

ENGINEERING ANALYSIS CLOSING REPORT
EA04-014
HEADLIGHT SWITCH FAILURES

SUBJECT: Headlight Switch Failures

VEHICLES: 1999-2004 MVP-EF Thomas Built school buses

ALLEGED DEFECT: The headlight switch may overheat, smoke and/or melt causing the exterior lights and/or dash lights to fail.

CORRESPONDENCE:

04 Feb 04	NHTSA PE Information Request letter to Freightliner
11 Mar 04	Freightliner Response to PE IR letter
24 Aug 04	Freightliner email response with test results
08 Sept 04	NHTSA email with further test questions
16 Sept 04	Freightliner email response with test results
19 Oct 04	NHTSA email with additional information requests
22 Oct 04	Freightliner email response to 19 Oct email
3 Dec 04	Freightliner response with additional information

POPULATION: The subject vehicle population contained a total of 8,790 MVP-EF model buses in Model Years 1999-2004. Production by year is as follows:

Model Year	Population
1999	1,575
2000	1,328
2001	1,784
2002	1,539
2003	1,381
2004	1,183
Total	8,790

BASIS: The PE (PE04-012) was opened based on fleet complaints reporting eighteen failures. During the PE, seven additional reports were received alleging lighting failures related to the switch. The PE was upgraded to an Engineering Analysis to allow time for the collection and testing of failed parts. The PE was opened on all 1999-2002 Thomas Built Buses. Because the switch was also used in model year 2003 and 2004 buses, these vehicles were included when the investigation was upgraded.

COMPLAINT & CRASH STATUS:

	EA Open	EA Closed
Complaints	25	25
Crashes	0	0
Injuries	0	0
Fires	0	0
Warranty	1	10

DESCRIPTION OF COMPONENT/VEHICLE SYSTEM:

The headlight switch consists of two independent circuits. One circuit controls the outside markers and headlights. The other circuit controls the interior and dash lights. Pulling the knob out or pushing it in controls the exterior lights, and twisting the knob controls the interior and dash lights. The switch is mounted underneath a metal dash. It is attached in such a way that the rheostat wire is compartmentalized between the dash and a ceramic insulating housing.

MANUFACTURE, DESIGN, or MATERIAL COMPOSITION MODIFICATIONS:

Thomas Built incorporated two changes relative to the headlight switch. The first occurred in September 1999 when (due to a supplier's changes in production), a redesigned connector harness assembly was incorporated into the subject vehicles' headlight switches. The replaced harness is still available as a service item and this modification does not appear to have had an adverse affect on the performance of the switch.

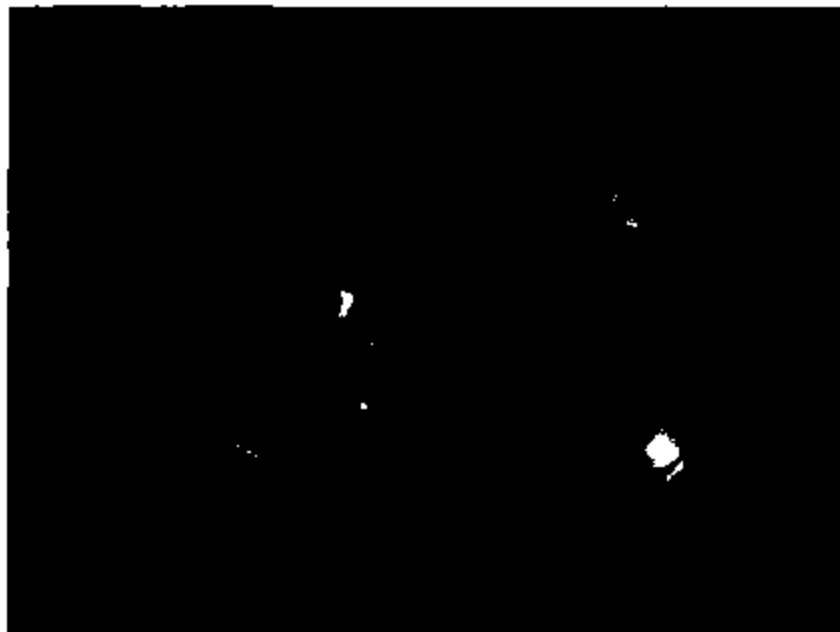
The second design change occurred in July of 2000, as a result of Thomas Built's safety recall (00V-174) to correct an overload condition in the headlight circuit. A relay was installed in the recalled school buses to correct for overloading and new production was changed to incorporate the relay.

TESTING:

The switch manufacturer, Cole Hersee, examined 70 switches, which had been returned to Thomas Built. None showed signs of heat damage. ODI then supplied Freightliner (Thomas Built's parent company) with six failed switches that displayed heat damage. These switches were found to be fully functional in regard to exterior lighting. Additionally, the interior and dash lights would work when the knob was rotated to the extreme right or left, respectively. The capability to dim the dash lights was the only functionality lost.

The testing revealed that the dimmer circuit was failing due to a broken rheostat wire. The broken wire (failed circuit) would then glow. See Picture 1 below. An infrared thermometer was used to measure the temperature of this wire. The temperature was found to be 268 degree Fahrenheit.

Picture 1: Glowing rheostat wire



SERVICE BULLETINS:

Thomas Built has not issued any service bulletins that are applicable to this investigation.

MANUFACTURER'S EVALUATION of ALLEGED DEFECT:

Based on the testing and complaint analysis conducted, Freightliner stated that it does not believe there is a safety issue associated with the alleged defect. According to Freightliner, operative components associated with the headlamp function are completely isolated from the dimmer circuit and none of the failed switches supplied by NHTSA displayed a failure other than in the dimmer circuit.

ODI ANALYSIS:

ODI's fieldwork, fleet visits and testing of failed parts (through Cole Hersee) reveals a broken rheostat wire is the cause of the failures. The failed rheostat wire results in an overheated switch and eliminates the control of the dimmer rheostat function. Of the 25 complaints, 15 were submitted from one fleet, which ODI visited. Buses were examined and no thermal damage was noted beyond the actual damage suffered by the inoperative switch.

Thomas Built reported ten warranty claims. Where information was known, the average time in service before the switch failure was two months and most of these switches failed shortly after one month of service. Further investigation of the vehicle's service records indicated that, with the exception of one vehicle, no vehicle experienced multiple failures. Therefore, ODI believes that these switch failures were infant mortality failures, as a trend was not evident and a common failure mode was not exhibited. Three warranty claims cited dash light failures, one claim reported a bent switch pull, and the remaining six reported various problems with exterior lighting those being, headlights inoperative, high beams inoperative, or intermittent inoperativeness of the headlights.

CONCLUSION:

The failure of the dimmer circuit does not have an impact on the performance of the headlights and other exterior lighting functions of the subject vehicles. The six warranty claims that reported headlight issues appear to be infant mortality with no common trend associated between claims. ODI also concurs that the failure of the circuit does not prevent the buses' operators from being able to read the dash gauges, as the interior and dash lights are still functional when the switch is positioned in the extreme clockwise or counter-clockwise setting. Finally, the temperature and location of the failed rheostat wire is such that other components will not be affected, as supported by the absence of fire allegations.

A safety-related defect has not been identified at this time and further use of agency resources does not appear to be warranted. Accordingly, this investigation is closed. The closing of this investigation does not constitute a finding by NHTSA that no safety-related defect exists. The agency reserves the right to take further action if warranted by the circumstances.


Safety Defects Engineer

12/16/04
Date

I Concur:


Chief, Medium & Heavy Duty Vehicle Division

12/17/04
Date


Director, Office of Defects Investigation

12-20-04
Date