L&T Technology Services

HEAVY EQUIPMENT CHASSIS ECU FAULT LOGGING

THE CHALLENGES

The world's leading manufacturer of mining and construction equipment found an intermittent fault on the Serial Peripheral Interface (SPI) bus on the chassis ECU. During engine start-up, the fault would occur infrequently over weeks of vehicle operation. A turn-key solution was needed to log SPI bus traffic during these faults to assist in finding the root cause and help in correcting the issue. With the issue only occurring during specific customer use cases, the data logging would have to be monitored remotely.

THE SOLUTION

A team of engineers from L&T Technology Services Applications Engineering group was selected to work with the client's ECU Electrical Engineering group to develop a solution that could be easily deployed in the field. LTTS engineers validated the data acquisition hardware selection, a CompactRIO by National Instruments, with whom we are an Alliance Partner.

LTTS engineers designed and fabricated an auxiliary mount for the DAQ hardware to minimize wire length to the ECU while maintaining machine operator seat maximum range space claims.

The CompactRIO embedded controller was programmed using LabVIEW. LTTS engineers worked with National Instruments embedded engineers to develop the software architecture that allows for pre and post trigger high-speed data logging of the SPI bus. LTTS developers used bit packing of the DIO data on the FPGA to stream to the real-time controller that handled buffering and logging to the storage drive.

Finally, LTTS engineers configured and validated a Sierra Wireless modem to handle remote access to the logger via 3G/4G cellular data networks.

BENEFITS DELIVERED

Intermittent faults can cause undesirable response of heavy equipment. Further, these intermittent faults can be difficult and time consuming to trace. L&T Technology Services partnered with this company to develop a remote data logging solution that would capture accurate and required information without the need for extra resources in the field for extended periods of time. With this solution, the client's engineers can now focus on root cause analysis to deliver corrected and improved product.

TEST AND AUTOMATION SERVICES

Mechanical & Electro-Mechanical System

- Mechanical System Engineering & Design
- Mathematical Model Development
- Test Stand Development
- Actuator Requirements / Specifications

Engineering Application Development

- LabVIEW, MATLAB, Simulink, Stateflow
- Excel (VBA), Java, C++, Python
- HTML, PHP, .NET

Data Acquisition

- Data Acquisition / Data Analysis
  - eDAQ, National Instruments, Arduino, LabJack
  - Vector CANcase
- Instrument Test
- Test Stand Development

Control System Development

- Automation
- Signal Processing

Power Systems

- Engine Performance Analysis & Simulation
- Emissions Simulation
- Test Cell Design

Multiple Applications

- Heavy Equipment
- Agriculture
- Electronics
- Automotive
- Consumer Products
- Industrial Processes

Simulation / Analysis Process Streamlining

- MATLAB scripting to automatically process large batches of data
- Integrate modular MATLAB and Python GUI applications for complete Windows based automation and optimization of complex simulations in a single unified user environment.

Web Based Interfaces to Databases

- Project Tracking
- Part Information
- Inventory and Asset tracking

Mechanical Design CAD Scripting Bench Software Validation

Compact measurement and control solutions that allow software engineers the ability to quickly validate the affects of code changes on the target ECM's right at their desktop or workstation.

- Connectivity to multiple communication buses
- Stand Alone processor options
- Analog, PWM, and Digital signals
- Powered by NI VeriStand / Test Stand for fast configuration
- FPGA capability for high-speed complex solutions
- Automated Test Sequences for repeatability

Software Issue Prevention & Root Cause Analysis

- Model based control for true Model-, Software-, and Hardware-in-the-Loop Solutions
- Turnkey systems with the capability of integration of external components
- Software regression testing/results linked to bug tracking & reliability software
- Fault insertion and load-based testing of circuits

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ENGINEERING **THE CHANGE**