



U.S. Department  
of Transportation  
**National  
Highway  
Traffic Safety  
Administration**

## ODI RESUME

**Investigation:** EA20003  
**Prompted By:** PE20010  
**Date Opened:** 11/12/2020      **Date:** 05/02/2024  
**Closed:**  
**Investigator:** Ajit Alkondon      **Reviewer:** Gregory Magno  
**Approver:** Tanya Topka  
**Subject:** Loss of rearview camera

### MANUFACTURER & PRODUCT INFORMATION

**Manufacturer:** Tesla, Inc.  
**Products:** 2016-2018 Tesla Model X and 2012-2018 Tesla Model S  
**Population:** 158,716

**Problem Description:** Failure of the touchscreen results in loss of rear camera image display when reverse gear is selected, resulting in reduced rear visibility when backing. Failure of touchscreen also impacts HVAC (defogging) ability, and audible chimes relating to ADAS, Autopilot and turn signals.

### FAILURE REPORT SUMMARY

	ODI	Manufacturer	EWR D&I	Other	Total	EWR Field Reports
<b>All Incidents:</b>	1,027	14,922	0	0	15,949	0
<b>Crashes/Fires:</b>	0	0	0	0	0	0
<b>Injury Incidents:</b>	0	0	0	0	0	0
<b>Number of Injuries:</b>	0	0	0	0	0	0
<b>Fatality Incidents:</b>	0	0	0	0	0	0
<b>Number of Fatalities:</b>	0	0	0	0	0	0

**Description of Other:**  
Includes 7,777 warranty claims and 4,746 non-warranty claims of MCU replacements

### ACTION/SUMMARY INFORMATION

**Action:** This (EA) Engineering Analysis is closed with Recall 21V-035.

**Summary:**

On November 20, 2020, the Office of Defects Investigation (ODI) opened Engineering Analysis (EA) 20-003 to investigate incidents of media control unit (MCU) failures resulting in loss of rearview camera in model year (MY) 2012-18 Tesla Model S and model year (MY) 2016-2018 Tesla Model X vehicles equipped with the NVIDIA Tegra 3 processor with an integrated 8GB eMMC NAND flash memory device.

During its investigation, ODI learned that the expected usage life rating for the 8GB eMMC NAND flash memory device is approximately 3,000 "P/E" or Program-Erase cycles, after which the eMMC NAND flash memory device would become fully consumed and no longer be operational, leading to a failure of the media control unit (MCU). At a daily cycle usage rate of 1.4 per block, accumulation of 3,000 P/E cycles would take only 5-6 years. Historically, the expected life of a vehicle generally far exceeds 5-6 years of service. ODI believes that a 5- or 6-year life expectancy for a component integral to providing the driver with safety functions is insufficient. During our review of the data, Tesla provided confirmation that all units will inevitably fail given the memory device's finite storage capacity. Tesla provided its own statistical model showing the number of projected weekly MCU repairs from 2020 to 2028, estimating that replacement rates for MCU failures will peak in early 2022 and gradually decline until (near) full part turnover has been accomplished in 2028.

According to Tesla, for subject vehicles equipped with the NVIDIA Tegra 3 processor with an integrated 8GB eMMC NAND flash memory device, the eMMC NAND cell hardware will fail when reaching lifetime wear, for which the eMMC controller has no available memory blocks necessary to recover. With this failure mode, the only recovery available is a replacement of the eMMC device, achieved by physical part replacement of either the MCU assembly or visual control module subcomponent. Tesla provided information concerning the effects of MCU failure on vehicle function, which include in loss of rearview/backup camera and loss of HVAC (defogging and defrosting) setting controls (if the HVAC status was OFF status prior to failure). The failure also affects the Autopilot advanced driver assistance system (ADAS) and turn signal functionality due to the possible loss of audible chimes, driver sensing, and alerts associated with these vehicle functions. Based on this analysis, ODI issued a Recall Request Letter (RRL) on January 13, 2021. The RRL was based on ODI's tentative conclusion that a defect related to motor vehicle safety exists in the subject vehicles because the eMMC NAND flash devices have a finite lifespan based upon the number of program/erase (P/E) cycles, after which the MCU fails due to memory wear-out, which constitutes a premature failure of safety-critical part.

Tesla responded to the Recall Request Letter (RRL) on January 27, 2021, and disputed the tentative findings of the RRL.

Nevertheless, on January 29, 2021, Tesla filed a safety recall (21V-035), recalling (MY) 2012-2018 Tesla Model S and (MY) 2016-2018 Model X vehicles with a center display equipped with a NVIDIA Tegra 3 processor and an 8GB eMMC NAND flash memory device. In this recall, Tesla is providing a free hardware remedy in addition to the over-the-air ("OTA") firmware updates that the company had previously implemented.

NHTSA will continue to monitor the issue as part of its ordinary processes for overseeing the effectiveness of recalls. However, based on available information, at this time, Tesla's recall appears to address the unreasonable risk to motor safety presented by the premature failure of the component. Accordingly, the investigation is closed. To review the ODI reports cited in the Closing Resume ODI Report Identification Number document, go to [NHTSA.gov](https://www.nhtsa.gov).