Intech®
Instruments

Intech Multi-Band Antennas for Ezeio Controllers

Installation Guide.

Wireless Antennas Installation Guide Index.

Intech Multi-Band Antennas

Indoor & Outdoor Antennas

Description.

The Intech multi-band wireless antennas are intended to be used in conjunction with the Ezeio-GSM controller to cover applications where the range of the radio signal requires extra gain.

Features.

- Indoor and outdoor Antenna types.
- Directional and Omni Directional Antennas.
- Supplied as a Complete Kit.
- Easy to Install.

Ordering Information.

EZE-ANT-229 2dBi Dual-Band Omni Directional Antenna.
EZE-ANT-225 3.5~5.5dBi Multi-Band Phantom Omni Directional Outdoor Antenna.
EZE-ANT-205 10~11dBi Wideband Directional Antenna.

Coax Options.

ZB-P-38 6m Coax, SMA Male to N-Male.
ZB-P-37 1m Coax, SMA Male to N-Male.
ZB-P-56 0.3m Coax, SMA Male to SMA Female Bulkhead.

Dual-Band 2dBi Indoor/Outdoor Antenna.

The 2dBi dual-band antenna has been added to the Intech wireless antenna range as a simple upgrade option, which attaches directly onto the ezeio-GSM controller unit. The Antenna features a magnet mount base and 3m coax with an SMA connector, allowing the antenna to conveniently sit anywhere nearby on a metal surface.

Specifications:

Frequency Range	698~868MHz, 1850MHz~2690MHz.
Gain	2dBi.
Polarisation	Vertical.
VSWR	<2.0.
Connector Type	SMA.
Operating Temperature	-40°~85°C.
Compliance	RoHS.
Dimensions	H=121mm, BaseØ=30mm.

6dBi Omni Directional Monopole Medium Gain Antenna.

DL-OD900-60

The 6dBi HyperLink antenna is a high performance omnidirectional antenna designed for the 800~900MHz Band. An ideal match with the Ezeio-GSM Controller, which uses the 850MHz Band.

This antenna comes standard with a heavy-duty steel bracket for pole mounting. The rugged construction of both antenna and bracket means it's designed for all weather operation.

Specifications:

Frequency Range	824~960MHz.
Gain	6dBi.
Range with Digi485 Radio	8.5Km Ideal Line of Sight.
Vertical Beam Width	30°.
Horizontal Beam Width	360°.
Polarisation	Vertical.
Connector Type	N-Female.
Impedance	50Ω.
Operating Temperature	-40°~85°C.
Pole Size	32~50mm.
Wind Speed	170Km/hr Max
Dimensions	H=600mm, Ø=33mm.

Normally supplied along with:

- 6m low loss coax cable N-Male to SMA male - to connect to Ezeio-GSM Controller.
- Coax-Seal Hand Mouldable Plastic - to keep outdoor coax connections weather tight.

Broadband 10~11dBi Directional Antenna.

EZE ANT-205

This compact panel antenna provides 10~11dBi gain with very broad coverage. Designed for all weather operation, this antenna features a tilt and swivel mast mount kit allowing the antenna to be positioned for optimal performance.

Specifications:

Frequency Range		698~960MHz,	1710~2700.
Gain	698~960MHz	10dBi,	11dBi.
Vertical Beam Width		50°,	40°.
Horizontal Beam Width		75°.	60°.
Polarisation		Vertical.	
Connector Type		N-Female.	
Impedance		50Ω.	
Pole Size		40~50mm.	
Dimensions		W=102mm, H=102mm, D=102mm.	

Normally supplied with:

- 6m low loss coax N-Male to SMA Male - connects to Ezeio SMA Connector.
- Coax-Seal Hand Mouldable Plastic - to keep outdoor coax connections weather tight.

Placement Considerations.

Antennas are devices that focus energy in a particular direction similar to the way the megaphone focuses voice energy. Antennas can provide different radiation patterns depending on the design and application. How much the energy is focused in a given direction is referred to as Antenna Gain.

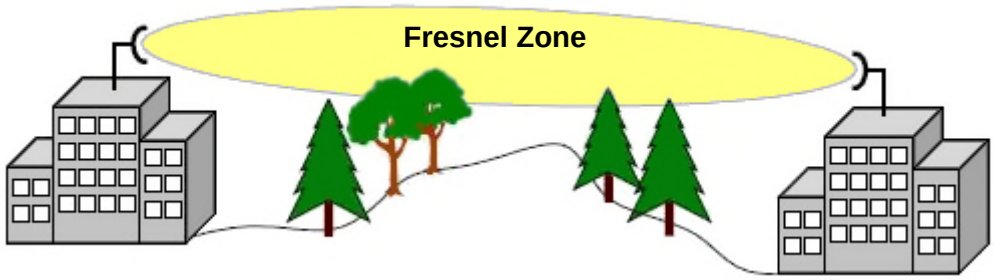
Environment.

Physical obstructions can enter into the environment and limit the system's ability to get information from one place to another. Range-reducing elements are commonly introduced into simple wireless communications systems in the form of walls, vehicles, trees, wind, etc.

Visual vs. RF Line-of-Sight.

Attaining RF Line-of-Sight (LOS) between the sending and receiving antennas is essential in achieving optimum range in wireless communication systems. There are two types of LOS that are generally used to describe an environment.

- ***Visual LOS:*** Visual LOS is the ability to see from one site to the other. It requires only a straight linear path between two points.
- ***RF LOS:*** RF LOS requires not only visual LOS, but also a football-shaped path (Fresnel Zone), free of obstacles for data to optimally travel from one point to another.



Fresnel Zone.

The Fresnel Zone can be thought of as a football-shaped tunnel between two sites that provides a path for RF signals. In order to achieve the greatest range, the football-shaped path in which radio waves travel must be free of obstructions. Buildings, trees, trucks or any other obstacles in the path will decrease the communication range. If the antennas are mounted just barely off the ground, over half of the Fresnel zone ends up being obstructed by the earth, resulting in significant reduction in range. To avoid this problem, the antennas should be mounted high enough off of the ground so that the earth does not interfere with the central diameter of the Fresnel zone.
It is also important to understand that the environment may change over time due to growing vegetation, building construction, etc.
How high above the ground and other obstacles the antennas need to be can be determined by the radius of the Fresnel zone. The radius of the Fresnel zone depends upon the radio frequency and measured distance between the two radios. Typically 20% Fresnel Zone obstruction introduces little signal loss to the radio link. Beyond 40% obstruction, signal loss will become very significant.

As an example various estimate data points at 850MHz are given below**:**

Range Distance	**80% of Fresnel Zone Radius**
1.0 km	7.4m
3.0 km	12.9m
5.0 km	16.6m
10 km	23.5m
20 km	33.2m

To have ground clearance, the combined antenna height should be equal to the radius of the Fresnel zone; these are the ideal numbers. Most installations will not be able to provide sufficient clearance and this will reduce the range available between the Antennas.

Intech antenna Ideal LOS distance specifications are measured with no Fresnel zone obstructions and no measureable wireless interference.

Antenna Gain versus Beam Widths.

Omni-directional antennas focus energy evenly in a doughnut-shape around the antenna.
Here's an example of antenna gain versus vertical beam width (VBW) using 900MHz Omni-directional antennas:

Gain	**vs.**	**VBW** (*Horizontal Beam width = 360º*)
3dBi	=	60º
6dBi	=	30º
8dBi	=	16º

Directional Antennas focus energy more in one direction. Here's an example of antenna gain versus vertical and horizontal beam widths (VBW & HBW) using 900MHz Yagi antennas:

Gain	vs.	VBW		HBW
9dBi	=	48º	~	54º
11dBi	=	40º	~	48º
13dBi	=	30º	~	30º

Getting the most out of your Wireless Network.

Under ideal conditions, increasing the gain of an antenna at one end by 6dBi should double the distance the link will work over. Higher antenna gain means that the signal will be focused more in one direction; you do not get more power from antenna gain, just a more focused beam of energy to give a greater distance. Using the highest gain antenna is not always best. This is because a higher gain antenna has a narrower focused signal beam; while it does travel further, there is a smaller 'sweet spot'. This can make point to point links more tricky to align and they can easily go out of alignment if the antenna mast moves slightly.

Also, with a high gain omni directional antenna the signal is focused into a narrower vertical beam width. This can mean the areas above and below the antenna may have poor coverage. When choosing an antenna for your system, you need to consider your surroundings first. Sometimes a 4dBi antenna will give you better performance than a 8dBi. If your problem is due to large distances then 8dBi is good, but if the problem is hard surfaces obstructing the signal, then the 4dBi can be better than the 8dBi. The 8dBi has a more concentrated beam and will reflect more off the surfaces, causing multipathing problems that reduce signal quality. Also never forget to consider the use of one or more signal repeaters to overcome obstructions.

Attenuation.

The makeup of a building can affect the signal strength, things such as metal studs in walls, concrete, concrete fibreboard walls, aluminium cladding, foil-backed insulation in the walls or under the cladding, pipes, electrical wiring and tinted or mesh windows.

Here are some common building materials with their typical average attenuation:

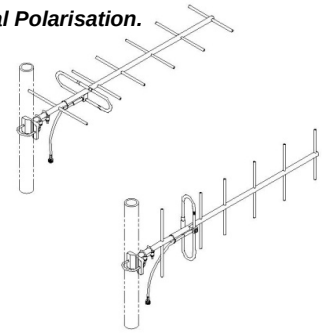
Single glazed window:	0.8dB
Double glazed window:	2.0dB
Timber wall (76mm)	2.8dB
Brick wall: (89mm)	3.5dB
Brick wall: (267mm)	7dB
Concrete Wall (102mm):	12dB
Reinforced Concrete (203mm):	27dB

Solid metal structures are not listed above because radio waves do not propagate through metal. Keep your wireless radio as high as possible and away from metal objects and concrete walls as these can block and/or reflect the signal causing signal degradation. If you are going between floors on a multi story building, tilting the antenna may give you a better coverage.

Example of Horizontal Polarisation.

Antenna Polarisation.

It is important when installing antennas that both ends have the same polarization, otherwise there will be almost no communication between them at all. Polarisation is the relationship between the antennas physical orientation and the electric field that is parallel to the radiating element. Omni directional antennas tend to have vertical polarisation due to the fact that they stand vertically. Most directional antennas can be installed in either vertical or horizontal polarisation; you just have to have the same directional antenna type at both ends.



Example of Vertical Polarisation.

Good Signal Can't be Guaranteed.

Even when all the above precautions are taken into account, no one can guarantee a good link, as there are many more factors that could cause problems.

Important.

Make sure you power off any wireless equipment before you connect the antenna, as you can damage the radio transmitter if you don't. Also, all outdoor coax connections that are exposed to the weather should be sealed with a suitable coax seal tape or the connection may become damaged over time. Many wireless installers forget about this vital part of their installation and end up with expensive repairs a few months later. It is very important to <u>seal all outside connector joints</u> to prevent moisture from entering.
Self bonding tape is supplied with all outdoor antennas.

Intech Wireless Nodes, Bracket Kit and Enclosure.

MODEL	DESCRIPTION	
ezeio-GSM	Ezeio 3G/GSM cellular Controller. The eze System is suitable for a wide range of measuring, logging and alarm applications – from temperature, level, flow, analytical pH etc, energy, run & fault conditions, door switches and security and so on. The system is designed to be easy to install and deploy in anything from single sites to hundreds spread out over a wide area and across the globe.	
ezeio-GPS-ANT	External antenna for connecting to the GPS SMA connector on the Ezeio controller. This antenna is required if using the GPS functions within Eze.	
ZB-P-56	0.3 metre, short length coax extension lead with an SMA bulkhead fitting. Ideally suited for the Ezeio controller antenna connector for mounting the supplied antenna on the outside of a cabinet. *Indoor use only.*	
ZB-P-37	1 metre coax cable. This short length of coax is for situations where the outdoor antenna is mounted relatively close by. It features an SMA connector on one end for the ezeio and N-Male connector to the Antenna.	
ZB-P-38	6 metre coax cable. This is our stock standard for any Ezeio antenna installations, as it connects directly onto the Ezeio Controller and the outdoor antenna. The ideal length of 6 metres allows for more mounting options for the outdoor antenna, which means better RF clearance.	

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