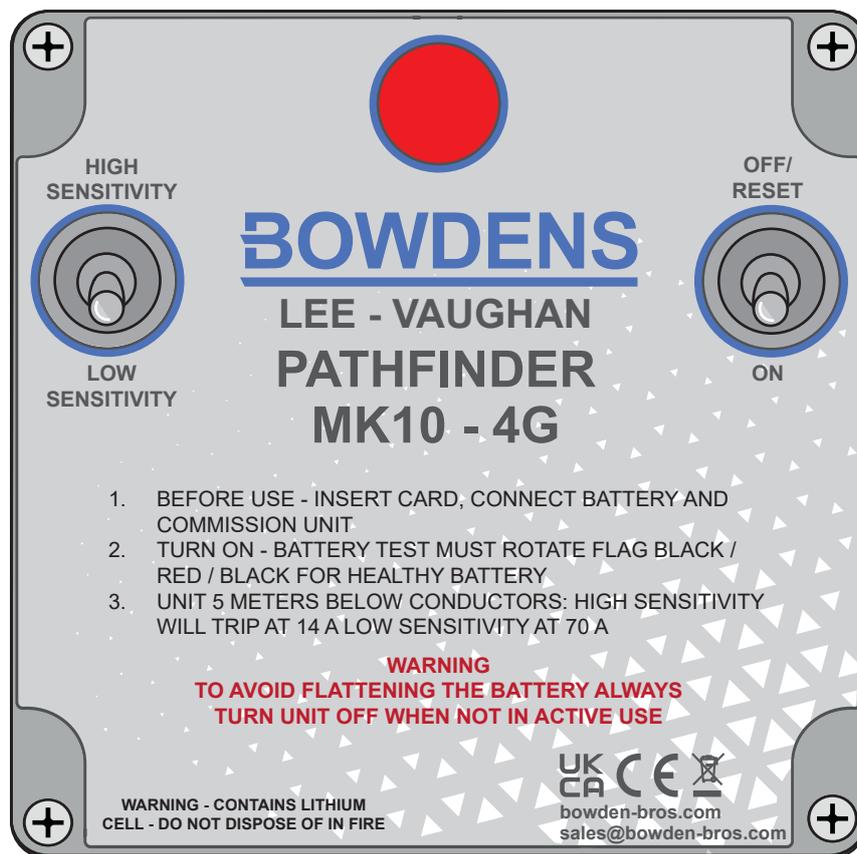


BOWDENS

RIGHTWAY PATHFINDER MK10



PORTABLE OVERHEAD LINE FAULT PASSAGE
INDICATOR WITH 2G OR 4G COMMUNICATION

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1.0 OVERVIEW

Based on the highly successful MK8 Portable Overhead Line Fault Passage Indicator for locating HV Earth & Phase to Phase faults, the MK10 incorporates a 4G modem which allows a fault alarm to be sent using 2G, 3G or 4G mobile networks. A standard size SIM card for any Network Service provider is installed and allows messages to be sent to an engineer's mobile phone (or multiple mobile numbers to a max of four) or to a specific data alarm platform. When an earth fault, or a phase to phase fault occurs on the H.V. Network a message will be sent from the MK10 Pathfinder if fault current has passed beyond the point at which the instrument is installed. The fault can be narrowed down by deploying a number of instruments, the fault will lie between a Pathfinder that has sent an alarm message, and the next one that has sent no message. The message will give the date and time of the fault event.

Communications can be set up and commissioned from a dedicated website to program the mobile telephone number that is due to receive the call, the identity of the unit, and the wording of the alarm. The unit is designed to be fitted to the line poles, at approximately eye level, and can be left for a period of days to detect persistent transient and hard to find permanent faults. The instrument enclosure is environmentally tested to IP65, has no visible antenna to attract vandals or theft, and is powered from an integral Lithium Thionyl Chloride battery which will give an operational life of up to 10 years, (dependant on usage and storage conditions). Using the 'Heartbeat' routine it can report on status (Alarm/Reset - Comms Signal strength - Battery state) at an interval of your choosing through the website set up.

2.0 MODEL FEATURES

- Integral and Factory Changeable Lithium Battery- Up to 10 Years Life
- Responds to Phase/Earth and Phase/Phase Faults
- Auto Battery Test Facility
- Sensitivity Selector - 14 Amps High - 70 Amps Low at 5 metres below conductors
- Identifies Permanent, Transient and Intermittent Faults
- Helps to Identify Faulty Cable sections in OHL Networks
- Helps to indicate OHL Transformer Winding Faults
- Modern PIC selection allows zero standing current when alarmed and reduced current demand when listening, with associated improvement in battery life.
- Remote fault messaging over 4G private, or public mobile networks, with dropback to 3G or 2G.

3.0 OPERATION

The MK10 must be mounted in the vertical plain with the instrument body at right angles to the conductors. It is most convenient to strap it to the wood pole at eye level, which makes it approximately five metres below the conductors. The instrument can be placed at mid-span if no intermediate pole without transformers or Reclosers can be found. When the MK10 is switched on it will initiate a 'status' or health-check message to your mobile, and perform a battery test on the instrument. If the flag does not return back to black the battery requires changing so contact Bowdens.

The flag will be BLACK when you leave the instrument. Make a note of the location against each serial number, so when they report in you know exactly where they are located. There is no GPS facility to locate them afterwards.

The Pathfinder will be monitoring the overhead line until a fault occurs. This can be either a permanent or a transient fault, but must be of a duration greater than 50msecs for the MK10 to detect it (this allows protection against false tripping on network spikes or magnetising in-rush current when energising a line from dead). On detecting the FAULT the BLACK flag flips to RED and remains in this state for a period of three hours (timed reset period) or until reset manually.

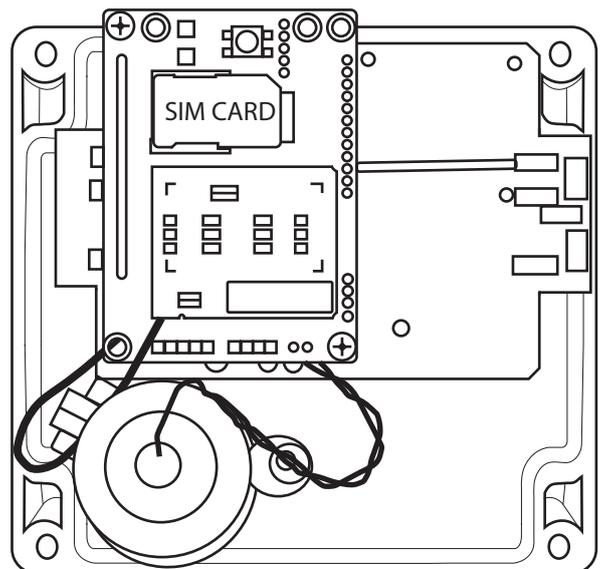
However, two minutes after the trip the MK10 returns to the ALERT MODE and the remote communications will be RESET without resetting the FLAG. In this state the MK10 will respond to subsequent fault current by sending a second ALARM message, before resetting again after two minutes as before. No RESET message is sent to the designated mobile phone or base station, or when the RED Flag is time RESET. To do a manual RESET switch the unit 'OFF', this will not return the disc to BLACK. Switch the MK10 'ON' to do a battery test, and when the disc returns to 'BLACK' turn it 'OFF' The indicator is now RESET.

3.1 FIELD SETUP

The Rightway Pathfinder MK10 has the same electro-magnetic sensing circuit as the MK8 and so will detect both Earth Fault and Phase to Phase faults. It has two switches, on the right is OFF/Reset – ON. Switch to ON and it will perform a battery test, where, with a satisfactory battery, the flag will flip from BLACK to RED and back to BLACK. If the indicator stays at red, or flips to red the unit needs returning to Bowdens for a battery change. The left hand switch defines the sensitivity where at HIGH it will respond to a current above 14 Amps at five metres, or at LOW it will respond to currents above 70 Amps at five metres. When selecting sensitivity thought must be given to anticipated fault levels, so for a suspected fault near to the source, where the fault level is high, then LOW sensitivity should be used. For more remote faults some distance from the source HIGH sensitivity should be used. The instrument can be strapped to the wood pole using either bungee cord, or nylon strap provided (customer option).

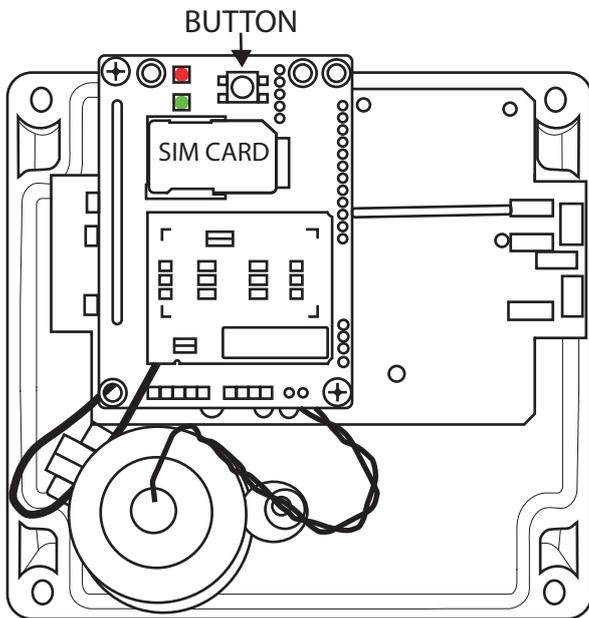
3.2 COMMUNICATIONS SETUP

The Pathfinder MK10 uses either a 'Pay as you go' or contract 4G SIM card. However with new PAYG SIM cards, be aware that to keep them active a message must be sent at least once in 60 days. If using the 4G network to a recognised alarm data platform, a data SIM card will be required to report to an IP address via an internet socket. If using a private APN ensure that the network setup supports SMS. Unscrew the lid of the MK10. Insert your SIM Card as per the drawing.



SIM Card problems are the most common fault for the non-operation of the MK10. Is the SIM Card activated? Does it have sufficient Credit (PAYG)? Is it registered with the correct telephone number? Has the MK10 been commissioned with the correct data? Does the APN support SMS messaging?

Before the MK10 can be used remotely it must be commissioned. This is done using our Faultwatch.com website to transmit the setup data to the MK10. To receive this setup data the MK10 must be put into commissioning mode.



To put the MK10 into commission mode, turn the Pathfinder to ON from the switch on the front panel. With the lid removed, wait for the LED lights to go out, and then press and hold the button shown.

The green LED will light, when the red LED lights take your finger off the button. After 30 seconds or so the green LED will start flashing. This indicates commission mode, and the MK10 is waiting for data to be sent from our website at www.faultwatch.com

Commissioning must be carried out using a SIM enabled for a public APN. The MK10 will only go into commission mode if the SIM card can register onto the network. The MK10 can also be commissioned via a recognised alarm data platform, but still has to be put into 'Commissioning Mode' to receive the commission message.

Welcome to our **GSM** products on-line set-up service.

Please Log in:
We will direct you the the Product Selection page

Customer ID

Password

Bowdens

On the internet go to www.faultwatch.com and this screen will be shown. When supplied with your MK10 you should have purchased some credits to use our setup site, and you will have been given a Username and Password. Enter them into the fields in the above format and Log-in. One credit will be used for each message sent from the Website.

This will take you to the product selection page. You can now chose the Comms product that you wish to setup. In this instance it is the MK10 to a mobile telephone, so select by putting a dot in the circle, and then submit.

Product Selection

Please select your instrument type and click Submit

Product Name	Mobile	Basestation
MK10 - GSM	<input checked="" type="radio"/>	<input type="radio"/>
MK10 - 4G	<input type="radio"/>	<input type="radio"/>
P360 - GSM	<input type="radio"/>	<input type="radio"/>
PowerWatch	<input type="radio"/>	<input type="radio"/>
Sigma - GSM	<input type="radio"/>	<input type="radio"/>

Submit

When you submit your selection it will take you to the setup page.

BOWDENS MK10 - 4G Setup to **Mobile**

About your MK10 Unit

Unit's SIM card Telephone number:

Give your unit an identity or location caption:

Where to Send Your Alert Messages

1st Mobile Telephone number

2nd Mobile Telephone number

3rd Mobile Telephone number

4th Mobile Telephone number

How often do you require MK10 to report it's status?

Select which Mobile(s) are to receive HealthCheck messages:

<input type="checkbox"/> Receive Alarm Messages	<input type="checkbox"/> Receive Health Check Messages
<input type="checkbox"/> Receive Alarm Messages	<input type="checkbox"/> Receive Health Check Messages
<input type="checkbox"/> Receive Alarm Messages	<input type="checkbox"/> Receive Health Check Messages
<input type="checkbox"/> Receive Alarm Messages	<input type="checkbox"/> Receive Health Check Messages

Text to send (for example "FPI" or "MK10")

Alarm Text

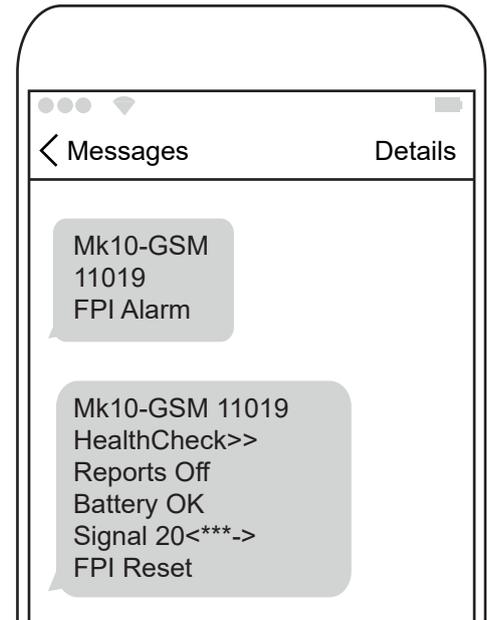
Reset Text

Enter the telephone number of the SIM card you have put into the MK10, in the format +44 leaving out the first 0 (international call format). Enter the phone number/s of the recipient mobile/s. Enter the serial number of the MK10 and any identifying information. You can alter the text meaning on the website as well if required. You can also select whether to have a 'Status' message sent from the MK10 and at what frequency, but unless it is likely to be left out for an extended period this should not be necessary. When complete push 'SEND'. It is recommended that no location is entered for the MK10 because being a portable instrument this will change each time it is used. When the instruments are deployed make a note of the location of each serial number and make sure whoever is receiving the data knows this information.

The MK10 will receive the 'Commission Message' and the flashing green LED will light RED & GREEN and go out. When commissioned for the first time, the MK10 will send a SETUP Complete message to the receiving telephone number/s.

To prove an alarm message bring the MK10 close to a significant electro magnetic source, such as a strong magnet, which will trigger the indicator and set up a call, which will be received by the designated mobile.

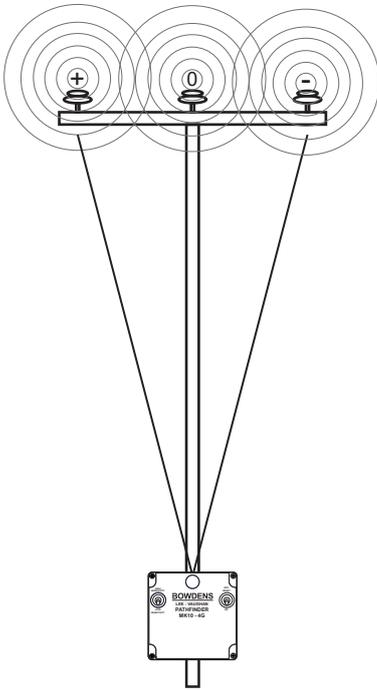
If the health check frequency is set at commissioning the MK10 will report in to the mobile at the frequency requested, giving the status of the FPI, the battery state, and the signal strength.



Screw the lid back onto the base, and the MK10 is ready to deploy. The following are some tips for optimal use.

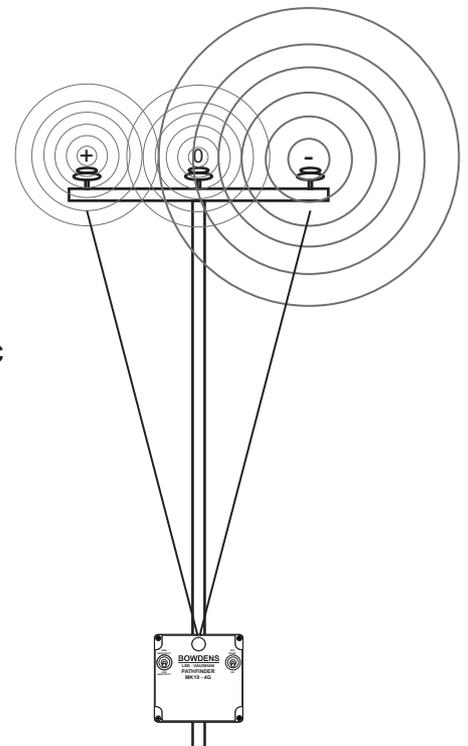
1. Always insert the SIM card and commission the unit when it is received. If it is not commissioned and cannot register to the network, if the unit is inadvertently left switched ON it will flatten the battery quite quickly.
2. Always ensure the instrument is switched OFF after use. There can be no auto-power down as the MK10 is monitoring the electro-magnetic field continuously. If it is inadvertently switched on in the office the electro magnetic field due to computers and fluorescent lights, is likely to trigger the device which will keep on trying to connect to the network, and will flatten the battery.
3. A hard ABS case can be purchased with the MK10 to carry a set of three instruments. This makes it more secure and less likely to be turned ON by mistake.
4. The MK10 can be strapped to the pole of the overhead line using either a bungee cord, or a nylon buckled strap. Chose your option when ordering.
5. Try and avoid using poles with equipment that will distort the magnetic field such as Transformers, PMARs, ABIs, fuses, earth wire or LV under-build, tee off poles, etc.
6. Be aware of other lines nearby, especially transmission and higher voltage distribution lines that may cross and interfere with the electro-magnetic field.

3.3 SENSING ELECTRO-MAGNETIC FIELD



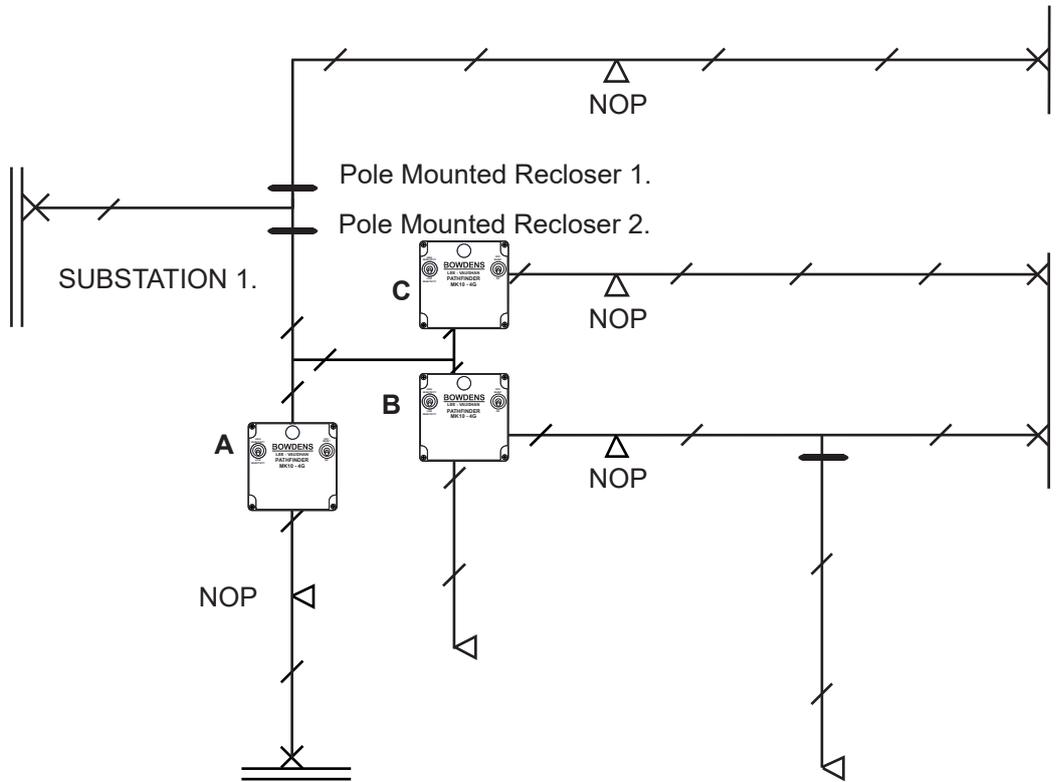
On an HV overhead line each conductor will radiate an electro-magnetic field. Due to the phase separation one field will be in a positive direction, the other in a negative direction, and the third at zero. Therefore the field will be balanced, only the load imbalance on the phases giving rise to any residual field. As we move away from the line the physical separation of the conductors becomes less of an influence and at ground level, about five metres from the conductors the residual field is insignificant.

If an earth fault occurs on one conductor it has a strong effect on the electro-magnetic field which can be detected by the MK10 fault passage indicator. If a phase to phase fault occurs the fault current values may be higher, but the electro-magnetic influence is less than for an earth fault. However, we rotate the detection coil to 30° from the horizontal in Pathfinder which increases its response to the phase to phase fault, whilst retaining almost the same response to earth faults.

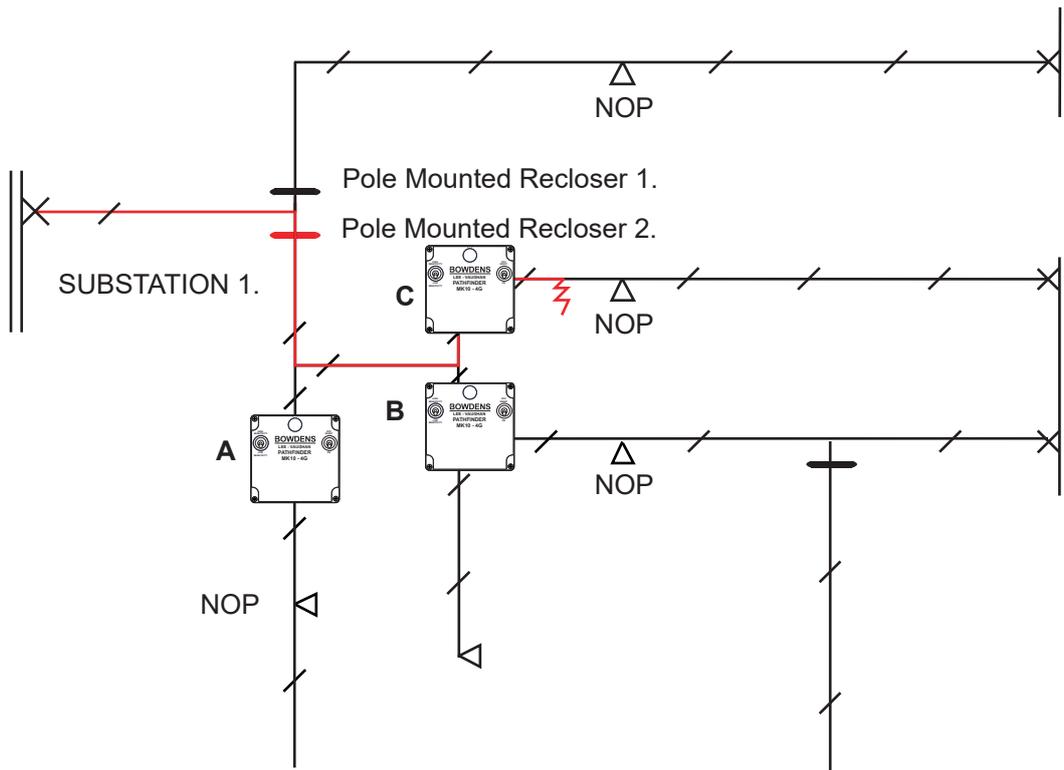


3.4 FAULT FINDING

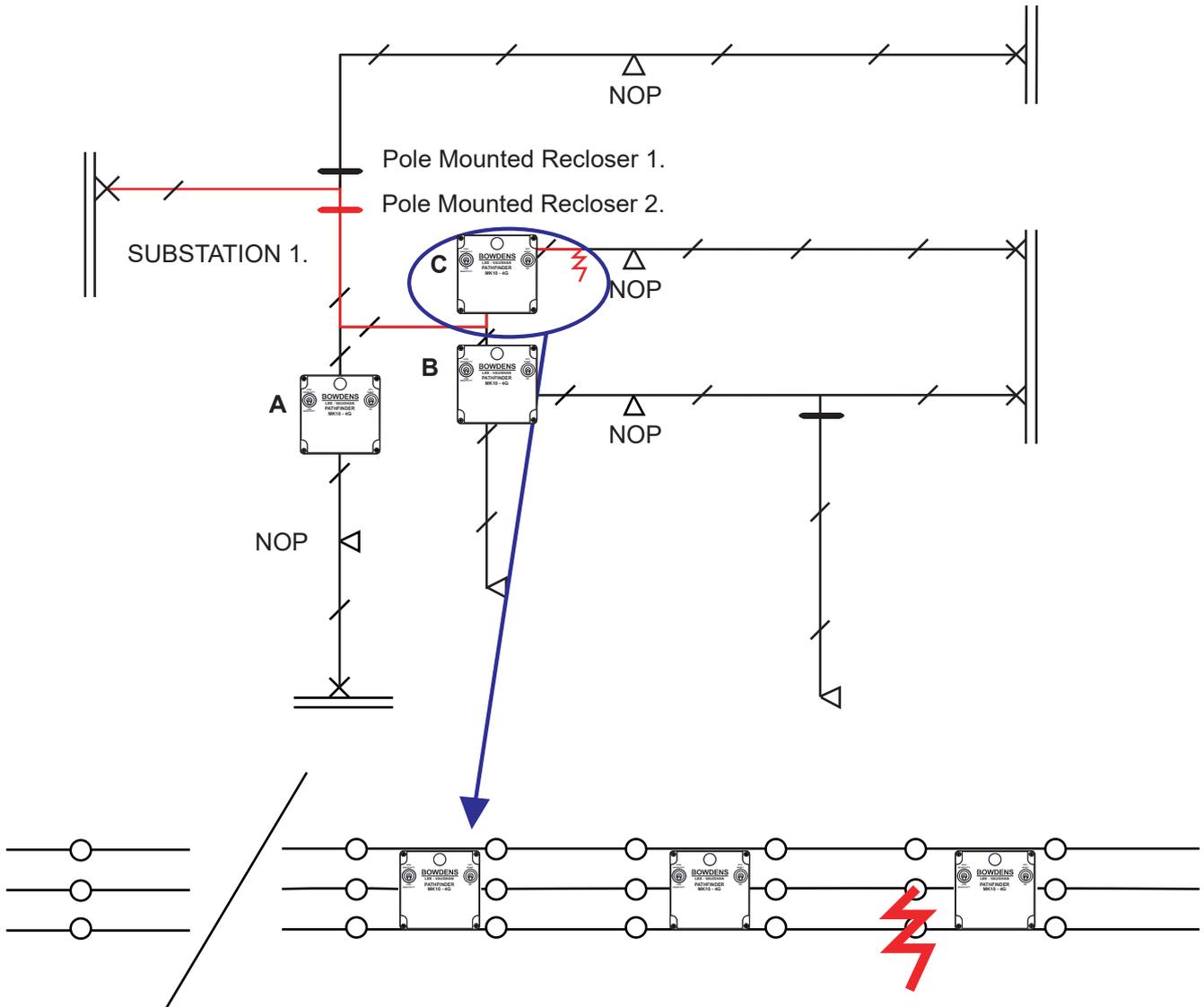
On an overhead HV network we are getting repetitive tripping at PMAR 2. MK10 Pathfinders are deployed at points A, B & C to find out which leg of the network has the transient fault.



When the fault occurs PMAR 2 trips. The MK10 at C flags. The instruments at A and B do not trip. We know that the fault lies between the MK10 at C and the Normally Open Point (NOP).



Trying to locate a fault due to a cracked insulator can be very difficult. The MK10's can be re-deployed down the main line a few poles apart to divide the network up into the smallest sections.



4.0 POWER SUPPLY

The MK10 is powered from a SAFT LSH20 Lithium cell rated at 13Ah. The battery calculations support a ten year life under normal usage, operating within the temperature range - 10°C to +60°. During a service, the battery, which is plugged into the PCB, will be changed if necessary, the unit re-calibrated, and the enclosure re-sealed to ensure a full IP65 rating. It is very important that the instrument is switched off after every field outing to prevent shortening its life.

5.0 ROUTINE TESTING

Functional testing is carried out on 100% of all manufactured units before shipping.

6.0 SPECIFICATION

Dimensions: 150 mm x 120 mm x 110 mm (including the bracket and switches)

Weight: 720 grams (including the battery)

Mounting: Hand-held or attached to pole with an elastic bungee cord, or nylon buckle strap.

Enclosure: Polycarbonate sealed to IP65

Trip Level: High -14 Amps at five metres (faults below 150MVA). Low - 70 Amps at five metres (faults above 150MVA). Linear if moved closer to the conductors.

Battery: Lithium Thionyl Chloride 3.6V and 13Ah cell

Trip Delay: 50msecs nominal

Reset: Manual with ON/OFF switch

Battery Test: With ON/OFF routine.

Temperature Range: -10° to + 60°C

Usage: Up to 10 years life under normal usage

WARNING

DO NOT SWITCH THE MK10 ON WITHOUT A SIM CARD INSERTED

THIS WILL RESULT IN THE COMMS TRYING TO REGISTER TO THE MOBILE NETWORK, NOT BEING ABLE TO, AND AFTER MANY ATTEMPTS WILL FLATTEN THE BATTERY.

ALWAYS KEEP THE MK10 TURNED OFF WHEN NOT IN ACTIVE USE ON THE NETWORK.

INSERT A SIM CARD WHEN THE INSTRUMENT IS FIRST RECEIVED, AND COMMISSION IT TO YOUR PREFERRED MOBILE.

IF THE MK10 IS INADVERTENTLY TURNED ON A MESSAGE WILL BE RECEIVED AND ALERT YOU TO ITS ACTIVE STATE.



Please consider the environment at the end of this product's life.
At end of life please take this unit to your closest electrical recycling point or return this unit to Spring (Europe) Limited for recycling.
Recycle Responsibly
ISO14001

VERSION 2.1

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ECO0371	08.09.25