

GETTING DOWN TO BASICS

For any system to work effectively one has to get the basics right and electric fencing is no exception. The good news is you don't have to be a rocket scientist to understand the basics of electric fencing. In fact it's easier to explain these than the off-side rule to your wife during a rugby test match – especially when Ritchie McCaw is playing.

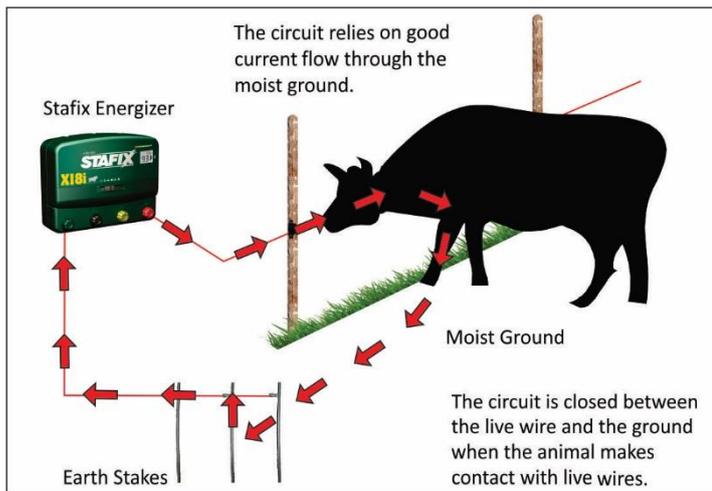
There are three components to an electric fence system – (four if you're talking security): the energizer, the earthing system and the fence line itself. If any one, or more, of these components is faulty, the whole system will be faulty.

The energizer is the heart of the system; it is the 'electron pump' that provides the pressure (Voltage) and energy (Joules) to power the whole system. The earth grid is necessary to complete the circuit and the fence line itself is the conduit through which the current (Amps) flows. (In the case of a security fence there is a further component – the monitoring system). Link these three components together and we have an electric fence circuit.

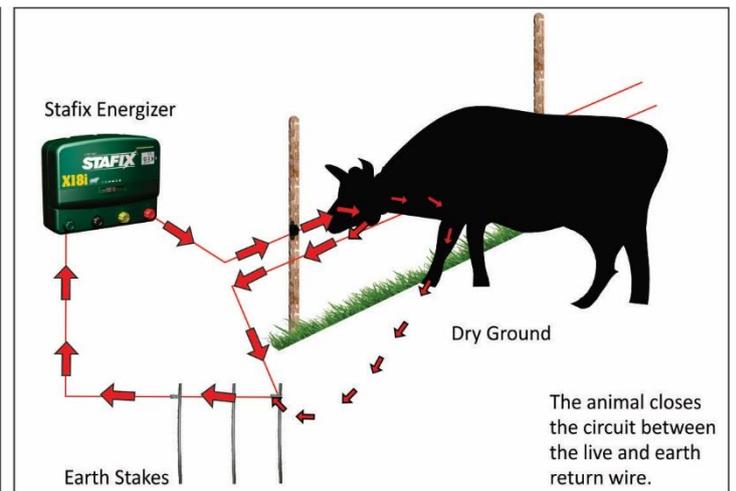
The animal, when it makes contact with the live wire, is in effect the switch which closes the circuit and the current can now flow from the red, positive terminal of the energizer to the green, negative terminal of the energizer during the course of which the animal receives a shock.

Basic Circuits and Wiring Configurations for an Electric Fence

Circuit 1. Circuit for Moist Conditions



Circuit 2. Circuit for Dry Land Conditions



Circuit for Moist Conditions

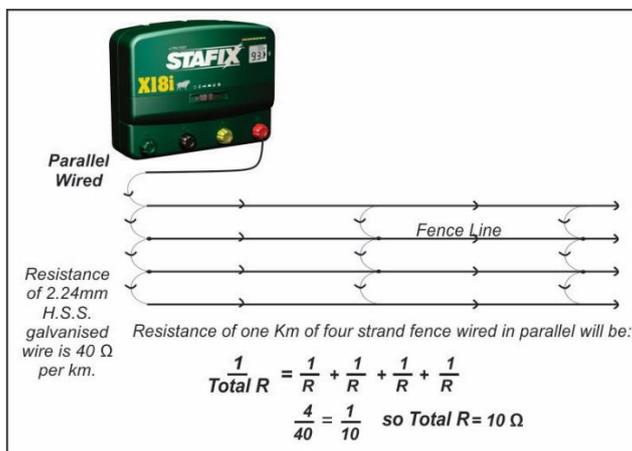
Here the current leaves the energizer, runs along the live fence wire and passes through the animal making contact with the fence wire. The current then passes through the ground following a path of least resistance to the earth stakes and then back on up into the energizer thereby completing the circuit. This flow of current gives the animal a good shock. This circuit, however, works well only in moist conditions because damp ground is a good conductor and the electrons will flow through it. If the ground is very dry, one has to resort to **Circuit 2**.

2. Circuit for Dry Conditions

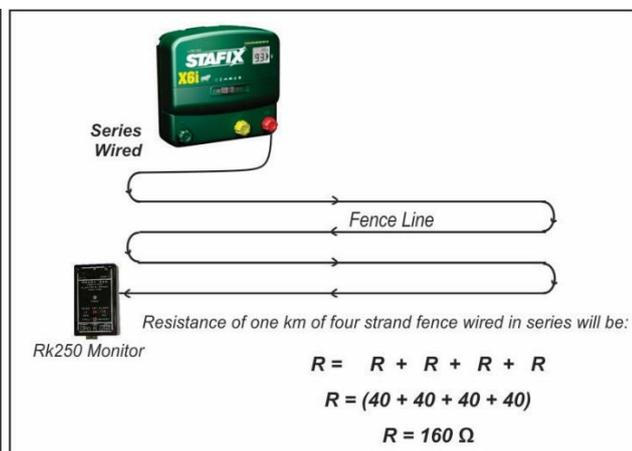
Here one cannot rely on the ground to conduct the electricity back to the energizer. So one has to introduce a second wire into the system called an *earth-return wire*. Now, when an animal makes contact with the fence, it may receive a slight shock but not enough to deter it completely. Should it then try to push through the fence, it will now make contact with the two wires – the live and the earth-return wire. The current will now flow from the energizer, along the live wire, through the animal to the earth earth-return wire, then back along this return wire to the earth pegs and from here back on up into the energizer and the animal will receive a good shock.

Parallel vs Series Wiring (1Km fence line, 2.24mm galv. wire, wire resistance 40 Ohms per Km)

Parallel Wiring



Series wiring



<p>Parallel Wiring</p> <p>Parallel wiring is where all the wires are joined together. This configuration considerably reduces the resistance of the fence line making it possible to fence much longer distances. It will also deliver a more powerful shock. However, if one wire is cut, current will still pass along the remaining wires making it less desirable for security purposes but better for animal control.</p> <p>Parallel wiring = lower resistance but less sensitivity making it more suitable for animal control purposes.</p>	<p>Series Wiring</p> <p>Series wiring is where the fence line is wired in one continuous loop. This configuration is generally used on security fence installations because if you cut any one wire you will break the circuit and the voltage monitor will trigger. The disadvantage of this configuration is that the resistance of the system is the sum of the resistance of the individual strands.</p> <p>Series wiring = higher sensitivity but higher resistance so is used on security fences.</p>
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Choosing an Energizer

Choosing the correct energizer for the application you require can be quite daunting. Firstly, there are a number of manufacturers on the market, and secondly, within a single brand name there is also a wide choice of models from which to choose. Here are some factors to consider when making ones choice:

- Choose a well-known brand name. Brands pop up and disappear and you're then landed with an unserviceable unit.
- Make sure that the unit you choose has a valid COC (*Certificate of Compliance*) and an LOA (*Letter of Authority*). These are legal requirements that will cover you should you ever be involved in a law suit.
- Make sure that service back-up is available. This is especially important when it comes to security installations.
- Choose a unit of modular construction for ease of service.

The actual choice of a unit within a brand will now depend on a number of other factors:

- Is the unit to be used for portable strip grazing or permanent fencing? (Battery or mains?)
- Do you have mains power available or will you have to use a battery unit - possibly with solar charging?
- Is it for cattle or sheep and goats? Sheep and goats generally require a more powerful unit as the wool is an insulator. It is best to introduce sheep to electric fencing after shearing.
- If the unit is for security purposes you will require a monitored system.
- The joule rating of the energizer will give you an idea of how powerful a unit is. Manufacturers use a misleading and over-simplified criterion of one joule to power 10Kms of wire, implying that a one-joule unit will power a 10Km fence and a 50-joule unit 500Kms of fence. Anyone who has installed an electric fence will know that this is ridiculous. There are many factors that will influence the distance one can achieve with an energizer, such as diameter of the wire; type of wire - galvanised, aluminium or stainless steel – all have different resistances; the standard of erection; the soil type (moist or dry), the condition of the earthing; the quality of the materials used etc.
- When looking at joule ratings, beware! Make sure that you are comparing apples with apples. Some manufacturers advertise stored energy while others out-put energy. Stored energy will give a higher figure than out-put so it may look more powerful while it is not. This is the classic little boys, 'Mine is bigger than yours,' syndrome. (American manufacturers are particularly guilty of making wildly exaggerated claims.)
- Beware also of buying on price alone. *Goedkoop* can be very *duurkoop* if you buy an energizer that does not meet your requirements. Broken fences, lost stock, or worse – animals on public roads, are all hazards that may occur.

The Earthing System

I cannot stress enough the importance of a good earthing system and if there is just one thing you remember from this series of articles it is the importance of good earthing. A rusty six inch nail or an old fencing standard does not constitute a good earth. In fact the new legislation stipulates that the energizer must have at least three 1.2m galvanised (copper or stainless steel) earth stakes, 1.2m apart, at the energizer and in urban areas, additional earth stakes at 30 meter intervals. This is increased to 100m intervals in rural areas. For the really large energizers on the market, even these specs are inadequate and one may even find one has to install up to ten earth stakes at the energizer to really enjoy the benefits of a very big energizer.

The Fence Line Itself:

- Strainer posts: Remember, good fences make good neighbours and good strainer posts make good fences. So make sure your strainers and corners are strong enough and are well anchored.
- Insulators: Use the right insulator for the task at hand. In other words strain insulators for straining and intermediates for in-between. Also, if the area is prone to fires use fire proof porcelain or fire resistant GFT (*Glass Fibre Thermo Moulded*) insulators. Use UV stabilized plastic if there is no likelihood of fire hazards.
- Wire: Generally for permanent electric fence 2.24mm high strain, galvanised, steel wire is adequate (heavily or double galvanised for coastal areas).
- Joints: All joints should be clamped and even sealed. This is especially important on long fence lines.
- Galvanized to galvanized: All components should be hot-dipped galvanised. Where unlike metals are joined together on an electric fence, electrolysis will occur causing rapid degradation of the metals, e.g. copper earth stakes to galvanised wire
 - Wire tension: Do not over tension fence wires. This will crack the galvanizing and reduce the lifespan of the wire.

Note: The electric fence is a psychological fear barrier and so relies on the shock to contain the animals. Although the fence must be neatly and correctly erected, it can be of relatively light construction. It is this that makes it so economical.