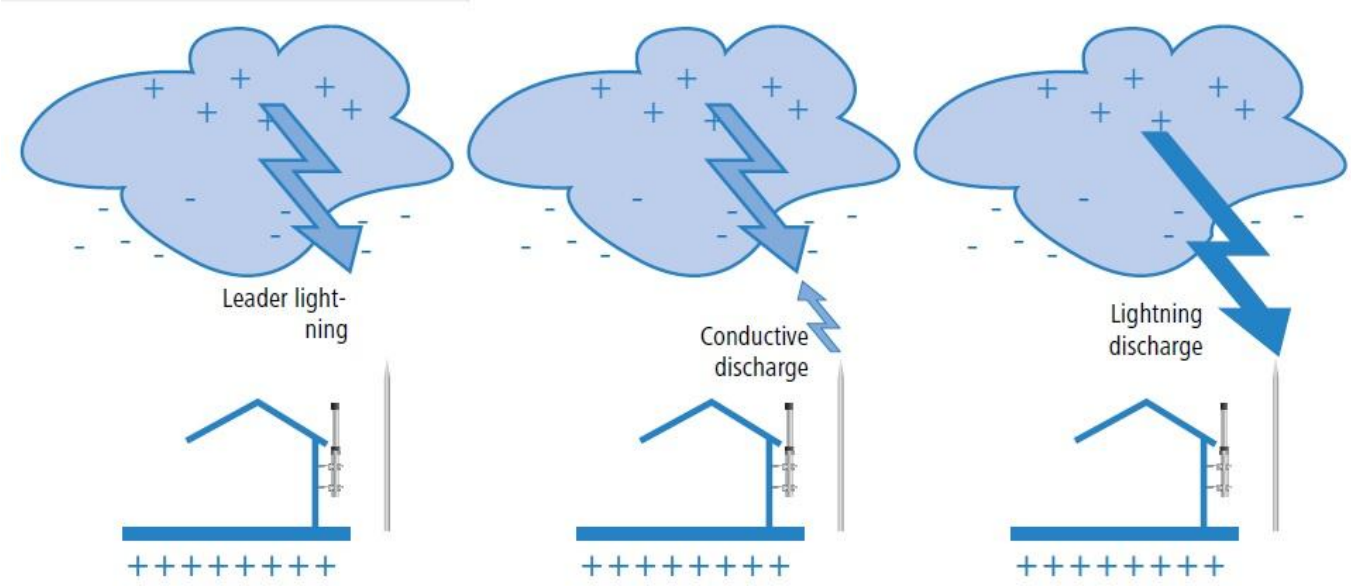
낙뢰 및 써지 보호

Lightning and surge protection

Where do lightning discharges come from?

Lightning flashes are electromagnetic discharges that are caused by differences in electric potential. Water particles are charged through friction when there is weather movement in the atmosphere. The predominantly positively charged particles rise upwards while the negatively charged particles tend to remain at the lower levels. This uneven distribution of electrical charge can cause discharges within the clouds that can be observed as cloud-to-cloud lightning.



As the earth is predominantly positively charged, a difference between the potential of the cloud and the earth arises. As soon as this potential difference is large enough, leader lightning descends earthwards.

Direct lightning strike

The most frequent type of lightning is cloud-earth lightning. A so-called lightning leader develops from a negatively charged center of a thundercloud. This leader descends, and when it is between 10 m and a several 100 m from the earth the electrical field strength increases so strongly in exposed places – for example at the roof of a house or top of a tree or even the tip of an antenna – that similar and opposite discharges to the lightening leader develop there, the so-called conductive discharges. One of possibly many conductive discharges meets the lightning leader and "earths" it. This determines the point where lightning strikes. If an antenna is struck by lightning, the instant increase in voltage is conducted via the coaxial cable to any connected devices, i.e. the Access Points in a wireless LAN system, and this generally results in their destruction. Additionally, any ungrounded components of a wireless LAN system may be subject to sparks or arcing to any earthed metal parts in the vicinity.

Partial discharges

Even if a conductive discharge originates in an antenna it does not necessarily mean that lightning will strike the antenna. In order to feed the conductive discharge in the antenna, a momentary electrical impulse flows through the antenna system – this is called a partial discharge. A partial discharge is therefore a conductive discharge that does not lead to a direct lightning strike. These partial discharges can also result in damage to connected electronic equipment such as Access Points unless protective measures are taken.

Even when there are no visible phenomena such as thunderstorms or a direct lightning strike, invisible electrical discharges from the atmosphere can still occur that can lead to sensitive wireless LAN modules or other electronic devices being destroyed or damaged.

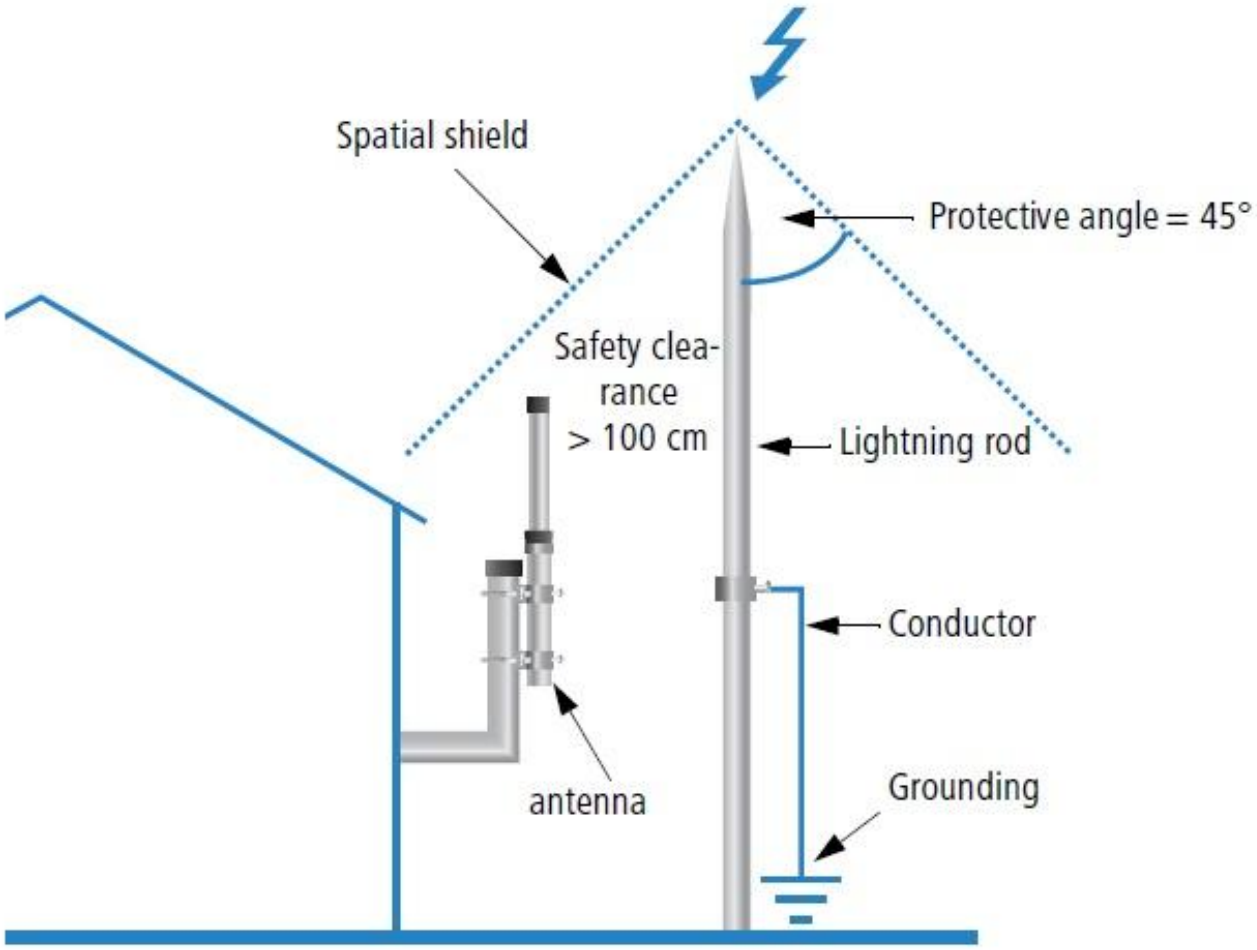
Risks to antennas

Antennas for wireless LAN systems are at particular risk from lightning strike as they tend to be mounted in exposed positions and they are designed to be very good electrical conductors. The more pointed, needle-shaped and exposed antennas are, the greater the danger posed by a conductive discharge that could result in a direct lightning strike or partial discharge.

Please note that the explanations of lightning protection in this documentation only refer to protection for wireless LAN systems. The protection of the buildings themselves and other equipment and associated networks (LANs) must be installed and planned separately, if necessary.

External lightning protection

External lightning protection includes all measures intended to prevent a **direct** lightning strike in the equipment to be protected. This includes, for example, arrester equipment such as lightning rods etc. which intentionally offer an exposed point for electrical discharges. Any lightning striking this equipment is channeled by a conductor along the shortest path to the grounding system. Intentionally "catching" the lightning with the arresting equipment creates a spatial shield where no direct lightning strike is possible. The actual design and construction of external lightning protection depends on the prevailing structural circumstances.



Internal lightning protection

Internal lightning protection refers to measures which counteract the effects of lightning strikes and surges that may arise despite the external lightning protection. These disturbances may for example be triggered when a lightning strike some distance away is subsequently diffused through the power network or by discharges in the atmosphere that are not accompanied by visible lightning. There are two ways in which these surges can get into a building and then spread: Via the connection to the public power supply or via cable entry points, for example antennas fixed to the outside of the building. The following is a description of how to protect the system form the perspective of antennas. Protection for equipment connected to the power supply from surges emanating from the public power supply must be planned and implemented by a specialist electrician.