

A&D eAxle HiL Testing Solution

Hardware-in-the-Loop Simulation Testing Systems

A&D Technology Inc.

A&D Technology Inc. stands as a global leader in pioneering advanced solutions for measuring, monitoring, controlling, and testing, especially for the automotive industry. Our comprehensive suite of offerings includes cutting-edge products such as the iTest testing automation platform, the LabWorX lab automation and management suite, the Ethernet-compatible I/O iConnect X-Series, flat belt tire testing rigs, as well as rapid control prototyping and hardware-in-the-loop (HiL) simulation platforms like ADX and Procyon. These solutions cater to diverse customer needs in development and testing.

In line with the latest technical and commercial advancements, A&D Technology Inc. has innovated state-of-the-art solutions for electrification, ADAS, and Autonomous Driving applications. Our portfolio encompasses battery and BMS (Battery Management System) testing, eAxle testing, OBC (Onboard Charger) testing, and ADAS/AD HiL testing, among others, ensuring we remain at the forefront of the automotive industry evolution.

Flexible Solution for eAxle HiL Testing

eAxle is the combination of inverter, motor, and gearbox for EV and HEV applications. There is great need for vigorous testing of eAxle in test cell environment. A&D Technology integrates high-performance real-time computation platform Procyon or Helios, Flexible VCU (Vehicle Control Unit), dynamometers and drives, power cycling and test system, conditioning systems, as well as requisite vehicle modeling and control software, data acquisition and control software, lab management software, and friendly GUI etc. to facilitate eAxle testing in test labs.

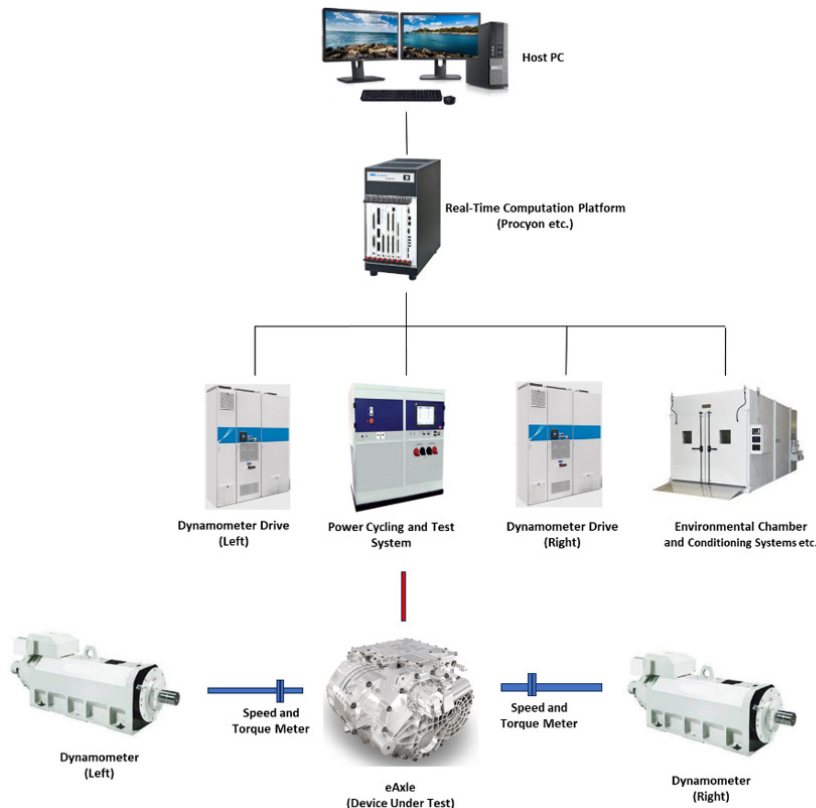
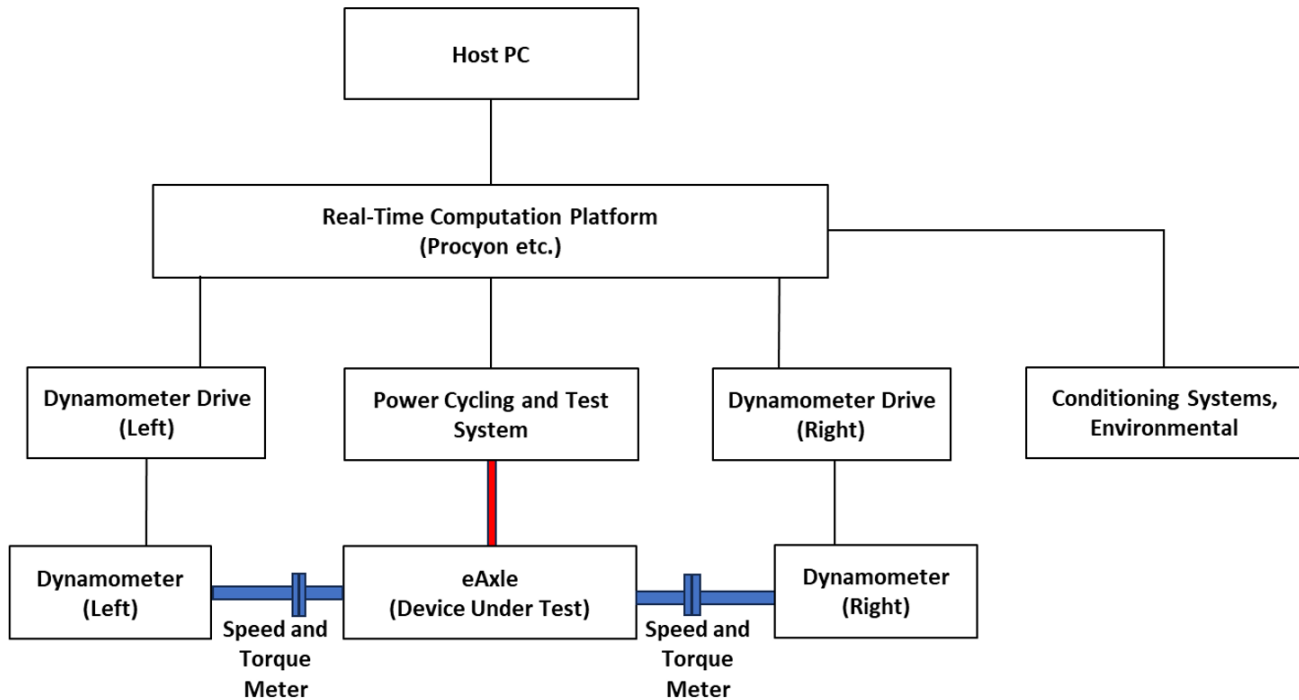
The solution is centered on A&D Technology's Procyon or Helios high-speed real-time simulation and control platform that could be customized for a diverse range of applications. The open and configurable system architecture supports multiple CPUs with multiple cores, as well as HyperTransport, PCI Express, conventional PCI interconnections, and various interfaces. It seamlessly integrates with A&D's iTest as front end for system monitoring, parameter setting, and data acquisition and control. MathWorks products (MATLAB/Simulink/Stateflow etc.) are used for modeling and control development.

The testing solution uses two oppositely mounted dynamometers connected to the output shafts of the eAxle being tested, replicating the loads applied to the eAxle by the wheels. Suitable power cycling and test system (e.g., Chroma, Webasto) is incorporated to emulate battery pack behavior. Conditioning systems are also integrated to enable testing across a wide range of environmental conditions.

The solution could be customized per specific customer requirements, offering a high degree of flexibility for various eAxle testing. By integrating necessary modeling and control functions, duplicating signal flow and energy flow pertinent to the eAxle being tested, real-world operating conditions could be emulated in a controlled test lab environment. This facilitates comprehensive eAxle design, development, verification testing, and calibration, ensuring robust performance and reliability.

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Possible eAxle HiL Testing Scenarios

- VCU and eAxle Control Function Development
- eAxle Performance Mapping
- Efficiency Testing
- Thermal Management Testing
- Endurance Testing
- Control Parameter Calibration and Performance Optimization
- Dynamic Testing with Vehicle Simulation
- Torque Vectoring and Wheel Slip Simulation
- Regenerative Testing

Features and Key Benefits

• Comprehensive Test Automation and HiL Simulation Solution

Our offering encompasses both test automation and HiL simulation capabilities, providing a holistic approach to eAxle testing.

• Flexibility and Scalability

Easy modification to hardware configuration and software models to accommodate different eAxles and diverse testing needs.

• Model-Based Development

Modeling and control algorithms development using MathWorks products and build using automatic code generation to run on A&D hardware target.

• Integration of 3rd Party Simulation Models

Customizable to incorporate third-party simulation models according to customer preference and needs, enhancing versatility and compatibility.

• Emulation of Real-World Operating Conditions

Replicate authentic vehicle operating conditions within a controlled test lab setting, ensuring consistency and repeatability of test results.

• Battery Pack Simulation and Road Load Simulation

Facilitate comprehensive testing by simulating battery pack behavior and emulating road load conditions, enabling thorough evaluation of eAxle performance.

• Real-Time Monitoring and Adjustment

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Major Specifications

Dynamometer Nominal Power	400 kW (200 kW each)
Dynamometer Peak Power	600 kW (300 kW each)
Dynamometer Nominal Torque	6000 Nm (3000 Nm each)
Dynamometer Peak Torque	10000 Nm (5000 Nm each)
Dynamometer Nominal Speed	1200 rpm
Dynamometer Max Speed	3000 rpm
Power Cycling and Test System Max Voltage	1000 V
Power Cycling and Test System Max Current	1500 A
Power Cycling and Test System Max Power	600 kW
Environmental Chamber Operating Temperature Range	-30 °C to 130 °C