

FORD MOTOR COMPANY (FORD) RESPONSE TO RQ24014-1 Request 10Request 10

Furnish Ford's assessment of the alleged defect in the subject vehicles, including:

- a. The causal or contributory factor(s);
- b. The failure mechanism(s);
- c. The failure mode(s);
- d. The risk to motor vehicle safety that it poses; and
- e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring, or subject component was malfunctioning; and
- f. The reports included with this inquiry.

Answer

National Highway Traffic Safety Administration (NHTSA) Office of Defects Investigation (ODI) opened this Recall Query based on Vehicle Owner Questionnaire (VOQ) reports alleging loss of motive power in certain model year (MY) 2021 Ford Bronco Sport vehicles after receiving the 24V-267 recall remedy. While the alleged defect and subject component are defined broadly in the Information Request, based on conversations with NHTSA, Ford understands the alleged defect to be a loss of motive power, accompanied by a failure in the electrical system, after the vehicle comes to a stop and the engine shuts off as designed pursuant to the auto stop/start feature. Some VOQs may indicate loss of motive power while the vehicle is moving, but Ford has not yet been able to confirm this. Ford has investigated this subject, including the cause of these reports, the circumstances under which they occur, and the anticipated performance of the subject and peer vehicles and subject component (12-volt battery) related to these reports.

The Bronco Sport's electrical system is designed to meet specific fuel economy standards, and, to do so, certain conditions during a drive cycle cause the alternator output to be reduced to 12.75V. During these conditions, the system relies on the 12-volt battery to provide the necessary output to meet the vehicle's electrical demand. If during the drive cycle the 12-volt battery experiences a failure causing it to drop out of circuit, the vehicle's electrical loads will not be supported, and will require the alternator to react to provide current. If the alternator cannot ramp up quickly enough to maintain the required system voltage above 6.5 volts, the vehicle may become incapable of resuming motive power with no Low Battery Warning from the Body Control Module (BCM). The stop/Start system is designed to be inhibited to avoid loss of motive power when the electrical system reaches certain degraded electrical levels.

A major causal or contributing factor is that the existing calibrations used to detect a 12-volt battery with a low SOC are unable to detect an abrupt battery failure under certain conditions. Engineering analyses at the system and vehicle level revealed that the Body Control Module (BCM) and Powertrain Control Module (PCM) calibrations are unable to detect some abrupt battery failure, which can result in a LOMP if the alternator is unable to keep up with the electrical load demand. This primarily manifests during auto stop/starts.

Ford employs a battery management sensor (BMS) to monitor the SOC of the 12-volt battery. The BMS measures the output voltage during engine crank and vehicle ignition "on", and if the output voltage is not within operating conditions, a visual alert warning will be displayed in the

instrument panel cluster. This is known as the Charging System Service Soon warning .It requires power to execute and serves to warn the driver of the battery state. The BMS was not designed to monitor the current state of charge of the 12-volt battery during a drive cycle and cannot detect if the battery has degraded significantly during the drive cycle or experienced a catastrophic failure.

Ford has determined that the cause of the failures described in the VOQs is traceable to supplier manufacturing defects for batteries used in a portion of the vehicles included in safety recall 24S24, and which the BCM sometimes cannot detect. The tear-down and evaluation of several 12-volt batteries that had experienced the subject failure in the field revealed heavy cracking of the internal Cast On Strap (COS) and failed intercell welds. These types of failures are indicative of a supplier quality issue. Manufacturing defects plus long exposures to high heat environments increase the likelihood of these types of sudden failures.

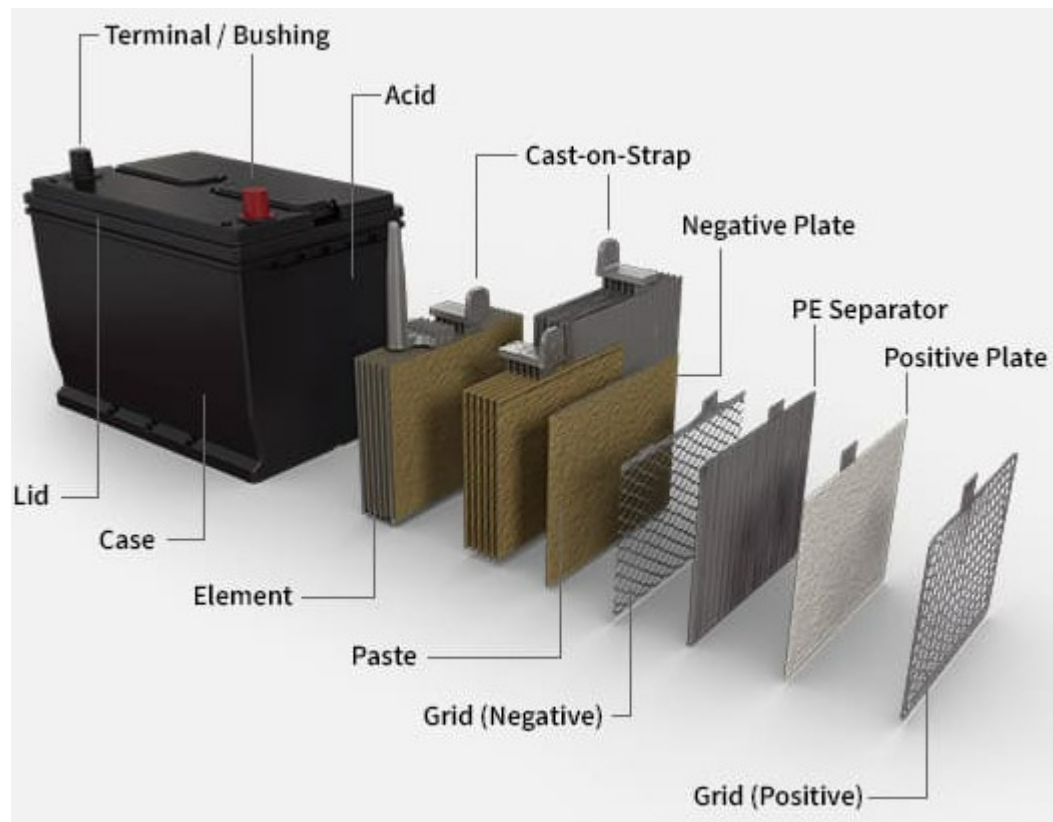


Figure 1. Generic Example of Enhanced Flooded Battery

If the vehicle does not detect a sudden loss of battery voltage while driving and this results in a loss of motive power while coming to a stop, the driver will still be able to perform braking and steering functions. Once the vehicle's speed falls below 5 MPH, the transmission will automatically engage the park pawl, resulting in a ratcheting noise. When the vehicle reaches a stop, the transmission will be locked in park gear, preventing a vehicle rollaway condition.

If the vehicle does not detect a sudden loss of battery voltage while driving and allows an auto stop/start event to occur, the vehicle may not restart when the brake pedal is released.

If one of these conditions occurs, customers will not receive an advance warning of a battery failure, and 12-volt accessories may no longer operate if the battery fails, including hazard lights.

Ford is providing an analysis of the reports included in this inquiry. First, Ford reviewed the 15 vehicle owner questionnaire (VOQs) provided by NHTSA and found that:

- 6 described LOMP while stopped
- 4 described that the vehicle was moving
- 2 were inconclusive as to whether in motion or stopped
- 1 did not mention an LOMP event
- 1 had an LOMP before the FSA 24S24 repair was completed
- 1 was a repeated VOQ.

Second, Ford completed a thorough review of model years 2021-2024 Bronco Sport and model years 2022-2023 Maverick vehicle warranty, field claims, and supplier production dates related to the alleged defect of loss of motive power and have found the manufacturing issues were limited to start of production model year 2021 until 10/20/2022 for Bronco Sport and start of production model year 2022 until 10/20/2022 for Maverick. On October 19th, 2022 a new 12V battery supplier was introduced into production for both vehicle lines.

The battery manufacturing defects that have been discovered, that lead to a catastrophic battery failures, cannot always be detected 100% of the time with the current software.

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