# LIGHTNING PROTECTION

The single greatest cause of equipment malfunction and failure is due to the effect of lightning strike. Precautions against lightning strike damage are built into our equipment in the form of energy absorbing devices. However, in order to function correctly, these devices require an adequate low-resistance (<=0.01 Ω) earth and it is important that the installation is carried out to provide this. Even when there are no lightning strikes, the presence of an electrically charged cloud can give rise to unequal earth potentials over the range which in turn can cause equipment damage.

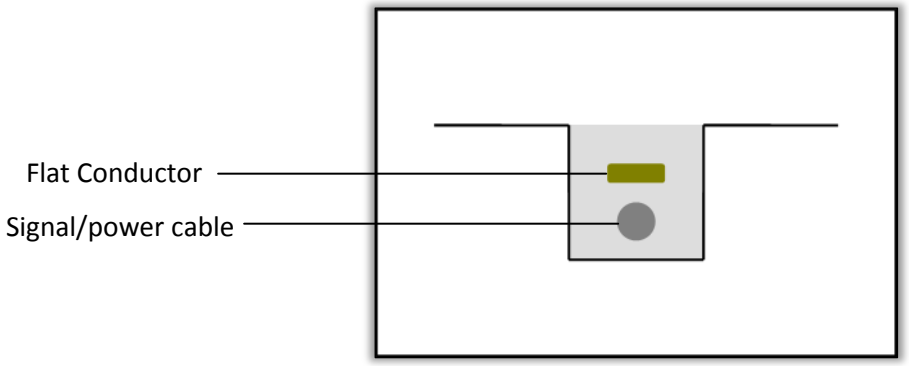
***At the outset, it must be stated that there is no adequate protection against a direct lightning strike***.

If lightning directly strikes any piece of equipment or cable then damage will be sustained, the severity of the damage depending on the path that the electrical discharge takes to earth. However a nearby lightning strike, say within 1 to 2 kilometres from the installation, will induce potentially damaging voltages in the signal and mains cabling; in these circumstances the cabling simply acts as an antenna of approximately 1.5Km in length. In order to protect the equipment against the induced voltage from a close lightning strike, the excess electrical energy has to be absorbed. Each electronic unit, for example, the head amplifier, contains protection circuits which limit the induced voltage to safe levels. A vital factor in the installation procedure is to ensure that the earth screens around the cables are continuous and are not damaged in the process of installation.

The essential points of good practice in installing a system that offers the greatest immunity to lightning strike are:

- Ensure that *low-resistance* local earth connections are made, either by the use of earth rods or by connection to a *low-resistance* conductor to earth, such as a metal water pipe. Use flat copper braid to connect to the earth. It is important to ensure that all cable earth screens are continuous and not damaged; any damaged cable must be replaced.
- Protect the circuit by absorbing the induced power at as many points as possible in order to ensure that the local power level that is dissipated is within the peak ratings of the protection devices.
- In order to minimise the induced voltage and, in addition, to equalise potentially damaging earth voltages, use a flat metal conductor laid above the main cable run (see diagram below).

This latter flat conductor minimises the induced voltage into the signal and mains cables by acting, electrically, as a shorted turn. In other words, the low impedance of the flat earth conductor substantially reduces the local field strength. In addition, the flat conductor equalises the general earth potential. In the absence of a lightning strike, a charged cloud in closer proximity to one end of the range to the other will cause large variations in local earth potential. The flat conductor equalises the earth potentials and reduces them to a safe level.




**Section through Cable Duct**

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