This indicates that an oscillation occurs at gains 50 dB and higher. Separating the antennas is very important to get the necessary gain* for the system to give maximum coverage and a green light. Lowering gain decreases your coverage area. The Outside Antenna, if directional, needs to be pointed at the cell tower with its back to the Inside Antenna. The Inside Antenna needs to have its back facing the back of the Outside Antenna. Without proper orientation of the antennas, you

will not be able to get maximum gain from the booster.

***Note:** *If the antennas cannot be sufficiently separated, the booster will have to operate with reduced performance by decreasing the Gain until a green light is obtained.*

4. SOLID GREEN

The indicator lights on the Signal Booster will be a solid green after the first 15 minute installation period, if the unit is powered up and working properly.

Warnings and Recommendations

⚠ Warning: The Directional Antenna must always be located so the back or side points to the Inside Antenna. Never point the front of the Outside Antenna toward the Inside Antenna – this is to prevent oscillation.

⚠ Warning: Connecting the Signal Booster directly to the cell phone with use of an adapter will damage the cell phone.

⚠ Warning: Use only the power supply provided. Use of a non-Wilson Electronics product may damage your equipment.

⚠ Warning: **RF Safety**: All Inside Antennas used with this Signal Booster may not have gain (less cable loss) that exceeds 9 dBi and must be located at least 8 inches from all people. Outside Antennas may not have gain (less cable loss) that exceeds 15 dBi and must be located at least 23 inches from all people. All antennas shown on page 1 meet these requirements.

⚠ Warning: Verify that both the Outside Antenna and the Inside Antenna are connected to the Signal Booster before powering up the Signal Booster.

Recommendation: *Lightning Surge Protection is recommended for all in-building installations.*

This device complies with Part 15 of FCC rules. Operation is subject to two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by Wilson Electronics could void the authority to operate this equipment.

About Wilson Electronics

Wilson Electronics, Inc. has been a leader in the wireless communications industry for over 40 years. The company designs and manufactures Signal Boosters, Antennas and related components that significantly improve cellular phone signal reception and transmission in a wide variety of applications, both mobile (marine, RV, vehicles) and in-building (home, office, M2M).

With extensive experience in antenna and Signal Booster research and design, the company's engineering team uses a state-of-the-art testing laboratory, including an anechoic chamber and network analyzers, to fine-tune antenna designs and performance. For its Signal Boosters, Wilson Electronics uses a double electrically shielded RF enclosure and cell tower simulators for compliance testing.

Wilson Electronics Signal Boosters feature patented Smart Technology II™ that enables them to automatically adjust their power based on cell tower requirements. By detecting and preventing oscillation (feedback), signal overload and interference with other users, these Smart Technology II™ Signal Boosters improve network cell phone areas without compromising carrier systems.

All products are engineered and assembled in the company's 55,000-square-foot headquarters in St. George, Utah. Wilson Electronics has product dealers in all 50 states as well as in countries around the world.

Contact Wilson Electronics Technical Support Team with any questions at 866-294-1660 or email: tech@wilsonelectronics.com. Hours: 7 am to 6 pm MST.

30-Day Money-Back Guarantee

All Wilson Electronics products are protected by Wilson Electronics 30-day money-back guarantee. If for any reason the performance of any product is not acceptable, simply return the product directly to the reseller with a dated proof of purchase.

1-Year Warranty

Wilson Electronics Signal Boosters are warranted for one (1) year against defects in workmanship and/or materials. Warranty cases may be resolved by returning the product directly to the reseller with a dated proof of purchase.

Signal Boosters may also be returned directly to the manufacturer at the consumer's expense, with a dated proof of purchase and a Returned Material Authorization (RMA) number supplied by Wilson Electronics. Wilson Electronics shall, at its option, either repair or replace the product. Wilson Electronics will pay for delivery of the repaired or replaced product back to the original consumer if located within the continental U.S.

This warranty does not apply to any Signal Booster determined by Wilson Electronics to have been subjected to misuse, abuse, neglect, or mishandling that alters or damages physical or electronic properties.

Failure to use a surge protected AC Power Strip with at least a 1000 Joule rating will void your warranty.

RMA numbers may be obtained by contacting Technical Support at 866-294-1660.

Disclaimer : The information provided by Wilson Electronics, Inc. is believed to be complete and accurate. However, no responsibility is assumed by Wilson Electronics, Inc. for any business or personal losses arising from its use, or for any infringements of patents or other rights of third parties that may result from its use.

U.S. Patent Nos. – 7,221,967; 7,729,669; 7,486,929; 7,409,186; 7,783,318

Signal Booster Specifications

		Tri-Band 4G-V		
Model Number		275165		
Antenna connectors		N-Female		
Antenna impedance		50 Ohms		
Dimensions		8.875 x 6.0 x 1.5 inch (22.5 x 15.2 x 3.8 cm)		
Weight		2.8 lbs (1.270 kg)		
Frequency		746-787 MHz / 824-894 MHz / 1850-1990 MHz		
[1]Passband Gain (nominal)				
		70 dB Typical / 77 dB Maximum		
[2]20 dB Bandwidth (nominal)		**700 MHz**	**800 MHz**	**1900 MHz**
	Uplink	N/A	25 MHz / 28 MHz Maximum	60 MHz / 66 MHz Maximum
	Downlink	N/A	25 MHz / 28 MHz Maximum	60 MHz / 66 MHz Maximum
[3]Power output for single cell phone (uplink) dBm		**700 MHz**	**800 MHz**	**1900 MHz**
	CDMA	N/A	28.5	29.4
	EDGE	N/A	27.7	28.3
	GSM	N/A	28.6	28.7
	WCDMA	N/A	25.3	26.1
	LTE	25.0	24.7	25.8
[3]Power output for single cell phone (downlink) dBm		**700 MHz**	**800 MHz**	**1900 MHz**
	CDMA	N/A	21.8	23.3
	EDGE	N/A	21.5	22.4
	GSM	N/A	24.9	25.1
	WCDMA	N/A	20.2	21.0
	LTE	22.9	22.7	25.1
[4]Power output for multiple received signals (uplink) dBm			**Maximum Power**	
The maximum power is reduced by the number of signals:	Number of signals	**800 MHz**		**1900 MHz**
	2	22.8		17.9
	3	19.2		14.3
	4	16.7		11.8
	5	14.8		9.9
	6	13.2		8.3
[4]Power output for multiple received signals (downlink) dBm			**Maximum Power**	
The maximum power is reduced by the number of signals:	Number of signals	**800 MHz**		**1900 MHz**
	2	22.3		18.4
	3	18.7		14.9
	4	16.2		12.4
	5	14.3		10.5
	6	12.7		8.9
Noise Figure (typical downlink/uplink)		4 dB nominal		
Isolation		> 90 dB		
Power Requirements		6 V, 1.5 A - 3.0 A		

Notes:
1. Nominal gain is the maximum gain at any frequency in the passband.
2. Nominal bandwidth is the difference between two frequencies that are adjacent to the passband where the amplification is 20 dB lower than the passband amplification. One of the frequencies is lower than the passband and the other is higher.
3. The Manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.
4. The maximum power for 2 or more simultaneous signals will be reduced by 6 dB every time the number of signals is doubled.

Wilson® Electronics, Inc.

3301 East Deseret Drive, St. George, UT 84790
For additional Technical Support visit www.WilsonElectronics.com
or email at: tech@wilsonelectronics.com
Phone: 866-294-1660 Local: 435-673-5021 Fax: 435-656-2432
www.twitter.com/WilsonCellular www.facebook.com/WilsonCellular

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