

Fault Locating System :FLS

Advanced Maintenance For Transmission Line



Nippon Kouatsu Electric Co.,Ltd

Objective

Fault locating

- Faster Locating and Restoration
- Minimum Human Effort and Time
- Without Troublesome Maintenance of Locating Equipment

Goal ; Long Term

- Fault prevention & Fault cause identification
- By analyzing surge data collected by the FLS

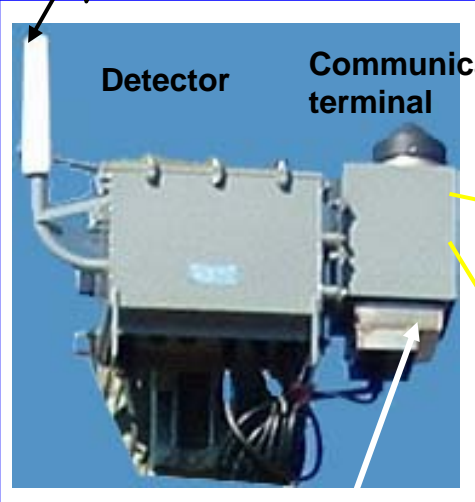
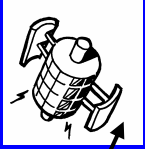


- **Customer Satisfaction Improvement**

NKE FLS will realize this goal for Utility Company

Configuration (Tower Unit)

GPS satellite



Detector

Communication terminal

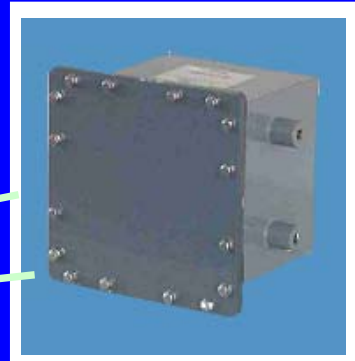
Mobile phone, or Satellite phone inside

Host PC



Data Communication

The tower units are composed by detector, communication terminal, sensors and battery box. If there will be no power source for these equipment beside tower, NKE can provide solar panel.



Solar Panel



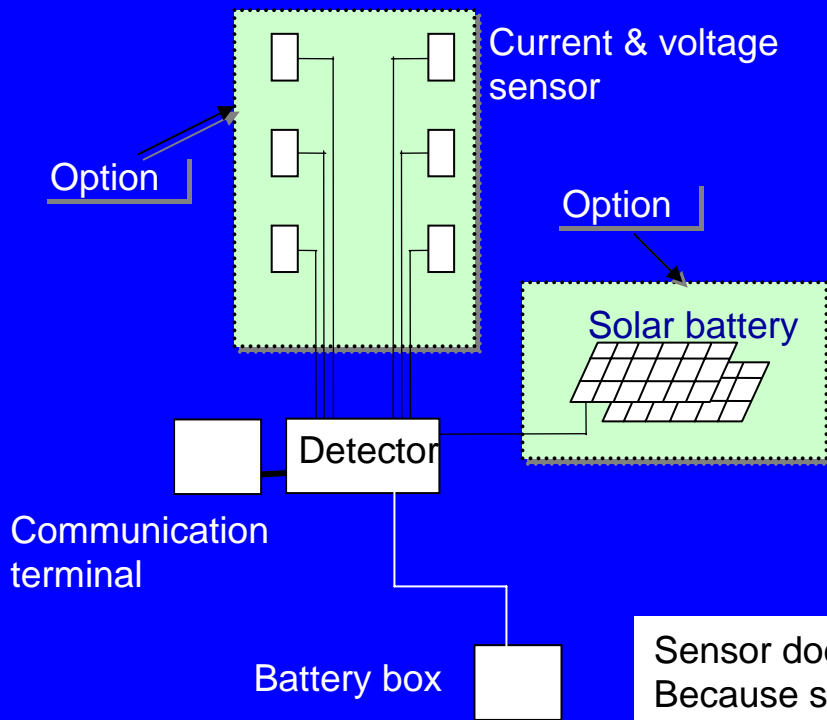
Battery Box



FLS Tower Units

2 Circuits Example

Current & voltage sensor: 6 (one sensor per phase)
 Detector: 1
 Communication terminal: 1
 Solar battery: 1 or 2
 Battery box: 1

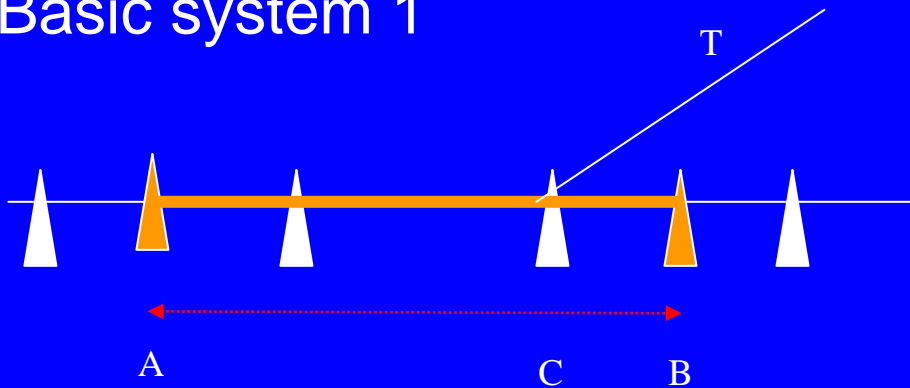


Sensor does not need to be connected to the power line conductor physically, because the sensor detects the electro-magnetic field from the power line.

One detector and communication terminal support up to 6 sensors that mean 2 circuits, 3 phases.

System Architecture

Basic system 1



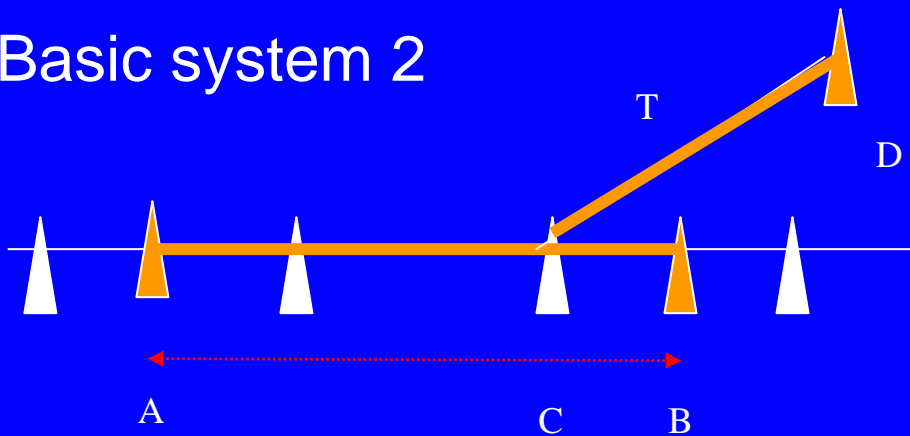
A,B: FLS tower unit will be installed

B: Tap of transmission line.
(there won't be installed tower units)

Availability for Fault detection: A-B

- When the fault will be located between A and B, fault point will be indicated the distance between nearest tower and fault point on the screen of PC at office
- When Fault will be located on T line, Fault point will shown at C point on the screen of PC
- When the fault will be located outside of A-B, Point A or B will be shown.

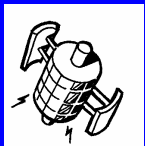
Basic system 2



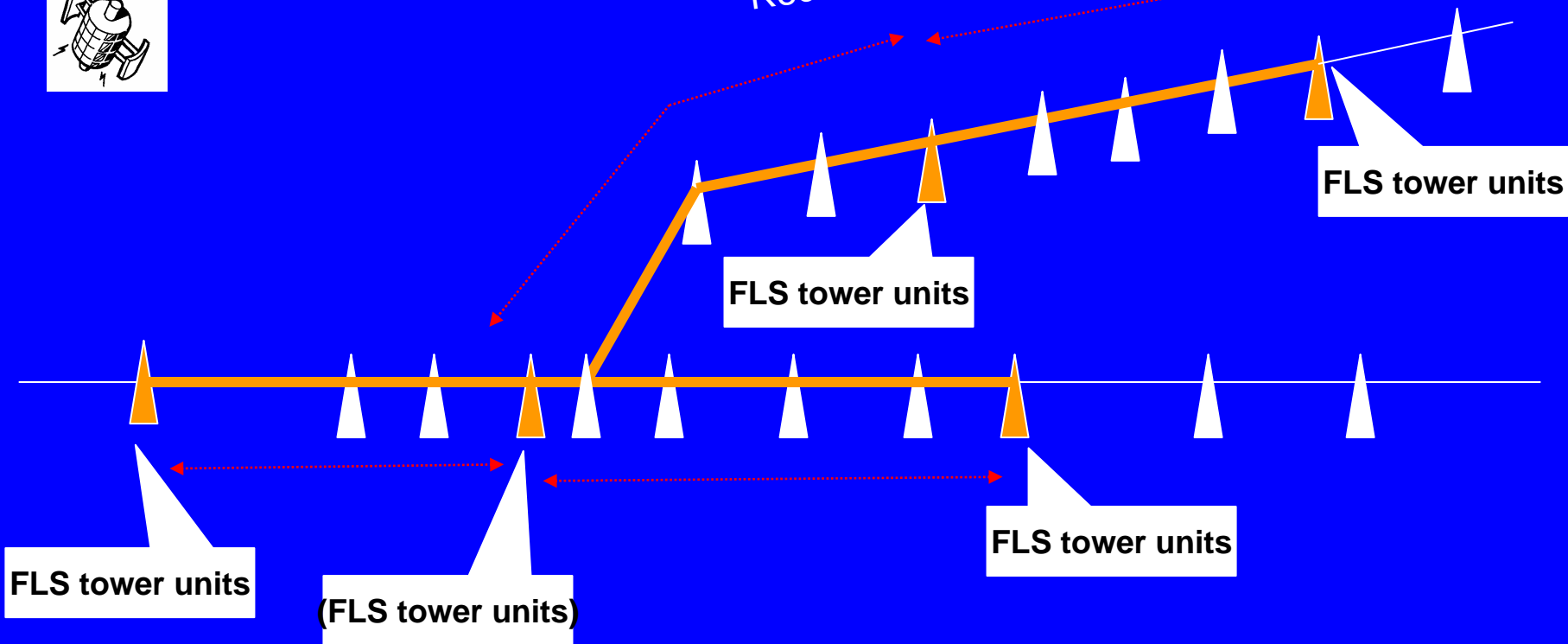
Additional tower unit D will realize fault locating function on the all line orange colored.

System Architecture

GPS satellite for Time Keeping



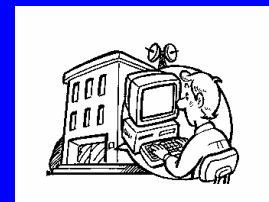
Unit installation interval
3-12miles(5-20km)
Recommend interval for installation is 10-15Km



Mobile phone,
Satellite phone, etc.

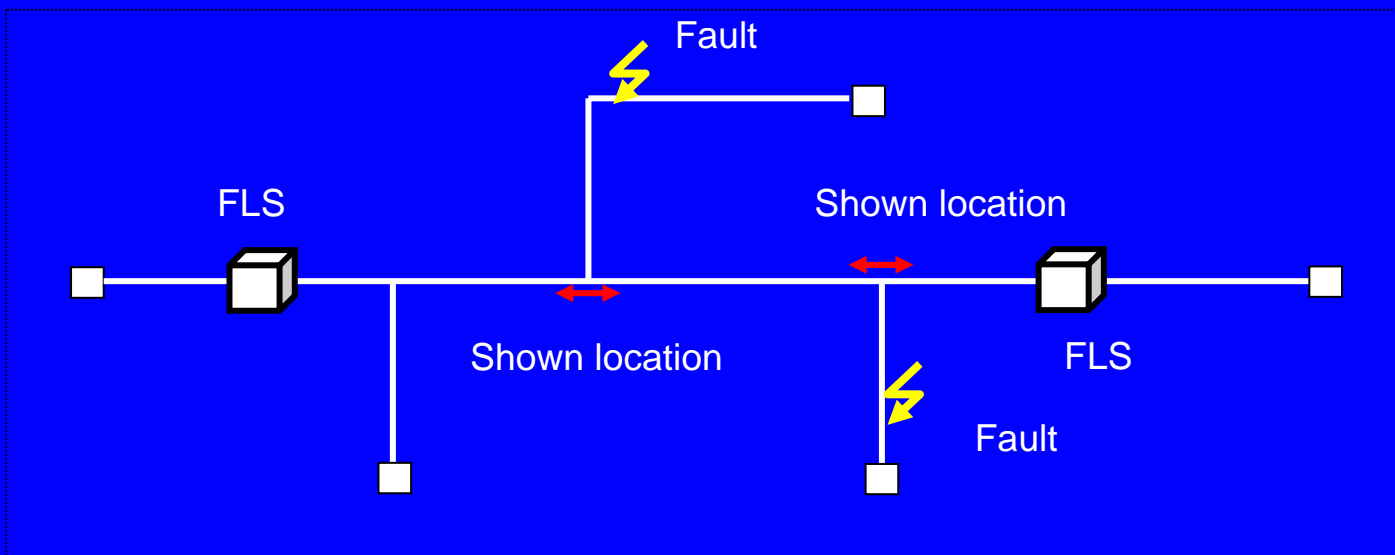
Data Communication

Host PC

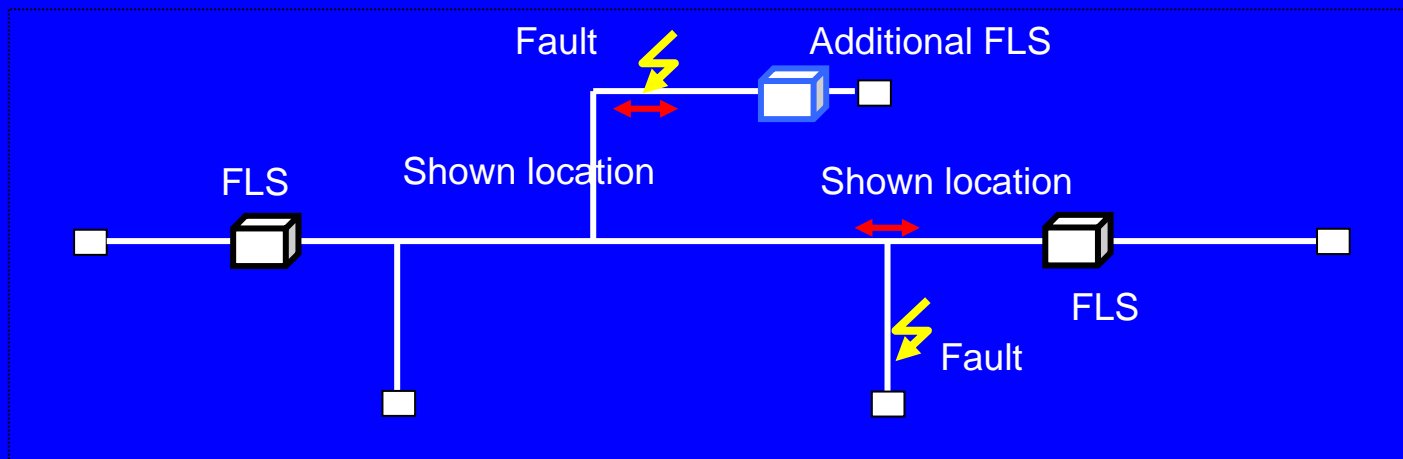


The case 2 FLSs are deployed on only main line.

When the fault will be occurred on the branch lines, this system can show around branch cross point.



The case additional FLS will be deployed on the branch line



Features

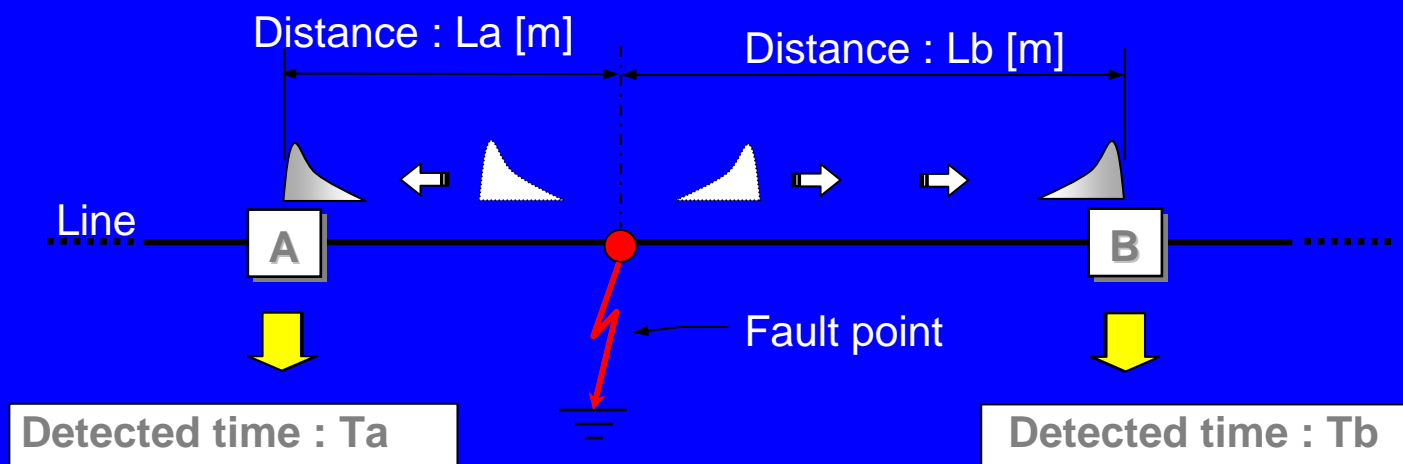
- Detection of all types of faults
(Short Circuit, Ground Fault, High-resistance GF, Faults caused by lightning, insulator/cable deterioration, wildlife, etc.)
- Centralised monitoring with a PC at office
- Clean power source - solar panels
(No local power required)
- Self-diagnosis of locating equipment
- No effect to other equipment on the line

Detection Principle

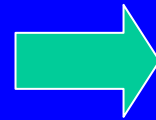
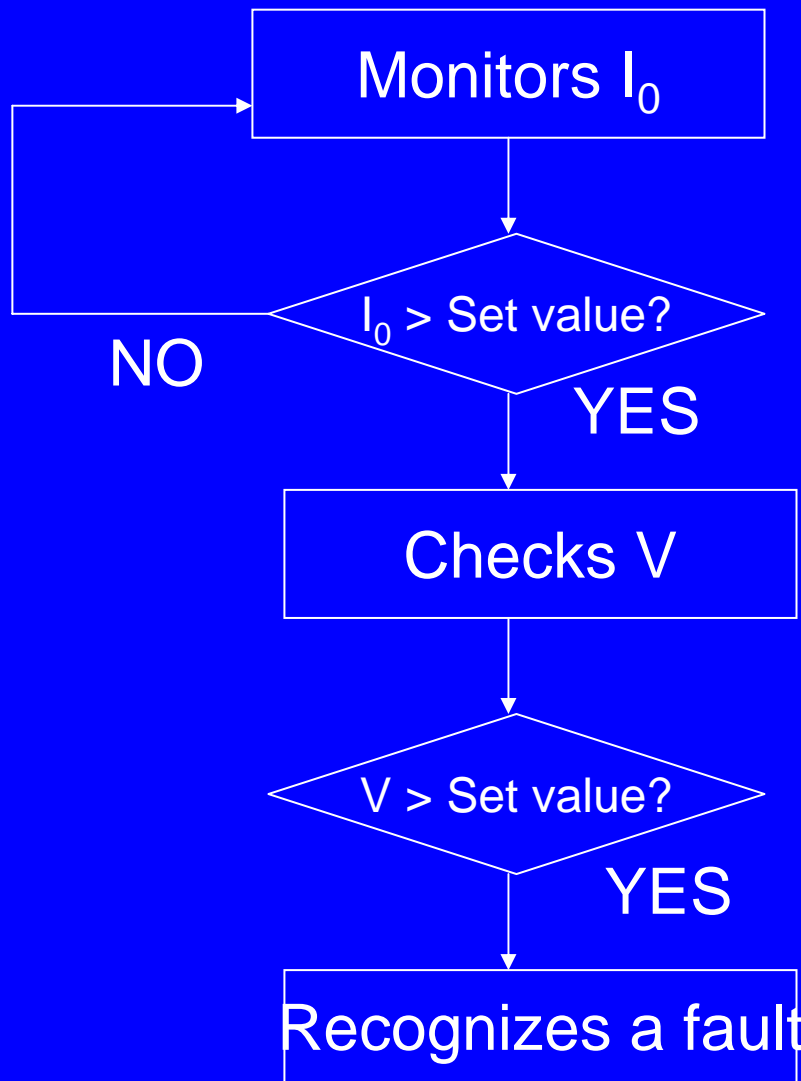
When a fault occurs in a transmission line , a surge is propagated along the line.

Two detectors adjacent to fault detect the surge & measure time of arrival.

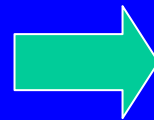
The fault point is located by calculating difference between surge detection times.



$$L_a = \frac{1}{2} (L + (T_a - T_b) \cdot V) \text{ metres} \quad V : \text{surge propagation velocity m/S}$$



Data collection for
Fault prevention &
Fault cause identification



Fault Locating

Host PC Screen

Closest tower number indication for Fault

NKE Fault Locating System

File Setting Option Help

Line

Data update date Self-check date

COMMUNICATION

COMM. HISTORY

CLEAR

QUIT

Circuit #1 (On display)

No.	Date	Time
1	22/05/2003	13:58:49
2		
3		
4		
5		

Circuit #2

No.	Date	Time
1		
2		
3		
4		
5		

Line : Merriwa

Located point : 8L 40332

Legend: ■ - Ground fault ■ - Over current

Line diagram Result

List

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Memo

Memo EDIT



Host PC Screen Result display – Fault point indication

NKE Fault Locating System

File Setting Option Help

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CLEAR

QUIT

Auto locating

Manual locating

Line diagram Result

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EDIT