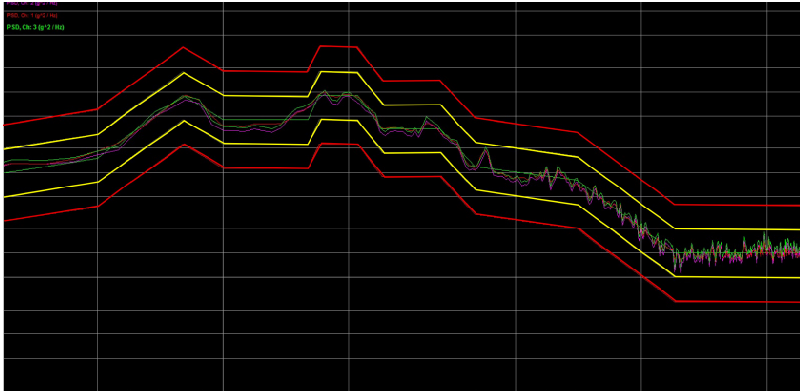


Case Study

# Controlling Fixture Resonances With a Well Designed Vibration Fixture Design + Build + Test Solution



One stop shop for your vibration testing needs.

### The Customer

Our customer is a major Tier 1 automotive parts manufacturer of electromechanical devices. They had extensive experience designing and testing their products for lower frequency ranges (<100 Hz). They were now developing an actuator which included an electronic control unit (ECU). The test requirements for this new actuator extended the vibration test frequency range out to 1,000 Hz.

During vibration validation, our client experienced a series of failures of the actuator gear box housing while testing with a vibration fixture of their own design.

The most obvious remedy apparent to the design engineer was to strengthen the housing. This succeeded in changing the failure location but did not improve the life of the actuator.

The laboratory where the vibration testing was being conducted did not recognize the obvious design failings of the vibration fixture and continued to test redesigned actuators until the client approached us for a fresh look.

### The Challenge

With their development schedule now severely impacted, we needed to diagnose the most likely cause of the failures and then propose and execute on a solution with a very tight time frame.

### The Paragon Systems Solution

A summary design review of the existing vibration fixture revealed that it was likely not rigid enough for the 1,000 Hz vibration environment.

We subjected the fixture to a full resonance qualification test in all three axes which revealed that, due to fixture resonances, the gear box was experiencing acceleration levels two orders of magnitude higher than required by the CTS.

With the clients CAD model and GD&T, we designed a vibration fixture for the frequency range called out in the CTS. The new fixture design was optimized with FEA and subsequently fabricated in our in-house shop. The final fixture was completed within 3 weeks of the project kick-off and was fully resonance qualified prior to testing any actuators.

We tested a batch of actuators on the new fixture which passed the test on the first run.

Many engineers don't recognize the critical role played by the vibration fixture which attaches their device under test (DUT) to the vibration table surface.

Most laboratories won't discuss vibration fixture qualification with their clients, because they can't offer them a solution if the fixture cannot maintain +/- 3 dB control.



### Tools

- Solidworks CAD Software
- FEA Software
- Manual and CNC Machine Tools
- Unholtz Dickie Vibration Machine
- Unholtz Dickie 16 Channel Apex Controller