lead of the fault locator to a ground wire of the fence and hold the fault locator so that the probe rests on the active fence wire. Then follow the direction indicated by the directional indicator lamps.

As you move closer to the fault you may find that the voltage reading diminishes but the current reading remains roughly the same. If the current reading suddenly drops this will indicate that you have gone past the fault. In that case retrace your steps to locate the cause of the fault.

In some cases the effect of the fault is so severe that the voltage will drop to near zero. If that should happen it may no longer possible to obtain a reliable indication of the direction of the fault, in which case one of two things may happens; either the fault locator will no longer give a display, indicating a complete short circuit across the fence somewhere nearby, or else **both lamps** will flash. In the latter case a current reading will still be displayed if you haven't yet reached the fault or the current reading show a significant drop if you have passed the fault.

The current into the load depends upon the **voltage** on the fence as well as the resistance of the load according to the formula:

current (A) = voltage (V) / resistance (ohms)

For example, suppose that **voltage = 3,000 (3,000 volts = 3 kV)** and that **resistance = 500 (ohms)**. In this example, the current is:

current = 3000 / 500 = 6 (amps)

So, if the voltage and current readings are 3 (kV) and 6 (A) respectively, these readings would indicate that a load of about 500 ohms is present across the fence. A load of 2,000 ohms to 10,000 ohms is relatively light. It might be caused by dry vegetative growth alongside the fence. 500 ohms to 2,000 ohms is moderate. It might be caused by an animal or green grass growing alongside the fence. A load of 100 ohms to 500 ohms is heavy. It might be caused by a tree fallen onto a fence or by thick wet grass growing alongside the fence. Anything less than 100 ohms is extreme.

7. Care and maintenance

Always store your Thunderbird Fault Locator in a dry place, away from corrosive chemical substances. Take special care to prevent water from entering the unit. Examine the unit each time before use to make sure that the case has not been damaged. Do not use if a crack develops in the case because such use could result in a possible electrical shock.

Never attempt to use the Thunderbird Fault Locator for any purpose other than as described in these instructions as to do so may result in the severe hazard of a possible electrical shock.

If the battery is flat, remove the battery from the unit to prevent the danger of corrosion due to leaking battery terminals. Likewise, please remove the battery if you do not expect to use the unit for some significant period of time (e.g. six months or longer).

To clean the unit, use only a slightly damp cloth and allow to dry before using. Never use cleaning fluids.

Thunderbird Fault Locator Instructions

1. Warranty

This Thunderbird Fault Locator is warranted against any defects in materials or workmanship for a period of 12 (twelve) months from date of purchase.

If this instrument is found to be defective within the warranty period it should be returned for repair to the place of purchase or to an authorized Thunderbird reseller or repairer, **freight prepaid**, along with proof of purchase. Any defective component or fault due to workmanship that may arise during the warranty period will, at our option, be replaced or repaired free of charge.

This warranty does not cover any faults arising from misuse or operation contrary to the instructions given herein, nor does it cover faults arising from ingress of water or accidental damage.

2. Warnings and precautions in using your Thunderbird Fault Locator.

To avoid the possibility of electrical shock it is essential that certain precautions be taken during both storage and use. Some important **do**'s and **don't**s are:

Do always store your Thunderbird Fault Locator in a dry environment and never use this instrument if there is any possibility that water has entered into it.

Don't store your Thunderbird Fault Locator in a place where it may be exposed to corrosive fumes, for example, near an automotive battery or near agricultural or industrial chemicals.

Do always make sure that, during use, the **earth** wire of this instrument is connected only to the non-energized **earth** wire of an electrified fence, **never** to a live fence wire.

Don't use this instrument on an electrified fence that delivers impulse voltages greater than 10,000 V (10 kV), and don't use this instrument for measuring any voltage or current other than that of an electrified fence. **Never** attempt to use this instrument to measure live mains voltage.

Don't, under any circumstances attempt to use this instrument if the case is cracked or otherwise damaged. If the case is damaged, return it to the place of purchase or to an authorized Thunderbird dealer for repair.

3. Battery installation

To install or replace a battery, first remove the two screws underneath the cover using a Phillips type screwdriver. If replacing a flat battery, disconnect the old battery by pulling it away from the plug which is attached to the battery lead.

The battery terminals and the plug terminals are polarized so that the plug can be connected in only one way. Make sure that the terminals of the plug are correctly orientated to lock with the corresponding terminals of the battery. Do not allow the plug

terminals to touch the battery terminals in the reversed orientation.

When you have connected the battery leads to the battery, fit the battery into the battery compartment and replace the cover. Make sure that the cover is securely attached to the case and that there are no gaps between the cover and the case after the attaching screws are tightened.

4. Operation

To use your Thunderbird Fault Locator, first attach the earth lead to the earth wire or ground of the electrified fence. Then place the locator so that the metal probe at the front end of the locator rests on the active wire of the fence.

The locator automatically switches on and gives both a voltage and a current reading whenever a peak voltage at least equal to 0.2 kV is present on the fence.

If a voltage is present then a reading of the voltage will be displayed on the left half of the display. At the same time a reading of the current will be displayed on the right half of the display. The two readings are separated by a colon (:).

When voltage pulses are present on the fence, either or both direction indicating lamps just below the main display will light momentarily each time a voltage pulse is detected on the fence.

If only one lamp lights up then this lamp indicates the direction of current flowing through the fence. For example, if only the left side lamp lights up then current is flowing through the fence from right to left, signifying the possibility of a fault along the fence toward the left. If only the right side lamp lights up then current is flowing in the opposite direction, signifying the possibility of a fault along the fence toward the right. If both lamps light up simultaneously then either of two possibilities exist, either:

- the voltage on the fence is too low to indicate a direction, in which case the current reading (right hand side of main display) may or may not be zero, or

- there is insignificant current flowing in the fence wire, in which case the current reading will be zero, while the voltage reading may or may not be zero.

5. Normal and fault conditions of a fence

An electric fence in normal (good) condition will usually give a relatively high voltage reading and a relatively low current reading everywhere along the fence. The reverse usually applies to an electric fence in which a fault condition exists. Fault conditions occur in several forms. Some of the most common of these include:

Poor connections - These are often accompanied by rust on fence wires and often arise when improper connecting techniques are used. A poor connection can often be detected by measuring the fence voltage at either side of the connection. If the **voltage** readings are similar then the connection is probably satisfactory but any significant difference in voltage readings indicate a bad connection.

Broken fence wires - A break in a fence wire can be detected by a relatively high voltage reading on the fence at the energizer side of the break, and the absence of any significant voltage on the other side.

Shorts - Often a fallen object causes an active fence wire to short-circuit to an earth wire or to ground, causing a marked drop in voltage on **both** sides of the fault. In these cases, the voltage readings (if any) do not usually differ significantly on either side of the fault. However, the **current** readings may differ greatly. In such cases the higher current reading will occur on the side of the fault nearer the energizer.

Excessive vegetative growth around fence, especially during wet weather - The effect of excessive vegetative growth is usually distributed over a much wider distance and the fall in voltage is usually not as great. It is therefore much more difficult to pinpoint exactly where the fault occurs. Ensure that any lush vegetation is kept clear of the active wires.

Resistance and Capacitance – Under normal conditions voltage readings are relatively high over most or all of a fence and the current readings are low. However if the fence is very long the voltage readings can be somewhat less than might be expected and the current readings may be higher. The electrical **resistance** of the fence wires is cumulative with length of fence, which diminishes the power available with distance from the source of power. The **capacitance** acts somewhat like a resistance in **parallel** with the fence wire(s) and increases the **current** that might otherwise flow in the fence. In general, the longer the fence, the greater the overall capacitance, and the greater the current flowing in the fence due to that capacitance. In this respect, the effect of capacitance is similar to that of vegetative growth, for example, and can often be mistaken for a fault condition in a fence even when the fence appears to be otherwise in perfect condition.

6. Interpretation of readings

The **voltage** reading (left side of main display) is the peak value of any voltage pulses that may exist on the fence. The reading is given in units of kV (1 kV = 1,000 volts). The highest voltage that can be displayed is 9.9 kV. If the voltage exceeds this value then the display will show “HI”. Typically a voltage reading will be from 6 kV to 8 kV for a fence in good condition. The reading may be somewhat less if there is a fault on the fence.

The **current** reading (right side of the main display) indicates current (measured in amps) flowing along the wire. The current may be due to capacitance of the fence, especially if the fence is a long one. Current may also flow along the fence due to a **load** across the fence. The load may be an animal touching the fence, or some other object or it may be due to vegetative growth touching the fence.

When a fault occurs in a fence that results in an abnormally high current reading, the direction of the fault can usually be determined by observing which of the direction indicator lamps lights. Thus is the right indicator lamp lights then the fault is most likely in the direction to the right. Conversely, if the left indicator lamp lights then the fault is most likely in the opposite direction.

The best approach to locate a fault (if the fault results in an abnormally high current reading) is to start somewhere near the power source (energizer). Do not start closer than about 10 m because many energizers generate magnetic fields which may cause the fault locator to give a misleading direction indication. Connect the ground