



Safe and Effective Electric Fences

How Does an Electric Fence Work?

An electric fence controls livestock by delivering an uncomfortable current flow through the body for a sufficiently short duration so as not to cause injury to the animal. In order for this to occur, the animal must touch the fence wire and complete the circuit from the "hot" terminal of the fence energizer, through the animal to earth, and back to the "ground" terminal of the energizer (Figure 1).

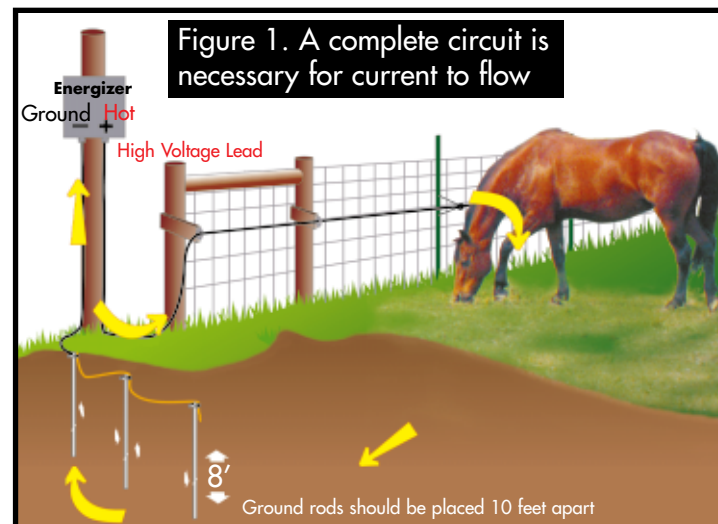


Figure 1. A complete circuit is necessary for current to flow

Electric Fence System Components

There are three main parts to an electric fence:

- (1) The **energizer** (fence charger) produces a high voltage charge that only lasts a fraction of a second.
- (2) The **fence** is an extension of the high voltage terminal on the energizer. Types of fence material depend upon the animal to be controlled and whether permanent or temporary.
- (3) The **ground rods** return the current to the energizer. They are necessary to complete the circuit.

Improving the grounding may be the lowest cost, most effective means of improving the operation of the electric fence system.

Selecting the Proper Energizer

Most early fence energizers were **high impedance** (resistance) units that worked over short distances when they were weed-free. Dry soil conditions had little effect on the effectiveness of high impedance units.

Energizers today are generally of the **low impedance** type that deliver a very high current to the fence for a very short time. Even when some grass or other vegetation is touching the fence, the system can still deliver enough current to control livestock. However, if you skimp on the number of ground rods with a low impedance energizer, the current delivered to livestock can be drastically reduced.

Choosing an energizer that is **labeled** by a testing laboratory is recommended. **Caution** should be taken to prevent small children from contacting high energy output electric fences. All individuals should take extra care to avoid electric fence contact with your head or neck.

For other references on electric fence installations visit the following web sites:

www.egr.msu.edu/age/
www.wfec.org

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Grounding Is Essential

One of the most important aspects of making sure an electric fence system works effectively is proper grounding of the energizer. If an energizer does not control livestock, the solution is not necessarily a more powerful energizer. **Improving the grounding** may be the lowest cost, most effective means of improving the operation of the electric fence system.

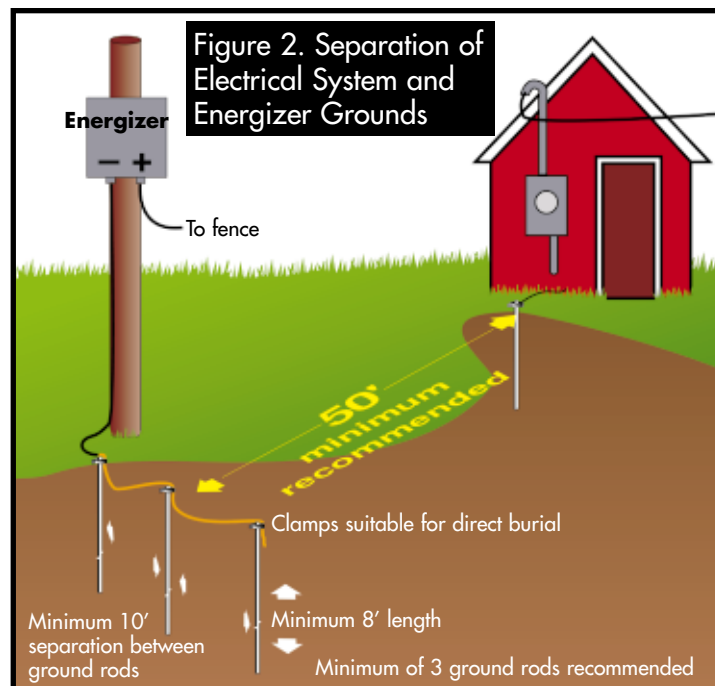
- The grounding required by a fence energizer will vary depending on the soil type and moisture.
- For an average soil, it is recommended that a 5 Joule low impedance charger be grounded with **three, 8-foot ground rods** spaced at least 10 feet apart.
- Doubling the Joule output of the energizer would double the grounding needed.

One method to check the adequacy of the earth return system is to measure the voltage between the energizer ground rods and a connection to the earth a few feet away such as to a screwdriver stuck in the ground. If there is a perceivable voltage between these points with the fence wire touching the earth, the energizer grounding should be improved. This voltage can be measured with a tester designed to measure high voltage fences.

Where to Install the Energizer

An energizer should be placed at a location where it is possible to maximize separation of the energizer grounding and electrical wiring system grounding. The best place for the energizer may be outdoors away from animal buildings and grounded equipment. If an energizer is installed indoors, the high voltage must be taken to the outside using **high voltage**

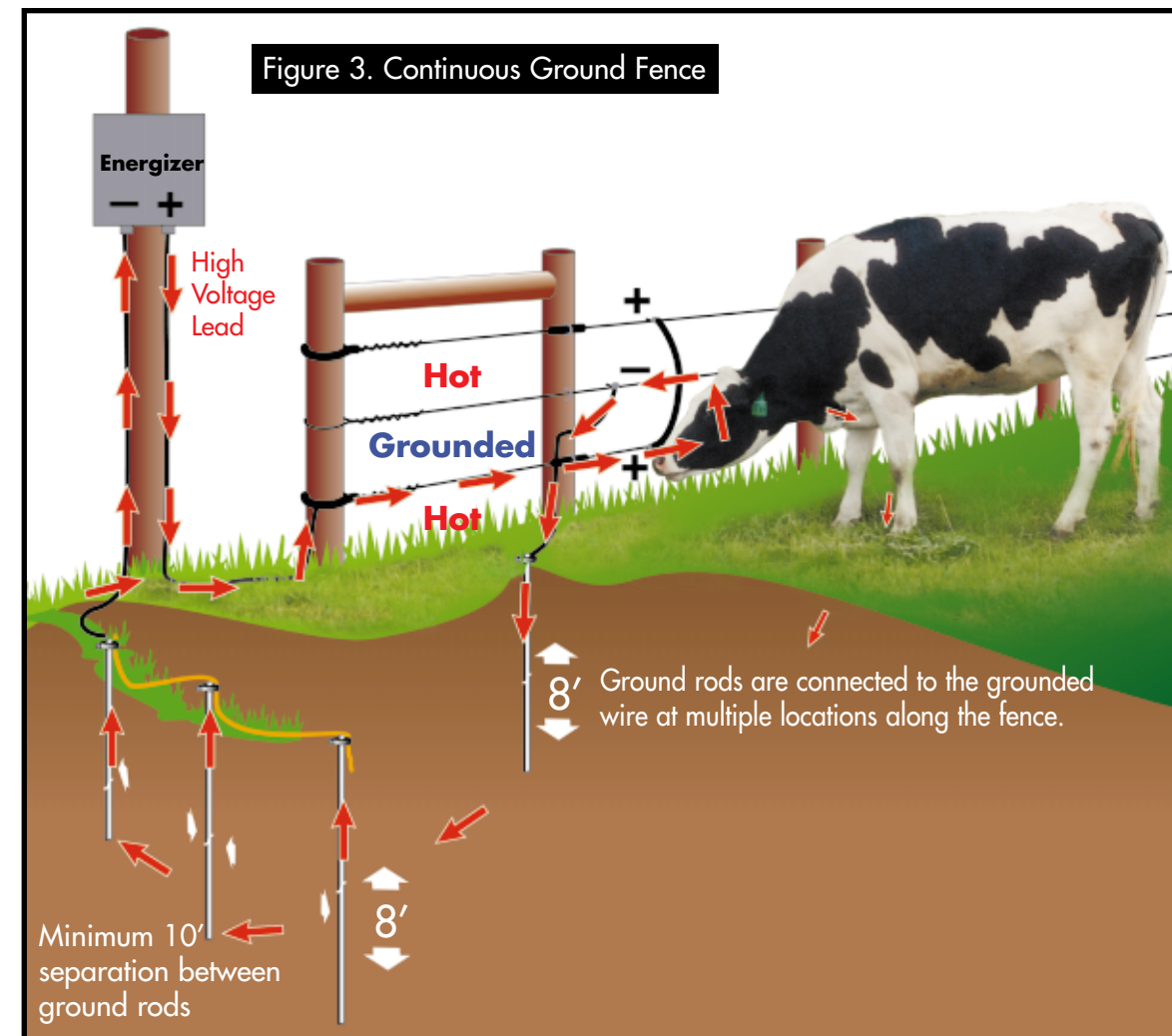
The energizer must have its own grounding electrode located well away from any other grounds or metal object in the earth



lead cable (20,000 volt insulation is recommended). Electrical wire of the type used for the building wiring, with 600 volt insulation, must never be used for this purpose.

Preventing Unintended Shocks

An improperly installed electric fence system can result in unintentional shocks to livestock at grounded equipment such as at waterers, feeders or even in a milking barn. The most frequent cause is improper grounding of the energizer. **The energizer must have its own grounding electrode** located well away from any other grounds or metal object in the earth (50 feet minimum recommended, Figure 2). An energizer must never be grounded to the farm electrical system grounds, to the utility system grounds, to metal water pipes, or to metal objects in a building



such as stalls, fences, or dividers. Such improper grounding puts the metal objects and livestock in the electric fence earth return path.

Types of Fence Circuits

A **standard fence** circuit can use single or multiple wires with the animal contact made between the fence and the earth. In areas where the soil is sandy or dry, a path through the earth is not easy to obtain and a **continuous ground fence** circuit is recommended (Figure 3). The energized wire(s) are alternated with grounded wire(s)

connected to ground rod(s) near the fence energizer and at other locations. When an animal touches both an energized wire and a grounded wire, the intensity of the shock will be greater than when touching the energized wire and the earth. Connect the grounded wire to ground rod(s) and use the earth as a part of the return path back to the energizer to reduce lightning damage. Achieving reduction of lightning damage may require additional steps on both the fence and the power supply sides of the energizer.