<u>Notes on LV Cable Fault Location</u>

<u>Classification of LV Cable Faults</u>

Transitory - irregular voltage dips
Intermittent - irregular fuse operations
Persistent - repetitive fuse operations
Permanent - opens and welded shorts

<u>Problems specific to LV Cable Fault Location</u>

Multiple branches
Single phase services
Access to terminals
Connected loads
<u>Fault behaviour</u>

<u>Behaviour of LV Cable Faults</u>

Many LV cable faults ‘progress’ from the ***Transistory*** condition to the ***Non-Persistent*** and then to the ***Persistent*** condition. (Complaints of ‘flickering lights’ are an indication of the probable existence of a ***Transitory*** cable fault)

During this ‘progression’ LV cable faults are ***unstable/non-linear*** and are only apparent, and therefore pre-locatable, when the cable is energised <u>at normal working voltage</u>.

Only when a fault has ‘progressed’ to a ***Permanent*** condition, where it exhibits a ***stable/linear*** characteristic, will there be the possibility of pre-location with the cable in a de-energised state.

All ***unstable*** LV cable faults require ***pre-conditioning*** in order to make them locatable. The only acceptable method of ***pre-conditioning*** for cables with consumers still connected is to <u>re-energise at normal working voltage</u>.

When time intervals between re-energisation and the next burst of fault activity are long the most economic and convenient method of maintaining supply will be a fuse. For frequently recurring intermittent faults, and where space is available, REZAP units allow supplies to be restored quickly and may ‘assist’ in ***pre-conditioning*** the fault into a ***persistent*** or ***permanent*** condition.

Methods of locating LV cable faults

Unstable/non-linear faults:

- ***Power Frequency methods***
- ***TDR methods***
- ***Travelling Wave methods***

Stable/linear faults:

- ***TDR methods***

Power Frequency **methods can be based on voltage or current.**
Both methods require access to multiple locations
Voltage sensors can be connected at convenient points such as consumer terminals, link boxes, street light columns etc…
Current sensors must be placed around the faulty cable at points such as link boxes, feeder pillars or exposed cores
Voltage sensing allows fault location
Current sensing only allows fault sectionalisation

TDR **methods require that the fault produces a reflection (echo) which can be identified amongst the reflections from joints and other impedance discontinuities.**
The reflection magnitude is a function of the fault resistance
Fault reflection recognition is simplified if ***comparison*** **techniques can be used such as:**

- ***Before and After*** **(permanent faults after** ***pre-conditioning*****)**
- ***Before and During Arcing*** **(all types of unstable fault)**

NOTE: Comparison is not normally possible between the faulty and a healthy phase due to single phase connections

KEHUI **T-P22** fault locators provide both ***Power Frequency*** and ***TDR*** methods of fault location thereby allowing the most appropriate method to be used for each specific case. The over-riding advantage of ***TDR*** methods are their reduced dependence on cable records and knowledge of cable parameters combined with the fact that faults can often be located from a single measurement point. ***Power Frequency*** methods, by comparison, do not suffer from pulse attenuation nor do they require high frequency 'isolation' from busbars with multiple cables connected.

KEHUI **T-P22** fault locators operating in the ***TRS*** mode are much less limited by pulse attenuation and the need for high frequency 'isolation' at busbar connections is eliminated. Manually initiated ***TRS*** tests can ensure that units are correctly sited to maximise the chance of a successful location. Combining ***TDR*** and ***TRS*** results can often identify whether a fault is on the main cable or along a branch.