

Reliable Research

Fault recorder system at CERN

■ The company

CERN (“Centre Européenne de Recherche Nucléaire”) is the most important European organization for nuclear research and is financed by 20 member states.

CERN has been responsible for important discoveries within the microcosm of the smallest particles. To make such research possible, CERN operates several particle accelerators requiring a large amount of energy.

■ The starting situation

On the French side, CERN is supplied with electrical power by EdF – RTE (400 kV) and on the Swiss side by EOS. They also receive emergency power from the 16 kV power supply system of SI Geneva. In addition, CERN operates internal emergency generator sets. Power is distributed internally via the Prévessin station by means of a 16 kV ring. According to their own indications, CERN operates approx. 7000 medium-voltage cells.

The quality of the power supply is extremely important. Any fluctuation or fault can falsify research results and delay research projects for months.

No possibility of integration into the telephone network

In the past, CERN relied on the fault recording systems at the individual power supply points for obtaining the necessary data in the event of a power failure. Fault recorders from various manufacturers are used, including Siemens OSCILLOSTORE systems operated autonomously at 5 infeed stations. Integration in the customer’s own telephone network was planned, but the network proved obsolete and could not safely be used for a reliable transmission of fault data.

Time-intensive evaluation

When a fault occurred, technicians had to drive to a station before they could access the data and start analysis. This evaluation method, which had developed over time, was time-intensive and highly inefficient. Because the fault recorders used came from different manufacturers, it was not possible to combine data in a single system software.

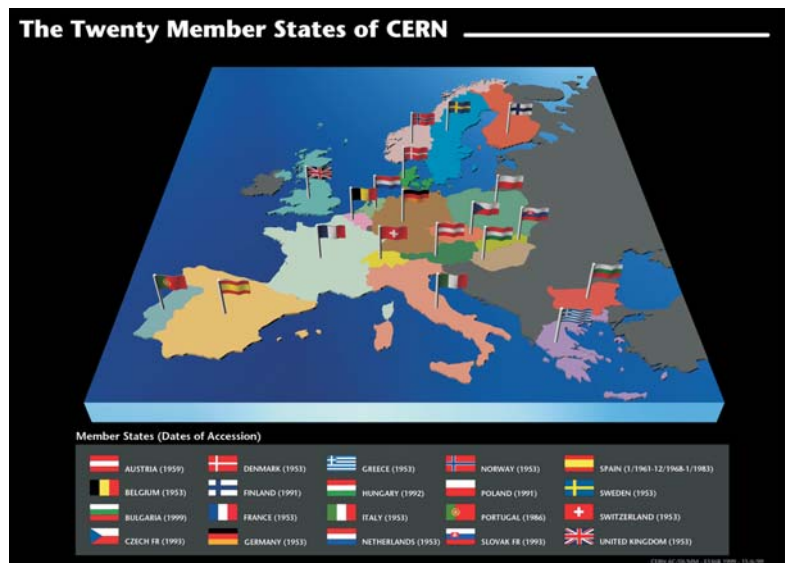


Fig. 1 CERN member states

CERN’s requirement: All data must be concentrated and analyzed centrally.

■ The concept

Siemens Power Automation Division developed a suitable concept that permits centralized evaluation without necessitating the replacement of existing devices. As a further advantage, the proposed solution allows a future system expansions.

Centralized data

The solution serves to concentrate the data at the customer’s head office. This placed special demands on the communication concept. It was the customer’s requirement that no additional electronic components are to be installed in the particle accelerators, because they might falsify the research results.

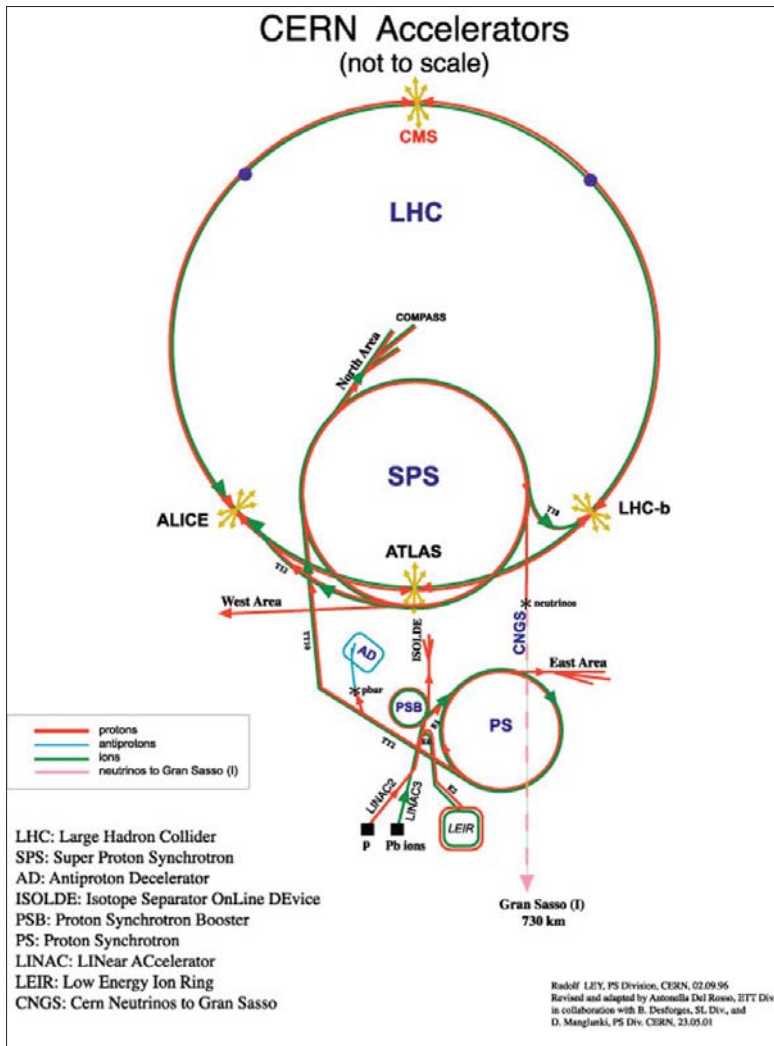


Fig. 2 CERN, schematic diagram

Connection via interfaces

The device located furthest from the head office is about 14 km away. The demands on the communication links could be met only by employing mono-mode fiber-optic cables (1320 nm). The old-model fault recording devices currently in use were not bus- or network-capable. A point-to-point connection to a star configuration had to be set up for each device to provide a sufficient number of serial interfaces at the data collection center.

The solution implemented includes a DAKON 98 data concentrator at the customer's head office with an appropriate number of serial interfaces. It was possible to integrate all existing Siemens fault recorders in a global concept by means of converters connected to 1320 nm fiber-optic cables. Fig. 5 provides a detailed diagram of the communication link.

The old fault recording systems were adapted to the new communication options. This required a partial replacement of the firmware as well as a re-parameterization.

The special advantages

Easy to expand

The Siemens concept permits the cost-effective and user-friendly integration of potential expansions. In addition, the DAKON 98 system used makes it possible for a higher-level office to access the recorded and stored data.

CERN considers this future-oriented concept to be the ideal solution. They eagerly promoted the conversion and also replaced the non-Siemens fault recorders with SIMEAS R.

Flexibility in data synchronization

An evaluation station that can be set up at a separate location was connected to DAKON 98. At this station, data synchronization can be performed either manually or automatically and more extensive fault analyses can be conducted using the OSCOP P system software.

Future-proof system

CERN plans to expand the current fault monitoring system to include power quality analysis with SICARO PQ. They must also be able to include data from other users in the analysis, which requires converting to a client-server system architecture. This conversion can easily be performed using the OSCOP P system software.

Conclusion

A fault recording system was installed at CERN, permitting the concentration and analysis of all data and making it possible to take fast and effective action in the event of a fault. This is extremely important to CERN, because their research work cannot be safely conducted unless high power quality is guaranteed. Moreover, future system expansions are possible and easy to implement.

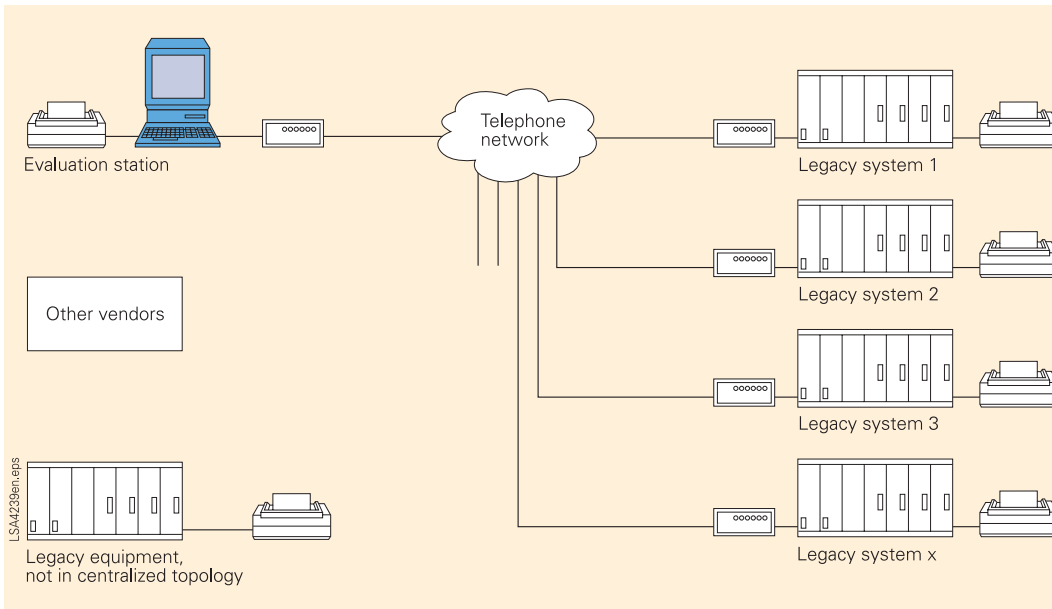


Fig. 3 Technical configuration before modernization

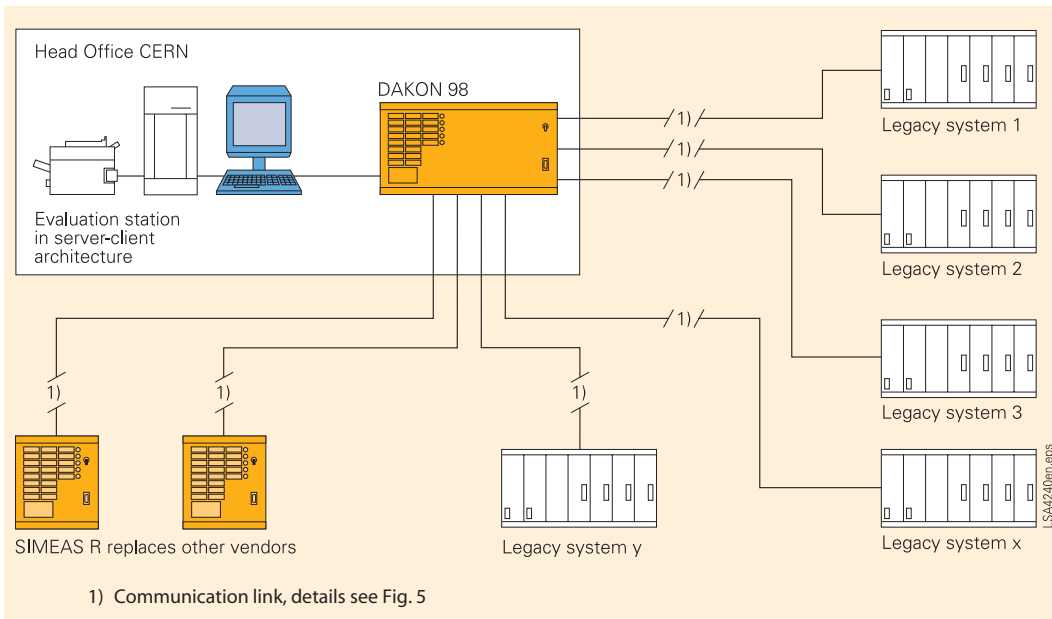


Fig. 4 Enhanced fault recording system of CERN

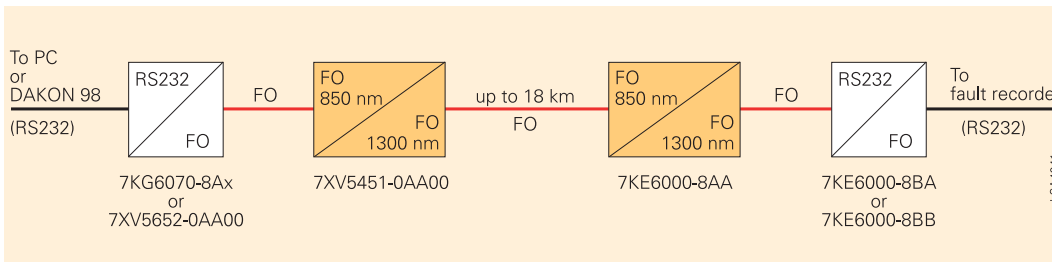


Fig. 5 Schematic diagram of a communication link

