

• PE 09-042

Motor Coach
Industries

10/15/09

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PE09-042
PRODUCTION DATA

[illegible]

MCJ DATA RESPONSE TO PE09-042 (REDACTED VERSION)

2

CONTAINS CONFIDENTIAL BUSINESS INFORMATION OF
MOTOR COACH INDUSTRIES INTERNATIONAL, INC.

PE09-042
REQUEST NUMBER TWO DATA

MODEL YEAR	MODEL	a. CONSUMER COMPLAINTS	b. FIELD REPORTS	c. INJURY/CRASH CLAIMS	d. PROPERTY DAMAGE CLAIMS	e. ARBITRATION PROCEEDINGS	f. LAWSUITS
2006	D4500			0	0	0	0
2008	D4500			0	0	0	0

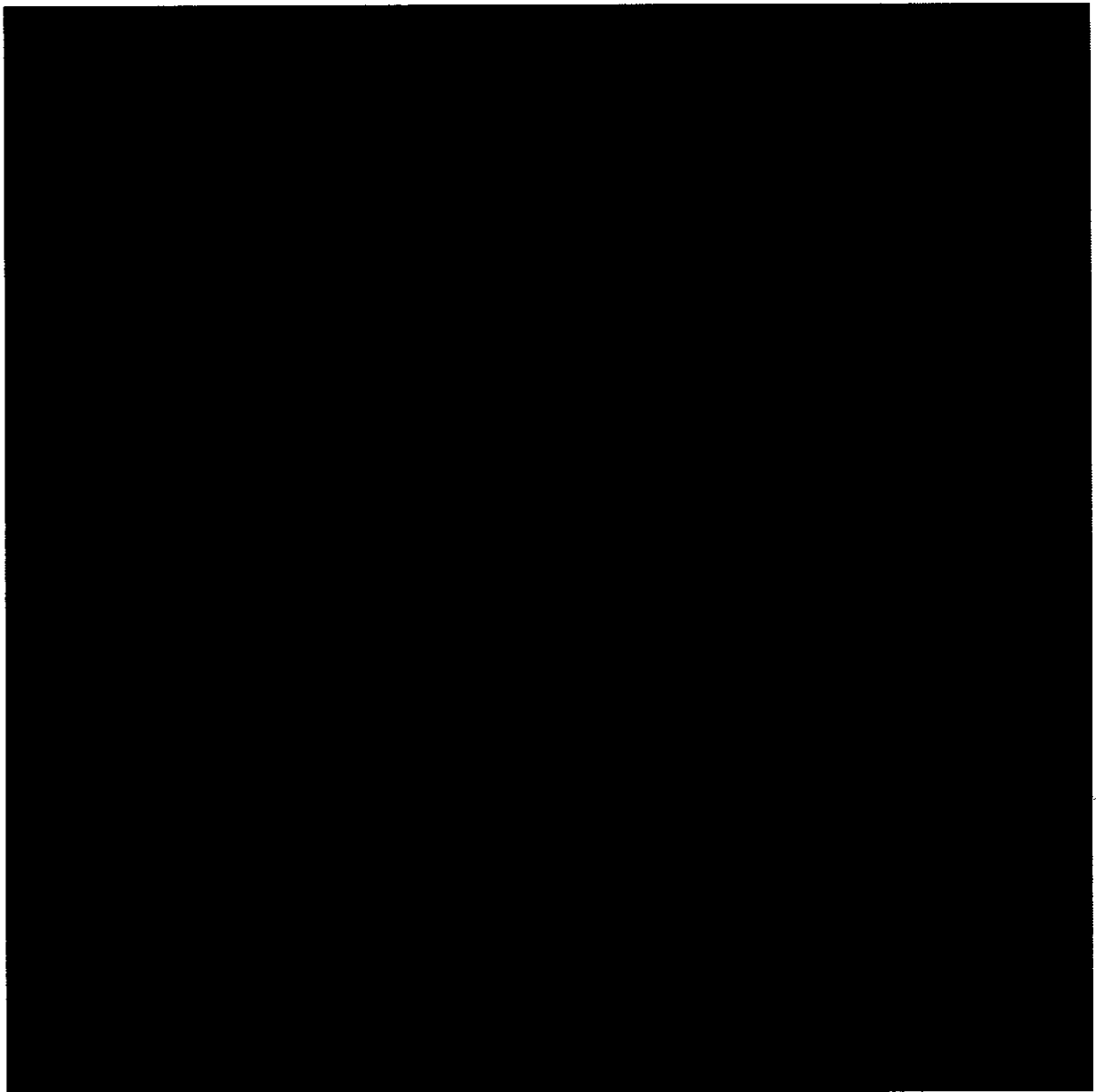
REDACTED DATA

MODEL YEAR	MODEL	VIN	CATEGORY c, d, e, or f	SUMMARY DESCRIPTION OF THE ALLEGED PROBLEM AND CAUSAL AND CONTRIBUTING FACTORS	MCI'S ASSESSMENT OF THE PROBLEM	SUMMARY OF THE SIGNIFICANT UNDERLYING FACTS AND EVIDENCE	PARTIES TO THE ACTION	CAPTION	COURT	DOCKET NUMBER	FILING DATE
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

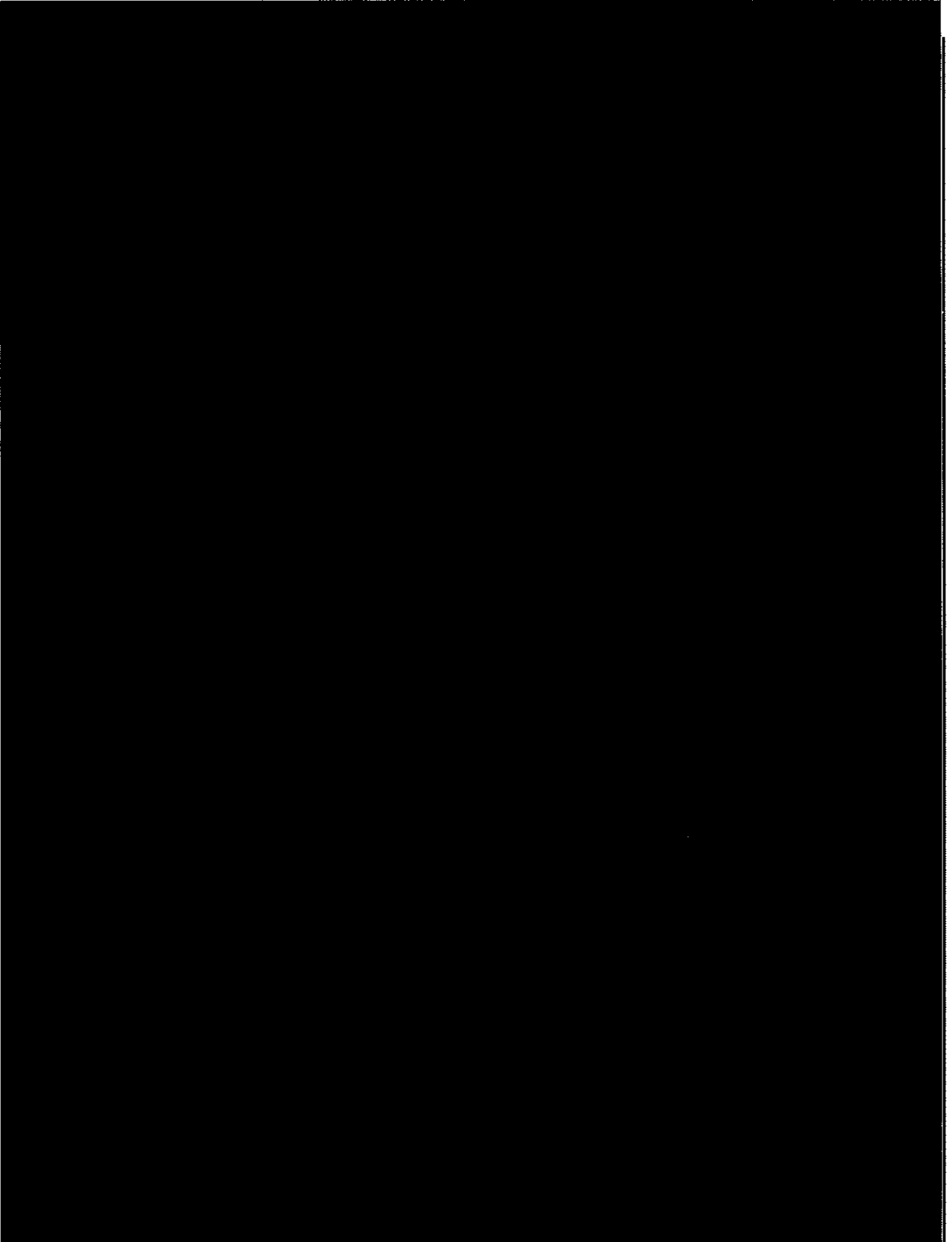
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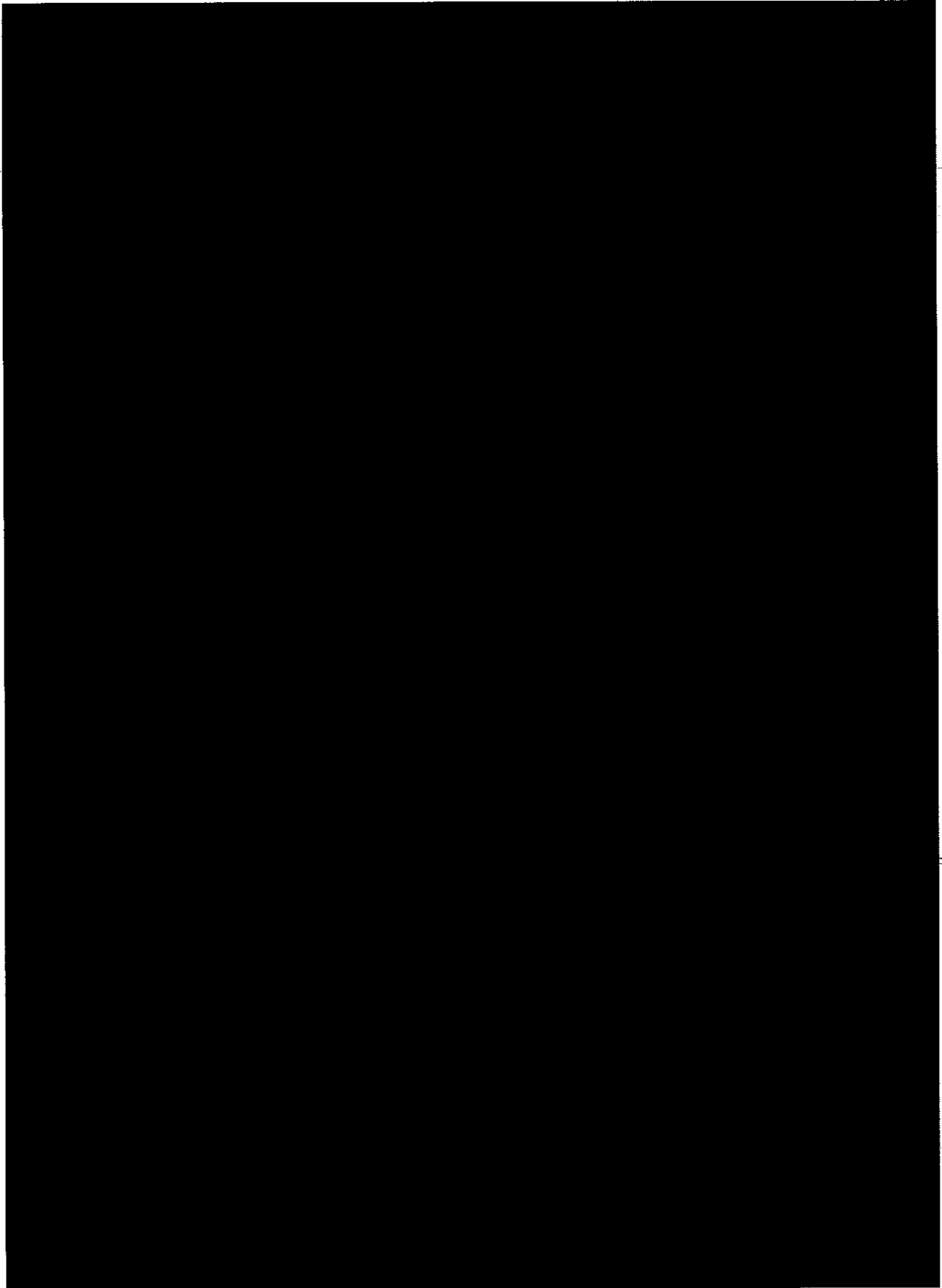
MCI SERVICE REPORT Report No: 5697920060110222653 <i>Old Report No: 6986343175</i>	Report Open Date: 01/10/2006	Status: Complete
	Report Closed Date: 04/24/2006 08:39 AM	Reported By: Dan Besserer



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MCI DATA RESPONSE TO PE09-042 (REDACTED VERSION)

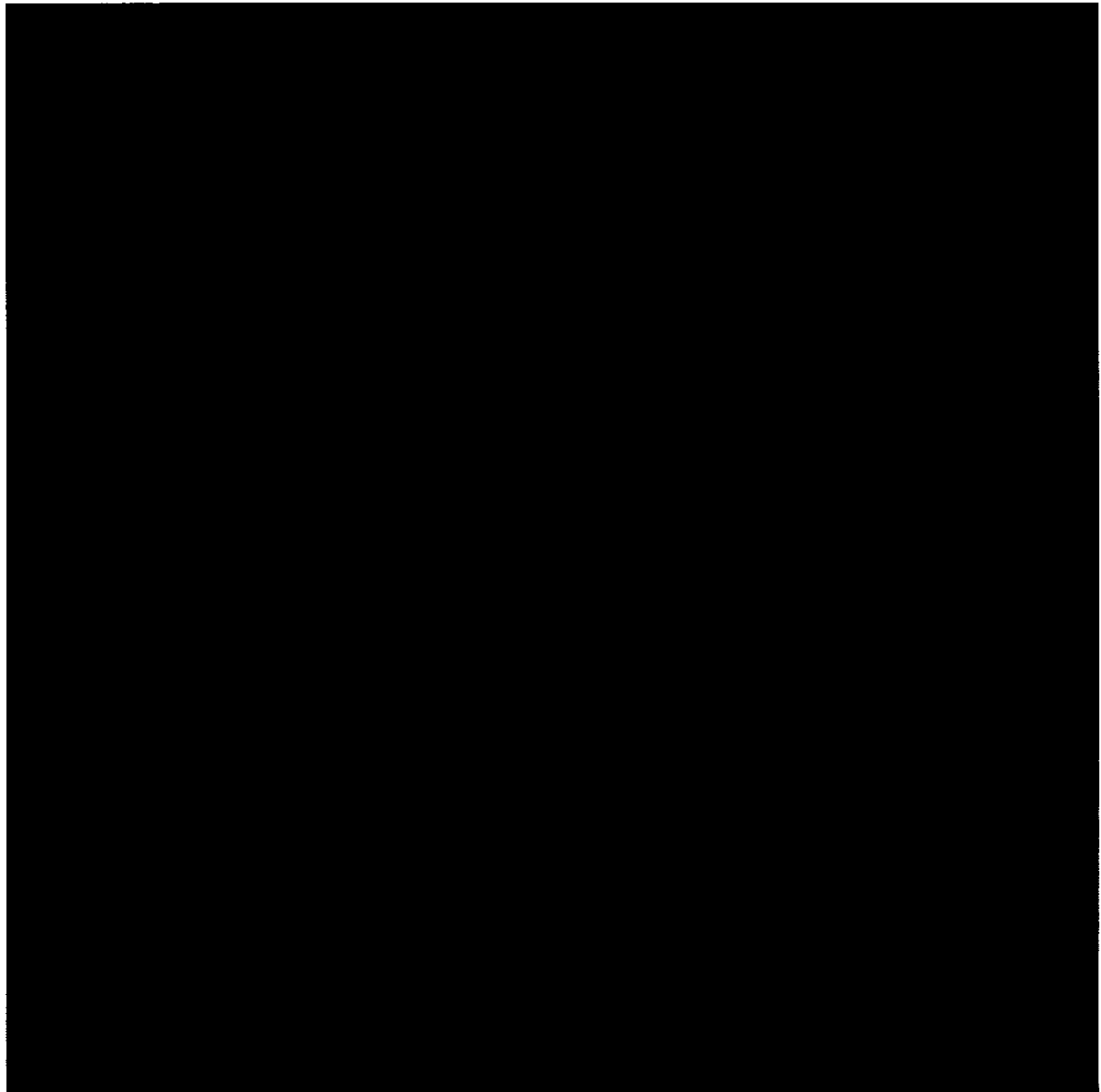


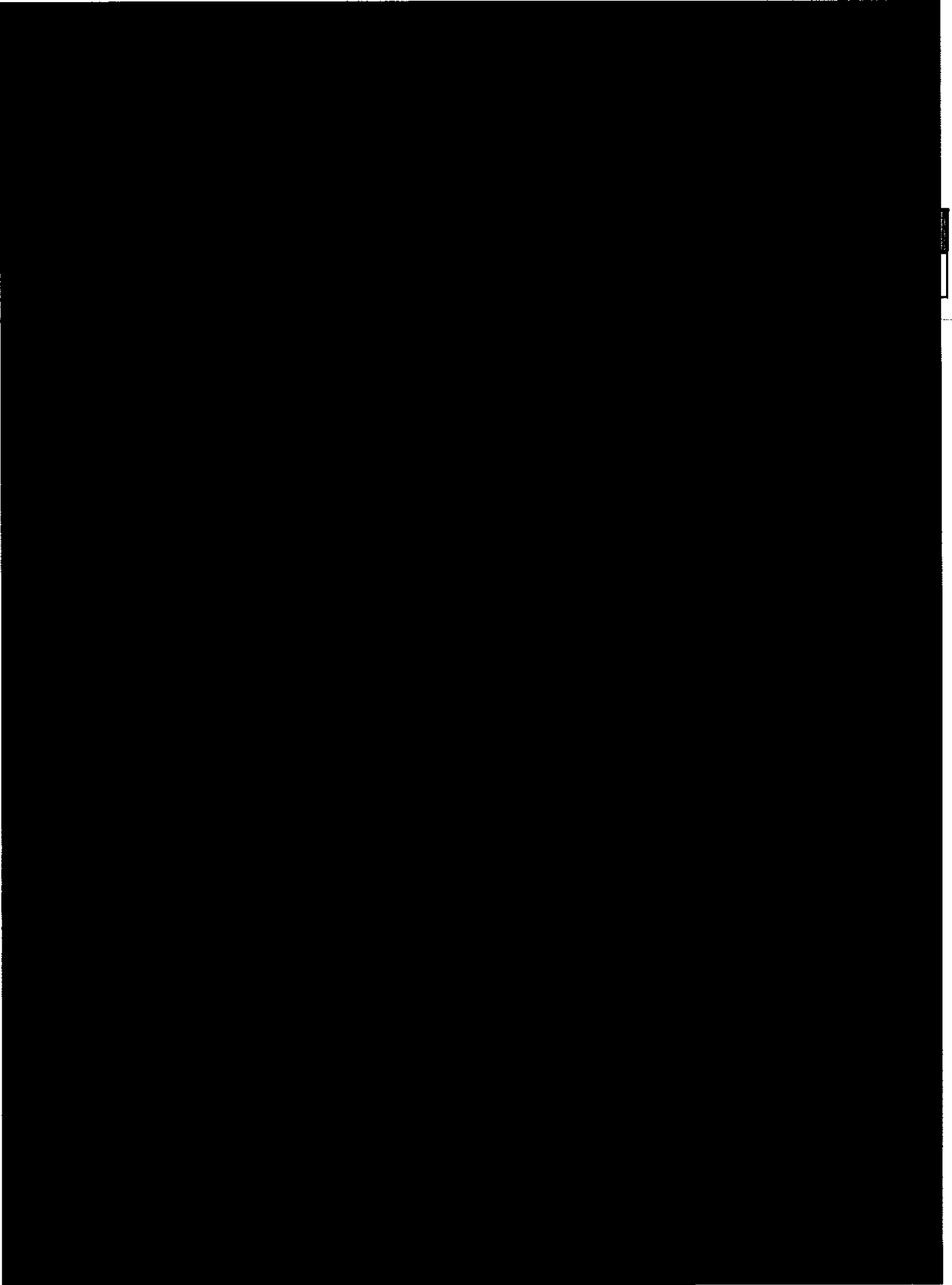
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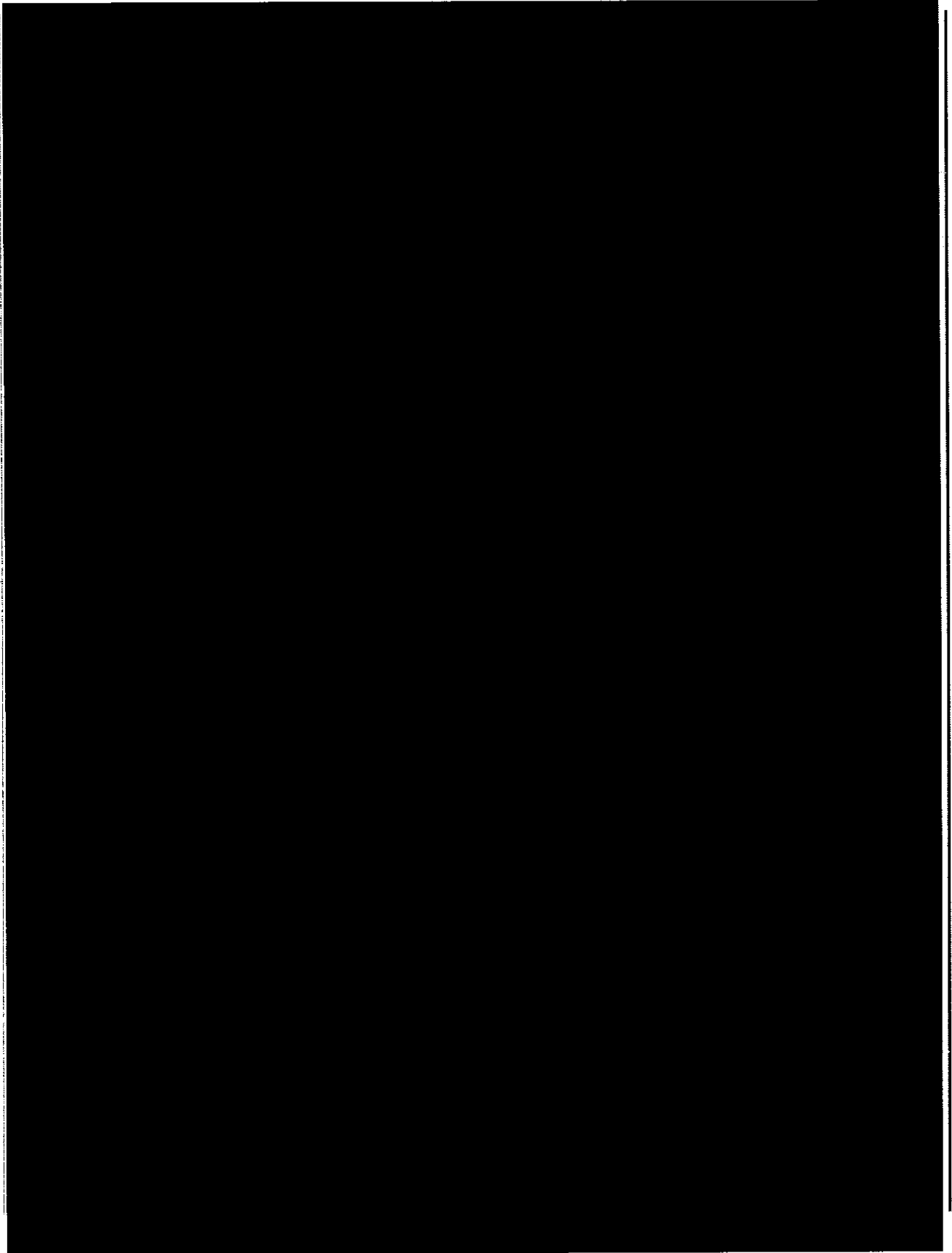
MCI DATA RESPONSE TO PE09-042 (REDACTED VERSION)

MCI SERVICE REPORT Report No: 58259200808118252	Report Open Date: 08/11/2008	Status: Complete
	Report Closed Date: 08/11/2008 07:41 AM	Reported By: Anthony Amaducci



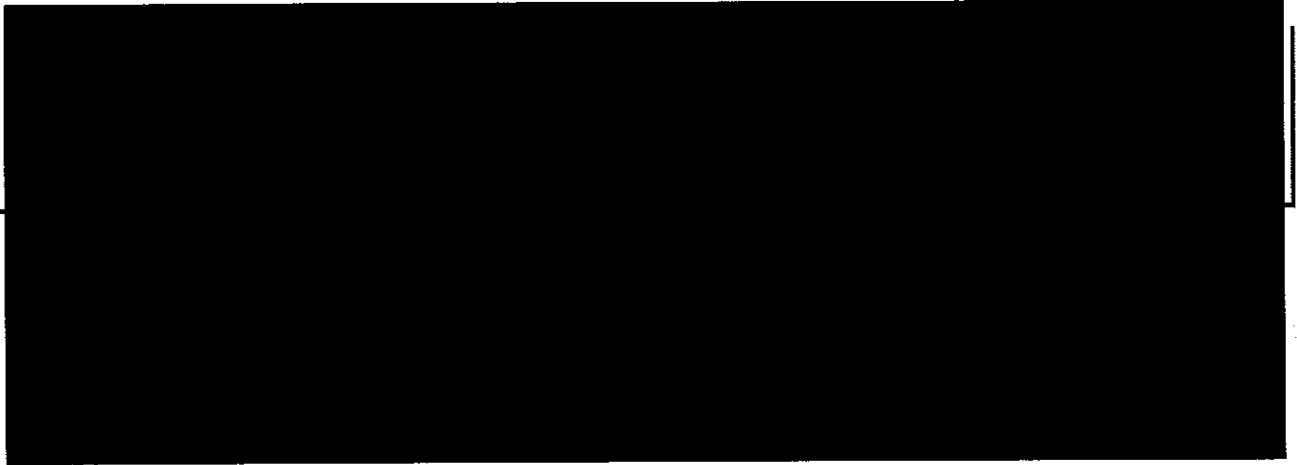


CONTAINS CONFIDENTIAL BUSINESS INFORMATION OF
MOTOR COACH INDUSTRIES INTERNATIONAL, INC.



MCI DATA RESPONSE TO PE0-042 (REDACTED VERSION)

**CONTAINS CONFIDENTIAL BUSINESS INFORMATION OF
MOTOR COACH INDUSTRIES INTERNATIONAL, INC.**



MCI DATA RESPONSE TO PE0-042 (REDACTED VERSION)

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CONTAINS CONFIDENTIAL BUSINESS INFORMATION OF
MOTOR COACH INDUSTRIES INTERNATIONAL, INC.

PE09-042
REQUEST NUMBER THREE DATA

MCI'S FILE NUMBER	ITEM CATEGORY	OWNER NAME	ADDRESS 1	ADDRESS 2	CITY	STATE	ZIP	CONTACT 1	PHONE 1	VIN	MAKE	MODEL	YEAR	MODEL	YEAR	INCIDENT DATE	REPORT OR CLAIM DATE	WHETHER THERE WAS A THERMAL EVENT	NUMBER OF ALLEGED INJURIES	NUMBER OF ALLEGED FATALITIES	SUMMARY DESCRIPTION OF THE COMPLAINTS	MCI'S OPINION/ASSESSMENT OF THE INCIDENTS
509 920060110225653 (formerly number 6806 M3175)	B										AKT	D4500	2006	2006	2006	1/7/2006	1/10/2006		0	0		
50259200608118252	B										MCI	D4500	2008	2008	2008	9/7/2008	8/8/2008		0	0		

REDACTED DATA

MCI DATA RESPONSE TO PE09-042 (REDACTED VERSION)

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**CONTAINS CONFIDENTIAL BUSINESS INFORMATION OF
MOTOR COACH INDUSTRIES INTERNATIONAL, INC.**

**PEO09-042
REQUEST NUMBER FOUR DATA**

By Model Year and Model

a.	Type	Year	Model	# Claims
	Warranty	2008	D4500	
	Total			
b.	Extended Warranty			
	Total			
c.	Goodwill	2006	D4500	
	Total			
d.	Field, Zone	N/A	N/A	N/A
	Total			
e.	Campaign / P7-58	2006	D4500	
	Total			
	Grand Total			

REDACTED DATA

5

PF09-042
REQUEST NUMBER FIVE DATA

MCI DATA RESPONSE TO PE09-042 (REDACTED VERSION)

MCI DATA RESPONSE TO PE09-042 (REDACTED VERSION)

MCI DATA RESPONSE TO PE09-042 (REDACTED VERSION)

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REQUEST NUMBER SIX DATA**1ST SENTENCE**

MCI searched its New Service Tracking database, warranty records, TREAD Act reports and supporting data, and lawsuit and incident files, for any data involving (1) any of the subject vehicles, and (2) any references to "fire", "smoke", "thermal", "thermal event", "chafe", or "chafing", or (3) any of the following terms: "alternator", "alt", "generator", "electrical", "electric", "clamp", or "bracket", including plurals and other variants of the foregoing terms. Each report or other data resulting from the foregoing searches were then reviewed individually to determine if such report or data was responsive to either Request 2 or 5.

2ND SENTENCE

MCI searched its warranty records for part numbers listed in Service Bulletin 3016 for relevant coaches with Caterpillar engines and with 50DN alternators.

Part numbers searched:

07-03-1172	Bracket Assm - Alternator Cable
07-09-1495	Cable
19-04-0419	Split clamp
19-04-0410	Kit - Clamp
19-2-37PK	Lock washer, pack
19-3-2PK	Locknut - Hex, pack of 25
19-4-46	Clamp, Line Support
07-03-1198	Bracket, Clamp
07-14-4485	Kit, C13 Alternator Cable, 2007 EPA Engine
07-14-4484	Kit, C13 Alternator Cable, Pre--2007 EPA Engine
T07-2805	Clamp & Bracket Kit - Alternator

MCI does not use labor operations, labor operation descriptions, problem codes, or problem code descriptions.

3RD SENTENCE**New Vehicle Warranty Offered**

Model	Model Years	Warranty Term
D-Series Coaches	2005 to 2009	24 Months
E4500	2005 to 2009	36 Months
J4500	2005 to 2009	30 Months

See attached coverage descriptions.

4TH SENTENCE**Relevant Extended Warranty Information**

Extended Warranty Type	Model	Model Year	Number of Subject Vehicles Covered
7 Yr Alternator	D4500	2005	124
		2006	192
		2007	188
		2008	38
3 Yr Alternator	D4500	2007	18
		2008	9
Grand Total			569

SELLER'S LIMITED WARRANTY

Seller's Limited Warranty applies only to new coaches manufactured and sold by Seller for use in the territorial limits of Canada and the United States, including Hawaii and Alaska, excluding Puerto Rico, Guam and the Virgin Islands. This Limited Warranty is not assignable or otherwise transferable to subsequent owners of the Coach unless the subsequent owner provides timely written notice to MCI.

Seller warrants for the Warranty Term herein specified that each new Coach, subject to certain exceptions, exclusions, and conditions noted below, will be free from defects in material and workmanship. This Limited Warranty applies only to defects discovered during the Warranty Term, which shall be twenty-four (24) months, unlimited mileage, from the date of delivery of the new Coach to Buyer.

Buyer shall give Seller written notice of any defect occurring during the Warranty Term to which Buyer claims this Limited Warranty applies within thirty (30) days from the date such defect becomes apparent, specifying the nature of the claimed defect and the date it became apparent.

Seller's obligation under this Limited Warranty is limited to (A) repairing or, at Seller's option, replacing free of charge any parts that, in Seller's reasonable opinion, have failed as a result of a defect in material or workmanship occurring during the Warranty Term under normal service conditions, provided that Buyer (i) has given Seller timely written notice of the defect; and (ii) upon Seller's request, has returned the defective part(s) to Seller, transportation charges collect; and (B) crediting Buyer for the labor cost incurred in the removal and replacement of any such defective part(s) based on (i) the number of hours designated by Seller to be required for such work, multiplied by (ii) 125% of the base rate for mechanical labor prevailing at Buyer's garage locale at the time of replacement, such base rate to have been previously approved by Seller.

THIS LIMITED WARRANTY IS FURTHER SUBJECT TO CERTAIN ADDITIONAL TERMS, CONDITIONS, AND EXCLUSIONS THAT ARE ATTACHED HERETO AND HEREBY INCORPORATED BY REFERENCE AS EXHIBIT A.

Buyer acknowledges that this Limited Warranty shall not apply to (A) any parts, components, materials, goods or services furnished or provided after Seller has completed its manufacturing processes with respect to the Coach; or (B) any routine maintenance repairs or replacements; or (C) normal wear and tear of the Coach; or (D) any other repairs or replacements that, in Seller's reasonable opinion, are required because the Coach or any accessories or other equipment comprising the Coach:

(i) has been altered, modified, changed, reworked, or replaced in a manner that would likely affect serviceability in any respect; or

(ii) has been subject to abuse, neglect, or damage from an accident, or from intentional acts; or

(iii) has not been serviced and maintained at reasonable intervals according to Seller's recommendations; or

(iv) has been operated at speeds in excess of Seller's and/or any component supplier's recommended maximum speed; or

(v) has had installed replacement parts not recommended by Seller and which have been substituted in such a way as to affect serviceability.

ENFORCEMENT OF THE FOREGOING OBLIGATIONS OF SELLER SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AGAINST SELLER WITH RESPECT TO THE COACH. THIS LIMITED WARRANTY AND SELLER'S OBLIGATIONS HEREUNDER ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED

WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL SELLER BE LIABLE FOR ANY OTHER OBLIGATIONS OR LIABILITIES, INCLUDING LIABILITY FOR ANY GENERAL, SPECIAL, DIRECT, INDIRECT, INCIDENTAL, PUNITIVE, ENHANCED, RELIANCE, OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS AND LOSS OF USE) WITH RESPECT TO THE SALE OR USE OF THE COACH. NO PERSON IS AUTHORIZED TO CHANGE OR OTHERWISE MODIFY THIS LIMITED WARRANTY OR ASSUME ANY OTHER LIABILITY ON BEHALF OF SELLER UNLESS SUCH CHANGE, MODIFICATION OR ASSUMPTION IS MADE IN WRITING AND SIGNED BY AN OFFICER OF SELLER.

EXHIBIT A
Agreement To Purchase Terms and Conditions

ADDITIONAL EXCLUSIONS/LIMITATIONS OF COVERAGE

Antennae	Not covered for breakage
Batteries	Pro-rated coverage by battery manufacturer
Belts	50,000 miles (80,467 km) or 6 months (whichever comes first)
Brake Drums & Shoes	Not covered as a primary failure
Coach Conversion	Parts, components, and services by third party not covered
Electrical Motors	Failure only; not brush replacement
Engine	Covered only by engine supplier
Engine Accessories	Covered only by engine supplier (incl. alternator/belt tensioner, Bendix air compressor, etc.)
Entertainment System	Covered only by system manufacturer
Exterior Glass	Not covered for breakage due to stone chips or other road hazards
Exterior Mirrors	Covered for loss of function only, not breakage
Light Bulbs	Incandescent – none; LED – per terms of warranty
Pinion Seals	50,000 miles (80,467 km) or 1 year (whichever comes first)
Radius Rod Bushings	50,000 miles (80,467 km) or 1 year (whichever comes first)
Refrigerant	Covered only as a failure secondary to a covered primary warranty failure
Seats	Covered only by seat manufacturer
Shocks & Bushings	50,000 miles (80,467 km) or 1 year (whichever comes first)
Sway Bar Links	50,000 miles (80,467 km) or 1 year (whichever comes first)
Tires	Covered only by tire manufacturer
Transmission	Covered only by transmission supplier
Wheel Alignment	25,000 miles (40,234 km) (covered only as a failure caused by a covered primary warranty failure)
Wheel Bearings & Seals	To first brake reline or 50,000 miles (80,467 km), whichever comes first
Wheel Studs	Not covered
Wiper Blades	Not covered

SELLER'S LIMITED WARRANTY

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Seller warrants for the Warranty Term herein specified that each new Coach, subject to certain exceptions, exclusions, and conditions noted below, will be free from defects in material and workmanship. This Limited Warranty applies only to defects discovered during the Warranty Term, which shall be thirty-six (36) months, unlimited mileage, from the date of delivery of the new Coach to Buyer.

Buyer shall give Seller written notice of any defect occurring during the Warranty Term to which Buyer claims this Limited Warranty applies within thirty (30) days from the date such defect becomes apparent, specifying the nature of the claimed defect and the date it became apparent.

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Antennae	Not covered for breakage
Batteries	Pro-rated coverage by battery manufacturer 24 months
Belts	50,000 miles (80,467 km) or 6 months (whichever comes first)
Brake Rotors & Pads	Not covered as a primary failure
Coach Conversion	Parts, components, and services by third party not covered
Electrical Motors	Failure only; not brush replacement
Engine	Covered only by engine supplier, 24 months
Engine Accessories	Covered only by engine supplier (incl. alternator/belt tensioner, Bendix air compressor, etc.) 24 months
Entertainment System	Covered only by system manufacturer
Exterior Glass	Not covered for breakage due to stone chips or other road hazards
Exterior Mirrors	Covered for loss of function only, not breakage
Light Bulbs	Incandescent – none; LED – per terms of warranty
Pinion Seals	50,000 miles (80,467 km) or 1 year (whichever comes first)
Radius Rod Bushings	50,000 miles (80,467 km) or 1 year (whichever comes first)
Refrigerant	Covered only as a failure secondary to a covered primary warranty failure
Seats	Covered only by seat manufacturer
Shocks & Bushings	50,000 miles (80,467 km) or 1 year (whichever comes first)
Sway Bar Links	50,000 miles (80,467 km) or 1 year (whichever comes first)
Tires	Covered only by tire manufacturer
Transmission	Covered only by transmission supplier, 24 months,
Wheel Alignment	25,000 miles (40,234 km) (covered only as a failure caused by a covered primary warranty failure)
Wheel Bearings & Seals	To first brake reline or 50,000 miles (80,467 km), whichever comes first
Wheel Studs	Not covered
Wiper Blades	Not covered

SELLER'S LIMITED WARRANTY J4500

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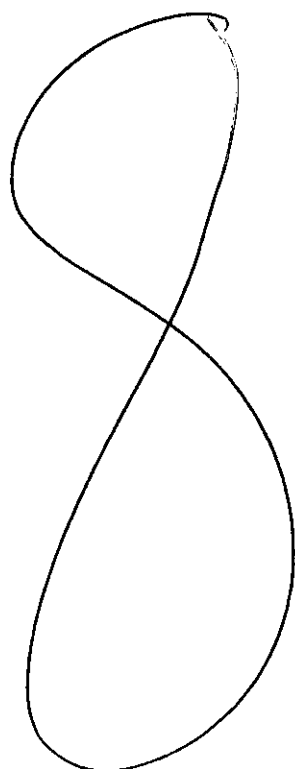
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Antennae	Not covered for breakage
Batteries	24 months, pro-rated only
Belts	50,000 miles (80,467 km) or 6 months (whichever comes first)
Brake Drums & Shoes	Not covered as a primary failure
Brake Rotors and Pads	Not covered as a primary failure
Coach Conversion	Parts, components, and services by third party not covered
Electrical Motors	Failure only; not brush replacement
Engine	Covered only by engine supplier for 24 months
Engine Accessories	Covered only by engine supplier (incl. alternator/belt tensioner, Bendix air compressor, etc.) for 24 months
Entertainment System	Covered only by system manufacturer
Exterior Glass	Not covered for breakage due to stone chips or other road hazards
Exterior Mirrors	Covered for loss of function only, not breakage
Light Bulbs	Incandescent – none; LED – per terms of warranty
Pinion Seals	50,000 miles (80,467 km) or 1 year (whichever comes first)
Radius Rod Bushings	50,000 miles (80,467 km) or 1 year (whichever comes first)
Refrigerant	Covered only as a failure secondary to a covered primary warranty failure
Seats	Covered only by seat manufacturer
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Tires	Covered only by tire manufacturer
Transmission	Covered only by transmission supplier for 24 months
Wheel Alignment	25,000 miles (40,234 km) (covered only as a failure caused by a covered primary warranty failure)
Wheel Bearings & Seals	To first brake reline or 50,000 miles (80,467 km), whichever comes first
Wheel Studs	Not covered
Wiper Blades	Not covered





Service Bulletin No. 3016

MODEL D Series Coaches equipped w/ C13 engine & 50DN alternator	TYPE Product Improvement	SECTION/GROUP 7-Electrical	DATE July 10, 2009
SUBJECT 50DN ALTERNATOR CABLE CHAFFING			
CONDITIONS Parts may be purchased from MCI Service Parts, Louisville, Kentucky or from MCI Service Parts, Newcastle, Ontario.			

Description:

Effective with unit number 58880, MCI made design changes to the alternator cable installation on coaches equipped with a Caterpillar C13 engine and a Delco 50DN alternator. The new alternator cable installation will reduce the potential for cable damage or chafing due to contact with brackets and / or movement within the cable clamps.

PREVENTATIVE MAINTENANCE NOTICE

MCI recommends that customers thoroughly inspect the alternator cable for damage and chafing every 6000 miles/9000 km or every engine oil change (whichever service interval occurs first).

Parts

Qty.	New P/N	Description
1	07-14-4484	Kit, C13 Alternator Cable, Pre-2007 Engine <i>Kit Contents Are:</i>
1	07-03-1172	Support Bracket, Alternator Cable
1	07-09-1495	Cable
3	19-04-0419	Split clamp
6	19-1-376	Capscrew
2	19-2-37	Lockwasher
4	19-3-2	Locknut
1	19-4-46	Clamp, Line Support
1	07-03-1198	Bracket, Clamp
3	19-11-569	Tyrap
1	07-14-4485	Kit, C13 Alternator Cable, 2007 EPA Engine <i>Kit Contents Are:</i>
1	07-03-1172	Support Bracket, Alternator Cable
1	07-09-1495	Cable
3	19-04-0419	Split clamp
6	19-1-376	Capscrew
2	19-2-37	Lockwasher
4	19-3-2	Locknut
1	19-4-46	Clamp, Line Support

Service Information:

1. New parts will be available for service replacement.

Service Procedure:

General notes

Read this entire procedure before beginning work.

Use Safe Shop Practices At All Times.

NOTICE

For coaches equipped with the Pre-2007 C13 engine configuration, upon completion of this retrofit, the alternator cable will now be routed from the alternator DC stud to the power terminal stud on the curbside engine rail.

1. Turn the main battery disconnect switch to the OFF position. Chock both sides of the tires.
2. Open the engine compartment and curbside, rear side service compartment doors.
3. Locate the 50DN alternator. Disconnect the alternator cable from the 50DN alternator.
4. Remove and discard the alternator cable support bracket. Retain the mounting bolts.
5. Locate the cable terminal stud on the forward wall of the curbside, rear side service compartment (refer to Figure 1 or Figure 2). Remove and retain the nut. Remove the alternator cable from the cable terminal stud.

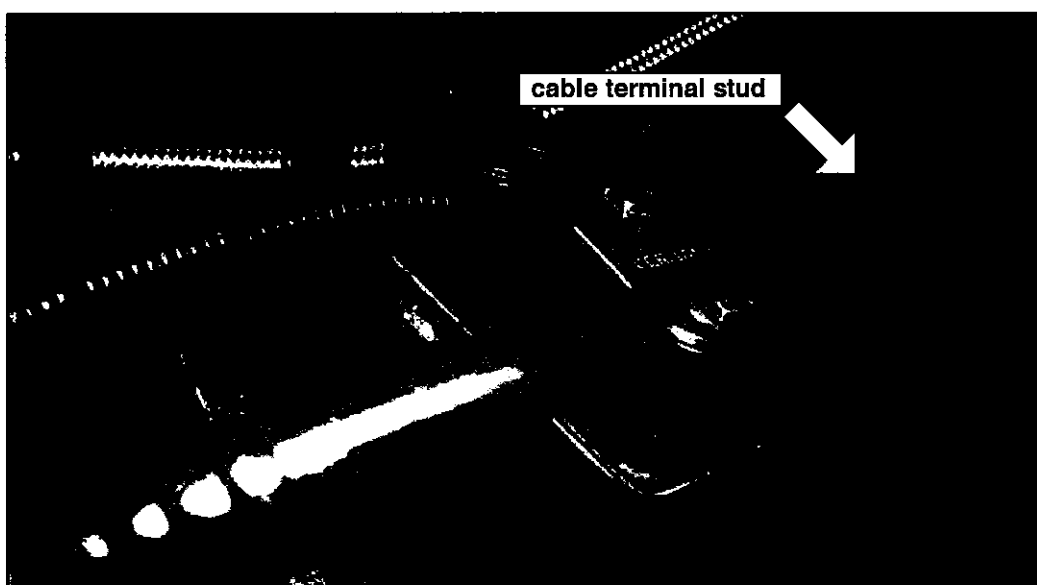


Figure 1. Pre-2007 C13 engine configuration.

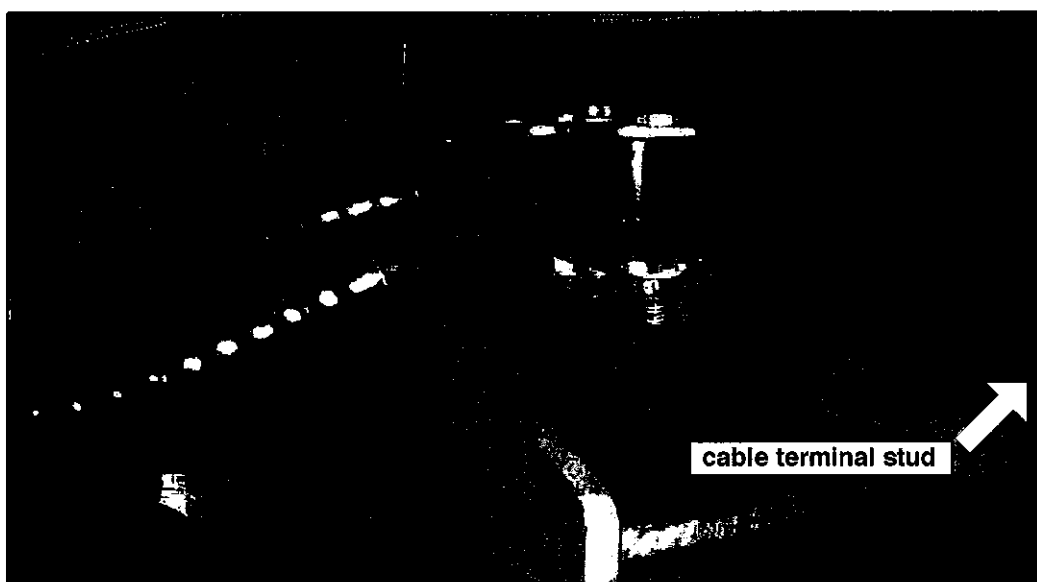


Figure 2. 2007 EPA C13 engine configuration.

6. Follow the routing of the alternator cable along the curbside of the C13 engine. Release alternator cable from existing split clamps (refer to Figure 3 or Figure 4). Remove and discard the alternator cable.



Figure 3. Pre-2007 C13 engine configuration.

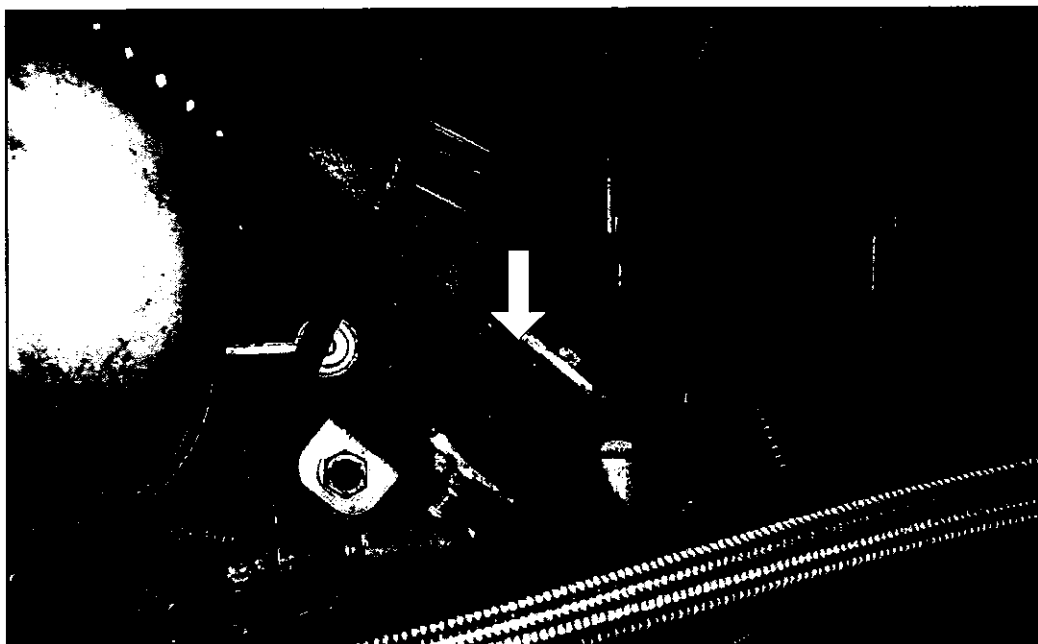


Figure 4. 2007 EPA C13 engine configuration.

7. Using the mounting bolts removed in Step 4. , install the new alternator cable support bracket, p/n 07-03-1172. Torque alternator bracket to 50 to 60 in. -lbs.
8. Using capscrew, p/n 19-1-376, lock washer, p/n 19-2-37 and the existing plate at the top of the split clamp, secure the cable, p/n 07-09-1495, in the new split clamp, p/n 19-04-0419. Torque capscrews to 9 ft. lbs.

NOTICE

Torque alternator DC output stud nut to 30 – 35 ft. lbs.

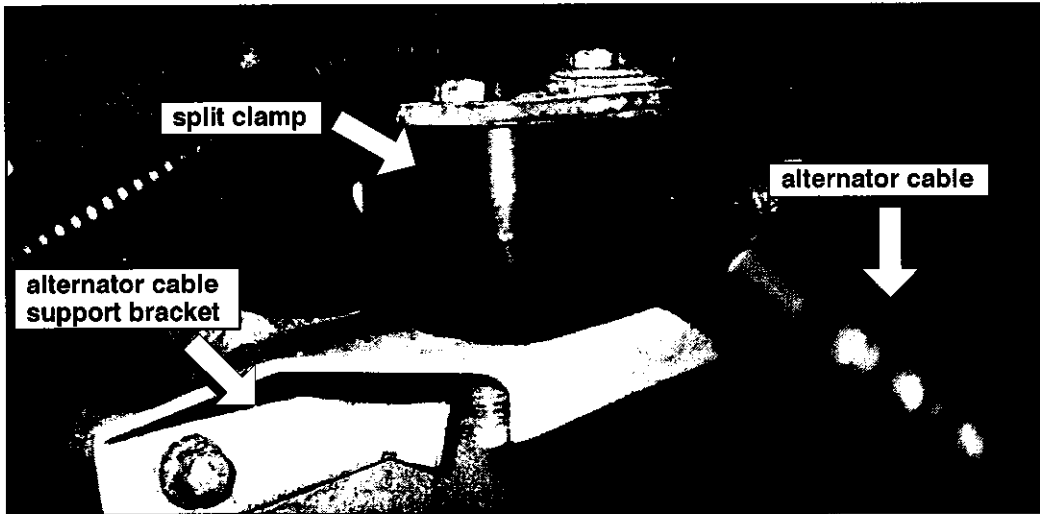


Figure 5. Reference photo.

NOTICE

Ensure alternator cable does not touch any stainless steel braided or fabric covered lines.

9. Remove the existing split clamps with new split clamp, p/n 19-04-0419 (refer to Figure 3 or Figure 4). Use existing capscrew 19-1-376 and lock nut 19-3-2 to secure alternator cable. Torque to 9 ft. lbs.
10. Remove and discard existing P clamp on alternator cable (refer to Figure 6). Use existing hardware, install new P clamp, p/n 19-4-26.

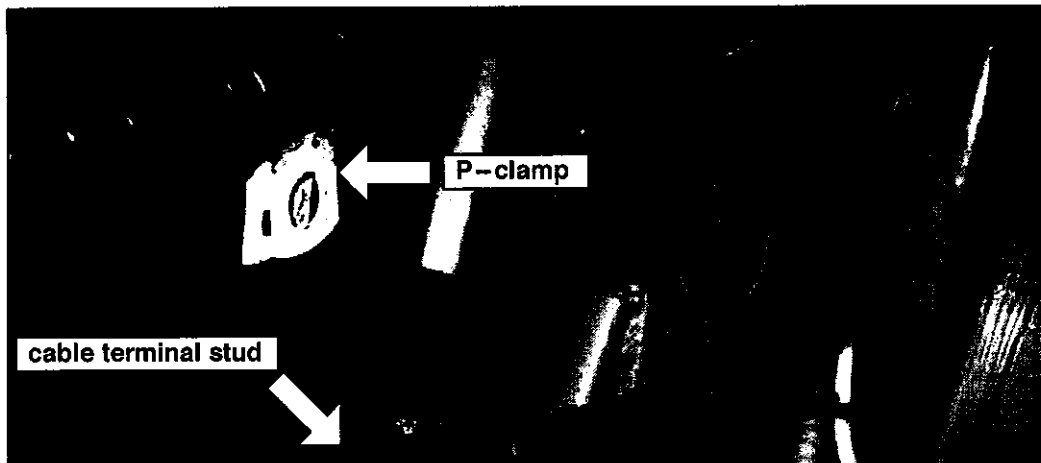


Figure 6.

CAUTION

Failure to return the starter and alternator cables on the cable terminal stud and properly torque the nut will result in arcing of the energized cables.

11. Place the alternator cable on the cable terminal stud. Secure on the cable terminal stud using nut removed in Step 5. Torque to 20 to 25 ft. lbs.

NOTICE

For coaches equipped with the Pre-2007 C13 engine configuration, use tyraps, p/n 19-11-569, to secure existing field wire split loom to the alternator cable (refer to Figure 7).

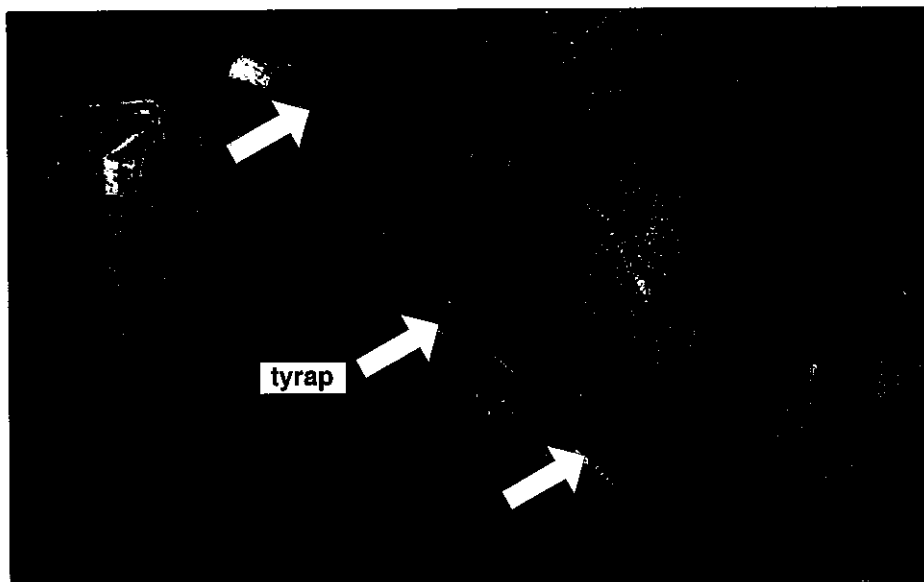


Figure 7. Pre-2007 C13 engine configuration.

12. Close the engine compartment and curbside, rear side service compartment doors

Procedure complete.

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PE09-042
REQUEST NUMBER NINE DATA

The requested documents contain MCI Confidential Business Information. MCI has therefore submitted copies of the documents to NHTSA's Office of Chief Counsel.

10

CONTAINS CONFIDENTIAL BUSINESS INFORMATION OF
MOTOR COACH INDUSTRIES INTERNATIONAL, INC.

PE09-042
REQUEST NUMBER 10 DATA

ECN #	ECN release date	Date incorporated into production	Vehicle Unit Number	Description of the change	Reason for the change	Part Name	Part # New	Revision	Part # Old	Date When Old component withdrawn from Service	Date new part available as a service component	Interchangeable with earlier production components
44666	9-May-08											
46290	23-Jan-09											
47383	9-Apr-09											
47383	9-Apr-09											

PE09-042
REQUEST NUMBER 10 DATA

REDACTED
DATA

PE09-042
REQUEST NUMBER TEN DATA

The requested documents contain MCI Confidential Business Information. MCI has therefore submitted copies of the documents to NHTSA's Office of Chief Counsel.

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PE09-042
REQUEST NUMBER ELEVEN DATA

Component Name	Part Number	Model Year	Model	Date	Qty
Alternator Cable Kit for 2007 EPA Engine (PI Bulletin 3016)	07-14-4484	UNK	UNK	Jul-09	2
Alternator Cable Kit for Pre - 2007 EPA Engine (PI Bulletin 3016)	07-14-4485	UNK	UNK	Sep-09	2
Clamp & Bracket Kit - Alternator (Procedure 7-58) Pre- 2007 EPA Engine	T07-2805	2006	D4500	Aug-08	80
Clamp & Bracket Kit - Alternator (Procedure 7-58) Pre- 2007 EPA Engine	T07-2805	2006	D4500	Aug-08	40
07-03-1172 Bracket Assm - Alternator Cable	07-03-1172	2006	D4500	Apr-09	1
07-03-1172 Bracket Assm - Alternator Cable	07-03-1172	2006	D4500	May-09	1
07-03-1172 Bracket Assm - Alternator Cable	07-03-1172	2006	D4500	May-09	2
07-03-1198 Bracket, Clamp	07-03-1198	2006	D4500	Apr-09	55
07-03-1198 Bracket, Clamp	07-03-1198	2006	D4500	Apr-09	55
07-09-1495 Cable	07-09-1495	2006	D4500	Apr-09	1
07-09-1495 Cable	07-09-1495	2006	D4500	Apr-09	1
19-04-0410 Kit - Clamp	19-04-0410	2006	D4500	Apr-09	3
19-04-0410 Kit - Clamp	19-04-0410	2006	D4500	Apr-09	3
19-04-0410 Kit - Clamp	19-04-0410	2006	D4500	May-09	6
19-2-37PK Lock washer, pack	19-2-37PK	2006	D4500	Jan-09	2
19-3-2PK Locknut - Hex, pack of 25	19-3-2PK	2006	D4500	Jan-09	1
19-3-2PK Locknut - Hex, pack of 25	19-3-2PK	2006	D4500	Apr-09	1
19-3-2PK Locknut - Hex, pack of 25	19-3-2PK	2006	D4500	Apr-09	1



Comments to VTTI Response Table Formatv3
10/27/09 07:55 AM



Comment Set	NHTSA Reviewer Comment	Enacted		Explanation
		Yes	No	
				There were many different types of data reduction which contributed to the analyses and findings in this report. Limitations of various types of data reduction have been presented in each report where they are introduced. This report introduces the Case Crossover baseline for the first time, and explains the limitations of this reduction explicitly; for example, the 2nd paragraph on page 26 begins "Limitations in the analysis of the Junction Match baselines are presented by the subjective nature of Junction definitions and the difficulty of interpreting video consistently" and proceeds to discuss these limitations in detail. Similar explanations are used for other matching variables. Discussing the limitations of event reduction, eyeglass reduction, etc. as presented in previous reports would bog this section down. Instead, sentences have been added where appropriate: "Further information on the [eyeglass reduction process] can be found in xxxx (200X)."
1	In general, we would suggest more explicitly acknowledging the limitations and possible inaccuracies arising from the data reduction process. The authors do that to some extent, but we believe this should be addressed more directly.	X		The authors will contact representatives of the Human Factors Committee of the SAE to inform them of the impending release of this report.
1	The authors point to 2 SAE rules as being inappropriate. We suggest that the authors provide SAE advanced notification of this finding.	X		
	Abstract 1 st paragraph. Add an explanation of the differences between the case cross-over and case-controlled baselines here. Something along the lines of "The case-crossover approach controls for potential confounding and interactions by selecting comparison samples of the same driver on the same types of roadways, the same day of week and hour of the day, thus matching similar conditions. The case control approach draws a random sample from the total possible drivers which may or may not be similar to the original driving events." "and is considered appropriate for short duration exposures with transient effects, such as distraction and eyes-off-road."			
1	Abstract, 1st paragraph: Double check the appropriateness of "significantly".	X		This information will be added to the executive summary however the abstract is already too long and thus will not be included as an abstract is not the best place to define/explain important concepts of the research, given the limited word count.
1	Abstract, 2nd paragraph: "Secondary tasks that were found...had...risk ratios greater than 1.0, although not significantly so." Please clarify, it appears that this finding was not statistically significant but is being treated as such.	X		Checked, and all of the cases used in this paragraph are significant.
1	Abstract, 2 nd paragraph, "Results indicated that drivers in the 100-Car Study engaged in secondary tasks 23.5 percent of the time that they were driving; approximately 40 percent higher than indicated in previous research." Add "Some of the differences may be due to operational definition differences among the studies." Add a sentence or two about the kinds of secondary tasks were the most and least risky.	X		Changed to: Secondary tasks that were found to be both of long duration and with a high percent of TEOR had crash/hear-crash risk ratios that were not significantly greater than 1.0.
1	Executive summary. Strongly consider adding brief section that summarizes case control vs. case crossover procedures. Highlight key differences and explain why the latter procedure is considered more conservative.	X		Added the first suggested sentence. Added an example for each case. Note that the Abstract is supposed to be limited to 200 words, and is already over 400 words.
1	Executive summary, 1st paragraph. Delete 2 sentences "Driving research prior to the 100-Car Study...6 to 10 minutes surrounding the crash".	X		This information will be added to the executive summary near the additional information added per comment # 3.
1	Executive summary. Consider explaining the "2 second glance" and "15 second" rules.			Deleted.
1	Executive summary, page ii 3rd bullet delete unnecessary qualifiers "tasks are generally lower... are shown to significantly increase crash/...engagement does not significantly increase crash/..."			Added a brief explanation at the end of the Task 2 findings. However, this seems awkward and perhaps unnecessary since these rules are discussed in depth near the beginning of the main body of the report.
1	Add Figures 13, 14, and 15 to the executive summary - after they are reformatted so they are legible. Add a paragraph or two about the kinds of secondary tasks were the most and least risky. Readers will be particularly interested in these findings.	X		Edits done.
				In an effort to keep the executive summary from exceeding 5 pages, we will only add Figure 15 to the ES at this time. Are happy that you find these results important and feel that they are important enough to add to ES.
1	Executive summary, page iv, 4th bullet "The OR calculations using the case-crossover approach generally represented slightly lower risk levels...While the actual point estimates changed slightly, the relationship and..."	X		Edits done.
1	iv, 5th bullet. "The slight drop in the ORs is not surprising and was expected given that all of the baseline epochs were matched on specific temporal and environmental and driver factors (time of day and day of the week, as well as relationship to junction, and the same driver).(such as age), were controlled matched in the case-crossover study".	X		Edits done.
1	iv last bullet, Delete the last bullet. There is no cost information presented in the report about the differences between the two approaches. Consider replacing it with something along the lines that explains that a naturalistic study is comprised of massive amounts of uncoded video data and there are cost implications of various information retrieval methods-- reviewing and coding actual video footage require human observers.	X		Removed reference to cost early in the bullet, and added this sentence to the end: "Case-control approaches may also be conducted with a more efficient use of resources, given that a naturalistic study is comprised of massive amounts of un-coded video data which requires viewing and coding, typically by human researchers."
1	The limitations section at the conclusion of the report was a nice inclusion. Consider briefly summarizing these in the executive summary.	X		Summarized these in a few new sub-bullets at the end of the ES.
1	Page, 2nd paragraph, "Until recently, only crash databases combined with cell phone records (and, as in the case of some studies, interviews) have been used to calculate relative risk in transportation safety; however, these data sources are far from precise." There have been many examples of relative risk calculations that use neither cell phone records nor interviews.	X		Edits done.

1	Page 1 3 rd paragraph. "Case-control designs are optimal one approach to for calculating relative risk (also referred to as odds ratios - ORs)-due-to-the-increased-power-inherent-in-a-case-control-data-set." Add a sentence or two describing some limitations of the case control approach to parallel the structure of the next paragraph about case crossover.	X	Edits done and sentence(s) regarding weakness of case-control has been added.
1	Page 3, 1 st paragraph. "...may be systematically different..." It is sufficient to suppose the conversations are different, but the authors do not provide information to suggest that the differences are "systematic".	X	Edits done.
1	Page 4, 5 th paragraph. Given that the 100-Car Naturalistic Driving Study provides more detailed driver behavior data compared to other studies in the transportation safety field, this comparative approach will provide insight into not only the relative risk of driving while inattentive, but also and how the results from naturalistic driving studies compare to other epidemiological and empirical research studies in transportation research." Shorten this extremely long sentence, and frame it in the positive. Consider reducing the number of times on this page that tout the uniqueness/novelty of the 100-Car Study. Once should be sufficient to make your point.	X	Made the suggested edits and removed an unnecessary sentence in the following paragraph (which was then moved to Conclusions per the next comment).
1	Page 14, last sentence of Table 3. Clarify definition of normal driving --- did the author mean "inside" rather than "outside" of the 95% confidence limit?	X	Changed to "inside."
	Page 24, 2 nd paragraph (b, c & d) "Many of the events... "Can you quantify how many events were within a subject's entry into the study (a) or were recorded for an infrequent, secondary driver (b), or were discarded because of malfunctioning cameras (d)? Please explain how these were issues dealt with.	X	Key information regarding the make-up of the baseline databases is listed in Table 8 and key information regarding what data were analyzed is discussed in the results section. Any further discussion is beyond the scope of this final report and was carefully discussed between the TOM and VTTI.
	Page 26, 1 st paragraph (3) Can you quantify the extent of the problem of not matching the same direction of travel?	X	No we did not record the number of matches where the driver entered the intersection/roadway from a different direction. The NHTSA TOM and supervisor as well as VTTI discussed these methods and decided the best course of action to take. The match was to match traffic patterns and traffic densities by using time of day, day of week, and GPS location. While direction through intersection can affect this, there would have ultimately been many fewer GPS matches with that stipulation.
	1. Page 26 2 nd paragraph. Please quantify the extent that baselines were drawn from each of the selection procedures. It looks like 2/3 (10 of the 15 in the last paragraph) were selected from the Junction Match procedure which biases the comparison to driving near intersections and not necessarily on the same type of road (RT). How many subjects did this affect?	X	The number of baselines from each selection process was stated in the text. You are correct that 2/3s of the baseline was junction match and 1/3 was gps match. I would argue that it doesn't bias the data as we are simply matching these conditions as best we can to the original crash/near-crash data. You are correct this matching does affect the number of baselines where drivers are near intersections but not necessarily on the same road type. For these reasons the case-crossover baseline can not be used to calculate odds ratios for these types of environmental variables (the risk of driving on specific road types or relation to junction). As far as which subjects this affects, it isn't quite that simple as that...these restrictions with a case-crossover baseline affect all of the subjects.
	1. Page 29 3 rd paragraph. "These 100 percent reviews were repeated until a reductionist's error rate dropped below 10 percent." How does this error rate compare to coding during the original study?	X	The crash and near-crash data reduction was completed by only 2 expert data reductionists. Similar data reduction requirements were employed for the case-control data reduction as well.
1	Page 31 2 nd paragraph. "The matching task would most likely altered or biased the case-crossover data set toward various road types and, quite possibly, to relation to junctions." If as noted in number 15 above, the majority of baselines were different.	X	Edits done.
1	Page 33, 1 st paragraph. "Figure 11 shows that there are more non-junction baseline epochs in the case-control database and more intersection, intersection-related, and interchange epochs in the case-crossover database. This is an artifact of the known dangers of traveling through intersections and interchanges." "More crashes occur in intersections than in other roadway locations and therefore more of the case-crossover baseline epochs were also selected from these areas during the matching process." Add "This reflects that the case-crossover approach more closely matched the situations of the initial triggering event or incident (same time of day, location, etc), while the case-control approach selected random situations that may or may not have been similar to the driving environment."	X	Suggested edits accepted. Very nice suggestion.
	Page 38, 1 st paragraph. Please double check that the values match the text describing them. "The OR for driver drowsiness using this model was 38.7 (CI 26.4, 56.8). This result is much higher than the original calculation, which was 4.24 (CI 3.3, 5.5). There are several reasons for this larger OR. First, as presented in the Method section, the case-crossover baseline epochs were selected in higher traffic densities, higher number of lanes, and closer to intersections than the case-control baseline epochs. These are all locations and scenarios where Klauer et al. (2006) found that drowsiness occurs less frequently. Thus, the frequency of identifying extreme drowsiness behaviors in the case-crossover (0.5%) baseline epochs was eight times lower than for the case-control epochs (4%). Similarly, the differences between the two ORs also reflect a difference by nearly a factor of 8; thus, the differences in the ORs."	X	The text is correct as written; however edits were made to clarify.
1	Charlie - I think he/she is saying that the numbers seem reversed from the beginning to the end of the paragraph. Just check to make	X	Used the following examples: Simple - adjusting radio volume; Moderate - tuning radio to a specific frequency; Complex - dialing a cell phone
1	Page 40, 1 st paragraph, 3 rd line. "...previously, only 10 percent of the crashes..."	X	Edit done.
1	Page 46 & 47. Figures 13-15. The labels on the X axes are illegible. Consider making these pages landscape, or rotating the figure so that the text is horizontal, or making the tables larger.	X	This and other formatting problems appear to have occurred during the PDF conversion process. Extra care will be taken that the PDF version of the revised report is legible both when viewed on screen or when printed.

1	Page 47, "...the longer bars on the far right side of the graph..." Please check that the text matches the graph.	X	Clarified as follows: "Given that the order of the tasks on the x-axis is based upon task duration, the tasks to the right side of the x-axis that also have high EOR percentage (the longer bars) are both long in duration and also require the longest TEOR."
1	Page 49 1st paragraph. Provide support for the statement "...the increase in secondary task engagement could be due to an increase in cell phone use... but also due to slightly different task duration operational definitions." Please explain the differences in operational definitions of secondary tasks between the Stuuts study and this one and the relative frequency of the secondary tasks in the two studies. Explain how much of the differences could be accounted for by differences in the operational definitions and how much by cell phones. How much did cell phone use increase in the two years between Stuuts (2001&2) and 100-car (2003 & 4)?	X	A direct comparison between these two reports at this level of detail is beyond the scope of this project. The intended meaning of this statement suggests that the details in the operational definitions could have/were probably slightly different. The sentence will be rephrased to better capture the spirit in which it was written.
1	Page 55, 2 nd bullet. "The slight drop in the ORs is not surprising and was expected given that all of the baseline epochs were matched on specific temporal and environmental and driver factors (time of day and day of the week, as well as relationship to junction, and the same driver)." Page 56 1st bullet, 4th line "if safety is a priority, TEOR..."	X	Edits done.
1	Page 56, last line. The paragraph does not carry over to the next page.	X	Edits done.
1	Page 58, 1st paragraph. Please revise "However, many (is this most?) of these crashes and all of the near-crashes are of less severity (no property damage, no injuries, no fatalities, not reported to the police) than these crashes recorded in crash databases. or used in other transportation safety studies calculating relative risk. Add ... Because crashes were rare events in the 100-Car study, the operational definition was expanded to include events that are not normally considered crashes, such as bumping into a curb."	X	It does now. No change was made. This is not happening on our version, may have been an error in converting to pdf.
1	Page 58, 2 nd paragraph - it may be helpful, when stating that only 10 events were reclassified, to provide context. Consider including the total number of events reviewed, or the percentage of that total that the 10 events represents. Were two independent coders used to review events? If so, can a coefficient of inter-observer reliability be presented?	X	The specification of 'high speed curb strikes' was added to text. The definition was never expanded to include these due to low number of crashes.
1	Page 58, 3rd paragraph. Didn't you try to draw matches with Road Type including number of lanes (page 27) but did not? So instead of saying that "an important factor was missed or overlooked, please revise this paragraph along the lines that matching on more situational variables could affect ORs and more precision would be gained with naturalistic driving data by even more accurate matching than was done here."	X	The total number of events was included in the text. A co-efficient of inter-rater reliability is not feasible or possible for these 2 reductionists.
1	Should the fact that drivers are aware they are being monitored be included as a potential limitation to the validity of risk calculations? Is it possible that the additional cognitive load produced by that awareness, while engaged in the secondary task, amplifies its associated risk?	X	Text was added to this paragraph to reflect that further precision could be gained by matching on other variables of interest.
1	Page 59, last paragraph. Delete the entire paragraph. The report does not provide any information about the cost implications of the two methods.	X	Analyses conducted for the original 100 Car Study report indicated that drivers drove similarly from the beginning of the study (within hours) as they did after 12 months. Personal experience indicates that it is nearly impossible to remember that you are being observed when in one of those vehicles. Many of the observed behaviors (e.g., various personal grooming activities) would not be included in if the drivers were remembering that they were being observed. Therefore, the authors do not agree that this is a possible limitation, or that it should be addressed in this report.
1	1. Page ii, bullet above Table 1 refers to "...moderate and secondary tasks..." Should this be "...moderate and complex secondary tasks"? Last sentence starts but does not pick up on page iii.	X	Did not delete entire paragraph. Removed reference to cost early in the bullet, and added this sentence to the end: "Case-control approaches may also be conducted with a more efficient use of resources, given that a naturalistic study is comprised of massive amounts of un-coded video data which requires viewing and coding, typically by human researchers."
1	2. Page 1, final paragraph, second sentence: Please provide an example of a matching variable related to the driver (e.g., age, sex).	X	Complete
1	3. Page 4, first full sentence (and other instances throughout the document): Use apostrophes following plural possessives; e.g., "...mean that drivers' eyes are..."	X	Complete
1	4. Page 4, first full sentence: It is not necessary to include both "could" and "potentially." Consider rewriting the sentence to read something like, "...this could mean that the drivers' eyes are off the forward..."	X	Complete
1	5. Page 10, first full sentences (and other instances throughout the document): Avoid passive voice; for example, consider changing this sentence to read something like, "The housing also contained an unobtrusive miniature camera..."	X	Complete
1	6. page 29, 2 nd paragraph, 2 nd to last line. "another"	X	Complete
1	7. page 32, last sentence above fig 9. "This could also be further support the idea..."	X	Complete
1	8. pages 37 & 50. The font of the logit model is unclear.	X	Complete
1	9. page 40, 2 nd paragraph, line 5. Add "tasks" after "complex"?	X	Complete

1	10. page 40, last paragraph, line 7. Add "complex" before "secondary"?	X	Complete
1	11. Page 43, 1 st full paragraph, 3 rd sentence: The word "only" occurs two times in the first phrase. Delete one instance.	X	Complete
1	12. Page 43, 2 nd paragraph, 1 st sentence: The word "also" occurs two times. Delete one instance.	X	Complete
1	13. Page 46, final paragraph: Three sentences in this paragraph begin with "Note that." Consider eliminating two instances of this opening.	X	Complete
1	a. page 59, to line. "assess the whether the"	X	Complete
2	In general – avoid used "r" as a replacement for a word or a choice of words, e.g. "large/representative", "and/or" because it is confusing to the reader. "near crash/crash" seems OK to me because it is more an abbreviation for a group combination than a choice.	X	Made changes throughout document.
2	Page ii – What is meant by "moderate and secondary tasks"? Should it have been "moderate secondary tasks"?	X	Corrected per comment in set 1.
2	Page ii to page iii – is something missing between the bottom of page ii and the top of page iii? On my copy the bullet at the bottom of page ii ends with the start of a new sentence "This", but at the top of page iii is a new bullet, not the end of the sentence that began with "This".	X	Corrected.
2	Page 37 – something is wrong with the font for the equations, at least on my copy, they don't print legibly.	X	Corrected.
2	Page 56, the 1 st bullet under Task 2 – "assessment tools ... is not predictive", the "is" should be "are"	X	Edit done.
2	Page 56 to page 57 – something seems to be missing between the bottom of page 56, where the last bullet ends with an incomplete sentence, and the top of page 57, which starts with a large white space. The first sentence of the last bullet on page 56 doesn't make sense to me, but maybe it would if I could read the remainder of the paragraph.	X	Corrected.
3	In the very first sentence of the Executive Summary, the authors describe the 100-Car Naturalistic Driving database as the most comprehensive pre-crash and pre-near-crash driving. It would eliminate potential confusion if this and other references throughout the report that make this claim also include a caution to remind readers that this sample is and was not intended to be representative of the general driving or crash experience of the entire United States or even of the region in which the data were collected, due to the oversampling of drivers deemed more likely to sustain crashes. This report applies new methods of epidemiology to traffic data, and proposed some interesting approaches for traffic safety analysis using eye-glance analysis, case-control, case-crossover studies, and conditional logistic regression. Several types of baseline database and data reduction techniques are introduced. The report also searches extensively references like Redelmeier & Tibshirani, 1997.	X	Added the following sentence to the end of the mentioned paragraph. Not sure where else the reviewer would like to see it. "The limitations of the data include the fact that they were collected in a single geographic area of the U.S., and that the participant sample was slightly weighted towards participants who were more likely to be involved in crashes (by age, gender, or number of miles driven per year)."
4	2. " Case-control study and case-crossover control are applied to this study, since the case-crossover study seems new to many transportation researchers, and it could be even more clear, in "Introduction" (page 1-2), to provide some background and motivations of the case-crossover method (or in general Case-PseudoControl Design), for example - Case is used as its own Control (similar to 1:1 matching) to avoid selection bias; the case-crossover method works best if the exposure is intermittent, if the effect on risk is immediate and transient, and if the outcome is abrupt, etc. Some discussions on advantages/disadvantages of the case-crossover study could also be helpful to readers at the earlier stage, although "limitations" page 57-59 are very useful. On page 1 the statement of "case-control designs are optimal for calculating relative risk (also referred to as odds ratio - ORs)" - This statement may be modified as "relative risk is approximately equal to odds ratio for rare events" (since , only if p1 and p2 are small, say under 10%).	X	This comment does not appear to require a change to the document.
4	" It could be even more helpful to show readers detailed info of modeling on page 37 and page 50: main independent risk variables in condition logistic regression equation?(drowsiness is main one, any other main risk factors? Is it possible to display the odds ratio comparison chart of all main risk factors?), if any intercept constant in logistic reg. equation? Any brief discussions on confounding variable?	X	I guess that I would disagree that the case-crossover approach is new or unknown to transportation researchers since both of the main epidemiological studies (Redelmeier & Tibshirani, 1997; McEvoy, Stevenson, McCart (2005) used case-crossover. Another sentence will be added to the description of case-crossover to enhance what is already written. Per comment set 1, a summary of the limitations was added to the executive summary.
4	" Also could be helpful if including a brief discussions on the goodness-of-fit of the conditional logistic model, and a discussion on larger CI of Figure 12 when TEOR>8 seconds. Is the SAS PROC LOGISTIC used for case-crossover study (page 45)? while the report mentions PROC ANOVA of SAS on page 53 and PROC GLM on page 43.	X	Suggestion accepted and change made.
4	" It could be interesting to see more details of effect of "Time of Day" in Case-Crossover study, when various time effects are matched with the Case .	X	Given that the regression was only calculated to obtain odds ratio values, the addition of the model will not add anything to this discussion and will actually muddy the results section and take away from the key results. No action will be taken at this time.
4	I don't think this is feasible, but will let you or Feng explain.	X	PROC LOGISTIC was used.
5	First and foremost, the first paragraph should NOT confuse the definitions of distraction vs. inattention. In fact, the second sentence is just inaccurate. This report must be careful to distinguish the two.	X	This comment does not appear to require a change to the document. Removed the words "or inattention" from the first sentence. The authors disagree with the reviewer that the second sentence is inaccurate. Made the following changes to address the first half of this comment: "... using wireless devices such as cell phones and PDAs. Most observed tasks consisted of dialing and talking on the cell phone, although some data entry was also observed. Texting was not common during the time these data were collected." Did not address the second half of the comment because this did not seem to be the appropriate location to do so.

5	Consider putting the explanation of all that is 100-Car in an appendix. It's so much to get through, and I have to assume that most readers are either familiar with this work or would be willing to look up the original report and/or the appendices.				Due to current intense interest in this topic, we are finding that we are still getting new readers of reports related to the 100 Car Study. We feel that the digest of information presented here is still useful to the reader, although we may consider doing this for future reports.
5	4. Starting on page 38: I find this section on drowsiness confusing, in part because I think the paper would be much stronger sticking to (secondary task) distraction. Furthermore, because the drowsy driver sample in this study was limited to a few offenders, I think publishing the odds ratio would be misleading. To publish such a high number would require more explanation than provided.				Assessing the odds ratio for drowsiness was an important aspect of the statement of work and thus drowsiness will remain present in this report. Even though the numbers were low, they were high enough to be statistically significant, indicating that the problem is severe enough to warrant attention. Removing it would be a disservice to the reader.
5	Page 42: Where are the corresponding analyses for Fig. 12?				There was no table included as the point estimates and confidence intervals are graphically presented in the table, which we believe is more understandable than a data table. Will confer with TOM per adding table.
5	Page 43, first full paragraph: The interpretations in this paragraph are a little too strong. Specifically, one cannot know whether drivers engaged in a secondary task were compensating unless you know the speed limit or, better yet, the flow rate of the other traffic. I also think any comparisons to test track studies should be given more attention, including specific references and results.				Modified the end of this paragraph as follows to address the first half of this comment: "This result appears to support the controlled studies in that drivers in this study may also have compensated for reduced attention by slowing their vehicle speed in real-world situations. However, without knowing the speed limits or the exact traffic conditions, nor the driver's state of mind, one cannot never be entirely sure of motivations." The authors feel that the amount of description given to the controlled studies is appropriate for this location in the document.
5	Figures 13 – 15 are not legible. Please enlarge so they can be seen, or present the information in a table.				PDF conversion error. Will be corrected in revised version.
5	8. The Conclusions should contain a discussion not a summary of the results. Moreover, the discussion should be more geared toward how to interpret the findings.		X		The conclusions were restructured.
6	A. The Abstract, Executive Summary and text of the report should be made consistent with any changes made in the text.			X	This has been done.
6	Provide a Glossary: include terms such as EOR, TEOR, OR, Visual Demand, (p.47), Cognitive (as it pertains to secondary tasks in this report), SAE 15 second rule, It is recommended that these terms be used consistently in the report, avoiding synonyms.			X	Complete.
6	C. Provide titles for Appendices A, B, and C (pages 65, 103 and 131). Titles to include accurate descriptions of the contained data, especially indicating which database(s) (Event, Case-control, Case-crossover) and/or other analyses that each supports.			X	Edits done.
6	epidemiological methodology to assess the significance of contributing factors (e.g., Drowsiness, Inattention) to an Event. The determination of odds ratios require different ways to think about and organize the data set compared to the more familiar inferential statistics. As such, a description of these methods is important to understand how to reproduce the results and this description is important to interpreting the results. There is a variety of types of analyses in this report on Task 1 and Task 2. The description of the method used for each of these analyses varies in detail. Table 4 on page 15 is a useful start on describing the <i>high level</i> "reductions," but there are linkages from this table to the reported results that need to be supplied or clarified. The report provides information at varying levels for only some of the methodological linkages. Many of the comments below point to the concern for such linkages. Please ensure that the report provides a clear and thorough understanding of the methods used for the analyses.			X	Implies that required edits will be provided in subsequent comments.
6					
6					
6					
7	The report is not about real world driving. The report title should be something like, "How Secondary Driving Tasks Mediate Driver Inattention and Crash Risk" or "Exploring Risk Models for Predicting Driver Inattention and Crash Risk"				Agreed that the title needs to change. Authors will confer with TOM and change the title of the report to an agreed upon name.
7	Abstract: Avoid double negatives – suggest, "...the"15 second rule" ...is only predictive of crash/near-crash risk for tasks that are visual/manual in nature." The abstract needs consolidation with big-picture statements. Ideas appear random and disconnected			X	Abstract has been edited and modified. Nice suggestion.
7	The TEOR definition (Total Eyes-Off-Road Time) is more complex than the reader initially expects. There are variations related to 1) glances per unit time; 2) glances per unit time per number of button presses; 3) glances per task completion; 4) duration of glances per unit time; 5) duration of glances per unit time per task completion. Prepare the reader for the different variations (Perhaps there should be more than one eyes-off-road variable).				
7			X		While these variations can exist, TEOR is defined and does not vary in this report. A glossary was added and the definition of TEOR is listed. Will check document to ensure that this definition does not change.

7	There is a theory of eye-glance behavior that emerges, which should be articulated up front and throughout. It is not intuitive that as task duration increases, it is the frequency of brief eyes-off-road episodes that contribute to crash risk, e.g. numerous 1.5s glances away from the road while entering text. In contrast, there is also increased risk when talking on a cell phone or when drowsy, where the total eyes-off-road per unit time is significantly lower, i.e. starting ahead with few mirror glances.		X	Eyes off road, in whatever pattern it occurs, be it multiple brief eye glances or few long glances, is dangerous. We are not trying to push forth a theory of eye glance patterns here, we are simply saying that any secondary task that results in eyes off the forward roadway, increases risk of crash/near-crash involvement. The TEOR metric did not include any forward glances even though some other metrics used by other researchers may have included it.
7	Invoking the importance of the 100-car study should be accompanied by a statement of limitations regarding the application of the data, and the uses of those data for generalizing findings to the US driver population.		X	Limitations have been added to the executive summary.
7	Pg iii, Bullet 2, 3 rd sentence: The idea might be clearer if stated. "...as task duration increases, the accumulation of lower component percentages of TEOR time (self limited by the driver to no more than 1.5s) increases crash/near-crash risk."		X	This text has been re-written to convey clearer message.
7	Pg iv: Again, remove double negative expression regarding the SAE 15 second rule. In the Conclusions section, the reader has no idea what "relation to junction" is. There were other temporal and environmental factors that should be named and defined (at this point in the text or by reference). Also in the Conclusions section, 3 rd bullet, it is not clear what variety of TEOR the author is referring to; are these total glance length, very low or very high glance frequencies per task or per unit time?		X	Done. Done. TEOR is always the same metric. This was clarified.
7	Acronyms: The report describes more varieties of TEOR. Perhaps each should be defined as separate variables, e.g. FEORT – Frequency of Eyes-Off-Road per Unit Time, etc.		X	This was corrected.
7	Pg. 1: The Case Crossover and Case-Control methods should be better articulated in terms of a statistical procedure for addressing the full range of specific risk events best suited for each. There are limitations of each regarding control of error. Please compare and contrast the methods more fully, and discuss how the 2 methods will be compared or contrasted for assessing relative risk. Specifically, we are not informed about how well the models ended up fitting the data or the statistical procedures used for describing the fit.		X	The logistic regression model used for the case-crossover was enhanced. The case-control was not calculated using logistic regression, as stated in results section.
7	Pg. 4, 3 rd Sentence: The hyphen after 0.5 – suggests that a range of glance time was intended, not simply .5.		X	This was corrected.
	Pg. 12, Table 2: Event trigger g-forces were higher than expected. These levels, .5g -.7g are generally achieved by an extreme crash avoidance braking maneuver. These are also coupled with TTC values of 4s or less. These may or may not have resulted in a crash. However, the types of selected near-crash events must have been those that would have resulted in significant injury. Question: Is this an artifact of not including Road Type and other contexts in the baseline cases; were these events mostly from open-high speed highways? If so, is this study truly representative of most inattention-related crashes?		X	The inattention-related crash and near-crashes were fairly evenly split between occurring on divided and undivided highways. Therefore roadway doesn't appear to skew the results.
7	Pg. 24, bottom: Please briefly describe the definition of a Junction Match and GPS Match, and the basis or reason for using these types of matches, before the full explanation is provided on subsequent pages.		X	This process was clarified.
	Pg. 26: It takes some vigilance in reading to understand that selecting the 15 event baselines was first a process of finding GPS matches. If there were not enough, then Junction matches were added for a total of 15. Was there an effect of having a differential number of GPS and Junction matches for different events? What was the general proportion of GPS to Junction matches? Which ones were fully GPS or fully Junction matched?		X	The general proportion of GPS to Junction matches waws one GPS match for every 2 junction matches (as can be derived from the numbers presented in the text). An analysis to assess the impact of this was not conducted because power too low. These decisions were not made lightly and in coordination and agreement with the TOM and other NHTSA researchers.
7	The reader is surprised that the magnitude/cost of the case-crossover analysis was not anticipated from case-crossover studies in the mid 90's. This led to decisions for leaving out important baseline cases that are relevant to the inattention crash problem, i.e. road type and junction match. The selections made in favor of junction type, excluded the baseline cases that are conducive to drowsiness. Since road type and drowsiness are key mediators of inattention, the study results do not tell the entire story, i.e. not representative. This must be identified as a shortfall; not left unsaid.		X	First comment: the naturalistic data collected here is very different than the data collected in the mid '90s. Our difficulties were quite a bit different and could not have been anticipated until it was attempted. Second comment: matching on either the factors we selected or any other factor will always skew the baseline to some degree. While some power is achieved due to the matched nature and thus removal of confounds, the limitations are also present. We agree that this is a delicate dance that researchers must be aware of...this was clarified in the conclusions.
7	Pg. 33: Figures 10 and 11 are artifacts of the data selection procedures, just described, and not a description to communicate a finding or a true comparison between Case-Crossover and Case-Control methods. Specifically, in figure 10, the number of lanes was induced by favoring a particular road type. In figure 11, there are of coarse more non-junction related epochs in the case control database because they were purposely removed from the cross-over baseline.		X	This is a true statement. These figures are meant to inform the reader of the differences that exist between these two databases. These differences are there due to the matching procedure. It is important for the reader to understand both the benefits of matching and the costs/limiting factors that occur due to the matching procedure. This is related to your question above, where you indicate that the types of roadways and road segments are not conducive to drowsiness, that are data are no longer representative. When we match baselines to the observed crashes and near-crashes on any one or multiple factors, than we are limiting/restricting the data present within that baseline database.

7	The Case-Control baseline may be more generalized to inattention events, because they naturally included a fair statistical representation of road type, drowsy conditions, non-junction roadways, driver age, etc. On the other hand, the Case-Crossover baseline was manipulated by the experimenter, perhaps by direction, causing a misrepresentation of results and leading to uncertain conclusions.		X	These are the pros/cons of case-control versus case-crossover. Comment does not seem to require change to document.
7	Pg. 38, Question 1: The OR magnitudes are reversed. The case-crossover baseline epochs were selected from situations where drowsiness would not be expected (high traffic density, greater number of lanes, closer to intersections). Therefore, the magnitude number should be much lower than the original calculation. Also, we would expect less TEOR in a drowsy state, much like using a cell phone.		X	First, the OR calculation is not reversed because there were more controls with drowsiness present in the case-control baseline than there were controls with drowsiness present in the case-crossover baseline. Thus a higher OR with the case-crossover. Second part of comment: TEOR also included eyelid closures.
7	Pg. 42, Top: The sentence should read, "...that as duration increases, <i>higher frequencies of lower percentages</i> of TEOR also increase crash/near-crash risk."		X	I disagree. This addition does convey the same message.
7	Pg. 55, Conclusions: Please associate results to re-stated research questions. Also, results do not belong in the Conclusions section.	X		Conclusions have been re-written and re-structured.
7	Pg. 55, Conclusions: There are no previous discussions in the report that addressed drowsiness or driver youth, yet there are claims made with regard to these in the conclusions. Moreover, these statements disagree or are inconsistent with the statements made in the Limitations section.	X		Conclusions have been re-written and re-structured.
7	There is no Discussion section following the Results section. Conclusion, Future Research, and Summary sections do not follow the Discussion.			These reports typically only have a results and conclusion section.
7	In the analysis sections, please provide the OR tables and regression model terms. There was an important omission in the approach, which should have examined the interactions of terms and relative proportions of term contribution. Model fitting procedures should have also been included when comparing the Case-Crossover v. Case-Control methods.			Given that the regression was only calculated to obtain odds ratio values, the addition of the model will not add anything to this discussion and will actually muddy the results section and take away from the key results. Only the interaction of drowsiness and inattention was evaluated. No other interactions were assessed. No action will be taken at this time.
7	The major missed opportunity was relating factors like drowsiness and road type, which are known to mediate the prevalence of inattention-related crashes. For example, we were provided no information regarding risks related to cell phone use, as explained by levels of driver drowsiness, type of roadway, etc. These latter key effects were intentionally excluded from the baseline cases, and these effects (and actions) were omitted from the discussion. The paper carries on as though denying the omissions.			This dataset is not large enough to relate drowsiness to roadway as the number of cases on controls with drowsiness present are not frequent enough nor do they occur frequently enough on each road type to perform any statistical analysis. I completely agree in the value of such analyses but we will need to wait for the SHRP 2 data to begin these analyses. Thus these were not omitted from the discussion, there were no analyses to discuss.
7	The best title of the paper should be something like, "Exploring Risk Models for Predicting Driver Inattention and Crash Risk". The writing style was fine, but the overall presentation of the subject (how it all hung together) appeared to be the result of excessive editing, i.e. to the point of losing coherence. In some cases, it is worthwhile just starting over. I am worried that additional editing will only further obscure the true merits of the study, which appear lying just outside the reach for the typical reader.	X		I agree with the 'over-edited' comment and this version will be much improved. As stated previously, we will confer with TOM and arrive at an acceptable title. Many thanks for your thoughtful comments. Much appreciated.



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Traffic Safety Facts

Vehicle Safety Research Notes



DOT HS XXX XXX

October 2009

Fuel economy driver interfaces: Driving simulator study of component concepts

A fuel economy driver interface (FEDI) gives drivers an indication of fuel usage or efficiency. Many passenger vehicles in recent model years have FEDIs, and they have been included in some vehicle models for decades. FEDIs present fuel economy information in a variety of forms. Some show fuel economy in miles per gallon (mpg) while others provide a relative measure of economy or provide an alert if fuel economy is especially poor. The appearances of FEDIs vary drastically between vehicle makes and models. FEDIs can provide numerical output, analog or digital gauges, bar charts, illuminator lamps, and a variety of other display features. With the recent emergence of high resolution LCD screens in cars, detailed and complex color displays are possible, and these make feasible a variety of new FEDI concepts. FEDIs may even include vehicle-adaptive features that influence some aspect of vehicle performance in response to inefficient driver behaviors.

While FEDIs have the potential to encourage efficient and safe driving, it is possible that the displays themselves might cause distraction at the expense of attending to the roadway. Overall goals of this research program are to understand how characteristics of FEDIs influence driver behavior, and to identify best practices for FEDI design to meet drivers' needs and minimize the potential for distraction and undesirable behaviors. Previous work on this project included documenting the range of existing FEDI designs and conducting focus groups with vehicle owners to discuss fuel driving behaviors and FEDI designs (Jenness, et al., 2009). Usability testing of several FEDI components (FEDIC) was conducted to select display types for testing in the driving simulator.

The purpose of the driving simulator study presented here was to investigate the effect that two specific FEDIC displays would have on fuel economy and safety. The displays that were tested are shown in Figures 1 & 2. FEDIC-FE represented average fuel efficiency for a trip by showing an increasing (or decreasing) number of "leaves" as drivers drove in a fuel efficient (or inefficient) manner. This display also showed instantaneous fuel efficiency with a variable length horizontal bar that moved to the right when fuel efficiency (mpg) was high. A hatched region to the left indicated when fuel efficiency was poor. FEDIC-B included the same average fuel efficiency "leaf" component as FEDIC-FE, but FEDIC-B

Figure 1. FEDIC-FE represented average fuel efficiency plus instantaneous fuel efficiency.

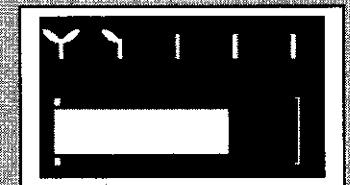
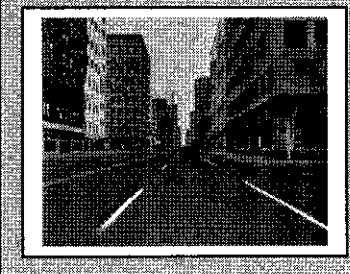


Figure 2. FEDIC-B represented average fuel efficiency plus instantaneous acceleration and deceleration.



Figure 3. Driving environment for the Stop-and-Go scenario.



showed instantaneous acceleration and deceleration rather than instantaneous fuel efficiency. Hatched regions appeared on each end of the display to indicate when a participant's acceleration or deceleration was excessive and would decrease fuel economy.

Methods

Three different driving scenarios were used in the driving simulator evaluation of FEDICs:

- 15 Stop-and-Go - an urban setting requiring multiple stops (Figure 3)
- 20 Free Driving - several miles of traffic-less highway
- 25 Car Following - A highway setting with the participant following a lead vehicle

Each participant drove through each scenario twice. On the first drive, participants were instructed to drive normally. On the second drive, participants were instructed to drive in a fuel efficient manner. On their second drive, one group of participants had access to FEDIC-B. Another group had access to FEDIC-FE, and a third group did not have access to any FEDIC.

This experimental design allowed for the following key comparisons. We compared:

- 30 Normal driving versus driving in a fuel efficient manner without a FEDIC;
- 35 Normal driving versus driving in a fuel efficient manner with a FEDIC;
- 40 Driving in a fuel efficient manner with a FEDIC versus without a FEDIC;
- 45 And driving in a fuel efficient manner with FEDIC-FE versus FEDIC-B.

Selected Results

Overall, there was a 41% increase in average fuel economy during Drive 2 as compared to Drive 1 for the Stop-and-Go scenario with the greatest improvement for those using the FEDIC-FE (Figure 4). In the Free Drive scenario there was an overall 5.6% increase in fuel economy during Drive 2 as compared to Drive 1. However, a similar increase in fuel economy was not found with the Car Following scenario.

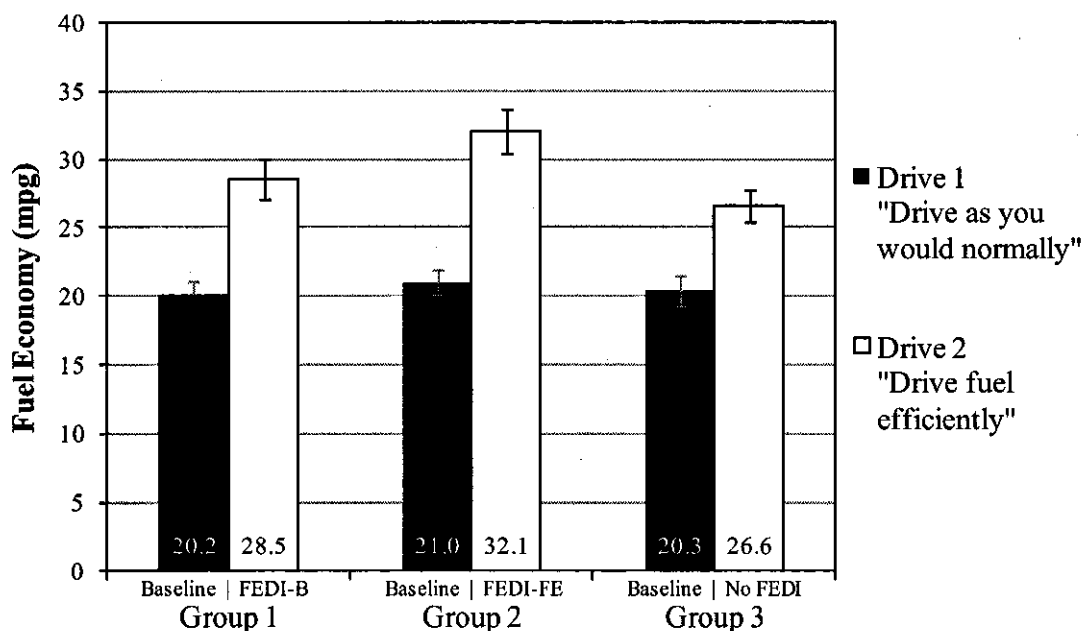


Figure 4. Average fuel economy (mpg) during the Stop-and-Go scenario.

Key findings

- 18 Participants made significant improvements in fuel economy just by being asked to drive fuel efficiently.
- 21 Although the information on the fuel economy FEDIC (FEDIC- FE) did not instruct participants how to modify their driving, participants using this display made changes to their driving behavior that improved their fuel economy within the Stop-and-Go and Free Drive scenarios to a greater extent compared to participants that drove without a FEDIC or with FEDIC-B.
- 26 The behavioral FEDIC, which did not instruct participants on how fuel efficiently they were driving, was associated with an increase in fuel economy similar to participants that drove fuel efficiently without a FEDIC. Interestingly, this FEDIC was associated with driving that was similar in smoothness compared to those that drove without a FEDIC within the Stop-and-Go scenario. Participants drove the smoothest with FEDIC-FE, although it did not present acceleration.
- 30 As would be expected by introducing a visual display in a vehicle, drivers made more glances away from the road while the FEDIC displays were present. This indicates there are safety implications due to FEDIC use.

Recommendations

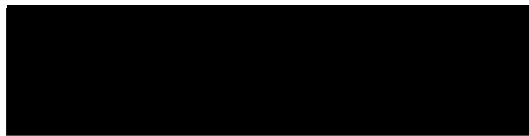
- 36 A longer-term evaluation in a real world setting is recommended to explore the long-term usage as the simulator study evaluated short-term driving. Within the simulator study, we can only assume from these data that drivers can use a FEDIC to increase their fuel economy during one drive.
- 41 Presenting fuel economy information allows drivers to improve their fuel efficiency, perhaps better than directly presenting information on their behavior (e.g., acceleration). Examination of this relationship in longer-term and real-world settings is necessary to make how robust this relationship is over multiple drives.
- 47 FEDIC designs should be optimized to display information during slower-speed or most stop-and-go scenarios, because drivers' capacity to improve fuel economy was shown to be the greatest in these types of situations.
- 52 Because the act of asking drivers to drive fuel efficiently was shown to improve fuel efficiency, the presence of a FEDIC alone may be sufficient to remind drivers to drive fuel efficiently. However, viewing the displays was shown to draw attention away from the road. Therefore, FEDICs should be designed to have a noticeable presence within the vehicle while limiting the amount of attention required to view and to understand the information presented.

References

- Jenness, J.W., Singer, J., Walrath, J., Lubar, E. (2009). Fuel economy driver interfaces: Design range and driver opinions (Task 1 and Task 2 Report). National Highway Traffic Safety Administration, Washington, DC. DOT HS 811 092.



This Vehicle Safety Research Note is a summary of the technical research report: *Fuel Economy Driver Interfaces: Develop Interface Recommendations. Report on Task 3.* (DOT HS XXX XXX). This report can be downloaded free of cost on the Vehicle Safety Research section of NHTSA's Web site (www.nhtsa.gov).



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Traffic Safety Facts

Vehicle Safety Research Notes



DOT HS XXX XXX

October 2009

Fuel economy driver interfaces: Usability study of display component concepts

A fuel economy driver interface (FEDI) gives drivers an indication of fuel usage or efficiency. Many passenger vehicles in recent model years have FEDIs, and they have been included in some vehicle models for decades. FEDIs present fuel economy information in a variety of forms. Some show fuel economy in miles per gallon (mpg) while others provide a relative measure of economy or provide an alert if fuel economy is especially poor. The appearances of FEDIs vary drastically between vehicle makes and models. FEDIs can provide numerical output, analog or digital gauges, bar charts, illuminator lamps, and a variety of other display features. With the recent emergence of high resolution LCD screens in cars, detailed and complex color displays are possible, and these make feasible a variety of new FEDI concepts. FEDIs may even include vehicle-adaptive features that influence some aspect of vehicle performance in response to inefficient driver behaviors.

While FEDIs have the potential to encourage efficient and safe driving, it is possible that the displays themselves cause distraction at the expense of attending to the roadway. Overall goals of this research program are to understand how characteristics of FEDIs influence driver behavior, and to identify best practices for FEDI design to meet drivers' needs and minimize distraction and undesirable behavior. Previous work on this project has included documenting the range of existing FEDI designs and conducting focus groups with vehicle owners to discuss fuel efficient driving behaviors and FEDI designs (Jenness, et al., 2009). The purpose of the usability study presented here was to narrow down the range of possible FEDI designs so that the most usable concepts could be tested in a subsequent driving simulator study.

Usability tests

Overview of usability evaluations:

- Based on a formal analysis of user needs, nine recommended prototype FEDI component-sets (FEDI-CS) were created.
- Each CS included two components and two separate types of fuel economy information (e.g., instantaneous, trip average, and overall average).
- Thirteen participants completed three usability evaluation tasks.
- Initial Comprehension task - determined if users understood the CS after a short exposure. More specifically this task evaluated how well participants identified state changes and understood information presented on each

Results on general usability measures

General usability measures are summarized in Figure 2:

- Participant responses on nine usability scale questions were reduced into usefulness and satisfying scores ranging between -2 and +2 for each CS evaluated.
- CS that populate the upper-right quadrant of Figure 2 were perceived by participants as being both satisfying and useful. These included CS05, CS03, and CS02.

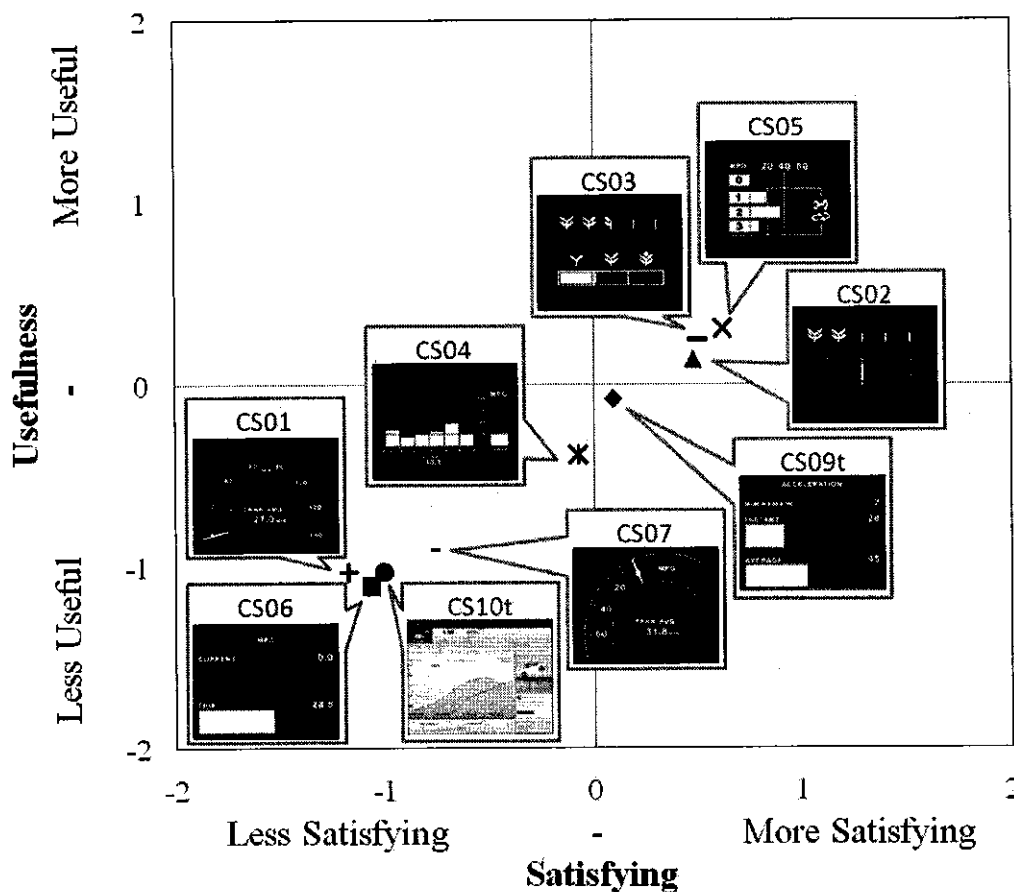


Figure 2. Overall fuel economy comprehension for seven FEDIC-CS.

Participants preferred representational forms of fuel economy information as compared to text, although text may improve comprehension.

Key findings

- Horizontal bars and/or simple representations (i.e., pictures) of fuel economy information were the most usable.
- Participants preferred representational or symbolic forms of fuel economy information (e.g., bars or pictures) as compared to text representation.
- Text representation can improve comprehension when presented along with representative component features.
- Presenting information relating directly to behavior may be as useful as presenting fuel economy information.
- One FEDIC-CS (CS10t) did not include any in-vehicle display. Unlike other CS tested, fuel efficiency information and other driving data were accessible for viewing on a website only after a trip had been completed. This CS was generally well received by participants despite its low general usability scores.

Limitations

Initial usability and preference are important for a good display. However, other aspects such as longer term motivation, engagement with the display and potential for driver distraction could not be assessed in this testing.

Designs selected for further testing

Based on the results of the usability tests, two fuel economy driver interface designs were created similar to the design of CS02 for further refinement and testing with participants in a driving simulator study.

References

Jenness, J.W., Singer, J., Walrath, J., Lubar, E. (2009). Fuel economy driver interfaces: Design range and driver opinions (Task 1 and Task 2 Report). National Highway Traffic Safety Administration, Washington, DC. DOT HS 811 092.



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National Highway
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