Lynx Data Acquisition

Simplicity and versatility in experimental data acquisition
Researchers, engineers and technicians need to measure and test in their daily work. As computer data acquisition is an essential tool for them, Lynx designed products for those who want to have a complete and versatile system, yet affordable and easy to use.

**AqDados**

AqDados is a versatile and simple to use general purpose data acquisition program. It has many resources to configure and calibrate the inputs and a fast and reliable streaming to disk capability. Even at high data acquisition rates AqDados can record for long periods.

Channel calibration and adjust:
- hardware control (if the feature is available in the signal conditioner used): input type selection, gain, balance, offset and filter settings;
- linear regression for scale calculation;
- signal linearization (thermocouples);
- cold junction compensation (thermocouples);
- full scale adjust using gain information.

Programmable acquisition rate:
- from mili-Hertz to dozens of kHz (depends on computer and data acquisition equipment used).

Programmable acquisition time:
- from seconds to hours and days.

Programmable recording:
- one touch recording;
- interval timer;
- trigger based (level crossing).

Real time visualization:
- variable × time (x×t) and variable × variable (x×y);
- signals are distributed in folders (up to 16 folders with up to 8 signals each), allowing a fast access to grouped signals;
- selectable sweep time (visualization);
- vertical zoom;
- visual offset adjust (trace centering);
- real time spectral analyzer: window and average selection (linear, exponential, instantaneous).

Pulse input support:
- counter;
- period measurement;
- frequency measurement.

Easy to use

With AqDados, data acquisition is very easy. You don’t need to be a specialist in electronics or programming. You unpack and start to use:

- configure the channels;
- calibrate;
- select a file name;
- define the acquisition rate;
- start recording;
- your data are ready to be displayed, analyzed and processed.

Event recorder:
- pre-definable comments;
- manual comments;
- up to 32 events in a file.

Help online:
- signal connection diagrams;
- jumper and switches configuration (for manually configured models);
- commands and functions.

During acquisition
Real time display, allows continuous test monitoring.
Full featured with functions to help in displaying.

Portuguese version shown
English version available
AqDAnalysis is the companion analysis and processing module for AqDados.

Folder organization:
- each folder shows a set of graphics of the same type;
- up to 16 folders with up to 16 graphics each;
- folders are grouped in views and there are 4 of them allowing to display up to 1024 graphics;
- you can select the signals by dragging from the tree to display area.

Signal types:
- time domain;
- frequency domain;
- statistics (standard, Markov and Rainflow).

Graph modes:
- time domain: time and x-y, overlapped or tiled, polygraph mode;
- spectra (power, power density, real and imaginary parts) line or bar mode; Nichols diagram and Nyquist diagram;
- Markov and Rainflow statistics.

A full set of tools do easy graphic displaying (see figure).

Signal Analysis:
- spectra: window (Rectangular, Hanning, Hamming, Bartlett, Blackman), from 256 to 8192 lines. Cross spectra, transfer function and coherence calculation;
- Rainflow and Markov (for material analysis);
- signal statistics by segment (maximum and minimum, mean, RMS, standard deviation);
- material fatigue analysis using Rainflow;
- comfort analysis.

Signal Filtering:
- integration;
- derivation;
- high pass;
- low pass;
- band pass.

Signal edition:
- point to point;
- splines.

File export and import:
- ASCII files (text);
- RPC (MTS) file import.

Reports:
- you can copy graphics for Windows clipboard area and paste them in your document or
- you can use the pre-defined reports.

Color can be adjusted to fit user preferences.

Arithmetic operations:
- +, -, *, / sum / subtraction / multiplication / division
- k, Pi numeric constants, π
- t time variable
- Abs (x) absolute value of x
- Exp (x) exponential value of x
- Ln (x) natural logarithm of x
- Sqr (x) square root of x
- Sqr (x) x²
- Tan (x) tangent of x
- ATan (x) arc tangent of x
- Tanh (x) hyperbolic tangent of x
- Sin (x) sine of x
- ASin (x) arc sine of x
- Sinh (x) hyperbolic sine of x
- Cos (x) cosine of x
- ACos (x) arc cosine of x
- Cosh (x) hyperbolic cosine of x
- Sign (x) sign of x
- Rand (x) random number

High technology
Our products are a result from years of investment in research and development.

The products use the best components and the most advanced hardware and software technologies.

Up to date with the latest trends Ethernet networks and DSPs (Digital Signal Processors).

High quality graphic interface.
Applications

Lynx data acquisition product can be used in a wide range of scientific and technical applications: from basic research to industrial applications. The following list shows some real applications using our systems:

<table>
<thead>
<tr>
<th>Applications</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railroad engineering</td>
<td>structural test laboratory&lt;br&gt;brake testing</td>
</tr>
<tr>
<td>Automotive engineering</td>
<td>component characteristic curve&lt;br&gt;dynamic performance&lt;br&gt;brake testing</td>
</tr>
<tr>
<td>Aerospace engineering</td>
<td>components and structures</td>
</tr>
<tr>
<td>Electrical engineering</td>
<td>high voltage circuit brake tester: open close timing&lt;br&gt;power generation equipment commissioning and test: turbines generators and auxiliary equipments</td>
</tr>
<tr>
<td>Thermal engineering</td>
<td>PID loop adjust&lt;br&gt;heat mapping</td>
</tr>
<tr>
<td>Agriculture engineering</td>
<td>machine development and testing&lt;br&gt;process research</td>
</tr>
<tr>
<td>Naval engineering</td>
<td>scale modelling&lt;br&gt;real scale test in ships and offshore platforms</td>
</tr>
<tr>
<td>Industrial processes</td>
<td>machine monitoring (failure analysis)&lt;br&gt;vibration analysis&lt;br&gt;PID loop adjust</td>
</tr>
<tr>
<td>Structures</td>
<td>vibration and stress&lt;br&gt;finite elements model adjust</td>
</tr>
<tr>
<td>Soil</td>
<td>mechanics</td>
</tr>
<tr>
<td>Physiology</td>
<td>hemodynamics&lt;br&gt;drug effects</td>
</tr>
</tbody>
</table>

Strain measurement

Strain measurement is a technique to measure material deformation using sensors called strain gages. With Lynx signal conditioners and software gage measurements becomes an easy job. The conditioners includes bridge completion resistors and 3 wire configuration to allow the connection of gages in ½ and ¼ bridge using 120 or 350Ω gages. In some models the balance and shunt calibration can be performed with a click in the mouse button.

Sensors

Thermocouples, Pt100<br>Load Cells, torque and pressure transducers<br>Potentiometers, encoders<br>Current and voltage signals<br>Piezo-resistive accelerometers<br>Current driven piezo-electric accelerometers<br>Servo-accelerometers

Pulse input

This type of input is very useful in applications that needs to measure the behavior of a rotating element. A pulse input can be used to:

- counting;
- average speed measurement;
- instantaneous speed (measured when each pulse occurs, or, as we call period to period measurement).

The period to period measurement is the most interesting for dynamic analysis, e.g., in rolling mills, ABS break test, motors and rotative couplings. The figure shows an accelerating indented wheel. In this example the wheel suffers an oscillations in it’s angular speed.

Flexibility

Lynx always has a solution to meet your technical and financial requirements.

Experience

Lynx team has a large experience and specialization in data acquisition design and application.
Ethernet/IP protocol technology opens new possibilities for data acquisition. Many of Lynx products incorporate this technology that has the following advantages:
- **Operating system portability and compatibility**;
- **Distance between equipment and computer: 100 m for direct connection, expandable using hubs/switches**;
- **Use in any cabled local area network (LAN)**;
- **Possibility of using wireless LAN**.

### ADS1000 IP

**A/D and D/A converters for special applications**

**Composition:**
- Compact enclosure;
- 12 V supply (external AC power supply included);
- Acquisition controller with A/D converter and PC communication;
- D/A converter expandable up to 16 channels;

**Main features:**
- Ethernet/IP network communication;
- 16 analog inputs;
- 12 bits A/D converter (20k samples/sec/channel) or 16 bits (4k samples/sec/channel);
- Pulse type input;
- Internal DSP can be used for special applications.

### ADS2000 IP

**General purpose modular and compact integrated system**

**Composition:**
- Module enclosure;
- AC and DC embedded power supply (90~240 Vac) and (10 a 18 Vdc);
- Signal conditioner boards;
- Acquisition controller with A/D converter and PC communication;

**Main features:**
- Ethernet/IP network communication;
- Up to 2 (4 depending on enclosure) signal conditioners;
- 16 bits A/D converter with conversion time of 12.5 µs/channel;
- Up to 4 synchronized units allowing up to 128 channels (256 with 4 conditioners enclosure);
- Up to 6 pulse input signals (optional);
- Conditioner options: AI2080, AI2161 and AI2164.

### ADS500 IP

**Compact low cost integrated system**

**Composition:**
- Includes acquisition controller with A/D converter, PC communication and versatile integrated signal conditioners;
- Compact enclosure;
- 12 V supply (external AC power adapter included);

**Main features:**
- Ethernet/IP network communication;
- 16 jumper configured signal conditioners;
- 12 bits A/D converter, up to 500 samples/sec/channel.

### Versatility and cost saving

From product conception, to manufacture, Lynx efforts are directed to supply world class products that can meet current and future customers' needs, by incorporating features that maximize the return for the investment done.

With high versatility, the same product can be used in different applications, avoiding the need for additional accessories or equipment.

### ADS1000 IP

![ADS1000 (models AC1120/AC1160)](image)

**Servicing**

Servicing customers well is a great concern for Lynx. Free technical support and reasonable maintenance cost guarantees the availability and usage of our systems.

### ADS2000 IP

![Signal conditioners]

![Controller with A/D converter (AC2122)](image)

**Ethernet/IP**

Ethernet/IP protocol technology opens new possibilities for data acquisition. Many of Lynx products incorporate this technology that has the following advantages:
- **Operating system portability and compatibility**;
- **Distance between equipment and computer: 100 m for direct connection, expandable using hubs/switches**;
- **Use in any cabled local area network (LAN)**;
- **Possibility of using wireless LAN**.
### Acquisition controllers

<table>
<thead>
<tr>
<th></th>
<th>CAD12/32</th>
<th>CAD12/56</th>
<th>CAD12/32-IP</th>
<th>ADS500</th>
<th>AC1120</th>
<th>AC1160</th>
<th>AC2122</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>interface</strong></td>
<td>ISA</td>
<td>ISA</td>
<td>IP(Ethernet)</td>
<td>IP(Ethernet)</td>
<td>IP(Ethernet)</td>
<td>IP(Ethernet)</td>
<td>IP(Ethernet)</td>
</tr>
<tr>
<td><strong>A/D converter resolution</strong></td>
<td>12 bits</td>
<td>12 bits</td>
<td>12 bits</td>
<td>12 bits</td>
<td>12 bits</td>
<td>16 bits</td>
<td>16 bits</td>
</tr>
<tr>
<td><strong>conversion time</strong></td>
<td>8/16/32 simple</td>
<td>16 simple</td>
<td>16 simple</td>
<td>16 simple</td>
<td>16 simple</td>
<td>16 simple</td>
<td>16 simple</td>
</tr>
<tr>
<td><strong>D/A converter channels x resolution</strong></td>
<td>2 x 12 bits</td>
<td>2 x 16 bits</td>
<td>2 x 16 bits</td>
<td>2 x 16 bits</td>
<td>2 x 16 bits</td>
<td>N.O.</td>
<td>N.O.</td>
</tr>
<tr>
<td><strong>output voltage</strong></td>
<td>± 10 V</td>
<td>± 10 V</td>
<td>± 10 V</td>
<td>± 10 V</td>
<td>± 10 V</td>
<td>± 10 V</td>
<td>± 10 V</td>
</tr>
<tr>
<td><strong>digital input/output</strong></td>
<td>16/16 TTL</td>
<td>16/16 TTL</td>
<td>16/16 TTL</td>
<td>16/16 TTL</td>
<td>16/16 TTL</td>
<td>8/8 TTL</td>
<td>8/8 TTL</td>
</tr>
<tr>
<td><strong>pulse input</strong></td>
<td>1 (ct)</td>
<td>1 (ct)</td>
<td>1 (ct)</td>
<td>1 (ct)</td>
<td>1 (ct)</td>
<td>6 (opt)</td>
<td>6 (opt)</td>
</tr>
<tr>
<td><strong>interruptions</strong></td>
<td>yes</td>
<td>yes</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td><strong>DMA</strong></td>
<td>no</td>
<td>yes</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

### Signal conditioners

<table>
<thead>
<tr>
<th></th>
<th>ADS500</th>
<th>MCS1000-V3</th>
<th>AI2080</th>
<th>AI2161</th>
<th>AI2164</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>applicable family</strong></td>
<td>ADS500 (integrated)</td>
<td>ADS1000/ not integrated</td>
<td>ADS2000</td>
<td>ADS2000</td>
<td>ADS2000</td>
</tr>
<tr>
<td><strong>channel</strong></td>
<td>8/16</td>
<td>8/16</td>
<td>8/16</td>
<td>8/16</td>
<td>8/16</td>
</tr>
<tr>
<td><strong>input type</strong></td>
<td>V, I, R bridge, tc, pot</td>
<td>V, I, R bridge, tc, pot</td>
<td>V, I, R bridge, tc, pot, Pt100</td>
<td>V, I, R bridge, tc, pot, Pt100, IPz</td>
<td>V, I, R bridge, tc, pot</td>
</tr>
<tr>
<td><strong>gains</strong></td>
<td>1/100/200/300/600 (manual)</td>
<td>1/100/200/300/600 (manual)</td>
<td>1/2/5/10/100 (manual)</td>
<td>1 a 5000, seq 1/2/5 (semi-ssw)</td>
<td>1 a 5000, seq 1/2/5 (ssw)</td>
</tr>
<tr>
<td><strong>filters</strong></td>
<td>20 Hz (modifiable)</td>
<td>20 Hz (modifiable)</td>
<td>35 Hz (modifiable)</td>
<td>5/20/100/200/2kHz (ssw)</td>
<td>3/30/100/1kHz/3kHz (ssw)</td>
</tr>
<tr>
<td><strong>sensor power supply</strong></td>
<td>2.5/5/10 V</td>
<td>2.5/5/10 V</td>
<td>5/12 V</td>
<td>0.25/0.5/0.5/2.5/10 V</td>
<td>0.125/2.5/5/7.5/10 V</td>
</tr>
<tr>
<td><strong>balance</strong></td>
<td>manual</td>
<td>manual</td>
<td>manual</td>
<td>manual</td>
<td>ssw</td>
</tr>
<tr>
<td><strong>shunt calibration</strong></td>
<td>auto (opt)</td>
<td>auto (opt)</td>
<td>N.O.</td>
<td>1 to ground (ssw)</td>
<td>3 to ground /Vexc (ssw)</td>
</tr>
<tr>
<td><strong>galvanic isolation</strong></td>
<td>N.O.</td>
<td>N.O.</td>
<td>500 V_{AC}</td>
<td>N.O.</td>
<td>N.O.</td>
</tr>
</tbody>
</table>

Captions:
- OPT: optional
- N.A.: not applicable
- ssw: selectable by software

**Input type:**
- **V:** voltage up to ±10 V
- **I:** current
- **R bridge:** resistive bridge: full, ½, ¼
- **tc:** thermocouple
- **pot:** potentiometer
- **IPz:** current driven piezo-electric sensors
- **Pt100:** platinum temperature sensor

**Requirements:**

- **AqDados /AqDAnalysis 7**
  - Operating systems: Win98, Me, XP, 2000, NT 4.0;
  - 64 MBytes, (Win98) 256 MBytes (XP) or more RAM memory;
  - CPU with 400 MHz or greater;
  - ISA slots for ISA boards;
  - ethernet network adapter for IP systems;
  - high capacity disk for data archiving (see below)

To calculate the space needed to data archiving use the following equation:

\[
\text{Size (approx)} = 2^\text{frequency} \times [\text{channel quantity}] \times [\text{duration}]
\]

Example:

- 100 samples/sec
- 32 channels
- 1 hour = 3600 sec
- Size = 2^100 * 32 * 3600 = 23 MBytes

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