EA02025

TEXAS INSTRUMENTS, INC.'S

09/10/03 LETTER TO ODI

REQUEST 9

BOX 12

PART A – O

PART L

A. R. O'Neill
Director
Vehicle Service and Programs
Ford Customer Service Division

Ford Motor Company
P O Box 1904
Dearborn, Michigan 48121

May, 1999

Safety Recall 99S15

Mr. John Sample
123 Main Street
Anywhere, USA 12345

Your Vehicle Identification Number: 12345678901234567

This notice is sent to you in accordance with the requirements of the National Traffic and Motor Vehicle Safety Act.

Ford Motor Company has decided that a defect which relates to motor vehicle safety exists in certain 1992 and 1993 Crown Victoria, Grand Marquis, and Lincoln Town Cars with Speed Control.

SAFETY DEFECT

Some Speed Control Deactivation Switches on the affected vehicles may develop a resistive short in the electrical circuit that may potentially result in an underhood fire. A fire is possible both when the vehicle is running and when the vehicle engine is off. Also, the short may disable the speed control system or cause the brake light fuse to open.

REPAIR

Repair parts may not be available until mid-June, 1999. If your dealer is not able to obtain the parts needed for this recall, an Interim Repair can be performed at no charge to you. However a second visit to your dealer will be required at a later date to have the permanent repair performed. We regret this inconvenience, but your safety is our primary concern.

Interim Repair: If parts are not available, the Interim Repair should be performed immediately. This repair involves disconnecting the electrical connector from the Speed Control Deactivation Switch and protecting the connector end from contamination. The Speed Control system will be inoperative until the Permanent Repair is performed; normal vehicle operation without Speed Control is not affected.

Permanent Repair: Parts for this repair are expected to become available the middle of June, 1999. This repair will involve the replacement of the Speed Control Deactivation Switch with a new switch. In addition, the switch hard-shell connector will be replaced to eliminate the possibility of undetected heat damage to the connector.

HOW LONG WILL IT TAKE?

The time needed for either of the repairs is less than one-half day. However, due to service scheduling issues, your dealer may need your vehicle for a longer period of time. Please call your dealer for a service date.

Call your dealer without delay. Ask for a service date and whether parts are in stock for Safety Recall 99S15.

If your dealer does not have the parts in stock, they can be ordered before scheduling your service date. If available, parts would be expected to arrive within a week after ordering. If parts are not available, your dealer can perform the Interim Repair free of charge. When parts are available, your dealer will perform the Permanent Repair free of charge.

When you bring your vehicle in, show the dealer this letter. If you misplace this letter, your dealer will still do the work, free of charge.

REFUNDS

If you paid to have this service done before the date of this letter, Ford is offering a full refund. For the refund, please give your paid original receipt to your Ford or Lincoln Mercury dealer. To avoid delays, do not send receipts to Ford Motor Company.

CHANGED ADDRESS OR SOLD THE VEHICLE?

Please fill out the enclosed prepaid postcard and mail it to us if you have changed your address or sold the vehicle.

If the dealer doesn't make the repair promptly and without charge, you may contact the Ford Customer Assistance Center, P. O. Box 6248, Dearborn, Michigan 48121. You also may send a complaint to the Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, S. W., Washington, D. C. 20590 or call the toll free Auto Safety Hotline 1-800-424-9393 (Washington, D. C. area residents may call 366-0123).

We regret the inconvenience this service may cause you, but we want you to have the work done for your safety and satisfaction with your Ford or Lincoln-built vehicle.

Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

A. R. O'Neill
Director
Vehicle Service and Programs
Ford Customer Service Division

Ford Motor Company
P.O. Box 1904
Dearborn, MI 48121-1904

Teaming for Excellence
Customer Focus
People Involvement
Continuous Improvement

May, 1999

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Sincerely,

A. R. O'Neill
Director
Vehicle Service and Programs

Safety Recall
99S15

Currey, Pat

From: John Shore [jshore@ford.com]
Sent: Tuesday, May 04, 1999 8:37 AM
To: Sharpe, Robert; McGuirk, Andy
Cc: Cheff, A. B.; gbalint@ford.com; fporter@ford.com
Subject: (U) Clarification

to: a-mcguirk@ti.com
to: rsharpe@ti.com

Several open questions that need to be reviewed....

1. Is the level FCSD is purchasing correct for our needed application:
   SERVICE PART: F2VY- 9F924-A___ SW ASY-SPD CONT DEACT
   ENGINEERING PART: F2VC 9F924 AB_____ ORIGIN:

   1992-3 Town Car and 1992-3 CV/GM

2. Timing to obtain 150,000 parts (schedule needed by week)

3. Define plant work schedule currently. (5 days 2 shifts 10 hour shifts...)

4. Identify costs to boost production (costs for tools, leased equipment, manpower, air freight, 2nd tier issues.....) that would permit TI to support 150,000 parts in 60 days.

Thank-you for your support with this issue.

Please Forward (PF5) All Responses.....Thank-You
John Shore - FCSD / PS&L Recall Manager
Phone (734) 26-69789 FAX (734) 52-33065 NPDC - 1855C
*** Forwarding note from FPORTER --DR8N007 05/03/99 17:49 ***
To: JSHORE --DR8N006

FROM: F. J. Porter USAET(UTC -04:00)
Subject: (U) Clarification

John,

Would you send a note to the folks a TI for clarification.

After the meeting, Andy McGuirk and Rob Sharpe were still unsure of their direction.

Please send them a note which outlines the number of pieces we are looking for (I believe 150,000 to start) and to what extent we (Ford) are backing up any commitment TI may make. I thought you said up to $1M between now and Friday but you may want to modify that.

I would appreciate your help.

Their email addresses are:

a-mcguirk@ti.com
rsharpe@ti.com

Thank you.

Regards,
Fred Porter OV - fporter fporter@ford.com

Chassis E/E Systems Applications (313)845-3722
Bldg S - Mail Drop 5030 - Cubicle 3E004 fax: 390-4145

Epstein, Sally

From: McGuirk, Andy (a-mcguirk@email.mc.ti.com)
Sent: Tuesday, May 04, 1999 11:12 AM
To: Haynes, John; Douglas, Charles; Fecheros, John
Cc: Diggle, Bryan; Baumann, Russ; Sharpe, Robert; Rowland, Thomas
Subject: FW: (U) Clarification

SEVERAL KEY POINTS HERE.....

FORD WANTS THE EXACT SAME SWITCH AS WAS IN '92-'93 TOWN CARS... I THINK THAT WAS OUR 3N SWITCH.

THEY ARE GETTING ALL CONFUSED BECAUSE THEY 'SEE' THE BART ON PROPORTIONAL VALVES AND AR LOST IN THE PARTS TRANSLATIONS.

CHARLIE, PLS CONFIRM TO JOHN H THE PART NUMBERS AND REV LEVEL SO WE GO DOWN THIS 'RIGHT PATH.....AND THEN THE TEAM CAN MAKE THEIR DELIVERY PLANS.

A

AUTOMOTIVE SENSORS AND CONTROLS ORA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

From: John Shore[SMTP:jshore@ford.com]
Sent: Tuesday, May 04, 1999 9:38 AM
To: rsharpe@ti.com; a-mcguirk@ti.com
Cc: Chaff, A. S.; gbalint@ford.com; fporter@ford.com
Subject: (U) Clarification

to: a-mcguirk@ti.com
to: rsharpe@ti.com

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I would appreciate your help.

Their email addresses are:

a-mcguirk@ti.com
rsharpe@ti.com

Thank you.

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 3 - Mail Drop 3030 - Cubicle 3E004 fax: 390-4145

Shahan, Sally

From:	John Shore [jshore@ford.com]
Sent:	Tuesday, May 04, 1999 8:37 AM
To:	Sharpe, Robert; McQuirk, Andy
Cc:	Cheff, A. S.; gbaird@ford.com; fporter@ford.com
Subject:	(U) Clarification

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

and wires. I hope to have that completed by Tuesday next week. In addition to the results already reported on the findings spreadsheet you already have,

<<chklist.xls>> <<switchLog.xls>>

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

Attachments sent separately:

Data Type	File Name
BINARY	CHKLIST.XLS_PC
BINARY	SWITCHLO.XLS_PC

Currey, Pat

From: Foster, Barbara [bfoster@email.mc.ti.com]
Sent: Tuesday, May 04, 1999 3:13 PM
To: Milkey, Mary-Jean
Cc: Haynes, John; McGuirk, Andy; Douglas, Charles; Walsh, Thomas; Kotch, Paul; O'Neill, Ed; Spencer, John; Walsh, Thomas; Mendonca, Helio; Gildea, Robert; Nicholls, Winston
Subject: 77PSL2-1 (F2VY 9F924 A) Ford Service Part

Mary,

I have spoke with Ford Service. They have scheduled 50,000 devices to be shipped week of 5-10-99. I told them that we have all the players in place, and we are expecting to have all the devices ready to ship by Friday 5-14-99. She did not know at this time what the requirements will be after this 50K. She is thinking it will be 25-50K per week, but will probably not know until Friday, 5-14. Amy did mention that the total number of devices that will be ordered may reach 300K before all is done.

I have checked with Julie on the 3 components that she is short on, and she has confirmed that all the material will be in house to meet our goal. The three part numbers are 27713-1, 46515-2, and 74078-143.

Julie and I contacted the disc department and gave them a "heads up" that you will be piloting tonight, and ordering the discs tonight or tomorrow.

Just to ease the tension, I did ask if we would be hit for late deliveries if
we did not get the whole 50K out the door next Friday. The answer was, no. Because of this being for a recall, it will not effect our performance.

Please keep me advised on your progress, in order to help me keep Ford updated.

Thanks,
Barbara

Epstein, Sally

From:	McGuirk, Andy [e-mcguirk@ford.mn.s.com]
Sent:	Tuesday, May 04, 1999 3:26 PM
To:	'Frederick J. Porter'
Cc:	Sharpe, Robert
Subject:	FW: 77P8L2-1 (F2VY 9F924 A) Ford Service Part

FYI

WE SHIPPED 6900 PCS YESTERDAY

A

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

From: Foster, Barbara
Sent: Tuesday, May 04, 1999 4:13 PM
To: Milkey, Mary-Jean
Cc: Haynes, John; McGuirk, Andy; Douglas, Charles; Walsh, Thomas; Kotch, Paul; O'Neill, Ed; Spencer, John; Walsh, Thomas; Mendonca, Hello; Gildea, Robert; Nicholls, Winston
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Thanks,
Barbara

Currey, Pat

From: Douglas, Charles [c-douglas2@email.mc.ti.com]
Sent: Tuesday, May 04, 1999 4:36 PM
To: Haynes, John; Pechonis, John; McGuirk, Andy
Cc: Dague, Bryan; Baumann, Russ; Sharpe, Robert; Rowland, Thomas
Subject: RE: (U) Clarification

Team,

This is to confirm that the 92-93 Town Car used our 77PSL2-1 which was / is a snap switch.

Regards,

Charlie

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

From: McGuirk, Andy
Sent: Tuesday, May 04, 1999 12:12 PM
To: Haynes, John; Douglas, Charles; Pechonis, John
Cc: Dague, Bryan; Baumann, Russ; Sharpe, Robert; Rowland, Thomas
Subject: FW: (U) Clarification

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rsharpe@ti.com

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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

Carney, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Wednesday, May 05, 1999 6:51 AM
To: Porter, Fred
Subject: FW: 77PS

WE ARE EVEN BUILDING THE RIGHT STUFF !!!!!!

A

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

From: Foster, Barbara
Sent: Tuesday, May 04, 1999 5:10 PM
To: Dague, Bryan; Gildea, Robert; Milkey, Mary-Jean; Haynes, John; Pombo, Julie; Martin, Scott
Cc: McGuirk, Andy; Pechonis, John
Subject: RE: 77PS

Team,

This is to confirm that the 92-93 Town Car used our 77PSL2-1 which was / is a snap switch.

Regards,

Charlie

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

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To: Haynes, John; Douglas, Charles; Pechonis, John
Cc: Dague, Bryan; Baumann, Russ; Sharpe, Robert; Rowland, Thomas
Subject: FW: (U) Clarification

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Scott,

Ford has confirmed they still want 77PSL2-1 and are putting 50K on schedule for week of 5-10 ship. They are using their existing purchase order. You should see the requirement in the AM, once the EDI Feed runs.

From: Martin, Scott
Sent: Tuesday, May 04, 1999 3:01 PM
To: Dague, Bryan; Gildea, Robert; Milkey, Mary-Jean; Haynes, John; Pombo, Julie
Cc: Foster, Barbara; McGuirk, Andy; Pechonis, John
Subject: RE: 77PS

All,

Bryan would like to refer to the PO for this answer, I agree with him.

John H.,

Have we received the PO yet? What part number(s) should we be building?

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartin1@ti.com

From: Martin, Scott
Sent: Tuesday, May 04, 1999 2:09 PM
To: Dague, Bryan
Cc: Gildea, Robert; Milkey, Mary-Jean; Haynes, John; Pombo, Julie; Pechonis, John
Subject: 77PS

Bryan,

In regards to the 77PS rebuild, is it the 77PSL2-1's we should be rebuilding? Please confirm.

Thanks-

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartinl@ti.com

Currey, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Wednesday, May 05, 1999 10:45 AM
To: Demers, Richard
Cc: Sundaram, Sundar; Lier, Lester; Hey, D; Martin, Scott
Subject: FW: 77PSL2-1 (F2VY 9F924 A) Ford Service Part

WE ARE QUICKLY BUILDING UP A 150,000 PCS RUN OF 77 PS SWITCHES FOR FORD SERVICE PARTS.

I WANT US TO TAKE EXTRA PRECAUTIONS DURING THIS BUILD FOR LEAKERS AND DAILY IMPULSE TESTING.

RICH, PLS CLOSE WITH SUNDAR AND LES AND IMPLEMENT A PLAN ASAP TO ASSURE WE SPEND MORE AUDIT TIME IN THAT LINE WHILE WE BUILD THESE UNITS.

SEND ME A DAILY VOICE MAIL OF OUR RESULTS.

A

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

From: Milkey, Mary-Jean
Sent: Wednesday, May 05, 1999 11:31 AM
To: Foster, Barbara; Pombo, Julie
Cc: Haynes, John; McGuirk, Andy; Douglas, Charles; Walsh, Thomas; Kotch, Paul; O'Neill, Ed; Spencer, John; Walsh, Thomas; Mendonca, Helio; Gildea, Robert; Nicholls, Winston; Martin, Scott
Subject: RE: 77PSL2-1 (F2VY 9F924 A) Ford Service Part

Julie,

With the first 50K due next Friday, we obviously need to turn our focus on the 77PSSL2-1 as much as we can along with running the scheduled requirements. Also, keep in mind that we need to pilot the lots (sometimes taking up to 16 hours) prior to producing. In order to manage this process efficiently, it is important that you keep us updated as to when we will see deliveries of those components we do not have in inventory. Since these components are also used in other devices, what we don't want happening is to work overtime using up our inventories, while leaving us dry during the week.

According to Marga, the pins that we use in ATTL are within -141 through -145 category. In looking at an IC41 there are a lot of these pins in

Mexico. Marga indicates that Mexico does not use these pins, if at all rarely. Can we get these pins back to help with this demand instead of ordering new ones?

Also, what is the status on the bases, the washers and the cups?

Thanks.

Regards,

Mary Milkey
phone: (508) 236-3424
pager: (508) 236-1010 #0299
fax: (508) 236-2328
email: mjmilkey@email.mc.ti.com

From: Foster, Barbara
Sent: Tuesday, May 04, 1999 4:13 PM
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Cc: Raynes, John; McGuirk, Andy; Douglas, Charles; Walsh, Thomas; Kotch, Paul; O'Neill, Ed; Spencer, John; Walsh, Thomas; Mendonca, Helio; Gildea, Robert; Nicholls, Winston
Subject: 77PSL2-1 (F2VY 9F924 A) Ford Service Part

Mary,

I have spoke with Ford Service. They have scheduled 50,000 devices to be shipped week of 5-10-99. I told them that we have all the players in place, and we are expecting to have all the devices ready to ship by Friday 5-14-99. She did not know at this time what the requirements will be after this 50K. She is thinking it will be 25-50K per week, but will probably not know until Friday, 5-14. Amy did mention that the total number of devices that will be ordered may reach 300K before all is done.

I have checked with Julie on the 3 components that she is short on, and she has confirmed that all the material will be in house to meet our goal. The three part numbers are 27713-1 (gold cup), 46515-2 (base) , and 74078-143 (transfer pin).

Julie and I contacted the disc department and gave them a "heads up" that you will be piloting tonight, and ordering the discs tonight or tomorrow.

Just to ease the tension, I did ask if we would be hit for late deliveries if we did not get the whole 50K out the door next Friday. The answer was, no. Because of this being for a recall, it will not effect our performance.

Please keep me advised on your progress, in order to help me keep Ford updated.

Thanks,
Barbara

Carrey, Pat

From: Fred Porter [a0186587@dalmail.itg.ti.com]
Sent: Wednesday, May 05, 1999 6:31 PM
To: McGuirk, Andy
Subject: 77PS

Did you send this to me by mistake? I don't recognize this part number. (77PS?)

Regards,
Fred Porter - DFAS Planning
f-porter@ti.com
972-995-9308 (office)
972-598-4111 (pager)

-----Original Message-----

From: McGuirk, Andy [mailto:a-mcguirk@email.ac.ti.com]
Sent: Wednesday, May 05, 1999 6:51 AM
To: Porter, Fred
Subject: FW: 77PS

WE ARE EVEN BUILDING THE RIGHT STUFF !!!!!!

A

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

From: Foster, Barbara
Sent: Tuesday, May 04, 1999 5:10 PM
To: Dague, Bryan; Gildea, Robert; Milkey, Mary-Jean; Maynes, John; Pombo, Julie; Martin, Scott
Cc: McGuirk, Andy; Pechonis, John
Subject: RE: 77PS

Team,

This is to confirm that the 92-93 Town Car used our 77PSL2-1 which was / is a snap switch.

Regards,

Charlie

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

From: McGuirk, Andy
Sent: Tuesday, May 04, 1999 12:12 PM
To: Haynes, John; Douglas, Charles; Pechonis, John
Cc: Dague, Bryan; Baumann, Russ; Sharpe, Robert; Rowland, Thomas
Subject: FW: (U) Clarification

SEVERAL KEY POINTS HERE.....

FORD WANTS THE EXACT SAME SWITCH AS WAS IN '92-'93 TOWN CARS... I THINK THAT WAS OUR SNAP SWITCH.

THEY ARE GETTING ALL CONFUSED BECAUSE THEY 'SEE' THE PART ON PROPORTIONAL VALVES AND ARE LOST IN THE PARTS TRANSLATIONS.

Scott,

Ford has confirmed they still want 7795L2-1 and are putting 50K on schedule for week of 5-10 ship. They are using their existing purchase order. You should see the requirement in the AM, once the EDI feed runs.

From: Martin, Scott
Sent: Tuesday, May 04, 1999 3:01 PM
To: Dague, Bryan; Gildea, Robert; Milkey, Mary-Jean; Haynes, John; Pombo, Julie
Cc: Foster, Barbara; McGuirk, Andy; Pechonis, John
Subject: RE: 77PS

All,

Bryan would like to refer to the PO for this answer, I agree with him.

John H.,

Have we received the PO yet? What part number(s) should we be building?

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartin1@ti.com

From: Martin, Scott
Sent: Tuesday, May 04, 1999 2:09 PM
To: Daque, Bryan
Cc: Gildea, Robert; Milkey, Mary-Jean; Haynes, John; Pombo, Julie; Pechonis, John
Subject: 77PS

Bryan,

In regards to the 77PS rebuild, is it the 77PSL2-1's we should be rebuilding? Please confirm.

Thanks-

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartin1@ti.com

Epstein, Sally

From: Beringhause, Steven [sberinghause@email.mc.ti.com]
Sent: Tuesday, May 11, 1999 2:48 PM
To: Rowland, Thomas
Subject: FW: 77PSL2-1

FYI, This may continue to be a battle with Ford.

Steve

From: Martin, Scott
Sent: Tuesday, May 11, 1999 9:44 AM
To: Beringhause, Steven
Subject: FW: 77PSL2-1

fyi...

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartin1@ti.com

From: Foster, Barbara
Sent: Tuesday, May 11, 1999 10:35 AM
To: Martin, Scott
Cc: Milkey, Mary-Jean; Pombo, Julie; Spencer, John; Kotah, Paul; Douglas, Charles; McGuirk, Andy; Mendonca, Helio; Nicholls, Winston; Pechenik, John; O'Neill, Ed
Subject: 77PSL2-1

Scott,
Per our telephone discussion, Ford service has increased the quantity of subject part # to 200K. I have checked with Julie for material availability to support this order. She feels there will not be a problem. She has everything either in house, or on order coming in this week. We contacted Winston and Helio together for the disc and base availability. They both have indicated that they can support us.
I have again spoke with Amy at Ford service. I have told her that we have worked very hard to support her request of 50K for this week, and we might (didn't promise) make that delivery in full. I did tell her, that in order to do this, other jobs were pushed out that we have to catch up on after this first 50K. I also told her because of being at full capacity we could not promise more than 30K per week for the balance of the 200K. She asked if they paid tooling or premium if we could do better, to which I responded "no". I told her we were running three shifts, 7 days a week, and were at full capacity. She seemed o.k. with that for now, but asked that even though we were only promising 30K to try to push to go over that for them.
Scott, I do not see a need for a conference call this afternoon. I think that Amy knows now that we are doing everything possible to work with Ford with their situation, and has thanked us for being in continuos contact with them to keep them updated.
Regards,
Barbara

Currey, Pat

From: Foster, Barbara [bfoster@email.mc.ti.com]
Sent: Tuesday, May 11, 1999 5:11 PM
To: Martin, Scott; Foster, Barbara
Cc: Milkey, Mary-Jean; Pombo, Julie; Spencer, John; Kotch, Paul; Douglas, Charles; McGuirk, Andy; Mendonca, Helio; Nicholls, Winston; Pechonis, John; O'Neill, Ed; Sharpe, Robert
Subject: RE: 77PSL2-1

Good news, I have just spoke with the person that is placing the purchase order for 200K devices. I asked her to write the purchase order 50K now and 30K per week for balance (explaining to her that we would do better if we could). She agreed to write it that way. I should have that agreement in writing tomorrow A.M.
Barb

From: Foster, Barbara
Sent: Tuesday, May 11, 1999 10:35 AM
To: Martin, Scott
Cc: Milkey, Mary-Jean; Pombo, Julie; Spencer, John; Kotch, Paul; Douglas, Charles; McGuirk, Andy; Mendonca, Helio; Nicholls, Winston; Pechonis, John; O'Neill, Ed
Subject: 77PSL2-1

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Amy knows now that we are doing everything possible to work with Ford
with their situation, and has thanked us for being in continuos contact with them to keep them updated.
Regards,
Barbara

Currey, Pat

From: Foster, Barbara [bfoster@email.mc.ti.com]
Sent: Wednesday, May 12, 1999 7:46 AM
To: Martin, Scott
Cc: Milkey, Mary-Jean; Pombo, Julie; Spencer, John; Kotch, Paul; Douglas, Charles; McGuirk, Andy; Mendonca, Helio; Nicholls, Winston; Pechonis, John; O'Neill, Ed; Sharpe, Robert
Subject: RE: 77PSL2-1

Scott,
As per our telephone conversation, I have received P.O. #15642 for 200K of subject part #. They have split the order into six increments. 50K this week, and 30K per week for 5 weeks thereafter. I have faxed you a copy and will enter the order today.
Barb

From: Foster, Barbara
Sent: Tuesday, May 11, 1999 6:11 PM
To: Martin, Scott; Foster, Barbara
Cc: Milkey, Mary-Jean; Pombo, Julie; Spencer, John; Kotch, Paul; Douglas, Charles; McGuirk, Andy; Mendonca, Helio; Nicholls, Winston; Pechonis, John; O'Neill, Ed; Sharpe, Robert
Subject: RE: 77PSL2-1

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Barb

From: Foster, Barbara
Sent: Tuesday, May 11, 1999 10:35 AM
To: Martin, Scott
Cc: Milkey, Mary-Jean; Pombo, Julie; Spencer, John; Kotch, Paul; Douglas, Charles; McGuirk, Andy; Mendonca, Helio; Nicholls, Winston; Pechonis, John; O'Neill, Ed
Subject: 77PSL2-1

Scott,
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Scott, I do not see a need for a conference call this afternoon. I think that Amy knows now that we are doing everything possible to work with Ford with their situation, and has thanked us for being in continuos contact with them to keep them updated.

Regards,
Barbara

Currey, Pat

From: DeMattia, Mike [m-demattia@email.mc.ti.com]
Sent: Thursday, May 13, 1999 3:53 PM
To: Tourangeau, Ray; McGuirk, Andy; Bredikin, Ted; Chemburkar, Yogen; Greenbaum, Arnold; Johnson, Alan
Subject: FW: Ford

more info
Regards

Michael De Mattia
e-mail: demattia@e-mail.mc.ti.com
Phone: 508-236-5226 Fax: 508-236-5246

From: Sharpe, Robert
Sent: Thursday, May 13, 1999 3:13 PM
To: DeMattia, Mike
Subject: FW: Ford

(FYI)

Best Regards,

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

-----Original Message-----
From: Sharpe, Robert
Sent: Thursday, May 13, 1999 2:53 PM
To: Pawlowski, Robin; Hall, Alison
Cc: Spencer, John; O'Neill, Ed; Foster, Barbara; McGuirk, Andy; Perry, Lorraine
Subject: RE: Ford

Hi Robin,

I sat with John Rentis this morning and discussed some of his concerns. John provided me with details of our scorecard performance for A9H2E and K9L1E (Robin, I will fax these to you this afternoon for your reference) and yes, I also agree that their appears to be some issues. The K9L1A scorecard looks good and is not a concern to John at this time. I explained to John that we are currently investigating these ratings and would have answers available for him next week. John seemed content with this and we have scheduled a meeting for next Friday 5/21 @ 10:00 a.m. in Dearborn. I plan on giving John a TI "overview" as well as discuss recent "hits" occurred to our scorecard (highlighted in Alison's E-Mail). Alison, I'll need some TRS samples to show John if you are not available.

We also discussed John's desire to understand our procedures for Q1 Site Code management. I stated that this would best be accomplished by a site visit to Attleboro/Mansfield and scheduled a 7/20 (yes, July) visit. Andy, do we have any "high level" documents/flowcharts that summarize our management procedures ?? This would help John, up to the time of our visit in July.

For our discussions next Friday with John, I will need to conference with

Attleboro to review our scorecards. Robin/Barb, can we schedule a call for Tuesday ??

For reference - John S. Rentis
Engineer - Supplier Technical Assistance
Ford Automotive Operations
Quality, Manufacturing, & Purchasing
17101 Rotunda Drive, MD610
Dearborn, MI 48121

Tel: (313) 337-5627
Fax: (313) 390-3449
jrentis@ford.com

Best Regards,

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

-----Original Message-----
From: Pawlowski, Robin
Sent: Wednesday, May 12, 1999 1:20 PM
To: Hall, Alison; Sharpe, Robert
Cc: Spencer, John; O'Neill, Ed; Foster, Barbara; McGuirk, Andy
Subject: Ford

Rob/Alison

Rob per your phone message to me this morning regarding the conference call with you and Alison. Yesterday I sent a message to John Spencer telling him that you would get back to me today regarding exactly what it was the new STA was looking for.

I did some research yesterday afternoon on all of our supplier codes. Yes there were some issues.
I want to wait until Barb and I have a chance to sit together. I can see what is going on and if we need to submit something to this gentleman at Ford we do not want to do anything hasty.

Further, John Spencer would like to sit with Barbara to go over what has been going on and what is going on at this time. In his message yesterday he asked that he have time to review the information before he speaks with Alison and Ford.

In short I would be more than happy to speak with you and Alison but, I think that you should wait until John has a chance to sit with Barbara and discuss this issue before going off and speaking to Ford.

Regards
Robin

Carrey, Pat

From: Foster, Barbara [bfoster@email.mc.ti.com]
Sent: Monday, May 17, 1999 8:01 AM
To: Milkey, Mary-Jean; Isaacsen, Bill; Gueye, Laudelina; Martin, Scott
Cc: Pechonis, John; Proia, Stephen; Gildea, Robert; McGuirk, Andy; Beringhause, Steven; Douglas, Charles; Spencer, John; O'Neill, Ed; Rowland, Thomas
Subject: RE: 77PSL2-1 Requirement

Scott,
Ford just called again (John Shore) and reitterated the urgency for these devices. He did not know that Sybil called earlier. He told me that dealer notification is going out today, because of the leak to the government.
Owner notification next week.
Regards,
Barb

From: Martin, Scott
Sent: Monday, May 17, 1999 8:43 AM
To: Milkey, Mary-Jean; Isaacsen, Bill; Gueye, Laudelina
Cc: Pechonis, John; Proia, Stephen; Gildea, Robert; Foster, Barbara; McGuirk, Andy; Beringhause, Steven
Subject: 77PSL2-1 Requirement

fyi,

Ford called this morning informing us that they needed to have 80ku's in the pipeline prior to the recall announcement they will be making shortly. Since shipping 50ku on Friday 5/14, they asked for an additional 30ku of the 77PSL2-1's to ship today. We were able to meet this request as the devices were in finished goods. Please thank your support team for their expedient service to our customer, I will also do myself. Let's continue to shoot for 150ku by 5/31.

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartini@ti.com

Morris, Irene

From:	Wellman, Stacey
Sent:	Monday, May 17, 1999 11:12 AM
To:	Beringhause, Steven; Dague, Bryan; Mulligan, Sean; Watt, Jim; Sundaram, Sundar; Pechonis, John
Cc:	Rowland, Thomas; Baumann, Russ; McGuirk, Andy
Subject:	Ford Audit

This message is being sent on behalf of Andy McGuirk:

Ford is inviting themselves to a Supplier Technical Assistance Audit of our Pressure Switch line possibly as early as May 21st or as late as May 25th or 26th.

Please initiate proper preparations.

More details to follow tomorrow.

Regards,
Stacey for Andy McGuirk

Currey, Pat

From:	Foster, Barbara [bfoster@email.mc.ti.com]
Sent:	Tuesday, May 18, 1999 9:20 AM
To:	Douglas, Charles
Cc:	Pombo, Julie; McGuirk, Andy; Spencer, John; O'Neill, Ed; Martin, Scott; Milkey, Mary-Jean; Walsh, Thomas; Nicholls, Winston; Pechonis, John
Subject:	Another increase to 77PSL2-1

Ford Service has just called, and faxed to me, an increase to their existing
purchase order. They want an additional 25K added to the 200K they have already ordered. Again, they reminded me that they want product as fast as we can build it. I am adding the increase to ship 6-25-99, but please build to an asap date.
Regards,
Barb

Curry, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Tuesday, May 18, 1999 1:42 PM
To: Baumann, Russ
Subject: FW: 77PS

AUTOMOTIVE SENSORS AND CONTROLS SRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

From: Sharpe, Robert
Sent: Tuesday, May 18, 1999 2:22 PM
To: McGuirk, Andy
Cc: Beringhause, Steven
Subject: 77PS

Hi Andy,

I just spoke with Fred and confirmed tomorrow's 2pm meeting. I will attend and would like you/Steve available via phone conference (please confirm the phone# which we should call). Fred stated today that we should be prepared to discuss the status of our investigation regarding manufacturing as this is the path that Ford "has really settled into".

Fred has also requested that STA John Rentis visit Attleboro to audit/review Ford's manufacturing concerns. I also spoke with John Rentis and he confirmed that he had spoken with Fred but did not seem to have much background into this issue. John asked me to meet with him at 1:00pm this Thursday (5/20) to help fill in the gaps. I'm O.K. with the background up to the point where Ford's focus went to a manufacturing issue. I will want to talk to you directly either tomorrow afternoon or Thursday a.m. in preparation for my meeting at 1:00 with Mr.Rentis. (I also have another meeting scheduled with John on Friday, 5/21, to discuss TI supplier ratings and give a TI "overview" - This meeting was scheduled last week, prior to Fred contacting the STA group, as Mr. Rentis is new to TI).

For your reference,

John S. Rentis
Engineer
Supplier Technical Assistance
Ford Automotive Operations

Quality, Manufacturing, & Purchasing
17101 Rotunda Drive, MD610
Dearborn, MI 48121

Tel: (313) 337-5627
Fax: (313)390-3449
jrentis@ford.com

Best Regards,

Rob Sharpe
Texas Instruments

Phone (248) 305-5729
Fax (248) 305-5734
rsharpe@ti.com

Carrey, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Tuesday, May 18, 1999 1:45 PM
To: Sharpe, Robert
Subject: FW: 77PSL2-1 Requirement

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 487-3700 PIN 604-2044

From: Martin, Scott
Sent: Monday, May 17, 1999 9:43 AM
To: Milkey, Mary-Jean; Isaacsen, Bill; Gueye, Laudelina
Cc: Pechonis, John; Proia, Stephen; Gildea, Robert; Foster, Barbara; McGuirk, Andy; Beringhause, Steven
Subject: 77PSL2-1 Requirement

fyi,

Ford called this morning informing us that they needed to have 80ku's in the pipeline prior to the recall announcement they will be making shortly. Since shipping 50ku on Friday 5/14, they asked for an additional 30ku of the 77PSL2-1's to ship today. We were able to meet this request as the devices were in finished goods. Please thank your support team for their expedient service to our customer, I will also do myself. Let's continue to shoot for 150ku by 5/31.

Regards,
Scott
phone: (508) 236-3434
pager: (508) 236-1010 #0929
fax: (508) 236-2328
e-mail: smartin1@ti.com

Morris, Irene

From: McGuirk, Andy
Sent: Wednesday, May 19, 1999 10:53 AM
To: Rowland, Thomas; Pechonis, John; O'Neill, Ed
Cc: Baumann, Russ
Subject: FW: Another increase to 77PSL2-1

i believe we still must better our delivery plan for this part.

let me suggest we take some on-time-delivery 'hits' (without 'shutdown' to customer(s)) so we can build this rating faster and/or air shipments.

Ford would like to avoid a 2 visit recall in this situation.....which they might be able to do if we deliver faster !! in any event, i suggest we never be the 'cause' of delay in their field action. I fully understand we should negotiate our delivery commitment so we do not get not-on-time hits.....so let us have an internal delivery commitment that is much more aggressive than ford purchasing req't. (say, 225,000 by 6/2 !! (i assume we are working thru the holiday weekend (as well as our suppliers) should we not be done by then)

a

AUTOMOTIVE SENSORS AND CONTROLS QUA MANAGER
14 FOREST ST M/S 33-05
ATTLEBORO, MA 02703
TEL : (508) 236-3886
FAX : (508) 236-3766
MOBILE: (508) 305-6110
PAGE: (800) 457-3700 PIN 804-3644

From: Foster, Barbara
Sent: Tuesday, May 18, 1999 10:19 AM
To: Douglas, Charles
Cc: Powles, Julie; McGuirk, Andy; Spencer, John; O'Neill, Ed; Martin, Scott; Milsey, Mary-Jean; Welsh, Thomas; Nicholls, Winston; Pechonis, John
Subject: Another increase to 77PSL2-1

Ford Service has just called, and faxed to me, an increase to their existing purchase order. They want an additional 25K added to the 200K they have already ordered. Again, they reminded me that they want product as fast as we can build it. I am adding the increase to ship 6-25-99, but please build to an asap date.
Regards,
Barb

Carrey, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Wednesday, May 19, 1999 6:04 PM
To: Baumann, Russ; Rowland, Thomas; Beringhause, Steven; Pechonis, John
Cc: Sullivan, Martha; Sharpe, Robert
Subject: p/s update

attorney - client privileged communication

we participated in fred's 'normal' weds core team meeting and rob delivered our '91-'92 data showing compliance to spec in the period of interest. again, ford and fred are looking for the evidence that something in our process got better over time so they can define an end point to the issue....and we'll review our records to see what data, if anything, we have to provide a response.

i have made plans to meet with tim donovan and his team friday morning at an as-yet-to-be finalized time. i would believe fred will be there too. this will provide the forum for a face to face dialogue and probable delivery of our summary statement letter being developed by me and/or ford acknowledgment that we met specs back in '91-'92.

rob and i will meet with our STA friday morning also and discuss/understand his 'desires' for the upcoming on-site audit. there is a major disconnect at ford regarding timing....STA thinking JULY and fred thinking 26th. fred's core team is meeting with the STA later friday and i believe will re-direct the time sensitivity as well as some of those STA 'desires'. i would guess it will be june 1 or 2. (which i need to make happen then as i travel to Mexico from 3rd thru 16th---- or after the 16th.)

fred has indicated this STA audit would like to be a very broad engagement....'92 records being verified by actual '99 practices. i acknowledged hearing the request and will address resolution friday. as suspected, the desire by fred was some unstated industrial tourism of the entire factory and records where we would 'bounce around' in some undirected fashion. i will not allow this non-agenda to happen.

pls contact me with any thoughts you develop.

a

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

Epstein, Sally

From:	Warner, Pam (pwarner@email.mo.ti.com)
Sent:	Thursday, May 20, 1999 3:20 PM
To:	DeMattia, Mike; Tolbert, Kenneth; Racine, James; Watt, Jim; Pechonis, John; Tourangeau, Ray; Bartosh, Bob; Proia, Stephen
Subject:	Ford Pressure Switch Audit

Written on behalf of Andy McGuirk.

Team,

We will be hosting, probably three individuals, from the Ford organization as early as Monday of next week to participate in some form of industrial tourism of our facility.

I am currently visiting Ford in order to work out the specific details, as well as, understand the objective.

I will see if it's possible to arrange this audit on or about June 17, but until that's resolved, I would ask that we put together an audit team to get into the 77PS operation and walk through with a fine-toothed comb and collect appropriate observations and start to drive us toward counter measures and corrective actions.

Again, time will be of the essence! I appreciate your urgent support in this matter. Thanks.

Regards,

Andy

Epstein, Sally

From:	McGuirk, Andy (a-mcguirk@email.mc.ti.com]
Sent:	Monday, April 19, 1999 3:19 PM
To:	Demers, Richard
Cc:	Watt, Jim; Sundaram, Sundar
Subject:	RE: IMPULSE TEST DATA FOR IP2 TEST

the answer will be a 'qualified' yes to both questions.....i do not know if you/i need characteristic sheets. i want all 77 pe impulse test 'history' with focus on the line 400k and 500k cycle test at room temp (the so called rapid cycler that all qc used to run in qc loading samples etc) with focus on after test for 'no oil leakers after cycles' for production pilots and runs that were ultimately built into product and shipped...

start the data summary with most recent history first

a

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

From: Demers, Richard
Sent: Monday, April 19, 1999 11:48 AM
To: McGuirk, Andy
Subject: IMPULSE TEST DATA FOR IP2 TEST

ANDY,

JIM WATT STOPPED ME THIS MORNING IN BLDG. 12 HE WAS TELLING THAT YOU WERE AGAIN LOOKING FOR SOME DATA FROM THE LINE, IN THE FORM OF CHARACTERISTIC SHEETS.

HE SAID HE THOUGHT YOU MAY BE LOOKING FOR STUFF FROM THE EARLY 90's 1991 etc. IS THIS CORRECT?

THE DATA I SUPPLIED YOU WITH LATE LAST YEAR WAS FROM 1998 .

IN ANY CASE, UNLESS YOU WANT STUFF YTD. I WOULD NEED TO

RETRIEVE IT FROM DATA STORAGE.

PLEASE ADVISE , THANKS & REGARDS, RICK

Rick Demers
Texas Instruments, Inc.
34 Forest Street Attleboro, Ma, 02703
tel # 508-236-2588 (fax) 508-236-2430

May 21, 1999

Mr. Fredrick J. Porter, Supervisor
E/E Systems Engineering
Building 5, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2053

Dear Fred:

I want to review our recent support of the Ford core team to assure we do not have any misunderstandings regarding our pressure switch performance and our contribution to the team.

For six months the Texas Instruments Automotive Sensors & Controls Team has been supporting the Ford Core Diagnostic Team with technical facts, data, and analysis regarding our brake pressure switch product applied in the Ford cruise control deactivation circuit.

A senior TI pressure switch engineer was in residence at Ford for three weeks to assist with switch related issues in the system diagnostic process. Senior TI leadership participation has also been involved in virtually every Ford Core Team meeting delivering facts, data, and technical support year-to-date '99.

Below is a very brief recap of activities leading us to several conclusions:

Dealer switch samples have produced several pressure switches with brake fluid leakage supporting a theory that switches were leaking in the field application. There has been significant focus upon the Kapton® seal system without concluding the cause of these brake fluid leakers. Certain switches evidenced wear-out due to exposure to many pressure cycles (it has theorized a vehicle application cycle quantity issue and/or Kapton stress riser issue maybe factors).

Conclusion to date: Some switches exhibit end-of-life wear out and leak brake fluid thru the Kapton® diaphragm and appear to be "beyond life".

We also investigated switch capability, and using agreed upon accelerated simulation life testing techniques, demonstrated the ability of the model year '92, '93, '94 Town Car brake switches to consistently exceed "cycle life specification" of 500,000 pressure cycles. TI Weibull reports of pressure switches tested in '1999 conservatively demonstrate 95% reliability to 1 million cycles (with confidence intervals greater than 50%) while success testing records of some

665 ES units shows zero leakage at 500,000 cycles during the 1991 - 1992 period (11/91 - 12/92).

Conclusion to date: 1992 period switches met specification. 1999 switch meets or exceeds specification

We have developed and delivered a model of accelerated plastic based ignition resulting from fluid in the switch cavity coupled with the constant power application of the speed control circuit. This model was used to help define the containment and countermeasure programs in the Ford overall program. Theories from the model suggest that fluids in the switch cavity could corrode and might create a plastic base ignition path.

Conclusion to date: Constant speed control power allows long term corrosion

We have been open and forthright in our communications and delivery of information and we believe we have been instrumental in helping Ford address the underhood fire concern issue.

In this regard, we think it is appropriate at this point that our active participation in the diagnostic journey of the vintage 1992 product move towards a timely conclusion. The 1992 test records we recently forwarded clearly demonstrate the product met specification.

We are committed to fulfilling your request for hosting a site visit, optimizing our product line process controls, supporting campaign field return device analysis, and participating in robust system brainstorming moving toward conclusion in July.

Our prime focus at this time is in rapidly supplying Ford with 225,000 units in support of the field actions.

Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

attachments: 1992 Testing History
TI 77PS Test synopsis
TI 77PS Investigation Flow Diagram

ATTORNEY CLIENT PRIORITY INFORMATION

May 21, 1999

Mr. Tim F. Donovan, Manager
E/E Systems-Ongoing Prod. Dev.
E/E Systems Engineering
Building 5, Mail Drop 5017
20000 Rotunda Drive, Rm 1A043
Dearborn MI 48121-2053

Dear Tim,

I want to review our recent support of the Ford core team to assure we do not have any misunderstandings regarding our pressure switch performance and our contribution to the team.

For six months the Texas Instruments Automotive Sensors & Controls Team has been supporting the Ford Core Diagnostic Team with technical facts, data, and analysis regarding our brake pressure switch product applied in the Ford cruise control deactivation circuit.

A senior TI pressure switch engineer was in residence at Ford for three weeks to assist with switch related issues in the system diagnostic process. Senior TI leadership participation has also been involved in virtually every Ford Core Team meeting delivering facts, data, and technical support year-to-date '99.

Below is a very brief recap of activities leading us to several conclusions:

Dealer and salvage yard switch samples have produced several pressure switches with brake fluid leakage supporting a theory that switches were leaking in the field applications. There has been significant focus upon the Kapton seal system without concluding the cause of these brake fluid leakers. Certain switches evidenced wear-out due to exposure to many pressure cycles (we have theorized a vehicle application cycle quantity issue may be a factor).

Conclusion to date: Some switches exhibit end-of-life wear out and leak brake fluid thru the Kapton® diaphragm and appear to be "beyond life".

We also investigated switch capability, and using agreed upon accelerated simulation life testing techniques, demonstrated the ability of the model year '92, '93, '94 Town Car brake switches to consistently exceed "cycle life specification" of 500,000 pressure cycles. TI Weibull reports of pressure switches tested in 1999 conservatively demonstrate 95% reliability to 1 million cycles (with confidence intervals greater than 50%) while success testing records of some 665 ES units shows zero leakage at 500,000 cycles during the 1991 - 1992 period (11/91 - 12/92).

Conclusion to date: 1992 period switches met specification. 1999 switch meets or exceeds specification

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Conclusion: constant speed control power allows long term corrosion

We have been open, and forthright in our communications and delivery of information and we believe we have been instrumental in Ford addressing the underhood fire concern issue. We would at this point like to conclude our exhaustive technical analysis as we believe we have clearly presented facts that validate product conformance to specification. In view of the recent discovery of 1992 test records which clearly demonstrate the product met specification we feel our contribution to further diagnostics appears limited and of diminishing value.

Our prime focus at this time is in rapidly supplying Ford with 225,000 units in support of the field actions.

Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

ACM/paw

C: Thomas E. Masters - Ford
Frederick J. Porter - Ford
Thomas Rowland - Texas Instruments
Steve Beringhause - Texas Instruments

Texas Instruments Incorporated
Materials and Controls Group

TEXAS INSTRUMENTS
34 Forest Street
P.O. Box 2964
Attleboro, MA 02703-0964
(508) 236-3800

May 21, 1999

Mr. Fredrick J. Porter, Supervisor
E/E Systems Engineering
Building 5, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2053

Dear Fred:

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Additionally "success testing records" of some 685 ES units that were tested during the 1991 - 1992 (11/91 - 12/92) showed 0 leakage at 500,000 cycles.

Conclusion to date: 1992 period switches met specification. 1999 switch meets or exceeds specification

We have developed and delivered a model of accelerated plastic based ignition resulting from fluid in the switch cavity coupled with application as designed in

of CONSTANT [illegible]

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Conclusion to date: Constant speed control power allows long term corrosion

We have been open and forthright in our communications and delivery of information and we believe we have been instrumental in helping Ford address the underhood fire concern issue.

In this regard, we think it is appropriate at this point that our active participation in the diagnostic journey of the vintage 1992 product move towards a timely conclusion. The 1992 test records we recently forwarded clearly demonstrate the product met specification. We are committed to fulfilling your request for a site visit and long term fluid exposure tests but would like to come to a mutual agreement on a near term milestone or time frame for concluding our effort.

Our prime focus at this time is in rapidly supplying Ford with 225,000 units in support of the field actions.

Regards,

Andrew C. McQuirk
QRA Manager
Texas Instruments

- RETURN TEST ASSEMBLIES
- OPTIMIZE PROCESS CONDITIONS
- PARTICIPATE IN ROOT CAUSE SYSTEM ANALYSIS

May 25, 1999

Mr. Frederick J. Porter, Supervisor
E/E Systems Engineering
Building 5, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2053

Dear Fred:

I want to review our recent support of the Ford core team to assure we do not have any misunderstandings regarding our pressure switch performance, our continued contribution to the 'core' team, and our commitment to a quick conclusion.

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Conclusion to date: Constant speed control power allows long term corrosion

In light of this laboratory model and the need for cruise system power only during vehicle operation, we suggest the system architecture of "key-on/off" based power be considered.

We have been open and forthright in our communications and delivery of information and we believe we have been instrumental in helping Ford address the underhood fire concern issue.

In this regard, we think it is appropriate at this point that our active participation in the diagnostic journey of the vintage 1992 product move towards a timely conclusion. Toward this end, we will continue to support the "core" team review of 1992 product history with targeted completion in July 1999.

We are preparing to fulfill your request for hosting a site visit, supporting campaign field return device analysis, and participating in robust system brainstorming sessions moving toward conclusion in July, as well as reviewing the optimization of our product line process controls.

Our prime focus at this time is in rapidly supplying Ford with 225,000 units in support of the field actions.

Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

attachments: 1992 Testing History
TI 77PS Test synopsis
TI 77PS Investigation Flow Diagram

Carrey, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Wednesday, May 26, 1999 9:02 AM
To: Beringhause, Steven; Baumann, Russ; Pechonis, John; Rowland, Thomas; Baker, Gary
Cc: Warner, Pam
Subject: ford draft...attorney client privileged communication

<<FredPort final2.doc>>

pls review and edit

a

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

May 25, 1999

Mr. Frederick J. Porter, Supervisor
E/E Systems Engineering
Building 8, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2063

Dear Fred:

I want to review our recent support of the Ford core team to assure we do not have any misunderstandings regarding our pressure switch performance, our continued contribution to the 'core' team, and our commitment to a quick conclusion.

For six months the Texas Instruments Automotive Sensors & Controls Team has been supporting the Ford Core Diagnostic Team with technical facts, data, and analysis regarding our brake pressure switch product applied in the Ford cruise control deactivation circuit.

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Conclusion to date: Constant speed control power allows long term corrosion

In light of this laboratory model and the need for cruise system power only during vehicle operation, we suggest the system architecture of "key-on/off" based power be considered.

We have been open and forthright in our communications and delivery of information and we believe we have been instrumental in helping Ford address the underhood fire concern issue.

In this regard, we think it is appropriate at this point that our active participation in the diagnostic journey of the vintage 1992 product move towards a timely conclusion.

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Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

attachments: 1992 Testing History
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TI 77PS Investigation Flow Diagram

Currey, Pat

From: Beringhause, Steven [sberinghause@email.mc.ti.com]
Sent: Wednesday, May 26, 1999 9:41 AM
To: McGuirk, Andy
Subject: RE: ford draft...attorney client privileged communication

Andy,
I think it looks good. Do we want to be more specific about eliminating power in FUTURE model years?

Steve

From: McGuirk, Andy
Sent: Wednesday, May 26, 1999 10:01 AM
To: Beringhause, Steven; Baumann, Russ; Pechonis, John; Rowland, Thomas; Baker, Gary
Cc: Warner, Pam
Subject: ford draft...attorney client privileged communication

<<File: FredPort final2.doc>>

pls review and edit

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3060
FAX : (508) 236-3745
MOBILE: (508) 208-6119
PAGE: (800) 467-3700 PIN 604-2044

Currey, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Wednesday, May 26, 1999 3:34 PM
To: Sharpe, Robert
Subject: FW: ford draft...attorney client privileged communication

right draft

a
AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
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From: McGuirk, Andy
Sent: Wednesday, May 26, 1999 4:22 PM
To: Sharpe, Robert
Subject: FW: ford draft...attorney client privileged communication

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PAGE: (800) 467-3700 PIN 604-2044

Attorney Client Privileged

May 26, 1999

Mr. Frederick J. Porter, Supervisor
E/E Systems Engineering
Building 5, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2053

Dear Fred:

I want to review our recent support of the Ford core team to assure we do not have any misunderstandings regarding our pressure switch performance, our continued contribution to the 'core' team, and our commitment to a quick conclusion.

For six months the Texas Instruments Automotive Sensors & Controls Team has been supporting the Ford Core Diagnostic Team with technical facts, data, and analysis regarding our brake pressure switch product applied in the Ford cruise control deactivation circuit.

A senior TI pressure switch engineer was in residence at Ford for three weeks to assist with switch related issues in the system diagnostic process. Senior TI leadership participation has also been involved in virtually every Ford Core Team meeting delivering facts, data, and technical support year-to-date '99.

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Conclusion to date: Constant speed control power allows long term corrosion

Per Fred no problem to this point

In light of this laboratory model and the need for cruise system power only during vehicle operation, we suggest the system architecture of "key-on/off" based power be considered.

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Understand manufacturing 1st

We are preparing to fulfill your request for hosting a site visit, supporting campaign field return device analysis, and participating in robust system brainstorming sessions moving toward conclusion in July, as well as reviewing the optimization of our product line process controls.

Our prime focus at this time is in rapidly supplying Ford with 225,000 units in support of the field actions.

Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

attachments: 1992 Testing History
TI 77PS Test synopsis
TI 77PS Investigation Flow Diagram

* Fred has issue with the last 3 paragraphs in regards to closing or defining a conclusion to the diagnostic journey. This comes from the fact that we still do not have a root cause.

* Initial field service to rewire switch circuit (w/ relay) was rejected due to durability concerns with relay (unsealed) Do not want to introduce another potential problem.

May 26, 1999

Mr. Frederick J. Porter, Supervisor
E/E Systems Engineering
Building 5, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2053

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Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

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TI 77PS Test Synopsis

This document is a synopsis of tests conducted by Texas Instruments during the 77PS investigation. The intent of this document is to highlight test findings which drove the investigation to its current state. Throughout the investigation, several tests were conducted with the same objective. When each objective was met, efforts were refocused to obtain a new level of understanding and to establish a new set of objectives. As such, tests have been categorized into (5) levels, representing the level of knowledge obtained from the group of tests conducted. Each level is listed below with a short description of the objective:

Level 1: Create a laboratory switch ignition without any restrictions on methods.
Level 2: Create a laboratory switch ignition using only conditions found in the switch operating environment.
Level 3: Understand the laboratory ignition mechanism.
Level 4: Compare factors contributing to laboratory ignition.
Level 5: Evaluate recommendations.

Refer to Brake Pressure Switch Test Log.

Level 1 Objective: Determine if a switch ignition can be created in the laboratory.

- Test 1

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

Switch contact cavity flooded with brake fluid mixed with varying amounts of % H_20.
14 volts applied to one terminal, second terminal electrically floating. (No electrical load across switch terminals).
Switch bezport electrically grounded.

Results: (8) samples were tested total:
(2) with 4% H_20 in brake fluid.
(2) with 6% H_20 in brake fluid.
(2) with 10% H_20 in brake fluid.
(2) with 75% H_20 in brake fluid.

No ignition occurred. No significant temperature rise observed in all samples. Current draw ranged from 0.5 mAmps to 5 mAmps over a period greater than (250) hours.

- Test 2

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

Switch contact flooded with brake fluid.
14 volts applied to one terminal, second terminal connected to a 14 Ω resistor which is tied to ground. (1 Amp load across switch terminals).
Switch hexport electrically grounded.

Results: (2) samples were tested. No ignition occurred. No significant temperature rise observed for a period over (250) hours.

Conclusion: A (1) Amp load through switch terminals did not ignite brake fluid in the contact cavity of switches.

- Test 6

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

Heater element installed in contact cavity of the switch.
Power applied to the heater element until plastic base melts.
Spark generated in contact cavity of switch.
Brake fluid present in the contact cavity (wet device) and absent in the contact cavity (dry device).

Results: (2) dry devices were tested and (1) wet device was tested. Ignition occurred in all devices.
Wet device: The internal temperature of a wet device reached 660°F. A hole burned through the base of the switch (close to the heating element). The applied spark ignited the fumes in the contact cavity of the switch and engulfed the base material of the switch.
Dry device: The internal temperature of a dry switch reached over 1000°F. The switch base flopped over. The applied spark ignited the fumes in the contact cavity of the switch and engulfed the base material of the switch.

Conclusion: A switch ignition can occur under the following laboratory conditions:

Heater element installed in the switch contact cavity.
5 watts of power dissipated in heating element
Spark generated in the contact cavity of the switch.

Brake fluid did not contribute to the ignition process.

Level 2: Objective: Determine if a laboratory ignition can occur using only switch components and elements found in the switch environment.

- **Test 6a**

Objective: Determine if corrosive degradation of switch electrical components can cause an increase in electrical resistance (and thus a source of heat) in the switch, which may lead to an ignition.

Results: (1) out of (15) samples tested increased resistance to 5 Ωs. A solution of 5 wt. % NaCl in H_20 can corrode the electrical components of the switch and cause an increase in electrical resistance. Repeated injections of the solution of 5 wt. % NaCl in H_20 into the contact cavity of a switch, with the switch continuously powered at 14 Volts, can cause an ignition.

Conclusion: A switch ignition can occur under the following laboratory conditions:

A solution of 5% NaCl in H_20 is injected into contact cavity of a switch.
Continuous 14 Volt power applied to the switch.
Hexport is grounded.
Current is limited at 15 Amps.

- **Test 6c**

Objective: Determine if brake fluid with metal shavings is conductive enough to create an ignition.

Results: (3) devices with various size metal particles were tested. No significant current increase detected.

Conclusion: Metal shavings did not significantly increase conductivity brake fluid. Current levels measured were well below levels necessary to create an ignition.

- **Test 7**

Objective: Determine if switch meets cycle life specification.

Results: Tests conducted during the first quarter of 1999 show that switches exceed cycle life specification.
In the first quarter of 1999, a total of (42) 77PSL2-1 snap switches were impulse tested to over 1,000,000 cycles with only (1) leak below 1,000,000 cycles, which

occurred at 728,000 cycles. A Weibull analysis showed 99.9% reliability at 500,000 cycles at 95% confidence level.

Conclusions: Switches meet cycle life specification. First quarter, 1999 tests confirm impulse test findings made during the period between 1991 and 1992. During that period, (6) impulse tests on 144 devices of 57PS and 77PS construction, had no leaks when tested to 500,000 cycles. A Weibull analysis of first quarter, 1999 tests, showed 99.9% reliability at 500,000 cycles at 95% confidence level.

- Test 15a

Objective: Determine the long term corrosive effects of brake fluid on the electrical components of switches which are continuously powered at 14 Volts.

Results: Test was suspended after 550 hours of testing. (6) samples were tested with continuous 14 Volts power. The contact cavity of (4) switches contained new brake fluid and (2) switches contained old brake fluid. Switches with old brake fluid drew very little hexport current and showed a decrease in hexport current over time to less than 1/10 mAmp. Samples with new brake fluid showed an increase in hexport current to over 20 mAmps toward the end of the 550 hours of testing. Analyses of (1) sample with new brake fluid and (1) sample with old brake fluid revealed electrolytic corrosion of the contact arm of both switches. There was a much lower level of corrosion in the sample with used brake fluid than the sample with new brake fluid.

Conclusion: Brake fluid in the contact cavity of switches, which are at 14 Volts continuous power for over 500 hours, can cause electrolytic corrosion of the switch contact arm and an increase in hexport current.

- Test 17

Objective: Quantify the long term corrosive effects of new brake fluid on the electrical components of switches under the following laboratory conditions:

Contact cavity of switch flooded with new brake fluid.
Switches at continuous 14 Volts power.
Switches subjected to vibration for (1) hour per day.
Switches subjected to 100°C for (1) hour per day.

Results: Test suspended after (312) hours. (50) samples tested. The average hexport current draw after (312) hours is 1.9 mAmps with a standard deviation of 1.8 mAmps. These results are consistent with results previously found in Test 15a at the 300 hour point.

Conclusion: New brake fluid in the contact cavity of switches, has not caused an increase in hexport current after (312) hours at continuous 14 Volts power.

Level 3: **Objective:** Understand the laboratory ignition process, determine the current path and establish a repeatable ignition method.

- Test 6b

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

Results: Multiple attempts at laboratory ignition, via injection of a solution of 5 wt. % NaCl in H_20 into the contact cavity of switches, has resulted in a repeatability rate of approximately 50%. Plots of hexport current verses time show an increase in current until the point of ignition.

Conclusion: A repeatable laboratory method for switch ignition was established. Based on hexport current measurements, the current path is from switch terminals to hexport body.
When a solution of 5 wt. % NaCl in H_20 is repeatedly injected into the contact cavity of powered switches, electrolytic corrosion of the switch terminal results in an increase in terminal resistance. When sufficient power is drawn through the corrosive resistance, switch elements heat up and begin to glow red hot. A hole burns through the switch base and ignition occurs. There is arcing visible throughout the corrosion process which may provide the spark necessary for ignition.

Level 4: **Objective:** Compare and contrast variables influencing ignition using the established laboratory ignition method.

- Test 13a

Objective: Compare various fluids in the established ignition method.

Results: The following fluids were tested.
(1) NaCl in H_20.
(1) tap water
(1) rain water
(1) used brake fluid
(1) used brake fluid with 5 wt. % H_20
(1) new brake fluid
(1) new brake fluid with 5 wt. % H_20
The switch filled with 5 wt. % NaCl in H_20 resulted in an ignition when average hexport current exceeded 2.5 Amps. Switches that were filled with tap water and rain water drew less than 10 mAmps over a (3) hour test and showed little signs of

corrosion. Switches filled with a matrix of new and used brake fluids, with water and without water, all drew less than 3 mAmps hexport current draw and showed no signs of corrosion over the (24) hour test.

Conclusion: Brake fluid is not conductive enough to cause the electrolytic corrosion and necessary current draw to create an ignition within a 3 hour lab test. Because of its' significantly higher conductivity, an ionic rich fluid such as NaCl in H_20 can cause an ignition in a 3 hour lab test exposure..

- Test 15

Objective: Compare the ignition characteristics of various plastics as switch base material.

Results: When 5 wt. % NaCl in H_20 was injected into switches with different base materials, the following results were obtained: Ceilanex 4300 ignited 3 out of 5 attempts. Noryl ignited 2 out of 5 attempts. Zytel ignited 1 out of 5 attempts.

Conclusions: All plastics tested can ignite using the established laboratory ignition method.

- Test 15b

Objective: Determine if switch ignition can occur in the vertical position and 45° orientation. Determine if switch ignition can occur and at different rotational angles in the 45° orientation.

Results: Switch ignitions can occur in both the vertical and 45° orientation using the established laboratory ignition method.

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

Level 5 Objective:

Test 16

- Objective: Test proposed relay circuit.

Results: (1) switch was injected with a solution of 5 wt. % Nacl in H_20 and placed in the proposed current limiting circuit for (48) hours. The current draw remained constant at 180 mAmps throughout the test. There was no activity observed and the contact arm remained mostly intact.
(1) switch was brought to an impending burn condition using the established burn method. An impending burn is a condition where a corrosive resistance has built

up in the switch and an ignition is imminent. The switch was then placed in the proposed relay circuit for(18) hours where it drew 160 mAmps, showed no visible activity and did not result in an ignition.
Because the proposed relay circuit acts as a resistor which limits current to the switch, the maximum power to the switch is limited to .75 Watts. A resistive wire was wrapped around the base of (1) switch and 0.75 Watts of power was dissipated in 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 insufficient to cause substantial electrolytic corrosion or significant switch terminal heating, which is necessary to create an ignition. In previous tests, using a resistor as the heating element (see Test 6), approximately 5 Watts of power was necessary to create an ignition.

Brake Pressure Switch Test Log, Updated 7/22/99

Category	Test	Location	Test Parameters	Results Update
Lab Simulation	1	TI	Vary water concentrations in 'new' Brake Fluid	250+ hours, Current draw in the 0.5mA to 5mA range
of Potential Ignition			14Vdc to one terminal, hexport grounded	Fluid has discolored.
in Switch			Water Conc: 4%, 6%, 10%, 76%	No Significant Temperature Rise. Test Suspended.
				Internal Analysis suspended.
	2	TI	New Brake Fluid	250+ hours. Constant temperature.
			1 Amp through switch terminals	No significant temperature rise with time
			14Vdc to one terminal, hexport grounded	Test Suspended.
	3	AVT	new Brake Fluid in Switch, 24 VDC to one	> 300 hours into test, max current 7mA
			terminal. Hexport Grounded	No significant change with time. Test suspended
	4	AVT	new Brake Fluid in Switch, 24 VDC to one	16 hours into test max current 5mA
			terminal. Hexport Grounded, Ambient at 100 C	No significant temperature rise with time. Test suspended.
	5	AVT	new Brake Fluid in Switch, 16 Amps	Temperature rise of 20 C above room temp
			Through switch terminals	Delta T reached steady state at 20 C. Test suspended.
	5a	AVT	new Brake Fluid in Switch approx. 50 Amps	Temperature rose to approx. 270 F. No smoke. No ignition
			through Switch Terminals	Test suspended.
	6	TI	Build heater elements into Switch.	3 tested. Smoke observed, ignition observed on part w/heater
			Heat til failure, include sparking.	See attachment
			(1) w/ solution of Brake Fluid and 6 wt. % H_2O	Test complete
				Brake fluid in cavity slows down heat build-up
				Smoke observed at 675 F, Base melts and falls off at 800 F
	6a	TI	Create heater by corroding spring arm	One out of 15 devices increased resistance to 5 ohms.
			Salt water solution, 14V between spring	Others either very low resistance or megaohms
			and hexport	It took about 100 hours to reach the 5 ohm stage.
				The 5 ohm device ignited under conditions similar to test 6.
	6b	TI	Re-run ignition test to understand	Switch ignition with repeated 5% water solution into switch
			repeatability and current path.	Current path is through hexport.
				See plots and video.
				Additional test include tap water, old BF, new BF and other.

	6c	TI	Pure 'new' brake fluid with metal shavings	Metal shavings do not contribute significantly to brake fluid conductivity
Life Cycle Reliability of Pressure Switch	7	TI	0-1400 psig pressure pulses at 135C per ES	First leak observed at 728,000 cycles. Test Completed. See attached Weibull Chart.
Diaphragm Wear	8	TI	0-1400 psig pressure pulses at 135C.	Parts withdrawn every 200k cycles, characterized for wear
Field vs Lab Correlation	9	Central Labs	Field returns, from dealer lots, junkyards	Parts in Central Labs, see Ford spreadsheet
Design Of Experiments (1)	10	TI	Vary water concentrations in 'new' Brake Fluid	Test Report being written investigation continues.
Evaluating Factors			12 snap + 12 quiet switches w/ 0 % water in BF	Suspended at 1.3 million cycles with no leaks observed.
Effecting Diaphragm Wear			12 snap + 12 quiet switches w/ 5 % water in BF	Snap samples suspended at 1.3 million cycles with 2 leaks
Impulse test				observed at 1.3M. Quiet samples suspended at 500k cycles to
				assess fouling anomalies.
On-Vehicle Characterization of Pressure & Temperature Profile in Town Car	11	AVT	Monitor Pressure and Temperature at Switch Location for ABS and non-ABS braking events.	Test at AVT.....see Ford charts...>500k in car?
Brake fluid analysis	11a	TI	Analyze used brake fluid at the master cylinder	Test complete.
Used fluid at master cylinder.			(UMC), used brake fluid at the caliper (UCA)	UMC: Cu = 415 (ug/ml), Fe = 5.6 (ug/ml), Cr = 0.68 (ug/ml), 1.1 %H20.
			and new brake fluid (NEW) for metal and water	UCA: Cu = 582 (ug/ml), Fe = 5.6 (ug/ml), Cr = 1.9 (ug/ml), 1.1 %H20.
			content.	NEW: Cu = <0.01 (ug/ml), Fe = 0.82 (ug/ml), Cr = <.01 (ug/ml), 0.3 %H20.
Spark /Arc Study	12	Central Labs	Determine if arc/spark forms in switch	Equipment set-up in progress at Central Labs.
			using clutch leads and high speed video.	TI Experimented with no 'significant' sparks observed
			Use dry switches as well as switches with	
			various brake fluid water mixes.	
Characterization of switches retrieved from field junkyards & other sources	13	Central Labs	Characterize electrical, mechanical and chemical aspects of returned switches	Data log and analysis procedure set up complete. Analysis of switches in progress.
Fluid Ingress Tests	13a	TI	Repeat ignition simulation with different fluids.	Test complete.
			(3) hour tests:	6% NaCl sample resulted in an ignition.
			6% NaCl in tap water	All brake fluid samples drew less than 3 mAmps. No corrosion
			rain water	visible on brake fluid samples.

Brake Pressure Switch Test Log, Updated 7/22/99

			(24) hour tests:	Rain water and tap water samples drew <10 mAmps and showed
			tap water	some signes of corrosion.
			used brake fluid	Chemical anlysis in process.
			used brake fluid w/ 5% H_2O	
			new brake fluid	
			new brake fluid w/ 5% H_2O	
Design Of Experiments (2)	13b	TI	Very water concentrations in 'new' Brake Fluid	Test suspended. Analysis in process to assess test fixturing.
Repeat of test 10			10 snap + 20 quiet switches w/ 0 % water in BF	
			10 snap + 20 quiet switches w/ 5 % water in BF	
Compatibility of Kapton	14	Dupont	Characterize change in properties of Kapton	Test in progress (100) hours completed. Oxalic acid shows
with Oxalic Acid			with various % oxalic acid in brake fluid.	similar effects that water has on Kapton proerties.
Evaluation of Plastic	15	TI	Assess properties and moldability of different	Test suspended.
Materials with improved			grades of plastic resin with additives	Celanese and Noryl ignited 3/5 and 2/5 trials
Parameters			to improve plastic part performance	ZYTEL samples tested 1/5 ignitions
Long duration brake fluid	15a	TI	(4) samples with new brake fluid	Test suspended (550) hours completed.
Ingress test.			(2) samples with used brake fluid	Used brake fluid current dropped off to <1/10 mAmp.
				New BF hexport current can increases w/ time under cont. power.
Evaluation of Switch	15b	TI	Assess ignition sensitivity to switch orientation.	Test complete. Ignition is independent of switch orientation.
Orientation			Test vertical verses 45 degree.	simulated switch ignition can occur in vertical or 45 degree angle.
			Test rotational sensitivity in 45 deg. orientation.	Ignition appears not sensitive to switch rotational alignment.
Relay Circuit	16	TI	Repeat test 13a in Ford relay circuit for (48) hrs.	Test complete. No ignition. Corrosion rate drastically reduced.
Test			Bring switch to impending ignition in (15) Amp	Insufficient power in circuit to create or move toward ignition in lab
			circuit then place in relay circuit for (18) hrs.	Heater element was warm to the touch.
			Input max. circuit power into heater on switch.	
Long duration brake fluid	17	TI	(50) samples filled with new brake fluid	Test suspended. (312) hours completed.
ingress test number 2.			(1) hour of vibration per day	Average hexport current is 1.9 mAmp (stdeviation = 1.8 mAmps)
			(1) hour soak at 100 deg C per day	

preliminary draft summary of TI record search findings of May 14-17 1999

summary by Steve Beringhause & Andy McGuirk May 19th 1999
TI P/N: 77PSL2-1
Ford P/N: F2VC-9F924-AB
Tested at 'room temp' per manufacturing ES requirements

Date	Lot Size	Qty Impulse Tested	Qty Leak
26-Nov-91	4,000	10	-
26-Nov-91	4,000	10	-
5-Dec-91	4,000	10	-
5-Dec-91	4,000	10	-
9-Dec-91	4,000	10	-
9-Dec-91	2,000	5	-
11-Dec-91	4,000	10	-
11-Dec-91	4,000	10	-
13-Dec-91	4,000	10	-
14-Dec-91	4,000	10	-
16-Dec-91	4,000	10	-
16-Dec-91	4,000	10	-
2-Jan-92	4,000	10	-
6-Jan-92	4,000	10	-
7-Jan-92	2,000	5	-
8-Jan-92	4,000	10	-
8-Jan-92	4,000	10	-
14-Jan-92	4,000	10	-
14-Jan-92	4,000	10	-
15-Jan-92	4,000	10	-
28-Jan-92	2,000	5	-
31-Jan-92	4,000	10	-
2-Feb-92	1,650	5	-
4-Feb-92	4,000	10	-
5-Feb-92	4,000	10	-
6-Feb-92	4,000	10	-
10-Feb-92	4,000	10	-
11-Feb-92	4,000	10	-
12-Feb-92	4,000	10	-
12-Feb-92	4,000	10	-
14-Feb-92	4,000	10	-
14-Feb-92	4,000	10	-
14-Feb-92	4,000	10	-
15-Feb-92	4,000	10	-
24-Feb-92	4,000	10	-
26-Feb-92	4,000	10	-
26-Feb-92	4,000	10	-
28-Feb-92	4,000	10	-
28-Feb-92	4,000	10	-
28-Feb-92	4,000	10	-
6-Mar-92	4,000	10	-
10-Mar-92	4,000	10	-

11-Mar-92	4,000	10	-
12-Mar-92	4,000	10	-
18-Mar-92	4,000	10	-
23-Apr-92	2,000	5	-
2-May-92	2,000	5	-
5-May-92	2,000	5	-
6-May-92	2,000	5	-
14-Sep-92	2,000	5	-
22-Sep-92	4,000	10	-
30-Sep-92	4,000	10	-
7-Oct-92	4,000	10	-
7-Oct-92	4,000	10	-
16-Oct-92	4,000	10	-
21-Oct-92	2,000	5	-
20-Oct-92	4,000	10	-
29-Oct-92	4,000	10	-
29-Oct-92	4,000	10	-
30-Oct-92	4,000	10	-
4-Nov-92	4,000	10	-
10-Nov-92	4,000	10	-
10-Nov-92	4,000	10	-
11-Nov-92	4,000	10	-
17-Nov-92	2,000	5	-
20-Nov-92	4,000	10	-
4-Dec-92	2,000	5	-
9-Dec-92	2,000	5	-
14-Dec-92	2,000	5	-
16-Dec-92	4,000	10	-
16-Dec-92	4,000	10	-
16-Dec-92	4,000	10	-
21-Dec-92	2,000	5	-
21-Dec-92	4,000	10	-
Totals units	265,650	665	-

Carrey, Pat

From: McGuirk, Andy [a-mcguirk@email.mc.ti.com]
Sent: Friday, May 28, 1999 8:01 AM
To: Sharpe, Robert
Cc: Baumann, Russ
Subject: FW: ford draft...attorney client privileged communication

per our discussion about your visit .....

AUTOMOTIVE SENSORS AND CONTROLS QRA MANAGER
34 FOREST ST M/S 23-05
ATTLEBORO, MA 02703
TEL : (508) 236-3080
FAX : (508) 236-3745
MOBILE: (508) 208-8119
PAGE: (800) 467-3700 PIN 604-2044

From: McGuirk, Andy
Sent: Wednesday, May 26, 1999 10:01 AM
To: Baringhause, Steven; Baumann, Russ; Pechonis, John; Rowland, Thomas; Baker, Gary
Cc: Warner, Pam
Subject: ford draft...attorney client privileged communication

<<FredPort final2.doc>>

pls review and edit

a

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May 25, 1999

Mr. Frederick J. Porter, Supervisor
E/E Systems Engineering
Building 5, Mail Drop 5011
20000 Rotunda Drive, Rm 3E004
Dearborn MI 48121-2053

Dear Fred:

I want to review our recent support of the Ford core team to assure we do not have any misunderstandings regarding our pressure switch performance, our continued contribution to the 'core' team, and our commitment to a quick conclusion.

For six months the Texas Instruments Automotive Sensors & Controls Team has been supporting the Ford Core Diagnostic Team with technical facts, data, and analysis regarding our brake pressure switch product applied in the Ford cruise control deactivation circuit.

A senior TI pressure switch engineer was in residence at Ford for three weeks to assist with switch related issues in the system diagnostic process. Senior TI leadership participation has also been involved in virtually every Ford Core Team meeting delivering facts, data, and technical support year-to-date '99.

We also investigated switch capability, and using agreed upon accelerated simulation life testing techniques, demonstrated the ability of the model year '92 & '93, Town Car speed control deactivation switches to consistently exceed "cycle life specification" of 500,000 pressure cycles. TI Weibull reports of pressure switches tested in '1999 conservatively demonstrate 95% reliability to 1 million cycles (with confidence intervals greater than 50%).

Additionally "success testing records" of some 695 ES units that were tested during the 1991 - 1992 (11/91 - 12/92) showed zero leakage at 600,000 cycles.

Conclusion to date: 1992 period switches met specification. 1999 switch meets or exceeds specification

We have developed and delivered a laboratory model of accelerated plastic base ignition of the switch resulting from fluid in the switch cavity coupled with application of constant power as designed in the speed control circuit. Theories from the model suggest that fluids in the switch cavity in the presence of uninterrupted power could lead to a corrosion product formation which might create a plastic base ignition path.

Conclusion to date: Constant speed control power allows long term corrosion

In light of this laboratory model and the need for cruise system power only during vehicle operation, we suggest the system architecture of "key-on/off" based power be considered.

We have been open and forthright in our communications and delivery of information and we believe we have been instrumental in helping Ford address the underhood fire concern issue.

In this regard, we think it is appropriate at this point that our active participation in the diagnostic journey of the vintage 1992 product move towards a timely conclusion. Toward this end, we will continue to support the "core" team review of 1992 product history with targeted completion in July 1999.

We are preparing to fulfill your request for hosting a site visit, supporting campaign field return device analysis, and participating in robust system brainstorming sessions moving toward conclusion in July, as well as reviewing the optimization of our product line process controls.

Our prime focus at this time is in rapidly supplying Ford with 225,000 units in support of the field actions.

Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

attachments: 1992 Testing History
TI 77PS Test synopsis
TI 77PS Investigation Flow Diagram

Morris, Irene

From: McQuirk, Andy
Sent: Friday, May 28, 1999 9:00 AM
To: Sharpe, Robert
Cc: Baumann, Russ
Subject: FW: ford draft...attorney client privileged communication

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From: McQuirk, Andy
Sent: Wednesday, May 26, 1999 10:01 AM
To: Beringhause, Steven; Baumann, Russ; Peshosis, John; Rowland, Thomas; Belser, Gary
Cc: Weaver, Pam
Subject: ford draft...attorney client privileged communication

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pls review and edit

B

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REDACTED

From: McGuirk, Andy
Sent: Friday, May 28, 1999 3:22 PM
To: 'Frederick J. Porter'
Cc: Beringhause, Steven; Sharpe, Robert
Subject: Ford Core team update

Fred, per our discussions and Rob Sharpe's visit enclosed is our updates...

<<FredPortCore.doc>> <<synopsi1.doc>> <<TESTLOG9.xls>>
<<77PSL2_1.xls>>

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In light of this laboratory model and the need for cruise system power only during vehicle operation, we suggest the system architecture of "key-on/off" based power be considered.

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Regards,

Andrew C. McGuirk
QRA Manager
Texas Instruments

attachments: 1992 Testing History
TI 77PS Test synopsis
TI 77PS Investigation Flow Diagram

TI 77PS Test Synopsis

This document is a synopsis of tests conducted by Texas Instruments during the 77PS investigation. The intent of this document is to highlight test findings which drove the investigation to its current state. Throughout the investigation, several tests were conducted with the same objective. When each objective was met, efforts were refocused to obtain a new level of understanding and to establish a new set of objectives. As such, tests have been categorized into (5) levels, representing the level of knowledge obtained from the group of tests conducted. Each level is listed below with a short description of the objective:

Level 1: Create a laboratory switch ignition without any restrictions on methods.
Level 2: Create a laboratory switch ignition using only conditions found in the switch operating environment.
Level 3: Understand the laboratory ignition mechanism.
Level 4: Compare factors contributing to laboratory ignition.
Level 5: Evaluate recommendations.

Refer to Brake Pressure Switch Test Log.

Level 1 Objective: Determine if a switch ignition can be created in the laboratory.

- Test 1

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

Switch contact cavity flooded with brake fluid mixed with varying amounts of % H_20.
14 volts applied to one terminal, second terminal electrically floating. (No electrical load across switch terminals).
Switch hexport electrically grounded.

Results: (8) samples were tested total:
(2) with 4% H_20 in brake fluid.
(2) with 6% H_20 in brake fluid.
(2) with 10% H_20 in brake fluid.
(2) with 75% H_20 in brake fluid.

No ignition occurred. No significant temperature rise observed in all samples. Current draw ranged from 0.5 mAmps to 5 mAmps over a period greater than (250) hours.

- Test 2

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

Switch contact flooded with brake fluid.
14 volts applied to one terminal, second terminal connected to a 14 Ω resistor which is tied to ground. (1 Amp load across switch terminals).
Switch hexport electrically grounded.

Results: (2) samples were tested. No ignition occurred. No significant temperature rise observed for a period over (250) hours.

Conclusion: A (1) Amp load through switch terminals did not ignite brake fluid in the contact cavity of switches.

- Test 6

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

Heater element installed in contact cavity of the switch.
Power applied to the heater element until plastic base melts.
Spark generated in contact cavity of switch.
Brake fluid present in the contact cavity (wet device) and absent in the contact cavity (dry device).

Results: (2) dry devices were tested and (1) wet device was tested. Ignition occurred in all devices.
Wet device: The internal temperature of a wet device reached 660°F. A hole burned through the base of the switch (close to the heating element). The applied spark ignited the fumes in the contact cavity of the switch and engulfed the base material of the switch.
Dry device: The internal temperature of a dry switch reached over 1000°F. The switch base flopped over. The applied spark ignited the fumes in the contact cavity of the switch and engulfed the base material of the switch.

Conclusion: A switch ignition can occur under the following laboratory conditions:

Heater element installed in the switch contact cavity.
5 watts of power dissipated in heating element.
Spark generated in the contact cavity of the switch.

Brake fluid did not contribute to the ignition process.

Level 2: Objective: Determine if a laboratory ignition can occur using only switch components and elements found in the switch environment.

- Test 6a

Objective: Determine if corrosive degradation of switch electrical components can cause an increase in electrical resistance (and thus a source of heat) in the switch, which may lead to an ignition.

Results: (1) out of (15) samples tested increased resistance to 5 Ωs. A solution of 5 wt. % NaCl in H_20 can corrode the electrical components of the switch and cause an increase in electrical resistance. Repeated injections of the solution of 5 wt. % NaCl in H_20 into the contact cavity of a switch, with the switch continuously powered at 14 Volts, can cause an ignition.

Conclusion: A switch ignition can occur under the following laboratory conditions:

A solution of 5% NaCl in H_20 is injected into contact cavity of a switch.
Continuous 14 Volt power applied to the switch.
Hexport is grounded.
Current is limited at 15 Amps.

- Test 6c

Objective: Determine if brake fluid with metal shavings is conductive enough to create an ignition.

Results: (3) devices with various size metal particles were tested. No significant current increase detected.

Conclusion: Metal shavings did not significantly increase conductivity brake fluid. Current levels measured were well below levels necessary to create an ignition.

- Test 7

Objective: Determine if switch meets cycle life specification.

Results: Tests conducted during the first quarter of 1999 show that switches exceed cycle life specification.
In the first quarter of 1999, a total of (42) 77PSL2-1 map switches were impulse tested to over 1,000,000 cycles with only (1) leak below 1,000,000 cycles, which

occurred at 728,000 cycles. A Weibull analysis showed 99.9% reliability at 500,000 cycles at 95% confidence level.

Conclusions: Switches meet cycle life specification. First quarter, 1999 tests confirm impulse test findings made during the period between 1991 and 1992. During that period, (6) impulse tests on 144 devices of 57PS and 77PS construction, had no leaks when tested to 500,000 cycles. A Weibull analysis of first quarter, 1999 tests, showed 99.9% reliability at 500,000 cycles at 95% confidence level.

- Test 15a

Objective: Determine the long term corrosive effects of brake fluid on the electrical components of switches which are continuously powered at 14 Volts.

Results: Test was suspended after 550 hours of testing. (6) samples were tested with continuous 14 Volts power. The contact cavity of (4) switches contained new brake fluid and (2) switches contained old brake fluid. Switches with old brake fluid drew very little hexport current and showed a decrease in hexport current over time to less than 1/10 mAmp. Samples with new brake fluid showed an increase in hexport current to over 20 mAmps toward the end of the 550 hours of testing. Analyses of (1) sample with new brake fluid and (1) sample with old brake fluid revealed electrolytic corrosion of the contact arm of both switches. There was a much lower level of corrosion in the sample with used brake fluid than the sample with new brake fluid.

Conclusion: Brake fluid in the contact cavity of switches, which are at 14 Volts continuous power for over 500 hours, can cause electrolytic corrosion of the switch contact arm and an increase in hexport current.

- Test 17

Objective: Quantify the long term corrosive effects of new brake fluid on the electrical components of switches under the following laboratory conditions:

Contact cavity of switch flooded with new brake fluid.
Switches at continuous 14 Volts power.
Switches subjected to vibration for (1) hour per day.
Switches subjected to 100°C for (1) hour per day.

Results: Test suspended after (312) hours. (50) samples tested. The average hexport current draw after (312) hours is 1.9 mAmps with a standard deviation of 1.8 mAmps. These results are consistent with results previously found in Test 15a at the 300 hour point.

Conclusion: New brake fluid in the contact cavity of switches, has not caused an increase in hexport current after (312) hours at continuous 14 Volts power.

Level 3: Objective: Understand the laboratory ignition process, determine the current path and establish a repeatable ignition method.

- Test 6b

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

Results: Multiple attempts at laboratory ignition, via injection of a solution of 5 wt. % NaCl in H_20 into the contact cavity of switches, has resulted in a repeatability rate of approximately 50%. Plots of hexport current verses time show an increase in current until the point of ignition.

Conclusion: A repeatable laboratory method for switch ignition was established. Based on hexport current measurements, the current path is from switch terminals to hexport body.
When a solution of 5 wt. % NaCl in H_20 is repeatedly injected into the contact cavity of powered switches, electrolytic corrosion of the switch terminal results in an increase in terminal resistance. When sufficient power is drawn through the corrosive resistance, switch elements heat up and begin to glow red hot. A hole burns through the switch base and ignition occurs. There is arcing visible throughout the corrosion process which may provide the spark necessary for ignition.

Level 4: Objective: Compare and contrast variables influencing ignition using the established laboratory ignition method.

- **Test 13a**

Objective: Compare various fluids in the established ignition method.

Results: The following fluids were tested.
(1) NaCl in H_20.
(1) tap water
(1) rain water
(1) used brake fluid
(1) used brake fluid with 5 wt. % H_20
(1) new brake fluid
(1) new brake fluid with 5 wt. % H_20
The switch filled with 5 wt. % NaCl in H_20 resulted in an ignition when average hexport current exceeded 2.5 Amps. Switches that were filled with tap water and rain water drew less than 10 mAmps over a (3) hour test and showed little signs of

corrosion. Switches filled with a matrix of new and used brake fluids, with water and without water, all drew less than 3 mAmps hexport current draw and showed no signs of corrosion over the (24) hour test.

Conclusion: Brake fluid is not conductive enough to cause the electrolytic corrosion and necessary current draw to create an ignition within a 3 hour lab test. Because of its' significantly higher conductivity, an ionic rich fluid such as NaCl in H_20 can cause an ignition in a 3 hour lab test exposure..

- Test 15

Objective: Compare the ignition characteristics of various plastics as switch base material.

Results: When 5 wt. % NaCl in H_20 was injected into switches with different base materials, the following results were obtained: Cellanex 4300 ignited 3 out of 5 attempts. Noryl ignited 2 out of 5 attempts. Zytel ignited 1 out of 5 attempts.

Conclusions: All plastics tested can ignite using the established laboratory ignition method.

- Test 15b

Objective: Determine if switch ignition can occur in the vertical position and 45° orientation. Determine if switch ignition can occur and at different rotational angles in the 45° orientation.

Results: Switch ignitions can occur in both the vertical and 45° orientation using the established laboratory ignition method.

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

Level 5 Objective:

Test 16

- Objective: Test proposed relay circuit.

Results: (1) switch was injected with a solution of 5 wt. % Nacl in H_20 and placed in the proposed current limiting circuit for (48) hours. The current draw remained constant at 180 mAmps throughout the test. There was no activity observed and the contact arm remained mostly intact.
(1) switch was brought to an impending burn condition using the established burn method. An impending burn is a condition where a corrosive resistance has built

up in the switch and an ignition is imminent. The switch was then placed in the proposed relay circuit for(18) hours where it drew 160 mAmps, showed no visible activity and did not result in an ignition.
Because the proposed relay circuit acts as a resistor which limits current to the switch, the maximum power to the switch is limited to .75 Watts. A resistive wire was wrapped around the base of (1) switch and 0.75 Watts of power was dissipated in 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 insufficient to cause substantial electrolytic corrosion or significant switch terminal heating, which is necessary to create an ignition. In previous tests, using a resistor as the heating element (see Test 6), approximately 5 Watts of power was necessary to create an ignition.

Brake Pressure Switch Test Log, Updated 7/12/99

Category	Test	Location	Test Parameters	Results Update
Lab Simulation	1	TI	Vary water concentrations in 'new' Brake Fluid	250+ hours, Current draw in the 0.5mA to 5mA range
of Potential Ignition			14Vdc to one terminal, hexport grounded	Fluid has discolored.
in Switch			Water Conc: 4%, 6%, 10%, 75%	No Significant Temperature Rise. Test Suspended.
				Internal Analysis suspended.
	2	TI	New Brake Fluid	250+ hours. Constant temperature.
			1 Amp through switch terminals	No significant temperature rise with time
			14Vdc to one terminal, hexport grounded	Test Suspended.
	3	AVT	new/ Brake Fluid in Switch, 24 VDC to one	> 300 hours into test, max current 7mA
			terminal. Hexport Grounded	No significant change with time. Test suspended
	4	AVT	new/ Brake Fluid in Switch, 24 VDC to one	16 hours into test max current 6mA
			terminal. Hexport Grounded, Ambient at 100 C	No significant temperature rise with time. Test suspended.
	5	AVT	new/ Brake Fluid in Switch, 16 Amps	Temperature rise of 20 C above room temp
			Through switch terminals	Delta T reached steady state at 20 C. Test suspended.
	5a	AVT	new/ Brake Fluid in Switch approx. 50 Amps	Temperature rose to approx. 270 F. No smoke. No ignition
			through Switch Terminals	Test suspended.
	6	TI	Build heater elements into Switch.	3 tested. Smoke observed, ignition observed on part wheeler
			Heat till failure, include sparking.	See attachment
			(1) w/ solution of Brake Fluid and 6 wt. % H_2O	Test complete
				Brake fluid in cavity slows down heat build-up
				Smoke observed at 575 F, Base melts and falls off at 600 F
	6a	TI	Create heater by corroding spring arm	One out of 15 devices increased resistance to 5 ohms.
			Salt water solution, 14V between spring	Others either very low resistance or megaohms
			and hexport	It took about 100 hours to reach the 5 ohm stage.
				The 5 ohm device ignited under conditions similar to test 6.
	6b	TI	Re-run ignition test to understand	Switch ignition with repeated 5% water solution into switch
			repeatability and current path.	Current path is through hexport.
				See plots and video.
				Additional test include tap water, old BF, new BF and other.
	6c	TI	Pure 'new' brake fluid with metal shavings	Metal shavings do not contribute significantly to brake fluid

Brake Pressure Switch Test Log, Updated 7/12/99

				coductivity
Life Cycle Reliability	7	TI	0-1400 psig pressure pulses at 135C	First leak observed at 728,000 cycles.
of Pressure Switch			per ES	Test Completed. See attached Weibull Chart.
Diaphragm Wear	8	TI	0-1400 psig pressure pulses at 135C.	Parts withdrawn every 200k cycles, characterized for wear
Field vs Lab Correlation	9	Central Labs	Field returns, from dealer lots, junkyards	Parts in Central Labs, see Ford spreadsheet
Design Of Experiments (1)	10	TI	Very water concentrations in 'new' Brake Fluid	Test Report being written investigation continues.
Evaluating Factors			12 snap + 12 quiet switches w/ 0 % water in BF	Suspended at 1.3 million cycles with no leaks observed.
Effecting Diaphragm Wear			12 snap + 12 quiet switches w/ 5 % water in BF	Snap samples suspended at 1.3 million cycles with 2 leaks
Impulse test				observed at 1.3M. Quiet samples suspended at 500k cycles to
				assess fixturing anomalies.
On-Vehicle Characterization	11	AVT	Monitor Pressure and Temperature	Test at AVT.....see Ford charts...>600k in car?
of Pressure & Temperature			at Switch Location for ABS and non-ABS	
Profile in Town Car			braking events.	
Brake fluid analysis	11a	TI	Analyze used brake fluid at the master cylinder	Test complete.
Used fluid at master cylinder.			(UMC), used brake fluid at the caliper (UCA)	UMC: Cu = 415 (ug/ml), Fe = 8.8 (ug/ml), Cr = 0.08 (ug/ml), 1.1 %H20.
			and new brake fluid (NEW) for metal and water	UCA: Cu = 282 (ug/ml), Fe = 8.5 (ug/ml), Cr = 1.9 (ug/ml), 1.1 %H20.
			content.	NEW: Cu = <0.01 (ug/ml), Fe = 0.02 (ug/ml), Cr = <.01 (ug/ml), 0.3 %H20.
Spark /Arc Study	12	Central Labs	Determine if arc/spark forms in switch	Equipment set-up in progress at Central Labs.
			using clutch loads and high speed video.	TI Experimented with no 'significant' sparks observed
			Use dry switches as well as switches with	
			various brake fluid water mixes.	
Characterization of	13	Central Labs	Characterize electrical, mechanical	Data log and analysis procedure set up complete.
switches retrieved from field			and chemical aspects of returned switches	Analysis of switches in progress.
junkyards & other sources				
Fluid Ingress Tests	13a	TI	Repeat ignition simulation with different fluids.	Test complete.
			(8) hour tests:	5% NaCl sample resulted in an ignition.
			5% NaCl in tap water	All brake fluid samples drew less than 3 mAmps. No corrosion
			rain water	visible on brake fluid samples.
			(24) hour tests:	Rain water and tap water samples drew <10 mAmps and showed
			tap water	some signes of corrosion.
			used brake fluid	Chemical anlysis in process.

			used brake fluid w/ 5% H_2O	
			new brake fluid	
			new brake fluid w/ 5% H_2O	
Design Of Experiments (2)	13b	TI	Vary water concentrations in 'new' Brake Fluid	Test suspended. Analysis in process to assess test fixturing.
Repeat of test 10			10 snap + 20 quiet switches w/ 0 % water in BF	
			10 snap + 20 quiet switches w/ 5 % water in BF	
Compatibility of Kapton	14	Dupont	Characterize change in properties of Kapton	Test in progress (100) hours completed. Oxalic acid shows
with Oxalic Acid			with various % oxalic acid in brake fluid.	similar effects that water has on Kapton properties.
Evaluation of Plastic	16	TI	Assess properties and moldability of different	Test suspended.
Materials with Improved			grades of plastic resin with additives	Celanese and Noryl ignited 3/5 and 2/5 trials
Parameters			to improve plastic part performance	ZYTEL samples tested 1/5 ignitions
Long duration brake fluid	16a	TI	(4) samples with new brake fluid	Test suspended (650) hours completed.
ingress test.			(2) samples with used brake fluid	Used brake fluid current dropped off to <1/10 mAmp.
				New BF hexport current can increases w/ time under cont. power.
Evaluation of Switch	16b	TI	Assess ignition sensitivity to switch orientation.	Test complete. Ignition is independent of switch orientation.
Orientation			Test vertical verses 45 degree.	simulated switch ignition can occur in vertical or 45 degree angle.
			Test rotational sensitivity in 45 deg. orientation.	Ignition appears not sensitive to switch rotational alignment.
Relay Circuit	18	TI	Repeat test 13a in Ford relay circuit for (48) hrs.	Test complete. No ignition. Corrosion rate drastically reduced.
Test			Bring switch to impending ignition in (16) Amp	Insufficient power in circuit to create or move toward ignition in lab
			circuit then place in relay circuit for (18) hrs.	Heater element was warm to the touch.
			Input max. circuit power into heater on switch.	
Long duration brake fluid	17	TI	(50) samples filled with new brake fluid	Test suspended. (312) hours completed.
ingress test number 2.			(1) hour of vibration per day	Average hexport current is 1.8 mAmp (sedeviation = 1.8 mAmps)
			(1) hour soak at 100 deg C per day	

preliminary draft summary of TI record search findings of May 14-17 1999

summary by Steve Beringhause & Andy McGuirk May 19th 1999
TI P/N: 77PSL2-1
Ford P/N: F2VC-9F924-AB
Tested at 'room temp' per manufacturing ES requirements

Date	Lot Size	Qty Impulse Tested	Qty Leak
26-Nov-91	4,000	10	-
26-Nov-91	4,000	10	-
5-Dec-91	4,000	10	-
5-Dec-91	4,000	10	-
9-Dec-91	4,000	10	-
9-Dec-91	2,000	5	-
11-Dec-91	4,000	10	-
11-Dec-91	4,000	10	-
13-Dec-91	4,000	10	-
14-Dec-91	4,000	10	-
16-Dec-91	4,000	10	-
16-Dec-91	4,000	10	-
2-Jan-92	4,000	10	-
6-Jan-92	4,000	10	-
7-Jan-92	2,000	5	-
8-Jan-92	4,000	10	-
8-Jan-92	4,000	10	-
14-Jan-92	4,000	10	-
14-Jan-92	4,000	10	-
15-Jan-92	4,000	10	-
28-Jan-92	2,000	5	-
31-Jan-92	4,000	10	-
2-Feb-92	1,650	5	-
4-Feb-92	4,000	10	-
5-Feb-92	4,000	10	-
6-Feb-92	4,000	10	-
10-Feb-92	4,000	10	-
11-Feb-92	4,000	10	-
12-Feb-92	4,000	10	-
12-Feb-92	4,000	10	-
14-Feb-92	4,000	10	-
14-Feb-92	4,000	10	-
14-Feb-92	4,000	10	-
15-Feb-92	4,000	10	-
24-Feb-92	4,000	10	-
26-Feb-92	4,000	10	-
26-Feb-92	4,000	10	-
28-Feb-92	4,000	10	-
28-Feb-92	4,000	10	-
28-Feb-92	4,000	10	-
6-Mar-92	4,000	10	-
10-Mar-92	4,000	10	-
11-Mar-92	4,000	10	-
12-Mar-92	4,000	10	-

18-Mar-92	4,000	10	-
23-Apr-92	2,000	5	-
2-May-92	2,000	5	-
5-May-92	2,000	5	-
6-May-92	2,000	5	-
14-Sep-92	2,000	5	-
22-Sep-92	4,000	10	-
30-Sep-92	4,000	10	-
7-Oct-92	4,000	10	-
7-Oct-92	4,000	10	-
16-Oct-92	4,000	10	-
21-Oct-92	2,000	5	-
20-Oct-92	4,000	10	-
29-Oct-92	4,000	10	-
29-Oct-92	4,000	10	-
30-Oct-92	4,000	10	-
4-Nov-92	4,000	10	-
10-Nov-92	4,000	10	-
10-Nov-92	4,000	10	-
11-Nov-92	4,000	10	-
17-Nov-92	2,000	5	-
20-Nov-92	4,000	10	-
4-Dec-92	2,000	5	-
9-Dec-92	2,000	5	-
14-Dec-92	2,000	5	-
16-Dec-92	4,000	10	-
16-Dec-92	4,000	10	-
16-Dec-92	4,000	10	-
21-Dec-92	2,000	5	-
21-Dec-92	4,000	10	-
Totals units	**265,600**	**660**	**-**