



Memorandum

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

Subject: Warning(s) of charging system anomalies in Buell 1125 motorcycles

Date: March 26, 2013

From: Bob Young - ODI

To: Public File - PE12-036

During the course of gathering information about alleged stator failures involving (primarily) MY 2009 Buell 1125-series motorcycles, we noted a number of owners claimed the engine quickly stalled "without warning" as a result. To assess how rapidly an engine stall would occur in the event of a stator failure and what, if any, warnings would precede it, Harley-Davidson (HD) conducted tests of 1125's on a rolling dyno. Additionally, we inspected a MY2009 1125 to view the instrument cluster warnings referenced in HD's testing chronology. This memo documents the testing and our inspection.

1.0 HD's TESTING

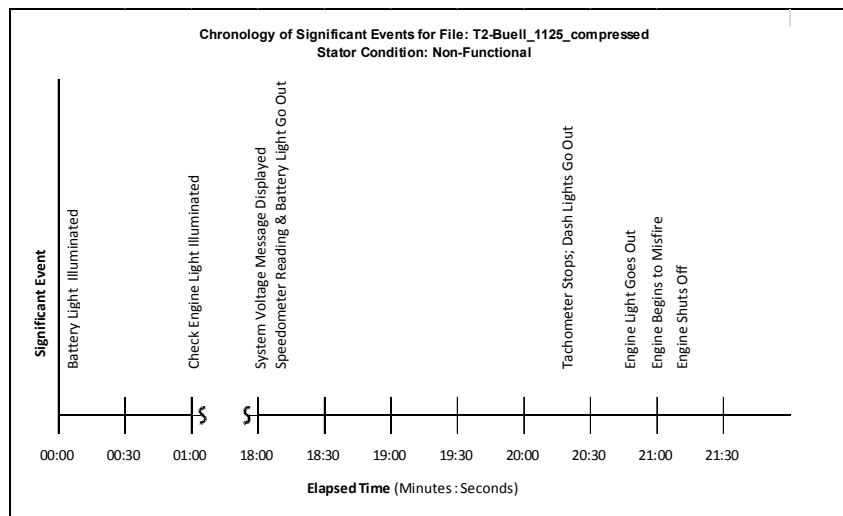
In December 2012, HD conducted Buell 1125 "Stator Failure Simulation" tests. The first replicated a completely disabled stator...a relatively infrequent condition. The second, documenting the more common failure mode, involved a partially disabled stator.

1.1 HD's "Full Failure" testing

HD described their effort as follows:

" Testing was conducted on a chassis dynamometer and documented via video cameras to demonstrate the indicators that the rider is given when the stator fails. A Go-Pro camera was mounted to the vehicle cosmetic airbox cover, and focused on the instrument cluster. A Sony HD Video Camera captured a right side view to display the overall test. The two respective videos were post processed and merged into a single video.

For the first test, the stator was completely disabled so that the vehicle was only operating on the battery. The test was initiated with a fully charged battery. From the vehicle start, the battery light was immediately displayed, and the vehicle ran for a total of 21 minutes. In addition to the battery light, other indicators to the rider included the check engine light displayed, and the speedometer indication, instrumentation lighting, and tachometer indication all shutting down prior to engine ultimately stalling. A chronology of events for the first test is as follows:"

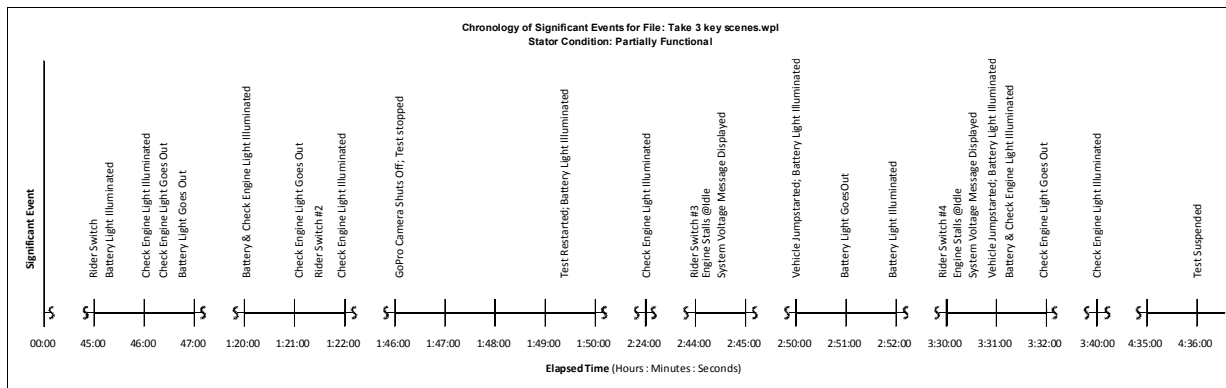


1.1 HD's "Partial Failure" testing

HD described testing of this failure mode as:

"For the second test, , the stator was partially disabled by shutting down one of the three stator legs to provide a partial charge. The loss of one stator leg is actually a typical failure mode when the stator experiences the failure addressed by Technical Service Bulletin B-099. The test was again initiated with a fully charged battery. The vehicle was run at approximately 30 mph in 3rd gear, which is the lowest speed/torque level the vehicle could be run on the dynamometer. When rider switches were made throughout the test, the vehicle was brought to a stop but the engine was left to idle.

Because the stator was still providing some level of charge, the vehicle was run for 1 hour-21 minutes until a consistent battery light was illuminated. Throughout the test, various check engine lights were displayed and then went back out. When the testing was stopped at 45 minutes, 1 hour-21 minutes, and 1 hour-46 minutes, the engine was able to maintain idle with sufficient battery charge. At 2 hours-44 minutes, the battery was no longer able to support engine operations at idle. At that point, the rider would have had the battery light illuminated for 1 hour-22 minutes, and three different points at which check engine light illuminated. The decision was made to suspend the test at 4 hours, 36 minutes as the level of vehicle performance required to operate on the chassis dynamometer was sufficient to generate enough electrical input to sustain the engine operation. At that point, all that would limit the vehicle continuing was the fuel quantity in the tank."

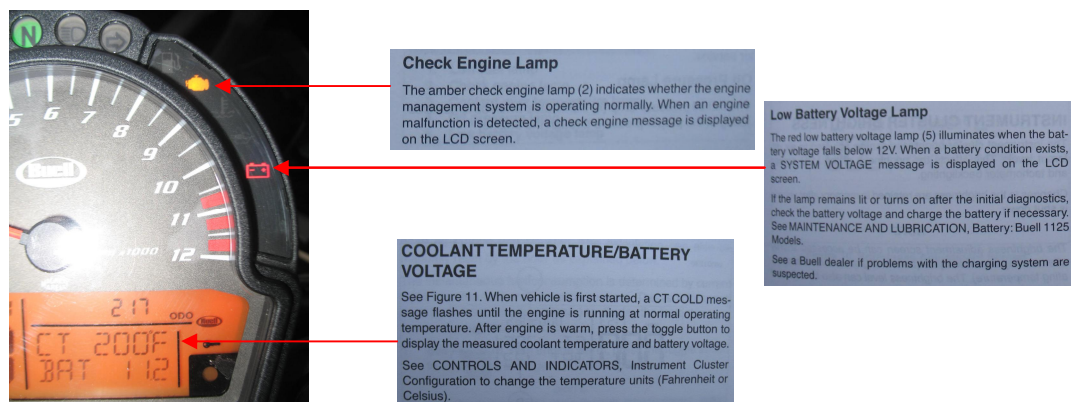


2.0 Charging System Warning Lights and Messages

The Buell 1125 features a number of warning lights and messages indicating its charging system is malfunctioning.

2.1 Instrument cluster warning lights and messages

As described in the 1125 owner's manual, the motorcycle's instrument cluster displays the following charging system condition warning lights and messages when an anomaly is detected:



2.2 Charging System Condition Parameters Triggering Warning Lights & Messages

Certain parameters trigger each warning light and/or message. They are:

2.2.1 Low Battery Voltage Lamp

The battery warning lamp is triggered when the battery voltage drops below 11.9v for more than five seconds. This condition could develop as a result of a partial/complete stator failure. The battery warning light will then go out if the battery voltage drops below 11.7v. At that point the instrument cluster display begins to shut down (for example, the speedometer will stop working) and/or the electronic control unit (ECU) begins to malfunction (which could lead to an engine stall) which is another indication to the rider that the charging system is compromised.

2.2.2 Check Engine Lamp

A failed stator will trigger illumination of the check engine lamp if stator output does not rise when engine speed is increased.

2.2.3 Battery Voltage Message

Since a failed stator cannot maintain battery voltage, a message is displayed when battery voltage falls below 11.9v.

3.0 BATTERY STATE OF CHARGE NEEDED TO CRANK AND START THE ENGINE

While ambient temperature affects the voltage required to crank and start the engine, nominally 11.7v is needed to accomplish this. The battery voltage lamp is purposely set to illuminate at 11.9v so an 1125 rider is never in a situation where battery voltage is too low to re-start the bike without there first being a warning that the battery/charging system is compromised.

4.0 ANALYSIS

HD's testing shows that operators who experience stator-related engine stalls have ignored numerous warnings, occurring over an extended period of time, that their 1125's charging system is compromised. An engine stall occurs after:

- The low battery voltage lamp is illuminated;
- The battery voltage message is displayed;
- The check engine lamp is illuminated;
- The instrument cluster stops displaying certain information (vehicle speed, for example); and
- The engine begins to misfire.

Based upon this information, it is apparent that a stator failure-related engine stall only occurs after numerous warnings, displayed over an extended period of time, have been displayed to the rider.