

Steering Hardware-in-the-Loop (HIL) Test Rig



SPECIFICATIONS / FEATURES

- Deploy and run stimulus profiles with single-click operation
- Real-time data visualization in multiple graphical formats
- User-configurable parameter logging and data saving
- Safety controls including Emergency Stop
- Modular and scalable architecture for EPAS/HPAS

CHALLENGE

The system is designed to validate and test the performance of Electric Power-Assisted Steering (EPAS) and Hydraulic Power-Assisted Steering (HPAS) systems under real-time conditions. It ensures accurate simulation of vehicle dynamics using multiple actuators and complex control logic, while reliably logging critical parameters. Additionally, it provides operator-friendly control and integrated safety mechanisms for efficient and secure testing.

SOLUTION

TMCS developed a PC-based HIL test rig with application software built in LabVIEW and integrated with NI VeriStand for real-time control. The system interfaces with NI PXIe hardware, Instron controllers and multiple hydraulic actuators to simulate steering dynamics. Operator GUI allows deployment of test profiles, monitoring real-time data, and recording results for analysis and traceability.

TEST TYPE	DESCRIPTION / PARAMETERS MONITORED
Steering Input Simulation	Performs real-time simulation of steering commands and feedback.
PID Control Testing	Validates proportional-integral-derivative control performance.
Signal Response Verification	Checks analog, digital and CAN signal accuracy and timing.
Multi-Actuator Validation	Tests coordinated functionality of multiple actuators
Data Logging & Analysis	Records and analyzes critical performance parameters.

TECHNOLOGY USED

- NI VeriStand & LabVIEW 2020
- PXIe DAQ hardware
- Real-time model interface toolkit for C/C++ and Simulink models

