

## ELECTRIC MACHINE TEST CELL CONTROL AND DATA ACQUISITION SYSTEM

### SYSTEM OVERVIEW

The rapid development in the electric machines market combined with new and emerging technology implementations and complexity is driving the demand for new test systems and architectures. Test cells require a much more modular approach; combining standard frameworks and commercial-off-the-shelf (COTS) hardware this Test Cell Control and Data Acquisition System provides a low-cost route to a reconfigurable, flexible, modular, expandable solution.

The e-machine Test Cell Control and Data Acquisition System is a complete, off-the-shelf solution for either real-time component testing or full system testing. The platform has been designed with a deterministic real-time test engine at its heart, to ensure that the system can run high-speed models and close the loop with real sensor data at rates upwards of 1 kHz. With the National Instruments hardware and software platform at its core, the system has also been designed with maximum flexibility and extensibility in mind. The modular system comprises:

- Test Cell Control and Data Acquisition System
- Test Cell Management Unit
- Optional: Power Analyzer Rack and Remote Patch Panel



- Open platform provides greater modularity, flexibility, model integration and custom sensors
- Quick and easy to deploy, configure and replicate
- Reduce cost and complexity with a future-proof platform
- Achieve complete test coverage with a flexible platform
- Enable accurate and innovative powertrain test systems
- Achieve faster development times with automation and collaboration
- Adaptable to rapidly accommodate changing project requirements
- Independent review of requirements and outsourced testbed completion
- Integration with existing systems
- Detect defects earlier through scalable testing

### TEST APPLICATIONS

-  2WD / 4WD E-AXLE
-  E-TRANSMISSION
-  E-MACHINE DYNO
-  MOTOR EMULATION
-  DYNAMIC SPIN RIG

# KEY FEATURES



## HIGH-SPEED DETERMINISTIC MODELLING AND CONTROL. (HIL)

The software provides the ability to run many different types of models, ranging from MATLAB/Simulink, AVL Boost and Cruise, TechnaliaDynaCar, IPG CarMaker to simple models built in LabVIEW or pure C code.



## OPEN EXTENSIBLE ARCHITECTURE.

Based on NI PXI modular hardware platform offering a cost-effective, adaptable solution for changing hardware requirements. Flexible to accommodate new technologies and extendable chassis for increased demands. Add new sensors, or bespoke protocols via a simple low-cost, 'plug-in' upgrade.



## INTUITIVE TEST SEQUENCING AND SCRIPTING VIA PYTHON SCRIPTING ENGINE

No need for high-level programming experience. Predefined test-steps for configuration and test profile creation. Integrated Python scripting tool allows new steps to be created for applying calculations to channels, importing new file formats and other requirements.



## CHANNEL MAPPING WITH CALIBRATION AND ALARMING.

Assign specific physical channels to in ports and out ports in models. Name channels appropriately for your specific test. Apply scaling and calibration for your sensors.



## MULTI-LINK CAPABILITY

Multi-link capability- deterministic high-speed data sharing between multi-axis or systems for maximum scalability to facilitate multiple test applications.



## DATA-LOGGING

All Data is synchronised, time-stamped and logged to TDMS file format. Plug-ins are available for both MATLAB and Microsoft Excel™.



## USER LEVEL BASED ACCESS

Multiple Configurable User Access Levels ensure ease of use, extensibility, system security, and allow new scripts and testing sequences to be generated and low-level functionality increased.



## DYNAMIC USER INTERFACE

Configure and save user interface in the test. Create profiles specific to your requirements. No need to restart the test.



## SIGNAL ISOLATION.

Optional galvanic isolation provided via the Test Cell Management Unit.

### MAIN CONTROL SYSTEM SPECIFICATION

The main control system consists of a quad-core 2.6 GHz i7 processor running a real-time operating system, for maximum determinism. This allows high-speed models to be run up to 3 kHz. Data acquisition channels will run at the same speed as the model (typically 1 kHz) with the exception of the high-power measurements, which include a snapshot mode for acquiring signals at 500 kHz for short bursts.

The unit is configurable on request, however, as standard, offers:

### CONTROL AND DATA ACQUISITION UNIT

#### Standard Channels

Analogue Input	16	CAN (HD/FD/Low Speed (Fault Tolerant) or LIN channels (selectable at the point of order)	
Digital Input	8	Torque	3
Resistance temperature detector	1	Encoder	2
Analogue Out	8	EtherCAT	1
Digital Out	8	Ethernet	2

#### Extensible to accommodate additional channels as required

Noise Vibration & Harshness	8	RS232	
FlexRay		Thermocouple	
RS485		PT100/1000	