

FENCESCOPE™

MULTITOOL

USER MANUAL



NEMTEK
Electric Fencing Products



www.nemtek.com

FOREWORD

We hope you enjoy using our product. We are passionate about what we do and hopefully this becomes apparent in using this instrument. It will enable you to evaluate electric fence installations, electric fence energizers, and also be an indispensable diagnostic tool. Used properly it will enable the user to reduce losses associated with a fence installation and, if permitted, choose the appropriate operating voltage of the energizer for most effective results. We would appreciate feedback regarding this instrument in order for us to tailor equipment that suits your needs: fencescope@nemtek.com. Kindly visit our website, www.nemtek.com, to view other electric-fencing related products.

LIMITED WARRANTY






Each FenceScope will be free from defects in materials and workmanship for one year. The warranty does not cover disposable batteries, leads, alteration, damage from neglect, contamination, exposure to moisture, misuse, accident or abnormal conditions of operation or handling, including failure caused by use outside of the product's specifications, or normal wear and tear of mechanical components. Nemtek will, at its discretion, repair at no charge, replace or refund the purchase price of a defective product purchased through a Nemtek authorized sales outlet and at the applicable international price. Nemtek reserves the right to charge importation costs of repair/replacement parts if the product purchased in one country is sent for repair elsewhere.

This warranty is your only remedy, no other warranties, such as fitness for a particular purpose, are expressed or implied, Nemtek shall not be liable for any special, indirect, incidental or consequential damages or losses arising from any cause or theory.

Designed and manufactured in South Africa.
Nemtek (pty) Ltd.
Northriding Commercial Park
Stand 251
Aintree Street
Northriding
Randburg
Johannesburg
South Africa.

WARNING

Electric-fences can be dangerous. Approach with extreme caution and never under the influence of alcohol. Be aware that it may be possible to receive a shock when using the FenceScope™ due to improper use or damage.

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See Centerfold for a brief Overview

FenceScope

Leads + -




1000 Ω Load resistor

2 GETTING STARTED




2a Turning the FenceScope™ On/Off.

Turning ON

Press the  key and the NEMTEK screen will appear.
If no FenceScope™ function is chosen within 5 seconds the Help menu will appear on the screen.

Turning OFF


The unit will automatically turn itself off, if not used, after a time delay. The delay period is a function of the last function used. Inadvertently turning the unit on will result in a delay of fifteen seconds whilst a “freeze display” will have a turn-off delay of 5 minutes.

Alternatively, using the  or  keys, return to the Nemtek screen, and press the  key briefly.

Push
enter
to turn
on



2b Turning On the Display Back light.

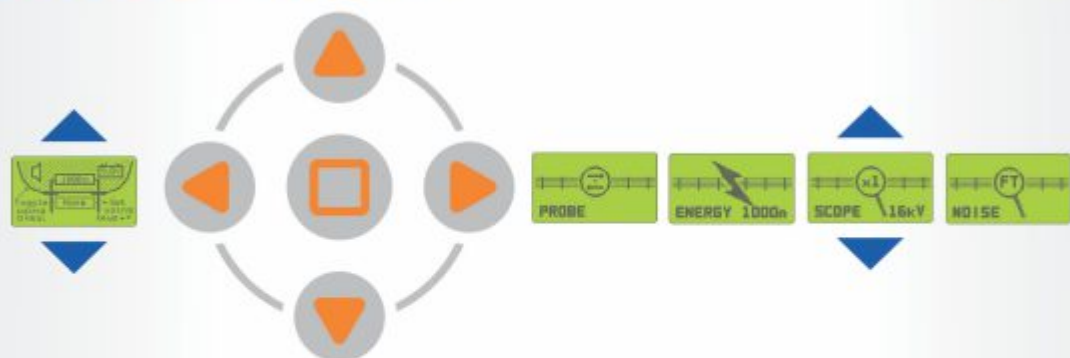
Press and hold the  key until the back light is lit.

Press and hold the same button to switch the back light off.

Push and hold
enter
to turn back light
on/off



The FenceScope™ can be used for routine checking and maintenance of an electric fence. Typically indicating fence voltage, current amplitude and direction, and pulse repetition rate. It can give an audible indication, with pitch proportional to fence voltage, that is useful under poor lighting conditions or awkward locations.



The key is the Enter (Accept) key. After navigating to the desired function, press the key. The countdown timer screen will be displayed. On receiving a pulse from the fence, the measured parameters will be displayed. If no pulse is received within the allowed period, the "No Impulse Detected" screen will be displayed for two seconds followed by the original measurement function that was selected. Press the key again to repeat a measurement.

To abort a measurement or go to another function press either the or keys.

To "freeze" a measurement or waveform briefly press the key.

3 THE 4 KEY FUNCTIONS.

3a PROBE FUNCTION.

For a quick measurement of fence voltage and current parameters do not attach any leads to the FenceScope.

After turning the FenceScope on, from the Nemtek display, press , and the PROBE display will show, . Press to activate the measurement. The display will show a decrementing counter, . Hook the metal clip of the FenceScope onto a live strand of the fence as illustrated in Figure I, and on receiving an impulse, the fence voltage and current amplitude and polarity will be displayed.





Figure 1 :
Position of Live Strand
in Probe Function



If an accurate voltage measurement is required, connect the negative (black terminal at the bottom of the FenceScope) to the earth strand of the fence as illustrated in Figure 2.

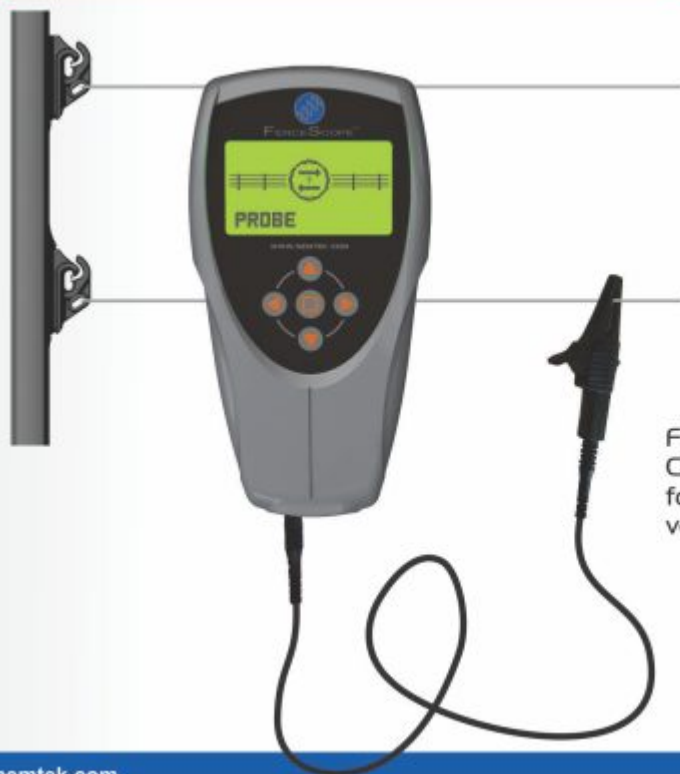


Figure 2
Connecting to earth strand
for a more accurate
voltage measurement.



This enables the measurement and calculation of:

- Voltage
- Current through load
- Energy dissipated in load

Both leads must be connected to the FenceScope™, Figure 3, and connected to the fence. A 1000ohm load is present between the red and black terminals of the instrument.

Procedure: Insert the leads in the FenceScope™ first. It is advisable to turn the energizer off, attach the FenceScope™ leads to the fence, and then turn the energizer on again. Repeat the procedure for removing the leads.

If you are not prepared to follow this procedure, always connect the live lead last and remove the lead first to reduce the likelihood of receiving a shock. If unsure of the excitation of the fence wires use the FenceScope™ as a Probe initially. This enables the user to identify the live and earth strands.






Figure 3
Connect Both
Leads for Energy
Measurement.



Energy Measurement (Legal Specification: 500Ω)

Turn the energizer off before connecting , or disconnecting, the supplied external 1000Ω load resistor. This resistor is inside the grey cylinder with red and black wire at either end . It must be connected in parallel, red wire to red clip and black wire to black clip, to the FenceScope™ (see figure 4).

Turn the energizer on and press the  key. The setup display will appear

Press the  or  keys until the word "None" on the set-up screen is replaced with a value of 1000Ω. Press the  key three times to show the ENERGY display. The equivalent load resistance of 500Ω will be displayed.


Press  to start the measurement. When an impulse is received the energy, voltage and current through the load is displayed.



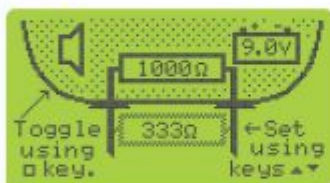
Figure 4
Load resistor.

3b ENERGY FUNCTION.

Energy Measurement (Other load values)

A load resistance of between 50Ω and $20\,000\Omega$ may be used externally for energizer characterization purposes. Example: Three external 1000Ω resistor tubes could be used in parallel with the FenceScope™.







Parameter setting 333Ω on the setup screen and 250Ω will be displayed on the energy screen.

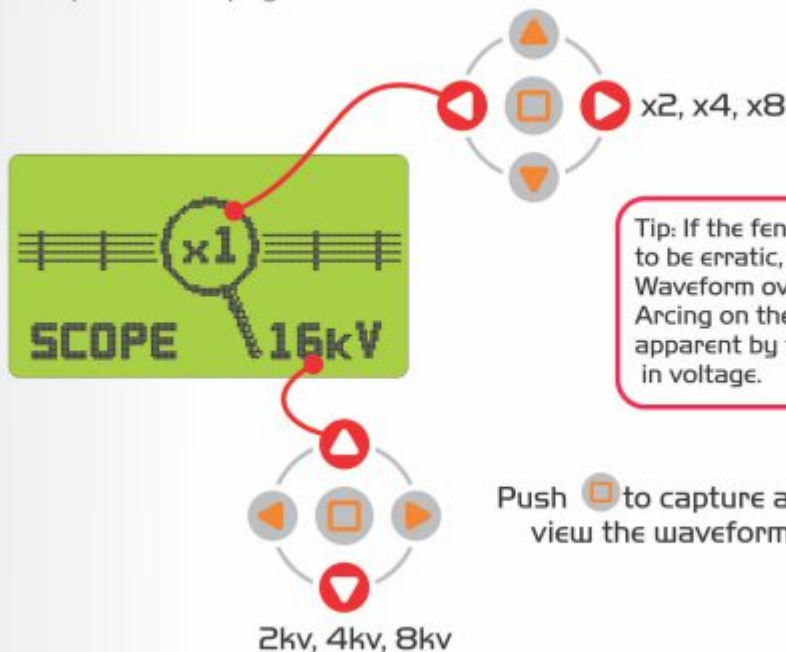


3c SCOPE FUNCTION.


The Scope function displays the measured high voltage pulse wave shape. This function is useful in identifying arcing, which typically causes the fence voltage to collapse.

Displaying the Fence Waveform



Turn the instrument On and by pressing the  key 3 times the Scope display will appear. Note that a number of horizontal scales, waveform stretch in time, may be selected (x1, x2 etc) by use of the  and  keys and the maximum display voltage (kV) may be altered by pressing the  and  keys. Press the  key to capture and display the waveform.



Tip: If the fence voltage appears to be erratic, look at the Fence Waveform over a period of time. Arcing on the fence becomes apparent by the sudden collapse in voltage.

Push  to capture and view the waveform

3d NOISE FUNCTION.

Turn the instrument On, and press  repeatedly until the Noise display appears. Press the  key.



The FenceScope has the ability to indicate the frequency components of a waveform. High frequency components may cause harmful interference. Electromagnetic interference that is produced is a function of energizer design and fence condition. Arcing on a fence is to be avoided.

Tip: Connect the FenceScope™ directly to the energizer with no fence attached and measure the noise. Repeat the measurement with the fence attached. Source of noise may be determined. Artificially introduce an arc on the fence for comparative readings.

4 BATTERY REPLACEMENT

The battery voltage is displayed on the setup screen. However, if the low battery indicator appears on the screen, replace the internal battery before proceeding.



Replace battery

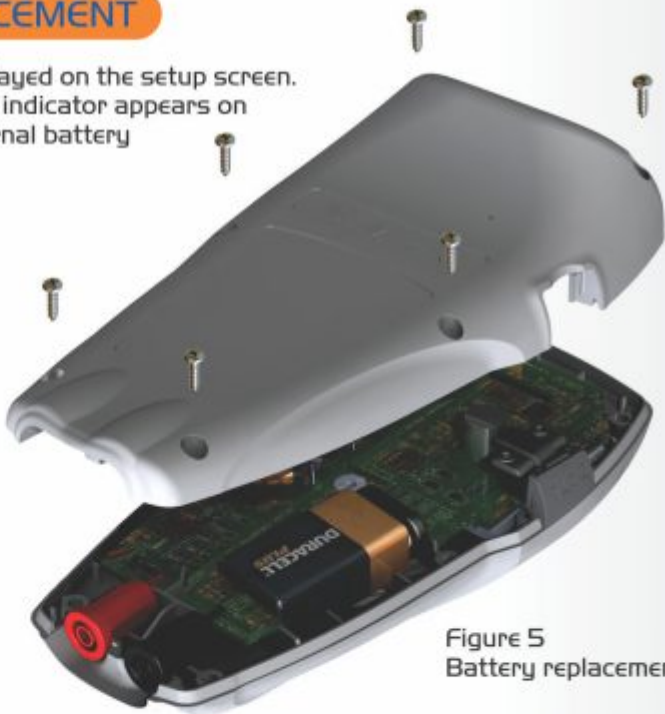


Figure 5
Battery replacement

Disconnect FenceScope™ from all other equipment. Remove the six recessed screws located at the rear of the instrument. Gently remove the back cover, disconnect the existing battery and replace it. Replace rear cover and fasten the six screws. Discard the old battery according to the battery manufacturers recommendations.

5 SPECIFICATIONS

Refer to the sleeve cover supplied with the box for accuracy specifications or visit www.nemtek.com.

Physical Specifications

Display (LCD)	128 x 64 pixels, landscape orientation, 1 bit/pix colour depth
Operating Temperature	-10°C to +50°C
Storage Temperature	-20°C to +60°C
Battery Type	9V alkaline, 6LR6 / PP3, (17mm x 26 mm x 48mm)
Battery Life	50 hours typically (without using backlight)
Size	102mm W x 50mm H x 192mm L
Weight	298g (battery included), 251g (battery excluded)

The FenceScope is not designed for measuring waveforms other than those defined by the IEC 60335-2-76 standard.

Nemtek reserves the right to alter specifications at any time without prior notification or warning.

Some background information.

In order to help understand the operation of an electric fence it is often easier to use an analogy. In this case a garden hosepipe that has the tap wide open but at the other end of the hosepipe it is sealed.

In this analogy: water pressure is equivalent to voltage; water flow rate is equivalent to current; a hole in the pipe results in a loss of pressure and the reduction in the total flow available at the end of the pipe. This is equivalent to a resistance to earth.

Under ideal circumstances there are no leaks anywhere along the pipe and the pipe is under considerable pressure. If a leak should occur at any point along the pipe, the loss of water through that leak, is a function of the pressure inside the pipe.

In order for an electric fence to be effective, it must be capable of supplying sufficient current (flow) at an appropriate voltage (pressure).

If an electric fence is not performing effectively:

- is the fence the problem?
- Is the energizer the problem?

In reality there is one very important constraint. Insulators are designed to withstand a certain voltage. The maximum voltage that an energizer should produce is typically constrained by insulator limitations. In other words the maximum pressure at the start of the pipe is constrained. The analogy to arcing on a fence is the bursting of the hosepipe. If the pressure in the pipe is increased (voltage on the fence) beyond its design limitation, the pipe bursts (fence arcs) and there is very little flow and pressure (voltage) and resultantly, energy, at the end of the pipe.

A fence problem will be related to 1) losses to ground (leaks) or 2) losses within the fence (pipe diameter too small).

Finding losses to ground:

An electric fence ideally operates at a few thousand volts, typically 7000 Volts (security applications) and greater than 3000 Volts (agricultural applications). Firstly, it helps to find the significant leaks on the fence. Tip: Insert the 1000 ohm load resistor (grey tube with two wires) supplied with the FenceScope™, between the live wire and earth, at the end of the fence furthest away from the energizer output terminal. Use the FenceScope™ as a voltage and current probe. This effectively causes a significant flow of current along the fence, reducing the effects of minor leakages, and enables the dominant losses along the fence (reduction in current) to be determined as one probes along the fence from the energizer output terminal towards the end of the fence where the load resistor is located.

In an ideal world the current along the fence would remain constant. Note that these losses are very dependent on the operating voltage of the fence. Deposits and moisture on insulators, particularly along coastal areas, can significantly reduce the performance of insulators i.e. breakdown voltage. In such cases a slight reduction in fence voltage may reduce fence losses significantly.

Determining losses within the fence:

If a calibrated hole (known resistance) was inserted at a point along the hosepipe, the distance of the resulting spray and volume of water flowing out of the hole (energy) would give us a very good indication of the overall condition of the hosepipe and the available pressure. Having previously "eliminated" the leaks along the fence (losses to ground) it is time to address losses within the fence itself. The FenceScope™, when used as an energy measuring instrument, presents a known load of 1000 Ohms (calibrated hole) on the fence, and measures the energy flowing through the hole at that point.

By measuring the available energy at the energizer output terminal and then progressively moving away from the energizer along the fence, the reduction in available energy is attributed to losses within the fence itself. If significant, the options are to increase wire diameter or increase the number of parallel live strands (security implications).

Energizer Problem.

One cannot reiterate the importance of the proper installation and maintenance on an electric fence. Losses do occur along a fence and at some point the suitability of the energizer must be questioned for a given installation. The resulting spray from a pin-hole in the hosepipe may be impressive but what happens when the hole is increased in diameter. FenceScope™ enables the resistive load (size of the calibrated hole) to be altered. Energizer manufacturers are constrained by output voltage (the insulator breakdown problem) and safety considerations. Typically energizers try and maintain a given output voltage irrespective of load resistance while still staying within safety requirements.

There are fundamentally two types of energizers:

- those designed for agricultural applications
- those designed for security applications

Use the FenceScope™ to determine what the optimal load is for a particular energizer. Remove the energizer from the fence. Systematically increasing the calibrated hole size (reducing resistance by using known external parallel resistors with the FenceScope™ connected to the energizer terminals), and measure the energy dissipation. A point will be reached when the energy no longer increases as a function of decreasing load resistance. For that particular energizer, the output is now at its constrained, optimal, limits for that particular load. Record the Vrms voltage on the energy measurement display. This load resistance is at the optimum load resistance for the energizer to transfer maximum energy.

Agricultural Energizers:

Are designed for a lot of leakage due to vegetation and often multiple fences attached in parallel to the same energizer. Attach the FenceScope™ to the terminals of the energizer with no other external load resistors and measure the energy. Connect the fence(s) to the terminals of the energizer. If the Vrms voltage is below the value recorded, with no fences connected and the optimal load resistance, the energizer is adequately rated for the application and fence condition. The energizer could raise the voltage if required to do so.

Security Energizers:

Are designed to deliver maximum energy into the typical human body impedance of 500ohm, this same value is used in the legal qualification of energizers. Security energizers typically produce a higher voltage pulse (more pressure) than agricultural units and are therefore better at delivering more energy to any person touching a series connected security fence.

Tip, use the FenceScope™ in conjunction with the provided external 1000 Ohm load, resulting in an equivalent load resistance of 500 Ohms, and measure the energy available at various points along the fence. Energizers designed for security fence applications will often perform better than much higher powered and expensive agricultural units in these applications.

7 APPENDIX B

Declaration of Conformity

Declaration of conformity	
	
IO Tech Manufacturing (PTY) LTD 13 Richard Road Industria North Roodepoort South Africa	
Declares that the product	
FenceScope™	
Is in conformity with	
(reference to the specification under which conformity is declared in accordance with 89/336/EEC - Electromagnetic Compatibility (EMC) Directive) EN55014-1 EN55014-2	
And also in conformity with	
IEC 61000-6-1 (EMC - Susceptibility) IEC 61000-6-3 (EMC - Emissions) IEC 61000-4-2 (Electrostatic discharge immunity tests)	
Signature: 	Place / Date: <i>KORR</i> / <i>2/10/08</i>
Printed name: <i>S. Hurly</i>	Position / Title: <i>Director</i>

