Automotive Data Acquisition & In-Vehicle Data Logging
NI Data Logging Platform

**Modular Hardware Platform**

**Variety of Analog and Digital Signal Modules**

**Data Logging Platform**

**Flexible Software to Adapt to Applications**

**Powerful Analysis and Processing Software**
Key In-Vehicle Data Logging Requirements

• Typical Automotive I/O Logging

• Vehicle Network Communication Logging

• Synchronization of Network Communication and Sensor Data

• Support of In-Vehicle Logging Use Cases

• Diagnostic and Calibration Protocol Logging
More and More Data

- Engine Temperature
- Strain Measurements
- Outside Temperature
- Engine Noise
- Chassis Vibration
- Driver Interactions
- HVAC Monitoring
- PWM Signal
- Tire Pressure
- NOx Sensors
- O2 Sensors
- Throttle Position
- Active DTCs
- Battery Voltage
- Tire Temperature
- GPS Location

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Variety of Sensors and Measurements

• Analog and digital I/O can provide additional information for custom tests
• ECUs require sensor data for their decisions
• See the whole picture with an accurate view of the entire vehicle
Traditional Hardware Components
Mixed-Measurement Systems Usually Involve Additional Connectivity and Conditioning

Sensors/Signals
- Thermocouple
- Accelerometer
- Strain Gage
- Solar Cell
- (etc)

Physical Connectivity
- Screw Term TC Jack
- BNC SMB
- Screw Term 10P10C (RJ50)
- Screw Term Banana

Signal Conditioning
- Amplification, Cold-Junction Compensation, Filtering
- Excitation, Anti-Alias Filtering, Dynamic Range
- Voltage Excitation, Bridge Configuration, Linearization, Filtering
- Isolation

ADC

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NI CompactDAQ is an integrated, modular solution.

**Sensors/Signals**

- Thermocouple
- Accelerometer
- Strain Gage
- Solar Cell

(etc)

**C Series Modules**
C Series I/O Modules

• Over 100 NI and Partner Modules
  • Analog Input/Output
  • Powertrain Controls
  • Digital I/O
  • Relay Output
  • Counter, Pulse Generation
  • Communication
    o CAN
    o LIN
    o PROFIBUS
  • Motion Control
  • Wireless
  • Engine Control
• Signal Conditioning
• Rugged Mechanicals
• Signal Conditioning/Filtering
• Isolation Barrier
Software – DAQmx Drivers

NI-DAQmx Driver Software
(includes MAX, Virtual Channels, and DAQ Assistant)

Programming Languages
LabVIEW | LabWindows™/CVI | C/C++ | C# | VB .NET

Data Acquisition Buses
PCI | PCI Express | PXI | PXI Express | USB | Ethernet | Wireless
LabVIEW with NI DAQmx

**Configuration**

- Minimum value
- Maximum value
- Number of channels
- Rate
- Number of samples
- Strain gage information
- Samples per channel

**Programming**

- DAQ Assistant
- Waveform Graph
- Sample Clock

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Chameleon Software for Ready-to-use DAQ Applications

- Configuration-based software, powered by LabVIEW
- Acquire static and dynamic signals
- Measures voltage, current, vibration, strain, and temp
- Runs directly on stand-alone NI CompactDAQ
- Supports over 20 modules and USB, Ethernet, and stand-alone chassis

"Using Chameleon turnkey software based on NI LabVIEW and DAQ software, we can measure more than 32 channels of pressure data from our sensors with expansion capabilities while maintaining time-synchronized data from transient shot events on the firing range.” -Raytheon BBN
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It’s Not Just Analog and Digital Sensors

- The rise in electronics means ECUs must talk to each other
- Vehicle networks provide communication
- Smarter sensors becoming more common
- Reduce vehicle weight
Universal Network Platform

NI-XNET

High-Performance Interfaces for CAN, LIN, and FlexRay
NI-XNET is Hardware and Software

Hardware Interfaces

LabVIEW API

C/CVI API

Database Editor

Bus monitor

NI-XNET
High-Performance Hardware

Synchronization with other hardware
Field Upgrades and Onboard Processing
Software Termination
Bus Isolation
LEDs
Flexible for Multiple Networks
Flexible for Multiple Networks
Take Your Application Anywhere

Lab/Desktop  Mobile Communication  In-Vehicle Test/Logging  End of Line Test

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Combining and Synchronizing

- Log all of the sensor and vehicle network data together
- Synchronization of the data ensures more accurate analysis
- Use a common platform for everything
NI-STC3 Timing and Synchronization Technology
7 Hardware-Timed Streams

- Built-In Timing Engines
  - 3 Analog Input
  - 1 Analog Output
  - 1 Digital Input
  - 1 Digital Output

- Additional Timing Sources
  - Counter/Timers
  - External PFI Lines
Mixed Measurements with Multiple Timing Engines
Synchronization

- **Channel-Channel**
  - Channels within a module use the same *Sample Clock*

- **Module-Module**
  - *Sample Clocks* are derived off of the same internal *Sample Clock Timebase*

- **Chassis-Chassis**
  - Output *Sample Clock* from one chassis and import into second chassis to synchronize devices
Triggering

- Supports software, analog and digital triggering
  - Start - Software or hardware trigger
  - Stop - Software, hardware trigger, or number of samples
- Hardware trigger options
  - Start Trigger, Reference Trigger, Pause Trigger
- Built-in trigger lines for import/export of digital clocks on certain chassis*

*Included with cDAQ-9178, 9188
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- **Support of In-Vehicle Logging Use Cases**
- Diagnostic and Calibration Protocol Logging
In-Vehicle Data Logging Use Cases

**Test Track Logging**
- Short sessions of data logging
- Sometimes use UI for feedback
- Usually an operator with laptop

**Fleet Recorder**
- Long periods of data logging over long distances
- Runs headless without user interaction
- Store data reliably for longer periods of time
NI CompactDAQ Platform

Reuse Your Applications Across the Entire Platform
New NI CompactDAQ Controllers (Standalone Data Acquisition)

Simplify System Complexity
- Integrated PC and signal conditioning
- Built in RS232, trigger line, and XNET port
- Removable SD data storage

Deploy Anywhere
- Up to -40 to 70 deg C operating temperature
- 5g vibration, 50 g shock
- Class 1, Div II location certified
- Ventless

Easy Measurements and Logging
- Familiar experience with Windows 7
- Easy streaming and logging with DAQmx
- Port code from existing systems
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ECU Measurement and Calibration Toolkit

- Access to ECU physical values
- Supports CCP and XCP Protocols
- Import *.A2L files
- Works with all NI-XNET CAN interfaces
- Includes NI VeriStand Support
Automotive Diagnostic Command Set

• Set of functions for automotive diagnostic protocols
• Implement automotive diagnostic protocols in LabVIEW and CVI/C
  • KWP2000, UDS (OBD-II), and Diagnostics Over IP (DoIP)
• Works with all XNET CAN interfaces
• Develop and deploy custom diagnostic applications
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Questions?
## Get in Touch

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Configure the Right System for your Application

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  - Meet others in my team
  - To meet Seniors
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  - Product(s)
  - Please describe your application

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Please write to us at Planetni.india@ni.com or ni.india@ni.com
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