Radio

Radio communication

Wireless data communications via a radio modem provide a means of maintaining communications with:

- remote units.
- measuring stations.
- external buildings and unmanned installations.
- temporary or mobile sites.

The purpose may be that of gathering test readings, controlling or regulating equipment or recording various kinds of alarms.

Radio communications technology and how to plan, dimension and cope with noise and interference, differ greatly from local communications in a data network.

How it works

Communication equipment is provided using a radio modem that converts the data signal into radio waves for a specific channel with a specific bandwidth. The data signal may require some form of signal processing or filtering before it can be transmitted by the radio channel. In addition, the signal is modulated (by a modem) to a correct carrier frequency and can be transmitted via a radio link to the receiver. Irrespective of whether the source is analogue or digital, the transmission is nearly always analogue. The receiver equipment decodes and reconstructs the original signal.

The available frequency range for radio communications is limited and regulated by an international agreement (ITU).

Radio waves are propagated in the atmosphere in the layer between the ionosphere and the surface of the earth. Communication conditions can vary greatly, depending on the frequency band, ranging from the longest wavelengths of up to 1 000 metres (0.63 mi) in the ELF band to shortest ones of 10 mm (0.34 in) in the EHF band. Radio modems operate in the UHF band at around 440 mhz. The UHF band between 300 and 3 000 mHz also contains radar, radio, TV, NMT mobile telephony, mobile radio, satellite communications, amateur radio and both GSM and wireless telephones.

Frequency band	
ELF	300–3000 Hz
VLF	3–30 kHz
LF	30–300 kHz
MF	300–3000 kHz
HF	3–30 MHz
VHF	30–300 MHz
UHF	300–3000 MHz
SHF	3–30 GHz
EHF	30–300 GHz

Attenuation and noise

A propagated radio wave is affected by both the ground and the air layers through which it passes. In the frequency bands in which radio modems operate, with wavelengths of around 1 metre (3.28 ft), there are many objects such as hills and buildings that can cause a radio shadow (cf. Mobile telephony). This is in addition to intermittent interference from other equipment. Such interference caused by objects is termed shadow or interference fading, and causes signal attenuation or distortion.

The signal reaching the receiver is often very weak compared with the transmitted signal but this in itself does not imply any quality deterioration of communication. What may cause problems is interference outside our control, noise that is added to the signal. This not only occurs in the receiving equipment but also exists in the form of thermal noise (thermal motion of particles), atmospheric noise (electrical phenomena such as lightning), cosmic noise (incipient radio-frequency radiation from the sun or other so-called galactic noise) and locally generated noise (electrical equipment in the receiver's surroundings).