AT

Delta-T Devices

DL2e Data Logger

The DL2e is a versatile, programmable field data logger, well suited to remote site, environmental and laboratory applications. Easy to operate, the DL2e system offers a wide choice of sensors, logging intervals, data collection and analysis facilities.

- **Battery powered, weatherproof, rugged and portable**

- **Logs DC Voltage, Resistance, Counter, Frequency and Status channels**

- **Expandable up to 64 channels**

- **Easy programming with Ls2Win PC Software**

Proven versatility

Chosen by thousands of customers worldwide across science and industry, the DL2e is a highly versatile, rugged and portable data logging system that offers impressive performance and ease of use.

The DL2e is supplied with the Ls2Win software package. This sets up logging sessions, sensor libraries and conversions from raw readings to physical units, and controls the collection of stored data via the DL2e's RS-232 serial interface. Once set up, the DL2e acquires data independently and automatically.
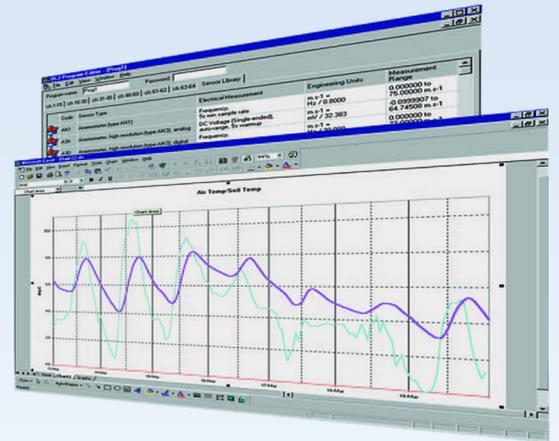
Expandable as standard

As standard the DL2e includes a 15/30 channel DC analogue input card, 4 resident channels (2 digital inputs and 2 relay outputs), and memory for over 128,000 (128k) timed readings. Extra LAC1 cards are easily fitted by the user.

Suitable for most sensors

The DL2e measures DC voltage, current, resistance, logic state, pulse train and contact closure inputs, in almost any configuration (see panel on page 3). During programming, each channel can be set up with an individual sensor type and range, a data conversion characteristic, reading frequency from 1 second to 24 hours, and with limits above or below which a flag is set or an output relay switched. Logging sequences may be started at a pre-set time and date, or by an external event, and can be repeated as many times as desired. The DL2e also provides for sensor excitation and warm-up, control outputs, and malfunction warnings.

DL2e Data Logger

Data handling

Engineering units

Where base measurements of voltage, resistance, current and count must be converted to physical units, the DL2e includes a library of conversions into appropriate units for many popular sensor types. Using the Ls2Win software, users may also program the DL2e with their own non-linear conversions in the form of look-up tables, and specify linear readings conversions in the form y = mx + c.

Compression

Compression saves memory space by recording only the average, maximum or minimum reading for that channel in a selected period from 5 seconds to 24 hours, instead of every reading.

Flags

Flags identify noisy or out-of-range readings and reading above or below pre-set limits for that sensor.

Analogue measurement

The DL2e accommodates up to 60 analogue channels, logged at a maximum 10 channels/second. Each analogue channel can be independently programmed for one of four ranges, each with a resolution of 12 bits plus polarity (sign), or to automatically select the optimum range for any particular measurement.

Standard Analogue Card, type LAC1

This card provides measurement of 30 channels of single-ended voltage, or 2-wire resistance, or 15 channels of differential voltage, or 3-wire resistance. The maximum input range is ±2 V

Logging the SWT range of tensiometers

When fitted with a TVB Voltage Regulator, The DL2e Logger can log up to 15 of the SWT range of water-filled tensiometers. The TVB1 Voltage Regulator fits inside the logger terminal compartment and provides a stabilised 10.6 VDC (+5.6 V – 5.0 V) for powering up to 15 tensiometers. The TVB-M version is a lower cost option, but requires environmental protection and a 7.5 V – 16.0 VDC power supply.

Please download our Soil Moisture Measurement Catalogue for details of tensiometers and other moisture sensors.

Resident channels

Two digital inputs and two relay outputs are built into the DL2e. The inputs may be used for logging digital logic level or switch contact status, for pulse count and frequency measurement, or for recording the occurrence of events and for triggering logging sequences. The outputs provide volt-free changeover contacts for alarms, sensor power and warm-up, or control.

DL2e Loggers are well suited to meteorological applications. Delta-T can supply complete weather stations, including masts.

Built for all environments

Weatherproof, rugged and portable

The DL2e is a true stand-alone unit, operating without inconvenient external power supplies, memory modules and connector housings. The main case is protected to IP65 rating, which states that "water hosed against the enclosure shall have no harmful effect". Sensor connections are housed in a weatherproof compartment on the side of the case.

Power supply options

6 AA alkaline cells power the DL2e for up to 1 year, or until 500k readings have been taken. If required, an external 7-15V DC power supply can be connected via a weatherproof socket. Solar power options are available.

Easy sensor connection

A screwdriver is the only tool needed for connecting sensors to the numbered screw terminal connector blocks. Because these plug into the logger's terminal panel, it is easy to detach the DL2e from its sensors. For thermistors or other resistance sensors, the DL2e supplies its own current excitation.

Data security

Every aspect of the DL2e design gives priority to data security. Readings are stored in highly reliable double battery-backed RAM. A password facility can prevent unauthorised interruption of logging and erasure of data.

Input protection

All DL2e input channels are protected against brief high voltage pulses.

On-site checking

The logger's LCD can show instantaneous output from any sensor in engineering units. It can also show battery and memory status, and report on any sensor malfunctions which may have occurred during logging.

Ordering Information

DL2e	Data Logger including 15/30 analog channels, 128k readings memory, Ls2Win software and RS232 cable
LAC1	15/30 Channel Analog Input Card
TVB1	Voltage Regulator, provides stabilised 10.6V DC
TVB-M	As TVB1 but requires environmental protection such as M2-ENCL enclosure
USB-RS232	USB to RS232 Adapter Cable type USB-RS232. 100cm cable, connects 9 pin RS232 to USB (for connection to PC).

Measurement configurations

Single-ended voltage up to ±2V DC

For general purpose voltage measurement where a common earth is acceptable, use the LAC1 in 30 channel mode.

Differential voltage up to ±2V DC

Advised for low level signals, such as thermocouples, or where signals are susceptible to electrical noise. Use LAC1 in 15 channel mode. Can also be used in a fully floating configuration where there is an existing connection to the DL2e earth.

Current

Fit precision shunt resistors across logger terminals.

Resistance 10k Ω to 1M Ω

An LAC1 in 15 or 30 channel, 2 wire resistance mode is suitable.

Resistance 100 Ω to 10k Ω

At lower resistance values, it is better to use an LAC1 in 15 channel mode with 3 wire resistance connection.

Frequency, Event Count

Sensors producing a logic level pulse or contact closure output can be connected to a resident digital input.

LsWin – Software Tools for the DL2e Data Logger

- **Program, interrogate and control the logger**
- **Retrieve and display recorded data**
- **Import data into Excel**

Logging tasks are set up using a PC and the Ls2Win software, via the logger's RS-232 serial port. Data collection can be handled without disturbing logging. Ls2Win contains four integrated software modules:

DL2 Control Panel

Provides communication facilities for the DL2e. It can monitor logger status, dataset status and display realtime readings for any sensor.

Program and Sensor Library Editors

The standard sensor library contains entries for most standard sensors and Delta-T sensor types; these include application hints and wiring details. Entries for new sensor types can be quickly added. The Program Editor lists all available channels and makes it easy to pick a sensor type, logging interval and other options.

Dataset Viewer

With the Dataset Viewer, it is possible to avoid using Excel. The logger datasets are converted into comma separated ASCII.dat files, for importing into most data analysis applications.

Dataset Import Wizard

Uses the power of Excel to directly import, display and graph datasets. The Wizard guides the user through importing datasets into a Worksheet. User-configured Excel templates can be used to create daily, weekly or monthly graphs. Ls2Win can also be used to generate Excel graphs automatically.

DeltaLINK Software
Please note that the DL2e Logger is not compatible with DeltaLINK Software.

More Data Loggers in the Delta-T range

GP2 Data Logger and Controller

- **Powerful and rugged data logger**
- **12 differential channels**
- **Up to 6 relay outputs**
- **Unique Simulator feature**
- **SDI-12 enabled**

The GP2 is an advanced 12 channel data logger that is easy to use, versatile, rugged and reliable. It is compatible with most sensor types including SDI-12 Sensors, and is the ideal data logger for demanding field work.

The GP2 Data Logger features powerful controller functionality, and sophisticated programs can be easily created via a simple scripting editor.

PLEASE NOTE: For many applications the GP2 Data Logger will provide a better solution than the DL2e Data Logger. However, for customers who wish to log larger numbers of analog inputs using a single data logger, the DL2e is an excellent choice.

GP1 Data Logger

- **High accuracy 7 channel data logger**

The GP1 is ideal for logging Delta-T soil moisture sensors: up to 2 ThetaProbes, 4 SM300s or 4 SM150s.

DL6 Data Logger

- **Ideal for Profile Probes and ThetaProbes**
- **High accuracy 8 channel data logger**

The DL6 is optimised for use with Delta-T soil moisture sensors. It can log Profile Probes or single point soil moisture sensors (ML3, SM300, SM150). The DL6 can also accept a raingauge and soil temperature probe input.

DL2e Specifications

Logging

Logging interval and speed	1, 5, 10, 30 seconds, 1, 5, 10, 30 minutes, or 1, 2, 4, 12 or 24 hours, programmable for each channel. Readings can also be reduced to averages, maxima or minima at these intervals. Typically 10 channels per second in total.
Input channels	60 channels maximum, depending on number of input cards installed, plus 2 resident digital inputs and 2 relay outputs.

Analogue Inputs

Standard Analogue Card - LAC1

Each LAC1 multiplexer card can select analogue inputs from:
Either: 15 channels of differential voltages and/or 3-wire resistances
Or: 30 channels of single-ended (common ground) voltages and/or 2-wire resistances

Directly measures voltages up to ±2 V or resistances <1M Ω. Voltages up to ±50 V and currents can be measured using precision divider or shunt resistors mounted directly on the input screw terminals.

Voltage Readings

4 ranges, user-selected or autoranged		**Full Scale**	**Resolution** (12 bits + sign)
	Range 1:	±4 mV	1 µV
	Range 2:	±32 mV	8 µV
	Range 3:	±262 mV	64 µV
	Range 4:	±2.097 V	0.5m mV

DC Accuracy

(typical figures in brackets)

Logger temperature	15 – 25 °C	-20 to +60 °C
Full scale error	±0.07% (0.04%)	±0.2% (0.1%)
Long term stability	±0.25% (0.02%) over 1 year	
Differential offset	±10 µV (3µV) ±0.02%	±12 µV ±0.02%
Noise	(0.2 µV rms)	
Input impedance	100M Ω approx	
Common Mode Range	±2 V or ±1.05 V if "+" input is closer to logger 0 V than "-" input	
Common Mode Rejection Ratio	(140 dB), on voltage range 1	

Resistance Readings

Autoranging 12-bit voltage readings with programmable 2, 20, 200 or 2000 µA excitation, giving 1M Ω full scale, or better than 0.01 Ω resolution on lowest range.

Accuracy

As voltage readings, with additional errors:

Logger temperature	15 to 25°C	-20 to +60°C
2 µA excitation	±0.3% reading	±0.6% reading (to +50°C)
Other excitation currents	±0.05% reading	±0.1% reading
2-wire LAC1	±5 Ω typical	±5 Ω typical

Input Protection

Analogue inputs withstand ±15 V continuously, and much higher voltages in brief pulses (500V 1.2/50 µs).

Digital Inputs and Outputs

Digital Inputs	All loggers have 2 resident 16-bit counter channels that continuously monitor logic levels or switch closures, logging digital status, counts or frequency (up to 100Hz), or for triggering special logging sequences.
Relay Outputs	2 SPDT relays for powering up sensors, or for providing alarms or malfunction warnings. 1 A, 24 V rating.

Other Specifications

Processing of Raw Readings	The DL2e converts readings into engineering units using look-up tables or a linear conversion $y = mx + c$. User expandable sensor library includes Delta-T sensors, Platinum Resistance Thermometers, Thermistors (Fenwal 2K, 2K252, 10K and 100K types), and Thermocouples (types J, K and T). Cold junction temperature is measured at isothermal terminals.
Display	A 2-line LCD shows instantaneous output from any sensor (in engineering units if appropriate), time, battery and memory condition, and status messages, without disturbing logging.
Memory / Data Format	Highly reliable CMOS RAM, double battery-backed. 128k timed readings. Automatic RAM check. ASCII, easily loaded into many spreadsheets and other packages, e.g. Excel. Transmitted readings are date/time stamped, and labelled in engineering units with errors flagged. Data files created by the Ls2e software are comma separated.
Interface	RS-232 serial, up to 9600 baud. Up to 10000 readings transferred per minute without disturbing logging.
Power	6 internal AA alkaline cells typically provide power for 500k readings, or 24 hours' operation using the keypad/LCD or RS-232 interface, or 12 months' quiescent operation. An external 7-15V DC supply can be used, with the alkaline batteries providing a back-up. The internal lithium cell will retain data for 2 months in the event of a power supply failure.
Environmental	Operating temperature: -20 to +60°C. IP65 weatherproof main case with desiccant and humidity indicator.
EMC Conformity	Tested to comply with EN 50081-1 and EN-50082-1 (1992) harmonised emissions and immunity standards.
Size/Weight	280 x 220 x 140mm / 2.7kg.