High-Speed Data Acquisition Clutch Performance Test System

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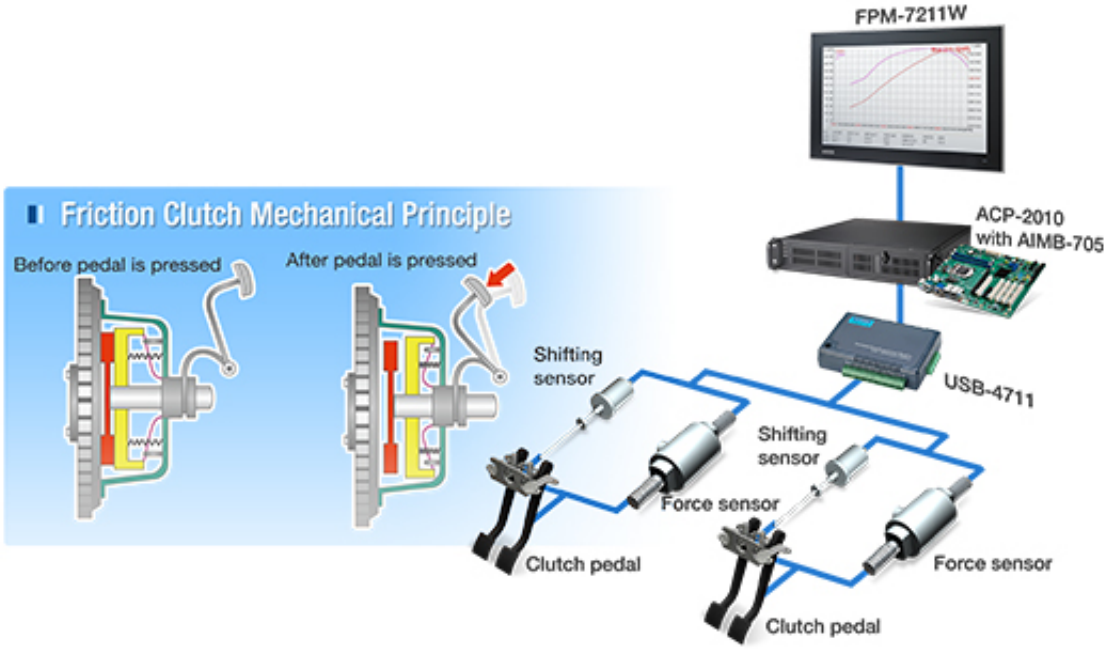


Project

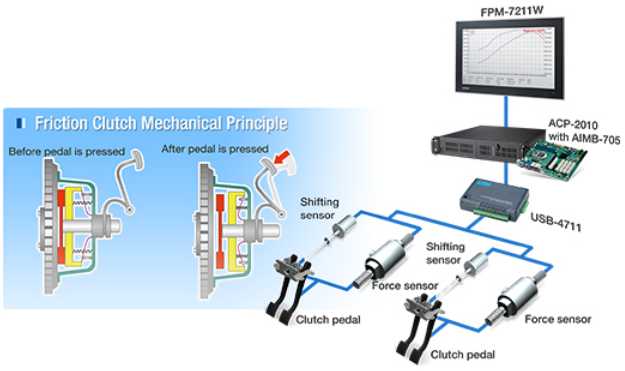
The clutch pedal is an important component within a vehicle?s transmission system and directly affects the performance of the vehicle. The industry standard QC/T 27-2004 is typically used to perform the overall function as well as clutch durability and reliability characteristic tests. However, the price for the equipment needed to perform this test is very high, because of the high data accuracy requirements and the ultra-stringent data reliability standards. Maintenance for such high precision equipment is also much more difficult. Therefore, a portable and low cost clutch feature analyses system that can be used in real vehicle test environments is essential.This system can measure and analyze the clutch pedal mechanics and location characteristics, time-domain characteristics, and separation actions, thus resolving the shortcomings of the traditional systems that can only perform the tests based on the independent parameters of the clutch or the pedal. The high-speed USB data acquisition module can perform high-precision tests, and its simultaneous multi-parameter real vehicle test capability can significantly improve

test efficiency.

Requirements

In terms of the clutch characteristic detection test, we can use a variety of characteristic parameters to analyze the power transmission performance of the clutch pedal being tested, and appropriately evaluate whether the pedal complies with the production standards. To maximize ease of installation and removal as well as the convenience of system construction, this system uses Advantech?s USB series high-speed data acquisition module to record the data in real-time collected by the pressure and displacement sensors, which is used as the basis to analyze the following seven key areas:

- Maximum resistance during the pedal stroke process.
- Maximum pedal stroke.
- Free pedal stroke.
- Clutch contact point.
- Clutch synchronization point.
- Pedal force hysteresis.
- System efficiency.



System Features

For this project, the USB-4711 data acquisition module was equipped with 16 route 12-bit simulated volume input channels and 8 route DIO channels for a sampling rate of up to 100Ks/S, far higher than the required 60Ks/S. All data is collected using ACP-2010, a 2U rackmount chassis, and AIMB-705, a 6th generation Intel® Core? i motherboard, to enable data analysis. FPM-7211W was also deployed for visualization and monitoring.This USB 2.0 high-speed test system can provide substantial data to support clutch design improvements and is a breakthrough from previous models that could only test the characteristic parameters of a single clutch

or pedal. This system boasts real-time responses, high scalability, and comprehensive functions. Additionally, the convenient plug-and-play design makes this system a highly flexible product design tool for clutch or transmission manufacturers.