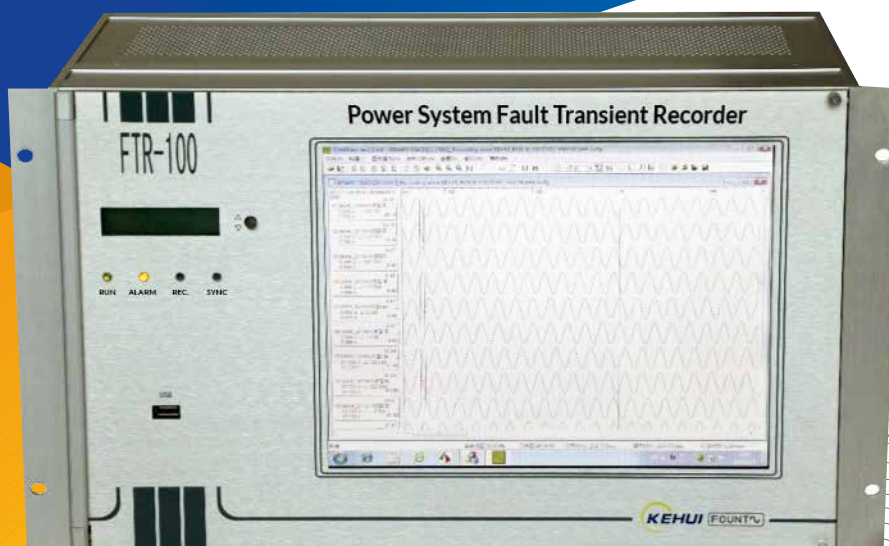


THE APPLICATION
OF TECHNOLOGY



**FTR-100
TRANSIENT FAULT
RECORDER**

Kehui International

Kehui International,
Ware, UK



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.

Kehui factory,
Zibo, China



FTR-100 Fault transient Recorder

Power system digital fault recorders (DFR) automatically and accurately record the pre-fault and post-fault electrical quantities when a disturbance occurs. Through analysis of the waveforms and the events, the reason behind the disturbance can be determined and the correct operation of the protection can be verified. The FTR-100 power system transient recorder provides transient, steady state and continuous recording of the primary equipment and is applicable to both conventional and digital substations.

Benefits of FTR

- Analysis of conventional analogue and digital signals or process/station bus data from digital substations
- Available with or without a built-in industrial PC display for local interrogation
- Efficient data management
- 2Tb of data storage available on integrated hard drive
- Data integrity ensured through the use of Redundant Array of Independent Discs (RAID) storage technology
- Data compression to increase storage space
- Intuitive event enquiry facilitated by a calendar interface which classifies and identifies the time of the events



FTR without integral display

FTR-100 Fault transient Recorder

In conventional operation, the FTR measures analogue and digital signals obtained through a Remote Acquisition Unit (RAU). The RAU contains interposing CTs/VTs and opto-couplers for direct interfacing to the substation's primary equipment. It samples the analogue input signals and the digital status and converts them into Sampled Values (SV) and GOOSE messages, which are transmitted serially through optical fibres to the FTR-100. Up to 96 analogue signals (including AC voltages and currents, DC voltages) and 192 digital status inputs can be monitored.



RAU

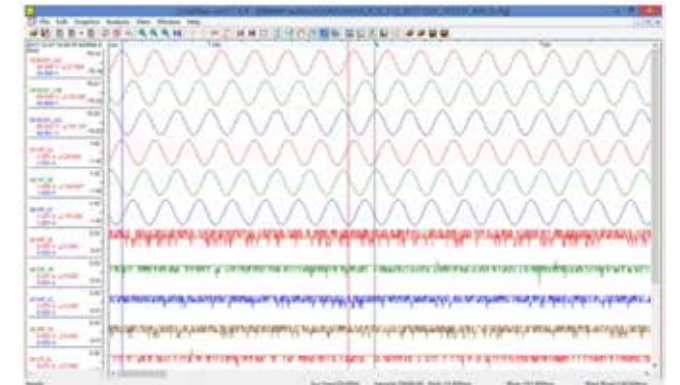


RAU rear view

Alternatively, the FTR can capture digital network information within a substation, ideally using Ethernet technology under the framework of the IEC 61850 communications standard. With this technology, it will be interfaced directly to the merging units (MUs). It captures and records Sample Values (SV) and GOOSE messages on the process bus, and communicates using MMS messages on the station bus. It checks the integrity of the messages for abnormalities and performs error-reporting to ensure the displayed figures are of the highest accuracy.



FTR with integral display



FTR rear view

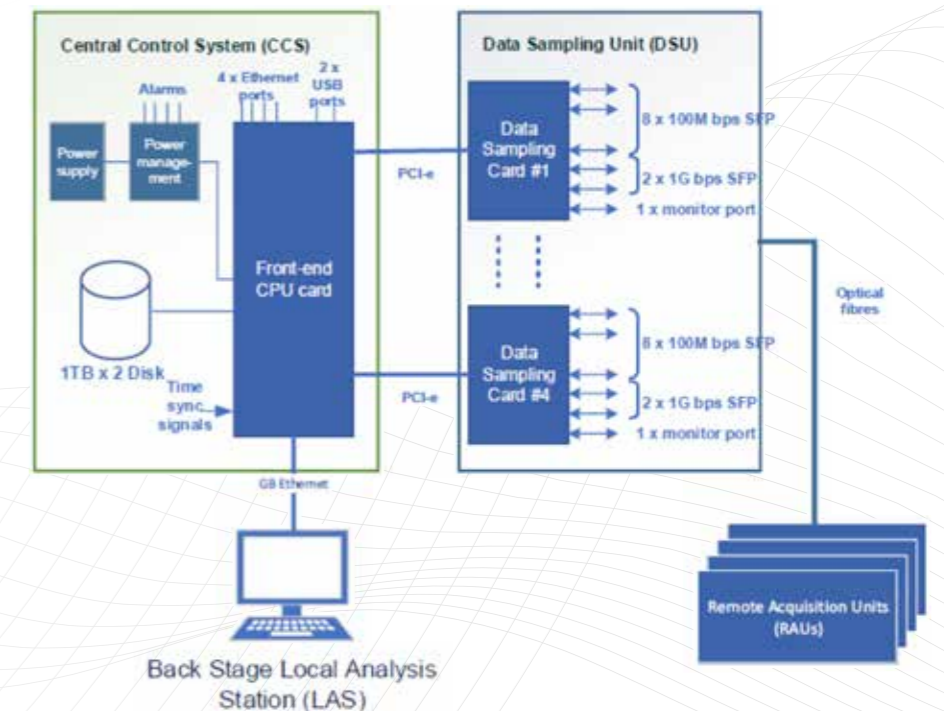
FTR-100 Technical Specification

Monitoring and Recording	Up to 96 AC/DC analogue signals and up to 192 digital signals (or 384 with 5U RAUs) Up to 128 Sample Values (SV) and 512 GOOSE inputs, with up to 32 MUs (merging units),
Continuous recording capability	7 days; 24h for SV messages and 15 days for GOOSE and MMS raw message
MMS interface	2 optical and 2 electrical 1000M Ethernet ports
SV/GOOSE interface	24 100M or 6 1000M Ethernet interface
Recording method	0.5s pre-fault, 10s (extendable) post-fault
Data storage	Storage speed >70MB/s, maximum storage 2TB
Time synchronisation	IRIG-B time code (DC / RS485 / optical)
Time sync. accuracy	<±4us; Internal Clock accuracy:<±500us/24h
Timing accuracy	Message receiving timing accuracy <60ns
Digital sampling interface error	<1us
Status signal resolution	<1ms
Recorded data Integrity	Data can be recorded up to 5s after power-off
Communication protocol	Process bus IEC61850-9-1, IEC61850-9-2 and IEC61850 GOOSE; station bus IEC61850 MMS
Accuracy	magnitude error <1% at In; <10% at 20In
Accuracy, distance to fault	<3%
Sampling rate	DFR (Disturbance fault Recording): 10kHz CFS (Continuous Fast Speed): 1kHz CSS (Continuous Slow Speed): 50Hz
Sampling error	GOOSE message /SV synch. deviation <1ms Analogue signal and SV synch. error <0.3us Sampling resolution <0.5%, phase error <1°
Trigger error	Analogue channel change trigger; error <10% Analogue channel threshold; error <5% Change of frequency trigger; error <0.05Hz Oscillation trigger / harmonic trigger; error <5% Sequence component threshold trigger / over-excitation trigger / reverse power trigger / differential current trigger; error <10%
Electromagnetic Compatibility	IEC 60255-22-1 to -7; IEC 61000-4-8 and -10; IEC255-25 and IEC255-11
Power Supply	AC 220V; DC 110V/ 220V; tolerance ±20%
Power consumption	FTR-100 <50W RAU <10W (with 8 DC voltage channels) <30W
Dimensions and weight	FTR-100 482w x 266h x 240d (mm); 7kg RAU 482w x 177h x 330d (mm); 20kg

System Architecture

FTR-100 has a modular design architecture, using powerful embedded microprocessors as the core to handle various real-time functions. It consists of the central control system (CSS), a data sampling unit (DSU) and a back stage local analysis system (LAS). The CSS front-end operates under a 64-bit embedded Linux operating system. Apart from providing fast processing and real-time multi-tasking capabilities, Linux's rich network software resources also help to make the FTR-100's communications with other equipment more efficient.

In a digital substation, the DSU will be interfaced directly to the merging units (MUs). The DSU consists of up to 4 data sampling cards, capable of connecting up to 32 merging units. In a conventional substation, Remote Acquisition Units (RAUs) are used to sample analogue quantities and digital status. The RAUs convert the data acquired into Sampled Values (SV) and GOOSE messages. The data is transferred to the DSU through optical fibres. Up to 96 AC/DC analogue signals and 192 digital status inputs (extendable to 384) can be monitored. A maximum of 3 RAUs can be accommodated.





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