

# Amplifier Installation Guide



In-Building  
Wireless  
Amplifier

## Contents:

Guarantee and Warranty . . . . .	1
Antenna Options and Accessories . . . . .	2
Before Getting Started / How It Works . . . . .	3
Installation Overview . . . . .	4
Installing a Wilson Outside Antenna . . . . .	5
Installing a Wilson Inside Antenna . . . . .	6
Installing a Wilson Amplifier . . . . .	7
Powering Up a Wilson Amplifier . . . . .	8
Understanding the Amplifier Lights . . . . .	9
Understanding the Amplifier Lights . . . . .	10
Understanding the Amplifier Lights . . . . .	11
Warnings and Recommendations . . . . .	12
Factor Conversions . . . . .	13
Distance Coverage Chart . . . . .	14
Amplifier Specifications . . . . .	Back Cover



**Warning:** 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 amplifier.

### **30-Day Money-Back Guarantee**

All Wilson Electronics products are protected by Wilson's 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 amplifiers 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.

Amplifiers 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 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.

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

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

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.

Operation is subject to the following two conditions: (1) This device may not cause interference and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

**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.

Copyright © 2009 Wilson Electronics, Inc. All rights reserved.



3301 East Deseret Drive, St. George UT 84790

For additional Technical Support visit

[www.wilsonelectronics.com](http://www.wilsonelectronics.com)

Phone: 866-294-1660 Fax: 435-656-2432

## Installation Instructions for the Following Wilson Amplifiers:

### **In-Building Wireless Cellular Smart Technology™ 50 dB Amplifier**

Model # 801105

FCC ID: PWO8011SB IC: 4726A-8011SB

### **In-Building Wireless Cellular Smart Technology™ 60 dB Amplifier**

Model # 801106, Part # 801108, Part # 801110

FCC ID: PWO8011SB IC: 4726A-8011SB

### **In-Building Wireless PCS Smart Technology™ 60 dB Amplifier**

Model # 801306

FCC ID: PWO8013SB IC: 4726A-8013SB

### **In-Building Wireless iDEN Smart Technology™ 50 dB Amplifier**

Model # 804005

FCC ID: PWO8040SB IC: 4726A-8040SB

### **In-Building Wireless iDEN Smart Technology™ 60 dB Amplifier**

Model # 804006

FCC ID: PWO8040SB IC: 4726A-8040SB

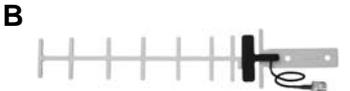
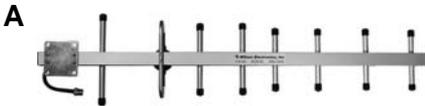
### **In-Building Wireless 900 MHz Smart Technology™ 60 dB Amplifier**

**Model # 801506, Model # 801606, Model # 801170, Model # 801370**

**Not for sale in the U.S. and Canada.**

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

## Antenna Options & Accessories



- A 13 dB 800 MHz Yagi Cellular Antenna (301111)
- B 1900 MHz Yagi PCS Antenna (301124)
- C 800 MHz Yagi Cellular Antenna (301129)
- D Dual-Band Panel Antenna (301135)
- E Dual-Polarity Dome Antenna (301123)
- F Dual-Band Dome Antenna (301121)
- G Splitters (Multiple splitters available)
- H Amplifier Soft Cases
- I Omni-Directional Antenna (301201)
- J Marine Antenna (301130)

## Before Getting Started

This guide will help you properly install Wilson's In-Building Wireless Smart Technology™ Amplifiers. **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. If you do not understand the instructions in full, seek professional help, or contact Wilson Technical Support at 866-294-1660.

## Inside this Package

- In-building wireless amplifier
- AC/DC 110 volt power supply



In-building wireless amplifier



AC/DC plug-in power supply

## Additional Required Equipment (sold separately)

- Outside antenna (Yagi recommended)
- Inside dome, panel or low-profile antenna
- Antenna coax cable

## How it Works

Wilson amplifiers are small, portable, 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 and in-building applications.

When using a Wilson amplifier in conjunction with Wilson antennas, the outside antenna will collect the cell tower signal and send it through the cable to the amplifier. The signal is then amplified and broadcast from the inside antenna to the surrounding area. 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 amplifier and broadcast back to the cell tower through the outside antenna.

## Installation Overview

The following steps provide a summary of the amplifier/antenna installation process. However, they are **not** a substitute for the complete installation instructions on the following pages, which you should read thoroughly. Contact Wilson's Technical Support Department with any questions at 866-294-1660.

### STEP 1 Install the Outside Antenna

Mount the Yagi antenna so that it points toward the cell site and away from where the inside antenna will be located. Depending on your amplifier model, the two antennas will need 50-75 feet of separation. (See illustrations on pages 5 and 7.)

### STEP 2 Install the Inside Antenna

Select a location in the center of where the signal needs to be amplified. Refer to the instructions included with the inside antenna. (See illustration on page 6 to determine the inside antenna model that best meets your specific needs.)

### STEP 3 Install the Amplifier

Position the amplifier in a well-ventilated location near a power outlet. Attach the outside and inside antennas to the amplifier using Wilson 400 low loss coax cable (available from Wilson Electronics).

### STEP 4 Power up the Amplifier

**IMPORTANT!** Before connecting the power supply, ensure that both the inside and outside antenna cables are connected. Also ensure that all cell phones and cellular data cards within 50 feet of the inside antenna are turned off. Plug in the supplied 6-volt power supply into the amplifier and then into a wall outlet.

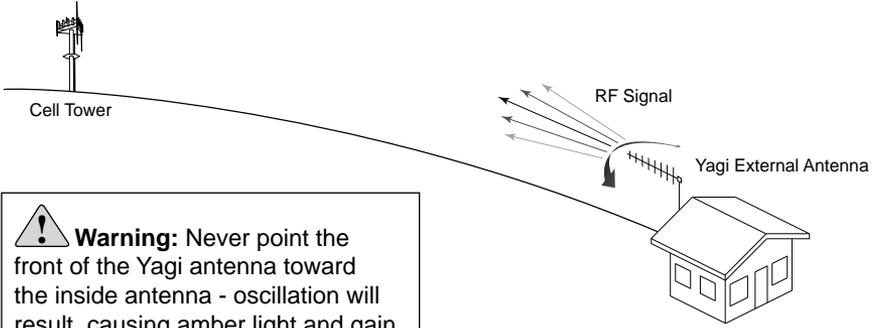
### STEP 5 Check the Amplifier Lights

The PWR light should be green, indicating that the amplifier has power. If all other lights are also green, the amplifier is operating properly; however, if you do not have the desired signal coverage area, refer to pages 5, 6, 9 and 10.

Note: if you are using an outdoor Yagi antenna, it must be adjusted for maximum signal.

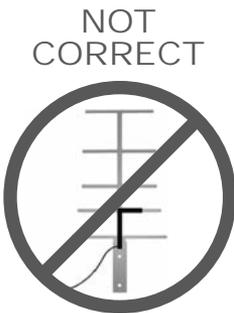
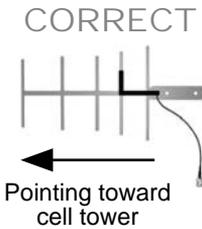
## Installing a Wilson Outside Antenna

Select a location on the roof of the building to install the outside antenna, using a cell phone in test mode to find the strongest signal from the cell tower.



 **Warning:** Never point the front of the Yagi antenna toward the inside antenna - oscillation will result, causing amber light and gain reduction.

For test mode help, visit [www.wilsonelectronics.com](http://www.wilsonelectronics.com) or call Technical Support at 866-294-1660. Follow the specific antenna installation instructions included with the outside antenna.



Lightning protection is recommended for all in-building installations. Take extreme care to ensure neither you nor the antenna come in contact with any electrical power lines.

A Yagi antenna must be installed horizontally with the elements vertical and the drip hole on the bottom. Ensure there are three feet of clearance in all directions surrounding the antenna.

 **Warning:** The outside antenna must be installed on an outdoor permanent structure with a separation of at least 20 feet from all persons during normal operation.

## Installing a Wilson Inside Antenna

Select a suitable location for the inside antenna, preferably in the center of where the signal needs to be amplified. To determine signal strength and coverage distance, refer to page 12 of this installation guide.

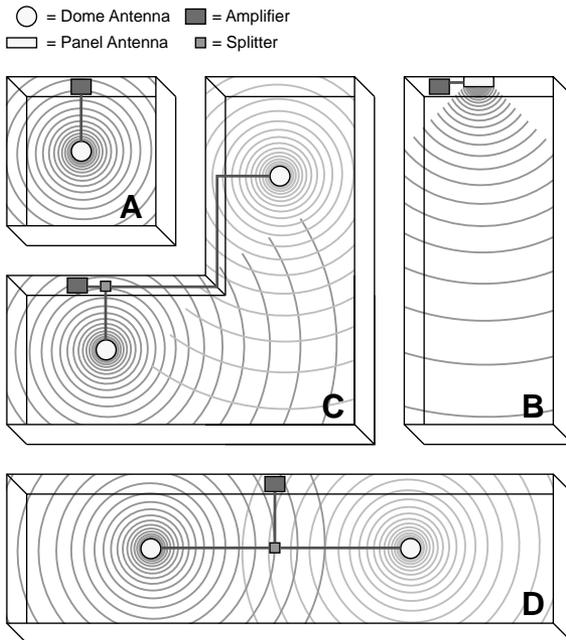
Follow the specific antenna installation instructions included with the inside antenna.

Wilson has several inside antenna options. The dome and panel antennas are the most popular for in-building applications.

For a square room, a dome antenna will provide better coverage. (A)

For a rectangular room, a panel antenna will provide better coverage. (B)

In some cases, multiple inside antennas may be required (C & D). A signal may be "split" by using a splitter. If using more than one inside antenna, a separation of at least 20 feet is necessary between inside antennas.



Connect the coax cable from the amplifier to the inside antenna. For distances of 20 feet or more, use Wilson 400 low loss coax cable to prevent significant signal loss.



**Warning:** An inside antenna must have a separation distance from all persons that is at least 12 inches for the 5.2 dBi dome antenna and 15 inches for the 7 dBi panel antenna.

## Installing a Wilson Amplifier

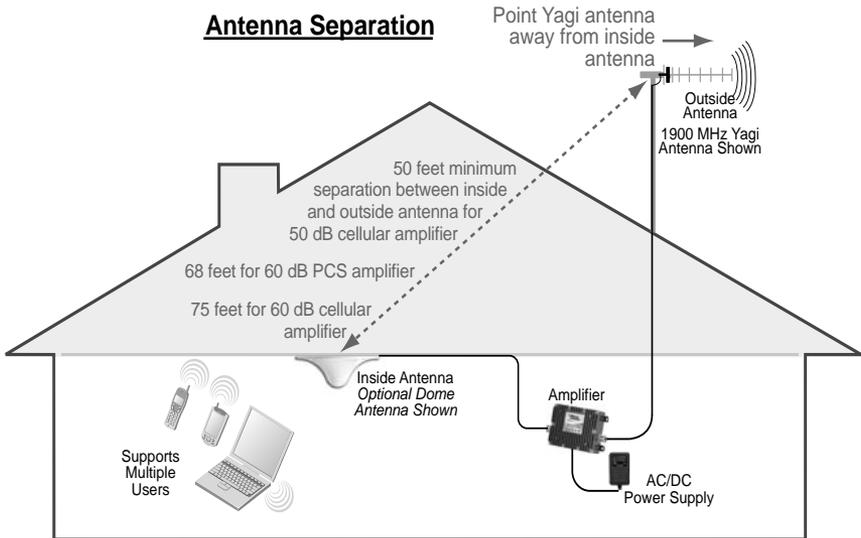
Select a location to install the amplifier that is away from excessive heat, direct sunlight, moisture and that has proper ventilation. Do not place the amplifier in an air-tight enclosure.

Recommended installation locations for in-building amplifiers are:

- On a wall
- On the ceiling
- Near a power outlet

Run the outside antenna cable to the amplifier and attach it to the N-Female connector labeled “outside antenna” on the amplifier. Run the inside antenna cable to the amplifier and attach it to the N-Female connector labeled “inside antenna” on the amplifier.

Note: Be careful when plugging the connector in so as not to damage the center pins on the connectors.



Connect the outside antenna to the amplifier with Wilson 400 low loss coax cable (available from Wilson Electronics). Place the inside antenna in the center of the area needing the amplified signal. It is important to have at least 50 feet of separation between the inside and outside antennas for the 50 dB amplifiers, 68 feet of separation distance for the 60 dB PCS amplifiers and at least 75 feet of separation distance for the 60 dB cellular amplifiers.



**Warning:** Connecting the amplifier directly to the cell phone with use of an adapter will damage the cell phone.

## Powering up a Wilson Amplifier

1. **IMPORTANT!** Ensure that all cell phones and cellular data cards within 50 feet of the inside antenna are turned off.
2. To verify proper installation of the amplifier and antennas, make sure that the distance between the inside and outside antennas is a minimum of 50 feet for the 50 dB amplifier, 68 feet of separation distance for the 60 dB PCS amplifier, and 75 feet for the 60 dB cellular amplifier.
3. If you are using an outside Yagi antenna, never point the front of the Yagi toward the inside antenna.
4. Ensure that both the outside antenna coax cable and the inside antenna coax cable are connected to the amplifier before powering up the amplifier.
5. Plug the 6-volt power supply into the amplifier input marked "power" (carefully, to avoid damaging the center pin) and then into a wall outlet.



**Warning:** Verify that both the outside antenna and the inside antenna are connected to the amplifier before powering up the amplifier.



**Warning:** Use only the power supply provided in this package. Use of a non-Wilson product may damage your equipment.

**NOTE:** The aluminum casing of a Wilson amplifier will adjust very quickly to the ambient temperature of its environment. For example, in the summer, when the attic of a house can easily exceed 100 degrees Fahrenheit, the amplifier temperature may be 10 or more degrees higher. The casing will be hot to the touch. Such high temperatures will not damage the amplifier, nor do they pose a fire risk. As recommended in these instructions, install the amplifier in a location with adequate ventilation. Keep the area free of items that could block air flow to the amplifier.

## Understanding the Amplifier Lights



If your amplifier has this light configuration refer to the instructions below.

The amplifier is equipped with sensitive electronics designed to detect amplifier oscillation or cell phone overload, both of which can hamper amplifier performance. The amplifier is designed to automatically reduce gain or, if necessary, shut down to prevent or compensate for these conditions. Oscillation or overload can be caused by improper equipment installation -- understanding the amplifier lights will help you identify and solve potential problems.



When the amplifier is initially powered on, the 60 light will turn green. This indicates the amplifier is working at the proper gain level.



If the 50 light is green, the outside signal is too strong and the amplifier is powering down. Verify that the outside Yagi antenna is pointed away from the inside antenna and not across the roof of the building. If need be, redirect the Yagi antenna so that it is pointing away from the inside antenna. Then, reset the amplifier by disconnecting and reconnecting the power supply.



If the 40 light is green, the amplifier is continuing to power down. Try operating the cell phone farther away from the inside antenna. If need be, redirect the Yagi antenna so that it is pointing away from the inside antenna. Then, reset the amplifier by disconnecting and reconnecting the power supply.



If the OSC light is red, the amplifier has shut down due to cell phone overload. Try operating the cell phone farther away from the inside antenna. Verify that the outside Yagi antenna is pointed away from the inside antenna and not across the roof of the building. If need be, redirect the Yagi antenna so that it is pointing away from the inside antenna. Then, reset the amplifier by disconnecting and reconnecting the power supply.

## Understanding the Amplifier Lights



If your amplifier has this light configuration refer to the instructions below.

The amplifier is equipped with sensitive electronics designed to detect amplifier oscillation or cell phone overload, both of which can hamper amplifier performance. The amplifier is designed to automatically reduce gain or, if necessary, shut down to prevent or compensate for these conditions. Oscillation or overload can be caused by improper equipment installation -- understanding the amplifier lights will help you identify and solve potential problems.



When the amplifier is initially powered on, the 65 light will turn green. This indicates the amplifier is working at the proper gain level.



If the 55 light is green, the outside signal is too strong and the amplifier is powering down. Verify that the outside Yagi antenna is pointed away from the inside antenna and not across the roof of the building. If need be, redirect the Yagi antenna so that it is pointing away from the inside antenna. Then, reset the amplifier by disconnecting and reconnecting the power supply.



If the 45 light is green, the amplifier is continuing to power down. Try operating the cell phone farther away from the inside antenna. If need be, redirect the Yagi antenna so that it is pointing away from the inside antenna. Then, reset the amplifier by disconnecting and reconnecting the power supply.



If the OSC light is red, the amplifier has shut down due to cell phone overload. Try operating the cell phone farther away from the inside antenna. Verify that the outside Yagi antenna is pointed away from the inside antenna and not across the roof of the building. If need be, redirect the Yagi antenna so that it is pointing away from the inside antenna. Then, reset the amplifier by disconnecting and reconnecting the power supply.

## Understanding the Amplifier Lights



If your amplifier has this light configuration refer to the instructions below.

The amplifier is equipped with sensitive electronics designed to detect amplifier oscillation or cell phone overload, both of which can hamper amplifier performance. The amplifier is designed to automatically reduce gain or, if necessary, shut down to prevent or compensate for these conditions. Oscillation or overload can be caused by improper equipment installation -- understanding the amplifier lights will help you identify and solve potential problems.



The power light will turn green when the amplifier is initially powered on.



A **BLINKING** red light indicates a cell phone overload. Try operating the cell phone farther from the inside antenna.



When the D light is green, the amplifier is working at proper gain level (peak performance).



If light C is green but D is out, the combination of outside signals is too strong and the amplifier is powering down. To remedy this, turn the outside antenna slightly away from the cell site until the D light turns green.



If light B is green and C and light D are off, the amplifier is continuing to power down due to cell phone overload. Try operating the cell phone farther from the inside antenna.



If light A is solid red, the amplifier has shut down because the combination of outside signals is too strong. To remedy this, turn the outside antenna slightly away from the cell site. The amplifier will reset automatically but may also be reset by disconnecting and reconnecting the power supply.

## Warnings and Recommendations

-  Warning: The Yagi antenna must always be located so the back or side points to the inside antenna. Never point the front of the Yagi antenna toward the inside antenna – oscillation will result, causing amber light and gain reduction.
-  Warning: The outside antenna must be installed on an outdoor permanent structure with a separation of at least 20 feet from all persons during normal operation.
-  Warning: Connecting the amplifier directly to the cell phone with use of an adapter will damage the cell phone.
-  Warning: **Connect both the outside and inside antenna cables to the amplifier before powering up the amplifier.**
-  Warning: Use only the power supply provided in this package. Use of a non-Wilson product may damage your equipment.
-  Warning: **RF Safety:** An inside antenna must have a separation distance from all persons that is at least 12 inches for the 5.2 dBi dome antenna and 15 inches for the 7 dBi panel antenna.

Lightning protection is recommended for all in-building installations.

## Finding Signal Strength and Calculating Coverage Distance

Signal strength and the corresponding coverage distance you can expect to achieve with your amplifier/antenna system are based on a combination of several factors: the received signal strength of your cell phone alone, the signal gain achieved by your amplifier and antennas and the signal loss from cables, taps and splitters you may be using.

To calculate your approximate signal coverage distance, you can enter this information into our Coverage Area Calculator on the Technical Support page on our website ([www.wilsonelectronics.com](http://www.wilsonelectronics.com)). If you prefer, you can manually calculate your approximate signal coverage distance using the instructions on this and the following two pages.

First, measure the Outside Signal Level (OSL) at the intended outside antenna location using a cell phone in test mode. (For assistance, visit the Phone Test Modes section on the Technical Support page on our website or call 866-294-1660.) The OSL will always be a negative number. (Even if the cell phone shows a positive number, you will need to change it to a negative for this calculation.) Maximum signal strength is usually about -50. When the signal weakens to about -100 or worse, the call may be dropped.

Depending on the model, your amplifier gain (AG) will be 50, 60 or 65 dB (see the label on your amplifier or the specification table on the back cover of this guide). Your inside and outside antennas will also add signal gain, again depending on the antenna models you are using (see the table on page 13).

You will also experience some signal loss from cables, splitters and taps used to connect your system (see the table on page 13).

## Factor Conversions

Using the table below, find and circle the appropriate decibel (dB) numbers that correspond to the equipment in your particular system. Be sure to choose your numbers from the appropriate frequency column based on the service you receive (iDEN, Cellular or PCS).

	Frequency		
	iDEN 851	Cellular 869	PCS 1930
<b>Antenna Factor (AF)</b>			
Low Profile (inside)	+3 dB	+3 dB	+3 dB
Dual-Band Panel (inside)	+7 dB	+7 dB	+7 dB
Dual-Band Dome (inside)	+2 dB	+2 dB	+2 dB
Dual-Polarity Dome (inside)	+5 dB	+5 dB	+5 dB
Yagi 806-939 MHz Cellular (outside)	+13 dB	+13 dB	+13 dB
Yagi 800-900 MHz Cellular (outside)	+10 dB	+10 dB	+10 dB
Yagi 1800-1900 MHz PCS (outside)	+14 dB	+14 dB	+14 dB
<b>Cable Factor (CF)</b>			
20' RG 58	-4 dB	-4 dB	-7 dB
20' 9913	-3 dB	-3 dB	-4 dB
30' 9913	-3 dB	-3 dB	-5 dB
50' 9913	-4 dB	-4 dB	-7 dB
100' 9913	-7 dB	-7 dB	-10 dB
<b>Splitter Factor (SF)</b>	-3 dB	-3 dB	-3 dB
<b>Tap Factor (TF) (depends on model - refer to tap label)</b>	-6/-10 dB	-6/-10 dB	-6/-10 dB

Use the following formula to calculate your Signal Strength (S). Write in your numbers as appropriate. Be sure to account for the length of **all** cable, inside and out. Add up the numbers for **all** taps and/or splitters (if you are not using any, enter 0). Remember, AG and AF will be positive numbers; OSL, CF, TF, SF and S will be negative.

$$\frac{\quad}{\text{OSL}} + \frac{\quad}{\text{AG}} + \frac{\quad}{\text{AF}} + \frac{\quad}{\text{CF}} + \frac{\quad}{\text{SF}} + \frac{\quad}{\text{TF}} = \frac{\quad}{\text{S}}$$

Once you have calculated your signal strength, use the graph on the following page to determine approximate coverage distance. See below for a sample calculation.

### Sample Signal Strength and Coverage Calculation

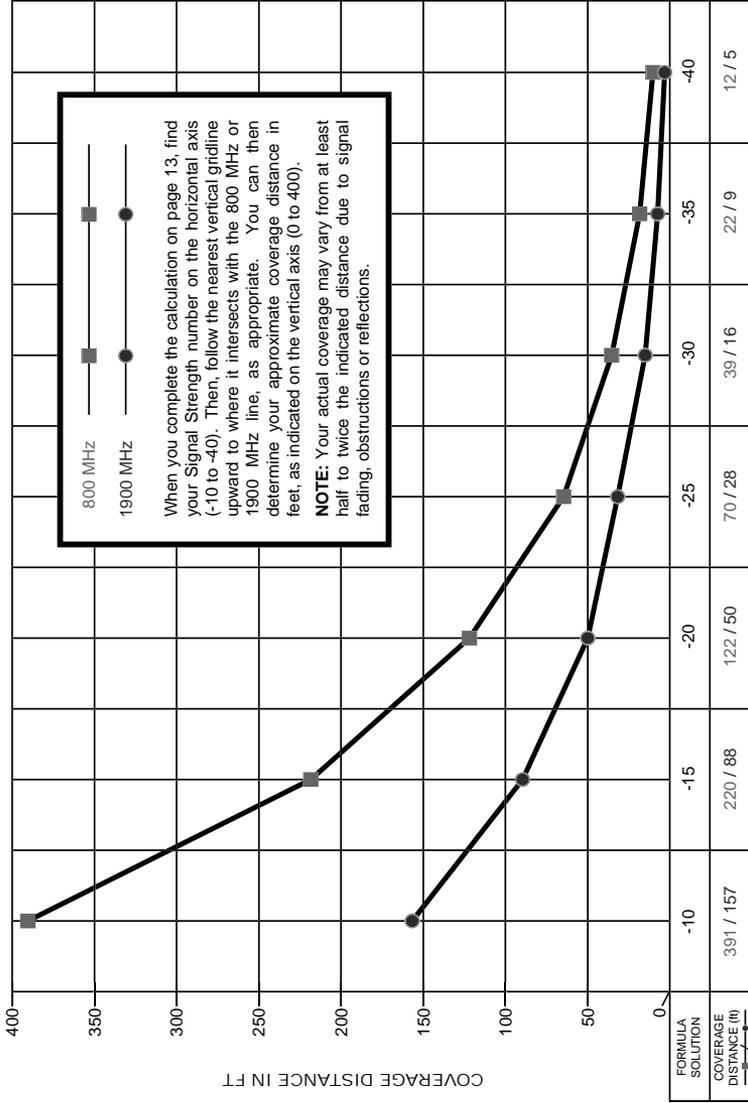
This example assumes an OSL of -90, use of a 60 dB cellular amplifier, an 806-939 MHz Yagi antenna and a low profile inside antenna with 100 total feet of inside and outside 9913 cable with no splitters or taps.

- OSL -90 (always a negative number) found on cell phone in test mode
- AG +60 gain
- AF +16 dB gain (+13 dB for the Yagi antenna and +3 dB for the low-profile antenna)
- CF -7 dB loss
- SF 0 (none used)
- TF 0 (none used)

$$\text{Formula: } -90 + 60 + 16 + -7 + 0 + 0 = -21$$

With a signal strength of -21, coverage distance would be approximately 120 feet from the inside antenna.

# INSIDE BUILDING COVERAGE DISTANCE



## In-Building Wireless Amplifier Specifications (GSM & Cellular)

Model/Part Number	GSM only # 801170	GSM only # 801370	Cellular # 801105	Cellular # 801106	Cellular #801108	Cellular #801110	Cellular #801165
	Not for sale in the U.S. or Canada						
<b>Frequency</b>							
Uplink	824-849 MHz	1850-1910 MHz	824-849 MHz	824-849 MHz	824-835 MHz	835-849 MHz	824-849 MHz
Downlink	869-894 MHz	1930-1990 MHz	869-894 MHz	869-894 MHz	869-880 MHz	880-894 MHz	869-894 MHz
Gain	70 dB	50/65 dB	50 dB	60 dB	Channel A 60 dB	Channel B 60 dB	65 dB
Max Output	up to 3 watts	up to 2 watts	3 watts				
AGC Limit (uplink/downlink)	+ 30 dBm / + 30 dBm						
Noise Figure	3 dB nominal	4 dB nominal	3-4 dB typical				
Flatness (uplink/downlink)	± 2.5 dB	± 4 dB	± 2.5 dB				
Isolation (uplink/downlink)	>90 dB	>90 dB	> 90 dB				
Power Requirements	Input: 100-240 V AC 50/60 Hz 0.6 A / Output: 6 V DC 3 A						
Connectors	N-Female 50 ohms						
Dimensions	5.6 x 3.6 x 1.7 (inch) / 14.2 x 9.1 x 4.4 (cm)						
Weight	1.5 lbs / 0.7 kg						

## In-Building Wireless Amplifier Specifications (iDEN, PCS, EGSM & DCS)

Model/Part Number	iDEN # 804005	iDEN # 804006	iDEN # 804070	PCS # 801306	PCS # 801365	EGSM #801506	DCS #801606
	Not for sale in the U.S. or Canada						
<b>Frequency</b>							
Uplink	806-821 MHz	806-821 MHz	806-821 MHz	1850-1910 MHz	1850-1910 MHz	880-915 MHz	1710-1755 MHz
Downlink	851-866 MHz	851-866 MHz	851-866 MHz	1930-1990 MHz	1930-1990 MHz	925-960 MHz	1805-1880 MHz
Gain	50 dB	60 dB	50 dB / 70 dB	60 dB	65 dB	60dB	60dB
Max Output	3 watts			2 watts		3 watts	
AGC Limit (uplink/downlink)	+ 30 dBm / + 30 dBm			+30 dBm / +30 dBm			
Noise Figure	3-4 dB typical			4 dB typical		3 dB typical	
Flatness (uplink/downlink)	± 2.5 dB			± 4 dB			
Isolation (uplink/downlink)	> 90 dB						
Power Requirements	Input: 100-240 V AC 50/60 Hz 0.6 A / Output: 6 V DC 3 A						
Connectors	N-Female 50 ohms						
Dimensions	5.6 x 3.6 x 1.7 (inch) / 14.2 x 9.1 x 4.4 (cm)						
Weight	1.5 lbs / 0.7 kg						