

## Why use two cellular antennas instead of one?

While it is possible to use only one antenna with your 3G/4G cellular device, doing so may result in reduced bandwidth and reliability. For this reason, Logic Data Systems recommends using two antennas to achieve what is called receive diversity or MIMO, depending on the cellular equipment.

In receive diversity and MIMO (multiple input-multiple output), the cellular radio uses two or more antennas installed a minimum distance apart. This configuration allows the radio to compare signals between the antennas for reduced interference from multipath propagation. Because radio signals bounce off certain materials and travel at different speeds through various atmospheric conditions, this multipath propagation effect is a common concern in radio design.

High bandwidth service such as 3G and 4G are especially reliant on receive diversity and MIMO due to the large amount of data packed into tighter spectrum. Without multiple antennas, such speeds are difficult to attain.

Conversely, low bandwidth devices such as smart meters and standalone GPS tracking units typically do not benefit from receive diversity or MIMO due to the slower speed link. In such cases, a second antenna is not necessary.

## Hints For Optimal Use

- Mount antennas as high as possible, with minimal obstruction on all sides.
- Space primary and secondary antennas at least 18 inches apart. Avoid close proximity with other transmitting antennas.
- Locate primary antenna as close to modem as possible and shorten antenna coax to minimum possible length (may require specialized tool for connector replacement).  
**Long cable runs = extra signal loss.**
- Use physically identical antennas for primary and secondary antennas (cellular and rx div) for best signal strength and broadband speed.
- Mount antennas 18" or more from the roof edge.
- Orient antennas vertically by mounting them on a horizontal surface. Antennas mounted at an angle suffer severe signal degradation as the mounting angle increases.
- Ensure antennas are mounted to a metallic surface with clean electrical contact between the mounting surface and the antenna mounting nut.
- Always use the correct antenna for your equipment. Antennas are designed for a specific purposes and should be used accordingly.

