

<b>Case study #</b>	1.6
<b>Title</b>	Electric fence interference
<b>Type of trouble</b>	Acoustic noise, degradation, abnormal operation, loss function.
<b>Source of trouble</b>	Electric fences used to protect property or keep animals contained generally use a high voltage (8 kV) impulse (ms) to energize the fence at intervals of about 1 second. Noise/EMC.
<b>System affected</b>	Customer's equipment, office equipment, access network.
<b>Location</b>	Customer premises, telecommunication centre.
<b>Keywords</b>	Immunity, common mode chokes, screening, filtering.
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#### System configuration

A normal PSTN or ISDN telephone line can be affected. Close proximity to the source generally results in noise being generated (on buried and aerial telephone cables running parallel to the electric fence) up to a few tens of metres away.

#### Searching techniques

Detection is simple, as regular clicks, every second, can be heard on the telephone, or data errors are received at regular intervals.

#### Mitigation method /Results/Conclusion

A number of mitigation methods are available in such circumstances. Ideally, the problem should be solved at the noise source.

The installation of the electric fence should be checked to ensure that it meets the manufacturer's guidelines: the generator earth should be remote from any other power earths and of low enough resistance so as not to cause excessive step potential ( $< 200\text{ V}$ , 1 m from the earth point). The fence should be installed on suitable insulation; vegetation should not touch (should be cut back) the fence wires; in areas of high earth resistivity, a base wire connected to the generator earth point should be installed; alternating the fence wires forming the fence (e.g., from the bottom to the top – earth/HV/earth/HV) can help reduce stray currents and provide a more effective fence; sitting the generator mid-way along the parallel section of the route and energizing the fence in both directions can help minimize inductive effects; avoiding making a total loop around a field with the wire (break inserted at a post) can reduce loop antenna effects.

If the above does not succeed or the fence owner is uncooperative, then mitigation measures need to be taken on the telephone system. First, ensure that the cable balance of the network is at least 60 dB; otherwise, mitigation measures will not be as effective. Most electric fence interference affects the customer end-terminal equipment. The fitting of a choke and drain circuit will in most instances cure the problem (Note that a connection to earth is necessary for the drain to be effective.). See Rec. ITU-T K.37. In the small number of instances where the telecommunication centre equipment is being overloaded by the induced impulses, then the fitting of 100 mH common mode chokes can be quite effective. If the telecom cable has a screen available along the section parallel to the fence, then ensure it is earthed at each end, and at a few intermediate points of the parallelism. The filters described above are generally very effective, especially with services such as pair-gain or ISDN (see Rec. ITU-T K.37).

#### References

Rec. ITU-T K.37; Annexes A and B.