



U.S. Department  
of Transportation

**National Highway  
Traffic Safety  
Administration**

## ODI RESUME

**Investigation:** PE 12-004  
**Date Opened:** 02/17/2012  
**Investigator:** Tom Bowman  
**Approver:** Scott Yon  
**Subject:** Diminished Brake Performance

**Date Closed:** 08/17/2012  
**Reviewer:** Bruce York-B

### MANUFACTURER & PRODUCT INFORMATION

**Manufacturer:** Tiffin Motorhomes, Inc.  
**Products:** 2006 - 2007 MY Tiffin equipped with Bosch ZOHT brakes  
**Population:** 463 (Estimated)  
**Problem Description:** Diminished brake performance

### FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
<b>Complaints:</b>	3	0	3
<b>Crashes/Fires:</b>	0	0	0
<b>Injury Incidents:</b>	0	0	0
<b>Fatality Incidents:</b>	0	0	0

### ACTION / SUMMARY INFORMATION

**Action:** Close this EA: Daimler Truck Safety Recall 12V-242 addresses the reported issues.

**Summary:**

Daimler Truck has issued 12V-242. See ODI closing report for further details.

The associated VOQs are: 10442468, 10442861, 10442879, and 10454022 (Model Year 2008).



## Closing Report – PE12-004

### Diminished Brake Performance in Model Year 2006 and 2007 Tiffin Motor Homes Equipped With Bosch Hydraulically Actuated Disc Foundation Brakes Installed in Daimler Trucks North America (DTNA) Chasses

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**(1) Subject Components -**

This report summarizes the Office of Defects Investigation's (ODI) investigation of diminished brake performance in model years 2006 and 2007 Tiffin Motor homes equipped Bosch hydraulically-actuated disc foundation brakes installed in chassis manufactured by Freightliner Custom Chassis (FCCC), a division of Daimler Trucks North America (DTNA).

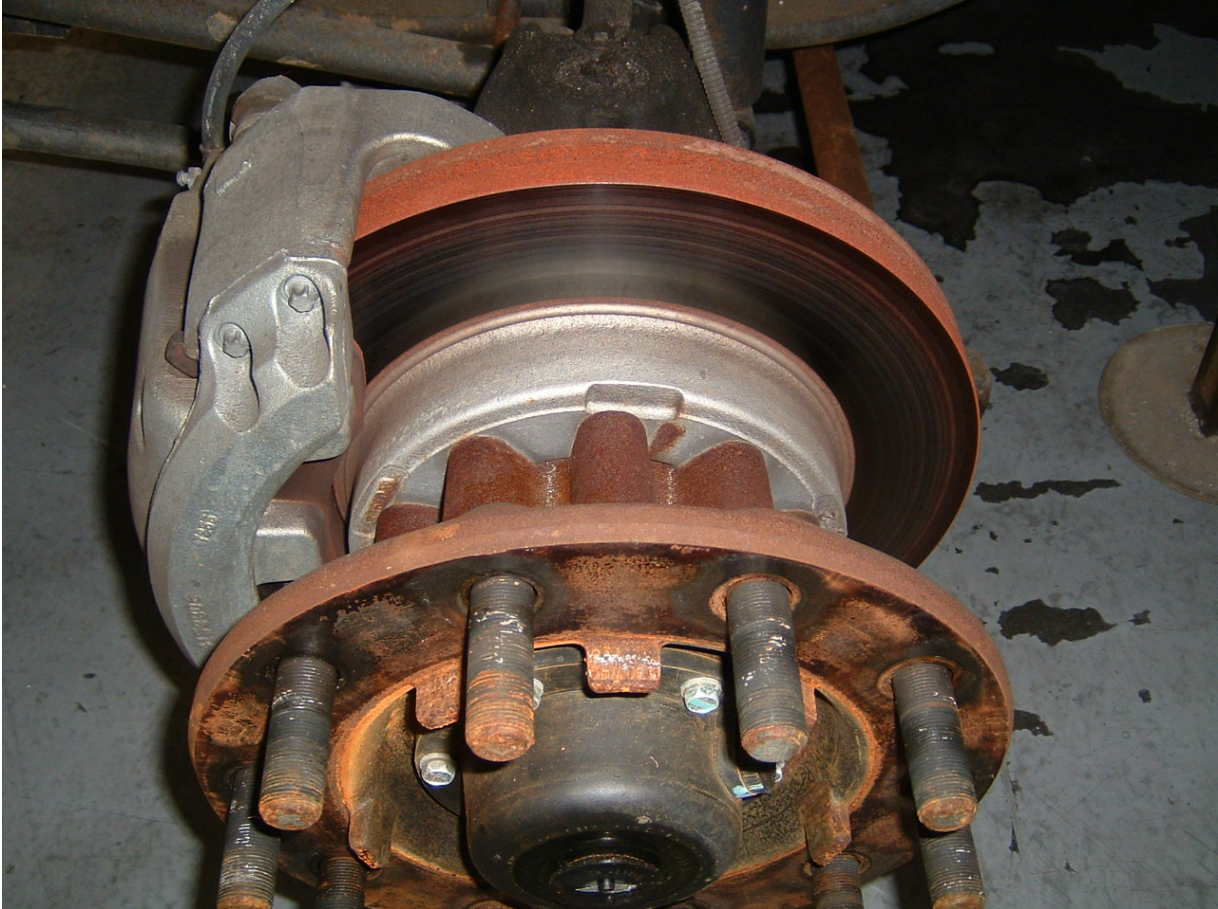
**(2) Product Description -**

Photograph 1 – Representative Tiffin Allegro Bay Vehicle



Source – ODI Field Visit, Tampa area, June 6, 2012.

Photograph 2- Representative Bosch Wheel-End-Mounted Foundation Disc Brake



Source – ODI Field Visit, Tampa area, June 6, 2012.

Section 1, “Subject Components,” of the closing report associated with ODI investigation EA07-016 provides descriptive product information and technical findings regarding the Bosch foundation brake assembly installed in recreational vehicles built on chassis manufactured by Workhorse.

### **(3) Background-**

This investigation (PE12-004) is associated with prior ODI investigation EA07-016 (referenced above) that ODI conducted in 2008-2009. EA07-016 was closed on August 19, 2009, following Navistar’s (Workhorse) decision to conduct safety campaign 09V-110. Campaign 09V-110 addressed brake drag / diminished brake performance potentially affecting motor home recreational vehicles built on model year 2001-2008 model year Workhorse W20, W21, and W-22 chassis.

ODI initiated PE12-004 in response to three complaints from Tiffin vehicle owners. These complaints are summarized in Table 1a below.

Table 1a – Summary of Complaints – Tiffin Vehicle Owners

VOQ	Date	Make	Model Year	Model	Summary Comments
10442468	January 5, 2012	Tiffin	2007	Allegro Bay	Owner reports brakes over-heated, burned ABS sensors, locked up rear brakes.
10442861	January 8, 2012	Tiffin	2007	Allegro Bay	Owner reports a reduction in brake performance.
10442879	January 9, 2012	Tiffin	2006	Allegro Bay	Owner reports “hot brakes” requiring vigorous pumping to slow/stop the vehicle.

ODI received one additional complaint, summarized in Table 1b below, from a Tiffin vehicle owner received during the course of the investigation.

Table 1b – Summary of Complaints Received During the Course of Investigation PE12-004 (January, 2012 – July, 2012)

VOQ	Date	Make	Model Year	Model	Summary Comments
10454022	April 3, 2012	Tiffin	2008 (*)	Allegro	Owner reports smelling brake smell and found left rear brake very hot.

(\*) This report pertains to a MY 2008 vehicle. Model year 2008 vehicles are not within the scoping parameters of PE12-004. However Daimler Truck’s responsive campaign 12V-242, dated May 30, 2012, included model year 2008 vehicles.

#### (4) Chronology -

Table 3 lists the principle pertinent investigatory activities and milestones to date.

Table 3 -

<b>Date</b>	<b>Event</b>
January, 2012	ODI received three complaints (Summarized in Table 1a above).
February 12, 2012	ODI, Daimler Trucks North America, Tiffin, and Bosch meeting/ phone conference.
February 17, 2012	ODI initiates PE12-004.
March, 2012	VRTC conducts dimensional checks on field returned brake pistons.
March 1 – April 5, 2012	VRTC conducts postcard survey to owners of Tiffin vehicles residing in Florida for the purpose of developing performance information and identifying vehicle candidates for possible future brake performance evaluation / inspection.
March 6-8, 2012	Instrumentation and test drive (Tampa area) intended to simulate vehicle operating conditions which induce brake drag / diminished braking performance.
March 9, 2012	Information Request sent to Tiffin.
March 22, 2012	DTNA provides ODI with an investigation plan.
March 28, 2012	Information Request sent to Daimler Trucks North America.
April 13, 2011	Tiffin provides information requested on March 9, 2012.
May 30, 2012	DTNA files Defect Report 12V-242.
June 19, 2012	Tiffin Motor Homes, Inc. files 12V-327.

**(5) Affected Population (Based on Freightliner Production Volumes) –**

Manufacturers	Number of VINs	Campaign Number	Date Campaign Reported to NHTSA
TIFFIN	1373	12V-327	6/19/2012
GULFSTREAM	443	12V-366	7/30/2012
MONACO COACH	181	12V-314	7/ 4/2012
THOR MOTOR COACH	135	12V-280	6/19/2012
WINNEBAGO	84	12V-278	6/14/2012
NEWMAR	81	12V-371	7/31/2012
TRIPLE E	25	--	--
FLEETWOOD	6	Out of business	--
COACHMEN RV OF INDIANA	5	--	
FOREST RIVER CARDINAL DIVISION	3	--	--
NATIONAL RV	1	Out of Business	--
REXHALL	1	--	--
FOREST RIVER DIESEL DIVISION	1	--	--
Total	2339		

Source: DTNA provided ODI with the above-listed production volumes in February 2012. ODI added the two right columns to provide a cross-reference identifying the associated campaign numbers for each of the affected final-vehicle manufacturers.

**(6) Failure Mode -**

The actuating pistons installed in the Bosch ZOH-T hydraulic disc brake manufactured during the suspect period are subject to swelling when exposed to long periods of inactivity. Piston swelling increases the piston diameter thereby decreasing the piston-to-bore clearance and risking brake drag, over-heating of the affected foundation brakes and nearby components such as ABS sensors and brake fluid. Over-heated foundation brakes may damage components in proximity to the affected wheel end cause increased stopping distances due to brake fade and/or boiled brake fluid.

## **(7) Product Changes -**

In 2010, Bosch notified their customers of the following changes made to the ZOH-T brake to “improve robustness to drag”

- (1) Increase the diameter of the caliper housing bore;
- (2) Decrease the diameter of the seal groove;
- (3) Change the piston material to increase the glass transition temperature.

## **(8) ODI Investigation Activity –**

ODI participated in a test drive of an instrumented complaint vehicle in the Tampa area in March, 2012. The test was intended to simulate vehicle operating parameters that would induce unintended brake drag.

VRTC conducted a Tiffin vehicle owner survey to identify previously unreported incidents of brake malfunctions and to identify candidate vehicles for possible future evaluation (e.g. instrumentation and test).

VRTC conducted a dimensional inspection of returned parts from a Tiffin vehicle.

VRTC provided DTNA and Bosch engineers with background information developed in earlier investigation EA07-016.

## **(9) Manufacturers Investigation Activity –**

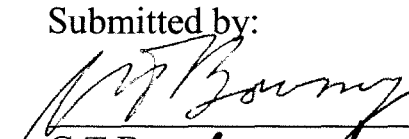
DTNA and Bosch conducted vehicle and brake tests prior to reaching their determination to file 12V-242. Since these were self-evaluation tests conducted on DTNA’s initiative, ODI did not request, and was not provided, a summary of these results.

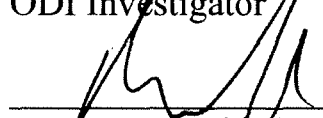
**(10) ODI Recommendations -**

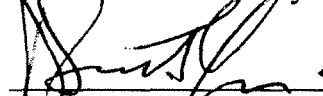
Given the forgoing assessment, ODI concurs with DTNA decision to conduct the campaign outlined in 12V-242 for the designated population.

**(11) Concurrence -**

Submitted by:

 8/9/12  
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ODI Investigator

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