EA02-025

FORD 10/27/03

APPENDIX N

BOOK 34 OF 61

PART 1 OF 6

G. Humidity

1. Test Requirements

a. Mount the switch in the test port in a humidity chamber. Currently released mating electrical connector must be installed before start of test.

b. Subject the switch to ten (10) continuous humidity cycles as follows:

(1) Raise temperature to 65 +10/-2 °C over 2.5 hours; at 90-98% relative humidity.

(2) Hold 3 hours at 65 +10/-2 °C at 90-98% relative humidity.

(3) Lower temperature to 25 +10/-2 °C over 2.5 hours; at 80-98% relative humidity.

2. Acceptance Requirements

a. Within 15 minutes after completion of the tenth humidity cycle check the switch on sections A, B, C, D, using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, or D.

H. Salt Spray

1. Test Requirements

a. Mount the switch in the test port in a salt spray chamber. The currently released mating electrical connector and wiring must be installed prior to start of test.

b. Expose the switch assembly to 72 hours of salt spray per ASTM B-117.

2. Acceptance Requirements

a. After exposure, check the switch to sections A, B, C, D, using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, or D. Samples used for this test must be destroyed after all testing is completed.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

I. Vibration

1. Test Requirements

a. Mount the switch in the test port and attach the customary released mating electrical connector before start of test.

b. Switches are to be vibrated in all 3 planes with electrical continuity being monitored during the entire test. See Figure 1 for switch orientation in the 3 planes. Vibration tests are to be conducted at room temperature using brake fluid, ambient air, or equivalent as the pressure medium.

c. Internal pressure shall be maintained at 0 KPa G, when the switch is in the closed position and 1.1 times max actuation pressure shown on print when the switch is in the open position.

d. Vibrate the switch at 1.5 mm displacement (peak-to-peak) while varying the frequency uniformly from 5 to 50 to 5 Hz over a 5 minute period.

e. Vibrate the switch in alternate one-hour periods in the open and closed positions for a total of 8 hours in each plane. (Total test time is 24 hours).

2. Acceptance Requirements

a. After the entire vibration sequence check the switches to sections A, B, C, or D using the procedure established in each section.

b. Nonconformance is defined as any evidence of leakage or any change in electrical continuity/discontinuity during the vibration cycles, or any switch not meeting the criteria in sections A, B, C, or D. Samples used for this test must be destroyed after all testing is completed.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

J. Terminal Strength

1. Test Requirements

a. Mount the switch in the test port.

(1) Apply a 89 ± 9 N axial force to each terminal.

(2) With a pendulum apply a 45 ± 5 N impact force to the switch housing at the connector end, perpendicular to the centerline axis of the switch. See Figure 2 for force application point and direction.

2. Acceptance Requirements

a. Check the switch to sections A, B, C, and D using the procedures established in each section.

b. Nonconformance is defined as any terminal or housing fracture, or any switch not meeting the criteria in sections A, B, C, or D.

K. Vacuum

1. Test Requirements

a. Mount the switch in the test port. Vacuum tests are to be conducted at room temperature using ambient air as the pressure medium.

b. Subject the switch to 3 cycles of vacuum from atmospheric pressure (760 mm Hg) to an absolute pressure of 3-6 mm Hg. Maintain the vacuum for a minimum of 60 seconds.

2. Acceptance Requirements

a. Check the switch to sections A, B, C, and D using the procedure established in each section.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, and D.

TI-003589

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

L. Temperature Cycle

1. Test Requirements

a. Mount switches in test parts; test to be run using currently released brake fluid.

b. Repeat the following procedure 25 times.

(1) Lower the switch and fluid temperature to at least -40°C.

(2) Cycle the switches ten times at 10 seconds/cycles. One cycle consists of a pressure variation from 0 - 276 KPa.G (0-40 psi) to 10,000 ± 345 KPa.G (1450 ± 50 PSI). Note: Switch must open and close each cycle.

(3) Raise switch and fluid temperature to 38°C minimum.

(4) Repeat Step 2.

c. At completion of Step b, check switches per sections A, B, C, and D.

2. Acceptance Requirements

a. Nonconformance is defined as any evidence of switch fluid leakage, seepage, or not meeting the criteria of sections A, B, C, and D.

M. Fluid Resistance

1. Test Requirements

a. Mount the switch in the test part and orient as installed in the vehicle.

b. Install the currently released mating electrical connector (with wire leads) to the switch.

c. Sequentially, immerse the switch into each of the specified fluids, at a temperature of 23 ± 2 °C, for 5 ± 1 second. Remove the switch and drain and store the switch for the specified time at room temperature, prior to immersing into the next fluid.

III. TEST PROCEDURES AND REQUIREMENTS (cont'd)

Fluid	Drain Time	Storage Time
Reference Fuel C ASTM D471	60 ± 5 min.	none
10W40 Engine Oil	24 ± 1 hour	14 days
Ethylene Glycol/ Water 50/50 by Volume	24 ± 1 hour	24 ± 1 hour
Brake Fluid DOT 3	24 ± 1 hour	48 ± 1 hour
Automatic Transmission/ Power Steering Fluid (same) ESP-M2C138-CJ	24 ± 1 hour	14 days
Isopropyl Alcohol/ Water 50/50 by Volume	24 ± 1 hour	none
Reference Fuel C, ASTM D471 with Methyl Alcohol 85/15 by Volume	24 ± 1 hour	none

d. Per the Flow Chart, subject the prescribed number of immersed switches to the post immersion tests specified below:

III. E. Impulse
III. G. Humidity
III. H. Salt Spray
III. J. Terminal Strength

Acceptance Requirements

a. Switches must fully meet the requirements of the specified post, immersion test.

b. Nonconformance is defined as any switch not meeting the criteria in sections A, B, C, or D. Samples used for this test must be destroyed after all testing is completed.

IV. STATISTICAL ANALYSIS METHODS

A. For PV, IP-1 and IP-2 tests, all samples tested must pass. Having all the required sample size pass will provide data to support the conclusion that the switch has a minimum reliability R, at a given confidence of C. The notation Pn-R is interpreted as minimum reliability equal to R, at a confidence C; thus P90-.80 means a minimum reliability of 80% at 90% confidence.

B. All samples must pass is the statistical test acceptance criteria stated for tests with 100% frequency; or samples from lots, which could have a variable size.

V. REVALIDATION REQUIREMENTS

A. No change in design, material, process or component supplier shall be made without prior approval from the releasing Product Engineering Office. As part of approving a change, the releasing Product Engineering Office will establish the portion of the Product Validation tests required to be run to revalidate the switch. The following table is to be used as a guide in determining the type of tests required for revalidation requirements.

RUNNING CHANGE REVALIDATION

Component	Process or Material Change or New Supplier
1. Terminals, Contacts, or Connector	III, B, C, E, G, H.I, J, L, M.
2. Case or Housing	All Tests
3. Disc or Diaphragm	III, A,B,E,F,I,K,L.
4. Fitting or Fluid Connection	III, B, E, F, H, I, M.

5. Annual revalidation is not required on carryover switches.

VI. LOT DEFINITION

A lot is defined as no more than eight (8) hours of production up to 4,000 pieces. If shifts extend beyond eight (8) hours, or more than 4,000 pieces are produced in a shift, the product must be separated into at least two lots.

TI-003592

VII. RECORD RETENTION

A. Recording and record retention shall conform with Ford Q-101.

B. Production Validation test results and analysis are to be forwarded to the releasing Product Engineering Office before approval for shipment of production parts can be granted.

C. In-Process test results shall be available at the supplier's manufacturing facility for the releasing Product Engineering Office and Ford SQA or its representatives to review on request.

VIII. INSTRUCTIONS AND NOTES

All switches are to be identified with the Ford part number, supplier identification, and a date code indicating final assembly.

All test equipment and test procedures for testing to this specification must be approved by the releasing Product Engineering Office and no change in equipment or procedure may be made without their written concurrence.

Test port configuration is shown in Figure 3.

O-rings, if used in the design, shall be free from cuts, nicks, abrasions or any other damage which would result in a fluid leak.

All switches must have a shipping cap installed over the port threads to prevent contamination. All shipping caps must be approved by the releasing Product Engineering Office prior to production incorporation.

All switches that do not pass the calibration test are to either be readjusted and rechecked, or scrapped. (Salvage of component parts permitted with 100% reinspection).

If product nonconformance occurs for test Sections III. B, C, D, E, F, and J, production shall be stopped and the problems corrected. All production lots shall be sorted 100% prior to shipment. Suspected nonconformance of any shipped parts shall be reported immediately to the releasing Product Engineering Office.

If nonconformance of the statistical acceptance criteria occurs for test Sections III. G, H, I, K, L and M, a cause to recall the subject weeks production and to stop production may result.

IX. **COMPILATION OF REFERENCE DOCUMENTS**

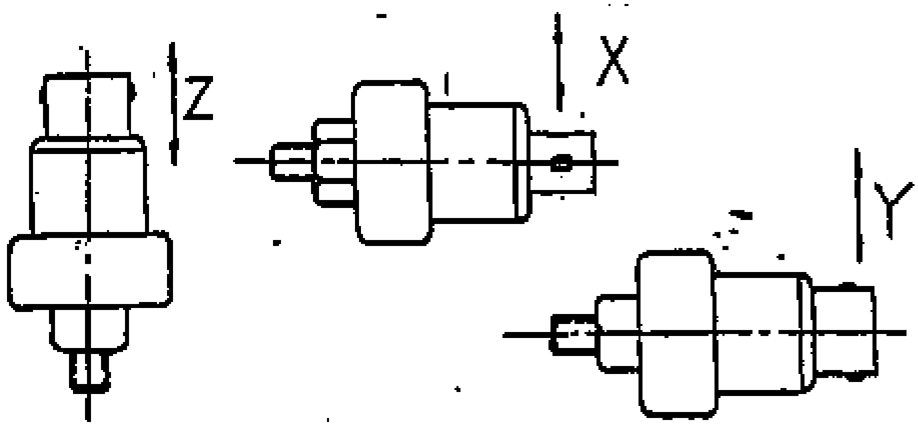
ASTM B-117, Salt Spray Testing

Ford Q-101, Quality System Standard - 1990 Edition

ES-F0EB-14A464-AA, Specification - SLT Assy - Wire Connector

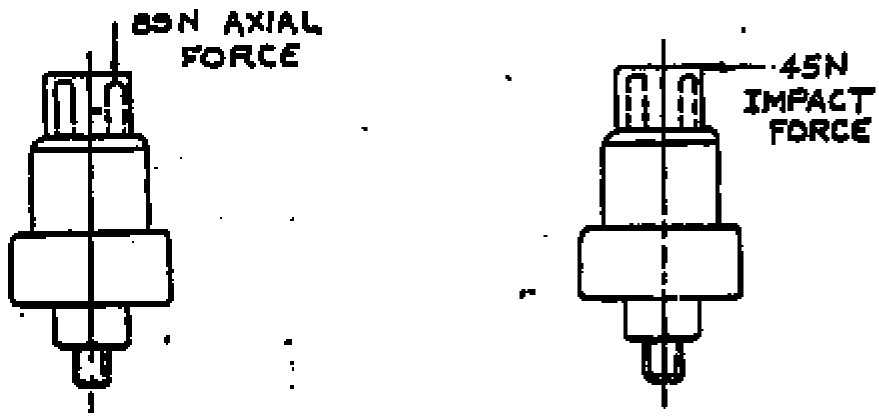
ES-F2VF-9C735-AA, Specification - Servo Assembly Speed Control

Engineering Specification



VIBRATION TEST - SWITCH ORIENTATION

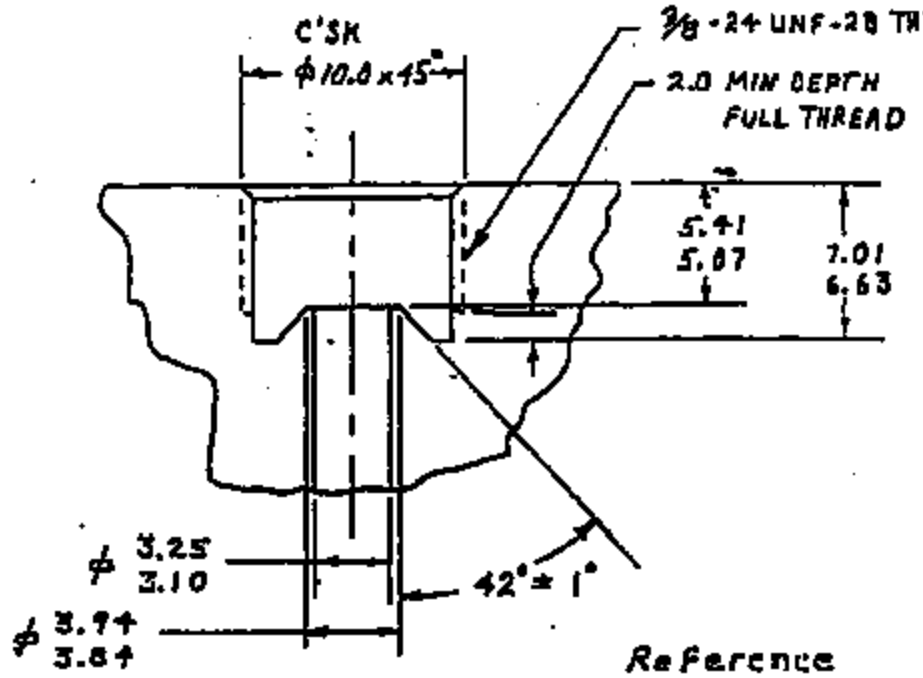
FIGURE 1.



TERMINAL STRENGTH - LOAD ORIENTATION

FIGURE 2.

Engineering Specification



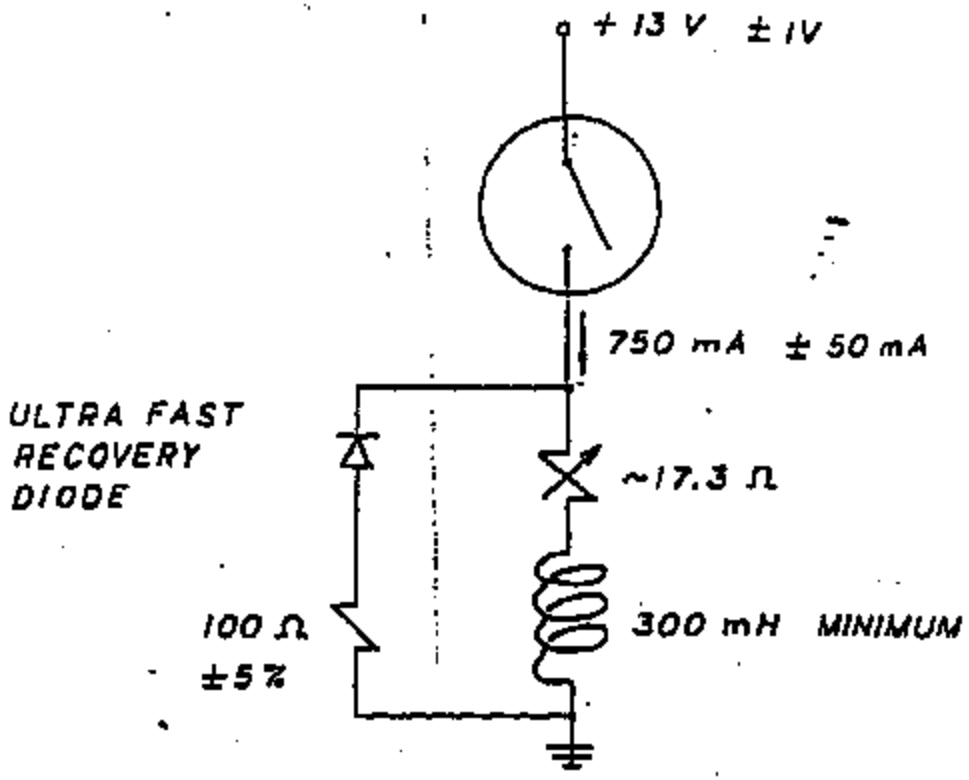
TEST FIXTURE PORT CONFIGURATION

FIGURE 3

FRAME 17 OF 18	REVISED		▽ 28-2270-4P924-AA NUMBER

PD 3947-62

TI-003596

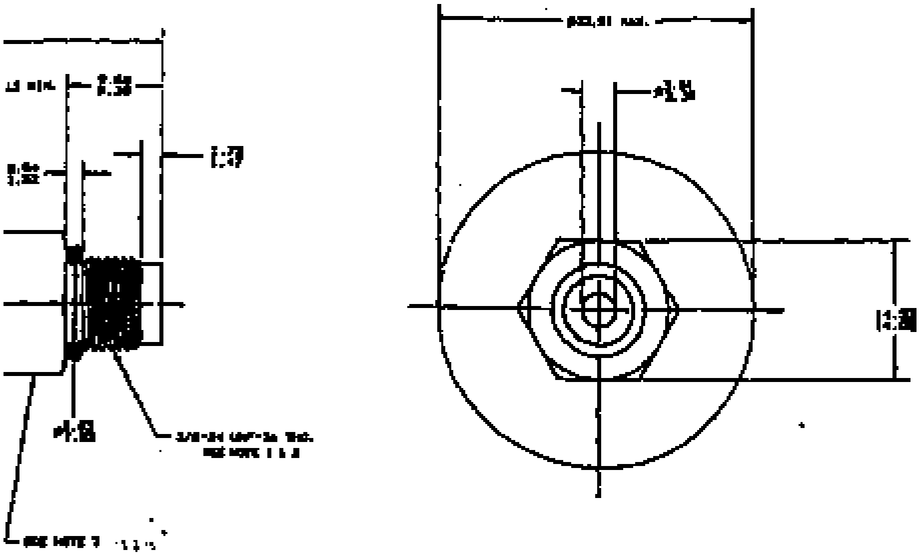


DEACTIVATE SWITCH
TEST SET UP

FIGURE 4

TI-003597

REVISIONS



FOR REFERENCE ONLY
REVISION
Must Conform To
JAN 22 199[illegible]

SPECIFICATIONS

DEVICE MUST CONFORM TO FORD MOTOR CO. SPEC. NO. [illegible]

NOTES:

1. PROTECTIVE COVER ON THREADS REQUIRED FOR SHIPMENT
2. [illegible]
3. STAMP DATE CODE AND FORD P/N ON THIS SURFACE.
4. SEALING SURFACE MUST BE FREE OF FLASH OR VOIDS WHICH WOULD BE DETRIMENTAL TO SEALING PERFORMANCE.
5. STAMP CALIBRATION POINT MARK ON THIS SURFACE.
6. CRIMP RING MATERIAL TO BE [illegible] ALUMINUM.
7. HEXPORT PLATING TO BE ZINC WITH YELLOW CHROMATE.

TI-003598

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MM

TOLERANCE ON FRACTIONS DECIMALS ANGLES

MATERIAL

METRIC

DRAWN BY: SYDNEY HARLEN

TEXAS INSTRUMENTS

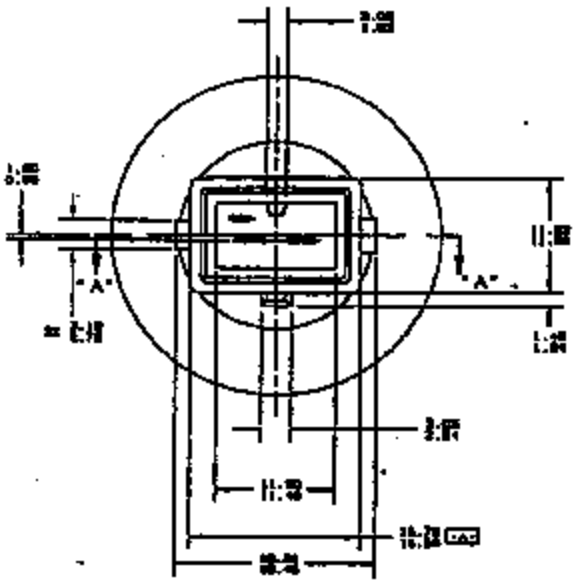
TITLE: PRESSURE SWITCH ENVELOPE DRAWING

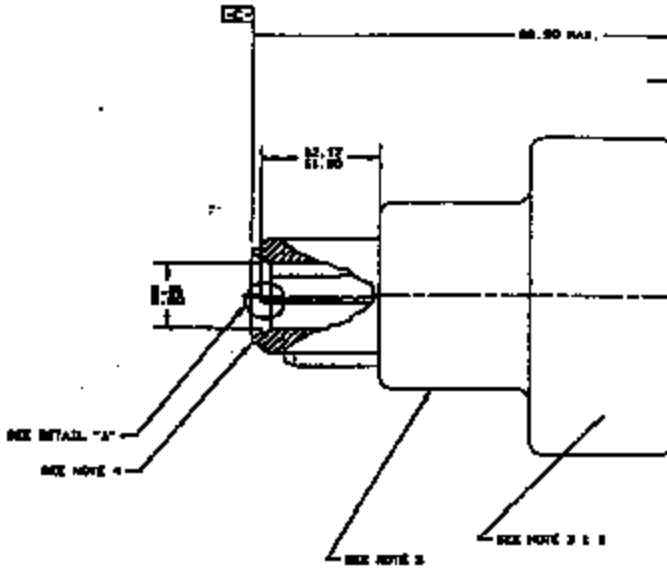
SIZE: D

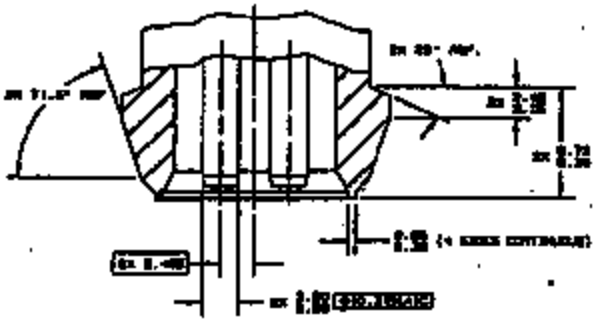
CODE IDENT NO.: 82647

APPROVED

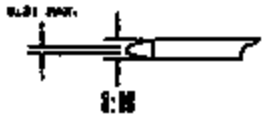
EA82-825-A 12838







SECTION "A-A"



DETAIL "A"

NHTSA Inquiry PE98-055 Kickoff Meeting

Subject Vehicles: All 1992 and 1993 Lincoln Town Car vehicles

Alleged Defect: all under hood fires, or other thermal anomalies, from any source or origin, of any description, level degree, or magnitude, occurring in the left, or drivers side, of the engine compartment. This would include fires in the area of the left front wheel, or left front fender

Name	Org	Dept.	Profs	Bldg.	Room	Phone	Fax	Initial
Bill Bohan	ASO	PVSC	WBOHAN	FPS	500	29115	42264	[illegible]
William Abramczyk	ASO	PVSC	WABRAMCZ	FPS	500	23264	42264	
Bob Wheelock	ASO	PVSC	RWHEELOC	FPS	500	76446	42264	[illegible]
Lynn Edwards	ASO	PVSC	LEDWARDS	FPS	500	26428	42264	
Ray Nevi	ASO	PVSC	RNEVI	FPS	500	47646	42264	[illegible]
Joe Bradley	FCSO	Recalls	JBRADLEY	OSC II		72487	51024	
Andrew Brandt	FCSO	Recalls	ABRANDT1	OSC II	[illegible]	87610	51024	[illegible]
Frank Sykaylo	FCSO	MORS II	FSYKAYLO	OSC II		64888	69475	[illegible]
Phillip Moore	FCSO	CQIS	PMOORE4	OSC II		44788	86446	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jay Logel	OGC	Legal	JLOGEL	FTW	300	43723	60019	
Rob Siskup	OGC	Discovery	RSISKUP	FTW	1400	47734	68862	
Julie Petrucci	PVT	Manager	JPETRUCC	Wixom		45106	[illegible]	
Jack Paskus	LVC	Eng Dir.						
Mike Zevalkink	LVC	Veh Line Dir.						
Chuck Teske	LVC	PD Chief Prog su	CTESKE					
Zandra Deering	LVC	[illegible]	[illegible]	[illegible]		41083	66002	[illegible]
John McInerney	LVC	OPO	JMCINERN					
Mike Jett	Visteon		MJETT			89977		
Rob English	AVT - Electrical		RENGLIS1			73225		[illegible]
Brian Geraghty	Design Analysis		BGERAGHT			40058	44822	[illegible]
Trevor Worthington	Supv		TWORTHI1			58178		
Liaquat Hussain	[illegible]	[illegible]	LHUSSAIN	2	[illegible]	83815		[illegible]
Mike Soltis	Mgr [illegible]		MSOLTIS			25477		
Ralph Arning	[illegible]		[illegible]			[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	OPD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

Porter
EXHIBIT NO. 11

3713 0152

12/1/98 Kickoff Meeting list of attendees.xls

PRODUCED BY FORD

EA02-025-R 12832

12/10/98

Switch current ? — speed control deactivation switch

Brake fluid ignition ?

Are Service Parts Involved ?

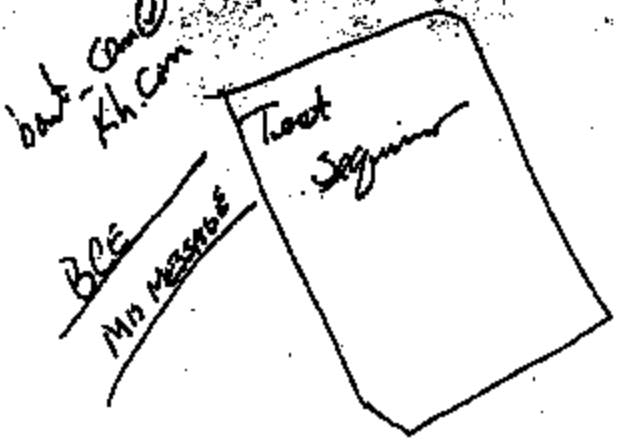
was cruise control standard on Town Car

Repairs are ambiguous

Is speed control standard optional on CVGM

Contact for future NHTSA MEETINGS

CALS on Road
WARM SPARES



Porter
EXHIBIT NO. 12

3713 1527

PRODUCED BY FORD

ER02-025-R 12834

92 Town Car Mtg — brake pressure switch
Jim [illegible] & TOM MASTERS
Joe [illegible]
Mike Fodera
Brad Porter
[illegible]
→ Planned in brake pressure for [illegible]
Brake pressure switch called speed control deactivation switch
[illegible] in PEA to prop. valve
Supplier = [illegible]

QUESTIONS
• Is brake fluid flammable
• will brake fluid ignite if switch hot at all times — brake pressure switch / speed control deactivation switch
• Is speed control STD on Town Car
• How similar is Town Car & GM [illegible] switch VIN, packaging, etc.
• Any Town Car VIN's with safety issue had previous service repair.
• Need single point contact for chassis brake switch.
• why is this just 92 MY

IS SPEED CONTROL SWITCH HOT ON ALL VEHICLES

DISPOSE of Copies (Black Stamped) by:	
RETAIN Record Copy (Red Stamped) Thru:	2019
Schedule Number:	27.03

L. W. Camp
Director
Automotive Safety Office
Environmental And Safety Engineering

Ford Motor Company
330 Town Center Drive
Dearborn, Michigan 48126

February 15, 1999

Mr. Thomas Z. Cooper, Chief
Vehicle Integrity Division
Office of Defects Investigations
National Highway Traffic
Safety Administration
400 Seventh Street, S. W.
Washington, DC 20590

Dear Mr. Cooper:

Subject: PE98-055:NSA12jfa

This letter supplements Ford's January 22, 1999 response concerning the subject agency investigation by providing additional information in response to Request No. 3. As the agency is aware, Ford is continuing to gather information necessary to complete our response to Request No. 3 for other models and model years of potentially affected vehicles. We expect to be able to provide additional information by March 12, 1999.

If you have any questions concerning this response please contact me.

Very truly yours,

L. W. Camp

Attachment

Porter
EXHIBIT NO. 13

ATTACHMENT
February 15, 1999

FORD'S RESPONSE TO PE98-055 Request No. 1

Ford's response to this Preliminary Evaluation inquiry was prepared pursuant to a diligent and good faith search for the information requested. While we have employed our best good faith efforts to provide responsive information, the breadth of the Agency's request and the requirement that information be provided on an expedited basis makes this a difficult task. We nevertheless have made every effort to provide thorough and accurate information and we would be pleased to meet with Agency personnel to discuss any aspect of this inquiry.

The scope of Ford's investigation conducted to locate responsive information focused on Ford employees most likely to be knowledgeable about the subject matter of this inquiry, and to reviewing Ford files in which responsive information ordinarily would be expected to be found and to which Ford ordinarily would refer, as more fully described in this response. To the extent that the Agency's definition of Ford includes suppliers, contractors and affiliated enterprises for which Ford does not exercise day-to-day operational control, we note that information belonging to such entities ordinarily is not in Ford's possession, custody or control. Ford has construed this request as pertaining to vehicles manufactured for sale in the United States.

Responses to your specific numbered requests follow. As requested, after each numeric designation, we have set forth verbatim the request for information, followed by our response to it.

Request No. 2

State the number incidents, known to Ford, in which the alleged defect has been reported to have occurred in the subject vehicles. Furnish copies of all documents, from any and all sources, including documents which may not originally have been submitted to Ford, which are in Ford's possession or control, or of which it is otherwise aware, that pertain, in any way, to any of these incidents. This should include, but is not limited to, all documents possessed by Ford, or of which it is otherwise aware, pertaining to the reports included with this letter. Furnish all documents whether or not Ford has verified the validity of each document. For each incident in this response please provide the vehicle owner' s name, address, and telephone number; and identify all vehicles by vehicle identification number, model year, date of manufacture, date of, retail sale, date of incident, mileage at the time of the incident, and problem description. For all incidents involving lawsuits please identify the caption, court, docket number, and filing date of each lawsuit and a copy of the complaint document initiating the lawsuit. Sort all incidents by cause and area or component of origin.

Request No. 3

State the total number vehicles sold in the United States by model name and model year that have engine compart (sic) configurations (i.e., components and component location, wiring harnesses and harness location) the same as the subject vehicles. Provide a response to question number two for all vehicles identified in your answer to this question.

Answer

In accordance with the agency's January 11, 1999 letter and a January 21, 1999 telephone discussion between Ford Automotive Safety Office personnel and Messrs. Cooper and Abbott of NHTSA, Ford and the agency identified four components located in left side under hood of the subject vehicles which are of interest to the agency. The components identified were as follows:

1. Switch - speed control deactivation
2. Relay center
3. 12A581 wiring harness which connects to the EEC
4. EDIS ignition module.

Additional study of these components was conducted by Ford to determine their usage, package location, and design level. In a follow up telephone discussion on February 9 between Ford Automotive Safety Office personnel and Messrs. Cooper and Abbott of NHTSA, Ford and the agency agreed that vehicles using the speed control deactivation switch with a part number of F2VC-9F924-**, vehicles with a 12A581 wiring harness that functions with a 60 pin EEC connector and has the relay center integrated as a part in assembly, and vehicles using an EDIS-8 the Electronic Distributorless Ignition System module (EQIS-8 12K072) are to be considered those vehicles as having "specific components identified" as described in the agency's January 11 letter. Therefore, Ford's response to Request Nos. 2 and 3 focuses on the vehicles with the "specific components...identified...following examination of vehicles."

A matrix of vehicles with the above identified components, as agreed to in the February 9, conversation with the agency, is contained in Appendix I. Information provided on this matrix also contains the approximate number of the identified vehicles produced for sale in the United States.

The following information relates to the second part of Request No. 3, "Provide a response to question number two for all vehicles identified in your answer to this question."

For purposes of identifying reports of incidents potentially involving the alleged defect and any related documents, Ford has gathered "owner reports" and "field reports" maintained by Ford Customer Service Division ("FCSD").

and claim and lawsuit information maintained by Ford's Office of the General Counsel ("OGC").

Owner Reports. As the agency is aware, within FCSD's North American Customer Service Operations, there is a Customer Assistance Center ("CAC") that is responsible for facilitating communication between customers, dealerships and Ford Motor Company. Among other things, the CAC handles telephonic, electronic (via the Internet), and written inquiries, suggestions, informational requests, and concerns ("contacts") from Ford and Lincoln-Mercury vehicle owners about their vehicles or sales and service processes. The contacts are handled by CAC customer service representatives, who enter a summary of the customer contact into a database known as MORS (Master Owner Relations System). Certain contacts, such as letters from customers, are entered into the MORS database and also are copied to microfilm, or more recently, imaged and stored electronically.

The CAC assigns to each vehicle-related contact report a "symptom code" or category that generally reflects the nature of the customer contact or vehicle concern, as described by the owner. The CAC does not undertake to confirm the accuracy of the description provided by the owner; they simply record what is reported. Therefore, given the complexity of the modern motor vehicle, it is Ford's experience that a significant percentage of owner contacts do not contain sufficient information to make a technical assessment of the condition of the vehicle or the cause of the event reported. Accordingly, although MORS contact reports may be useful in identifying potential problems and trends, the records are not the empirical equivalent of confirmed incidents and/or dealership's diagnosis. The MORS database maintains customer contact information for five years.

In responding to this information request, Ford electronically searched MORS contact reports dated through December 4, 1998 for 1992 and 1993 model year Crown Victoria and Grand Marquis and 1991, 1994-1995 Lincoln Town Car vehicles with symptom codes 203*** (Electrical/Charging System-Low Charge, High Charge, Inoperative, Noise, Indicator, Wiring/Basic- Attachment, Routing, Trailer, Starting System-Drive Engage, Slow Crank, Ignition Switch, Inoperative, Noise, Battery-Low Fluid, Broken Terminal, Case Cracked, Leaks, Won't Hold Charge, Auxiliary (Dual), Circuit Protection-Fuse Box Internal, Distribution Box (External)); 301*** (Chassis/Service Brake System-ABS Indicator, Noisy-Front, Rear, Front and Rear, Drag-Front, Rear, Front and Rear, Pull-Left, Right, Left or Right, Lock-Up/Grab-Front, Rear, Front and Rear, Pedal-Appearance, Attachment, ABS Self Actuating, High Efforts, Soft/Spongy, Pulsates, Low Pedal, Noise, Inoperative/Ineffective-Front, Rear, Front and Rear, Excessive Wear-Front, Rear, Front and Rear, Leaks-Air Pressure, Fluid); 304*** (Chassis/Suspension System/Suspension Ride Quality-Harsh, Soft/Float, Bottoming, Lean/Sag/Height-Both Ends Low, Both Ends

High, Front Low, Front High, Leans Left, Leans Right, Suspension Dog Tracking, Suspension Leaks, Suspension Noise-Front, Rear, Both, Suspension Indicator, Suspension Shocks/Struts- Leaks); 403** (Exhaust System Visual Smoke-Blue, Black, White); 404*** (Exhaust System/Fuel System/ Leaks-Filter Area, Tank/Seams area, Filler Neck, Gas Cap Area, Pump/Seal Area, Lines, Tank Selector, Fuel System Odor-Engine Compartment, Passenger Compartment, Truck, Exterior, Fuel System Noise-Pump Assembly, Tank Area, Engine Compartment, Passenger Compartment, Trunk Area, Exterior, Fuel System Slow Fill, Fuel System Attachment- Filter, Tank, Filler Neck/Cap, Injector, Fuel System Routing-Filter, Tank, Filler Neck/Cap, Injector, Fuel System Expulsion/Press-When Refueling, When Running, When Turned Off, Fuel System Indicator-Low Fuel); 499*** (Engine Noise/Basic Engine/Engine General Concern, Appearance, Appearance Corrosion, Attach/Mounting, Missing Comps., Misassembly, Mechanical Failure, Indicator Check Engine); 704*** (Unknown Source/Fire Smoke/Visible Flame-Coll. Related, Trunk, Cargo/Bed Area, Passenger Area, Underhood, Under Vehicle, Fire/Smoke/Smoke-Coll. Related, Trunk, Cargo/Bed Area, Passenger Area, Underhood, Under Vehicle, Fire/Smoke Scorched/Burnt-Coll. Related, Trunk, Cargo/Bed Area, Passenger Area, Underhood, Under Vehicle); 705*** (Unknown Source/Odor/ Underhood, Trunk Area, Passenger Compartment, Under Vehicle, Cargo/Bed Area). The electronic search was performed with Concordance full-text information retrieval software, using the following search terms: smoke*, fire, flam*, burn*, melt*, thermal, underhood, smolder*, hot, overheat*, smell*, odor* and computer generated variations of those words. Contact reports obtained from the electronic search were reviewed for allegations concerning all under hood fires or other "thermal anomalies," from any source or origin, of any description, level, degree, or magnitude, occurring in the left, or drivers side, of the engine compartment, including fires in the area of the left front wheel, or left front fender. To the extent that the above records reflect reports or allegations of under hood fires or thermal anomalies occurring in the left, or the driver side which may relate to the "specific components," four reports are contained in Appendix II-A for the 1992 and 1993 model year Crown Victoria and Grand Marquis and four reports are contained in Appendix III-A for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included owner reports which describe under hood fires but are ambiguous as to the cause or origin of the fire or whether they may relate to the above-mentioned components. Sixteen reports are contained in Appendix II-B for the 1992 and 1993 model year Crown Victoria and Grand Marquis and fifteen reports are contained in Appendix III-B for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included owner reports which described full vehicle fires but are ambiguous as to the alleged cause or origin of the fire or whether they may relate to the above-mentioned components. Twenty-four reports are contained in Appendix II-C for the 1992 and 1993 model year Crown Victoria

and Grand Marquis and fifteen reports are contained in Appendix III-C for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included owner reports of other fires or "thermal anomalies," of any description, level, degree, or magnitude, occurring under hood in which it is alleged that the source of the fire was other than one of the "specific components." We have provided these reports in Appendix II-D for the 1992 and 1993 model year Crown Victoria and Grand Marquis and in Appendix III-D for the 1991, 1994-1995 model year Lincoln Town Car Vehicles as "non-specific allegations" for your review because of the broad scope of the request. Based on our judgment, the information in the reports in Appendices II-B, III-B, II-C, III-C, II-D, and III-D is insufficient to support a determination that they pertain to the alleged defect. We have not provided reports with specific allegations of smoke or burnt front brakes, brake rotors, calipers, etc. that reside in the wheel well and not under hood.

For consistency, the four categories, Appendix *-A through *-D, used for classifying documents as they may relate to Request No. 2 will be used for all types of reports (owner, field, lawsuit, and claim) addressed in this response. When no documents have been identified, the appendix will exist, but contain only a statement that there are no responsive reports.

In the interest of responding promptly to this inquiry, Ford has not undertaken to gather the microfilm or electronic images related to these contacts because of the largely duplicative nature of the information contained in the microfilm and images, as well as the time and the burden associated with locating and producing those documents. The pertinent information related to those contacts generally would be included in the contact reports obtained from the MORS system. To the extent that those documents exist, they are reflected in the "Micro Nbr:" field of the MORS contact reports. Upon request, Ford will attempt to locate any specific items that are of interest to the agency.

Field Reports. Within FCSD, there is a Vehicle Service & Programs Office that has overall responsibility for vehicle service and technical support activities, including the administration of field actions. That Office is the primary source within Ford of vehicle concern information originating from Ford and Lincoln-Mercury dealerships, field personnel, and other sources. The information is maintained in a database known as the Common Quality Indicator System ("CQIS"). The CQIS database includes reports compiled from more than 40 Company sources (e.g., Company-owned vehicle surveys, service technicians, field service and quality engineers, and technical hot line reports, etc.) providing what is intended to be a comprehensive concern identification resource. As with MORS contact reports, CQIS reports are assigned a "symptom code" or

category that generally reflects the nature of the concern. The CQIS database maintains information for five years.

In responding to this information request, Ford electronically searched CQIS reports dated through December 8, 1998 for 1992 and 1993 model year Crown Victoria and Grand Marquis and 1991, 1994-1995 Lincoln Town Car vehicles with the following symptom codes: Electrical/Start/Charge/ Charging System-Other, Low Charge, High Charge, Inoperative, Noise, Indicator, Not Listed; Wiring-Basic-Other, Attachment, Routing, Insul/Shielding, Trailer, Not Listed; Starting System-Other, Drive Engage, Slow Crank, Ignition Switch, Air Systems, Inoperative, Noise, Not Listed; Battery-Other, Low Fluid, Broken Terminal, Case Cracked, Leaks, Won't Hold Charge, Auxiliary (Dual), Not Listed; Circuit Protection-Other, Fuse Box (Interior), Distribution Box (Exterior), In-Line Fuse, In-Line Breaker, Fuse Link, Diode, Relay, Resistor, Not Listed); 301*** (Chassis/Service Brake/Indicator-Other, Red Only, Amber Only, Red/Amber Only, Not Listed; Other-Other; Noisy-Other, Front, Rear, Front and Rear; Drag-Other, Front, Rear, Front and Rear; Pull-Other, Left, Right, Left or Right; Lock-Up/Grab-Other, Front, Rear, Front and Rear, Not Listed; Pedal-Other, Appearance, Attachment, ABS Self Act., High Efforts, Soft/ Spongy, Pulsates, Low Pedal, Noise, Not Listed; Inoperative/ Ineffective-Other, Front, Rear, Front and Rear, Not Listed; Excessive Wear-Other, Front, Rear, Front and Rear; Leaks-Other Air Pressure-Vacuum, Fluid, Not Listed; Not Listed Service Brake-Other, Not Listed); 304*** chassis/Suspension/Other-Other; Ride Quality-Other, Harsh, Soft/Float, Bottoming, Not Listed; Lean/Sag/Height-Other, Both Ends Low, Both Ends High, Front Low, Front High, Leans Left, Leans Right; Dog Tracking-Other, Rear Tracks Left, Rear Tracks Right; Leaks-Other, Not Listed; Noise-Other, Front, Rear, Both, Not Listed; Indicator-Other, Not Listed; Shocks/Struts-Other, Leaks, Not Listed; Not Listed Suspension-Other, Not Listed); 403*** Engine/Exhaust System/Visual Smoke-Other, Blue, Black, White, Not Listed); 404*** Engine/Fuel System/Other-Other; Leaks-Other, Filter Area, Tank/Seams Area, Filler Neck, Gas Cap Area, Rail/ Injector, Carburetor Area, Pump Seal Area, Lines, Tank Selector, Evaporative System, Not Listed; Odor-Other, Engine Compartment, Passenger Compartment, Trunk, Exterior, Not Listed; Noise-Other, Pump Assembly, Lines, Tank Area, Engine Compartment, Passenger Compartment, Trunk Area, Exterior, Not Listed; Slow Fill-Other, Not Listed; Attachment-Other, Not Listed, Filter, Tank, Filler, Neck/Cap, Fuel Rail/Regulator, Injector Carburetor, Pump Assembly, Lines; Routing-Other, Not Listed, Filter, Tank, Filler Neck/Cap; Fuel Rail/Regulator, Injector, Carburetor, Pump Assembly, Lines; Expulsion/Press-Other, When Refueling, When Running, When Turned Off, Not Listed; Indicator-Other, Low Fuel, Not Listed; Not Listed Fuel System-Other, Not Listed); 409*** Engine/Power Components/ Other-Other; Block-Other, Not Listed; Head-Other, Not Listed; Crank-Other, Not Listed; Cam-Other, Not concern; Rod-Other, Not Listed; Piston-Other, Not Listed, Ring-Other, Not Listed; Oil Pump-Other, Not Listed; Power Components-Other, Not Listed); 499*** (Engine/General Concern/Other-Other; Appearance-Other,

Corrosion, Not Listed; Attach/Mounting-Other, Concern Not Listed; Misassembly-Other, Mounts/Dampers, Not Listed; Mechanical Failure-Other, Concern Not Listed; Other-Other, Not Listed); 704*** (Unknown Source/Fire/Smoke/Other-Other; Visible Flame-Other, Coll. Related, Trunk, Cargo/Bed Area, Passenger Area, Under hood, Under Vehicle, Not Listed; Smoke-Other, Coll. Related, Trunk, Cargo/Bed Area, Passenger Area, Under hood, Under Vehicle, Not Listed; Not Listed Fire/Smoke-Other, Listed); 705*** (Unknown Source/Odor/Other-Other, Under hood-Other, Not Listed; Trunk Area-Other, Not Listed; Passenger Compartment-Other, Not Listed, Under Vehicle-Other, Not Listed; Cargo/Bed Area-Other, Not Listed); and containing the computer search terms: smoke, fire, flame, burn, melt, thermal, and computerized variations of those words. Reports were reviewed for allegations concerning all under hood fires or other thermal anomalies, from any source or origin, of any description, level, degree, or magnitude, occurring in the left, or drivers side, of the engine compartment, including fires in the area of the left front wheel, or left front fender. To the extent that the above records reflect reports or allegations of under hood fires or thermal anomalies occurring in the left, or the driver side which may relate to the "specific components," two field reports are contained in Appendix IV-A for the 1992 and 1993 model year Crown Victoria and Grand Marquis and one field report is contained in Appendix V-A for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included field reports which describe under hood fires but are ambiguous as to the cause or origin of the fire or whether they may relate to the above-mentioned components. Three reports are contained in Appendix IV-B for the 1992 and 1993 model year Crown Victoria and Grand Marquis. No similar field reports were located for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Unlike the owner complaints, no field reports which describe full vehicle fires but are ambiguous as to the alleged cause or origin of the fire or whether they may relate to the above-mentioned components were located for the 1992 and 1993 model year Crown Victoria and Grand Marquis or 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included field reports of other fires or "thermal anomalies", of any description, level, degree, or magnitude, occurring under hood in which it is alleged that the source of the fire was other than one of the "specific components." We have provided these reports in Appendix IV-D for the 1992 and 1993 model year Crown Victoria and Grand Marquis and in Appendix V-D for the 1991, 1994-1995 model year Lincoln Town Car Vehicles as "non-specific allegations" for your review because of the broad scope of the request. Based on our judgment, the information in these reports is insufficient to support a determination that they pertain to the alleged defect. We have not provided reports with specific allegations of smoke or burnt front brakes, brake rotors,

calipers, etc. that reside in the wheel well and not under hood.

As requested, a listing of the above identified reports has been prepared and is provided in Appendix XI.

Lawsuits and Claims. Ford's Office of the General Counsel ("OGC") is responsible for handling product liability lawsuits and claims and consumer breach of warranty lawsuits against the Company.

Ford understands this request to only seek a copy of the complaint for these lawsuits. Therefore Ford is providing, to the extent available, a copy of the complaint. Upon request, Ford also would be glad to produce to the agency Ford's answer to the complaint, Plaintiff's responses to Ford's and/or other parties' discovery requests, Ford's responses to Plaintiff's discovery requests, documents produced in discovery, Plaintiff's medical records, police/fire department/emergency medical service reports, vehicle recall history, vehicle warranty history, owner communications with Ford, photographs, and/or non-privileged vehicle inspections and expert reports.

Based on a reasonable and diligent search, Ford located ten lawsuits, 27 claims, and no consumer breach of warranty lawsuits potentially related to the alleged defect in the "specific components." To the extent that the above records reflect reports or allegations of under hood fires or "thermal anomalies" occurring in the left, or the driver side which may relate to the "specific components identified," no lawsuit complaints were located for the 1992 and 1993 model year Crown Victoria and Grand Marquis or for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included lawsuit complaints which describe under hood fires but are ambiguous as to the cause or origin of the fire or whether they may relate to the above-mentioned components. One lawsuit complaint is contained in Appendix VII-B for the 1992 and 1993 model year Crown Victoria and Grand Marquis and one lawsuit complaint is contained in Appendix VIII-B for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included lawsuit complaints which described full vehicle fires but are ambiguous as to the alleged cause or origin of the fire or whether they may relate to the above- mentioned components. No lawsuit complaints were located for the 1992 and 1993 model year Crown Victoria and Grand Marquis and two lawsuit complaints are contained in Appendix VIII-C for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included lawsuit complaints of other fires or "thermal anomalies", of any description, level,

degree, or magnitude, occurring under hood in which it is alleged that the source of the fire was other than one of the "specific components." We have provided these reports in Appendix VII-D for the 1992 and 1993 model year Crown Victoria and Grand Marquis and in Appendix VIII-D for the 1991, 1994-1995 model year Lincoln Town Car Vehicles as "non-specific allegations" for your review because of the broad scope of the request. Based on our judgment, the information in these Appendices VII-B, VIII-B, VII-C, VIII-C, VII-D, and VIII-D is insufficient to support a determination that they pertain to the alleged defect. We have not provided reports with specific allegations of smoke or burnt front brakes, brake rotors, calipers, etc. that reside in the wheel well and not under hood.

For each claim, Ford is providing, to the extent available, the claimant's medical records, police/fire department/emergency medical service reports, vehicle recall history, vehicle warranty repair history, owner communications with Ford, photographs, claim-disposition notification, Ford requests for information to claimant, non-privileged vehicle inspections and expert reports, and the owner or his/her attorney's description of incident/claim and accompanying information.

To the extent that the above records reflect reports or allegations of under hood fires or "thermal anomalies" occurring in the left, or the driver side which may relate to the "specific components," four claims are contained in Appendix IX-A for the 1992 and 1993 model year Crown Victoria and Grand Marquis and no claims were located for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included claims which described under hood fires but are ambiguous as to the cause or origin of the fire or whether they may relate to the above-mentioned components. Six claims are contained in Appendix IX-B for the 1992 and 1993 model year Crown Victoria and Grand Marquis and four claims are contained in Appendix X-B for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included claims which describe full vehicle fires but are ambiguous as to the alleged cause or origin of the fire or whether they may relate to the above-mentioned components. Four claims are contained in Appendix IX-C for the 1992 and 1993 model year Crown Victoria and Grand Marquis and one claim is contained in Appendix X-C for the 1991, 1994-1995 model year Lincoln Town Car Vehicles.

Ford has also included claims of other fires or "thermal anomalies," of any description, level, degree, or magnitude, occurring under hood in which it is alleged that the source of the fire was other than one of the "specific components." We have provided these reports in Appendix IX-D for the 1992 and 1993 model year Crown Victoria and Grand Marquis and in Appendix X-D for the 1991, 1994-1995 model year

Lincoln Town Car Vehicles as "non-specific allegations" for your review because of the broad scope of the request. Based on our judgment, the information in Appendices IX-B, X-B, IX-C, X-C, IX-D, and X-D is insufficient to support a determination that they pertain to the alleged defect. We have not provided claims with specific allegations of smoke or burnt front brakes, brake rotors, calipers, etc. that reside in the wheel well and not under hood.

A listing of the identified lawsuits and claims has been provided in Appendix XI.

Responsive documents that are privileged or attorney work product are reflected on the Privilege Log contained in Appendix XI.

We note that the Agency's definition of Ford includes Ford's outside law firms. However, to the extent that Ford retained law firms in connection with the claims and lawsuits identified above, any files maintained by Ford's law firms ordinarily would contain voluminous duplicative documentation and take months to gather and process. Nevertheless, in the interest of ensuring the thoroughness of our production, we have contacted the law firms which handled the claims identified and asked them to provide, to the extent available, copies of documents produced in discovery and non-privileged reports of vehicle inspections and experts. These documents, to the extent that any exists, will be provided under separate cover in the near future. Ford understands this request to only seek a copy of the complaint for the lawsuits identified above, so Ford has not included similar information from its law firms' files related to those lawsuits.

A search of Ford's litigation prevention files located a single file relating to a specific owner report and has been provided in Appendices II-A.

W:\word\98PE\PE13_pe98-055.doc
wmk/dp

PE98-0[illegible] Engine Compartment Fires
Revised per NHTSA discussion 09-Feb-99
Request No. 3

Vehicle	1991	1992	1993	1994	1995	1996	1997	1998	Total vehicles
Crown Victoria		x	x	x	x	x	x		
Speed Control Deactivation		F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924		
Wiring		12A581	12A581	12A581					
Relay center integral to 12A581		Relay center	Relay center	Relay center	Relay center	Relay center	Relay center		
[illegible] module		12K072	12K072	12K072					
Approximate number of Vehicles produced for sale.		1[illegible]	1[illegible]	101,000	[illegible],300	10[illegible],300	12[illegible]		[illegible]
Grand Marquis		x	x	x	x	x	x		
Speed Control Deactivation		F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924		
Wiring		12A581	12A581	12A581					
Relay center integral to 12A581		Relay center	Relay center	Relay center	Relay center	Relay center	Relay center		
[illegible] module		12K072	12K072	12K072					
Approximate number of Vehicles produced for sale.		148,400	[illegible]	9[illegible],100	94,300	[illegible]	117,[illegible]		[illegible]41,500
Town Car	x	x	x	x	x	x	x		
Speed Control Deactivation		F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924	F2VC-9F924		
Wiring	12A581	12A581	12A581	12A581					
Relay center integral to 12A581	Relay center	Relay center	Relay center	Relay center	Relay center	Relay center	Relay center		
[illegible] module	12K072	12K072	12K072	12K072					
Approximate number of Vehicles produced for sale.	119,000	1[illegible]	11[illegible]	113,[illegible]	1[illegible],700	[illegible]	10[illegible]		7[illegible]
Mark VIII			x	x	x				
Speed Control Deactivation			12A581	12A581	12A581				
Wiring			F2VC-9F924	F2VC-9F924	F2VC-9F924				
Relay center integral to 12A581									
[illegible] module			12K072	12K072	12K072				
Approximate number of Vehicles produced for sale.			3[illegible]	27,000	2[illegible],100				7[illegible]
	11[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		2,1[illegible]

EA02-025-A 12847

****

Note printed by JMCINERN on 17 Dec 1998 at 07:10:58

****

From: FPORTER --DRBN007
To: WARRANCE--DRBN005
BEGEN --DRBN007
JEVANS8 --DRBN008
EGRIBBLE--DRBN005
JMCINERN--DRBN008
RNEVI --DRBN005
CTHOMAS8--DRBN005
EWELFERI--DRBN006

Date and time 12/17/98 07:41:51
RCLAYTON--DRBN005
RENGLISH--DRBN005
JGREGOIR--DRBN005
WLAPOINT--DRBN005
JWRMK --DRBN005
GSTEVEN1--DRBN005
DGOEL --DRBN005

FROM: F. J. Porter
Subject: (U)

CHART(UTC -05:00)

1992-1993 Town Car F2VC-9F924-A Brake Pressure Switch Investigation

TEAM:

AVT EESE Chassis Electronics:	Fred Porter	x84-83722	fporter
AVT Chassis Engineering:	Joe Evans	x32-33832	jevans8
	Barry Egan	x32-39512	begen
AVT EESE BOS:	Rob English	x33-73225	renglish
AVT Design Analysis:	Norm LaPointe	x59-42616	nlapoint
AVT EESE OPE:	Jim Gregoire	x33-79962	jgregoir
EASE Prod. Veh. Safety:	William Abramczyk	x32-22284	wabramcz
	Ray Nevi	x83-47688	rnevi
Large Luxury VC:	Joe Mesa	x33-06133	jcame
	Ron Clayton	x32-24028	rclayton
Large Luxury VC Safety:	John McInerney	x32-20276	jmcinern
AVT Materials Engineering:	Ken Gribble	x32-18658	kgribble
	Clark Thomas	x59-41313	cthomas8
	Greg Stevens	x32-36686	gstevens

INFORMATION:

NHTSA letter: PE98-058

Vehicles identified: 21 initially identified.
26 additional vehicles reported since publication of the investigation.

Warranty: A total of 69 warranty claims are identified in ANS on the F2VY-9F924-A for 1992 and 1993 Town Cars.

Two CQIS reports (WJIAA135 & VDUAA322) mention underhood fire in connection with the brake pressure switch.
WJIAA135 occurred at 51,500 miles.
VDUAA322 occurred at 84,802 miles.

Supplier: The pressure switch was manufactured by Texas Instruments. The switch was purchased in assembly with the brake proportioning valve bought from Surfaces.

Contacts: Surfaces - Mike Thomas (248)543-4520 [KELSEY Industries]
TI - Andy McQuirk (508)236-3060.

Function: The brake pressure switch is a redundant switch for turning off the

Porter
EXHIBIT NO. 44

3713 6668

PRODUCED BY FORD

speed control function.

ON-GOING ACTIVITY:

Norm LaPointe and Clark Thomas will meet with engineers from Central Laboratory to x-ray one part on 12/17/1998.

QUESTIONS: (in no particular order)

1) What is the normal current in the brake pressure switch?

2) Was cruise control standard on Town Car in 1992 and 1993?

3) Under what circumstances is brake fluid flammable?

4) What is the repair history for vehicles that have exhibited a problem

5) What other vehicles use this brake pressure switch? What are their electrical configurations?

6) Is this switch still in use? If not, why not? If so, what design cha have been implemented since 1992/1993?

7) What fault codes are stored if the brake pressure switch fails?

Regards,

Fred Porter
Chassis E/E Systems Applications
Bldg S - Mail Drop 5038 - Cubicle 3E004
CC - fporter
fporter@ford.com
(313) 845-3722
fax: 336-4145

(6) SWITCH TERMINALS W/ INTERFACE PORTION OF SWITCH CAN FORM CORROSION. (Remainder To Remain CLEAN)

(7) TO BE ANALYZED & SUSPECT PART.

(8) NORYL GTX 930 - MATERIAL HOUSING

Request for Central Laboratory Service

Receipt - Copy

Lab Request Number: 009804105
Date of Request: 12/17/1998 10:50:33 AM
Print Date: 01/04/1999 01:35:52 PM

Request Description: SPEED CONTROL CUT-OFF SWITCH

Requester Information:

Primary Contact: STEVENS, GREG - 10006	Phone: (313) 323-6588	PROFS ID: GSTEVEN1	Fax: (313) 390-7224
Secondary Contact: LA POINTE, NORM - 10075	Phone: (313) 594-2648	PROFS ID: NLAPOINT	Fax: (313) 337-8258

Send Report to: MD-5006/2G065, AVT MATERIALS, BLDG. #5
Bill to:
Accts.Location: 5100
Dept: T113
Work Task: XQG04

Sample Information:
Total Number of Containers: 1
Source: Not specified
Sample Handling: Return after test
Supplier Code: Not specified

Part/Material Name	Qty	Sample Identification	Part Number	Material Spec	CPSC Code	Supplier
SPEED CONTROL CUT-OFF SWITCH	1	BURNED CONNECTOR	F2VY-9F924-A	NA	18.08.00	TEXAS INSTRUMENTS

Investigation Information:
Nature of Investigation:Requestor Info. Box: Mail typed report
Fax preliminary results
HIGH PRIORITY - POSSIBLE LEGAL

Additional Sample Information/Testing Requirements:
SAMPLE ID: BURNED CONNECTOR & PRESSURE ACTUATOR (REDDICK)

DETERMINE CAUSE
OF BURNED CONNECTOR - RADIOGRAPH, PHOTOGRAPH, PRESSURE TEST DIAPHRAGM.

EVALUATE/UNDERSTAND CIRCUITRY OF NEW SWITCHES.

ATTN: S. LA
ROUCHE - SAMPLE IN LAB

NOTE. ALL COMMUNICATIONS/REPORT, ETC. TO BE DUAL
(I.E. N. LA POINT).

Reporting Directions:
Date customer would like report: 01/13/1999
Date customer must have report: 01/14/1999

Report Format(s):

Log-In Information:
Initial Routing: Metallurgy
Accepted for Central Laboratory by: Morton, Jacqueline R. Phone: 59-47084

View your test status at: "HTTP://bd4web.pd7.ford.com/kals"

Program Name: KALS/Lab Eng/ Module
Program Version: Version: 2.0.8

Porter
EXHIBIT NO. 15

3713 2673

E982-025-A 12898

Douglas, Charles

From:	Douglas, Charles
Sent:	Friday, December 18, 1998 10:39 AM
To:	'Porter, Fred (Ford)'
Cc:	Stamps, Robert
Subject:	Usage Matrix - Speed Control Deactivation Pressure Switch

Fred,

The following represents a rough usage matrix over time:

MY92	MY93	MY94	MY95	MY96	MY97	MY98
Econoline-L	Econoline-L	Econoline-B	Econoline-B	Econoline-B	Econoline	Econoline - ?
Club Wagon	Club Wagon	Club Wagon	Club Wagon	Club Wagon	Club Wagon	Club Wagon
Town Car-P	Town Car-P	Town Car-P	Town Car-P	Town Car-B	Town Car-B	
Crown Vic-P	Crown Vic-P	Crown Vic-P	Crown Vic-P	Crown Vic-B	Crown Vic-B	
Grand Marquis-P	Grand Marquis-P	Grand Marquis-P	Grand Marquis-P	Grand Marquis-B	Grand Marquis-B	
	F Series-L	F Series-B	F Series-B	F Series-B	F Series-B	F Series-B
	Bronco-L	Bronco-B	Bronco-B	Bronco-B		
	SHO Taurus	SHO Taurus-	SHO Taurus??			
		Capri-P	Capri	Capri??		
		Win98	Win98	Win98	Win98	Win98
			Falcon	Falcon	Falcon	Falcon
			Taurus-P	?Explorer??-B	Explorer	Explorer-B
			Sable-P	?Ranger??-B	Ranger	Ranger
				?Aerostar-B	Expedition	Expedition-B
						Navigator-B

B = Booster Mount
P = Prop Valve
L = Line Mount

To be quite honest, I think we actually have more of a grasp on the application matrix in the MY92 - MY95 timeframe than MY96 on. Where you see ??, this means the actual starting or ending model year for a program may be +/- 1 model year. Also, it is conceivable that as of the MY98 timeframe, we are actually releases on more platforms than what is shown above. I say this because our actual shipped volumes which are in the 2MU range, would indicate either 100% penetration for cruise control on all of the platforms listed or we are on more than the listed platforms.

One additional note, during our discussion yesterday, you talked about the switch being hot on the Town Car. I think I misunderstood the context of your statement. At the time of our discussion, I was thinking thermal hot but upon further reflection believe you may have meant wired hot. If this is the case, I am pretty sure the switch is wired hot in virtually all of the above applications. This issue can be discussed further on Tuesday as we will be prepared to provide a brief overview on our understanding of how the switch is electrically plumbed into the system.

Any additional questions, please let me know me at your convenience. Also, if the above application matrix does not come across legible, please let me know and I will have this faxed to your attention.

Regards,

Charlie

Charlie Douglas
(508) 236-3687 (P)
(508) 236-1586 (F)
c-douglas2@ti.com

Porter
EXHIBIT NO. 17

****

* Note printed by GSTEVEN1 on 5 Jan 1999 at 08:26:22 *

****

From: FPORTER --DRBN007 Date and time 12/23/98 10:31:16
To: WABRAMCZ--DRBN005 ZDEERING--DRBN005
BEGEN --DRBN007 RENGLIS1--DRBN005
JEVANS8 --DRBN005 DGOEL --DRBN005
JGREGOIR--DRBN005 KGRIBBLE--DRBN005
WLAPOINT--DRBN005 SLAROUCH--FORDNA1
JMCINERN--DRBN005 JWEMS --DRBN005
RNEVI --DRBN005 GSTEVEN1--DRBN005
CTHOMAS5--DRBN005 HWELFER3--DRBN006

FROM: F. J. Porter U&ART(UTC -05:00)
Subject: (U) Part Analysis

Dr. Al Hopkins from TI suggests that representatives from Ford travel to Attleboro, MA via Providence, RI the evening of January 5, 1999 for a full day of analysis on January 6, 1999.

Can some find out the type of material used in the extinguisher? This will aid in the analysis.

It would also be helpful to understand the weather conditions at the time of the event. I don't have the data and dealership from this part.

Thanks.

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 5 - Mail Drop 5030 - Cubicle JE004 fax: 390-4145

Porter
EXHIBIT NO. 19

****
* Note printed by FPORTER on 22 Jan 1999 at 09:47:47 *
****

From: KGRIBBLE--DRBN005 Date and time 01/22/99 07:31:48
To: FPORTER --DRBN007

FROM: Ken Gribble USART(UTC -05:00)
Subject: (U) Brake Fluid Questions

Copper and brass have been used in brake systems for years and I'm not aware of any concerns

Regards,
Kenneth Gribble
Chassis Engineering
Materials & Corrosion Engineering Section
*** Forwarding note from CTHOMAS5--DRBN005 01/21/99 17:26 ***
To: MHAGA --FORDNA1 GGOULLEW --FORDNA1
cc: FPORTER --DRBN007 GSTEVEN1--DRBN005
KGRIBBLE--DRBN005

FROM: Clark Thomas USART(UTC -05:00)
Subject: (U) Brake Fluid Questions
Gayle/Mary: Can you comment on this? It is in reference to the issue of flies, possibly caused by the Texas Instrument Cruise Control Switch being looked at by NHTSA and our Legal Staff. Thanks.

Regards, Clark Thomas
AVT Materials (Plastics/Elastomers)
313-59-41313 (Bldg); 313-32-23198 (POEE)
*** Forwarding note from FPORTER --DRBN007 01/21/99 10:13 ***
To: CTHOMAS5--DRBN005 GSTEVEN1--DRBN005

FROM: F. J. Porter USART(UTC -05:00)
Subject: (U) Brake Fluid Questions

Two questions:

Is brake fluid conductive? How much?

Will brake fluid react with copper or brass? Will an electric field or current cause a reaction?

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg S - Mail Drop 3010 - Cubicle 1E004 fax: 390-4145

Porter
EXHIBIT NO. 19

Note printed by FPORTER on 4 Feb 1999 at 12:46:12

From: DGOEL , --DRBN005 Date and time 02/01/99 17:14:16
To: FPORTER --DRBN007

FROM: Deepak Goel USART(UTC -05:00)
Subject: T/C Tech Review

Regards,
Deepak Goel, Manager Restraints,Power Supply,Chassis & EMC
Bldg #5, MD 5011, room 2A019
(313) 31-75771, Fax: 42-14052, E-Mail: dgoel@ford.com
*** Forwarding note from SCOLE1 --DRBN005 01/01/99 15:11 ***
To: JNEME --DRBN005
cc: DGOEL --DRBN005 TDONOVAN--DRBN005

From: Sam L. Cole USART(UTC -05:00)
Subject: T/C Tech Review
JOE, THE POINT PERSON FOR THESE IS FRED PORTER. HE WORKS FOR DEEPAK GOEL. THE MANAGER IN CHARGE FOR OUR CCRG PROCESS IS TIM DONOVAN.

I HAVE TALKED TO DEEPAK AND HE CONFIRMS THAT FRED HAS STARTED A 14D. THE TECH REVIEW SHOULD BE SET UP WITH FRED, DEEPAK AND TIM.

PLEASE ADVISE IF YOU NEED ANY HELP, OR HAVE QUESTIONS.

Thank You,
Sam
Ext. 31959
BLDG. 2, 22J31 - MD# 1220 - SCOLE1@FORD.COM
*** Forwarding note from JNEME --DRBN005 01/01/99 09:54 ***
To: RNEVI --DRBN005
cc: CTESKE --DRBN005 WABRANC2--DRBN005
JNEME --DRBN005 ZDEERING--DRBN005
SCOLE1 --DRBN005

FROM: Joseph S. Neme USART(UTC -05:00)
SUBJECT: T/C Tech Review
Ray,

Chuck, Jon Bradley, and I discussed the T/C underhood tech review... We agreed to hold a kick off/strategy type meeting that I will lead then we will hand off the 14D to the appropriate activity. For a kick-off meeting... I need the following facts (I think your discovery people have all the answers):

1) How many 92-3 towncar underhood fires are there?
2) how many occurred while the vehicle were parked, running, unknown?
3) how many had the fire start of LHS of vehicle (claim photo's) and how many do we not know?
4) how many Crown Vic/Grand Marquis fires are there for 92-94 vehicles? include similar info as the T/C stuff
5) how many have claims from either dealer, insurance, NHTSA, etc that the fire initiation was the pressure switch?
6) anything else you think will be useful to put a "box" around the concern so that we can have a meaningful discussion

Porter
EXHIBIT NO. 20

3713 1237

PRODUCED BY FORD

ER92-625-A 12886

Please forward the info when you can... thanks

Joseph S. Nemo
LVC - Safety
Phone: 19-08133, Fax:19-07281, E-Mail:jnemo@ford.com
Location: MD121S/Cube 2M17, Building #2 Textpager:313-791-7003

3713 1238

CARY WILSON
|
DEEPAK GOEL
|
FRED PORTER

Porter
EXHIBIT NO. P2

FRED PORTER
STEVE REMERS
NORM LA POINTE
TOM MASTERS
TEXAS INSTRUMENT
AZIZ RAHMAN
ANDY McGUIRK
STEVE LAROUCHE
FRED KOHL
JOE KAFADI
BILL ABRACEYK
JOE NEME

****
* Note printed by TMASTERS on 1 Feb 1999 at 07:40:31 *
****

From: TMASTERS--DRBN005 Date and time 02/01/99 07:19:34
To: FPORTER --DRBN007
cc: TMASTERS--DRBN005 Tom Masters RENGLISH--DRBN005 Rob English

FROM: Tom Masters USAET(UTC -05:00)
Subject: '92Town Car NHSTA Investigate - Brake Pressure Sw.

Fred: We need an internal AVT-EESE Mtg 2/3/99 or 2/4/99 with you & appropriate Engs from your section along w AVT-EESE Engs (REnglish/JGregoir/TMasters). Mtg would consolidate AVT-EESE position per role that Brake Pressure Switch plays in regards to possible root cause for Town Car underhood fires.

Pls call x08657 or Text Page "TMasters" with suggested Mtg time/date - Thanks!

Phone 313-39-08657, Text Pager 313-451-2005, Fax 313-317-9158
MS-2A024, M.D.-5017 AVT-EESE-OPD Elect System/EDS Trk/Large Car
The Road To Success is Uphill, So -
Don't Expect To Break Any Speed Records.

Porter
EXHIBIT NO. 23

3713 5708

Dague, Bryan

From: Douglas, Charles
Sent: Friday, February 05, 1999 11:51 AM
To: Baker, Gary; Dague, Bryan; Rahman, Aziz; Rowland, Thomas; McGuirk, Andy
Cc: Pechonis, John
Subject: FW: Town Car Brake Pressure Switch

fyi,

Charlie

Charlie Douglas
(508) 236-3657 (P)
(508) 236-1598 (F)
c-douglas2@ti.com

Porter
EXHIBIT NO. 24

From: Sharpe, Robert
Sent: Friday, February 05, 1999 11:45 AM
To: Douglas, Charles
Cc: Beninghause, Steven; Sullivan, Martha; Baumann, Russ; Dodd, Bob
Subject: Town Car Brake Pressure Switch

Yesterday afternoon, I was requested to attend a meeting at Ford in regards to the Lincoln Town Car Fire issue.

Attendee's

Fred Porter, Steve Reimers - Chasis Electronic Systems
Tom Masters - Large/Lux Vehicle Systems & Wiring
Steve LaRouche - Ford Central Labs
Norm LaPointe - AVT Design Analysis
Rob English - Core Electrical
Paul Stokes - Speed (cruise) Control
John McInerny - Large/Lux Vehicle Safety Group
Joe Neml (sp?) - Large/Lux Vehicle Safety Group

Summary

This issue is one of Ford's top priorities and is gaining Executive Level exposure. Ford does not have a root cause to reply to NHTSA's inquiry. Strong perception that the fires have originated at the pressure switch, based on (1) NHTSA's internal investigation, (2) reports from insurance investigators, (3) incident at Memphis where vehicle fire started in front of mechanic and mechanic noted that only the switch was "burning" (switch was replaced and vehicle returned to owner - same switch that was analyzed in TI-A). Ford stated that the pressure switch should be considered as "guilty" until proven innocent. To this point, TI has been viewed as "cooperative" but not "proactive" (Ford is looking for our help as they consider TI the experts in regards to switch issues).

Ford is concerned that in absence of a "root cause" response to NHTSA, NHTSA will pick the brake switch and demand that all Town Cars with Cruise Control be grounded (recalled). Without a root cause, containment action is unclear. Possible containment includes (1) disengage cruise/speed control option (high impact to customer) or (2) rewire the brake switch to an ignition feed. It was confirmed by the cruise control group that there is no necessity to have the brake switch "hot" (12v) at all times. Both options are under discussion.

Although there is high attention on the brake switch, John McInerny stated that other components must be investigated as well. His comments were based on:

TI-004096

EA02-625-R 12600

- Data Base search of all MY92/93 Lincoln Town Car fires shows approx. 132 incidents
  Data Base search of all MY92/93 Town Car fires with brake switch identified shows approx 32 incidents
- NHTSA has requested Ford to investigate/respond to the following components;
  - Brake Pressure Switch
  - 42 way connector (beneath the brake fluid fill reservoir)
  - EEC (Controller) wire harness
  - Relay Pack (contains 3 relays (AC Cut off, EEC, fuel pump) and the EEC diode)

Ford is now investigating to verify if other fires, similar in nature, have occurred on other vehicle lines that use this switch. Focus is on the MY92/93 Crown Vic and Grand Marq as they have identical systems.

Ford has requested an "on site" TI representative familiar with this specific brake switch application.

Questions for TI

- What are the flash points for all components/material used in the switch?
- Are the material specs submitted to Ford the same as the material spec's used on the MY92/93 applications?
- Does our DFMEA or PFMEA identify any potential "fire" occurrences?
- How do we control our terminal positioning in production? Any chance for the terminals to "short"?
- Has our IP testing showed any failures or concerns (confirm IP testing results)?
- Are there any material differences between the different colored bases?
- Where are the answers/feedback to the "many" questions asked during the analysis at TI Tech Lab's? (stated many questions were asked, primary was in regards to the cause of the crease mark found on the kapton)
- What testing/investigating is TI doing internally. Are we trying to simulate any conditions that verify a fire potential?
- Do we sell the brake switch outside of Ford applications? If so, is it wired "hot" at all times?
- Ford would like "color" pictures from the Econoline failure analysis report (connector issue).

Actions

(TI) Respond to above questions by early next week
(TI) Respond to Ford request of providing on-site engineer, preferably on 2/5/99
(Ford) Develop a Work Plan to support a 14D and a Tech Review
(Ford) Retrieve additional field samples from the South. All components identified by NHTSA will be collected.
  12 additional switches from Houston (hi mileage, no fire) were given to Fred Porter
(Ford) Support meeting with UTA on 2/12/99 to discuss wiring/connector issues
(Ford) Monitor testing of brake switches (@ Bldg5) injected with brake fluid and a 24v supply across terminals (ongoing)

Please contact me if you have questions regarding the information above.

Best Regards,

Rob Sharpe
Texas Instruments
Phone (248) 305-5729
Fax (248) 305-5734
rsharpe@ti.com

TI-004097

TEXAS INSTRUMENTS

FACSIMILE TRANSMITTAL

TO: Name: Fred Porter

Location: Ford

Mail Station:

Phone Number: 313-845-3722

FAX Number: 313-390-4145

FROM: Steven Brighouse

TEXAS INSTRUMENTS MS

Phone Number: 508-236-3378

FAX Number: 508-236-3153

Total number of pages (including header page): 3

COMMENTS:

Steven Beringhause
Design Engineering Manager
Texas Instruments Incorporated
Attleboro, MA 02703

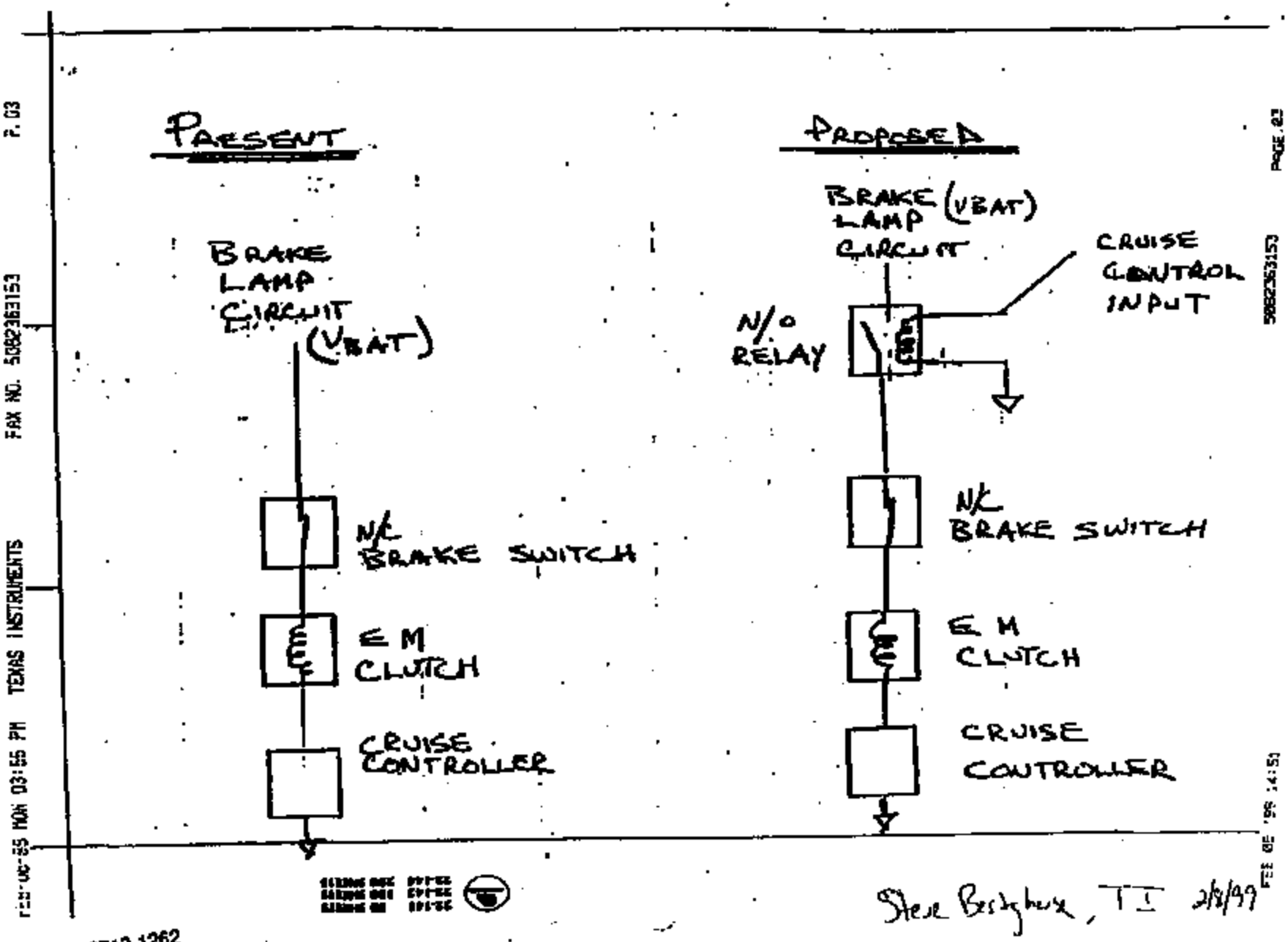
February 8, 1999

Fred,

As we discussed over the phone Friday, per your request we looked at the possibilities of adding a fuse in line with the pressure switch, however, we think a more appropriate solution might be to use a relay circuit (schematic attached). Our understanding of the application is that the brake pressure switch is a failsafe component to shut off the cruise control if the standard brake light switch fails. The brake switch therefore only needs to be powered when the cruise control is on. By placing a normally open relay in the circuit and only closing the relay when the cruise control is activated, the switch will only be powered when it needs to be, when the cruise control is enabled. If you are correct that the high current draw is the source of ignition a relay would be a better solution than an in line fuse because the relay prevents the high current situation from happening rather than reacting once it does occur. If you have any questions, please give me a call at 508-236-3378.

Regards,
Steven Beringhause

3713 1261



Sharpe, Robert

From: Rahman, Aziz
Sent: Friday, February 12, 1999 11:29 AM
To: McGuirk, Andy; Beringhause, Steven; Dague, Bryan; Baumann, Russ; Sharpe, Robert; Douglas, Charles; Baker, Gary; Rowland, Thomas
Subject: 77PS, 2/11/99

Main event of the day was the Technical Review. Highlights:

Key participants were:

Jack Pesques	Chief Engineer, Luxury VC
Chuck Peske	Program Engineer, Town Car
Ann O'Neill	Quality Directory, Luxury VC
Sam Cole	Manager Large Vehicles Electrical Systems

Next Tech Review: Every Thursday, implies core team prep meeting every Wednesday.

- There is a need to have the ability to implement, whatever solution is decided, in two months max.
- Next meeting with NHTSA is next week, as part of their regular quarterly meetings. Town Car underhood fires will be high on the discussion list, and the expectation (hope?) is that Ford will be able to get 2 months time to implement a solution.
- There is a very urgent need to re-create ignition in the lab. They kept coming back to this again and again.
- There was considerable concern that the field data set is not complete, and Joe Nemi has been tasked to get a clearer picture of the events breakdown.
- There were strong feelings of "got to do more".
- Fred's statement that "TI Engineering is resident here" elicited a "Good" response.

I met with Fred 2/12 morning to capture his thoughts on follow up actions:
- Need a "raft" of experiments to accelerate kapton wear. Need to design and execute a DOE with temperature, moisture, disc energy, contaminants (soap, detergent), # of kapton layers etc as factors. I will close with Bryan on this. We need a plan with timing by next Wednesday.
- Looks like we may need 2 - 3x life. Will need to establish real application requirement for 10yr/150k miles, 500k is not enough. What solutions can TI evaluate and put into place in 2 months.
- No potential solution should be eliminated for cost reasons.
- Having the switch hot at all times is not a good practice, and Ford will be internally working on a solution for this. I did not get a feeling that this is going to happen in the 2 month time frame established earlier.
- I have the formal workplan that Steve Reimers is coordinating. I will fax it to Andy today. Quite a few of the TI actions have been completed, but are open on the list. I will work with Steve to close these out.

I have a meeting with Central Labs folks at 1.00 today to look at kapton from non-fire, non-leak switches with varying mileage. This will be key in trying to correlate kapton aging in the field as opposed to lab tests. Bryan, can we do this with the switches we pulled from the field with known mileage. Can we swap parts in used cars, say at Tascar? Today PM, we will meet with Greg Stevens, materials guy at AVT who has been tasked with getting Dow in the loop.

With Fred out next week, Steve Reimers will be main TI liason. I do plan to continue my field assignment for another week, and will evaluate need for further extensions at the end of next week.

FYI, I have a phone & pager now. Thanks Andy. I felt like "Far From the Maddening Crowd " (Thomas Hardy) without the comm-link!
Phone: 606-206-6119
Pager: 1800-946-4646, pin 604-2042

Regards
Aziz.

Porter
EXHIBIT NO. 16

TI-001074

EA82-825-R 12865

Epstein, Sally

From:	Beringhause, Steven [sberinghause@email.mc.ti.com]
Sent:	Friday, February 12, 1999 8:38 AM
To:	Porter, Fred (Ford)
Cc:	McGuirk, Andy; Rahman, Aziz
Subject:	Ford Town Car Issue



Fred,

Attached in this message is a 77PS overview document that discusses the seal for the 77PS. I think this puts into one document answers to several questions your team has been asking about the 77PS design(we will mail you a copy of the report with the attachments referenced in the report). I have also attached the schematic of the proposed relay circuit and a cover letter describing the use of that circuit. My understanding is that you did not receive the fax I sent to you on this on 2/8. Please send me a quick email just to confirm that you received this and you were able to open the attachments. The schematic did not scan well, it is a little hard to read. Aziz has a hard copy that can be photocopied if necessary. Please feel free to give me a call with any questions you have. (508)236-3378.

<<FordTC1>> <<77PSOverview>> <<present proposed2.ppt>>

Steve Beringhause

Porter
EXHIBIT NO. 27

Steven Beringhause
Design Engineering Manager
Texas Instruments Incorporated
Attleboro, MA 02703

February 8, 1999

Fred,

As we discussed over the phone Friday, per your request we looked at the possibilities of adding a fuse in line with the pressure switch, however, we think a more appropriate solution might be to use a relay circuit (schematic attached). Our understanding of the application is that the brake preasure switch is a failsafe component to shut off the cruise control if the standard brake light switch fails. The brake switch therefore only needs to be powered when the cruise control is on. By placing a normally open relay in the circuit and only closing the relay when the cruise control is activated, the switch will only be powered when it needs to be, when the cruise control is enabled. If you are correct that the high current draw is the source of ignition a relay would be a better solution than an in line fuse because the relay prevents the high current situation from happening rather than reacting once it does occur. If you have any questions, please give me a call at 508-236-3378.

Regards,
Steven Beringhause

Proprietary Information

77PS Overview
2/10/99

TI's 77PS switch family has been specifically designed to operate in an automotive braking system. The pressure cavity of the switch has been designed to seal brake fluid pressure and transmit pressure and movement to the sensing portion of the switch over the life as defined in Ford ES -F2VC-9F924-AA.

Background:
The pressure cavity is composed of the hexport, gasket, and three Kapton ™ diaphragms (called out as "seal" on attachment 1.). The purpose of the gasket is to provide a fluid tight seal between the hexport and the diaphragms. The purpose of the Kapton ™ diaphragms is to provide a flexible fluid tight seal between the pressure cavity and the internal components of the switch. Furthermore, the diaphragms are intended to transfer pressure to the converter, and follow the movement of the converter as pressure in the pressure cavity (brake line pressure) is varied.

Two known ways that brake fluid may enter the contact cavity of TI's brake switches from the pressure cavity are i. brake fluid could leak past an impaired gasket seal, or ii. brake fluid could leak through a damaged or 'worn out' Kapton ™ diaphragm.

The Gasket:
In order to create a fluid tight elastomeric seal, there must be proper compression of the elastomer, sufficient backing of the elastomer to prevent movement when pressure is applied, and finally the elastomer must be compatible with the working fluid.

Fluid compatibility is typically established by the use of published tables. These tables list fluid groups and general material types. Lab testing is always done with the specific fluid that the customer has specified for the application along with the specific compound formulated by the selected gasket supplier. Ethylene Propylene is used in the 77PS and is standard throughout the industry for seal gasket materials. TI has been using this material in brake applications since 1988.

The gasket compression target was obtained from published industry standards (see Parker O-ring Handbook). In this particular design a nominal gasket compression of 24%was selected. The depth of the hexport gland shown on attachment #2 controls this attribute. This gland dimension is cut into the hexport at the time of manufacturing. As a result, this dimension in combination with the gasket dimensions determines the final gasket compression when the assembly is crimped together.

Lastly, the movement/position of the gasket when pressure is applied must be controlled and restrained. This design accomplishes this by selecting the outer diameter of the gasket to be slightly smaller than the inner diameter of the gasket gland of the steel plated hexport. Therefore, the hexport gland prevents the gasket from moving outwards when high pressure is applied to the switch.

The DFMEA outlines the types of tests that were selected and ran to confirm that all of these parameters are selected correctly. The resulting design was exposed to test conditions that were intended to duplicate actual application conditions, and in some cases go beyond the intended limits to failure. See the DFMEA Document number 503794 and customer specification ES-F2VC-9F924-AA . Specifically, burst testing, impulse testing, and thermal cycle tests were performed to confirm that the gasket performed as intended. The specific details of these tests and the results can be seen in the PV test report numbers listed below: (copies can be provided on request).

Test Report #	TI Switch Part number	Year Tested
1. PS/91/48	77PSL2-3	1991
2. PS/91/49	77PSL2-1	1991
3. PS/92/49	77PSL3-1	1992
4. PS/92/80	77PSL5-2	1992
5. PS/92/82	77PSL3-1	1992
6. PS/93/11	77PSL6-1	1993
7. PS/93/44	77PSL4-1	1993

Gasket-manufacturing anomalies can be produced from out of spec gaskets, contamination of the gasket or sealing surfaces, and as a result, may cause leaks early in life. In order to protect TI's customer supply chain from gasket-manufacturing issues there are several preventative actions in place. These actions include: hair nets, protective smocks, and cleaning procedures for the equipment. In addition, TI's automated assembly equipment has sensors to detected presence and orientation of the gasket and the 3 Kapton ™ layers. TI's customer return rates indicated by past return and analysis records are less then 1 ppm (one leaker return in 5 years from master cylinder leak testing).

Kapton ™ Diaphragms:
A pressure switch diaphragm must seal the pressure cavity, transmit pressure forces to the converter, and follow the converter motion without significantly affecting the switch calibration points. In addition, the diaphragm material must be resistant to chemical attack by the brake fluid.

Basically, a single piece of Kapton ™ in this design consists of a 0.003-inch thick polyimide film laminated on both sides with a 0.001-inch thick FEP Teflon film. The polyimide film has the ability to stretch without breaking (strains on the order of 70% before rupture), and the Teflon film is compatible with a wide range of chemicals. As a result of this layered construction, Kapton ™ was selected for its mechanical and chemical properties. Moreover, TI has been using this material in pressure switch applications since 1981. In this application three stacked Kapton ™ layers were used as the diaphragm seal.

To confirm the correct material was selected for this application we refer to the DFMEA. Specifically, this document identifies burst testing, impulse testing, and thermal cycle testing. These tests confirmed the Kapton's ™ ability to meet the specified requirements (PV reports listed above). Since temperature, chemical exposure, and stress levels all affect the life expectancy of the Kapton ™ diaphragms, additional testing is commonly done. A typical impulse test would include pressure cycles to 1450 psi, constant temperature of 135 C, and a cycle rate of 120 cycles/minute. Depending on the factors listed above, the life expectancy of a TI brake pressure switch can vary, but typically is around 1 million cycles which is well above the 500,000 cycles specified in the Ford specification (ES-F2VC-9F924-AA). (See Life Testing to Failure (PS/98/14))

In addition, continued conformance testing has been ongoing for many years at TI. The purpose of this testing is to confirm that the components, materials, and processes have remained stable over time and that the design intent is consistently being achieved. See attached IP reports which confirm 100% successful passing of all tests defined in the specification.

Manufacturing & PV anomalies such as pinched Kapton ™ can affect the Kapton ™ diaphragm seal performance (see PFMEA Document # 503831). Material/chemical compatibility and stress/strain concentrations can also cause the Kapton ™ diaphragms to fatigue. See DFMEA Document number 503796. In order to verify the correct design parameters were selected, the switch was subjected to a number of tests designed to simulate accelerated life testing of the application. See PS reports called out

above. Life testing per the customer specification (ES-F2VC-9F924-AA) has shown acceptable performance.

Typically, Kapton ™ fatigue occurs well over 0.5 million full-scale pressure cycles in our history of simulated and accelerated life testing. When Kapton ™ fatigue does occur, there are visual signs of de-lamination, cracking, and embrittlement. The Kapton ™ diaphragms break down first in the areas of highest stress and or strain. Typically, the first region to show break down is the circumferential area surrounding the converter button. See Endurance Test (report # PS/98/53). Again, diaphragm life depends on stress levels (pressure magnitude applied), temperature, and chemical exposure. The above mentioned tests were conducted in TI's Life Test lab with relatively controlled conditions.

Water has been shown to accelerate the aging of the base polymide. Water can be introduced in two known ways:

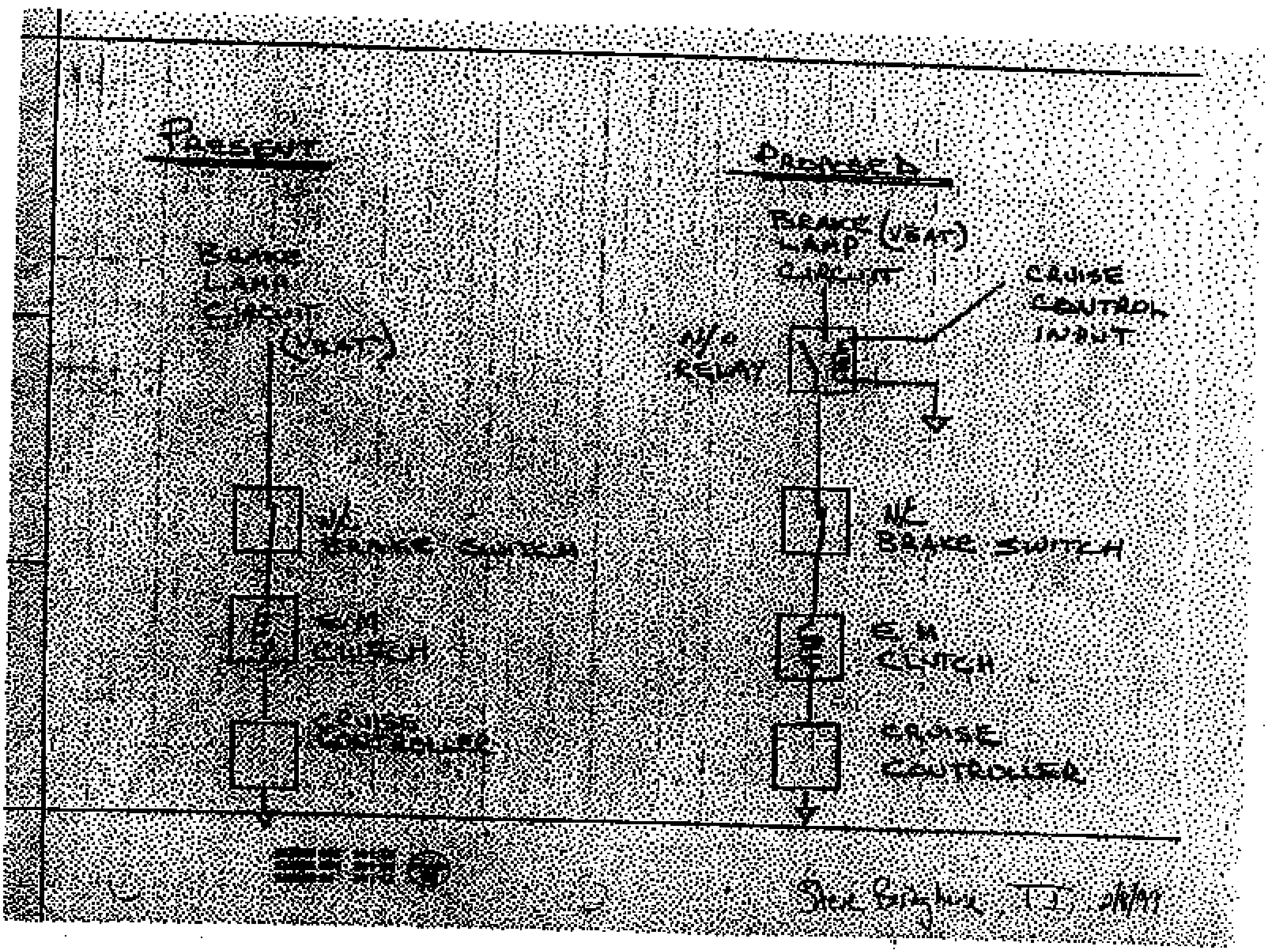
1) By entering the contact cavity via the electrical connector
2) By being in solution in the brake fluid and entering the switch via the pressure port.

When water enters the connector it will "age" the Kapton ™ diaphragms and make them appear as though they have reached the end of life. This condition leaves visual clues. Classic signs of chemical attack of the Kapton ™ include de-lamination of the Teflon from the base polymide base, embrittlement, and cracking of the base polymer. See Endurance Test (report PS/98/53).

Authored by Bryan Dague. Call Andy Mcguirk or Bryan Dague with questions.

77PS Overview Appendix

1. Pressure Switch Cross Section
2. Hexport Print (TI # 36900)
3. Gasket Print (TI# 74353)
4. DFMEA for Gasket and Kapton Seal
5. Life Test to Failure Test Report (Weibull Analysis)
6. Customer Specification (ES-F2VC-9F924_AA)
7. PFMEA
8. IP Test Reports
9. Endurance Test Report



Joe Neme	JNEME	Dan Kulkami, UTA
John McInerney	JMCINERN	Dick Radkey, UTA
Fred Gaynier	FGAYNIER	RATKE
Malcolm Lunn	MLUNN	
Fred Porter	FPORTER	
Will Dixon	WDIXON2	
Tom Masters	TMASTERS	
R. English	RENGLIS1	
Joe Kafati	JKAFATI	
Steve LaRouch	SLAROUCH	
Clark Thomas	CTHOMAS5	
Norm LaPointe	NLAPOINT	

Meeting 2-12-1999 w/ UTA, 1:00pm at Central Laboratories, Small Conf. Rm.

Subject: Connector F2AB 14A464 ADA
Agenda:

1. Obtain drawings for F2AB-14A464-ADA connector & components from UTA.
2. Obtain components for above connector (5 sets).
3. Obtain and discuss FMEA
4. Discuss sealing details & history of above connector.
5. Obtain the visual characteristics of: water, brake fluid, or other materials that could enter the connector or the wires.
6. Discuss assembly difficulties to seal joint.
7. Hand off 10 press. switch assemblies to UTA.
8. Develop game plan to dis-assemble and examine the submitted connector from Reddick veh.

file/ 14a464/nr/wp

Porter
EXHIBIT NO. 25

3713 6982

PRODUCED BY FORD

1. Will silicone sponge pass moisture
2. Both seals are sub. cont. red & gray
3. Housing is UTA molded
4. UTA – sole supplier
5. gray seal – lubricated for X time.

a. Check short to ground on flap of key switch.

(4) Field Review Connector

(1) check for correct engagement of connector to base: if not & current > X-ray for terminal fit-up.

(2) Trace evidence of less than full engagement dist witness lines.

(3) Wicking check on wire insulation, cut wire mark.

(4) Visual check on red seal for dist lines & indents 360°

(5) Visual check on Base cavity for debris. & ~~the~~ corrosion discoloration on terminals.

9/4

****
* Note printed by FPORTER on 12 Feb 1999 at 13:02:52 *
****

From: DGOEL --DREN005 Date and time 02/12/99 07:35:57
To: FPORTER --DREN007

FROM: Deepak Goel USART(UTC -08:00)
Subject: TOWN CAR INVESTIGATION
Fred,
From an infrastructure point of view is there anything that is not being done? I thought we had a full time task force working on this already.

Call me pls.

Regards,
Deepak Goel, Manager Restraints,Power Supply,Chassis & EMC
Bldg #6, MD 6011, room 2A019
(313) 33-75771, Fax: 42-14852, E-mail: dgoel@ford.com
*** Forwarding note from SCOLE1 --DREN005 02/11/99 17:41 ***
To: TDONOVAN--DREN005 DGOEL --DREN005
cc: CWILSON32--DREN005

From: Sam L. Cole USART(UTC -05:00)
Subject: TOWN CAR INVESTIGATION
JUST A HEAD'S UP.

I JUST LEFT THE TECH REVIEW FOR THE TOWN CAR NHTSA INVESTIGATION. THIS IS VIEWED AS A SERIOUS ISSUE AND FORD IS LATE IN RESPONDING (FROM NHTSA'S VIEWPOINT).

JACK PASKUS REQUESTED A 'TASK FORCE' BE FULL TIME ON THIS TO MAKE SURE WE 1) ESTABLISH ROOT CAUSES, 2) IDENTIFY WHICH VEHICLES ARE POTENTIALLY AFFECTED, 3) IDENTIFY CORRECTIVE ACTIONS AND 4) IMPLEMENT THE ACTIONS IN THE FIELD. NHTSA WILL BE IN NEXT WEEK TO MEET WITH ASQ. ASQ WILL ADVISE THEM THAT A TASK FORCE HAS BEEN STARTED AND WE WILL HAVE RESULTS IN 2 MONTHS.

JACK ASKED FOR A WEEKLY MEETING WITH HIM ON THIS. HE ASKED FOR HELP TO HAVE AN ELECTRICAL SYSTEM CHAMPION OVERSEE THE EFFORTS. TIM, I VOLUNTEERED YOUR NAME AND ADVISED JACK THAT I WILL ALSO HELP OUT. JACK REQUESTED THAT YOU AND/OR I ATTEND THE WEEKLY UPDATE MEETING WITH HIM.

DEEPAK AND TIM: WE NEED TO MAKE SURE OUR PEOPLE HAVE WHATEVER SUPPORT AND OVERTIME THEY NEED OVER THE NEXT SEVERAL WEEKS TO GET AHEAD OF THIS. I HAVE ASKED BOB ENGLISH TO TAKE THE LEAD ON LOOKING AT THE CONNECTOR TO DETERMINE IF THERE IS ANY POTENTIAL LEAKAGE PATH TO GROUND, EXTERNAL TO THE SWITCH THROUGH THE CONNECTOR OR WIRING. FRED HAS THE LEAD ON THE INTERNAL SWITCH INVESTIGATION. TOM HAS THE LEAD ON THE OVERALL SYSTEMS LOOK.

SOMEONE IN THE MEETING (NOT SURE WHO IT WAS) MENTIONED AN OUTSIDE AGENCY THAT FORD HAS USED BEFORE TO GO LOOK AT VEHICLES, TAKE PHOTOGRAPHS ETC. AS THE VARIOUS CLAIMS COME IN. TOM WILL FOLLOW UP ON THIS.

I AM REQUESTING YOUR PERSONAL INVOLVEMENT OVER THE NEAR TERM UNTIL WE KNOW BETTER WHAT THE ISSUES ARE AND HOW LARGE THE CONCERN IS. THE PERCEPTION OF JACK AND THE TEAM IN TODAY'S MEETING IS THAT THIS MAY AFFECT ALL TOWN CARS BUILT SINCE 1992, AND POSSIBLY CROWN VIC & GRAND MARQUIS. PLEASE ADVISE IF YOU WOULD LIKE TO DISCUSS THIS FURTHER.

Porter
EXHIBIT NO. 29

TI-002050

Work Plan- Brake Pressure Switch

Root Cause Investigation-

Identify flammability characteristics of switch components
- AVT EESE Materials Engineering

Identify switch contaminants in parts returned from the field
- Central Lab analysis

Identify potential source of contaminants
- Central Lab analysis

Identify potential for and possible sources of internal brake switch leaks
- Central Lab and Texas Instrument

Identify potential ignition sources during switch operation/malfunction
- AVT EESE Chassis Electronics

Simulate potential switch malfunctions in a laboratory environment to evaluate the potential for ignition
- AVT EESE Chassis Electronics

Collect additional field samples (including connectors) for laboratory analysis
- LVC - Safety

Root Cause Investigation Tasks

What are the combustibles?

AVT EESE Materials Engineering

Are the switch materials compatible with brake fluid?
by 2/18/99

Are the switch materials compatible with brake fluid in an electric field?
by 2/18/99

Are the switch materials compatible with brake fluid and contaminants?
by 2/18/99

Are the switch materials compatible with contaminated brake fluid in an electric field? by 2/18/99

Flash points for all materials? by 2/18/99

What is the difference in the base materials that look different?
Texas Instruments by *complete*

What are the material call-outs for 1992 and 1993?
Texas Instruments by 2/18/99

What are the contaminants in returned parts?

Central Lab analysis

Results of Memphis part analysis by 2/18/99

Results of testing with corrosion simulation?
AVT EESE Chassis Electronics by *complete*
Black corrosion recreated in lab on virgin parts. Given to Lab for analysis

TI analysis results of the Memphis parts (crease marks in diaphragm, etc) ?
Texas Instruments by 2/18/99

4/9

What is source of contaminants?

Central Lab analysis by 2/18/99

What causes brake fluid leakage? **By 2/24/99**

Central Lab and Texas Instrument

What does TI DFEMA say about this failure mode?

Texas Instruments by 2/16/99

What are TI in-process test failures?

Texas Instruments by 2/16/99

Does the event occur only on vehicles with ABS?

LVC-Safety by 2/18/99

What heat source(s) start event?

AVT EESE Chassis Electronics

Analysis of harness pig-tails

AVT EESE OPD by 2/18/99

Recreate Event in Lab

AVT EESE Chassis Electronics

What does it take to start an event? by on-going

If a switch is contaminated can it start the event? by on-going

Switch with clean Brake fluid inside is being monitored for increase in leakage current.

If current is stopped does combustion stop?

Collect Field Samples

LVC - Safety

Collect Brake Pressure switches and speed control servos with harnesses attached. By 2/22/99

TI-002053

5/9

Miscellaneous

Can the switch act as a fuse?

Team by complete

No.
Could a fuse (e.g. 2 amp) be added in series between the stop lamp fuse and the brake pressure switch? Failure parameters would have to be known.

What are descriptions from AWS and CQIS?

LVC-Safety by 2/18/99

What are we seeing in returned Speed control modules (FRACAS)?

Visteon Speed Control by 2/17/99

Provide color photos of Econoline?

Texas Instruments by *complete*

There are no color photos.

6/a.

Containment / Corrective Action Tasks

Competitive Vehicles

How is switch packaged?
Is it always Powered (HOT_ALL_TIME) ?
Are the contacts opened when pressure applied?
What is fuse limit?
What is being switched?
Is it a redundant switch?

AVT EESE Competitive Analysis by 2/24/99

What does Speed control FMEA say about Brake Switch ?

Visteon Speed Control by *completed*

The Brake Pressure Switch (Deactivation Switch) coupled with the Stop Lamp switch are categorizes as "Automatic Deactivation". The FMEA lists Automatic Deactivation" as current design control for 66 different potential cause/ mechanical failures.

Brake Pressure Switch (Deactivator Switch) is one of the most important safety features.

When was non-Pressure actuated switched introduced?

AVT EESE Chassis Electronics by *completed*

95 Continental and T/Bird were first to use it.

Is the Circuit drive hi-side or low-side?

Visteon Speed Control by *completed*

Circuit is low side driven.

How does speed control use this switch?

Visteon Speed Control by *completed*

1. *Brake Pressure Switch provides electrical power to the speed control servo clutch circuit The clutch circuit needs to be energized for the servo motor to pull the cable.*

2. *Switch provides a redundant method of sensing brake application independent of the primary system deactivation mode; this is a SDS (SC-0005) requirement.*

- *Signal from the stop lamp switch is primary deactivation mode for brake application.*
- *Under "hard" braking condition; Brake Pressure Switch provides redundant brake signal to the speed control logic (similar to stop lamp switch signal) and disconnects power to the clutch circuit; causing the speed control servo pulley to immediately return to the idle position. Note: Under normal braking conditions, only the stop lamp switch signal cancels speed control operation.*

Do all Ford applications use switch between fuse and load?

Visteon Speed Control **by** *complete*

YES

Do all Ford applications have switch connected to HOT-ALL-TIMES?

AVT EESE OPD **by** **2/18/99**

Can Brake Pressure Switch function be removed from power feed circuit and placed in ground return circuit?

Visteon Speed Control **by** *completed*

1. *Would require redesign of the speed control electronics.*
2. *Additional isolated ground circuit is required.*
3. *From FMEA position switching the ground circuit is not as good as switching the B+ feed.*
   - *With a ground return circuit; short to ground (fault) it would override the deactivation switch.*
   - *With the current power feed circuit; short to ground make the speed control system inoperative. A short to power is required to override the deactivation switch; much lower potential to occur.*

Why is this switch connected to HOT-ALL-TIMES?

Visteon Speed Control **by** *completed*

Because the SDS requires it to be connected to the same fuse as the stop lamp.

8/4

What is SDS requirement number?

Visteon Speed Control **by** *completed*

SDS (SC-0068) states: The stop lamp switch and redundant deactivator switch must be on the same fused circuit.

Is it feasible to disconnect the switch as immediate containment?

Yes. The customer will not have use of the speed control.

Is it acceptable to Jumper out the switch as immediate containment?

Visteon Speed Control **by** *completed*

NO... Would eliminate an important safety feature of the speed control system. The Brake Pressure Switch provides the redundant method for sensing brake application independent of the primary system deactivation mode. This is an SDS (SC-0005) requirement.

Elimination of this feature requires the concurrence of the OGC.

Other recommendations for immediate containment?

All **by** **on-going**

Add fuse between the stop lamp fuse and the brake pressure switch?

Note printed by FPORTER on 22 Feb 1999 at 17:54:19

From: JOYCE1 --CRSN007
To: JAMES --CRSN007
cc: FPORTER --CRSN007

Date and time 02/18 99 12 40.41

FROM: John Joyce
Subject: (U) Pressure Tests

USART(UTC -05:00)

Steve,

I got your note and will be on vacation tomorrow through Wednesday. Here's the info.

The more I think about this, the more I think TC activation may be the mechanism.

I am not sure of the order of the things connected and that can influence the low frequency amplitude of the signals. But the short answer is to instrument for 0-150 Bar and sample at 1 kHz or more.

Since I'm not sure of where the pressure switch is hydraulically connected I'll give you pressures at nodes and states I do know. The worst case for the switch would be to be connected between the HCU and the prop valve, which is where I think it is.

This is the low frequency component of the signal. I'll talk about the high-frequency component further down.

MC - HCU NODE
Maximum Pressure - ~175 Bar
Achieved by getting maximum vacuum (high revving engine and suddenly close throttle) then standing on the pedal as hard as you can. I don't remember this number very well it might be as low as ~130 or as high as 220. It also depends on your leg strength. This type of pressure is VERY RARE at this node. For this car, the driver will typically apply <20 Bar and very rarely exceed 50 bar.

HCU - PROP VALVE NODE
Standing Still - Same as MC pressure - see above.

ABS Maximum - ~110 Bar
This is achieved by loading to GVW and performing an ABS stop, you may find that you are pedal effort limited, not limited by ABS control. It's pretty rare to get this high of pressure in this mode.

TCS Maximum - ~180 Bar
This is a good candidate. On this vehicle because the HCU had to pump through the prop valve to do the brakes-only traction control, the pressures coming out of the HCU got very high. The pressure relief valve on the pump VERY often dictated the peak pressure which could be developed - not the control - put another way, because the pressure at the rear brake had to restrain the entire powertrain (no engine intervention) and push through a prop valve, it was often possible to drive through the TC - the engine could overpower the brakes, even though very high pressures were being generated at the HCU. The noise during TC activation in these applications was very dependent upon the pressure relief valve opening point. So the

3713 1388

Porter
EXHIBIT NO. 30

PROPERTY OF FORD

ER02-025-A 12883

pressure relief valve value got changed a few times over the years as performance was sacrificed for NVH. Also the tolerance on the pressure relief valves was fairly large - a total of 41 Bar, at that time I believe The pressure relief valve pressure might be anywhere from 89 to 130 Bar depending on part-to-part variation and the design generation that was agreed upon.

You can achieve this easiest by getting the rear wheels off the ground and putting the car in drive. Get into the throttle hard, but not so hard that you drive out of first gear or faster than ~15 mph. If you maintain this for a while, the thermal model to protect the rear linings will disable the Traction Control. You will then need to wait for them to cool, before the function will be reenabled. You can dramatically accelerate the cooling time by cruising (without braking) at about 40 mph.

Typical drivers can regularly get high pressures in this mode.

PRC# VALVE - REAR BRAKE MODE
ABS Maximum Pressure ~70 Bar
Load to GVW and perform an ABS stop at maximum pedal effort.

TCS Maximum Pressure ~190 Bar
This pressure level is strongly dependant upon the pressure relief valve level - see above.

Standing Still
Same as ABS Maximum Pressure

High Frequency Content
The high frequency content has two parts. If you are not in ABS or Traction Control there is practically no high frequency content - the pressure is modulated at <10 Hz. This is basically limited by Booster response times and hydraulic dampening in the ABS orifices.

High Frequency Content Due To Control
During ABS/TC events the pressure is changed in quick steps. Typically it will increase by ~10 Bar in a few milliseconds, and this type of change occurs about every 100ms. The pressure will decrease by about 30 Bar every 100 ms. There can be quite a bit of variation in these numbers, but those are pretty typical. (Actually the numbers I assigned were for ABS, swap "increase" and "decrease" for TC activation.)

High Frequency Content Due to Shock Waves
This is a secondary effect from the control. Generally it is worst right at the outlet of the HCU. It is dampened and dissipated the further you get from the HCU. The shock wave is generated from the cyclical pulsing of the pump as well as the sudden changes in pressure when a solenoid valve is snapped open or shut.

The amplitude of this can be really big - I haven't looked at it in this generation unit for a few years, but I think it's about 50 Bar peak-peak right at the HCU. It will fall off as you move further away from the HCU.

The frequency is pretty high and I think some components are above the 1 kHz level, but you can get a very good idea of the disturbances by sampling at ~1kHz

Regards,
John Joyce

Note printed by FPORTER on 4 Mar 1999 at 11:09:55

From: SLAROUCH--FORDNAL Date and time 03/02/99 11:56:23
To: FPORTER --FORDMAIL Porter, Fred (F.J. NLAPOINT--FORDMAIL LaPointe, Norman
SREIMERS--FORDMAIL Reimers, Steve (S. I2060625--EXTERNAL 'A. Rahman'
SMCCARTI--FORDMAIL McCarthy, Shaun (S SLAROUCH--FORDNAL LaRouche, Steve (S

From: LaRouche, Steve (S.)
Subject:

We have found three switches so far (including the one to be analyzed by the Sci Lab), that will not open electrically when disc is heard to snap under application of air pressure. I sectioned one of these switches and found what appears to be water (it evaporated rather quickly at room temp) and corrosion product. I found that the transfer pin has been stuck in place by the corrosion products. What this means, is that even if the disc snaps, the pin will not pull back, and the contacts will not open. None of these switches showed evidence of diaphragm leakage on the test stand.

Steve LaRouche [SLAROUCH]
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4876 (313) 322-1614 FAX

Porter
EXHIBIT NO. 31

****
* Note printed by GSTEVEN1 on 10 Mar 1999 at 07:12:21 *
****

From: SREIMERS--DRBN007 Date and time 03/08/99 15:08:38
To: GSTEVEN1--DRBN005
cc: SLAROUCH--FORDMA1 FPORTER --DRBN007 Porter, F.J.

FROM: Steve Reimers USAET(UTC -05:00)
Subject: RE: Town Car Testing
Greg, the brake cleaning fluid should be checked for contents that may be harm
ful to the BP switch. At MPG last week I observed the mechanic using it to cle
an the master cyclinder reservoir exterior and the area around the BP switch wh
ere the brake fluid had been dripping. Oxylate source?

Steve Reimers building 3 3E008
AVT Chassis E/E System Applications mail drop 5011
39-03286 SREIMERS sreimers@ford.com fax 39-03286 ;>
*** Forwarding note from JMORRIS6--FORDMA2 03/08/99 10:35 ***
To: SREIMERS--FORDMAIL Reimers, Steve (S.
cc: JGWISDAL--FORDMA2 Gwisdalla, Joe (J.

From: Morris, John (J.M.)
Subject: RE: Town Car Testing

I just FTP 27 test files to you and 1 excel sheet describing the test runs.
MPG will try to perform the low mu testing on Tuesday morning.

The brake parts cleaner # is
F6AZ-2CK10-AB

Ford internal Ref. # is
147124

John Morris
Michigan Proving Ground
Phone: 810-752-8770 Fax: 810-752-8656
jmorris6@ford.com

-----Original Message-----
From: Steve Reimers mailto:sreimers@gw.ford.com
Sent: Saturday, March 06, 1999 6:41 PM
To: Gwisdalla, Joe
Cc: jmorris6@mail.ford.com
Subject: Town Car Testing

Joe,
I will need more test runs. The 16 data sets I have so far do not have much
ABS event data. The transducer at the HCU must be checked to be absolutely
sure it is connected to the Prop-valve that has the Brake pressure switch. I
need some data from a low mu surface so that the rear has a long ABS event.
If
this means testing on snow then I can do without the fifth wheel channel so
you don't have to ruin it. I would like to see two data sets run at 40 mph
on
low mu. If the data looks good I will probably need 3 more similar runs.
If using a split mu surface helps go ahead, but be sure the low mu is on the
brake side that has the brake pressure switch.

Porter
EXHIBIT NO. 32

Stacy Balzer SBALZGG1 06765

Do These All Have Speed Control?

And Suspension?

SUMMARY

Reviewed 65 92/93 Crown Vic/Grand Marquis reports of which 46 were categorized engine unknown, engine off and underhood.

Of the 46 reports:
30 out of 46 are reported engine unknown.
16 out of 46 are reported engine off.

Of the 30 vehicles reported with the engine unknown:
9 are reported to be unknown probable cause.
4 are reported to be the alternator as a probable cause.
— 3 are reported to have started in the front of the car.
— 2 are reported to have started in the left front of the vehicle.
— 2 are reported to be the brake booster as a probable cause
— 1 is reported as brake light wiring touching brake fluid.
— 1 electrical short.
1 heating system
— 1 cowl area
— 1 master cylinder
— 1 would not shift out of park.
1 rupture hose.
1 starting system.
1 delta PFE hose burned.
1 air compressor

Porter
EXHIBIT NO. 33

Of the 16 vehicles reported with the engine off:
7 are reported to be unknown probable cause.
— 2 are reported to have started in the left front of the vehicle.
— 2 are reported electrical as a probable cause.
2 are reported fuel lines as a probable cause.
1 is reported as the fuel pump relay.
1 is reported as the starter.
— 1 is reported as the brake pressure switch.

A summary by jkafafi, x05389, created 3/8/99, revisions, page 1 of 1.

3713 1894

PRODUCED BY FORD

EA92-825-R 12887

Delivered to Andy M. 3/14/97 by Fax

Potential Actions

	Improve connector seal	Re-orient connector	Re-locate switch to brake pedal	Improve kapton diaphragm	Insert in-line fuse with switch	Add power off switch	Re-locate switch to ground side	Re-locate switch to RUN circuit	Insulate switch from prop valve	Use flame retardant plastic
Connector Seal	□	□	■							
Kapton Life			■	□						
Continuous Power					□	■	■	■	■	
Switch Orientation		□	■						□	
Current Capability					□	■	■		■	
Grounded Hex-port			■				■		■	
Plastic Parameters										□

■ = fixed
□ = improved

ES-00-022

ESD2-023-A 12598

Porter
EXHIBIT NO. 54

Shaun.Mccarthy

From: Shaun Mccarthy
Sent: Monday, March 15, 1999 8:10 AM
To: smccart3@gw.ford.com
Subject: SIT and brake switch overheating

Regards,
SHAUN McCarthy__SRL Room 1339 Mail Stop 1170
32-21355 FAX 32-31129
*** Forwarding note from CSTEPHAN--DRBN005 03/10/99 11:42 ***
To: SREIMERS--DRBN007 FPORTER --DRBN007
SMCCART3--DRBN005 Shaun Mccarthy ESICKAFU--DRBN005 Ed Sickafus
JDOSDALL--DRBN005 James Dosdall MFREELA1--DRBN005 Mark Freeland
MSMITH50--DRBN007 KAIELLO --DRBN005 Kelly Aiello
CSTEPHAN--DRBN005 Craig Stephan

FROM: Craig Stephan USAET(UTC -05:00)

Requester: Craig Stephan
Date to be scheduled: 03/11/99
Starting time: 02:00 PM
Ending time: 04:00 PM

Location: SRL-1529 (near Ed Sickafus office)

Subject: SIT and brake switch overheating

Purpose: Following introductory meeting of 3/10/99, this working meeting will use SIT to analyse 3 problems:

1. Improve present switch to prevent brake fluid/water ingress.
2. Find new way to provide redundant speed control deactivation.
3. Prevent corrosion leakage paths from starting a fire (in either present switch or new design).

Ú
Á Á ØeØ ÓÁØÚM
****

Porter
EXHIBIT NO. 35

Epstein, Sally

From:	McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent:	Friday, March 12, 1999 10:31 AM
To:	Beringhause, Steven; Dague, Bryan; Baumann, Russ
Cc:	Rowland, Thomas; Pechonis, John
Subject:	FW: (U) Brainstorming

AUTOMOTIVE SENSORS AND CONTROLS QRA MANGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3060
FAX : (508) 236-3745
PAGE: (800) 467-3700 PIN 604-2044

From: Frederick J. Porter[SMTP:fporter@ford.com]
Sent: Friday, March 12, 1999 9:01 AM
To: a-mcguirk@email.mc.ti.com
Subject: (U) Brainstorming

to: a-mcguirk@email.mc.ti.com

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax: 390-4145
*** Forwarding note from FPORTER --DRBN007 03/11/99 17:59 ***
To: N1654584--EXTERNAL

FROM: F. J. Porter USAET(UTC -05:00)
Subject: (U) Brainstorming

Andy,

Attached is a list of ideas that were developed by a group from our research laboratory of potential changes that could be made to the switch that may improve our condition. TI has investigated some of these already.

I would like you to go through each idea and let us know what your feasibility and manufacturing issues are as well as timing for their potential implementation.

1. Coat cup with plastic or other non-conductive coating (like anodizing)
   Lengthens corrosive path to ground
   Insulates from broken spring switch contacting ground

2. Make cup of non-conductive material
   Lengthens corrosive path to ground
   Insulates from broken spring switch contacting ground

3. Add plastic diaphragm between cup/transfer pin and the spring contact/switch cavity
   Additional layer of isolation between mechanical components and electrical components

4. Place plastic insulator disk on the cup with hole only for the transfer pin

Reduces surface area exposed between battery and ground

5. Replace kapton membranes with pure teflon membranes
   Increased flexibility of membrane

6. Replace kapton seal with sliding piston seal
   Eliminates wear on kapton

7. Change cup/converter topology
   Spread flexure over greater area of the kapton
   Reduce interfaces where extreme flexure occur

8. Replace switch with pressure transducer and semi-conductor switch
   Eliminates kapton seal

9. Design thermal link in power supply side of switch that opens at elevated temperature (one time or cycling)
   Turns off power before heat becomes great enough to cause ignition

10. Reverse polarity of switch contacts
    Removes power from spring contact if it moves out of position

11. Insulate/plastic coat spring except contact area
    Reduces corrosive exposure
    Reduces conductive material to making contact with ground

12. Gold plate spring contact
    Reduces corrosion

13. Fill air gap in switch housing with potting material to seal connector openning
    Seal off connector path of contamination

14. Change switch housing material for improved ignition parameters
    Reduces ability for flame to spread after initial heat source is removed

15. Add another layer to the kapton seal
    Possible increased life of seal before perforations occur

16. Add ground fault interrupter circuit to switch circuit
    Turns off power if ground path to case is detected

Regards,

Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313) 845-3722
Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax: 390-4145

Epstein, Sally

From:	McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent:	Saturday, March 13, 1999 8:01 AM
To:	Beringhause, Steven; Dague, Bryan; Baumann, Russ
Cc:	Rowland, Thomas; Baker, Gary
Subject:	FW: (U) Brainstorming

fred and team really like the last one....and it may be a very good solution as it deals with a method of de-powering which is near to our long term input to Ford.....TURN OFF THE POWER. this is done if a fault is detected....

when could we have an idea/concept? should we deploy this to an extended eng'g team outside us for 'invention' - delivery ?

a

AUTOMOTIVE SENSORS AND CONTROLS QRA MANGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
PAGE: (800) 467-3700 PIN 604-2044

From: Frederick J. Porter[SMTP:fporter@ford.com]
Sent: Friday, March 12, 1999 9:01 AM
To: a-mcguirk@email.mc.ti.com
Subject: (U) Brainstorming

to: a-mcguirk@email.mc.ti.com

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax: 390-4145
*** Forwarding note from FPORTER --ORBN007 03/11/99 17:55 ***
To: N1654584--EXTERNAL

FROM: F. J. Porter USAET(UTC -05:00)
Subject: (U) Brainstorming

Andy,

Attached is a list of ideas that were developed by a group from our research laboratory of potential changes that could be made to the switch that may improve our condition. TI has investigated some of these already.

I would like you to go through each idea and let us know what your feasibility and manufacturing issues are as well as timing for their potential implementation.

1. Coat cup with plastic or other non-conductive coating (like anodizing)
   Lengthens corrosive path to ground
   Insulates from broken spring switch contacting ground

2. Make cup of non-conductive material
   Lengthens corrosive path to ground
   Insulates from broken spring switch contacting ground

3. Add plastic diaphragm between cup/transfer pin and the spring contact/switch cavity
   Additional layer of isolation between mechanical components and electrical components

4. Place plastic insulator disk on the cup with hole only for the transfer pin

   Reduces surface area exposed between battery and ground

5. Replace kapton membranes with pure teflon membranes
   Increased flexibility of membrane

6. Replace kapton seal with sliding piston seal
   Eliminates wear on kapton

7. Change cup/converter topology
   Spread flexure over greater area of the kapton
   Reduce interfaces where extrame flexure occur

8. Replace switch with pressure transducer and semi-conductor switch
   Eliminates kapton seal

9. Design thermal link in power supply side of switch that opens at elevated temperature (one time or cycling)
   Turns off power before heat becomes great enough to cause ignition

10. Reverse polarity of switch contacts
    Removes power from spring contact if it moves out of position

11. Insulate/plastic coat spring except contact area
    Reduces corrosive exposure
    Reduces conductive material to making contact with ground

12. Gold plate spring contact
    Reduces corrosion

13. Fill air gap in switch housing with potting material to seal connector openning
    Seal off connector path of contamination

14. Change switch housing material for improved ignition parameters
    Reduces ability for flame to spread after initial heat source is removed

15. Add another layer to the kapton seal
    Possible increased life of seal before perforations occur

16. Add ground fault interrupter circuit to switch circuit
    Turns off power if ground path to case is detected

Regards,

Fred Porter OV - fporter fporter@fecd.com
Chassis E/E Systems Applications (313)845-3722

Bldg 5 - Mail Drop 5030 - Cubicle 36004 fax: 390-4145

****
* Note printed by GSTEVEN1 on 16 Mar 1999 at 06:45:46 *
****

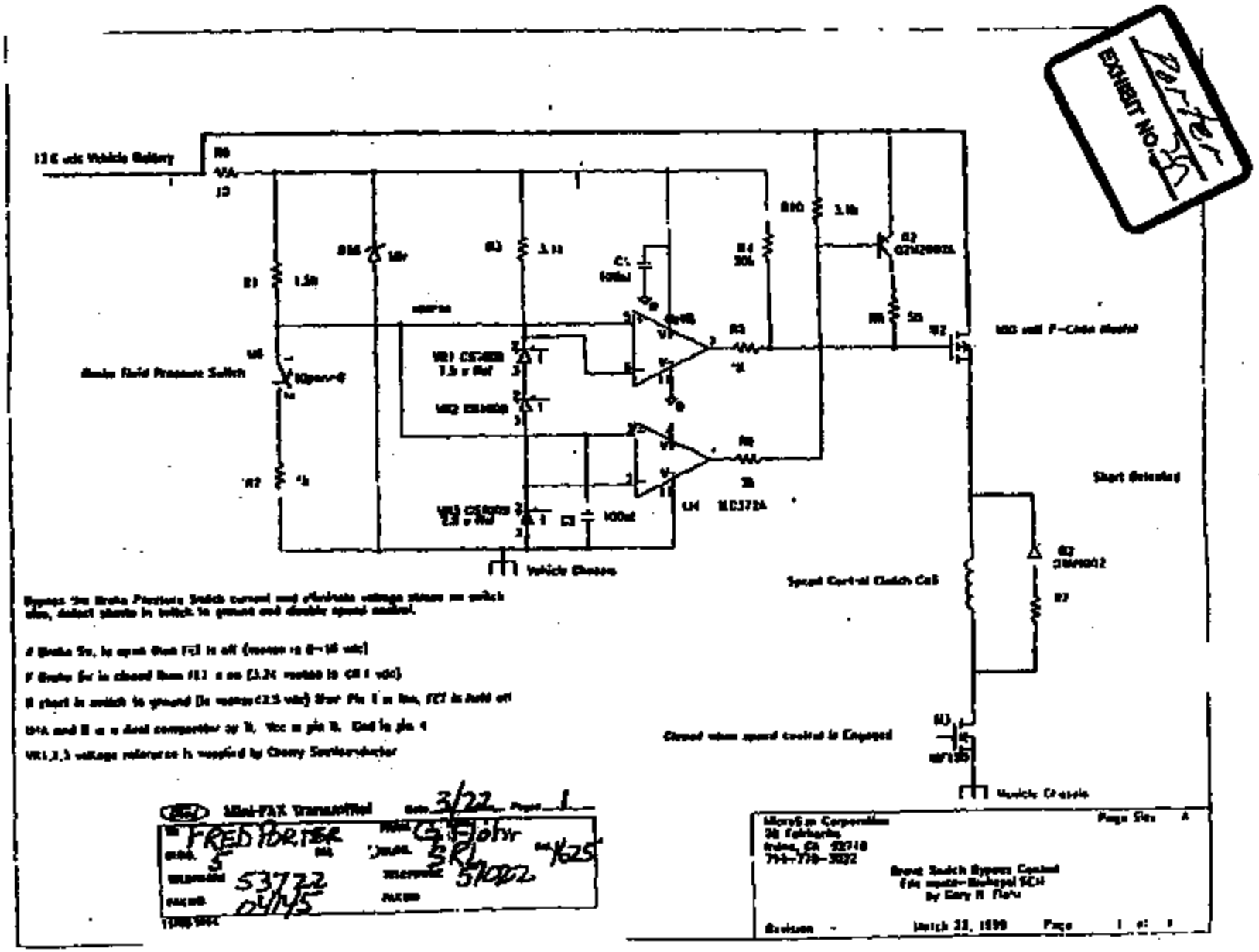
From: BPEASE --DRBN005 Date and time 03/15/99 16:34:17
To: KGRIBBLE--DRBN005 GSTEVEN1--DRBN005
cc: SREIMERS--DRBN007 FPORTER --DRBN007

FROM: Bruce Pease (BPEASE) USAET(UTC -05:00)
Subject: Non Conductor
In reviewing the speed control switch issue, it occurs to me that the switch might be isolated (not grounded) to the prop valve if we were to put an insulating spacer between the switch and valve in the form of a double threaded bushing. This bushing would have to have strength similar to steel and yet be a non conductor. I checked Marks Handbook and the resistance for steel (switch) is 95.8 (cir mil per foot), for aluminum (valve) is 17.01, and for cast iron is 448-568. Can a resistance path of 5x resistance cut the current back to an acceptable heating in dead short situation? The cast iron would be fairly easy to machine into bushings.
My question is: in the exotic world of materials, are there other candidates for bushing material? non-metallic?

Regards, Bruce Pease
R&VT-Adv. Brake Systems, 84-54774, fax 39-04145

Porter
EXHIBIT NO. 35

3713 6061



3713 2138

FIELD SERVICE ACTION EVALUATION PAPER (14D) TRANSMITTAL

FIELD REVIEW COMMITTEE

To: (North America)
Secretary, FRC
Suite 785
Diagnostic Service Center II
Ford Customer Service Division — North America

94015

To: (Europe)
Secretary, FRC
Room GB-1/329,
Ford Customer Service Division — Europe

The attached Evaluation Paper is being forwarded for review by the Field Review Committee. Copies have been submitted for review to:

Office of the General Counsel:	YES ☐	NO ☐
Vehicle Environmental Engineering:	YES ☐	NO ☐
Automotive Safety Office:	YES ☐	NO ☐
VC Purchasing Director	YES ☐	NO ☐

Subject: 1992-93 MY Town Car, Crown Victoria, Grand Marquis - Speed Control Deactivation Switch

Approve: _____
Vehicle Line Director

_____
Date

Approve: _____
Vehicle Center Engineering Director

_____
Date

Approve: _____
FCSD Vehicle & Service Programs Director

_____
Date

Note: Vehicle Line Director and/or VC Engineering Director signatures are required prior to Review by the Field Review Committee.

Porter
EXHIBIT NO 40

3713 5744

E982-825-A 12887 PRODUCED BY FORD

FIELD REVIEW COMMITTEE

To: (North America)
Secretary, FRC
Suite 785
Diagnostic Service Center II
Ford Customer Service Division — North America

To: (Europe)
Secretary, FRC
Room GB-1/329,
Ford Customer Service Division — Europe

The attached Evaluation Paper is being forwarded for review by the Field Review Committee. Copies have been submitted for review to:

Office of the General Counsel:	YES ☐	NO ☐
Vehicle Environmental Engineering:	YES ☐	NO ☐
Automotive Safety Office:	YES ☐	NO ☐
VC Purchasing Director	YES ☐	NO ☐

Subject: 1992 & 1993 Town Car Underhood Fires

Vehicle Line Director — *Vehicle Center Engineering Director*

5-6-99 — Date

Date

Note: Both signatures are required prior to Review by the Field Review Committee

3713 5745

1992 & 1993 Town Car ~~Underhood Fires~~ CROWN VIC, GR. MARQUIS SPEED CONTROL DEACTIVATION SWITCH

1. PROBLEM DESCRIPTION (what/when/extent)

A. NHTSA opened PE 98-055, dated November 24,1998, into "... 21 reports of engine compartment fires in 1992 and 1993 Lincoln Town Cars." Our investigation into these reports indicates the ~~brake pressure~~ switch may be involved in some of the reports.

The ~~brake pressure~~ switch was introduced on the 1992 Town Car in November 1991, as part of the Electronic Speed Control system. The same ~~brake pressure~~ switch was introduced on the 1992 Crown Victoria and Grand Marquis in February 1992. The switch wiring and packaging location are similar on all three vehicles.

Internal brake fluid leakage is one of the reasons service technicians remove ~~brake pressure~~ switches. Internal corrosion of the electrical switch components is observed in ~~brake pressure~~ switches with brake fluid leakage. Chlorine is not evident in these switches.

B. The ~~brake pressure switch~~, F2VC-9F924-AB (service part F2VY-9F924-A) is the redundant speed control deactivation switch (CPSC 060605) for the Electronic Speed Control that is standard on all Town Cars built between November 1991 and Job #1 MY1998 and is an option on Crown Victoria and Grand Marquis.

C. Vehicles Affected —

Model Year (s)	Vehicle Lines	Vehicle Volume	Variants	Other Limiting Factors
1992, 1993	Town Car	123,310	all	none
1992, 1993	CV/GM	155,335	all	With Electronic Speed Control

D. Markets Affected: All markets.

E. Corporate Product Systems Classification (CPSC) code(s) 06.06.05

USE THIS TERMINOLOGY THROUGHOUT PAPER IN PLACE OF BRAKE PRESSURE SWITCH

3713 5746

2. DEFINE ROOT CAUSE

A. Though we have not definitively identified the root cause, the ~~brake pressure~~ switch appears to be susceptible to brake fluid leaks and corrosion that may create a conductive path in the switch resulting in overheating. Analysis performed on field samples of the ~~brake pressure~~ switches involved in underhood fires has not allowed us to conclude that the ~~brake pressure~~ switch was the cause of the fires. Analysis performed on ~~brake pressure~~ switch field samples not involved in fires suggests brake fluid enters some of the switch cavities through cracks in localized brittle portions of the internal Kapton diaphragm or other contaminants through the electrical connector seals. This contamination in the presence of a continuous electrical potential is favorable to causing corrosion. Corrosion products inside the ~~brake pressure~~ switch cavity could create a conductive path between the uninterrupted battery power and ground. During lab testing, intended to create internal corrosion, it was observed that a conductive path to ground carried an increasing leakage current of 1 to 2 amps average at 14 volts, with transients of 10 amps at 14 volts. These lab conditions were capable of melting or igniting the ~~brake pressure~~ switch plastic bases in a 3 hour controlled environment (see chart #1).

In normal operation, the switch leakage current is expected not to exceed 0.0001 amps. The switch contacts normally conduct up to 0.75 amps to the speed control clutch when speed control is engaged and 0.005 amps when not engaged. The current into the switch is limited by a 15 amp fuse and is supplied by a circuit that is always energized.

B. The Ford process intended to prevent the diaphragm leakage and connector seal contamination is the engineering specification (ES-F2VC-9F924-AA) which requires:

- electrical current leakage to the housing (ground) not to exceed 0.0001 amps;
- proof test... no evidence of fluid leakage, seepage, or drop in test pressure greater than 62 psi (in 30 seconds) is permitted;
- 500,000 Impulse cycles at 224° F ambient using 275° F brake fluid;
- 80 hours of humidity cycling;
- 72 hours of Salt spray; and
- in-process testing to control the quality of the component.

C. The design process did not prevent this issue because DV testing did not evidence any leaking diaphragm or connector seal leakage or internal switch corrosion. The potential effect of creating a conductive path caused by contaminants on the internal switch metallic components was not anticipated in the brake pressure switch design FMEA. ES durability testing did not evidence a leaking diaphragm nor connector seal leakage nor internal switch corrosion.

D. Please check the applicable item(s) in each category:

- Type: ☐ Design ☐ Manufacturing ☐ Vehicle Assembly
  ☐ Other (If other, specify ___)
- System: ☐ Body ☒ Chassis ☐ Cooling ☐ Fuel ☒ Electrical ☐ Engine
  ☐ Glass ☐ Restraints ☐ Transmission/Axle
  ☐ Vehicle Label/Publications ☐ Emissions Control
  ☐ OBD ☐ Other (If other, specify ___)
- Symptom: ☐ Brake Control ☐ Emission Compliance
  ☐ Other Regulatory Compliance ☐ Driveability/No Start
  ☐ Engine Speed Control/Unexpected Movement ☒ Fire
  ☐ Steering Control ☐ Occupant Restraint ☐ Personal Injury
  ☐ Visibility ☐ Warranty/Serviceability/Customer Satisfaction
  ☒ Other (If other, specify Speed Control Inoperative)

3. PROBLEM INVESTIGATION/VERIFICATION DATA

A. Lab Test

Lab experiments were performed to reproduce ignition or melting as suggested by analysis of field returns and data. (see Attachment 4) These tests were done with a variation of brake fluid concentrations, water and salt to develop a model to understand the factors contributing to thermal events. These tests did not result in a melting or ignition with brake fluid or water. A salt water solution procedure reliably produced melted switches and some ignited plastic switch bases. This is shown in attachment 4 test 6b.

The test parameters used to create melting or ignition in an accelerated lab environment are:

Voltage: 14 volts dc
Current Limit: 15 amps
Solution: 5% NaCl and tap water
Orientation: connector 45° from vertical (in-vehicle orientation)

Procedure: Apply voltage between the switch contact components and the switch metallic base (normal operating condition). Inject salt water solution into the pressure switch cavity through the connector body. Repeat injection as water is boiled away. In 2 to 3 hours, the plastic switch bases will begin to melt and some will ignite drawing 1 to 10 amps of switch leakage current to ground.

This model was used to verify that the proposed relay and wire harness overlay is a robust modification for this concern.

Attachment 4 below lists tests that shows test details.

Include a summary of all of the paths we have investigated. Include the chart.

Include a discussion of change history—looked and found no pattern?

B. Vehicle tests: Vehicle tests were performed on a 1992 Town Car to determine the pressure applied to the ~~brake pressure~~ switch. Maximum pressure seen in these tests did not exceed the maximum test pressure of the engineering specification for the part. No fire or smoke was observed.

C. Plant/Supplier Reports: The Town Car, Crown Victoria and Grand Marquis assembly plants no longer used this part after mm/dd/ 1997. There were no plant or supplier reports..

D. Quality Indicators: 13 of 47 engine off-or-unknown fire incidents reported in MORS and CQIS on 1992 and 1993 Town Cars mention the ~~brake-pressure~~ switch or a symptom related to a ~~brake-pressure~~ switch failure. (See attachment 1)

Fire allegations on Town Car, Crown Victoria and Grand Marquis declined for vehicles built after November 1992. (see attachments 1& 2) Based on a review of fire allegations potentially related to the ~~brake-pressure~~ switch, the trend demonstrates that the affected vehicle population was built between November 1991 and November 1992.

The mileage at the time of the fire, of the vehicles involved, is 60,000 to 100,000 miles and the average time-in-service is 48 to 72 months (see attachment 3). Vehicles built after the affected population, predictably have reached this mileage and time-in-service for build dates up to BBBBBBB and do not show a similar fire incident rate.

E. Field Reports: Two separate incidents of observed flames on the ~~brake-pressure~~ switch were reported by mechanics servicing Town Cars.

Additionally, 48 switches from U.S. vehicles have been collected.

The results of examining these follow:

- 30 functioned correctly with no fluid leakage evident.
- 10 are alleged to be involved in fires.

- 6 leaked brake fluid through the Kapton diaphragm. These had black or dark green residue (containing Brake Fluid, Zinc, Copper, Sulfur) on the terminals and/or cup. 4 due to brittle cracks.
- 3 would not open the switch contact
- 1 had high switch contact resistance
- 8 showed transfer of brass contact material to cup (4 fire / 4 leakers)
- 2 missing movable contacts appear corroded away (2 leakers)
- 1 separated movable contact (leaker)

F. Part Sales: The service part is used for multiple model years and 4 vehicle lines. Sales for the affected vehicles cannot be segregated for comparison to other vehicle usage.

G. .... ~~*List number of accidents*~~ *... attributed to this condition.*
2 injuries

4. ACTIONS TAKEN IN PRODUCTION; INTERIM (CONTAINMENT) AND/OR PERMANENT

The affected production material were built in the 1992 and 1993 model years. No action is required to be taken in production as these parts are no longer used on Town Car and Crown Victoria and Grand Marquis built after the 1997 model year.

5. VERIFY EFFECTIVENESS OF CORRECTIVE ACTIONS

No corrective action has been implemented in production as this part is no longer used on the Town Car, Crown Victoria or Grand Marquis built after the 1997 model year.

FYI,
CURRENT TOTAL
OF ALLEGED FIRES
IS 147 (per W. ABRAMCZYK
AS OF 5/17/99

3713 5750

6. ESTIMATED PRODUCTION AND PROBLEM STATISTICS (MAGNITUDE OF CONCERN)

A.

VEHICLES AFFECTED (BY MODEL AND MODEL YEAR)	ASSEMBLY PLANTS (INCLUDING KNOCK DOWN OPERATIONS)	VEHICLE PRODUCTION DATES		POTENTIALLY AFFECTED UNITS	
		FROM	UP TO AND INCLUDING	NUMBER OF UNITS	ESTIMATED PERCENTAGE OF VEHICLES THAT CONTAIN THE CONDITION
Town Car	Wixom AP	11/4/1991	11/30/1992	123,310	unknown
CV/GM	St Thomas AP	2/5/1992	11/30/1992	155,335	unknown

B. The source of the data is a NAVIS report.

7. AFTERMARKET PARTS

A. The ~~brake pressure~~ switch is released as an individual service part and as part of assembly F2VY-2B091-B.

B. The affected service stock is usable with the proposed field service action below.

8. ASSESSMENT OF EFFECT ON VEHICLE OPERATION

Customers may experience inoperative speed control, difficulty shifting out of park (fuse #12 blown), dead battery, brake warning lamp ON, excessive brake pedal travel and/or smoke or fire on the left hand side of engine compartment.

9. DESCRIPTION OF CONCERN SOLUTION AND PARTS REQUIREMENTS (FIELD SERVICE ACTIONS)

A. Field Modification: The modification will be accomplished in two visits to the dealership. The first visit will cut the two wires at the ~~brake pressure~~ switch connector to remove power from the switch and prevent potential heating of the switch. The connector and wire stubs will be wrapped with tape to protect the switch until the next visit. The harness wires will be individually wrapped in tape and tied back to the harness to prevent a short to ground. This will disable speed control.

Return vehicles to dealerships a second time for installation of a wire harness overlay rework kit which includes a relay that limits power to the ~~brake pressure~~ switch to 200 milliamps. No power is applied to the ~~brake pressure~~ switch when the ignition is off in contrast to with the unmodified circuit which is always energized.

B. Assessment of procedure

- This modification procedure has been installed on a 1992 Town Car and a 1993 Crown Victoria. The speed control system functioned normally.
- The 200 milliamp current limit successfully prevented melting and ignition as demonstrated in lab testing (see attachment 4 test 16).
- The modification effects the electrical distribution system by adding a 200 milliamp load to the vehicle electrical system when the key is in the RUN or ACC position. There is no additional load and there is no power applied to the ~~brake pressure~~ switch when the key is in the OFF position.
- This modification changes the effect of a short to ground on the ~~brake pressure~~ switch. The unmodified effect disabled speed control. The modified effect disables the secondary deactivation function of the ~~brake pressure~~ switch. The speed control has 3 additional redundant deactivation functions.. No corrective action is necessary as this is a redundant function.
- Validation by FMEA process for other vehicles is not applicable.
- The modification procedure was evaluated by FCSD using appropriate tools, equipment, and a representative vehicle.

C.

- Kit name Relay Jumper.
- 150,000 rework kits will be ready for service by 6/25/99 (8 weeks). WERS concern C10965448 will be released with the completion of the rework kit design and procedure scheduled for TBD.
- production part number is not applicable
- service kit part number is F3VB-9A839-AA
- 1 kit is required per vehicle.

D. *... Other parts?????*

E. Drivesbility and Emissions not affected.

10. PROGRAM PARTS SIGN OFF/AVAILABILITY

EESE OPD is working with FCSD and wiring harness supplier to complete the design of the service kit.

30,000 kits will be available 5 weeks after supplier is started.

30,000 kits per week will be available thereafter.

(150,000 kits can be supplied in 8 weeks.)

11. SUPPLIER INVOLVEMENT

A. TBD

B.

C.

D.

E.

F.

12. FINANCIAL IMPLICATIONS

		Vehicle Volume	Cost Per Unit	Total Cost (000)
A	Program Administration Costs	278,645	$1.20	$334
B	Inspection Costs (Units to be Inspected but Not Modified)	0		0
C	Part I Modification Costs(Units to be Inspected and Modified) • Parts (priced at dealer price plus __%) ~~($1.00/(e))~~ Labor (0.3 hours x $58.34 labor rate)	278,645	~~$18.50~~ $17.50	~~5,155~~ $4,877
C	Part II Modification Costs(Units to be Inspected and Modified) • Parts (priced at dealer price plus 40 %) ($11.20 (e)) • Labor (0.5 hours x $58.34 labor rate) $52.50	278,645	~~$64.25~~ $11.20 $29.17	~~17,900~~ $3,121 $8,128
D	Dealer Administration Allowance (for safety and emissions recalls only) [0.1 hours x $58.34 labor rate – N.A.]	278,645	~~$5.83~~ $11.67	~~1,625~~ $3,251
E	Total Cost (total A through D)			~~26,014~~ 19,711
F	Percentage of Recommended Supplier Recovery (if applicable or TBD if unknown)			0%
G	Supplier Impact (E * F, if applicable)			0
H	Net FORD Exposure (E-G)			0
I	Potential Warranty Offset			0

.5

.2

(interim & final)

13. PREVENT ACTIONS

A. Review SDS,WCR Brake System Durability and Bench Testing (DVP&R) to examine the effect of contaminated, or aged, or incorrect brake fluid. Update FMEAs and FTAs.

B. .....*generic items or processes impacted*.....

C. ... *corporate memory updates* ...

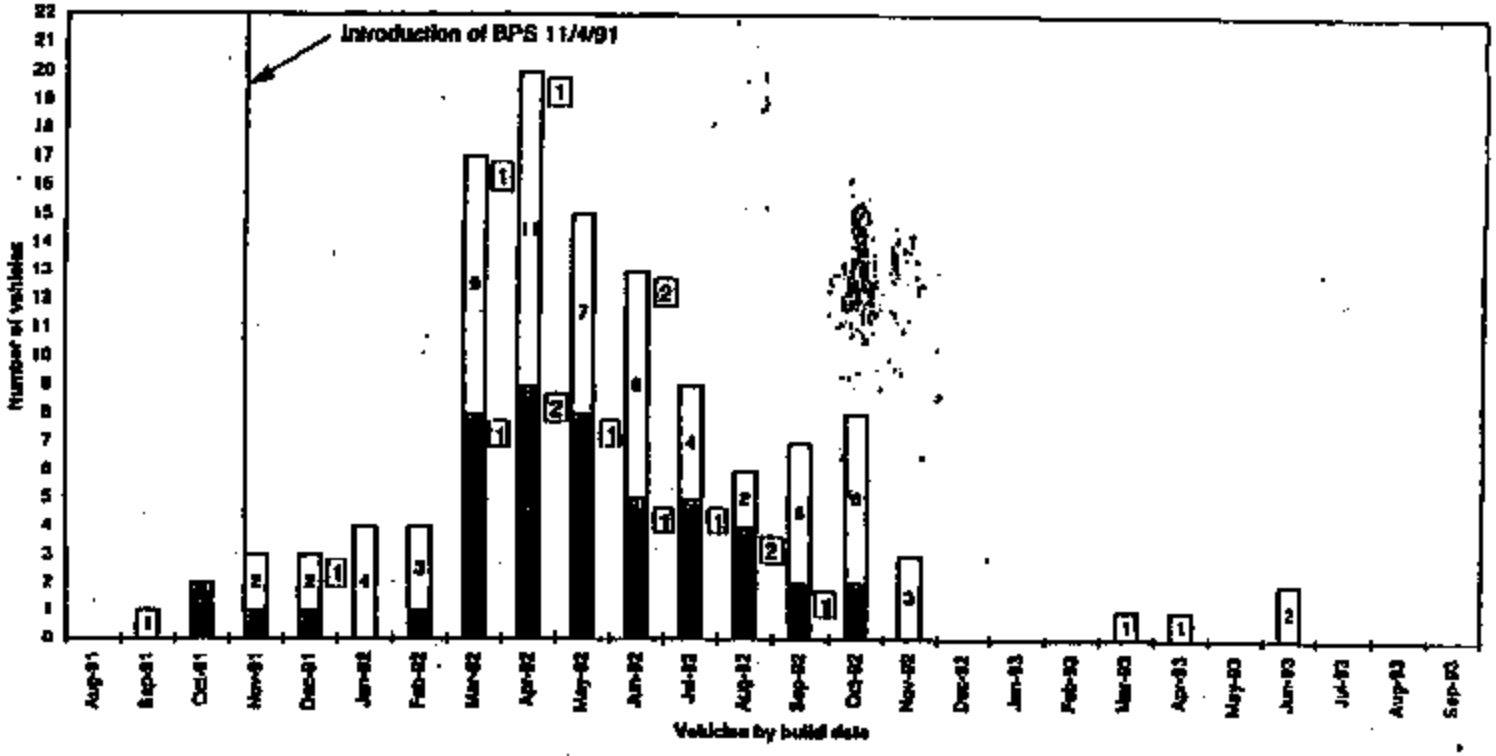
14. REFERENCE DATA

A. Attachments

1 Pareto of 92/93 Town Car Underhood Fire Allegations With Engine On/Off/Unknown.
2 Pareto of 92/93 Crown Vic/Grand Marquis Underhood Fire Allegations With Engine On/Off/Unknown.
3 92 Lincoln Town Car Reported Incidents Of 40 Vehicles with Engine Off/Unknown
4 9F924 De-activation Switch Test Synopsis
5 Hexport Current vs. Time , Fluid Ingress Experiment
6 Hydraulic Pressure Switch Cross Section

B. T. F. Donovan, Manager
Phone: (313)390-7420
E/E Systems, LVC/TVC OPD & Core Quality
Building 5, 1A043

Parato of 92/93 Town Car Underhood Fire Allegations With Engine On/Off/Unknown



Note:

The shaded region represents vehicles with engine off/unknown.
The unshaded region represents vehicles with engine on.
[1] Represents BPS symptoms

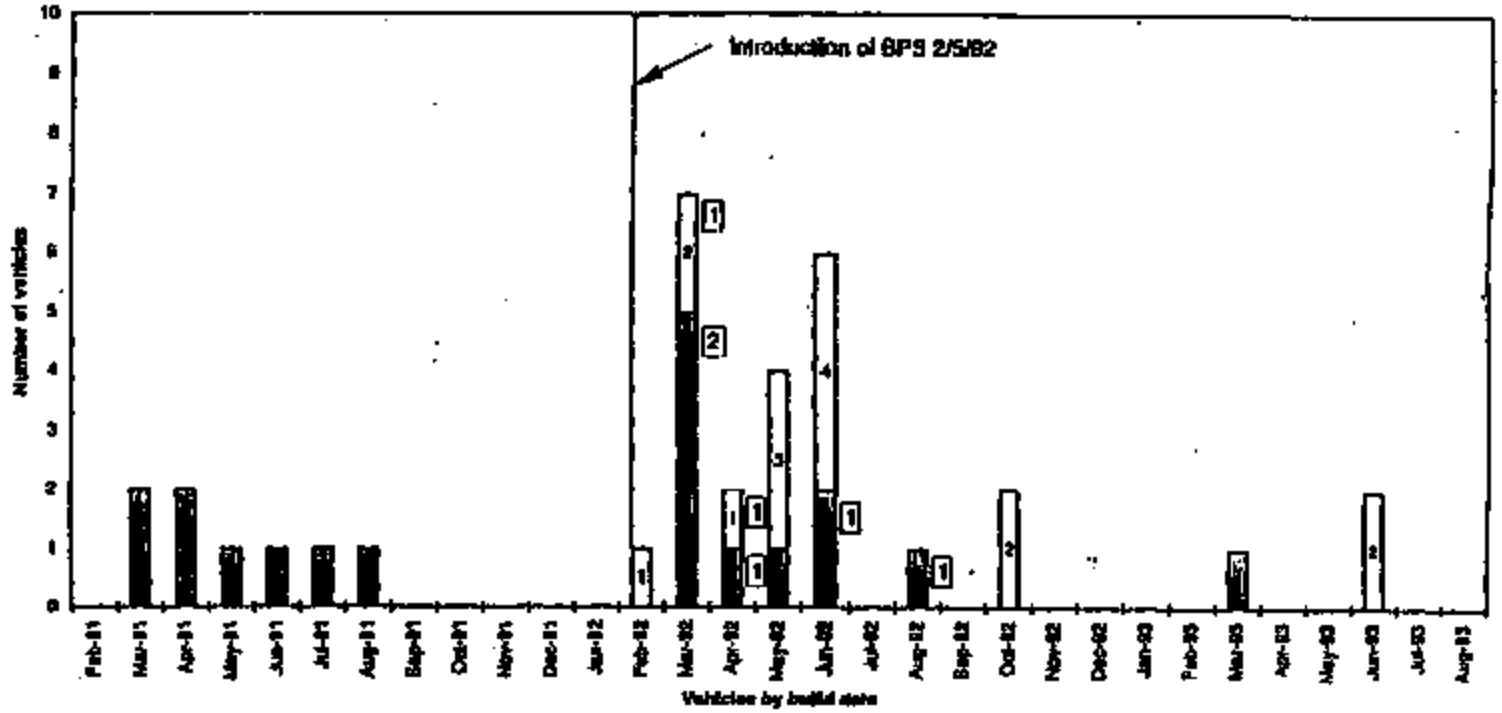
There were 11 vehicles in the unknown category.
3 engine off/unknown, [1] relates to a BPS symptom. 8 engine on.

SPEED CONTROL DEACTIVATION SWITCH

Originator: JKalati
FMC Subject #s
Date issued: 4/15/93
Date revised: 4/16/93

Attachment 1

Pareto of 92/93 CV/GM Underhood Fire Allegations With Engine On/Off/Unknown



Note:

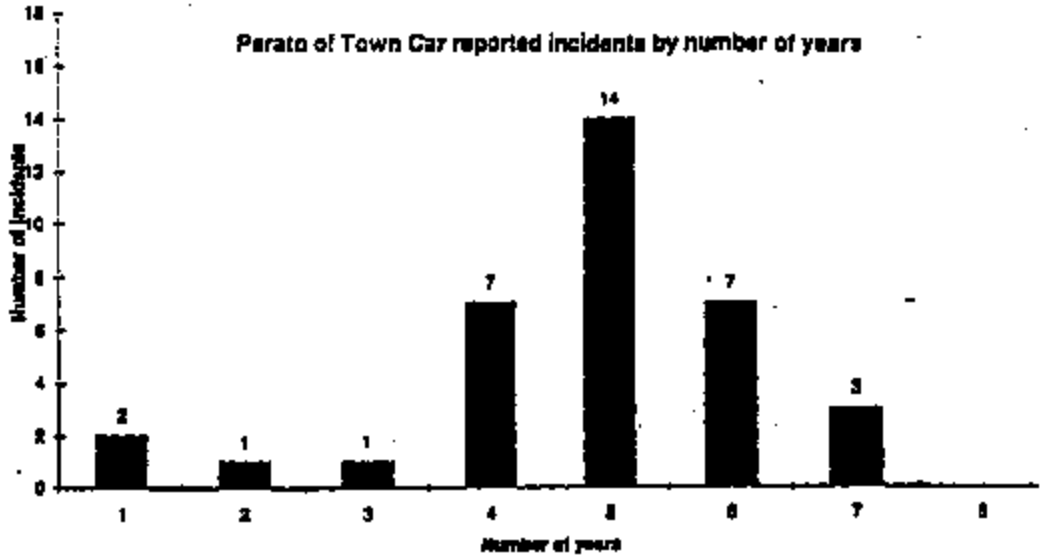
- The shaded region represents vehicles with engine off/unknown.
- The unshaded region represents vehicles with engine on.
- [1] Represents BPS symptoms

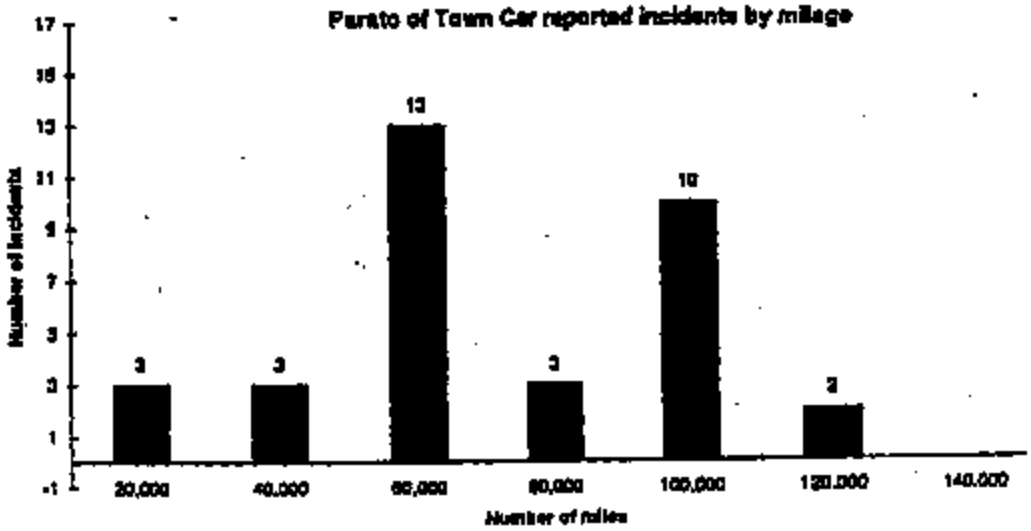
There were 4 vehicles in the unknown category.
3 engine off/unknown, [2]relate to BPS symptoms.
1 engine on, [1]relates to a BPS symptom.

Originator: JKistler
File: BpsMchr.xls
Date Issued: 4/16/93
Date revised: 4/16/93

Attachment 2

92 Lincoln Town Car Reported Incidents Of 40 Vehicles with Engine Off/Unknown





Notes:
There were 5 vehicles with unknown vins, therefore, years in service were undetermined.
There were 8 vehicles with unknown miles.

Attachment 3

3713 5758

Attachment 4

9F924 De-activation Switch Test Synopsis

This document is a synopsis of tests conducted during the investigation of the 9F924 brake pressure switch manufactured by Texas Instruments (P/N 77PS). These tests attempt to reconcile the parameters of the system with alleged field events. The following are the system parameters around the application of the brake pressure switch.

I. The switch components are exposed to battery potential continuously after the vehicle is manufactured.
   A. The hexport of the switch is screwed into the brake proportioning valve that is mounted to the vehicle frame. The vehicle frame is a ground potential.
   B. Battery voltage is continuously connected to moveable contact. The ignition switch does not modify battery voltage to the brake pressure switch.

The intent of this document is to highlight test findings.

Test 1

Objective: Determine if switch ignition can occur under the following conditions:

- Switch contact flooded with brake fluid mixed with varying amounts of % tap water.
- 14 volts applied to one terminal, second terminal electrically floating. (No electrical load across switch terminals).
- Switch hexport electrically grounded.

Test eight samples with the following mixtures:

2 with 4% tap water in brake fluid
2 with 6% tap water in brake fluid
2 with 10% tap water in brake fluid
2 with 75% tap water in brake fluid

Results: No ignition occurred. No significant temperature rise observed. Leakage current to ground ranged from 0.5 mAmps to 5 mAmps over the 250-hour test duration.

Conclusion: While degradation in performance is observed, brake fluid does not develop corrosion or a leakage current path quickly enough to use for laboratory validation testing.

Test 2

Objective: Determine if switch ignition can occur under the following conditions:

- Switch contact flooded with brake fluid mixed with varying amounts of % tap water.
- 14 volts applied to one terminal, second terminal connected to a 14-ohm resistor tied to ground. (1 Amp load across switch terminals).
- Switch hexport electrically grounded.

Results: No ignition occurred. The temperature rise was less than 10°F over the 250-hour duration of the test.

Conclusion: Heat generated by the switch contacts is not sufficient to ignite the plastic base or brake fluid.

Attachment 4

Test 6

Objective: Determine if switch ignition can occur under the following conditions:

- A heater element installed in contact cavity of the switch.
- Apply power to the heating element until plastic base ignites.
- Apply an external spark to the fumes from the plastic.
- Brake fluid present in the contact cavity (wet device) and not present in the contact cavity (dry device).

Results: Ignition occurred in both wet and dry devices.
Wet device: The internal temperature of a wet device reached 660°F. A hole melted through the base of the switch (close to the heating element). The externally applied spark ignited the fumes and flames engulfed the switch.
Dry device: The internal temperature of a dry switch reached over 1000°F. The switch base flopped over. The externally applied spark ignited the fumes and flames engulfed the switch.

Conclusion: The plastic base with brake fluid can be ignited when 5 Watts of electrical power are dissipated as heat in the switch for 15 minutes, followed by a spark.

Test A

Objective: Identify the interactions of the materials found in the switch returned from the Reddick report by placing a brass and copper electrode in a pool of brake fluid with a 12 volt potential between them.

Results: After 24 hours, a black residue formed on both electrodes. The brake fluid did not ignite.

Conclusion: The material found in the switch returned from the Reddick report was a result of an interaction between brake fluid, the internal switch components and the continuous electrical field present in the vehicle.

Test B

Objective: Show that the brake pressure switch is capable of supporting the maximum design current load by applying 15 Amps through the switch contacts until they reach a stable temperature.

Results: The temperature rise stabilized at 36°F after 10 minutes. Vehicle test results show a maximum temperature of 250°F at the left-hand engine mount. This mount is near the brake pressure switch. With the temperature rise observed, the maximum temperature the brake pressure switch is exposed to is 286°F. This is less than the 433°F melting point of the plastics used in the switch base.

Conclusion: The brake pressure switch will not ignite under extreme vehicle environmental conditions. Heat to cause an ignition must come from a source outside of the normal design of the switch. To ignite a switch, either an external source, or an internal short to ground must provide heat.

Test 6a

Attachment 4

Objective: Determine if corrosive degradation of switch electrical components can cause a decrease in electrical isolation (and thus a source of heat) in the switch that may lead to an ignition. Subject the switch to the following conditions:

- 5% NaCl in tap water solution is injected into contact cavity of a switch.
- 14 Volts is applied to the switch.
- Hexport is grounded.
- Current is limited at 15 Amps.

Results: Of 4 samples tested, over a 2 - 3 hour period, the switch leakage current averaged 1 Amp while reaching peaks of 10 Amps. Near the end of the experiment with leakage current greater than 2 Amps, the switch bases started to melt. 2 of the switches continued to heat until the plastic ignited. The other 2 continued to melt until electrical connection was broken.

Conclusion: Corrosion materials can create a conductive path that may lead to ignition. In this experiment, NaCl was used to accelerate the corrosion in the switch. Other corrosive processes may yield the same results.

Test 7

Objective: Determine if switches meet cycle life specification by running the life cycle test beyond specification until the switch performance is degraded.

Results: The first sample developed a leak in the kapton seal after 728,000 cycles. The mean time to developing leaks was determined to be 1,200,000 cycles.

Conclusion: The kapton seal exceeds design specification of 500,000 cycles.

Test 15a

Objective: Determine if long time switch exposure to brake fluid can lead to an ignition.

Results: Test is ongoing. Results to date show no increase in conductivity of both new and used brake fluid. At 350 hours of testing, current draw on each device is less than 20 mAmps.

Conclusion: 350 hours of brake fluid exposure is not sufficient to cause ignition. At 350 hours of testing, current draw remains below the levels needed to create ignition as simulated in laboratory experiments.

Attachment 4

Test 8b

Objective: Understand the ignition process, determine the current path and establish a repeatable ignition method.

Results: Multiple attempts at ignition, via injection of a 5% NaCl in tap water into the contact cavity of switches, has resulted in a repeatability rate of approximately 50%. Plots of hexport current vs. time show an increase in leakage current until the point of ignition in 2 to 3 hours.

Conclusion: A repeatable laboratory method for switch ignition has been established. Based on hexport current measurements, the current path is from switch terminals to hexport body. When a NaCl in tap water solution is repeatedly injected into the contact cavity of powered switches, electrolytic corrosion of the switch terminals results in an increase in terminal resistance and a conductive path to the sensor housing. When sufficient power is drawn through the terminal and conductive path, the materials inside the switch heat. These materials may begin to glow red hot. A hole melts through the switch base and ignition occurs. There is arcing visible throughout the corrosion process that may provide the spark necessary for ignition.

Test 13a

Objective: Compare various fluids in the established ignition method.

Results: A switch filled with 5% NaCl in tap water resulted in an ignition when average hexport leakage current exceeded 2.5 Amps during a 3 hour test. Switches that were filled with tap water and rainwater drew less than 10 mAmps during a 3-hour test and showed little signs of corrosion. Switches filled with new and used brake fluids, with water and without water, all had less than 3 mAmps leakage current and showed no signs of accelerated corrosion.

Conclusion: NaCl in tap water is the most effective method for creating a short-term corrosion to produce heat in the switch. While brake fluid is not as effective in producing corrosion for a lab test, it does produce corrosion when introduced into the switch cavity.

Test 15

Objective: Compare the burn characteristics of various plastics that have the potential to be used as switch base materials. Plastics tested have melting and flowing characteristics compatible with the molding process of the switch base.

Results: When 5% NaCl in tap water was injected into switches with different base materials, the following results were obtained: Celanex 4300 ignited 3 out of 5 attempts. Noryl ignited 2 out of 5 attempts. Zytel ignited 1 out of 5 attempts.

Conclusion: Different plastics exhibit different ignition characteristics. None of the plastics tested guaranteed protection against ignition.

Attachment 4

Test 15b

Objective: Compare: 1) the probability of switch ignition in the vertical position (connector up) verses a 45° orientation and 2) the probability of switch ignition as a function of rotational angle (about the switches length axis) in the 45° orientation.

Results: Switch ignitions in the lab occurred with the switches mounted both vertically and 45° from vertical. In addition, switch ignitions in the lab occurred at various rotational angles.

Conclusion: Switch ignition does not appear to be sensitive to vertical orientation vs. 45° orientation nor to rotational angle in the 45° orientation.

Test 16

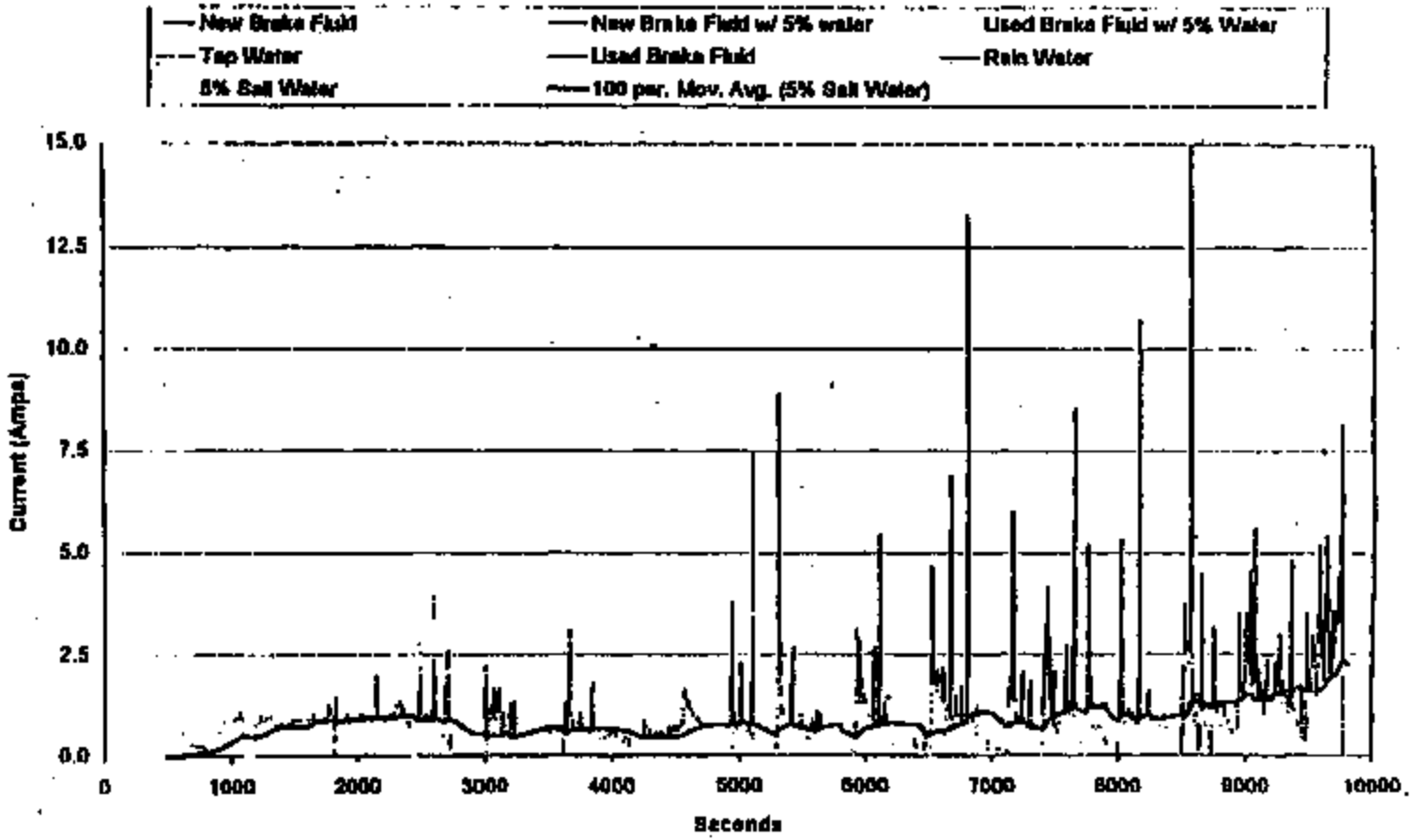
Objective: To test proposed relay circuit.

Results: A switch was injected with 5% NaCl in tap water solution and placed in a proposed current limiting circuit for 48 hours. The current draw remained constant at 180 mAmps throughout the test. There was no thermal activity observed and the contact arm remained intact.

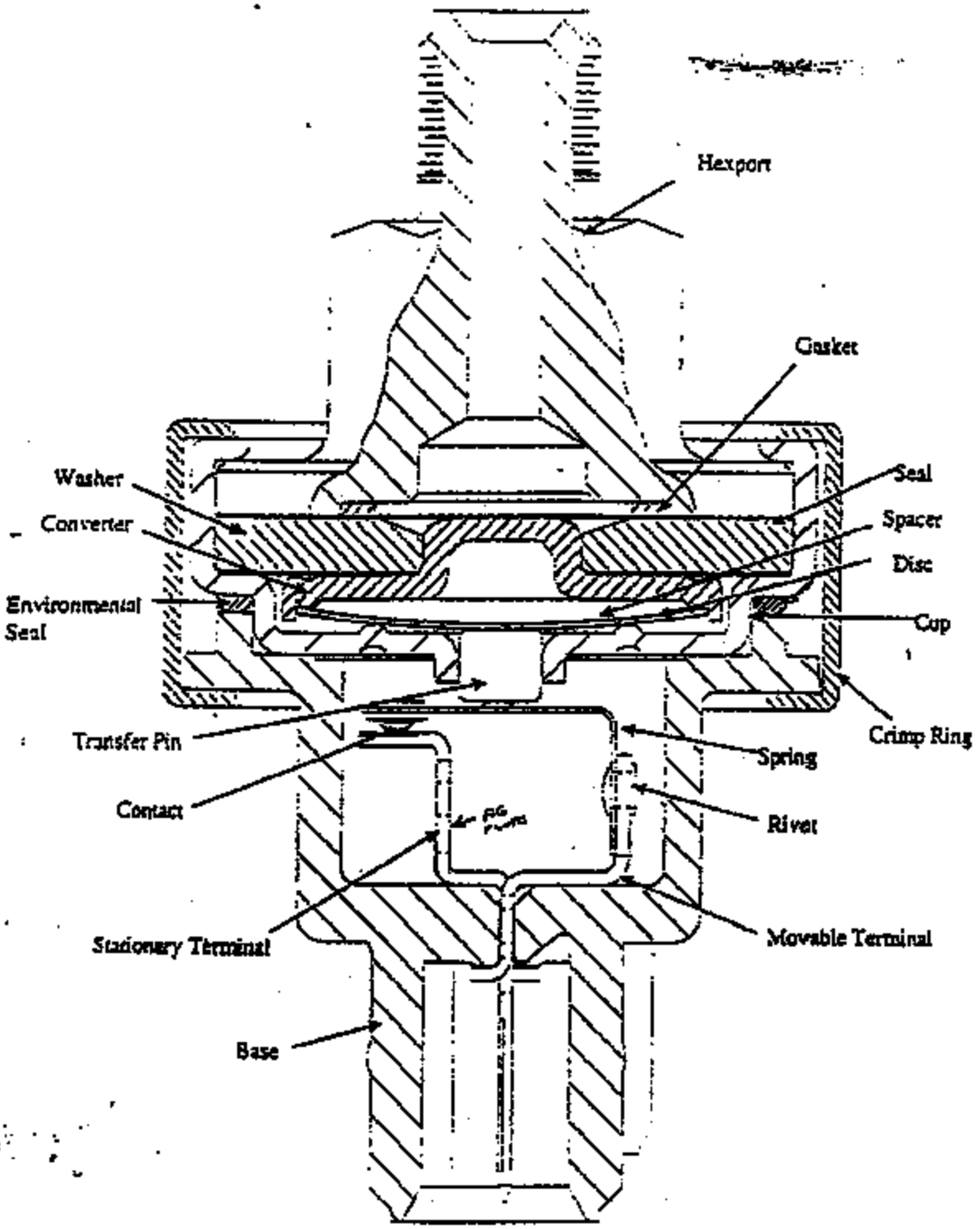
A switch was brought to a high leakage current condition using the established ignition method. An impending burn is a condition where a corrosive resistance has built up in the switch and an ignition is imminent as determined by observing leakage current. The switch was placed in the proposed relay circuit for 18 hours where it drew 180 mAmps, showed no visible thermal activity and did not result in a burn. Because the proposed relay circuit acts as a resistor that limits current to the switch, the maximum power to the switch is limited to 0.75 Watts. A resistive wire was wrapped around the base of the switch and 0.75 Watts of power was applied to the wire. The wire became warm to the touch but had no effect on the switch.

Conclusion: 0.75 Watts, the maximum power in the proposed circuit design, is not enough power to cause switch terminal heating sufficient for ignition. In previous tests, using a resistor as the heating element, approximately 5 Watts of power was necessary to create an ignition. There is not enough power in the proposed circuit to create ignition.

Hexport Current vs. Time
Fluid Ingress Experiment



Hydraulic Pressure Switch Cross Section



3713 5765