Development of a multi-transmission high-speed resistivity survey system

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【Outline】

The Exploration Geophysics Research Group has developed an ultra-high-speed measuring device that enables data measurement at several dozen times the speed of earlier resistivity survey devices, high-density 3D electrical exploration, and real-time resistivity monitoring.

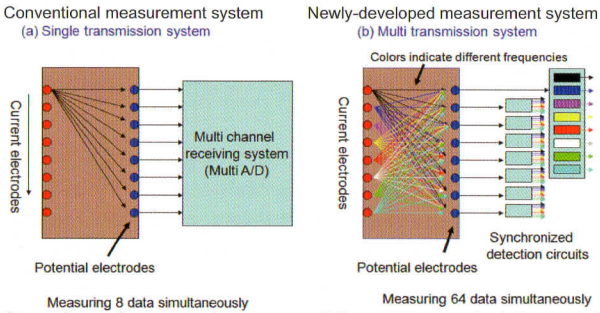
【Details】

Conventional measuring devices measure by using a single frequency current and switching between transmitting and receiving electrodes. The device developed through this research can transmit precisely controlled currents of different frequencies simultaneously from multiple electrodes, and take measurements through synchronous detection with receiving electrodes and separation of signals according to frequency, eliminating the need to switch transmitting electrodes, and enabling dramatically faster data acquisition.

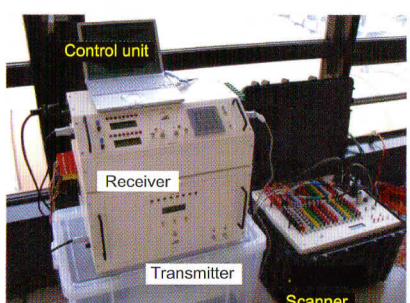
Jinguuji et al. (2007) Development of multi-transmission high-speed resistivity survey system. Expanded Abstracts, SEG 77th Annual International Meeting, San Antonio, USA

【Applications】

This device could be used in a wide range of construction and environment-related applications: high-density 3D electrical exploration can be used to evaluate the soundness of house foundations and to survey soil contamination, industrial waste disposal sites, and groundwater flow; and high-speed resistivity monitoring can be used to evaluate potential landslide sites, soundness of levees, and subsurface changes caused by air injection method.



Comparison of conceptual diagrams of the measurements between (a) conventional single transmission system and (b) the new multi-transmission system. Red circles are current electrodes and blue circles are potential electrodes. Different colors of the lines between current and potential electrodes indicate different frequencies.
The new device enables high-speed data acquisition through the simultaneous transmission of multiple currents of different frequencies and high sensitive signal separation using synchronous detection technology.



The new developed prototype can simultaneously transmit 8 channels and separate 64 mixed signals from received each potential electrodes channels, and enabling fast data acquisition of 1,200 data items per minute.

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