THE APPLICATION OF TECHNOLOGY





XC-2100E TRAVELLING WAVE FAULT LOCATION SYSTEM

Kehui International





In the Chinese language, Kehui literally means the Application of Technology. This phrase perfectly defines the company's commitment to technological innovation, which it accomplishes whilst achieving the highest levels of quality.

The company was founded in 1991 as a joint venture with a major US organisation, before becoming independent in 2005. It has utilised the best of Asian, European and American expertise to develop a selection of cable and transmission line fault locators, as well as equipment for the automation of electrical distribution systems and its range of switched reluctance motors.

XC-2100E Travelling Wave **Fault Location System**

Transmission systems are at the heart of the power network and their availability is essential to the reliability of the system. When a fault does occur, it can be difficult to locate, particularly on long remote lines.

Conventional fault locators work on the principle of measuring the impedance of the loop through which the fault current flows. In most cases, this includes a return path through the ground for which knowledge of the actual impedance is hard to obtain and is often estimated, leading to inaccuracies in the measurement of the distance to the fault. By utilising travelling waves, created when the fault occurs, the XC-2100E can measure the fault position independently of impedance and identify the fault point much more accurately.

The system provides accurate fault location for all transmission and distribution power lines, with each unit monitoring up to 8 lines. The fault distance measurement accuracy is greater than ±150m and is independent of line length and other factors which affect the fault location accuracy of traditional impedance measurement methods.

In addition to overhead lines, the system is also suitable for underground and submarine cables, plus hybrid systems combining overhead lines and cables. The XC-2100E consists of travelling wave data acquisition units, XC-100E, installed at the substations, and the master station which analyses the data using the XCF2100E software. For accurate timing of the devices involved, the XC-2100E uses an internal GPS time synchronisation module to provide an accurate time reference.



Benefits of the XC-2100E

- Automatic distance to fault calculation
- Precise fault location (typically less than ±150m)
- Independent of:
 - Earth/Ground impedance
 - Fault resistance
 - Instrument transformer accuracy
- Suitable for:
 - AC Transmission lines
 - HVDC transmission lines
 - Series compensated transmission lines
 - Lines with T branches
 - Hybrid lines comprising cable and overhead line
- GPS synchronisation embedded in to XC-100E unit
- Wide area fault location collects data from the whole network
- Up to 8 lines monitored by each unit
- Fault location superimposed on Google MapsTM network plan
- Comprehensive travelling wave analysis software

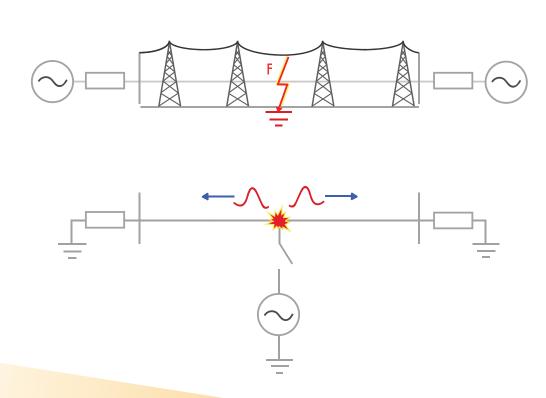


What is a **Travelling** Wave?

Transient travelling waves are produced when a stable power system is disturbed; which can result from flashover faults, CB operation or the influence of lightning.

The event can be represented as a voltage source at the point of disturbance; which produces both voltage and current surges propagating in both directions along the line.

The characteristic impedance of the line and the velocity of propagation of the travelling wave are related to its distributed capacitance and inductance. They are independent of the length and cross-sectional area of the line, but are dependent on its construction and insulation.

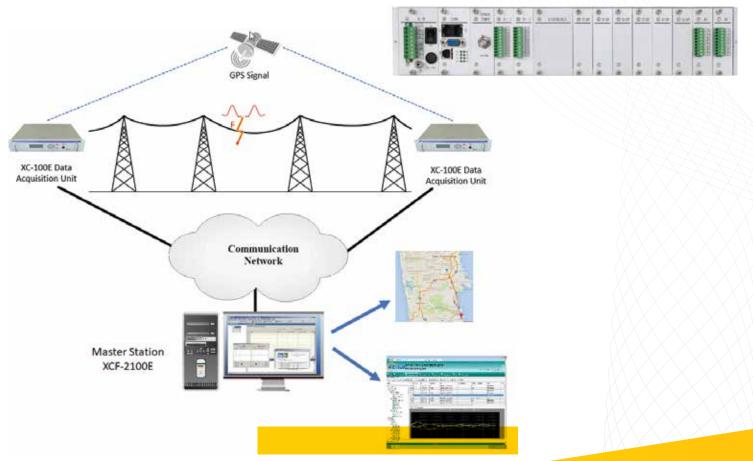


Travelling Waves for fault location

The distance to the fault can be determined by measuring the time taken by the travelling wave to travel from the fault to the busbars in the substations. This is achieved by connecting an XC-100E travelling wave data acquisition unit to either the existing line CT secondary winding, using a small interposing CT, or by direct connection to the protection CTs. The travelling wave will pass through the CT where it is recorded by the XC-100E unit.

Typically, the XC-100E units are synchronised in time using a GPS satellite signal. The arrival time tags of fault generated travelling waves are recorded at both ends. The fault distance is determined by measuring the difference in the arrival times, based on a known value of propagation velocity and the length of the line.

Unlike impedance measurements, this is completely independent of factors such as the accuracy of the instrument transformers and the impedance of the Earth/Ground path, which usually needs to be estimated. Its precision compared to other fault location techniques make this the ideal tool to reduce outage times, particularly on long and inaccessible lines.



Specification:

XC-100E Data Acquisition Unit	
Channels	3-24 configurable for 1-8 lines application
Input type	Current input with a clip-on CTCurrent input from CTVoltage input from PT
AC Current input	 Nominal 5A/1A Burden < 0.4VA (In = 5A) < 0.2VA (In = 1A) Overload withstand: 400% In continuous or 4000% In for 1s.
AC Voltage input	Nominal: 57V/63.5V/69VBurden: < 0.4VAOverload withstand: 200% Un continuous or 250%Un for 10s.
Digital Input	5 Dry contacts (standard) can be extended to a maximum of 16 contacts.
Communications Port	Serial port,2 Ethernet ports plus maintenance Ethernet portModem RJ-45 portUSB port
GPS time synchronisation	Internal GPS module with time accuracy: 100ns
Display	LCD display with 256 x 64 pixels; dimensions: 132 x 39 mm
Memory Space	8 GB, 1000 records minimum
Power Supply	- 85 to 264V, 50/60 Hz AC - 90 to 260V DC
Dimensions	483mm×323mm×88 mm (19"rack, 2U)
Weight	4 – 6kg (Depending on the configuration of modules)



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