



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

## ODI RESUME

Investigation: EA 04-035  
 Prompted By: PE04-061  
 Date Opened: 12/22/2004      Date Closed: 10/20/2005  
 Principal Investigator: Michael Lee  
 Subject: Front Turn Signal/DRL Failure

Manufacturer: General Motors Corp.  
 Products: 2003-2004 Saturn Ion Coupe  
 Population: 38,663

Problem Description: Front turn signal/daytime running lamp (DRL) may become inoperative due to bulb and/or socket failure.

### FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	4	88	92
Crashes/Fires:	0	0	0
Injury Incidents:	0	0	0
# Injuries:	0	0	0
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	0	4604	4604

\*Description of Other: Warranty Claims

Action: This Engineering Analysis has been closed.

Engineer: Michael Lee MJL  
 Div. Chief: Thomas Z. Cooper  
 Office Dir.: Kathleen C. DeMeter

Date: 10/20/2005  
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Summary: The combination front turn signal/DRL in MY 2003 Saturn Ion coupes experienced significant early-life failures due to various bulb quality issues due to inadequate design and manufacture. This problem trend appears to have disappeared after the fall of 2003. The change of lead wire material near the start of MY 2004 vehicle production appears to have reduced the failure rate for MY 2004 Saturn Ion coupes.

Although operating temperatures in the subject vehicles' lamp assemblies are below the socket material maximum temperature specification, they are only slightly below the specification. In December 2004, GM reduced the voltage to the lamp assembly in order to reduce the temperature in the assembly of the subject vehicles.

Warranty claims on the subject vehicles do not indicate an increasing trend over time. Warranty claim rate of subject vehicles (excluding early MY 2003 claims) is not significantly higher than other GM vehicles that use combination turn signal/DRLs.

A safety-related defect trend has not been identified at this time. 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 a safety-related defect does not exist. The agency will take further action if warranted by the circumstances.

See attached Summary Report.

10/21/05  
 JD

## SUMMARY REPORT

**BACKGROUND:** On August 17, 2004, ODI opened a Preliminary Evaluation (PE04-061) to investigate alleged front turn signal/daytime running lamp (DRL) failures on model year (MY) 2003 and 2004 Saturn Ion vehicles. In November 2004, General Motors (GM) recalled MY 2003 and 2004 Saturn Ion sedans (see NHTSA Recall No. 04V-547 for details). GM did not recall the Ion coupes. The turn signal/DRL bulbs in the sedan and coupe are identical in design and were supplied by Federal Mogul. However, the socket and wiring in the sedan and coupe are different in design and were supplied by different companies. On December 22, 2004, ODI upgraded the PE to an Engineering Analysis (EA04-035) for further investigation of MY 2003 and 2004 Saturn Ion coupe vehicles (herein referred to as subject vehicles).

**THE ALLEGED DEFECT:** The front turn signals/DRL's can become inoperative.

**DESCRIPTION OF COMPONENT OR VEHICLE SYSTEM:** The subject vehicles use combination front turn signals/DRL's (i.e., the same bulb is used for the front turn signal and DRL). The design of the lamp assembly includes a bulb with a flat, plastic base and a base sleeve for secure fit in the bulb socket. The socket and wiring were supplied by II Stanley.

**VEHICLE POPULATION:** A total of 38,663 subject vehicles were sold in the U.S.; 10,989 were MY 2003 and 27,674 were MY 2004.

**CHANGES/MODIFICATIONS:** The table below shows the changes that relate to the bulb in the subject vehicles and MY 2005 Ion coupes. No relevant changes were made to the socket.

**Bulb Related Changes**

Model Year	Change Date	Description of Change
2003	Dec. 2002	Reduce bulb to socket insertion force to prevent damage during assembly.
2003	Mar. 2003	Improve bulb to socket contact by modifying bulb base wire fabrication.
2004	Aug. 2003	Change lead wire material to reduce bulb glass cracking.
2004	Jun. 2004	Create snug fit between bulb glass bulb sleeve to keep lead wire from moving and arcing to socket terminal.
2005	Dec. 2004	Reduce voltage from 14V to 12.8V to reduce temperature in lamp assembly (confirmed problem in Ion sedan only).
2005	Jan. 2005	Change bulb supplier from Federal Mogul to Philips and change from "collared" bulb sleeve to "plastic base" sleeve to address wobble concerns.

**SERVICE BULLETINS:** In June 2004, GM issued a Technical Information Bulletin for erratic front turn signal operation when using a cell phone charger in vehicle's accessory power outlet in the subject vehicles. In addition, between May 2002 and December 2004, GM made several changes to the body control module to reduce cell phone charger noise (not shown above).

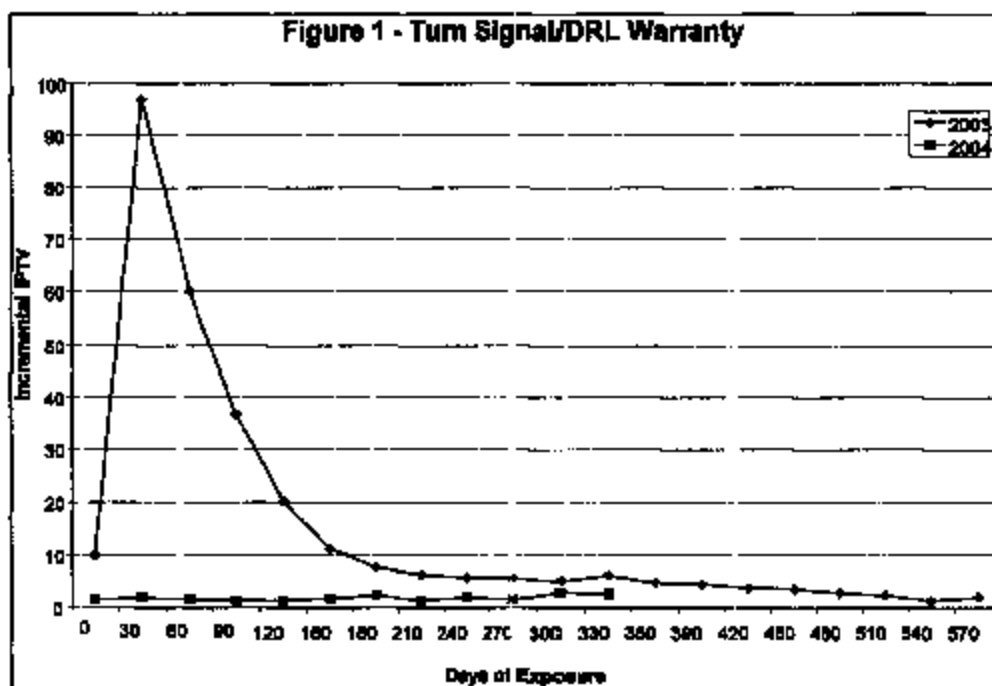
**FAILURE MODES:** The front turn signals/DRL's can become inoperative due to bulb burning out due to (1) inadequate lead wire, or (2) inadequate contact between bulb and socket due to the design and manufacturing issues listed in the table on page 2, or melted/deformed sockets.

**MANUFACTURER'S EVALUATION OF THE ALLEGED DEFECT:**

GM determined that temperatures in Ion sedan's lamp assembly can exceed the socket material maximum temperature specification which can cause the socket components to melt and deform. Due to differences in socket/housing design, temperatures in Ion coupe's lamp assembly are below the specifications. During its investigations, GM collected field-returned sockets from Ion sedans and found melted/deformed sockets. GM stated it does not have any coupe field-returned sockets and that no melted sockets have been returned through warranty. GM stated it is not aware of any coupe socket issues.

GM stated that bulbs are a consumable, replaceable item that can burn out within the life of the vehicle as well as within the warranty period due to early or random failures. The bulbs in the subject vehicles are the longest rated bulbs available for the combination turn signal/DRL application and are also used by other vehicle manufacturers. Driver usage of DRL is 20 times the usage of turn signals. Thus, a bulb used for combination turn signal/DRL will be replaced sooner and more often than for a turn signal only bulb.

GM stated that early bulb failures in MY 2003 Ion coupes were addressed by improvements in design and manufacture of the bulb and socket. As shown in Figure 1, the MY 2003 incremental warranty rate, after 180 days exposure, is below 10 incidents per thousand vehicles (IPTV). The MY 2004 incremental warranty rate is below 3 IPTV. These are in the expected range for turn signal/DRL bulbs.

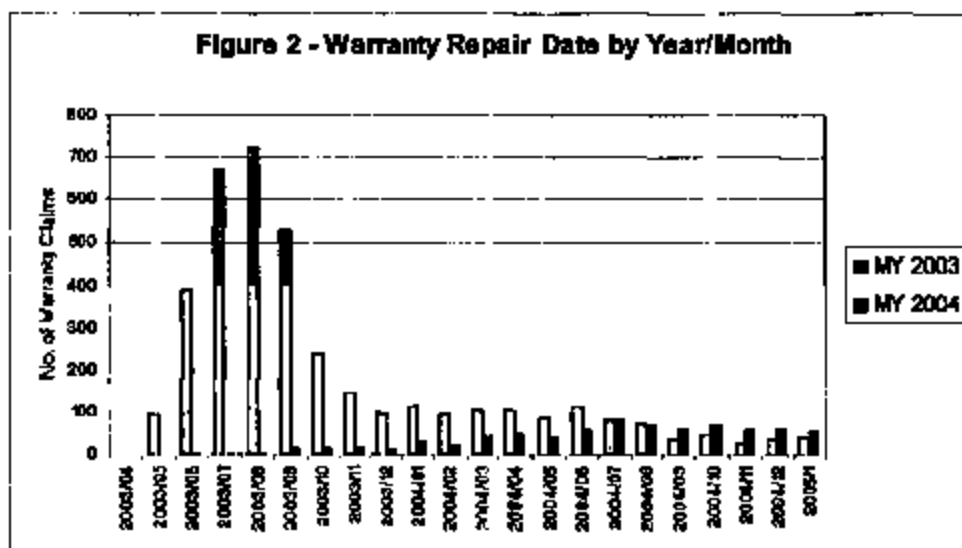


GM stated that the complaint rate is low and the warranty rate is as expected. When a turn signal/DRL bulb fails, the turn signal indicator warns the driver as required by FMVSS No. 108. There are no reported consequences associated with reported turn signal/DRL failures.

### **ODI'S ANALYSIS:**

ODI has received four complaints to date that relate to the alleged defect in the subject vehicles. GM has received 88 complaints through January 2005. The complaints stated that the left and/or right front turn signal/DRL failed intermittently or permanently. Some of GM's field reports indicated that the bulbs and/or sockets showed signs of overheating while other reports noted no signs of overheating.

There were 4,604 warranty claims through January 2005, which may be related to the alleged defect in the subject vehicles. Most of the warranty claims were on MY 2003 vehicles and were early life failures as shown in Figure 2 (this trend is also seen in Figure 1).



It appears that significant bulb quality issues occurred during MY 2003 vehicle production. However, most of the failures due to these issues occurred in the first several months of use. After the significant initial surge in warranty claims, the claims declined drastically and have declined steadily since. The change of the lead wire material in August 2003, near the start of MY 2004 vehicle production, appears to have been effective in reducing failures of turn signal/DRL in MY 2004 vehicles. MY 2004 warranty claims do not indicate an increasing trend over time.

Although operating temperatures in the subject vehicles' lamp assemblies are below the socket material maximum temperature specification, they are only slightly below the specification. In December 2004, GM reduced the voltage to the lamp assembly in order to reduce the temperature in the assembly of the subject vehicles.

ODI's Weibull analysis of MY 2003 warranty claims indicated a multiple failure mode problem and a "bad batch" problem. This is consistent with the bulb quality issues during MY 2003 vehicle production and the early-life failures represented in warranty claims. A Weibull analysis of MY 2004 warranty claims was unremarkable.

ODI reviewed warranty claim rates of other GM vehicles that use combination turn signal/DRL. GM identified 21 MY 2003-2005 vehicle models for this study. The warranty rate for ten of the 21 models is above 2 claims per 100 vehicles. Five models were above 3 per 100 vehicles and two models were above 5 per 100 vehicles.

Excluding the early-life failures on MY 2003 Ion vehicles, warranty rates of subject vehicles are not unusually high when compared to the other GM vehicles. The warranty rate of MY 2003 Ion coupes for the last 12-month data is approximately 8 claims per 100 vehicles. The cumulative warranty rate of MY 2004 Ion coupes is approximately 3 per 100 vehicles.

In summary, the combination front turn signal/DRL in MY 2003 Ion coupes experienced significant early-life failures due to significant bulb quality issues due to inadequate design and manufacture. The change of lead wire material near the start of MY 2004 vehicle production appears to have reduced the failure rate for MY 2004 Ion coupes. Warranty claims on the subject vehicles do not indicate an increasing trend over time. Warranty rate (excluding early MY 2003 claims) is not significantly higher than other GM vehicles that use combination turn signal/DRL's.

**CONCLUSION:** A safety-related defect trend has not been identified at this time. 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 a safety-related defect does not exist. The agency will take further action if warranted by the circumstances.