

SIMLOC carry case

SIMLOC

Fault Locating on Underground Distribution Lines

The Hydro-Québec Distribution (HQD) underground system is complex in its configuration, which makes fault locating quite a challenge for cable crews. The Institut de recherche d'Hydro-Québec (IREQ), in collaboration with HQD engineers, has developed a highly effective system for locating damage along underground lines and at cable joints.

Quick, safe fault locating

Conventionally, cable crews use a pulse generator or “thumper” to locate a fault on a de-energized underground line. This device produces an audible thump at the location of the fault. The operation is repeated until the crew determines the exact spot that the sound is coming from. This method has the disadvantage of producing an impact on the equipment, thus accelerating wear and tear. It also requires patience and is quite painstaking. Crews must travel along the lines, which can be long, have complex ramifications or be in hard-to-reach areas. SimLoc (for “simulate” and “locate”) shortens and standardizes the time it takes to locate a fault. It also reduces the risk of damaging the cables or other equipment through repeated thumping.

Time saver

With the old method, locating a fault could take three to four hours on average – and even several days in some cases. Since the deployment of SimLoc in 2009, a definite improvement has been noted in this regard. The tool has proven its worth, as the average time to locate a fault is now one hour.

Simulate and locate

The SimLoc method consists of two steps:

- The Sim module is used to simulate thumping at 20-m intervals on a numerical model of the line.
- With the Loc module, three consecutive thumps are produced on the actual line by means of a pulse generator



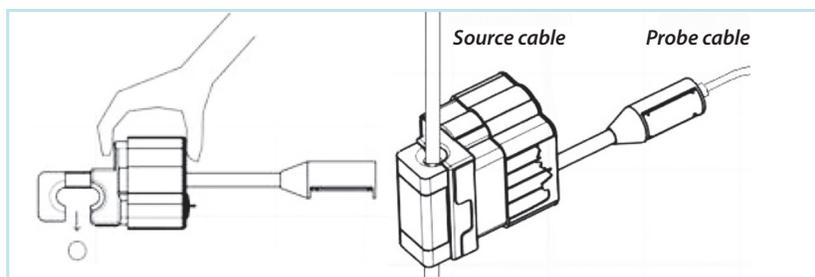
High-voltage protection box

Simulate and locate (cont.)

The software in the Loc module then compares the thump signals with the simulations. The simulation having the best correlation with the signals pinpoints the fault on the line. The user clearly sees the location on the line diagram displayed on the computer.

SimLoc overview

The simulations are done with the Sim module, which is a workstation with a software program developed for this purpose. The Loc module is in the cable crew's laboratory truck. It includes a computer and a probe that is connected to the end of the physical underground line and captures the signals generated by the thumps.



Main advantages

- > User-friendly interface
- > Technique applicable regardless of the number of branches on the isolated line
- > No instrumentation on the line except at the voltage source
- > No interpretation of results required
- > Fault location is displayed on a line diagram
- > Less stress on lines

Technical characteristics

- > Probe type: capacitive sensor
- > Response over a broad range of frequencies (up to 5 MHz)
- > Two modes of signal attenuation (1/2,000 and 1/20,000)
- > System performs self-check prior to each use
- > Remote control with 2-m cable, allowing probe to be controlled from a safe distance
- > Protection box (in truck) providing 60 kV maximum isolation between workstation and high voltage
- > Signal sampling rate: 100 million samples per second

For information

Lionel Reynaud – Project Coordinator
Institut de recherche d'Hydro-Québec
1800, boul. Lionel-Boulet
Varenes (Québec) J3X 1S1
Canada
Telephone: 450 652-8260
E-mail: reynaud.lionel@ireq.ca

Patent

WO 2012/012897

March 2012

2012G069-SIMLOC_A