

Fault Locating System



Challenges in the distribution system

Distribution line features : big supply scope, single source and less interconnections, simple line protection, less switchgears and changeable line operation environment.

Fault reasons : branches, large machines, pulling the cable, winding objects etc.



Fault indicator and fault locating solution



Basic distribution automation——Installing fault indicators



Simply distribution automation——One remote fault locating system



Satisfy with the monitoring and measurement of distribution automation
——Two remote on line monitoring system

Fault Indicators

Fault Indicators

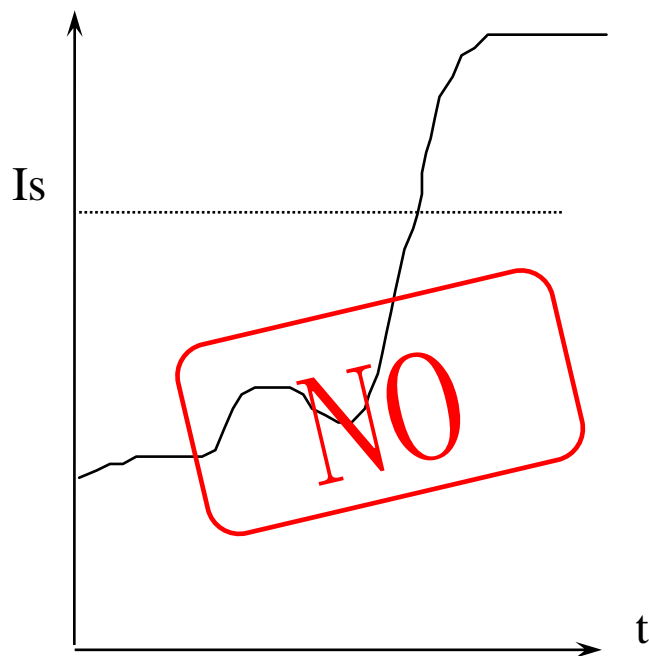
- The FI is a kind of intelligence device can indicate the fault current circuit, which installed on the distribution line
- Features: Accurate, reliable, convenient installation, automation reset, free maintenance.
- The application of FI is the only effective fault location technology method in distribution in the world



Perfect products series



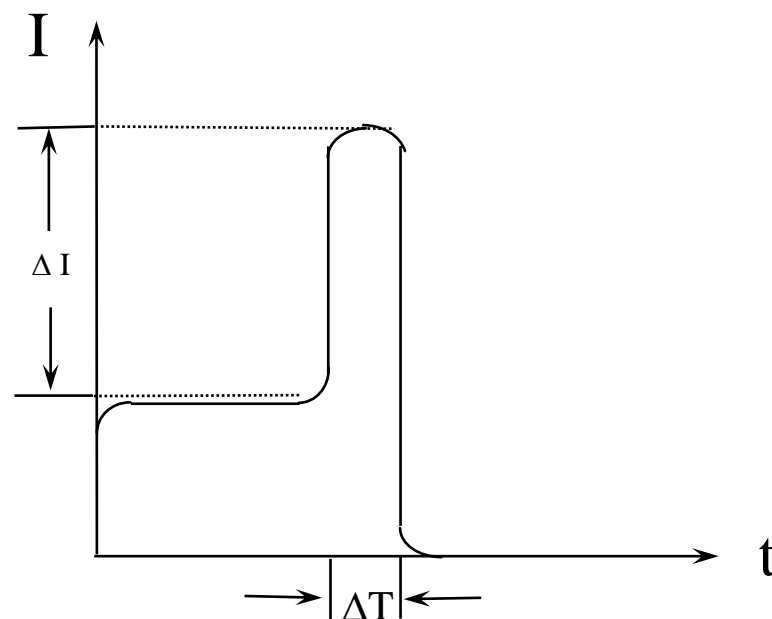
Advantage fault adjustment principle



The over current relay is used in traditional criterion

$$I > I_{set}$$

$$T > T_{set}$$



Intelligence surge method is used in the CREAT criterion

$$(1) I > 0 \text{ or } U > 0$$

$$(2) I_F > I_{set}, T_1 < \Delta T < T_2$$

$$(3) I_H = 0, U_H = 0$$

Earthing fault criteria

- The single phase earthing fault detection of the neutral earthing system is a world difficult
- CREAT solutions:
 - Install a signal source in substation, add a identified signal to the fault line by manual.
 - Depend on the system parameter change before the fault and after the fault.
 - Capacitor current detect
 - First-half wave detect
 - Fifth harmonics detect

Features

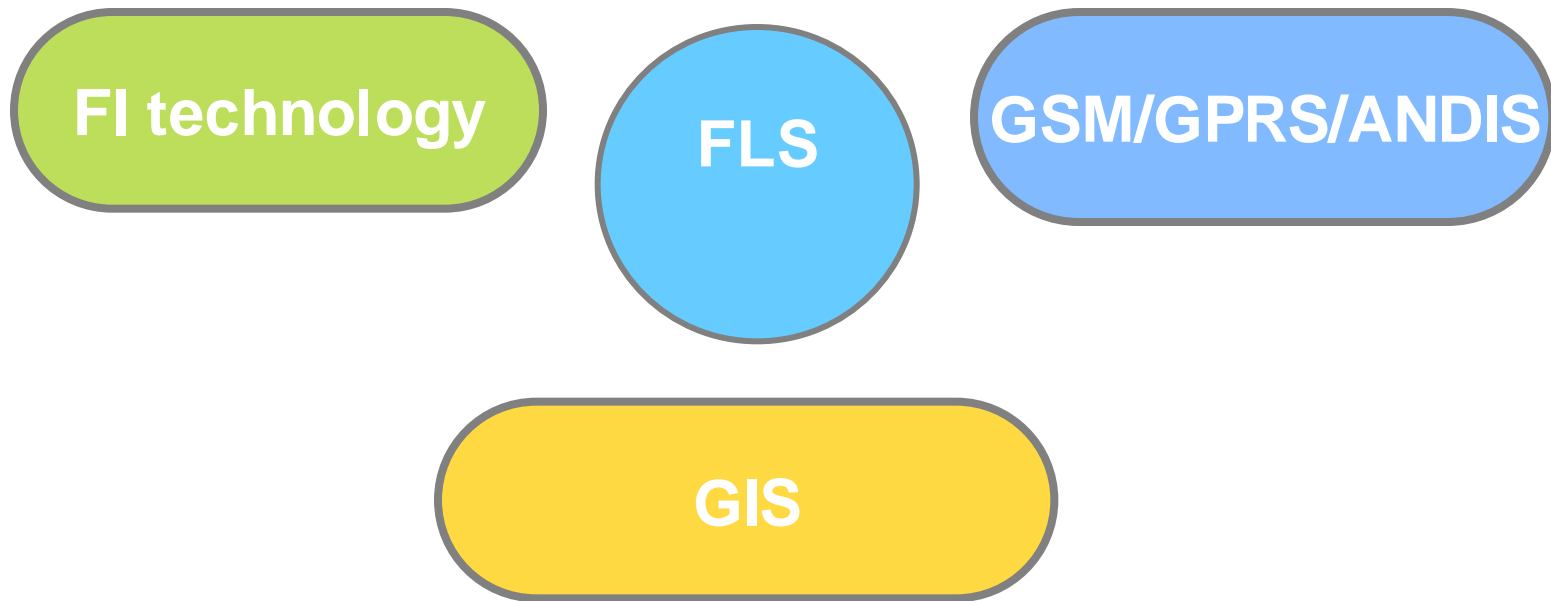
- 1 The flash interval is 3 seconds, Slight distance is 200 meters in day and 500 meters in night.
2. All the electric components can be used on the $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$
3. The battery in fault indicator can work 9 years without maintenance.



One Remote Fault Location System

One remote fault location system

Fault location system of distribution system is base on fault indicator technology, GSM/GPRS communication and ANDIS communication, can be combined with GIS (Geographic Information System)

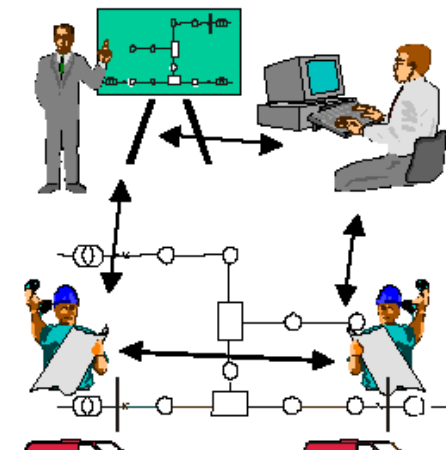
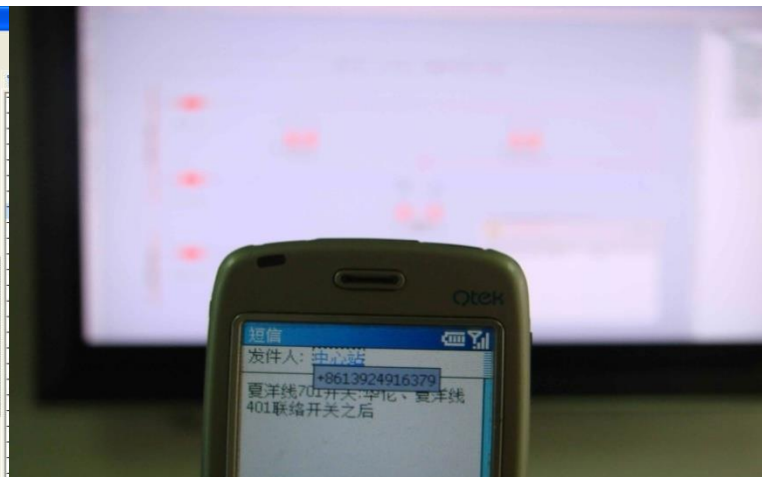


Fault location system features

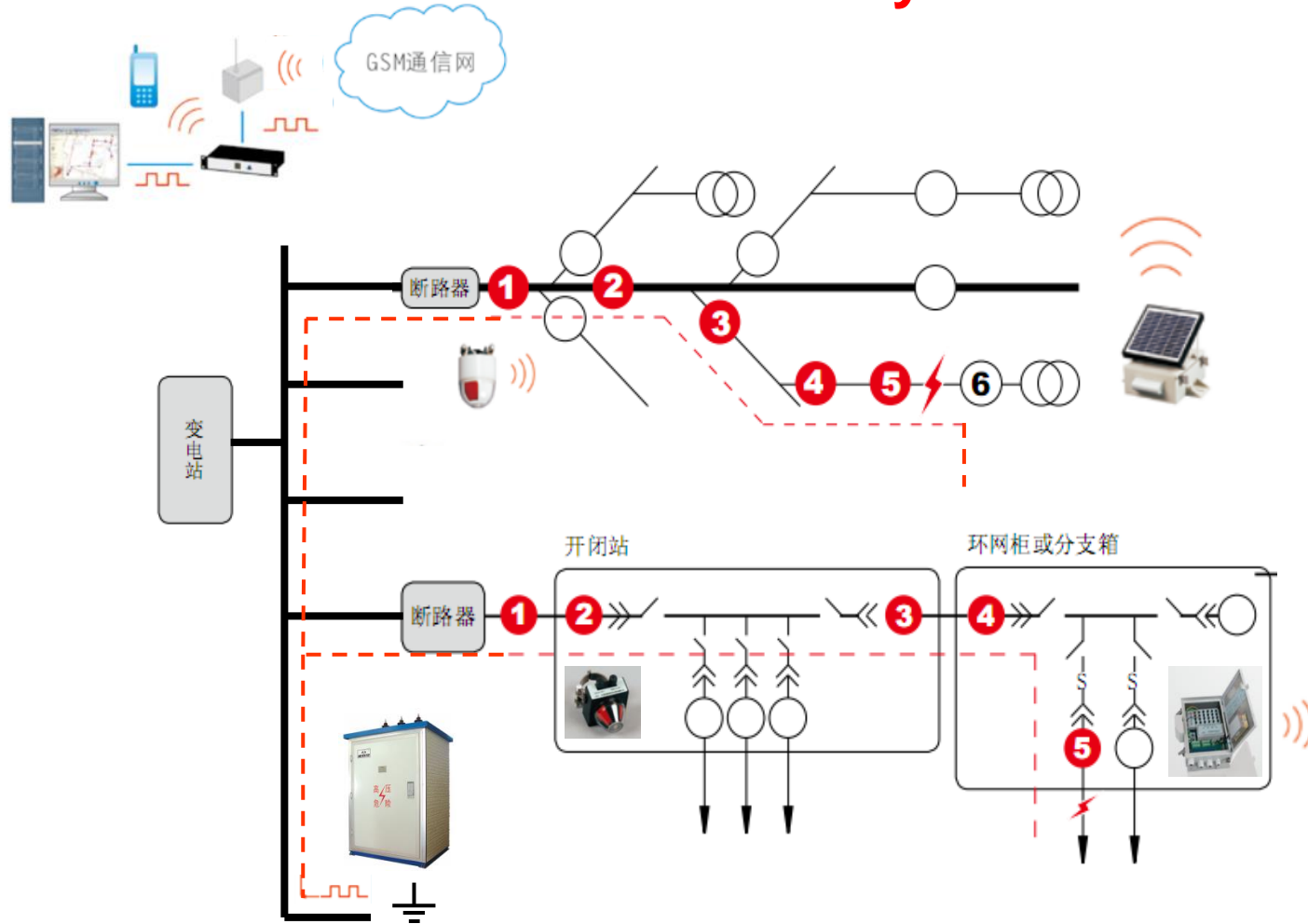
Promptly locate the fault circuit

Inform the fault information by message

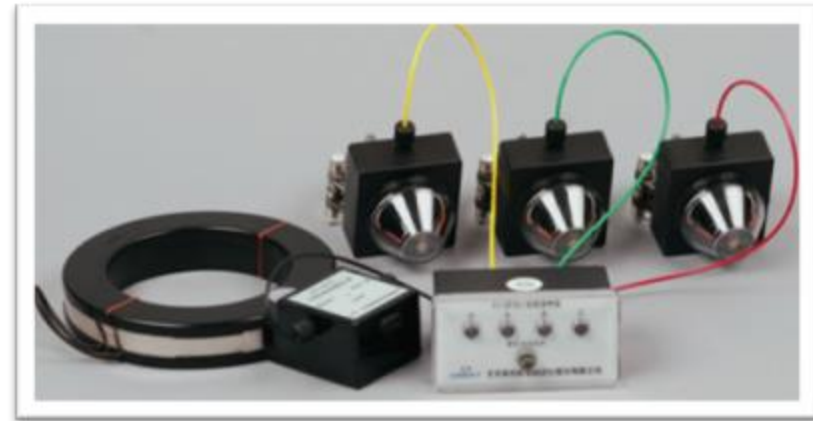
Supply assistance to operator in finding out the fault points



Fault location system



Compositions——Fault indicators



- Detect the short circuit or earthing fault
- Indicate the fault by LED flash & flag
- Transfer the information by wireless or optic fiber

Compositions——Sub-transmitter



- Receive the fault information
- Send the information by GSM/GPRS/ANDIS
- Report the status regularly
- Power manage



Signal Source



- Installed in substation or outgoing line
- Indoor or outdoor installation
- Reject a signal current automatically after a fault occurred, help the indicator to detect earthing fault.

Compositions——Hardware of the monitoring



Center station (communication)

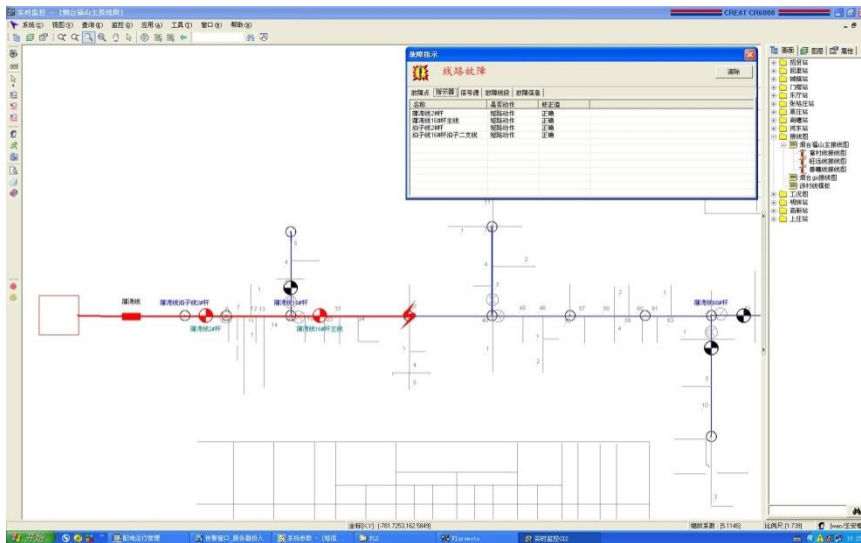


WEB server



Frame server

Compositions —— Software of monitoring



- SCADA feature

Data acquisition, treatment and control

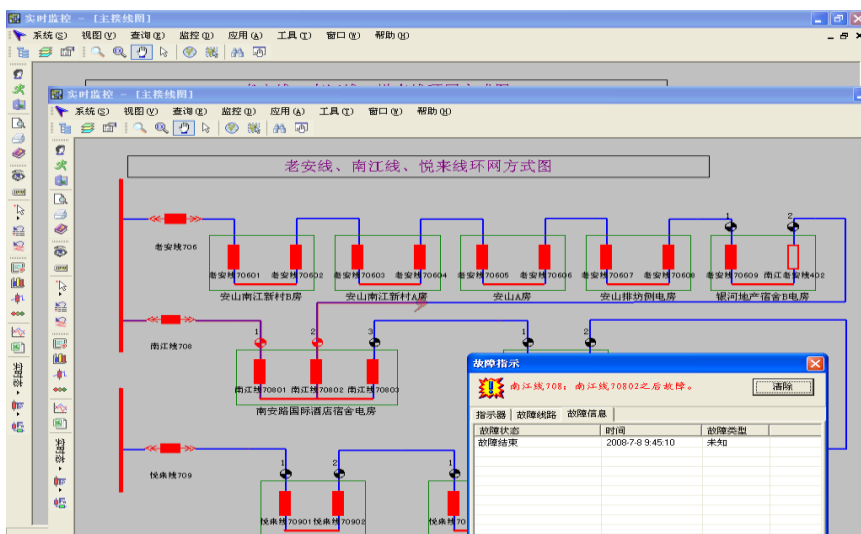
- Background functions of FLS

Fault locating and monitoring
Message notification

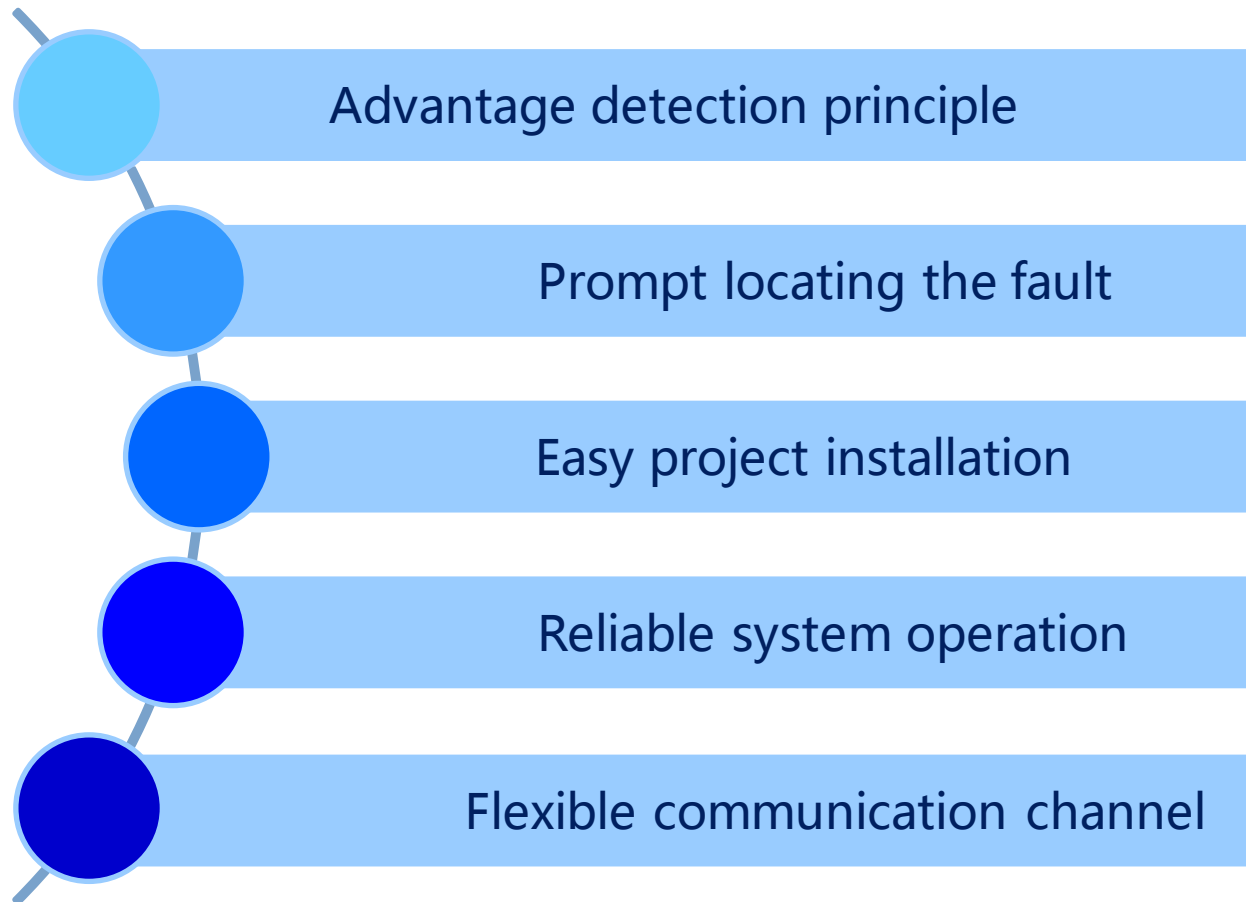
Fault information status evaluation and bad data identify

- Distribution GIS

- WEB review



Technology features

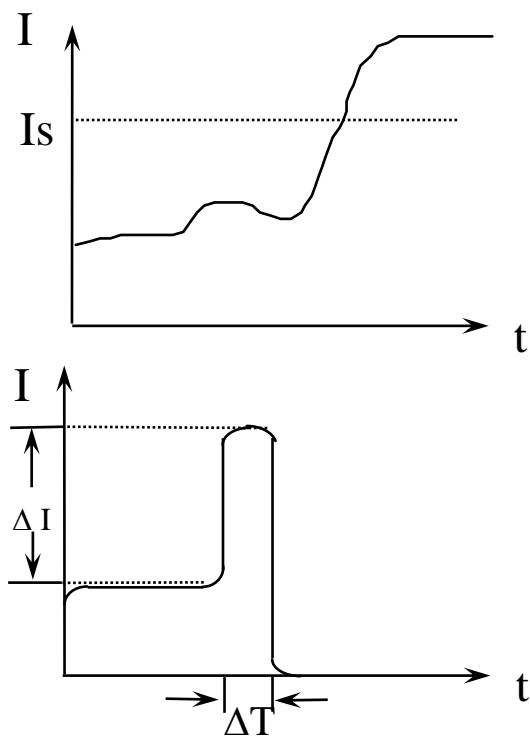


Technology Features

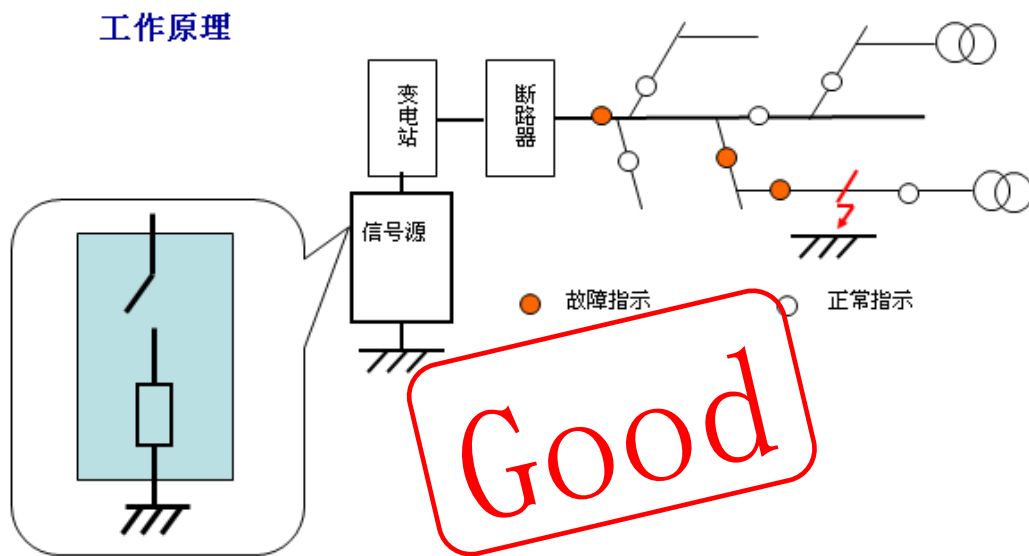
一、The advantage fault detection principle

Short circuit fault : Self-adjustment fault detecting

Earthing fault : Signal rejection



工作原理



Technology Features

Locate the fault in a short time, reduce the time of the fault solving.



Technology Features

The FLS installation no need to change the primary and secondary equipments, there will not be effects to the previous system



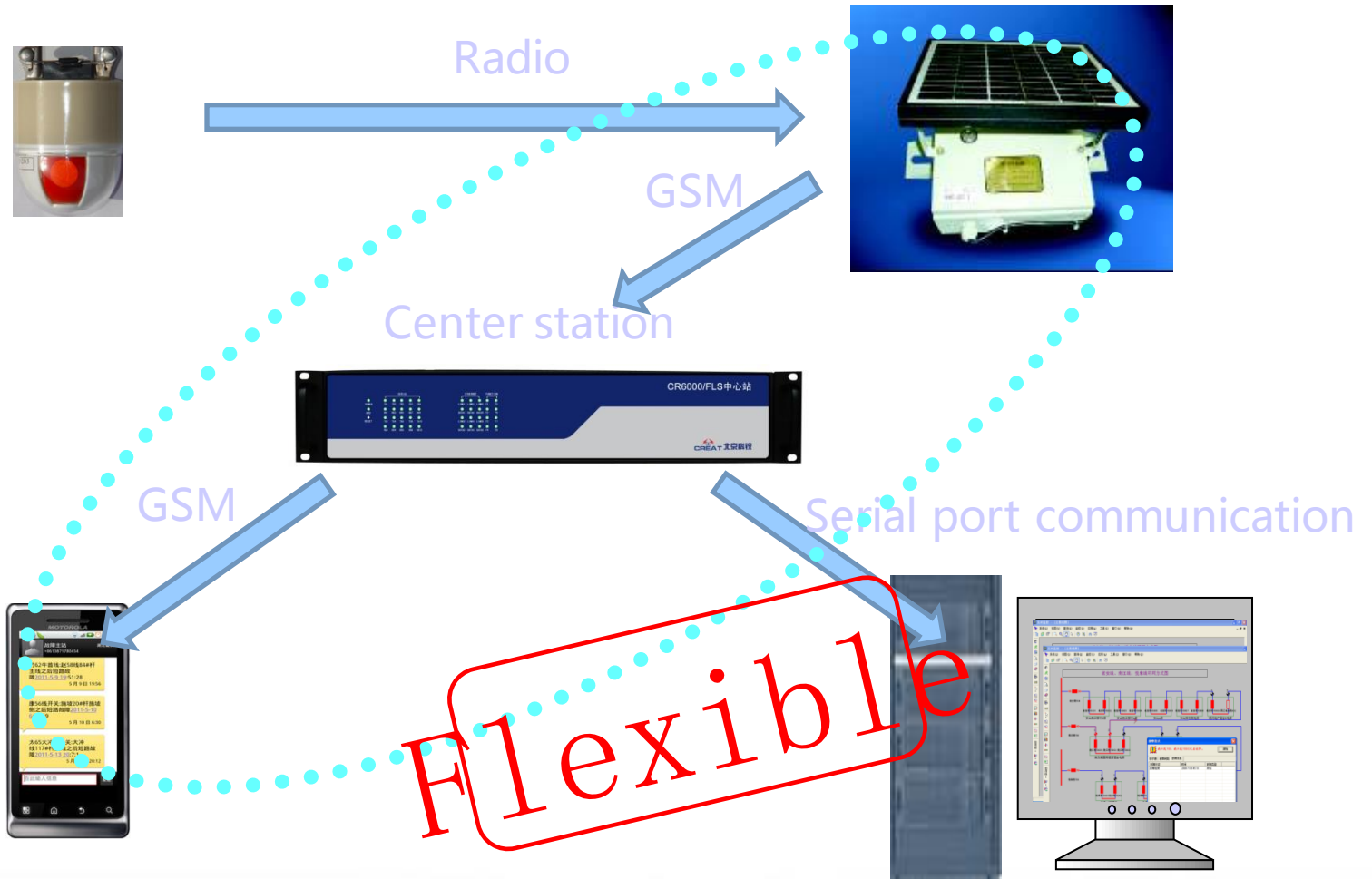
Technology Features

The power supply used the line supply and battery supply, the sub transmitter use the solar supply, it is reliable and free maintenance



Technology Features

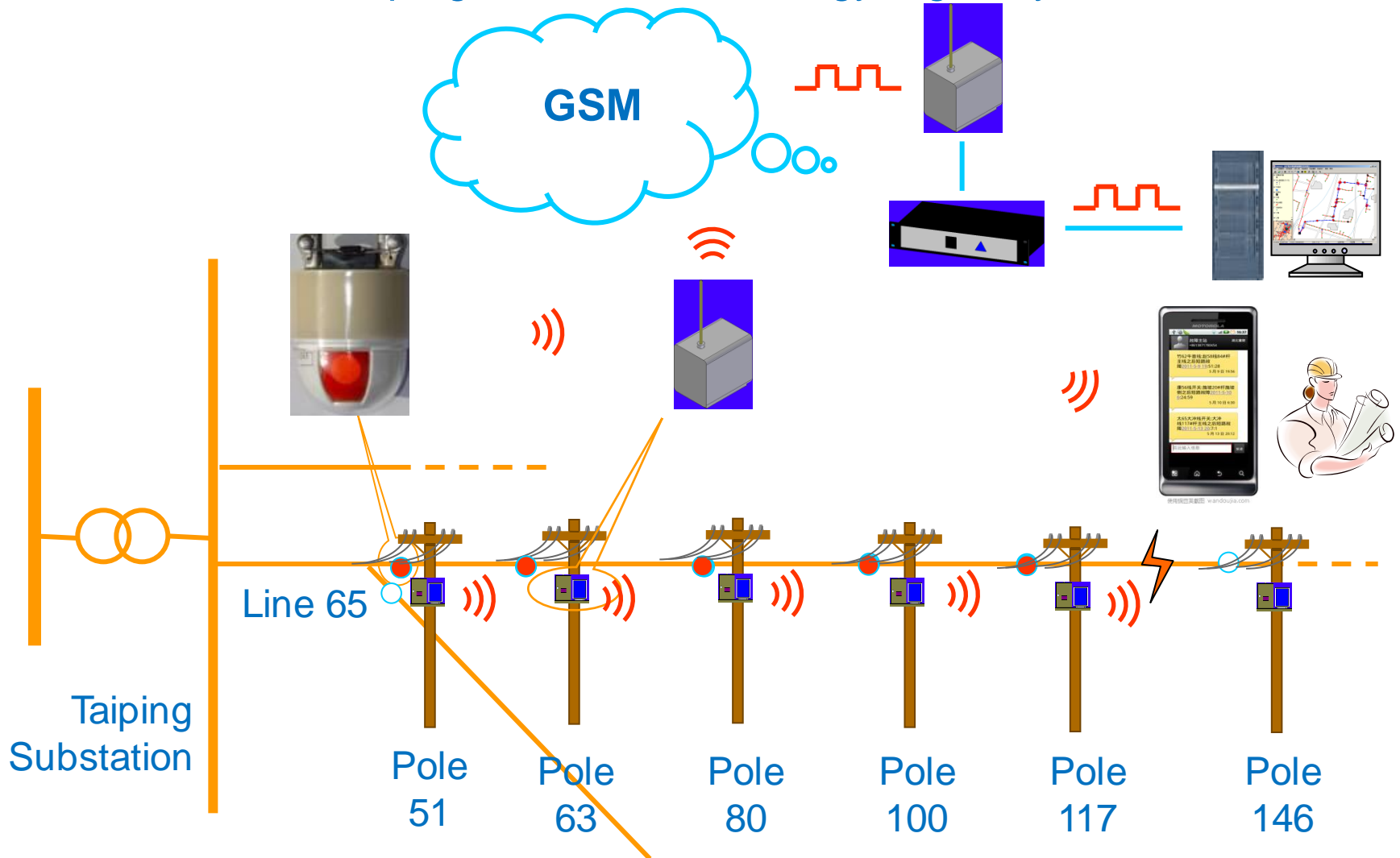
Flexible communication, the far distance data transferring with the GSM channel, no need build the special channel , easy to install



Application effects & analysis

Application Effect & Analysis

Line65, Taiping Substation of Xiangyang, May 13rd. 2011



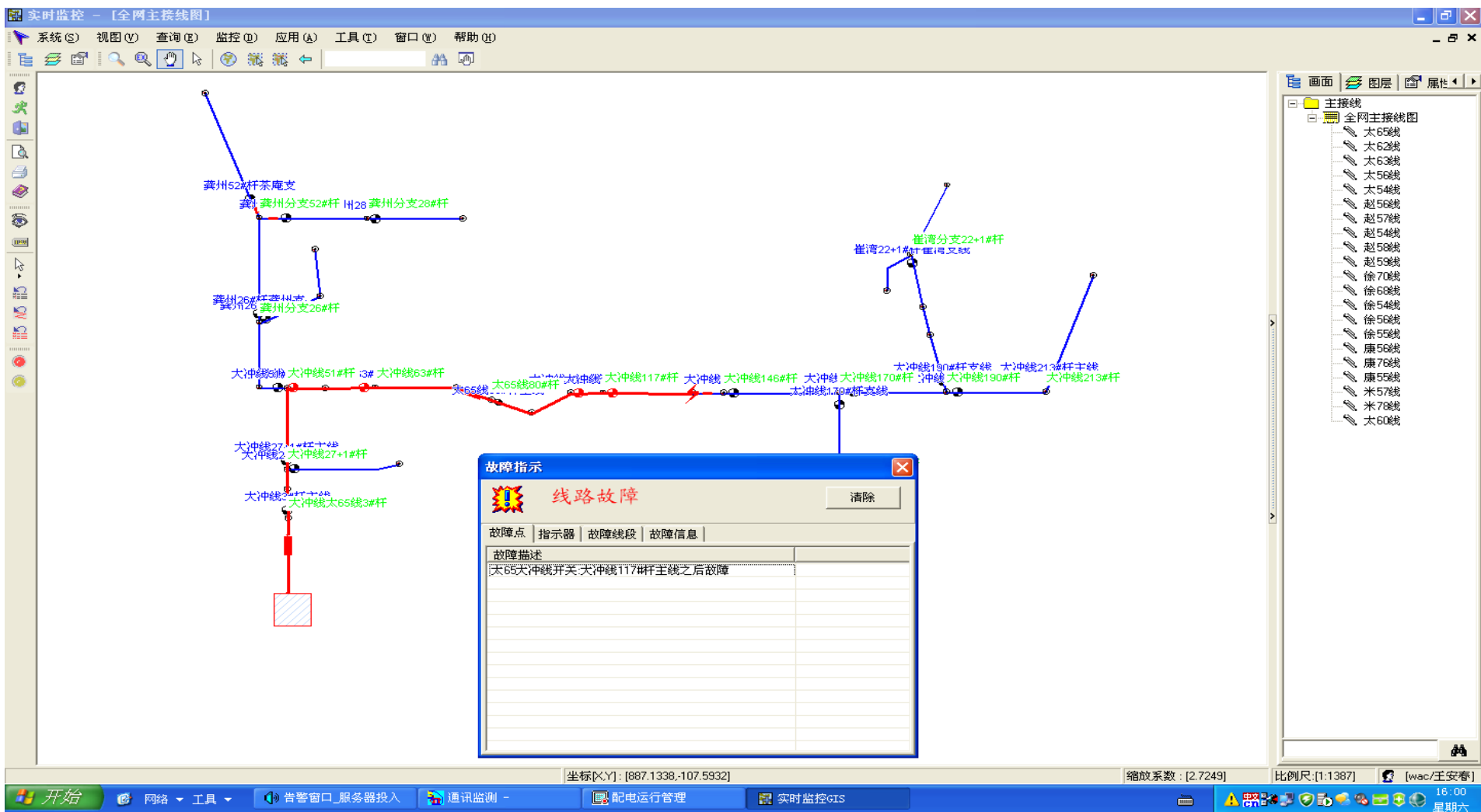
Application Effect & Analysis

■ 2011-05-13 **PM 20:06** Fault Report in Center Station

Time	Phone No. of Sub Transmitter	No. of Report	Contents
2011-05-13 20:07:27.0	8615671484152	065056067000255	Address: Line 65, Pole 117, ST No. 67 Fault type: Short-circuit
2011-05-13 20:07:24.0	8615671484151	065056065000255	Address: Line 65, Pole 100, ST No. 65 Fault type: Short-circuit
2011-05-13 20:07:10.0	8615671484152	065056067000255	Address: Line 65, Pole 117, ST No. 67 Fault type: Short-circuit
2011-05-13 20:07:08.0	8615671484136	065056059000000	Address: Line 65, Pole 80, ST No. 59 Fault type: Short-circuit
2011-05-13 20:07:04.0	8615671484133	065056057000000	Address: Line 65, Pole 51, ST No. 57 Fault type: Short-circuit
2011-05-13 20:07:03.0	8615671484158	065056070000000	Address: Line 65, Pole 63, ST No. 70 Fault type: Short-circuit
2011-05-13 20:07:01.0	8615671484151	065056065000255	Address: Line 65, Pole 100, ST No. 65 Fault type: Short-circuit
2011-05-13 20:06:47.0	8615671484133	065056057000000	Address: Line 65, Pole 51, ST No. 57 Fault type: Short-circuit
2011-05-13 20:06:44.0	8615671484136	065056059000000	Address: Line 65, Pole 80, ST No. 59 Fault type: Short-circuit
2011-05-13 20:06:36.0	8615671484158	065056070000000	Address: Line 65, Pole 63, ST No. 70 Fault type: Short-circuit

Application Effect & Analysis

■ 2011-05-13 **PM 20:07** Fault Location in Center Station



Application Effect & Analysis

- 2011-05-13 **PM 20:12** Line Patrolling Worker received the text message of Fault Location



Application Effect & Analysis

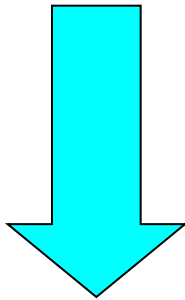
- 2011-05-13 **PM 20:32** line patrolling & emergency workers find the fault point



Application Effect & Analysis

Fault Report

55 min



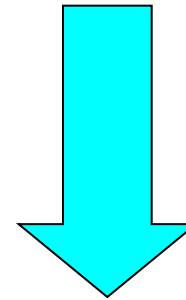
6 min

Before

After

Fault Location

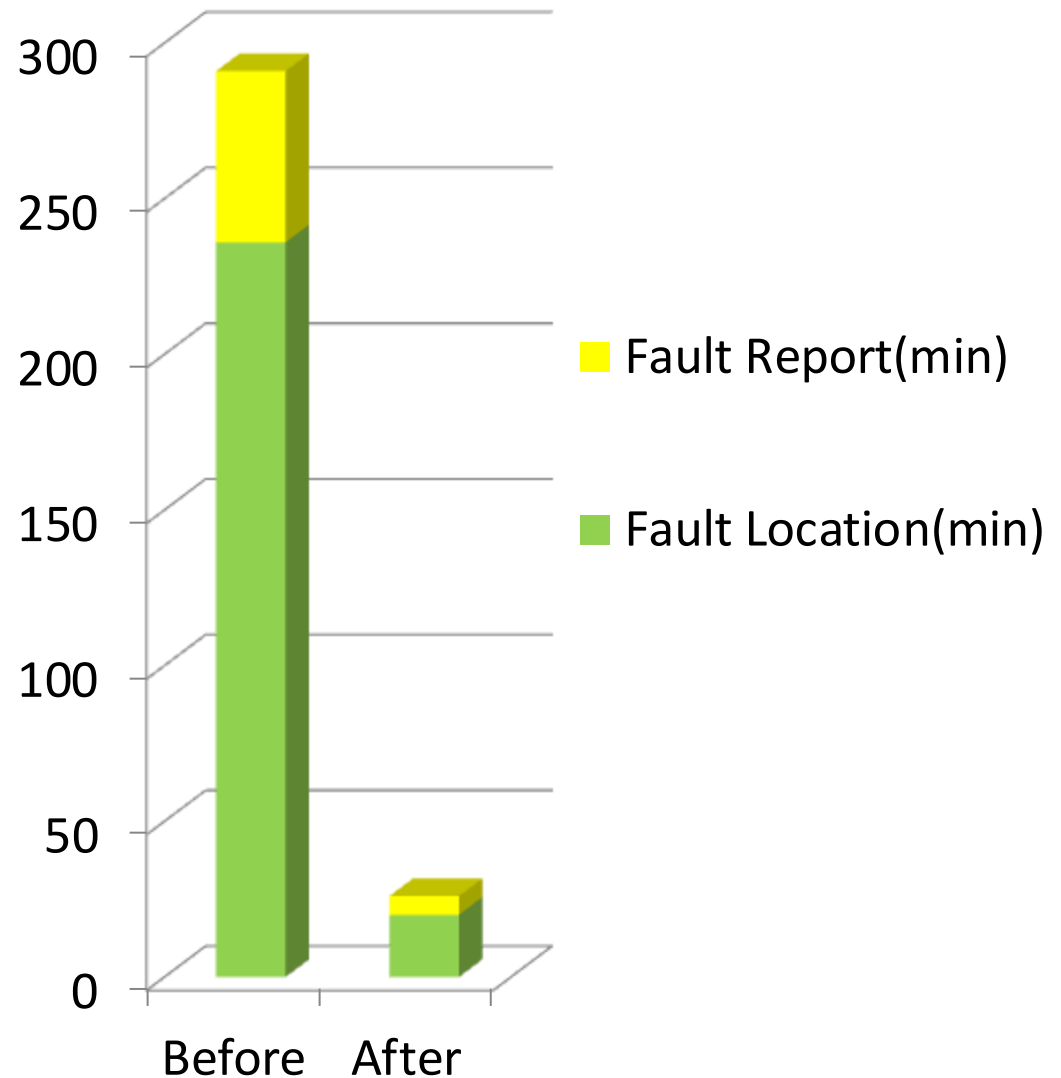
236 min



20 min

Application Effect & Analysis

Fault Treatment	Before (min)	After (min)
Fault Report	55	6
Fault Location	236	20
Total	291	26
Save	265	



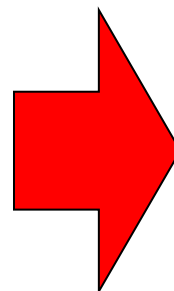
Application Effect & Analysis

Before

Dispatcher /User report the fault
when they find the fault



Locating the fault manually
by line patrol worker



After

FI&ST send message to report
fault automatically



Location be determined and send
to line patrol worker automatically

Application of overhead fault indicators



Application of the cable fault indicators



Q & A



Thanks

Creative Distribution Automation Co., Ltd