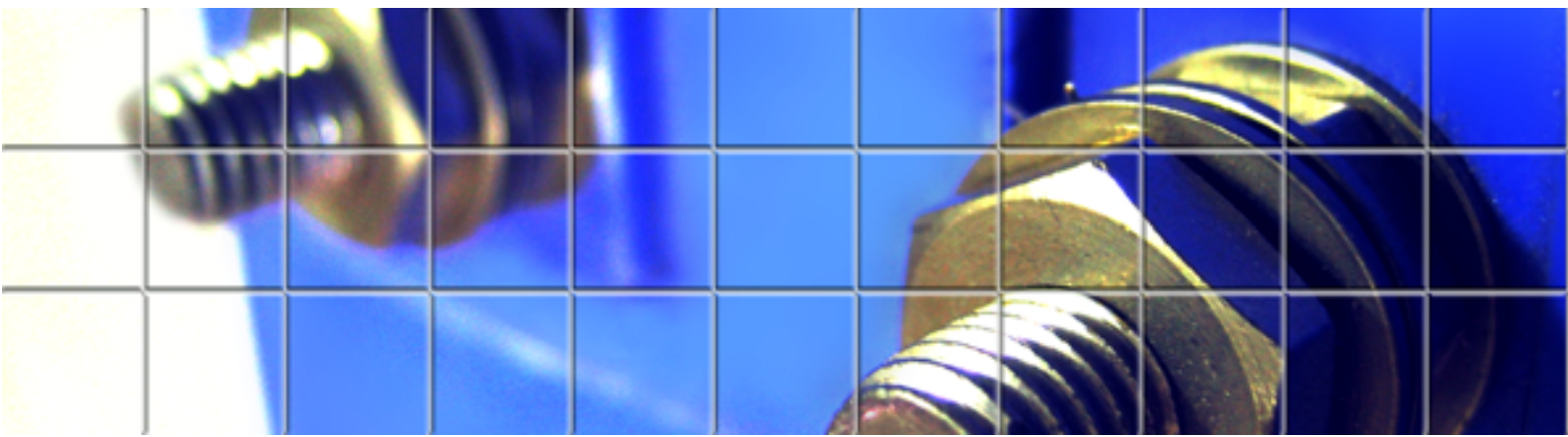


THYCON

Est.1968



Battery Data Logger

BDL3000

Concept

The Thycon Battery Data Logger (BDL) measures, stores, displays and analyses multiple battery parameters continually without user intervention.

The BDL combines 0.1% measurement accuracy and advanced analytical techniques to report variances in the condition of all batteries in an installation.

Fast parallel scanning and data processing allow for simultaneous readings of individual batteries, or overall string/bank measurements to be available immediately to the user during any phase of the battery discharge or recharge cycle.

The BDL has internal, non-volatile, storage capable of holding the data from hundreds of scans for later retrieval.

The BDL measurement data may be viewed using a standard web browser (e.g. Windows Internet Explorer or equivalent) on any PC connected over an Ethernet LAN/WAN network. This same interface may be used to access the stored battery information either locally or from a remote site.

Applications

Typical BDL applications include monitoring:

- UPS battery banks
- telecom exchange batteries
- battery banks in remote exchange, repeater stations.

BDL features and benefits

- high accuracy voltage measurement
- microprocessor-based diagnostics

Simple to use and flexible, it provides unsurpassed monitoring capabilities to achieve peak battery performance and long service life.

- no proprietary software required
- measures NiCd or lead acid batteries of any voltage
- measures up to 896 batteries over up to 16 battery banks
- flexible design allows for easy expansion
- high efficiency
- high reliability
- long life
- cost effective
- low maintenance cost
- compact, modular construction
- Australian made

Principle of operation

A standard BDL system consists of the following items:

- BDL unit
- battery measurement cards
- current-limited battery connectors
- battery current measurement modules
- AC/low voltage DC power supply
- charger current measurement modules (optional)
- pilot cell temperature measurement modules (optional)
- ambient temperature measurement modules
- embedded TCP/IP ethernet communications hardware and software (optional)



Battery status summary



Battery analysis report

The BDL does not require any proprietary software. Simple to use and flexible, it provides unsurpassed monitoring capabilities to achieve peak battery performance and long service life. The BDL sorts battery voltage deviations into five user-definable tolerance bands (typically 2%, 5%, 8%, 10% and 20%). Requests for data are read in real time, analysed and then presented to the user.

Battery voltages, currents and temperatures are continually scanned and stored in an internal memory card for easy download and retrieval through the web browser interface. The information can then be analysed using other tools such as Microsoft Excel, Access, Math cad, Mathematica, etc. The BDL memory card provides sufficient non-volatile data storage to capture years of data, enabling precise tracking of the battery bank's state over time.

BDL data is only stored when an 'out of tolerance' condition is detected or if the battery bank changes state, such as when batteries discharge and recharge. On detecting a discharge, the BDL logs battery voltages and currents for the duration of the discharge/recharge cycle and provides an analysis report of 'out of tolerance' batteries.

Battery banks

A single BDL can sample and read an entire battery bank of 216 batteries in just 5 seconds. It can scan battery banks with up to 896 batteries in 16 parallel strings; scanning occurs concurrently on each string

A single BDL can sample and read an entire battery bank of 216 batteries in just 5 seconds.

(e.g. four strings of 216 batteries in just 5 seconds) with scan intervals generally pre-set to 15 seconds. All sample rates in the different battery states (discharging, recharging and at float) can be independently set at the remote personal computer with an RS232 port.

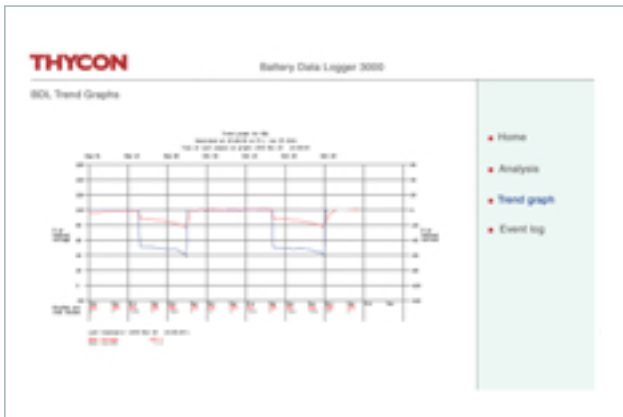
Trend log data

The screen above is a typical trend log data display as shown on the BDL web monitor. Each window consists of a snap-shot of battery bank operation over the previous 8 days. Sampling for the trend log is typically once every 10 minutes, however, it can be set to once every 15 seconds to 60 minutes. During a discharge/recharge cycle the sampling rate is automatically increased to a faster rate.

Buttons on the web page allow you to navigate through the data base.

Battery impedance

BDL is capable of measuring impedance utilising an external exciter connected to the battery bank. Impedance can be measured in AC as well as DC values, providing greater diagnostic capability; however the AC impedance option must be specified and ordered at the time of purchase.



BDL trend graphs



BDL event log

Battery measurement cards

Battery measurement cards are available for 2, 6 and 12 volt batteries and may be installed in various configurations according to nominal battery voltage.

The cards do not draw power from the battery and are connected via current limited high voltage isolation resistors. Each card contains an analog multiplexer, a 14-bit A/D converter providing an accuracy of voltage measurement better than 0.1% and can be configured to monitor either of the following:

- 2 x 12V batteries per card
- 4 x 6V batteries per card
- 12 x 2V batteries per card

The cards measure reversed-polarity batteries. The multiplexer samples each battery voltage sequentially. The A/D converter transforms the voltages into digital data and transmits it along an optically isolated serial bus to the BDL. All the battery cards on a battery bank perform their measurements simultaneously.

Measurement range per (2V) cell is +/- 4 V DC, this is important in the detection of failed and faulty batteries.

The battery measurement cards have 3500 VAC, 6000 VDC isolation and multiple safety barriers.

The BDL conforms to Australian Standard Safety requirements. This enables the BDL to be integrated into battery installations exceeding 1000 V DC.

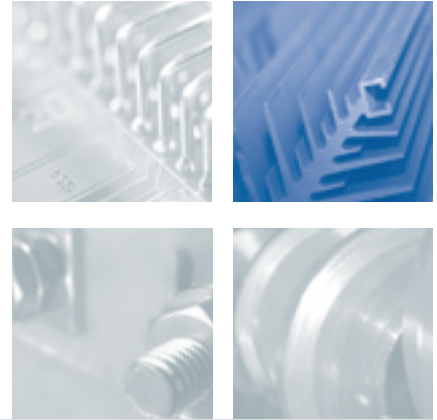
Installation and testing

The BDL conforms to Australian Standard Safety requirements (e.g. 10kV break down and less than 2mA current limited connections to batteries, 3500 V isolation barriers on each card and AS3108 1500 V isolation at BDL). This enables the BDL to be integrated into battery installations exceeding 1000 V DC.

Reliability and maintenance requirements

Thycon has been supplying battery data loggers for over 25 years and has demonstrated their high reliability and low maintenance demands in critical applications for defence, telecommunications, computer centres and manufacturing.

Thycon BDL maintenance requirements are dependent on environmental and application conditions. We accommodate customer requirements from basic to full warranty maintenance. Each maintenance plan ensures the equipment operates in top condition with maximum availability of engineers and parts at minimum cost to the customer. Qualified engineers perform the maintenance with the full back up and resources of Thycon.



Battery Data Logger 3000

Training and support

Training and support can be provided to on-site personnel to ensure that they are fully versed in the operation, maintenance and fault rectification of the Thycon BDL.

Control and monitoring

The BDL is controlled by a microprocessor and after initial configuration will monitor and log the battery bank(s) without any further intervention. The data logging periods are adjusted automatically according to the state of each battery bank (float, discharge, recharge etc.).

The real-time battery readings and the logged battery data can be accessed via a variety of methods as described below.

Control and status

The basic BDL provides a very simple control and status interface.

A *Scan* button on the front panel allows the operator to obtain a printout of the current battery voltages at any time as well as a summary of the recent discharge/recharge history of each battery bank.

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A *Power On* LED indicates that the BDL is operating and a *Summary Alarm* LED indicates an active alarm condition.

Low-level interface

The BDL has two voltage-free change-over contacts for remote alarm monitoring. These are energised (along with visual and audible alarm indicators) to indicate battery alarms such as 'out of tolerance' or other fault conditions detected by the BDL.

A RS232 serial port on the BDL provides a printer interface to obtain printouts of the battery voltages.

High-level interface

Both real-time and logged battery data may be monitored via a serial or TCP/IP connection.

An optional high-level interface via Modbus, SNMP or web html can be provided to those requiring additional display features for immediate performance monitoring and analysis.



Options

Remote monitoring

Modem connection enables the BDL to dial and notify Thycon or a remote user automatically whenever an alarm condition arises. Thycon's Service Centre automatically logs data, performs analysis and diagnostics and then alerts our 24-hour staff if further intervention is required. All battery utilisation and incidents found or reported are logged and a full report is provided for each occurrence. The report highlights remedial actions, cautions and follow up recommendations. Alternatively, the remote user can interrogate the BDL at will.

Thycon power system monitor

The BDL monitor offers the user a web-based interactive diagnostic tool and database management system for continuous real-time monitoring of BDL system utilisations, alarms, events and variables. The database management logs data to your PC's hard disk for future analysis and display.

Expansion

Continuous ambient temperature monitoring is standard. Individual battery or pilot cell case temperature monitoring is optional. Where more than

The web-browser allows you to view real-time data, histograms, trend log graphs ... can also be ported to database management software for sorting, graphing ...

896 batteries are to be monitored, additional BDL3000s can be networked easily. The BDL is easily integrated with UPS overall system monitoring, including with BMS Modbus TCP/IP interface.

The web-browser allows you to view real-time data, histograms, trend log graphs and other information, which can also be ported to database management software for sorting, graphing and analysis. BDL battery data as well as alarms and system events can be stored in solid state, non-volatile memory holding up to 500 MBs of information. Connecting the BDL to a PC using any of the available ports allows you to maintain a full history of the equipment over its lifetime.

Modem connection enables the BDL to dial and notify Thycon or a remote user automatically when alarm conditions arise.

Thycon BDL advantages

Design advantages

Simple, reliable design	Uncomplicated design facilitates high strength, durability and reliability.
Robust technology	Robust construction achieves reliable performance and long equipment life, as proven by over 25 years of Thycon installations.
Battery compatibility	Compatibility with all battery types facilitates the support of battery manufacturers guarantees.
Battery type flexibility	Ability to use a variety of battery capacities, types and manufacturers to ensure maximum flexibility in DC bus voltage application. DC bus voltage design ranges from 560 to 3000Vdc depending on the system or site requirements.
Compatibility	The control panel provides the operator with an efficient, user-friendly interface.
Modular construction	Construction from standardised components and modules ensures high mean time between failures (MTBF) and low mean time to repair (MTTR).
Environment	No special ventilation or air conditioning is required. The equipment is at home in computer rooms or in harsher environments. Thycon equipment can be containerised and installed in the extremes of Australian environments.

Performance advantages

Efficiency	System operates up to 99% efficiency resulting in lower running costs and heat dissipation.
Accuracy	Thycon BDLs remain the most accurate systems on the market. Hardwiring to each battery cell enables high accuracy throughout the operating range.
Safety	Safety for the operator and maintenance personnel is a priority in the design of the BDL. Each battery cell measurement card contains protection circuitry that ensures maximum safety protection for personnel.

Sample battery scan data

SCAN pushbutton pressed	<p>Manual scan DATA CNTR BANK 1 - AT FLOAT 08:54:15</p> <p>Ambient temp = 20°C Voltage = 490V Mean battery voltage = 2.269V Current = 0A</p> <p>1 = 2.305 2 = 2.261 3=2.275 4 = 2.229 5 = 2.187 6 = 2.302 7 = 2.228 8 = 2.261 9=2.275 10 = 2.229 11 = 2.272 12 = 2.248 13 = 2.257 14 = 2.261 203 = 2.272 204 = 2.253 205 = 2.255 206 = 2.261 207=2.270 208 = 2.259 209 = 2.268 210 = 2.260 211 = 2.257 212 = 2.261 213=2.269 214 = 2.260 215 = 2.272 216 = 2.258</p>
Out-of-tolerance batteries	<p>5-8% dev: 26 = 2.109</p> <p>2-5% dev: 5 = 2.187 18 = 2.162 24 = 2.350 59 = 2.319 116 = 2.221 202 = 2.190</p>
Discharge detected, logging initiated automatically	<p>Auto scan: 1 DATA CNTR BANK 1 - DISCHARGING 09:56:41</p> <p>Ambient temp = 21°C Voltage = 421V Mean battery voltage = 1.949V Current = 77A</p> <p>10-20% dev: 26 = 1.681</p> <p>5-8% dev: 5 = 1.800 18 = 1.810 24 = 1.842</p> <p>2-5% dev: 2 = 1.910 32 = 1.880 47 = 1.890 59 = 1.993 116 = 1.908 153 = 1.874 202 = 1.887</p>
Battery bank discharge	<p>Auto scan: 21 DATA CNTR BANK 1 - DISCHARGED 10:07:35</p> <p>Ambient temp = 21°C Voltage = 367V Mean battery voltage = 1.700V Current = -88A</p> <p>>20% dev: 26 = -0.452</p> <p>2-5% dev: 5 = 1.627 18 = 1.623 24 = 1.647 47 = 1.653 59 = 1.736 116 = 1.660 153 = 1.625</p>
Logging continues during recharging	<p>Auto scan: 23 DATA CNTR BANK 1 - RECHARGING 10:42:50</p> <p>Ambient temp = 22°C Voltage = 456V Mean battery voltage = 2.111V Current = 4.0A</p> <p>10-20% dev: 26 = 1.768</p>
	<p>Auto scan: 53 DATA CNTR BANK 1 - AT FLOAT 18:25:17</p> <p>Ambient temp = 20°C Voltage = 490V Mean battery voltage = 2.268V Current = 0.5A</p> <p>10-20% dev: 26 = 1.928</p>
Logging continues until boost charging is complete	<p>Auto scan: 59 DATA CNTR BANK 1 - ON BOOST 21:08:49</p> <p>Ambient temp = 18°C Voltage = 498V Mean battery voltage = 2.306V Current = 1.2A</p> <p>10-20% dev: 26 = 2.029</p>

Sample battery history data

Battery discharge history								
Battery bank name:	DATA CNTR BANK 1							
Manufacturer:	BATCO							
Type number:	BC-0238							
Capacity at 20hr rate:	38 Ah							
Number of batteries:	216							
Number of cells:	216							
Commissioned:	01/01/01							
Last discharge:	05/10/04 10:23:07							
Duration:	00:04:15							
Capacity depleted:	5.5Ah							
Minimum bus voltage (DCBVMIN):	401.5 V DC							
Average battery voltage at DCBVMIN:	1.859 V DC							
Maximum current:	81 A DC							
Total number of discharges:	33							
Total duration of discharges:	05:12:46							
Operating temperatures: max:	32°C on 23/02/05							
av:	21°C std dev: 4°C							
min:	14°C on 12/12/05							
Recharge delay history								
Discharge date	Time	Duration	Ah depl'd	Min. Voltage DCBV	Average	Max current	Recharge delay	OC DCBV
12/09/04	08:35:22	00:10:54	13	369	1.708	80	03:42:02	381
02/05/04	22:46:19	00:11:32	14	365	1.690	81	02:32:17	373
26/04/04	07:32:57	00:10:39	13	367	1.699	81	12:15:56	406
19/12/03	11:09:21	00:12:03	15	363	1.681	86	00:45:12	365
11/08/03	19:11:53	00:11:19	13	366	1.694	81	05:34:25	383
28/06/03	17:30:22	00:11:51	14	364	1.685	82	01:23:09	368
12/02/03	15:24:06	00:10:22	13	368	1.704	78	07:10:39	391
03/09/02	02:33:14	00:11:08	14	367	1.699	85	00:58:12	370
18/04/02	18:16:35	00:11:37	14	364	1.685	84	02:14:35	371
07/03/01	10:08:24	00:10:15	12	370	1.713	83	06:48:52	392

Technical specifications

Voltage accuracy:	Better than 0.1%	Ambient temperature normal:	0 - 45°C
Temperature stability:	100ppm / °C	for 0.1% accuracy:	10 - 35°C
Drift:	25ppm / 1000hrs	Power supply:	240V, 50Hz or 20 - 380 VDC
Resolution:	1 mV / cell	Power consumption BDL:	10W
Repeatability:	1 mV / cell	Power consumption BM Card:	100mW
Reading indication:	4 digits	Dimensions (w x h x d (mm))	
Input impedance		BDL:	310 x 225 x 260
Battery Measurement Card (BM):	50 MΩ	BMN:	45 x 10 x 120
Current limiting connector:	300 - 500 kΩ		
Input voltage		Programmable parameters	
Single 2V input:	± 4.00V DC	Scan periods (typical)	
BM Card:	0 - 36.0V DC	Discharge:	10s - 10 days
Conversion time:	25ms / input	Recharge:	10s - 10 days
Sampling time for 264 cells		Float:	10s - 10 days
Standard:	6 s	Boost:	10s - 10 days
Optional:	1 s	Tolerance bands	
Isolation:	3.75kV	Maximum:	5
Fault protection (BM Card):	1kV	Deviation range:	1 - 100%
Maximum no. of inputs per BDL:	896		
DC shunt (50 mV) accuracy		Alarm thresholds	
Standard:	1%	Battery out of tolerance limit	1 - 50%
Optional:	0.1%	Battery voltage limit	0.5 - 3.0V per cell
DC current tong		Bank voltage limit	0.5 - 3.0V per cell
(1 mV/A) accuracy:	5%	Battery temperature limit	0 - 50°C
Maximum current reading:	200% of rated	Discharge time limit	10s - 10 days
Temperature measurement accuracy:	± 1°C	User relays 2+1	1 C/O each 240V, 1A

Specifications are subject to change without notice

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