



November 25, 2014

Mr. Jeff Quandt, Chief
Office of Defects Investigation, NVS-213
U.S. Department of Transportation

National Highway Traffic Safety Administration (NHTSA)
Office of Defects Investigation (ODI)
Room W48-312
1200 New Jersey Avenue SE
Washington, D.C. 20590

Reference: NVS-213krh; DP14-004

Dear Mr. Quandt:

Attached is Chrysler Group LLC's ("Chrysler") partial response of the referenced inquiry for questions 1, 2, 8, and 9. As agreed during our November 6, 2014 discussion, Chrysler will submit the remaining unanswered questions on December 12, 2014 giving Chrysler the opportunity to further assess and, if necessary, revise and/or expand its response.

Chrysler is submitting to the Chief Counsel's Office, via overnight mail for Wednesday delivery with a request for confidentiality, additional detailed information responsive to DP14-004.

By providing the information contained herein, Chrysler is not waiving its claim to attorney work product and attorney-client privileged communications.

Sincerely,

A handwritten signature in black ink, appearing to read "Philip S. Hartnagel". The signature is stylized with long, sweeping strokes.

Philip S. Hartnagel
Sr. Manager – Product Investigations and Campaigns

Attachment and Enclosures

Preliminary Statement

On April 30, 2009 Chrysler LLC, the entity that manufactured and sold the vehicles that are the subject of this Information Request, filed a voluntary petition for relief under Chapter 11 of Title 11 of the United States Bankruptcy Code.

On June 10, 2009, Chrysler LLC sold substantially all of its assets to a newly formed company now known as Chrysler Group LLC. Pursuant to the sales transaction, Chrysler Group LLC assumed responsibility for safety recalls pursuant to the 49 U.S.C. Chapter 301 for vehicles that were manufactured and sold by Chrysler LLC prior to the June 10, 2009 asset sale.

On June 11, 2009, Chrysler LLC changed its name to Old Carco LLC. The assets of Old Carco LLC that were not purchased by Chrysler Group LLC, as well as the liabilities of Old Carco that were not assumed, remain under the jurisdiction of the United States Bankruptcy Court – Southern District of New York (In re Old Carco LLC, et al., Case No. 09-50002).

Note: Unless indicated otherwise in the response to a question, this document contains information up to October 20, 2014, the date the information request was received.

This attachment contains Chrysler Group LLC's partial response to Questions 1, 2, 8, and 9 as agreed upon with the National Highway Traffic Safety Administration's ("NHTSA") Office of Defect Investigations ("ODI").

1. State the number of subject vehicles sold by model, model year, and TIPM part number.

A1. The subject vehicles are noted in Table 1.

Vehicle Type	Model Years
Ram 1500 (DS)	2009 – 2012
Ram 2500 (DJ)	2010 – 2012
Ram 3500 (D2/DD)	2010 – 2012
Ram 4500 (DP)	2011 – 2012
Ram 5500 (DP)	2011 – 2012
Dodge Journey (JC)	2009 – 2010
Dodge Grand Caravan / Chrysler Town and Country (RT)	2008 – 2014
Jeep Wrangler (JK)	2007 – 2014
Dodge Nitro (KA)	2007 – 2011
Jeep Liberty (KK)	2008 – 2012
Jeep Grand Cherokee (WK)	2011 – 2013
Dodge Durango (WD)	2011 – 2013

Table 1: Subject vehicles with models and model years (model code).

The Totally Integrated Power Module (“TIPM”) -7 is a specific type of Body Control Module. TIPM part numbers are not necessarily unique to any model and model year combination, and TIPM part numbers do vary within any particular vehicle program based upon hardware and software versions. A dealer technician can use a diagnostic tool to determine what TIPM part number is present in a specific vehicle. Chrysler does not relate specific TIPM part numbers to vehicles after production. Over the production range of a vehicle program there were numerous changes in TIPM part number. The exact dates in which a new part number was implemented in production varied slightly based on a number of unplanned factors including production interruptions. TIPM volume has been noted by part number based on planned implementation dates for each TIPM part number. There is approximately 2% of part numbers for which Chrysler continues to validate TIPM part numbers within the above vehicle population. The detailed response of the production data listed by TIPM-7 part number, as requested, is provided in ENCLOSURE 1- TIPM-7 PART NUMBERS and is titled Volume by part number.xlsx.

2. Provide the following information for each subject complaint vehicle:

- a. Vehicle identification number (VIN);**
- b. Model;**

- c. **Model Year;**
- d. **Engine;**
- e. **TIPM part number;**
- f. **Date of manufacture;**
- g. **Date warranty coverage commenced;**
- h. **Applicability and completion date for all TIPM-related recalls; and**
- i. **The State in the United States where the vehicle was originally sold or leased (or delivered for sale or lease).**

Provide the table in Microsoft Access 2010, or a compatible format, entitled "DP14 004 PRODUCTION DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

A2. The subpart (a) through (i) is located in ENCLOSURE 2 and titled DP14 004 PRODUCTION DATA.accdb.

8. Provide the following information for the subject components:

- a. **TIPM-7 assembly drawings including PCB (printed circuit board) electrical schematics, stencil, layout, and BOM (Bill of Material) in PDF; and**
- b. **Describe, and provide copies of all documents relating to, all return part analyses that relate to, or may relate to, the alleged defect in the subject complaint vehicles.**

A8. Chrysler's response to subpart (a) is located in ENCLOSURE 8 – CONF BUS INFO, which has been submitted under separate cover to the NHTSA Chief Counsel's Office with a request for confidential treatment. The TIPM-7 is an Outside Design and Development ("ODD") component. Much of the detailed documents and information relating to the design and development of this ODD component, including some of the information requested in Q8, is (or once was) in the possession of the supplier and not Chrysler. Chrysler has searched its available records and does not possess PCB electrical schematics, stencil, layout, or BOM data. Chrysler has located and provided both 2-dimensional part engineering drawings as well as a computer-aided design ("CAD") rendering of the TIPM-7 Exterior, which is generally representative of all TIPM-7 part numbers found in all subject vehicles. The 2-dimensional drawings are found in subdirectory TIPM-7 and titled 68217404AA_2D CONF BUS INFO.pdf and 68217405AA_2D CONF BUS INFO.pdf. The 3-dimensional drawings found in subdirectory ENCLOSURE 8 - PUBLIC and titled TIPM7 - Exterior CAD PUBLIC.pptx. In addition, Chrysler has located and provided a schematic of the Fuel Pump relay circuits reviewed in the 14V-530/P54 investigation which can be found in subdirectory TIPM-7 and titled TIPM 7C - Fuel Pump Circuit schematic CONF BUS INFO.pdf and TIPM7S_Fuel_Pump_Relay_Mission_Profile_revF CONF BUS INFO.pdf.

Chrysler's response to subpart (b) is located in ENCLOSURE 8 – CONF BUS INFO within the subdirectory PART ANALYSIS. Chrysler reviewed all available returned part analysis reports and identified three of the subject complaint vehicles in which a TIPM-7 was returned to either Chrysler or the supplier. The three returned parts were all tested on the bench simulator. A summary of the part analysis reports can be found in the PART ANALYSIS directory and is titled Returned Part Analysis Summary CONF BUS INFO.pdf. Of the three reports, there are two which may be related to the alleged defect conditions. The failure mode of the first module (report 14D1456AC) does not appear to be related to the alleged defect. The failure mode of the second module (report 14H09632AA) appears to be related to the alleged defect; however, the cause was noted as assembly process, not module durability. The failure mode of the third module (report 14G [REDACTED]) appears to be related to the alleged defect, however, the returned module passed all testing.

9. Provide the following information regarding the subject recall:

- a. State the numbers of consumer complaints, field reports and warranty claims related to the recall condition in the subject components used in the recalled population that were received by Chrysler at the time of the recall decision;**
- b. Provide a Pareto chart of the failure modes/effects associated with the fuel pump relay defect condition (e.g., stall while driving, no start, etc.); and**
- c. Describe, and provide copies of all documents relating to, all field data analyses, testing, returned part analyses and design reviews performed by Chrysler to determine the root cause and scope of the fuel pump relay defect condition.**

A9. The following summarizes the number of reports identified by Chrysler that may relate to the recall condition in the subject components used in the recall population known at the time of the recall decision. Chrysler has conducted a reasonable and diligent search of the normal repositories of such information. In the 14v-530/P54 recall there were four fuel pump relay conditions stated: 1. Crank, No start, 2. Start, then immediately stall, 3. Stall while driving, 4. Fuel pump runs after ignition off. Only one of the conditions is related to motor vehicle safety (stall while driving). Chrysler issued the recall to remedy the safety condition. Below are the total numbers of reports related to the four fuel pump relay conditions, as well as the specific items related to the stalling while driving condition.

- a. Chrysler identified 342 consumer complaints (Customer Assistance Inquiry Request or CAIR and Customer Promoter Score or CPS) relating to the four fuel pump relay conditions in the subject vehicle population, which represent 290

unique VINs. Chrysler identified 68 related consumer complaints to vehicles stalling while driving in the subject vehicle population, which represent 66 unique VINs. These reports were categorized based upon a review of each narrative for the relevant fuel pump relay conditions.

Chrysler identified 608 field reports relating to the four fuel pump relay conditions in the subject vehicle population, which represent 600 unique VINs. Chrysler identified 15 field reports related to vehicles stalling while driving in the subject vehicle population, which represent 14 unique VINs. These reports were categorized based upon a review of each narrative for the relevant fuel pump relay conditions.

Chrysler identified 5,230 warranty claims relating to the four fuel pump relay conditions in the subject vehicle population, which represent 5,096 unique VINs. Chrysler identified 71 warranty claims related to vehicles stalling while driving in the subject vehicle population, which represent 71 unique VINs. To identify the warranty claims, a search was conducted by Labor Operation (“LOP”) and TIPM part numbers. Chrysler applied search terms reasonably related to the four fuel pump relay conditions. These search terms were used to categorize the reports into one or more of the four fuel pump relay conditions.

- b. Chrysler has provided a Pareto analysis of the four fuel pump relay conditions noted above associated with the 14v-530/P54 recall, including the above three data sources from question 9, subpart (a). Chrysler’s response to subpart (b) is located in ENCLOSURE 9 – CONF BUS INFO in the file named Conditions pareto CONF BUS INFO.pdf.
- c. In October 2013, Chrysler’s Vehicle Safety Office conducted a preliminary review of field narratives, which appeared to indicate the fuel pump circuit in the TIPM-7 body controller was not energizing the fuel pump and potentially resulting in a vehicle stall while driving. The TIPM-7 service part usage had increased sharply, causing a national backorder of TIPM-7 body controllers, preventing timely repair of numerous vehicles.

Chrysler conducted a review of dealer technician warranty narratives which indicated that the fuel pump on some 2011 Jeep Grand Cherokee and Dodge Durango vehicles were not energizing, which resulted in a no start condition. Some of these narratives include variations of the following details:

- Measuring 0 volts at the fuel pump and/or TIPM-7 fuel pump relay output pin while cycling the ignition to the “RUN” position;
- Measuring 0 volts at the harness pins leading into the fuel pump with the pump disconnected while cycling the ignition to the “RUN” position; and

- Measuring 0 volts at the upstream TIPM-7 fuel pump relay fuse holder terminal with the fuel pump relay fuse removed while cycling the ignition to the “RUN” position.

In an effort to understand the root cause and scope of the potential issue, Chrysler conducted a number of testing and data analysis activities. Chrysler developed a cross functional issue investigation team which held no less than weekly meetings, design reviews, field data reviews, as well as numerous test activities. In this section, Chrysler is providing key documents that memorialize this activity that ultimately led to the identification of root cause as well as the recommendation to issue the 14V-530/P54 campaign for the identified vehicles.

In November 2013, the TIPM-7 supplier and the fuel pump relay supplier each performed a teardown analysis on 10 of 2011 Jeep Grand Cherokee and Dodge Durango fuel pump relays from TIPM-7 modules returned due to field failures. These analyses showed relay spring deformation and relay contact erosion. The teardowns revealed that the relay failure was a durability, or end-of-life type failure, which was occurring prematurely. The reports detailing TIPM Fuel pump relay teardown can be found in ENCLOSURE 9 – CONF BUS INFO.

During the period of December 2013 through February 2014, the supplier conducted relay cycle testing to analyze the effect of inductance and current at the fuel pump relay. This testing failed to recreate TIPM-7 fuel pump relay conditions that were observed in the field. Relay testing data and results can be found in ENCLOSURE 9 – CONF BUS INFO.

The cross functional team continued to analyze the testing results as well as the field data. The team reviewed data related to vehicles reported to have exhibited the fuel pump relay conditions in question. Data sources included, but were not limited to, vehicle feature content, months in service, mileage at time of event, as well as location and region of sale. Multiple combinations of vehicle features were compared in an effort to identify relevant trends and potential root causes. Significant data analysis and collection of vehicle characteristics were obtained from multiple vehicle lines equipped with TIPM-7 body controllers. The analysis of the field data indicated certain trends:

- There was a significant difference in occurrence rate between 2011 MY Jeep Grand Cherokee and 2011 MY Dodge Durango vehicles when compared with all other TIPM-7 vehicles.
- There was no identifiable trend for vehicle content.
- Incident rate increased at approximately 18 months in service.
- Incident rate increased at approximately 20,000 miles.
- Suspected fuel pump relay failures were occurring at a higher rate in southern states with higher mean ambient temperatures.

A presentation containing the above analysis can be found in ENCLOSURE 9 – CONF BUS INFO, as well as materials previously produced on October 8, 2014 titled TIPM Overview (Bates numbers: 10.8.14 TIPM Overview Presentation -Voluntary- - Chrysler – 01 through 22).

Based on prior testing and analysis, additional testing was conducted in March and April 2014. In this testing, steady state loads were passed through the relay to analyze the effect of continuous high ambient temperature combined with high current at the fuel pump relay. This data was used to develop more precise conditions in future testing of the fuel pump relay. Relay testing data and results can be found in ENCLOSURE 9 – CONF BUS INFO.

In May through August 2014, three types of fuel pump relays were tested in simulated vehicle environments, including the 2011 WK/WD. The three relays tested were: 1. TIPM-7 body controller PCB mounted fuel pump relay, 2. Power Distribution Center (“PDC”) body controller PCB mounted fuel pump relay, and 3. a 4-wire external relay. Test factors held constant were ambient temperature and duty cycle. Variable factors adjusted were the relay type, the relay manufacture, as well as the simulated fuel pump current and inductance levels representative of multiple TIPM-7 vehicles. All relays were tested at an accelerated duty cycle. During the test, the TIPM-7 relays failed in a way that was representative of the field failures. The TIPM-7 relays tested in the 2011 WK/WD environment failed after fewer test cycles than all other relays in the test. In addition, the 4-wire external relay was tested in these same conditions in order to confirm the reliability of the relay as a potential service remedy for 14v-530/P54. This relay lasted substantially longer in the same test conditions. Testing was suspended after the relay lasted beyond three times its vehicle defined life cycle. Description of the test setup and results, as well as the effectiveness of the external relay can be found in ENCLOSURE 9 – CONF BUS INFO.

Chrysler identified the root cause of the premature relay failure to be the deformation of the contact spring due to the heat caused by contact power, ambient temperature around the fuel pump relay, and battery voltage. These factors, present in combination and in high amounts lead to premature fuel pump relay failure. Chrysler’s investigation into the fuel pump relay determined that the mechanical relay in question within the TIPM-7 was not able in all cases, to function to the defined vehicle life cycle within the 14V-530/P54 subject vehicles. An examination of the relay specification documentation from the Tier 2 supplier appears to support the conclusions of the investigation. The Tier 2 relay specification sheet can be found in ENCLOSURE 9 - PUBLIC and titled relay_ex1_ex2_e PUBLIC.pdf.

Based on the field data analysis, the rate of premature relay failures of the 2011 WK/WD vehicles appears to be unique within the TIPM-7 population. Chrysler determined at the August 26, 2014 meeting of the Vehicle Regulatory Committee to issue a recall for the 2011 WK/WD vehicles. It has been verified through multiple reviews, that in the case of a stall event, the vehicle maintains power and functionality for certain features, such as hazard indicators, seat belt pretensioners and airbags.

Mr. Jeffrey L. Quandt
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ATTACHMENT

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Chrysler continues to review design changes made in the WK/WD vehicles after the 2011 MY to determine what, if any, design changes positively affected the occurrence rate of stalling while driving among the 2012 and 2013 MY WK/WD vehicles.