GEO INSTRUMENTS

DL *Series*

Data Acquisition and Logging

Data logging systems (DL Series) are commonly used as a way to enhance the value and usefulness of geotechnical instruments. DL Series systems are used in a wide array of project types, including dams, mines, infrastructure work and research. Custom-built from parts from leading manufacturers, they are tailored to each application and can accommodate almost any type of instrument. They are rugged, reliable and will bring added value to any project.

DL Portable

Why use data Logging systems?

DL Series are designed to acquire and store data from all types of instruments. They alleviate the need for manual measurements and the associated personnel costs. Rather than having an employee make the rounds to each instrument, the entire process is automated. This also removes the risk of error associated with manually writing down measurements.

DL Series offer *smart* acquisition: acquisition rates can be changed according to events, since the DL Series are able to trigger other systems such as pump stations or seismographs, and manage the power available to instruments and external devices. Finally, they can include telecommunications options such as cellular or satellite modems to extract data in real-time from the instruments, removing the need for regular site visits.

How do they work?

A typical DL Series is built from a Campbell Scientific data logger, multiplexers, instrument interfaces, a battery and a solar panel. Each instrument is polled at specific intervals and the data is stored in the on-board memory. Each logger has a built-in battery that ensures continuous operation in the event of a blackout.

Example applications

Arctic mine tailings

Tailings dams in an arctic mine require a large number of instruments over a wide area. The instruments are typically spread out over several square kilometers and are too difficult to reach depending on the season. Careful planning and deployment of the DL Series therefore increases the reliability and ease of use of these instruments.

Construction

Major infrastructure work in cities often takes place near critical or sensitive buildings that require extensive monitoring to maintain their integrity. Crackmeters, tiltmeters, extensometers and in-place inclinometers are frequently used. By properly optimizing instrument types and routing, costs can be kept down and a high reliability can be guaranteed. Local personnel and engineers can immediately be warned of any anomaly and take the required action.

Hydroelectric dams

Hydroelectric dams necessitate the installation and reading of instruments whose reliability has to be guaranteed over the very long term. GEO-Instruments build their DL Series to the highest and most stringent standards to ensure this long-term reliability.

Structural health monitoring

GEO-Instruments' DL Series offer real-time measurements of instruments installed on large structures such as bridges and highways. The DL Series pushes this centralized real-time data to GEO's servers. Users can then easily access their data on our servers for visualization and analysis.

Technical features

Calculations

Each DL Series logger is custom-programmed to the requirements of the project. Data from the sensors is reduced in the DL Series in order to be outputted directly in an engineering format. This approach decreases the amount of work required for data analysis. Furthermore, complex calculations can be performed on-board using data acquired from multiple sensors to provide the required outputs to the user.

Programmable outputs

All DL Series have built-in digital I/O ports. These can be used to control external systems and instruments. DL Series can stand in as a miniature, low-cost control panel.

Standalone operation

DL Series can be designed to be powered by a regular power line or be completely stand-alone and powered by a solar panel. With this option, they can be deployed in remote areas with the assurance that the system will remain fully functional for the duration of the project.

Options

Instrument deployment

DL Series are highly flexible systems that allow for a large number of possible configurations.

LOCAL CONNECTIONS

Instruments can be directly connected locally to the DL Series. With the use of multiplexers, a large number of instruments can be connected to a single system. This simple approach is the most commonly used, each DL Series acting as a central connection point for all the instruments.

DEPORTED MULTIPLEXERS

Running long cables back to a central logger can be expensive. Rather than running a large number of cables back to a central DL Series, they can be connected to a local multiplexer whose single cable is run back to the central station. This is often done in a "star" configuration.

RADIO-CONNECTED DEPORTED MULTIPLEXERS

Instruments can be connected back to a central station with a radio module over several kilometers. In large work sites, this can help cut down installation and operating costs.

DL Multiplexers and manual switch

DAISY-CHAINED MULTIPLEXERS

Multiplexers can be stringed with each other to cover even longer distances, either over communication cables or by radio.

DL Series deployment

DEPORTED DL SERIES

As an expansion to the deported multiplexers, DL Series can be deported as a way to locally back up data from local instruments before running a cable back to the central station. These are often arranged in a star pattern radiating from a central location.

RADIO-CONNECTED DEPORTED DL SERIES

DL Series can be connected back to a central DL Series with a radio module over several kilometers. In large work sites, this can help cut down installation and operating costs.

DL Peripheral multiplexers

DAISY-CHAINED DL SERIES

DL Series can be stringed with each other to cover even longer distances, either over communication cables or by radio.

DL Series deployment (Cont.)

DL Series

BUS-CONNECTED DL SERIES

DL Series can be connected to each other on an RS-485 bus. In this configuration, long distances can be covered (several kilometers) and each system has its unique address.

ETHERNET-CONNECTED DL SERIES

DL Series can be connected through a distributed network over TCP/IP in work sites where such an infrastructure is available.

Communications

BETWEEN DL SERIES

- **Cabled**
  a. Ethernet: For short-distance transfer of large amounts of data.
  b. RS-485: For long-distance transfer of small amounts of data.
- **Wireless**
  a. 900 MHz radio: For long-range communications with small amounts of data. Allows the use of repeaters to connect hard-to-reach DL Series and instruments.
  b. Wi-Fi: For short-range transfer of large amounts of data.

BETWEEN DL SERIES AND SERVER

- **TCP-IP**: DL Series can be connected to any Internet-connected company network for remote access to data.
- **Cellular modem**: DL Series can be connected to the Internet using a cellular modem for field deployment.
- **Satellite modems**: DL Series can accommodate satellite modems for remote areas where cellular networks are not available.
- **RS-232**: Serial communications can be used to transfer data to a computer or local servers.

The DL Series can be built to automatically upload all data to external servers. Users can then access their data using the GEO Remote Data Management System (RDMS).

Technical Informations

Compatible instruments

- All vibrating-wire instruments
- Thermistors
- Measurand SAA
- Weather instruments
- RS-485 and RS-232 controlled instruments
- Analog instruments
  a. 4-20 mA
  b. 0-5 V DC
  c. Bridge strain gages
  d. Resistive thermometers
  e. Thermocouples
- TDR
- Dust monitors
- Sound level monitors

Power

Typical <1 W. Highly dependent on acquisition frequency, communications and instrument choice.

Temperature range

-60 °C to +50 °C

Acquisition period

>50 ms

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