

MODIFICATION OF THE LENNARTZ APPARATUS FOR THE SEISMIC ARRAY IN WEST BOHEMIA

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ABSTRACT. Seismological observations in the West Bohemia are closely linked to the study of a seismic and tectonical active part of the Bohemian Massif. The purpose of the proposed project is to carry out the two following ways of investigation in the region:

1. Continuous observations of seismic activity by means of local seismic networks "WEBNET".
2. Continuous registration provides an overview of the long-term trends of the recorded quantities, and enables us to specify the conditions for selection of the recording instruments and optimum technical parameter setting. The paper describes ways of combining digital seismic devices Mars 88 with former digital PCM 58000 (Lennartz Electronic) recording systems.

KEYWORDS: Seismic monitoring, seismic equipment, digital telemetry transport, seismological observations

1. INTRODUCTION

The region of Western Bohemia is known by the occurrence of seismic swarms, which have been observed for several hundred years. At the same time, this region is one of the most interesting from hydrological point of view, because of the presence of many healing mineral water springs.

Starting in 1991, the Institute of Rock Structure and Mechanics of the Czech Academy of Sciences initiated the recording of seismic events and their possible correlations with the changes of physical and chemical parameters of mineral springs in this region.

During the first period of recording (from 1991 to 1993), five autonomous seismic stations were installed, using the up-to-date digital seismic recorders of type MARS 88-FD, made by LENNARTZ ELECTRONIC (Germany).

In this first period of monitoring, the seismic stations were situated in the vicinity of the most known spa centers (Karlovy Vary, Mariánské Lázně, Jáchymov, Františkovy Lázně). This monitoring yielded the first instrumental information about the seismic regime of individual sites. Due to the weak seismic activity during this period (1991–1993) and the high level of local seismic noise at the stations, it was

impossible to identify weak seismic events which may have occurred within this region.

Data obtained by this network also created a satisfying basis for monitoring of the physical and chemical parameters of healing springs. However, measurements carried out during that time did not yield data series with sufficient density, homogeneity and dynamic range. They were carried out mostly by hand and with sampling intervals of once per day or even week. As an example of this monitoring, multiparametrical observations, which considered responses to seismic events, may be quoted, too, see [Knett 1898].

In order to meet present requirements, modern digital recording devices were installed at Jáchymov and Karlovy Vary, CR.

Basing upon these data, the foci of some microearthquakes were located in the vicinity of Aš, Trojmezí, Kopaniny, and in the region of Slavkovský Les hill, close to western border of the Czech Republic. Also based on these results, a reconfiguration of this local seismic network has been proposed (a grant application) in cooperation between the Institute of Geophysics and the Institute of Rock Structure and Mechanics. The proposed seismograph sites were selected to be optimal from the viewpoint of actual seismically active areas and recording conditions.

The advanced hardware and software enable the network of seismic stations to be extended to 8–10, and more effective interpretation methods to be established.

A fundamental step was the realization of telemetric transmission between seismic stations and the recording center. Contemporary technical equipment and limited financial means required the combination of different apparatuses, such as the PCM 5800 and MARS 88, and transmission of the homogenized digital data to the interpretation center in Prague. The block diagram involved is shown on Fig. 1.

The system PCM 5800 being operated by the Geophysical Institute is deployed in its basic telemetrical version with 4 three-component seismographs. This device is completed by the mixer PCM 5800 including the interface IEE 488 connecting it on-line with the computer PC/AT 386 equipped with a magneto-optical disk unit of 128 MByte memory with overwriting capability.

The three stations using the system MARS 88 with floppy disks were gradually modernized to systems with the modem control (MC). Two of them were completed by telemetric transmission radio control (RC). The stations of the MC type can operate with direct connection to GATEWAY as well as to public telephone lines by means of transmitting and recording modems.

The quality and applicability of this seismic network has been extended by parallel deployment of both mentioned digital systems and their components.

By using the direct connection between the mixer PCM 5800 with the UNIX WORKSTATION and the PC recorder, equipped with the magneto-optical disk as well as with a fast-transmitting modem, the access to all data in common data files is made possible.

Direct data transmission to the interpreting center in Prague is a necessary condition for securing an operative system for data interpretation. The routes of proposed transmissions are shown on Fig. 2.

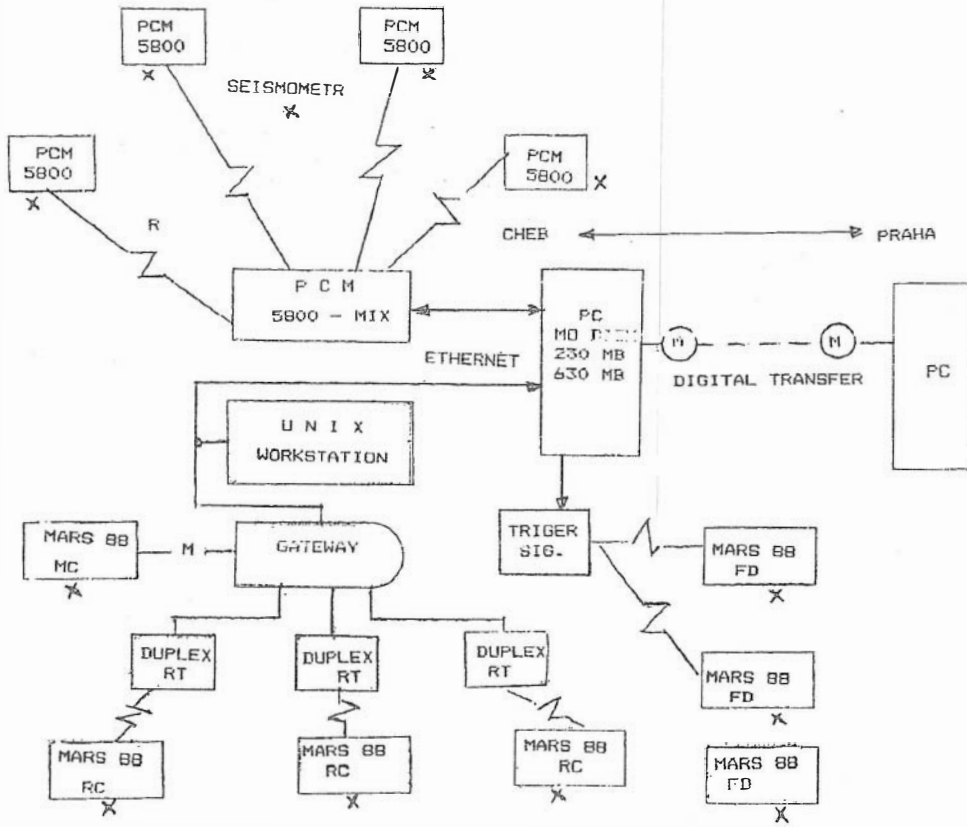


FIG. 1.

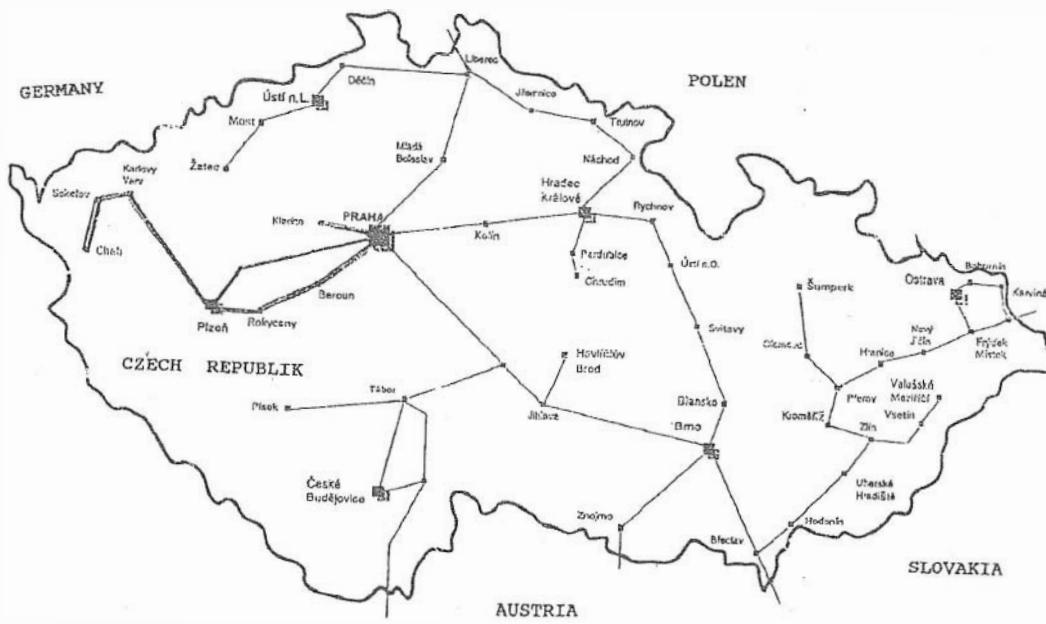


FIG. 2.

The actual digital data transmissions via optical cables make use of synchronous digital technology (SDT) with the possibility of using leased lines (LL). In these lines, technical parameters complying with the CCITT-M1040 standard are guaranteed by the TELECOM company. Defined data circuits secure the two-way transmission of data between two or more stations. According to special requirements, they can be installed with full or modified interface.

In the long distance operation, these data sets are made available by flexible multiplexors or by group modems (GM), even on analogue lines. Only approved equipment can be connected to these lines. Payments for these services depend on distance zones, on the transmission speed and on the type of the phone circuit (one or two pairs). Transmission speeds of digital networks reach from 64 kbit/sec to 2048 kbits/sec.

2. CONCLUSIONS

The described access to data transfer is a necessary condition for successful research of earthquakes in Western Bohemia, because it enables continuous acquiring and interpretation of data, using advanced seismic software.

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