

EA02-025

FORD 10/27/03

APPENDIX N

BOOK 18 OF 61

PART 1 OF 4

Case # 16

NHTSA

1992-93 Town Car/Crown Vic/Grand Marquis Under hood Fire Oesthousky

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: TOWN CAR VIN: 1LNLM81N0NY [REDACTED] Mileage: [REDACTED]

Do you still own the vehicle? Yes If not, do you know where it is?

Customer Name: [REDACTED]

Address [REDACTED] WEST DAVENPORT, FL

Did a dealer inspect your vehicle? NO If yes, name of the dealer Jenkins L-M / RULAND L-M

Was the vehicle involved in a natural disaster and as a result, destroyed? NO
If yes, where was the clean-up of the incident performed? NA

What is the repair history of the vehicle? NOTHING OTHER BRAKES REPLACED

- FRONT BRAKES repaired one month prior to fire

—Fuse blown few weeks prior to fire

Insurance Agency Information (if pertinent)

insurance agency name: _____
 insurance agent address: _____
 phone number: _____
 claims number: _____

Vehicle did not
have full coverage

N/A

Incident Info

Date of Loss: 3-6-99

Where did the fire start? Engine compartment? Specific location/component? Left side of under

Was the vehicle:
Engine on? Engine off? YES if off, how long was it off? 10-15 min
If on, how long was it on?

Moving?

10. Parked? If parked, where was the vehicle parked? (street, garage or carport) parking lot

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? ☐ 1 2

Speed control not working?	145
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Brake warning lamp illuminated? ☒ NO

Battery not holding a charge? 42

Fuses blowing? NO

Stop lamp inoperative? 14.0

Other? _____

Did you inspect the vehicle? Yes

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? _____

Were the underhood fuse links blown? YES

Were there any fuses that were blown or show evidence of other damage? YES

What areas of the vehicle were damaged? HOOD, GRILLE, WINDSHIELD, SOME INTERIOR

Was there any damage to any wiring in the area where you believe the fire was started?

SUCKS

Does the air suspension pump show evidence of overheating? _____

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

Was the vehicle repaired? NO When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

YES

For Inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS II module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

spotted 3/11/99

==>
VEHICLE ID: 1LNY (WNYFMAHNN) VIN: 1LNLMB1W0NY736847 DIV: 3 Status: 800
Vehicle Line: CVB Convy Deliv: 052992 Orig P-Lvl: 218 Selling Dlr: 45K1E8
Order Recpt: 032092 ShipTo Stat: Curr P-Lvl: 218 Sale Date: 061092
Orig Sched: 052592 Rls-To Stat: MI Order Dlr: 451E8 Demo Date:
Inv Prep: 051892 Orig Int St: 052792 Orig Rls Dlr: 45791 Deliv Type: H
Prod Date: 052692 Curr Int St: 052792 Rls Dlr P&A: 09623 Sales Prd: 092061
Rls Date: 052692 Dirfin Ext: Warr Start: 061092 Cancel Sl:
Memo Consign: Pac Ext: 062592 Warrs-Ind: Sale Status: G
Orig Flthbus: 052692 Advert Ext: -Date- -Dealer-
Curr Flthbus: 052692 Slapen SS#: Shipped: 052792 88M911
T/Name: 9 Curr Stock: 052692 45K1E8
Addr: State: OK 1st-Prior:
City: OKLAHOMA CITY W/A-Rep: 060992 2nd-Prior:
Zip: Warr-Ins-Ind: 3rd-Prior:
V.O.: 1 2 3 4 5 6 7 8
12345234567890123456789012345678901234567890123456789012345678901234
M91NY 43 5125E0346 1 KC F 3 P1 3P 2UL6L C P K45K1E8 1VAYG
8 9 0 1 2 3 4 5 6
567890123456789012345678901234567890123456789012345678901234567890
BT H WILNLO 9 B 2F A751A WP HZ050
F1-Help F3-Exit F4-Primary Menu F5-Financial Screen F9-Screen #3

LPREL10

3/12/99 - Ann
- called
- not in.
3/12/99 - PM
- reached MF. LON

MISC.

Name:

Address:

Address:

City:

HOUSTON

Zip/Postal:

Home Phone:

Day Phone:

State/Prov: TX

Country: USA

A VIN/

C Owner Status

Year

Model/

Previous Owner

Sale Type/

Open Issues

1997 FORD F-SERIES

1997

F-SERIES

RCO

F1=Help

F2=IssueList

F5=AddIssue

F7=Prev

F8=Next F9=ESP

F10=WarrHistory

F11=Menu

F12=Return

F13=Recall/ONP

F14=SpecialCoverage

NO MORE RECORDS AVAILABLE

LPREL10

*L NLM81W8NY

✓ 92 Town Car
on 93date of
Incident

3-17-97.

3/19/99

has taken ill. He states he will
never be available to answer any survey
questions. He asks that we (FORD) not
call his home again in relation to this
matter. Thank You! @ 5:50 PM

Michelle

Customer's

111

3-15-98

6:30

L04

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VEHICLE ID: 1LNY (WWFPH88888) Via: 1LNLMB1W6NY719486 DIVT 3 Status: 800
Vehicle Line: CVB Convy Deliv: 050492 Orig P-Lvl: 218 Selling Dlr: 25C729
Order Recpt: 032792 ShipTo Stat: Curr P-Lvl: 218 Sale Date: 050192
Orig Sched: 040692 Rls-To Stat: FL Order Dlr: 25729 Demo Date:
Inv Prep: 040992 Orig Int St: 041792 Orig Rls Dlr: 25729 Deliv Type: 4
Prod Date: 041592 Curr Int St: 041792 Rls Dlr P&A: 11643 Sales Prd: 092043
Rls Date: 041692 Dirfin Ext: Warr Start: 050192 Cancel Sl:
Memo Consgn: P&C Ext: 052592 WarrS-Ind: Sale Status: G
Orig Pltbus: 041692 Advert Ext: -Date- -Dealer-
Curr Pltbus: 041692 Slsprn 888 Shipped: 041692 888269
T/Name: 9 Curr Stock: 041692 25C729
Addr: State: FL 1st-Prior:
City: BOCA RATON N/A-Recpt: 043092 2nd-Prior:
Zip: Warr-Ins-Ind: 3rd-Prior:
V.O.: 1 2 3 4 5 6 7 8
12345234567890123456789012345678901234567890123456789012345678901234
M81NY 43 5906D0182 RC D P1 3P 2GL6L P 25C729 1 AYX
6 9 0 1 2 3 4 5 6
567890123456789012345678901234567890123456789012345678901234567890
BI H WILNLS 3 B 2 A751A WF VA001
F1-Help F3-Exit F4-Primary Menu F5-Financial Screen F9-Screen #3

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LPREL10

~~1992~~ 1992 vehicle (make unknown)
date of incident: 2-12-97

Lincoln Town Car (lease)

Kish Jack

#50
on
spreadsheet

3/16/99

Copy of survey.
What is Ford

of [redacted]
States the vehicle involved in the fire was a '92
Lincoln Town Car (leased).

He would not answer questions from survey. He instead
requested I forward the following to the powers at be
at FORD...:

- Forward a copy of survey/questionnaire
to fax # 901.324.6612.
- Have someone from Ford call him with
answers as to what they are going to do
about his vehicle.

Finally he notes that several attempts were made to
contact to correct group at Ford when the fire first happened.
He request a phone call ASAP. He also wanted to know of a
possible "Class Action Suit" he could join.

No survey
questionnaire
a few of his
answered!

Michelle
@ 6:01pm.

1992-95 Town Car/Crown Vic/Grand Marquis Under Hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: TOWN CAR VIN: 1LNLM51W6NV Mileage: 48,000

Do you still own the vehicle? 4/4 If not, do you know where it is? _____

Customer Name: _____ Phone: _____

Address: _____ Victoria, TX _____

Did a dealer inspect your vehicle? yes If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? NO
If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? install a phone

Insurance Agency Information (if pertinent)

Insurance agency name: State Farm Ins
Insurance agent address: 1945 E. McKinney Rd, Victoria TX
phone number: 572 1000 (area)
claim number: _____

Incident Info

Date of Loss: May 17, 1997

Where did the fire start? Engine compartment? _____ Specific location/component? ignition switch

Was the vehicle:
Engine on? _____ Engine off? ☒ If off, how long was it off? 2 hours
If on, how long was it on? _____

Moving? _____
Parked? ☒ If parked, where was the vehicle parked? (street, garage or carport) garage

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? _____

Speed control not working? _____

Brake warning lamp illuminated? _____

Battery not holding a charge? _____

Fuses blowing? _____

Stop lamp inoperative? _____

Other? hard to start (delay)

Did you inspect the vehicle? no

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? no

Were the underhood fuse links blown? no

Were there any fuses that were blown or show evidence of other damage? Don't know

What areas of the vehicle were damaged? Left side, Left passenger side, floor,

Was there any damage to any wiring in the area where you believe the fire was started?

Yes, completely burned

Does the air suspension pump show evidence of overheating? Don't know

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

none (phone)

Was the vehicle repaired? no When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

Don't know what car is

For Inspection: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 2/11/99

**>
 VEHICLE ID: 11LNY (WNYFSSBBB) VIN: 1LNLMB1W6NY723956 Div: 3 Status: 800
 Vehicle Line: CVB Convy Deliv: 052192 Orig P-Lvl: 218 Selling Dlr: 67C046
 Order Recpt: 033092 ShipTo Stat: Curr P-Lvl: 218 Sale Date: 052292
 Orig Sched: 042092 Rls-To Stat: TX Order Dlr: 67046 Demo Date:
 Inv Prep: 042492 Orig Int St: 051192 Orig Rls Dlr: 67046 Deliv Type: H
 Prod Date: 050592 Curr Int St: 051192 Rls Dlr P&A: 11413 Sales Prd: 092053
 Rls Date: 050792 Dlrfin Ext: 061092 Warr Start: 052292 Cancel Sl:
 Memo Consign: P&C Ext: 061092 WarrS-Ind: Sale Status: G
 Orig Pltbus: 050792 Advert Ext: 061092 -Date- -Dealer-
 Curr Pltbus: 050792 Slapen SS#: 0362 Shipped: 050792
 T/Name: 9 Curr Stock: 050792 67C046
 Addr: State: TX 1st-Prior:
 City: CORPUS CHRISTI N/A-Rept: 060292 2nd-Prior:
 Zip: Warr-Ins-Ind: 3rd-Prior:
 V.O.# 2 3 4 5 6 7 8
 1234567890123456789012345678901234567890123456789012345678901234
 M81NY 43 9120D1249 UC D P1 3P 2QL6L P J67C046 1 MD
 8 9 0 1 2 3 4 5 6
 567890123456789012345678901234567890123456789012345678901234567890
 AB H W1LNL6 S B 2 751A WP HZ287
 F1-Help F3-Exit F4-Primary Menu F5-Financial Screen F9-Screen #3

LPREL10

#24

[REDACTED]
 Victoria TX
 # [REDACTED]

not

3-12-99 no answer 5:40 PM Jm
 3-15-99 no answer 8:40 PM Jm

3/15/99
 Best time to reach
 5:30 - 7:30
 Zaf
 Lou Adair

3713 2354

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Town Car VIN: 1L6LMPIV22N Mileage: 80,000

Do you still own the vehicle? No If not, do you know where it is? Yes

Customer Name: [REDACTED] Phone: [REDACTED]

Address: [REDACTED] Dayton, TX [REDACTED]

Did a dealer inspect your vehicle? Yes If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? No
If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? None

Insurance Agency Information (If pertinent)

Insurance agency name: State Farm
Insurance agent address: Reedell Arnold
phone number: (419) 258-4623
claim number: Blue-clip incident # 970821070

Incident Info

Date of Loss: Aug 21, 97

claim #

Where did the fire start? Engine compartment? _____ Specific location/component? electrical system

Was the vehicle:
Engine on? _____ Engine off? ✓ If off, how long was it off? approx. 10 minutes
If on, how long was it on? _____

Moving? _____
Parked? ✓ If parked, where was the vehicle parked? (street, garage or airport) Airport

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? _____

Speed control not working? _____

Brake warning lamp illuminated? _____

Battery not holding a charge? _____

Fuses blowing? _____

Stop lamp inoperative? _____

Other? None

Did you inspect the vehicle? no

If yes, Did you find any of the following:

Any underhood relays show evidence of overheat? no

Were the underhood fuse links blown? no

Were there any fuses that were blown or show evidence of other damage? no

What areas of the vehicle were damaged? Left fender, hood, engine, melted, left tire

Was there any damage to any wiring in the area where you believe the fire was started?

Don't know

Does the air suspension pump show evidence of overheating? Don't know

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

CD Chilton

Was the vehicle repaired? no When? Where?

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

Don't know where vehicle is

For inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS II module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/1/99

Name: [REDACTED]

Address: [REDACTED]

Address: [REDACTED]

City: BAYTOWN

Zip/Postal: [REDACTED]

Home Phone: [REDACTED]

Day Phone: [REDACTED]

State/Prov: TX

Country: USA

A	VIN/	Year	Model/	Sale Type/
C	Owner Status		Previous Owner	Open Issues
-	-----	----	-----	-----
	1LNFM83W2WY [REDACTED]	1998	TOWN CAR	Individual Rtl
	ORIGINAL			
	2MEBP95F8FX [REDACTED]	1985	GRAND MARQUIS	Individual Rtl
	ORIGINAL			

F1=Help

F2=IssueList

F3=AddIssue

F7=Prev

F8=Next F9=ESP

F10=WarrHistory

F11=Menu

F12=Return

F13=Recall/ONP

F14=SpecialCoverage

NO MORE RECORDS AVAILABLE

LPREL10

41

92 Town car
VIN #

1LNLM81W2NY [REDACTED]

3-12-99 Call back today after 6:00pm

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VEHICLE ID: 1LNY (WWWPHHHHHH) VIN: 1LNLM81W2NY703705 Div: 3 Status: 800
Vehicle Line: CVB Convy Deliv: 032892 Orig P-Lvl: 218 Selling Dlr: 67K4E1
Order Recpt: 021992 ShipTo Stat: Curr P-Lvl: 218 Sale Date: 040192
Orig Sched: 031692 Rls-To Stat: TX Order Dlr: 674E1 Demo Date:
Inv Prep: 030992 Orig Int St: 031792 Orig Rls Dlr: 67726 Deliv Type: H
Prod Date: 031692 Curr Int St: 031792 Rls Dlr P&A: 11492 Sales Prd: 092033
Rls Date: 031692 Dlrfin Ext: Warr Start: 040192 Cancel Sl:
Memo Consign: P&C Ext: 042592 WarrS-Ind: Sale Status: G
Orig Pltbus: 031692 Advert Ext: -Date- -Dealer-
Curr Pltbus: 031692 Slapan S&A: Shipped: 031692 88R063
T/Name: 9 Curr Stock: 031692 67K4E1
Addr: State: OK 1st-Prior:
City: OKLAHOMA CITY W/A-Rcpt: 040192 2nd-Prior:
Zip: Warr-Ins-Ind: 3rd-Prior:
V.O.: 1 2 3 4 5 6 7 8
1234567890123456789012345678901234567890123456789012345678901234
M81NY 43 5116C0923 1 JB F 3 P1 3P 2GL6L C P K67K4E1 0VAYZ
8 9 0 1 2 3 4 5 6
567890123456789012345678901234567890123456789012345678901234567890
BI H WLLNL2 9 B 2D A751A WP H2001
F1-Help F2-Exit F4-Primary Menu F5-Financial Screen F9-Screen #3

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LPREL10

Case #30

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Town Car VIN: 1JNLM82N6N7 Mileage: 60,000 ^{Approx}

Do you still own the vehicle? NO If not, do you know where it is? HARTFORD TALE.

Customer Name: [REDACTED] Phone: [REDACTED]

Address: [REDACTED] Metairie, LA [REDACTED]

INS. CO. OK
Did a dealer inspect your vehicle? YES If yes, name of the dealer —

Was the vehicle involved in a natural disaster and as a result, destroyed? —
If yes, where was the clean-up of the incident performed? —

What is the repair history of the vehicle? Purchased used had approx. 6-8 months
had no problems and no repairs. Had some minor wear: Oil change
more other vehicles he had too.

Insurance Agency Information (if pertinent)

Insurance agency name: Hartford of Middletown
Insurance agent address: 700 24 Alsd. Southington CT 06480
phone number: 800-243-5860 / 800-246-0598 claims office
claim number: N/A 562ND61231
Southington 317/49
Spoke to Eric Vargus
800-246-0315 ext 8003

Incident Info

Date of Loss: 10/97 October 23 '97 @ 22:12/10:12 @ night

Where did the fire start? Engine compartment? — Specific location/component? —

Subbag checks. Little motor came on and off.
pump.

Was the vehicle:
Engine on? — Engine off? ✓ If off, how long was it off? Hours
If on, how long was it on? —

Moving? NO
Parked? YES If parked, where was the vehicle parked? (street, garage or carport) in front of house

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? —

Speed control not working? —

Brake warning lamp illuminated? —

Battery not holding a charge? —

Fuses blowing? —

Stop lamp inoperative? —

Other? Lump was making a lot of noise. Cold weather that day.

Did you inspect the vehicle? _____

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? NO

Were the underhood fuse links blown? NO

Were there any fuses that were blown or show evidence of other damage? NO

What areas of the vehicle were damaged? Under the hood. at that time entire car caught fire

Was there any damage to any wiring in the area where you believe the fire was started?

YES.

Does the air suspension pump show evidence of overheating? YES

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

NO

Was the vehicle repaired? NO When? TOTAL LOSS Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

For inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/11/99

[REDACTED]
Metairie, LA [REDACTED]

phone number : [REDACTED]

1LNLM82W6NY [REDACTED]

1992 Town Car

date of incident: 10-24-97

#52
on
spreadsheet

Surveyed
3-16-99
BT Michele
Henderson

Lou Federico

Voice mail

3-15-99 5:11

M. Bob Dinger
7:15 AM

* Note this was his wife's car.
She drove it on a daily basis

Case #
31

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Grand M. LS VIN: 2MECM75N1N Mileage: 84K

Do you still own this vehicle? Totaled If not, do you know where it is?

Customer Name: [Redacted] Phone: N/A

← CUSTOMER: [Redacted]

Address: Fort Loria, FL

Did a dealer inspection your vehicle? yes If yes, name of the dealer adjuster from ins. do dealer inspection

STANISLAW FL

Was the vehicle involved in a natural disaster and as a result, destroyed?
If yes, where was the clean-up of the incident performed?

What is the repair history of the vehicle? Basic oil changes. No major repair.

Motor. Eng. or frame.
trouble w/ cruise.

Insurance Agency Information (if pertinent)

Insurance agency name: State Farm Ins.
Insurance agent address: 25th Street, Fort Loria, FL
phone number: N/A
claim number: 5986 90 HA

claims office
800-627-4028

Fort
P. 1012

Agent
Cindy Simmons
407-953-7653

Incident Info

Date of Loss: July '98

Where did the fire start? Engine compartment? Centrally near left front wheel near engine Specific location/component?

Most of the damage was centered in the area too.

Was the vehicle:

Engine on? Engine off ☒ If off, how long was it off? Parked approx 3 hours during day
If on, how long was it on?

Moving? Yes

Parked? Yes If parked, where was the vehicle parked? (street, garage or carport) @ wife's place of work out side in parking lot.

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? Yes

Speed control not working? Yes

Brake warning lamp illuminated? Yes

Battery not holding a charge? Yes

Fuses blowing? Yes

Stop lamp inoperative? Yes

Other? Could not get car out of gear morning it happened! She called her husband for help.

Signals and brake lights stopped working
Tow truck operator replaced fuses.

Somehow thought
Thought fire was fueled
by fuel. Total inside
under hood. Mainly on
left side.

3713 2382

OVER →

Did you inspect the vehicle? yes (insurance co. State Farm)

If yes, Did you find any of the following:

Any underhood relays show evidence of overheat? NO

Were the underhood fuse links blown? yes They were replace by tow truck repair man

Were there any fuses that were blown or show evidence of other damage? yes signal and brake lights

What areas of the vehicle were damaged? near engine

Was there any damage to any wiring in the area where you believe the fire was started?
yes

Does the air suspension pump show evidence of overheating? did not know

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?
NO

Was the vehicle repaired? NO When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?
up to insurance co.

For Inspectors Parts that we would like from vehicle

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

*** Special note,**

 would like an amt of
good faith perhaps \$5000.00 off
a new Grand Marquis.

He's very serious. His wife loved
that car and would still like to
replace it.

updated 3/11/99

Vehicle located at:

ORANGE CITY AUTO AUCTION
151 TAFT VINELAND ROAD
ORLANDO FL 32824
Phone: 407-438-7191
CONTACT: MARY

STOCK #
824510

3713 2363

VEHICLE ID: 2MXX (WVFFHHEHE) VIN: 2MECM75W1NK728795 DIVI 3 Status: 800
 Vehicle Line: CFP Convy Deliv: 041592 Orig P-Lvl: 213 Selling Dir: 25A058
 Order Recpt: 032492 ShipTo Stat: Curr P-Lvl: 213 Sale Date: 050892
 Orig Sched: 040692 Rls-To Stat: FL Order Dlr: 25058 Demo Date:
 Inv Prep: 032792 Orig Int St: 040392 Orig Rls Dlr: 25058 Deliv Type: R
 Prod Date: 040292 Curr Int St: 040392 Rls Dlr PAA: 11636 Sales Prd: 092051
 Rls Date: 040292 Dlrfin Ext: 051092 Warr Start: 050892 Cancel Sl:
 Memo Consign: P&C Ext: 051092 Warr8-Ind: Sale Status: G
 Orig Pltbus: 040292 Advert Ext: 051092 -Date- -Dealer-
 Curr Pltbus: 040292 Slapen SS#: 1840 Shipped: 040392
 T/Name: 4 Curr Stock: 040292 25A058
 Addr: State: FL 1st-Prior:
 City: SEBASTIAN N/A-Recpt: 051292 2nd-Prior:
 Zip: Warr-Ins-Ind: 3rd-Prior:
 V.O. 1 2 3 4 5 6 7 8
 12345234567890123456789012345678901234567890123456789012345678901234
 M75NXY 4M J2 06D1552 OC E P1 J3P8Q7 LH B 25A058 1 YX
 8 9 0 1 2 3 4 5 6
 567890123456789012345678901234567890123456789012345678901234567890
 HT3H 3 2 W2MEC1 2 2 172A1 WP 8
 Fl-Help F3-Exit F4-Primary Menu F5-Financial Screen F9-Screen #3

LPREL10

#56

N/C dealership

7-7-98 Repair Order - No repairs were done.

Vehicle caught Fire under hood

Spoke to dealership suc.

Survey Attached

CUSTOMER INFO:

SEBASTIAN, FL

 STATE FARM
 INSURANCE
 claim #
 598690148

561-

 - Claims Office
 561-562-7110

 3-12-99 phone no longer in service for
 3-15-99 No Answer Loy Federico

 - Fire Office
 561-562-7120

← OVER →

DEALER: 325184 VERO BEACH LINCOLN-MERCURY INC
Address: 1066 US HWY 1
City: VERO BEACH
State/Prov: FL ZIP/Postal: 32960
Country: USA Trained: Y
Dlr Phone: 561 567 5272
Svc Phone: 561 567 5272
Svc Hours: 7:30 AM - 5:30 PM MON-FRI
Directions: MERKUR DEALER

P&A Code: 11607
Sales Region: 25 ORLANDO
Sales Zone: C
FCSD Region: 24 ORLANDO
Market: D2
Market Area:

A

C POSITION

Employee Name

FINANCE & INSUR. MANAGER
PARTS MANAGER
SALES MANAGER
SERVICE MANAGER

PARKER, LARRY
COSSER, MONIQUE C
WILLIAMSON, DAVE
STOREY, JOE

F1=Help F2=IssueList
NO MORE RECORDS AVAILABLE

F7=Prev

F8=Next

F11=Menu

F12=Return

LPREL10

*Spoke
to
Sandy in Service*

*3/16/99 [redacted] will can be reached @ [redacted] at approx
8:30am Wednesday morning. Per someone in his office
@ 5:07pm ~ Michele*

*Please call
back*

*3/17/99 @ approx. [redacted] agreed to answer survey questions.
See attached.*

ALAN CONGER
STATE FARM REP
770-460-4923

- We can inspect
- No parts may
be removed.

7/7/99 Ms Pam Kroemer @ 1. 20 AM.

Case # 31

asked for name and number. Only my name was given

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: TOWN CAR VIN#: 1LNLMBAW5NY Mileage: over one hundred thousand

Do you still own the vehicle? TOTALLED If not, do you know where it is? _____

Customer Name: _____ Phone: _____

Dealer: Dakin Tera Co. OH. / Alan Brighton Agent

Did a dealer inspection your vehicle? yes If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? _____

If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? Major electrical problems - can't fix or mail repair history

Trouble keeping coolant in vehicle.

Insurance Agency Information (if pertinent)

Insurance agency name: _____
Insurance agent address: _____
phone number: _____
claim number: _____

CUSTOMER
INFO

Incident Info

Date of Loss: 10/23/96

Where did the fire start? Engine compartment? _____ Specific location/component? _____

Started in motor compartment left front.

Was the vehicle:

Engine on? _____ Engine off? ✓ If off, how long was it off? Parked in garage for approx 5 days
If on, how long was it on? _____

Moving? _____

Parked? ✓ If parked, where was the vehicle parked? (street, garage or carport) garage

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? _____

Speed control not working? _____

Brake warning lamp illuminated? _____

Battery not holding a charge? _____

Fuses blowing? _____

Stop lamp inoperative? _____

Other? Door locks kept popping up and down. There was a lot of rain that evening. Not unusual per dealership. J/M of King's Auto Mall. They handled all servicing.

Did you inspect the vehicle? Yes

If yes, Did you find any of the following:

Any underhood relays show evidence of overhear? NO

Were the underhood fuse links blown? YES Did not know which ones

Were there any fuses that were blown or show evidence of other damage? Not sure

What areas of the vehicle were damaged? See front Started in motor compartment at left front.

Was there any damage to any wiring in the area where you believe the fire was started?
Did not know, but whole dash was completely melted

Does the air suspension pump show evidence of overheating? Not sure

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

NO

Was the vehicle repaired? Totaled When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

No - Check with Ins Co.

For inspectors: Parts that we would like from vehicle

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/11/99

VEHICLE ID: 1LNY (WWYPAN888) VIN: 1LNLM82W5NY728919 Div: 3 Status: 800
 Vehicle Line: CVB Convy Deliv: 052692 Orig P-Lvl: 218 Selling Dir: 15D040
 Order Recpt: 042192 ShipTo Stat: Curr P-Lvl: 218 Sale Date: 091692
 Orig Sched: 050492 Rls-To Stat: *Tord* Order Dir: 15040 Demo Date:
 Inv Prep: 050892 Orig Int St: 052092 Orig Rls Dir: 15040 Deliv Type: R
 Prod Date: 051592 Curr Int St: 052092 Rls Dir P&A: 10409 Sales Prd: 092092
 Rls Date: 051892 Dirfin Ext: 062592 Warr Start: 091692 Cancel Sl:
 Memo Consgn: PAC Ext: 062592 Warr8-Ind: Sale Status: G
 Orig Pltbus: 051892 Advert Ext: 062592 *Dealer*
 Curr Pltbus: 051892 Alapn 888: 3713 Shipped: *050000*
 T/Name: 4 *050000* Curr Stock: *050000*
 Addr: *050000* State: NJ 1st-Prior:
 City: CINNAMINSON N/A-Rcpt: 091792 2nd-Prior:
 Zip: *050000* Warr-Ins-Ind: 3rd-Prior:
 V.O.: 1 2 3 4 5 6 7 8
 1234567890123456789012345678901234567890123456789012345678901234
 M82NY 4L A 2 04E0305 LD E P14 3P8 4 3 L6L A P 7 15D040 1 DD
 8 9 0 1 2 3 4 5 6
 567890123456789012345678901234567890123456789012345678901234567890
 DH H8 WILNLS 7 D 755A 9WP
 F1=Help F3=Exit F4=Primary Menu F5=Financial Screen F9=Screen 93

LPREL10

#34
on spread
sheet

'92
Town
Car

Lebanon, OH
 phone
 * SURVEY
 ATTACHED

incident
 date
 11-1-96

3-15-99 voice-mail 5:40 PM
 3-15-99 voice mail 9m 6:30 PM

3/16/99 Reached *050000*, but she was on her cell phone at the time and
 request a call back either tonight around 8:00 pm or Wednesday morning
 (3/17/99) around 9:30 am. She would be happy to help. She stated the
 vehicle had been sitting in the garage for approx. 5 days when it caught on
 fire destroying other vehicles...
Wade F. Henderson

Home call
 3/17/99
 @ 9:30 am

Other cars had major smoke damage.

3/17/99 *050000* agreed to answer all questions. See attached

3713 2389

Case # 22

1992-95 Tera Car/Crown Vic/Grand Marais Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

1LNLM81W 2NY698313

Model Year: 92 Make: Tera Car VIN#: _____ Mileage: 100,000 over

Do you still own the vehicle? No If not, do you know where it is? Sherid's in town Detroit

Customer Name: _____ Phone: _____

Address: _____

Did a dealer inspect your vehicle? No If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? No

If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? owned 93 days

Insurance Agency Information (if pertinent)

Insurance agency name: not insured

Insurance agent address: _____

phone number: _____

claim number: _____

Incident Info

Date of Loss: 5/27/97

Left hand drivers side

Where did the fire start? Engine compartment? _____ Specific location/component? _____

Was the vehicle:

Engine on? _____ Engine off? ☒ If off, how long was it off? 3 hr.

If on, how long was it on? _____

Moving? _____

Parked? ☒ If parked, where was the vehicle parked? (street, garage or carport) _____

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? No

Speed control not working? No

Brake warning lamp illuminated? No

Battery not holding a charge? No

Fuses blowing? No

Stop lamp inoperative? No

Other? _____

CUSTOMER
SOLD VEHICLE
TO SALVAGE
YARD -

VEHICLE CAN
NOT BE
LOCATED

Did you inspect the vehicle? no

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? —

Were the underhood fuse links blown? —

Were there any fuses that were blown or show evidence of other damage? —

What areas of the vehicle were damaged? —

Was there any damage to any wiring in the area where you believe the fire was started?
—

Does the air suspension pump show evidence of overheating? —

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?
no

Was the vehicle repaired? no When? — Where? —

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?
yes

For inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/1/99

Case # 21

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Town Car VIN: 1LNLA82W5N7 Mileage: N/A

Do you still own the vehicle? no If not, do you know where it is? N/A - possibly LA

Customer Name: [REDACTED] Phone: [REDACTED]

Address: _____

Did a dealer inspect your vehicle? don't know If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? _____

If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? no repairs

Insurance Agency Information (if pertinent)

Insurance agency name: AETNA

Insurance agent address: _____

phone number: _____

claim number: _____

Incident Info

Date of Loss: 6/30/95

Where did the fire start? Engine compartment? _____ Specific location/component? _____

Vehicle hood

Was the vehicle: checked

Engine on? ✓ Engine off? _____ If off, how long was it off? _____

If on, how long was it on? _____

Moving? ✓

Parked? _____ If parked, where was the vehicle parked? (street, garage or carport) _____

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? _____

Speed control not working? _____

Brake warning lamp illuminated? _____

Battery not holding a charge? _____

Fuses blowing? _____

Stop lamp inoperative? _____

Other? _____

CUSTOMER IS
AN OLDER
GENTLEMAN -
HE DOESN'T
REMEMBER MUCH
ABOUT THE INCIDENT

Did you inspect the vehicle? _____

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? _____

Were the underhood fuse links blown? _____

Were there any fuses that were blown or show evidence of other damage? _____

What areas of the vehicle were damaged? _____

Was there any damage to any wiring in the area where you believe the fire was started?

Does the air suspension pump show evidence of overheating? _____

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

Was the vehicle repaired? _____ When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

For inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/11/99

NY 100-510**NAVIS Vehicle Inquiry**

03/04/99 10:01:

[illegible]

LPREL10

292 TOWN CASE

#8 on spreadsheet

Incident
6/30/95

Surveyed
3-15-99

1992-95 Towa Car/Crown Vic/Grand Marais Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Town Car VIN# 1H4NA81W2N4 Mileage: 65000

Do you still own the vehicle? No If not, do you know where it is? _____

Customer Name: _____ Ph: _____

Address: _____ Towson, Md _____

Did a dealer inspect your vehicle? No If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? No
If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? Transmission problem

Insurance Agency information (if pertinent)

Insurance agency name: Peabody Nat'l Ins
Insurance agent address: Beach Island, S.C.
phone number: _____
claim number: _____

Incident Info

Date of Loss: Don't know April/March 97

Where did the fire start? Engine compartment? _____ Specific location/component? _____

Under passenger side

Was the vehicle:

Engine on? _____ Engine off? ☒ If off, how long was it off? 5 mins
If on, how long was it on? _____

Moving? _____

Parked? ☒ If parked, where was the vehicle parked? (street, garage or carport) garage

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? _____

Speed control not working? _____

Brake warning lamp illuminated? _____

Battery not holding a charge? _____

Fuses blowing? _____

Stop lamp inoperative? _____

Other? None

Did you inspect the vehicle? yes

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? don't know

Were the underhood fuse links blown? don't know

Were there any fuses that were blown or show evidence of other damage? don't know

What areas of the vehicle were damaged? front end, hood in back, front windshield

Was there any damage to any wiring in the area where you believe the fire was started?

don't know

Does the air suspension pump show evidence of overheating? don't know

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

no

Was the vehicle repaired? totaled When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

yes

For Inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

KDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/1/99

==>

VEHICLE ID: 1LNY (WWFSSSSSS) VIN: 1LNLM81W2NY684783 DIV: 3 Status: 800
Vehicle Line: CVB Convy Deliv: 031292 Orig P-Lvl: 218 Selling Dlr: 25C707
Order Recpt: 012992 ShipTo Stat: Curr P-Lvl: 218 Sale Date: 031092
Orig Sched: 021092 Rls-To Stat: *Land* Order Dlr: 25707 Demo Date:
Inv Prep: 021492 Orig Int St: 022592 Orig Rls Dlr: 25707 Deliv Type: M
Prod Date: 022192 Curr Int St: 022592 Rls Dlr P&A: 11658 Sales Prd: 092031
Rls Date: 022492 Dlrfin Ext: Warr Start: 031092 Cancel Sl:
Memo Consgn: P&C Ext: 032592 WarrS-Ind: Sale Status: G
Orig Pltbus: 022492 Advert Ext: *125855-Dealer-*
Curr Pltbus: 022492 Slapan S&S: Shipped: 022592 88J474
T/Name: 9 Curr Stock: 022592 88J474
Addr: State: FL 1st-Prior:
City: ORLANDO M/A-Rept: 031092 2nd-Prior:
Zip: Warr-Ins-Ind: 3rd-Prior:
V.O.: 1 2 3 4 5 6 7 8
12345234567890123456789012345678901234567890123456789012345678901234
M81NY 43 5610B1701 TA D P1 3P 2GL6L C H J25C707 0 ACD
8 9 0 1 2 3 4 5 6
567890123456789012345678901234567890123456789012345678901234567890
BH H WLLNL2 5 B 2 A751A WP BU007
F1=Help F3=Exit F4=Primary Menu F5=Financial Screen F9=Screen #3

LPREL10

#35
on spreadsheet'92
Town
Car

EVANS, GA

Incident
date
4-29-96

3-15-99 voice mail 5:50 PM pm

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Lincoln VIN#: _____ Mileage: 90,000

Do you still own the vehicle? No If not, do you know where it is? Don't know, motor co

Customer Name: _____ Phone: _____ 713-675-6651

Address: _____

Did a dealer inspect your vehicle? No If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? No
If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? No

Insurance Agency Information (if pertinent)

Insurance agency name: No Insurance
Insurance agent address: _____
phone number: _____
claim number: _____

Incident Info

Date of Loss: Mar 98

Where did the fire start? Engine compartment? under the hood Specific location/component? _____

Was the vehicle:
Engine on? _____ Engine off? ✓ If off, how long was it off? 30 min.
If on, how long was it on? _____

Moving? _____
Parked? ✓ If parked, where was the vehicle parked? (street, garage or carport) driveway

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? No
Speed control not working? No
Brake warning lamp illuminated? No
Battery not holding a charge? No
Fuses blowing? No
Stop lamp inoperative? No
Other? _____

Did you inspect the vehicle? no

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? _____

Were the underhood fuse links blown? _____

Were there any fuses that were blown or show evidence of other damage? _____

What areas of the vehicle were damaged? _____

Was there any damage to any wiring in the area where you believe the fire was started?

Does the air suspension pump show evidence of overheating? _____

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?
no

Was the vehicle repaired? _____ When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

For inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 3 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/1/99

Name:

Address:

Address:

City:

Zip/Postal:

LEAKEY

Home Phone:

Day Phone:

State/Prov: TX

Country: USA

A	VIN/	Year	Model/	Sale Type/
C	Owner Status		Previous Owner	Open Issues
-	2FTJW361XGCA60052	1986	F-SERIES	Individual Rtl
	SUBSEQUENT			

F1=Help

F2=IssueList

F3=AddIssue

F7=Prev

F8=Next F9=ESP

F10=WarrHistory

F11=Menu

F12=Return

F13=Recall/ONP

F14=SpecialCoverage

NO MORE RECORDS AVAILABLE

LPREL10

#43
on spreadsheet

CUST

192
TOWN CAR

(check area code -
either 830 or 210)

1LNLM82WSNY

3-12-99 Voice mail at 6:45 PM Jm
3-15-99 Voice mail at 5:22 PM Jm

3-15-99 Buy 6:45 17

3/15/98 194

-->
 VEHICLE ID: 11NY (NNYPBBSBS) VIN: 11NLM82N5NY666597 DIV: 3 Status: B00
 Vehicle Line: CVB Convy Deliv: 010692 Orig P-Lvl: 213 Selling Dlr: 67C296
 Order Recpt: 120991 ShipTo Stat: Curr P-Lvl: 213 Sale Date: 042392
 Orig Sched: 121691 Rls-To Stat: TX Order Dlr: 67021 Demo Date:
 Inv Prep: 121091 Orig Int St: 122091 Orig Rls Dlr: 67021 Deliv Type: E
 Prod Date: 121791 Curr Int St: 122091 Rls Dlr P&A: 11408 Sales Prd: 092043
 Rls Date: 121991 Dirfin Ext: 012592 Warr Start: 042392 Cancel Sl:
 Memo Consgn: P&C Ext: 012592 Warrs-Ind: Sale Status: G
 Orig Plthbus: 121991 Advert Ext: 012592 -Date- -Dealer-
 Curr Plthbus: 121991 Slapan 854: 0797 Shipped: 121991
 T/Wama: 9 Curr Stock: 042292 67C296
 Addr: State: TX 1st-Prior: 121991 67021
 City: HOUSTON W/A-Rcpt: 042792 2nd-Prior:
 Zip: Warr-Ins-Ind: 3rd-Prior:
 V.O.: 1 2 3 4 5 6 7 8
 12345234567890123456789012345678901234567890123456789012345678901234
 M82NY 4L 2 16M5196 9M E PIJ 3P 4 2 L6L P 67C021 4 MK
 8 9 0 1 2 3 4 5 6
 567890123456789012345678901234567890123456789012345678901234567890
 CY H W1LNLS 9 D 755A 9WP
 F1-Help F3-Exit F4-Primary Menu F5-Financial Screen F9-Screen #3

LPREL10

Case # 26

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questions/Answers

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 93 Make: Town Car VIN#: Mileage:

Do you still own the vehicle? NO If not, do you know where it is? YES

Customer Name: _____ **Phone:** _____

Address: [REDACTED] Mount Holly, NJ

Did a dealer inspect your vehicle? no If yes, name of the dealer _____

Was the vehicle involved in a natural disaster and as a result, destroyed? _____
If yes, where was the clean-up of the incident performed?

What is the repair history of the vehicle? No major

Insurance Agency Information (if pertinent)

Insurance agency name: VJ Manufacture
Insurance agent address: _____
phone number: _____
claim number: _____

Incident Info

Date of Loss: Aug 10, 1997

Where did the fire start? Engine compartment? Front wheel well Specific location/component?

Was the vehicle:
Engine on? _____ Engine off? ☒ If off, how long was it off? 6 HR
If on, how long was it on? _____

Moving? ☐ Parked? ☒ If parked, where was the vehicle parked? (street, garage or carport) F/only

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? no
Speed control not working? Yes
Brake warning lamp illuminated? no
Battery not holding a charge? no
Fuses blowing? no
Stop lamp inoperative? no
Other?

Did you inspect the vehicle? No

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? _____

Were the underhood fuse links blown? _____

Were there any fuses that were blown or show evidence of other damage? _____

What areas of the vehicle were damaged? _____

Was there any damage to any wiring in the area where you believe the fire was started?

Does the air suspension pump show evidence of overheating? _____

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

Was the vehicle repaired? NO When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?
~~_____~~

For Inspectors: Parts that we would like from vehicles

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/1/99

Name:

Address:

Address:

City:

MOUNT HOLLY

Zip/Postal:

Home Phone:

Day Phone:

State/Prov: NJ

Country: USA

A	VIN/	Year	Model/	Sale Type/
C	Owner Status		Previous Owner	Open Issues
-	-----	-----	-----	-----
	1LNLM81W1P	1993	TOWN CAR	Individual Rtl
	ORIGINAL			
	2MEBM75F9K	1989	GRAND MARQUIS	Individual Rtl
	ORIGINAL			

F1-Help

F2-IssueList

F5-AddIssue

F7-Prev

F8-Next

F9-RSP

F10-WarrHistory

F11-Menu

F12-Return

F13-Recall/ONP

F14-SpecialCoverage

NO MORE RECORDS AVAILABLE

LPREL10

#53 in spreadsheet

3/15/99

No Answer

Best time

→ 6:00 pm

✓ Lou Antonio Federico II

Case # 3

1992-95 Town Car/Crown Vic/Grand Marquis Under hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 1992 Make: Town Car VIN: 1LNLM81W2NY Mileage: 114,000 So.

Do you still own the vehicle? Yes If not, do you know where it is? IAS - Co.

Customer Name: [REDACTED] Phone: [REDACTED]

Address: [REDACTED]

Did a dealer inspect your vehicle? Yes If yes, name of the dealer Fairway Ford in Tyler, TX

Was the vehicle involved in a natural disaster and as a result, destroyed? NO

If yes, where was the clean-up of the incident performed?

What is the repair history of the vehicle? 1-28-99 @ Fairway Ford Cruise

Control was inoperative - Brake lights inoperative - Vehicle would not come out of park - Elec/A-C heating problem - Wire

Insurance Agency Information (if applicable)

Insurance agency name: AUSTINE

Insurance agent address: TYLER, TX

Phone number: 903-535-4073

Claim number: 4852475524

Shortage near brake light switch
Fuse blown 1.5 circuit test
Shift Lock circuit test, brake light switch.

Incident Info

Date of Loss: 2-21-99

Where did the fire start? Engine compartment? YES Specific location/component?

CONTACT: GLEN BULTON
FIRE CAUSE INVESTIGATION
800-432-4669

Was the vehicle:

Engine on? OFF Engine off? OFF If off, how long was it off? 5 minutes

If on, how long was it on?

Moving?

Parked? Yes If parked, where was the vehicle parked? (street, garage or airport) parking lot

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? Yes

Speed control not working? Yes

Brake warning lamp illuminated? Yes

Battery not holding a charge? Yes

Fuses blowing? Yes

Stop lamp inoperative? Yes

Other? Yes

cust all
had concerns
these were
but rep'd 1-28-99
no more
concerns appeared

Did you inspect the vehicle? _____

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? _____

Were the underhood fuse links blown? Fuse #12 had blown 1st on 1/28/99, then again after the fire.

Were there any fuses that were blown or show evidence of other damage? _____

What areas of the vehicle were damaged? driver side firewall / steering column / brake booster

Was there any damage to any wiring in the area where you believe the fire was started?

Does the air suspension pump show evidence of overheating? _____

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

NO. IT DID HAVE A WHEEL CHAIR LEFT IN THE TRUNK.

Was the vehicle repaired? Yes When? 1-28-99 Where? Fairway Ford / Tyler, TX.

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

For Inspectors: Parts that we would like from vehicle

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 8 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/11/99

1992-95 Town Car/Crown Vic/Grand Marquis Under Hood Fire Questionnaire

We are contacting you, because you reported smoke or fire in your vehicle. Ford is investigating your report and would like to ask you some questions about it. We hope everyone was ok...

Vehicle/Customer Information

Model Year: 92 Make: Town Car VIN: 1LHLM82N1N1 Mileage: 22

Do you still own the vehicle? no If not, do you know where it is? _____

Customer Name: _____ Phone: _____

Address: _____ New Iberia, LA _____

Did a dealer inspect your vehicle? yes If yes, name of the dealer Bickner Lincoln-Mercury

Was the vehicle involved in a natural disaster and as a result, destroyed? yes
If yes, where was the clean-up of the incident performed? _____

What is the repair history of the vehicle? no

Insurance Agency information (if pertinent)

Insurance agency name: _____
Insurance agent address: _____
phone number: _____
claim number: _____ Case # 25

Incident Info

Date of Loss: Unknown

Where did the fire start? Engine compartment? _____ Specific location/component? _____

Left passenger wheel well

Was the vehicle:

Engine on? _____ Engine off? ☒ If off, how long was it off? 24 hours
If on, how long was it on? _____

Moving? _____

Parked? ☒ If parked, where was the vehicle parked? (street, garage or carport) street

Did customer notice anything unusual prior to fire, such as:

Difficulty shifting out of park? _____

Speed control not working? _____

Brake warning lamp illuminated? _____

Battery not holding a charge? _____

Fuses blowing? _____

Stop lamp inoperative? _____

Other? no

Did you inspect the vehicle? yes

If yes, Did you find any of the following:

Any underhood relays show evidence of overheating? don't know

Were the underhood fuse links blown? don't know

Were there any fuses that were blown or show evidence of other damage? No

What areas of the vehicle were damaged? front end, dash

Was there any damage to any wiring in the area where you believe the fire was started?

don't know

Does the air suspension pump show evidence of overheating? don't know

Was the vehicle equipped with any aftermarket components such as car alarm or remote start?

yes, remote

Was the vehicle repaired? totaled When? _____ Where? _____

If the vehicle has not been repaired and was involved in an underhood fire or fire of unknown origin that involved the engine compartment, we would like to inspect it.

Would you allow a Ford representative to inspect your vehicle and if necessary, replace some parts?

vehicle was taken away - to junkyard

For inspectors: Parts that we would like from vehicle

Brake pressure switch (preferably with wire pigtail/connector attached and still attached to prop valve)

Sample of brake fluid at prop valve (in sealed glass container)

Relay pack located on LH fender apron (with as much wiring as possible)

EDIS 5 module located on LH fender

Speed control module located on LH fender

Air suspension compressor located under air filter

Air suspension relay

Other suspect parts

updated 3/11/99

VEHICLE ID: 1LNY (WWXPHHSHH) VIN: 1LNLM82W1NY638182 DIV: 3 Status: 800
 Vehicle Line: CVB Convy Deliv: 110891 Orig P-Lvl: 213 Selling Dlr: 22B679
 Order Recpt: 100791 ShipTo Stat: Curr P-Lvl: 213 Sale Date: 111491
 Orig Sched: 101491 Rls-To Stat: Order Dlr: 22679 Demo Date:
 Inv Prep: 100991 Orig Int St: 101691 Orig Rls Dlr: 22679 Deliv Type: 0
 Prod Date: 101191 Curr Int St: 101691 Rls Dlr P&A: 12033 Sales Prd: 091112
 Rls Date: 101591 Dlrfin Ext: 111091 Warr Start: 111491 Cancel Sl:
 Memo Consign: P&C Ext: 111091 WarrS-Ind: Sale Status: G
 Orig Plthru: 101591 Advert Ext: 111091
 Curr Plthru: 101591 Shipped: 0717 Shipped: 101591
 T/Name: 1 State: LA Curr Stock: 101591
 Addr: City: NEW IBERIA N/A-Rcpt: 111591 1st-Prior:
 Zip: Warr-Ins-Ind: 2nd-Prior:
 V.O.: 1 2 3 4 5 6 7 8 3rd-Prior:
 12345234567890123456789012345678901234567890123456789012345678901234
 M82NY 4L 1 14K8209 7K D T14 3P 4 2 L6L A P 22B679 4 MD
 567890123456789012345678901234567890123456789012345678901234567890
 DY H W1LNL1 0 D 755A WT
 F1=Help F3=Exit F4=Primary Menu F5=Financial Screen F9=Screen #3

LPREL10

#19
 on
 Serial Sheet

'92 TOWN CAR

NEW IBERIA, LA

phone:

Surveyed
 3-18-99
 by M.R.

date of
 Incident
 1-12-93

Summaries Given
to CLS members
Ch. 6



CHINA, ADAMS BROS
BANK OF

3713 2391

Brake Actuated Speed Control Deactivation Switch

Problem:

A NHTSA preliminary evaluation of the speed control deactivation switch and other electrical components has been initiated as a result of approximately 130 underhood fires being reported in 1992-1993 Town Cars located in the southern states. Two occurrences at dealerships, in which a fire was caught in its early stages and confined to the speed control deactivation switch, indicate that at least some of the underhood fires may have originated in the switch. The fires occur when the vehicle is parked and the ignition off. Similar events may be occurring in Crown Victorias which use the same switch and packaging. Other vehicle lines, including light trucks, have used this switch without reported incidents. The switch is not used in currently designed vehicles.

Investigation Team:

Team members include representatives from AVT Chassis Electrical, AVT Materials, LVC Brakes, Powertrain Control Systems, Design Analysis, Automotive Safety Office, Central Laboratory, Scientific Research Laboratory, Texas Instruments, UTA, and Dow.

Switch Description:

The switch is used redundantly with the brake light switch to deactivate the speed control when the brakes are applied. The switch is mounted on the brake proportioning valve and is actuated by brake fluid pressure. A Kapton diaphragm/seal separates the fluid side of the switch from the switch cavity where the electrical contacts are located. Brake fluid pressure deflects the Kapton, which through a converter and snap disc, opens the electrical contacts of the switch, and deactivates the speed control. The switch is normally closed and is always energized (hot) even when the ignition switch is off. The switch is supplied by Texas Instruments, while the connector and brake fluid are supplied by UTA and Dow.

Central Laboratory Investigation:

Several switches have been investigated at Central Laboratory including: One partially burned switch in which a fire was discovered at a dealership; four switches in which leakage occurred or some malfunction of the speed control system was discovered (returned from dealerships as the result of an OASIS); seven completely burned switches from severely damaged vehicles found in junkyards, insurance storage lots, and auctions; and twenty six switches collected during junkyard surveys.

Testing included resistance measurements, functional checks, visual examination, live time fluoroscopy, disassembly, scanning electron microscopy, metallography, and infrared analysis.

Central Laboratory Findings:

Two failure modes were discovered:

1. The partially burned and leaking switches show evidence of an electrical cell occurring between the hot (+) brake switch contacts and grounded (-) portions of the switches. It appears that brake fluid, which entered the switch cavities, through cracks in the Kapton diaphragm/seal, may have acted as the electrolyte. Dezincification and stress corrosion cracking of the contacts indicates that moisture and corrosives other than brake fluid may have been present. The Kapton appears to have become embrittled and cracked by some unknown mechanism.

The completely burned switches also show evidence of a cell occurring, however, the switches were too badly damaged to determine if the Kapton leaked and caused brake fluid to enter the switch cavities.

Brake Actuated Speed Control Deactivation Switch

Central Laboratory Findings - continued

2. Three switches from the junkyard survey show evidence of water intrusion with corrosion of the steel parts in the switch cavities. These switches show no evidence of a cell or brake fluid leakage. It was found that this damage causes the switch to stick in the closed position even when pressurized to ~500 psi.

Although a cell would form a current leakage path from hot to ground, it has not been established whether the current flow produced would elevate the temperature of the switch sufficiently to cause a fire. Attempts by Texaco Instruments to produce a fire by injecting brake fluid into the switch cavity have not been successful. Consequently, the exact cause of the fires has not been determined.

Additional Actions:

Other members of the team are trying to determine what is unique about the packaging and circuitry of the 1992-93 Town Car that could cause a fire to occur in a switch that has been used in other vehicle lines without incident.

The necessity and scope of a recall is being investigated. Although the exact cause of the fires has not been determined, a proposed fix is being developed. The fix could include installing a choked relay into the circuit which would limit current flow through the switch while it is energized and which would de-energize the switch when the ignition is turned off. The connector design is also being evaluated, although a leak path through the connector has not been established.

Appendix I

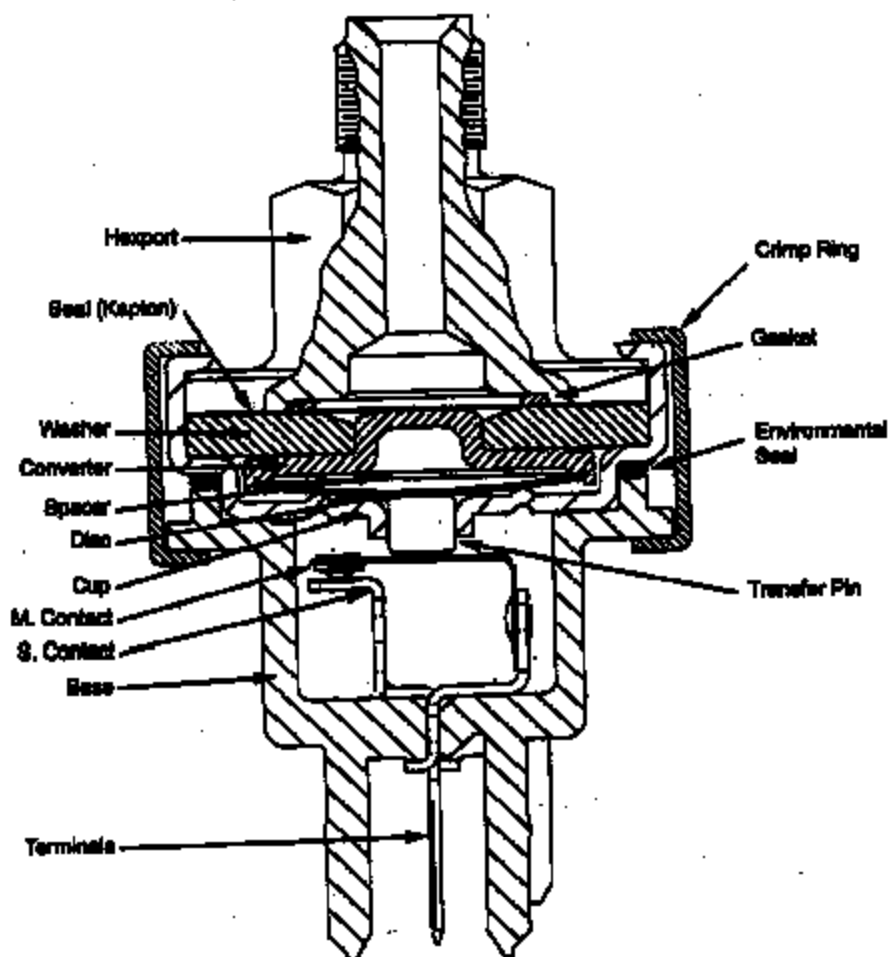


Diagram showing components of switch.

SPREADSHEETS

SUMMARYING TEST PROTOCOL,
TEST PROGRESS, SWITCH INFO,
AND RESULTS.

9804105 9900246 9900607
991571

C = COMPLETE
NA = NOT APPLICABLE
TBP = TO BE PERFORMED

Brake Switch Testing Checklist

INF = INFINITY (OPEN)
NP = NOT PERFORMED
NRCLS = NOT REC'D AT DEN. LAB.

		Memphis PY622977	A PY665224	B NY745119	C NY703705	D VX145373	E NX758774	F NY760055	G NX762858
Field Info	1 Log Field Info into Safety Logbook	C	C	C	C	C	C	C	C
	2 Condition	FIRE	FIRE	FIRE	FIRE	BF LEAK	NO FIRE/LEAK	BF LEAK	NO FIRE/LEAK
	3 Photograph Switch	C	C	C	C	C	C	C	NP
	4 Place any unusual external visual observations	C	C	C	C	C	C	C	C
	5 Check for Connector engagement	C	NA	NA	NA	NA	NA	NA	NA
Switch + Connector Assembly	6 X-ray if appropriate	C	NA	NA	NA	NA	NA	NA	NA
	7 Wire 1 (LSF) to Wire 2 (ORANGE) Resistance	NA	NA	NA	NA	NA	NA	NA	NA
	8 Wire 1 (LSF) to Hesperus Resistance	NA	NA	NA	NA	NA	NA	NA	NA
	9 Wire 2 (ORANGE) to Hesperus Resistance	NA	NA	NA	NA	NA	NA	NA	NA
	10 Separate Wires from Switch	C	NA	NA	C	NA	NA	NA	NA
Connector Only	11 Verify Connector Good	C	NA	NA	C	NA	NA	NA	NA
	12 Wire 1 (LSF) to Wire 2 (ORANGE) resistance	NA	NA	NA	NA	NA	NA	NA	NA
	13 Check for full engagement of connector	NA	NA	NA	NA	NA	NA	NA	NA
	14 Check wire insulation	C	NA	NA	NA	NA	NA	NA	NA
	15 Check wire gray scale	C	NA	NA	NA	NA	NA	NA	NA
Switch External Unpressurized	16 Cut wire insulation to check for corrosion	C	NA	NA	NA	NA	NA	NA	NA
	17 Assemble Switch to Calibration Stand	NA	NA	NA	NA	NA	NA	NA	C
	18 Spring Terminal to Stationary Terminal Resistance	NA	NA	NA	NA	0.4	0.2	NP	0.3
	19 Spring Terminal to Hesperus Resistance	NA	NA	NA	NA	4.6M	INF	2M	INF
	20 Stationary Terminal to Hesperus resistance	NA	NA	NA	NA	NP	NP	NP	INF
Switch External Pressurized	21 Wire to Hesperus Resistance	NA	NA	NA	NA	1.1	8.6M	NP	3.3M
	22								
	23								
	24 Switch Opening Pressure	NA	NA	NA	NA	NA	NA	NA	122
	25 Switch Closing Pressure	NA	NA	NA	NA	NA	NA	NA	59
	26 Pinel Test for Leakage	NA	NA	NA	NA	NA	NA	NA	NO LEAK
	27 Repeat Steps 17 through 20 at 100 gals	NA	NA	NA	NA	NA	NA	NA	C
	17 Spring Terminal to Stationary Terminal Resistance	NA	NA	NA	NA	NA	NA	NA	INF
	18 Spring Terminal to Hesperus Resistance	NA	NA	NA	NA	NA	NA	NA	INF
	19 Stationary Terminal to Hesperus resistance	NA	NA	NA	NA	NA	NA	NA	INF
Switch	20 Wire to Hesperus Resistance	NA	NA	NA	NA	NA	NA	NA	INF
	28 Remove aluminum strap ring	C	C	NP	C	C	C	C	NP
	29 Examine mated surfaces. Photograph	C	C	NP	C	C	C	C	NP
	30 Remove cup	C	C	NP	C	C	C	C	NP
	31 Examine mated surfaces. Photograph	C	C	NP	C	C	C	C	NP
Techniques	32 SEM-EDX/FTIR base, contacts, terminals	C	C	NP	C	C	C	C	NP
	33 SEM-EDX/FTIR cup, support, another seat, etc.	C	C	C	C	C	C	C	NP
	23 Metallurgical analysis of contacts	C	NA	NP	C	C	C	C	NP
	Look for evidence of corrosion or etching	C	NA	NP	C	C	C	C	NP

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Brake Switch Testing Checklist

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Field Info	1 Log Field Info into Switch Log-in	3	4	5	6	7	8	9	10
		PY724043	PY628170	PY632329	PY729611	NX728439	PX180223	PX637766	PY668375
Field Info	2 Condition	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK
	3 Photograph Switch	NP	NP	NP	NP	NP	NP	NP	NP
	4 Record any unusual external visual observations	C	C	C	C	C	C	C	C
	5 Check for Connector engagement	NA	NA	NA	NA	NA	NA	NA	NA
	6 X-ray if appropriate	NA	NA	NA	NA	NA	NA	NA	NA
Switch + Connector Assembly	7 Wire 1 (L/G/Y) to Harport Resistance	NA	NA	NA	NA	NA	NA	NA	NA
	8 Wire 2 (O/P/W) to Harport Resistance	NA	NA	NA	NA	NA	NA	NA	NA
	9 Wire 3 (O/P/W) to Harport Resistance	NA	NA	NA	NA	NA	NA	NA	NA
	10 Separate Harness from Switch	NA	NA	NA	NA	NA	NA	NA	NA
Connector Only	11 Verify Connector Seal	NA	NA	NA	NA	NA	NA	NA	NA
	12 Wire 1 (L/G/Y) to Wire 2 (O/P/W) resistance	NA	NA	NA	NA	NA	NA	NA	NA
	13 Check for full engagement of connector	NA	NA	NA	NA	NA	NA	NA	NA
	14 Check wire insulation	NA	NA	NA	NA	NA	NA	NA	NA
	15 Check wire gray seal	NA	NA	NA	NA	NA	NA	NA	NA
Switch External Unpressurized	16 Check wire insulation to check for corrosion	NA	NA	NA	NA	NA	NA	NA	NA
	17 Powerable Switch to Calibration Stand	C	C	NA	NA	C	C	C	C
	18 Spring Terminal to Stationary Terminal Resistance	0.2	0.3	NA	NA	0.2	0.2	0.2	2.2
	19 Spring Terminal to Harport Resistance	INF	INF	NA	NA	INF	INF	INF	INF
	20 Stationary Terminal to Harport Resistance	INF	INF	NA	NA	INF	INF	INF	INF
Switch External Pressurized	21 Base to Harport Resistance	11.4	1.6M	NA	NA	7.8M	18.5	7.5M	1.4M
	22 Switch Opening Pressure	134	160	NA	NA	147	132	140	137
	23 Switch Closing Pressure	58	88	NA	NA	70	68	112	65
	24 Proof Test for Leakage	NO LEAK	NO LEAK	NA	NA	NO LEAK	NO LEAK	NO LEAK	NO LEAK
	25 Repeat Steps 17 through 23 at 350 psig	C	C	NA	NA	C	C	C	C
Switch	26 Spring Terminal to Stationary Terminal Resistance	INF	INF	NA	NA	INF	INF	INF	INF
	27 Spring Terminal to Harport Resistance	INF	INF	NA	NA	INF	INF	INF	INF
	28 Stationary Terminal to Harport Resistance	INF	INF	NA	NA	INF	INF	INF	INF
	29 Base to Harport Resistance	INF	INF	NA	NA	INF	INF	INF	INF
Switch	30 Measure aluminum output sig	NP	NP	C	C	NP	NP	NP	NP
	31 Examine revealed surfaces. Photograph	NP	NP	C	C	NP	NP	NP	NP
	32 Measure cap	NP	NP	C	C	NP	NP	NP	NP
	33 Examine revealed surfaces. Photograph	NP	NP	C	C	NP	NP	NP	NP
Techniques	34 SEM-EDX / FTIR base, contacts, terminals	NP	NP	NP	NP	NP	NP	NP	NP
	35 SEM-EDX / FTIR cap, harport, weather seals, etc.	NP	NP	NP	NP	NP	NP	NP	NP
	36 Micrographic analysis of contacts	NP	NP	NP	NP	NP	NP	NP	NP
	37 Look for evidence of corrosion or arcing	NP	NP	NP	NP	NP	NP	NP	NP

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Brake Switch Testing Checklist

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		11	12	13	14	15	16	17	18
		PY726088	PX65270	NY740208	PX623672	PY655374	BY639884	PY650225	PY688796
Field Info	1 Log Field Info into Switch Log.xls	C	C	C	C	C	C	C	C
	Condition	NO FIRE/LEAK							
	2 Photograph Switch	NP							
	3 Record any unusual external visual observations	C							
	4 Check for Connector engagement	NA							
Switch + Connector Assembly	5 Wire 1 (LGR) to Wire 2 (ORANGE) Resistance	NA							
	6 Wire 1 (LGR) to Heepert Resistance	NA							
	7 Wire 2 (ORANGE) to Heepert Resistance	NA							
	8 Separate Harness from Switch	NA							
Connector Only	9 Verify Connector Seal	NA							
	10 Wire 1 (LGR) to Wire 2 (ORANGE) resistance	NA							
	11 Check for full engagement of connector	NA							
	12 Check wire insulation	NA							
Switch External Unpressurized	13 Check wire gray seal	NA							
	14 Cut wire insulation to check for corrosion	NA							
	15 Assemble Switch to Calibration Stand	C							
	16 Spring Terminal to Stationary Terminal Resistance	0.2							
Switch External Pressurized	17 Spring Terminal to Heepert Resistance	INF							
	18 Stationary Terminal to Heepert resistance	INF							
	19 Heepert to Heepert Resistance	INF							
	20 Heepert to Heepert Resistance	INF							
Switch External Pressurized	21 Switch Opening Pressure	138							
	22 Switch Closing Pressure	71							
	23 Proof Test for Leakage	NO LEAK							
	24 Repeat Steps 17 through 20 at 180 psig	C							
Switch External Pressurized	25 Spring Terminal to Stationary Terminal Resistance	INF							
	26 Spring Terminal to Heepert Resistance	INF							
	27 Stationary Terminal to Heepert resistance	INF							
	28 Heepert to Heepert Resistance	INF							
Switch External Pressurized	29 Remove electrical wiring cap	NP							
	30 Examine revealed surfaces. Photograph	NP							
	31 Remove cap	NP							
	32 Examine revealed surfaces. Photograph	NP							
Techniques	33 SEM-EDX AFTER beam, contacts, terminals	NP							
	34 SEM-EDX AFTER cap, Heepert, weather seal, etc.	NP							
	35 Metallographic analysis of contacts	NP							
	36 Look for evidence of corrosion or welding	NP							

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Brake Switch Testing Checklist

INF = INFINITY (OPEN)
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NRCLS = NOT RECD AT CEN. LAB.

		19	20	21	22	23	1	2	3
		PY774256	PY754576	PX643515	??	PX625934	PY658990	PX168920	HX641585
Field Info	1 Log Field Info into Switch Log-Log						C	C	C
	2 Condition						NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK
	3 Photograph Switch						C	C	C
	4 Record any unusual or noted visual observations						C	C	C
	4 Check for Connector engagement						C	C	C
Switch + Connector Assembly	5 Wire 1 (L.GND) to Wire 2 (ORANGE) Resistance						0.3	0.4	0.2
	6 Wire 1 (L.GND) to Harport Resistance						INF	INF	INF
	7 Wire 2 (ORANGE) to Harport Resistance						INF	INF	INF
	8 Separate Harport from Switch						C	C	C
Connector Only	9 Verify Connector Seal						C	C	C
	10 Wire 1 (L.GND) to Wire 2 (ORANGE) Resistance						INF	INF	INF
	11								
	12 Check for full engagement of connector						C	C	C
	13 Check wire insulation						C	C	C
Switch External Unpressurized	14 Check wire gray seal						C	C	C
	15 Cut wire insulation to check for corrosion						TBP	TBP	TBP
	16 Assemble Switch to Calibration Stand						C	C	C
	17 Spring Terminal to Stationary Terminal Resistance						0.3	0.1	0.2
	18 Spring Terminal to Harport Resistance						INF	INF	INF
Switch External Pressurized	19 Stationary Terminal to Harport Resistance						INF	INF	INF
	20 Seal to Harport Resistance						5.5	INF	17.7K
	21								
	24 Switch Opening Pressure						158	127	126
	25 Switch Closing Pressure						68	62	64
Switch	26 Proof Test for Leakage						NO LEAK	NO LEAK	NO LEAK
	27 Repeat Steps 17 through 23 at 100 psi						C	C	C
	17 Spring Terminal to Stationary Terminal Resistance						INF	0.1	INF
	18 Spring Terminal to Harport Resistance						INF	INF	INF
	19 Stationary Terminal to Harport Resistance						INF	INF	INF
Switch Techniques	20 Seal to Harport Resistance						INF	INF	INF
	28 Remove aluminum clamp ring						NP	C	NP
	29 Examine revealed surfaces. Photograph						NP	C	NP
	30 Remove seal						NP	C	NP
	31 Examine revealed surfaces. Photograph						NP	C	NP
Techniques	31 SEM-EDX (FOR base, contacts, terminals)						NP	C	NP
	32 SEM-EDX (FOR cap, harport, washer seals, etc)						NP	C	NP
	33 Micrographically analyze of contacts						NP	NP	NP
	Look for evidence of corrosion or wiring						NP	C	NP

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Brake Switch Testing Checklist

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		4	5	6	7	8	9	10	11
		PX163312	PY810384	NY724368	PY750172	NY733101	PY758168	PX161140	NY767408
Field Info	1 Log Field into into Switch Log.xls	C	C	C	C	C	C	C	C
	Condition	NO FIRE/LEAK	NO FIRE/LEAK	FIRE	NO FIRE/LEAK	FIRE	NO FIRE/LEAK	NO FIRE/LEAK	NO FIRE/LEAK
	2 Photograph Switch	C	C	C	C	C	C	C	C
	3 Record any unusual physical observations	C	C	C	C	C	C	C	C
	4 Check for Connector engagement	C	C	NA	C	NA	C	NA	C
Switch + Connector Assembly	5-Verify if appropriate	C	NA	NA	NA	NA	C	NA	NA
	5 Wire 1 (LGR) to Wire 2 (ORANGE) Resistance	NP	0.2	NA	INF	NA	2	0.4	NP
	6 Wire 1 (LGR) to Harport Resistance	NP	INF	NA	INF	NA	6.0M	INF	NP
	7 Wire 2 (ORANGE) to Harport Resistance	NP	INF	NA	INF	NA	6.1M	INF	NP
Connector Only	8 Separate Harness from Switch	C	C	NA	C	NA	C	C	C
	9 Verify Connector Gap	C	C	NA	C	NA	C	C	C
	10 Wire 1 (LGR) to Wire 2 (ORANGE) resistance	NP		NA	INF	NA	INF	INF	NP
	11								
	12 Check for full engagement of connector	C	C	NA	C	NA	C	C	C
	13 Check wire insulation	C	C	NA	C	NA	C	C	C
Switch External Unpressurized	14 Check wire girth seals	C	C	NA	C	NA	C	C	C
	15 Cut wire installation to check for corrosion	TBP	TBP	NA	TBP	NA	TBP	TBP	TBP
	16 Assemble Switch to Cylinder/Strut	C	C	NA	C	NA	C	C	C
	17 Spring Terminal to Stationary Terminal Resistance	0.1	0.2	NA	0.3	NA	1.5	0.4	0.1
	18 Spring Terminal to Harport Resistance	INF	INF	NA	INF	NA	6.3M	INF	INF
	19 Stationary Terminal to Harport resistance	INF	INF	NA	INF	NA	6.4M	INF	INF
Switch External Pressurized	20 Wire to Harport Resistance	INF	180K	NA	483K	NA	0.4	6.5	INF
	21								
	22								
	23								
	24 Switch Opening Pressure	133	151	NA	136	NA	164	136	135
	25 Switch Closing Pressure	63	82	NA	66	NA	66	100	74
	26 Proof Test for Leakage	NO LEAK	NO LEAK	NA	NO LEAK	NA	NO LEAK	NO LEAK	NO LEAK
	27 Repeat Steps 17 through 20 at 180 psig	C	C	NA	C	NA	C	C	C
	17 Spring Terminal to Stationary Terminal Resistance	INF	INF	NA	INF	NA	0.1	INF	INF
	18 Spring Terminal to Harport Resistance	INF	INF	NA	INF	NA	-970K	INF	INF
	19 Stationary Terminal to Harport resistance	INF	INF	NA	INF	NA	-970K	INF	INF
	20 Wire to Harport Resistance	INF	INF	NA	INF	NA	INF	INF	INF
Switch	28 Remove aluminum grip ring	NP	NP	NP	NP	NP	C	NP	NP
	29 Examine revealed surfaces. Photograph	NP	NP	NP	NP	NP	C	NP	NP
	30 Remove cap	NP	NP	NP	NP	NP	C	NP	NP
	31 Examine revealed surfaces. Photograph	NP	NP	NP	NP	NP	C	NP	NP
Techniques	31 SEM-EDX /FTIR base, contacts, terminals	NP	NP	NP	NP	NP	C	NP	NP
	32 SEM-EDX /FTIR cap, harport, strut/seals, etc.	NP	NP	NP	NP	NP	C	NP	NP
	33 Metallographic analysis of contacts	NP	NP	NP	NP	NP	NP	NP	NP
	Look for evidence of corrosion or arcing	NP	NP	NP	NP	NP	C	NP	NP

C = COMPLETE
NA = NOT APPLICABLE
TBP = TO BE PERFORMED

Brake Switch Testing Checklist

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		12	13	OASIS	OASIS	EAA	EAA	EAA	EAA
		PY742858	PY7433413	NY734410	PY605826	PY814985	NY736847	NY708341	NX774559
Field Info	1 Log Field into Switch Log via	C	C	C	C	C	C	C	C
	Condition	NO FIRE/LEAK	NO FIRE/LEAK	BF LEAK	BF LEAK	FIRE	FIRE	FIRE	FIRE
	2 Photograph Switch	C	C	C	C	C	C	NA	TBP
	3 Record any unusual external visual observations	C	C	C	C	C	C	NA	TBP
	4 Check for Connector engagement	C	C	NA	NA	NA	NA	NA	NA
Switch + Connector Assembly	5 X-ray if appropriate	C	NA	NA	NA	NA	NA	NA	NA
	6 Wire 1 (LOR) to Wire 2 (ORANGE) Resistance	0.3	0.3	NA	NA	NA	NA	NA	NA
	7 Wire 1 (LOR) to Heepot Resistance	20.2M	INF	NA	NA	NA	NA	NA	NA
	8 Wire 2 (ORANGE) to Heepot Resistance	21.6M	INF	NA	NA	NA	NA	NA	NA
	9 Separate Heepots from Switch	C	C	NA	NA	NA	NA	NA	NA
Connector Only	10 Verify Connector Seal	C	C	NA	NA	NA	NA	NA	NA
	11 Wire 1 (LOR) to Wire 2 (ORANGE) resistance	INF	INF	NA	NA	NA	NA	NA	NA
	12 Check for full engagement of connector	C	C	NA	NA	NA	NA	NA	NA
	13 Check wire insulation	C	C	NA	NA	NA	NA	NA	NA
	14 Check wire girth seals	C	C	NA	NA	NA	NA	NA	NA
Switch External Unpressurized	15 Cut wire insulation to check for corrosion	TBP	TBP	NA	NA	NA	NA	NA	NA
	16 Assemble Switch to Calibration Stand	C	C	C	C	NA	NA	NA	NA
	17 Spring Terminal to Stationary Terminal Resistance	0.2	0.2	>700K	>130K	NA	NA	NA	NA
	18 Spring Terminal to Heepot Resistance	34M	INF	>250K	>17K	NA	NA	NA	NA
	19 Stationary Terminal to Heepot resistance	39M	INF	>350K	>120K	NA	NA	NA	NA
Switch External Pressurized	20 Wire to Heepot Resistance	63.4K	7.5M	INF	INF	NA	NA	NA	NA
	24 Switch Opening Pressure	148	150	152	NO SOUND	NA	NA	NA	NA
	25 Switch Closing Pressure	61	70	82	NO SOUND	NA	NA	NA	NA
	26 Proof Test for Leaks	NO LEAK	NO LEAK	NO LEAK	NO LEAK	NA	NA	NA	NA
	27 Repeat Steps 17 Through 20 at 180 psig	C	C	C	C	NA	NA	NA	NA
Switch	17 Spring Terminal to Stationary Terminal Resistance	0.1	INF	>1.0M	170K	NA	NA	NA	NA
	18 Spring Terminal to Heepot Resistance	INF	INF	>600K	>140K	NA	NA	NA	NA
	19 Stationary Terminal to Heepot resistance	INF	INF	>400K	>15K	NA	NA	NA	NA
	20 Wire to Heepot Resistance	INF	INF	INF	INF	NA	NA	NA	NA
	28 Remove aluminum clamp ring	SCI LAB	NP	C	C	C	C	NA	TBP
Techniques	29 Examine revealed surfaces. Photograph	SCI LAB	NP	C	C	C	C	NA	TBP
	30 Remove cup	SCI LAB	NP	C	C	C	C	NA	TBP
	31 Examine revealed surfaces. Photograph	SCI LAB	NP	C	C	C	C	NA	TBP
	32 SEM-EDX /FTIR base, contacts, terminals	SCI LAB	NP	TBP	TBP	TBP	TBP	NA	TBP
	33 SEM-EDX /FTIR cup, heepot, washer seals, etc.	SCI LAB	NP	TBP	TBP	TBP	TBP	NA	TBP
	34 Photomicrographs analysis of contacts	SCI LAB	NP	NA	NA	NA	NA	NA	TBP
	35 Look for evidence of corrosion or arcing	SCI LAB	NP	C	C	C	C	NA	TBP

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Brake Switch Testing Checklist

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		Jun-98 KA92838	Apr-98 HB07667	Jan-97 LB08065	Apr-00 PA132524	May-93 LA92809	May-96 NA89619	Nov-96 CA19089	Oct-98 LA54324
Field Info	1 Log Field Info into Switch Log.xls	C	C	C	C	C	C	C	C
	2 Photograph Switch	C	C	C	C	C	C	C	C
	3 Record any unusual external visual observations	C	C	C	C	C	C	C	C
	4 Check for Connector engagement if any if appropriate	NP	NP	C	NP	NP	NP	NP	NP
Switch + Connector Assembly	5 Wire 1 (LGR) to Wire 2 (ORANGE) Resistance	NP	NP		NP	NP	NP	NP	NP
	6 Wire 1 (LGR) to Neutral Resistance	NP	NP		NP	NP	NP	NP	NP
	7 Wire 2 (ORANGE) to Neutral Resistance	NP	NP		NP	NP	NP	NP	NP
	8 Separate Harness from Switch	NP	NP		NP	NP	NP	NP	NP
Connector Only	9 Verify Connector Seal	NP	NP		NP	NP	NP	NP	NP
	10 Wire 1 (LGR) to Wire 2 (ORANGE) resistance	NP	NP		NP	NP	NP	NP	NP
	11								
	12 Check and seal for full engagement of connector	NP	NP		NP	NP	NP	NP	NP
	13 Check wire insulation	NP	NP		NP	NP	NP	NP	NP
	14 Check wire grommet	NP	NP		NP	NP	NP	NP	NP
	15 Cut wire insulation to check for corrosion	NP	NP		NP	NP	NP	NP	NP
	16								
Switch External Unpressurized	16 Assemble Switch to Calibration Stand								
	17 Spring Terminal to Stationary Terminal Resistance								
	18 Spring Terminal to Neutral Resistance								
	19 Stationary Terminal to Neutral resistance								
	20								
	21								
	22								
	23								
Switch External Pressurized	24 Switch Opening Pressure								
	25 Switch Closing Pressure								
	26 Proof Test for Leakage								
	27 Report Steps 17 through 20 at 400 psi								
	17								
	18								
	19								
	20								
Switch	28 Remove aluminum spring ring								
	29 Examine exposed surfaces. Photograph								
	30 Remove dust								
	31 Examine revealed surfaces. Photograph								
Techniques	31 SEM-EDX (FTIR) base, contacts, terminals								
	32 SEM-EDX (FTIR) exp, insulat, surface metal, etc.								
	33 Metallographic analysis of contacts								
	Look for evidence of corrosion or aging								

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Brake Switch Testing Checklist

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		7	97	Mar-97	Oct-95	93	97	97	92
		TX837543	X1Y78209	NC67348	UB08339	PY721210	LB22811	LA30881	7X725082
Field Info	1 Log Field into Switch Log.xls	C	C	C	C	C	C	C	C
	2 Photograph Switch	C	C	C	C	C	C	C	C
	3 Record any unusual external visual observations	C	C	C	C	C	C	C	C
	4 Check for Connector engagement	NP	NP	NP	NP	NP	NP	NP	NP
	5 X-ray if appropriate								
Switch + Connector Assembly	6 Wire 1 (LAMP) to Wire 2 (ORANGE) Resistance	NP	NP	NP	NP	NP	NP	NP	NP
	6 Wire 1 (LAMP) to Harport Resistance	NP	NP	NP	NP	NP	NP	NP	NP
	7 Wire 2 (ORANGE) to Harport Resistance	NP	NP	NP	NP	NP	NP	NP	NP
Connector Only	8 Separate Harness from Switch	NP	NP	NP	NP	NP	NP	NP	NP
	9 Verify Connector Seal	NP	NP	NP	NP	NP	NP	NP	NP
	10 Wire 1 (LAMP) to Wire 2 (ORANGE) resistance	NP	NP	NP	NP	NP	NP	NP	NP
	11								
	12 Check red seal for full engagement of connector	NP	NP	NP	NP	NP	NP	NP	NP
Switch External Unpressurized	13 Check wire insulation	NP	NP	NP	NP	NP	NP	NP	NP
	14 Check wire girth seals	NP	NP	NP	NP	NP	NP	NP	NP
	15 Cut wire insulation to check for corrosion	NP	NP	NP	NP	NP	NP	NP	NP
	16 Assemble Switch to Calibration Stand								
	17 Spring Terminal to Stationary Terminal Resistance								
Switch External Pressurized	18 Spring Terminal to Harport Resistance								
	19 Stationary Terminal to Harport resistance								
	20 Bus to Harport Resistance								
	21								
	22								
Switch External Pressurized	24 Switch Opening Pressure								
	25 Switch Closing Pressure								
	26 Proof Test for Leakage								
	27 Repeat Steps 17 through 20 at 180 psi								
	28								
Switch	17 Spring Terminal to Stationary Terminal Resistance								
	18 Spring Terminal to Harport Resistance								
	19 Stationary Terminal to Harport Resistance								
	20 Bus to Harport Resistance								
	21								
Switch	28 Remove stainless clasp ring								
	29 Examine revealed surfaces. Photograph								
	30 Remove cap								
	31 Examine revealed surfaces. Photograph								
	32								
Techniques	31 SEM-EDX/FTIR bus, contacts, terminals								
	32 SEM-EDX/FTIR cap, harport, washer seats, etc.								
	33 Metallographic analysis of contacts								
Look for evidence of corrosion or arcing									

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Brake Switch Testing Checklist

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NRCLS = NOT REC'D AT GEN. LAB.

		95							
		TXB18850							
Field Info	1 Log Field Info into Switch Log.xls	C							
	2 Photograph Switch	C							
	3 Record any unusual or normal visual observations	C							
	4 Check for Connector engagement	NP							
	5 Say if appropriate								
Switch + Connector Assembly	6 Wire 1 (LGRN) Wire 2 (ORANGE) Resistance	NP							
	7 Wire 1 (LGRN) to Harport Resistance	NP							
	8 Wire 2 (ORANGE) to Harport Resistance	NP							
Connector Only	9 Separate Harness from Switch	NP							
	10 Verify Connector Seal	NP							
	11 Wire 1 (LGRN) to Wire 2 (ORANGE) resistance	NP							
	12 Check seal and for full engagement of connector	NP							
	13 Check wire insulation	NP							
Switch External Unpressurized	14 Check wire gray scale	NP							
	15 Cut wire insulation to check for oxidation	NP							
	16 Assemble Switch to Calibration Stand								
	17 Spring Terminal to Stationary Terminal Resistance								
	18 Spring Terminal to Harport Resistance								
Switch External Pressurized	19 Stationary Terminal to Harport Resistance								
	20 Wire to Harport Resistance								
	24 Switch Opening Pressure								
	25 Switch Closing Pressure								
	26 Post Test for Leakage								
Switch	27 Repeat Steps 17 through 20 at 100 psi								
	17 Spring Terminal to Stationary Terminal Resistance								
	18 Spring Terminal to Harport Resistance								
	19 Stationary Terminal to Harport Resistance								
	20 Wire to Harport Resistance								
Techniques	28 Remove aluminum clamp ring								
	29 Examine exposed surfaces. Photograph								
	30 Remove cup								
	31 Examine exposed surfaces. Photograph								
Techniques	32 SEM-EDX AFTER base, contacts, terminals								
	33 SEM-EDX AFTER cup, harport, weather seal, etc.								
	34 Metallurgical analysis of contacts								
	Look for evidence of corrosion or etching								

C = COMPLETE
NA = NOT APPLICABLE
TSP = TO BE PERFORMED

Brake Switch Testing Checklist

INF = INFINITY (OPEN)
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Field Info	1	Log Field Info into Switch Log.xls							
	2	Photograph Switch							
	3	Record any unusual external visual observations							
	4	Check for Connector engagement							
	5	OK-ry II if appropriate							
Switch + Connector Assembly	6	Wire 1 (LGFB) to Wire 2 (ORANGE) Resistance							
	7	Wire 1 (LGFB) to Harport Resistance							
	8	Wire 2 (ORANGE) to Harport Resistance							
Connector Only	9	Separate Harness from Switch							
	10	Verify Connector Seal							
	11	Wire 1 (LGFB) to Wire 2 (ORANGE) resistance							
	12	Check red seal for full engagement of connector							
	13	Check wire insulation							
Switch External Unpressurized	14	Check wire gray seal							
	15	Put wire insulation to check for corrosion							
	16	Assemble Switch to Calibration Stand							
	17	Spring Terminal to Stationary Terminal Resistance							
	18	Spring Terminal to Harport Resistance							
Switch External Pressurized	19	Stationary Terminal to Harport resistance							
	20	Gate to Harport Resistance							
	21								
	22								
	23								
Switch External Pressurized	24	Switch Opening Pressure							
	25	Switch Closing Pressure							
	26	Pool Test for Leakage							
	27	Repeat Steps 17 through 20 at 150 psig							
Switch	17	Spring Terminal to Stationary Terminal Resistance							
	18	Spring Terminal to Harport Resistance							
	19	Stationary Terminal to Harport resistance							
	20	Gate to Harport Resistance							
Switch	28	Examine aluminum strip ring							
	29	Examine revealed surfaces. Photograph							
	30	Remove clip							
	31	Examine revealed surfaces. Photograph							
Techniques	31	SEM-EDX /FTIR base, contacts, terminals							
	32	SEM-EDX /FTIR exp, harport, washer seals, etc.							
	33	Photographic analysis of contacts							
		Look for evidence of corrosion or arcing							

Brake Switch Testing Checklist

INF = INFINITY (OPEN)
NP = NOT PERFORMED
NPKLS = NOT REC'D AT CEN. LAB.

3713 2406

Evaluation Process Brake Pressure switch / Harness

Brake Pressure Switch Plan Updated 2/19/80
Collection Plan for Field Return

Step #	Message	Date of Update	Or Date Code
1	1		
2	2		
3	3		
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100	100		

Steve Palmer, 313 258 2222,
epalmer@ford.com
the evalproc.xls

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original 2/19/80
revised 8/81

3719 2407

Evaluation Process

Brake Pressure switch / Harness

Optically examine revealed surfaces. Take optical photographs (Digital camera with macro lens plus instant microphotography) and document observations where appropriate.

Inside surface of caliper ring.

Reel nose and underside of base

Top of cap

Examine Need for Analytical Techniques

Steel SEM-EDX (Scanning Electron Microscope with Energy Dispersive Analysis of X-rays) analysis on the inside of the ring and on various sections of the plastic base.

Reinspect the top surface and remove the cap

Optically document all revealed surfaces starting with cap.

Meanwhile, start SEM-EDX analysis on top side of cap. . Particularly look for evidence of corrosion or welding

Particularly focus in on the edges of the ceramic pin guide and on the indicated ring that drops up with tapered wall of the switch body

Particularly look for evidence of corrosion or welding

Decide if we should try to blast off any of the overlapping debris to try to examine the underlying metal surfaces.

Proceed to perform SEM-EDX analysis on other component surfaces revealed by removal of cap.

Analytical
Techniques
REMEMBER

Data Entry

Log All data here into the Switch Log

Photographs, Drawings, etc must be retained and referenced by Switch #

Data Log Brake Pressure Switch

Log Updated 2/26/2008

Site ID	Site Data Code	Vehicle	VIN	Event	Mileage	Town/Hamilton Pinchpoint	Latency?	Region #1	Region #2	Region #3	Present Status	Pass Required
Sample 1	2070	Town Car	FD	Br. Pns								
A	2071	Town Car	FD	Underhood Fire				crack	crack	crack	Analysis Complete	
B	2074	Town Car	FD	Underhood Fire				as bld	as bld	as bld	Analysis Complete	
C	2080	Town Car	FD	Underhood Fire							Ex. not available	
D		Crown Vic Police Car	FD	Underhood Fire							Analysis In Progress	
E	2037	Town Car	FD	Crack leak		4.8825/0.0000	yes	crack	crack	crack	Analysis Complete	
F	2038	Town Car	FD	Refugee		OPEN	yes	crack	crack	crack	Analysis Complete	
G	2039	Town Car	FD	Crack leak		6.8825/0.0000	yes	crack	crack	crack	Analysis Complete	
H	2040	Town Car	FD	Refugee	7064	OPEN						
I	2041	Town Car	FD	Refugee	7107	OPEN						
J	2042	Town Car	FD	Refugee	6987	OPEN						
K	2043	Town Car	FD	Refugee	6988							
L	2044	Town Car	FD	Refugee	6989							
M	2045	Town Car	FD	Refugee	6990							
N	2046	Town Car	FD	Refugee	6991							
O	2047	Town Car	FD	Refugee	6992							
P	2048	Town Car	FD	Refugee	6993							
Q	2049	Town Car	FD	Refugee	6994							
R	2050	Town Car	FD	Refugee	6995							
S	2051	Town Car	FD	Refugee	6996							
T	2052	Town Car	FD	Refugee	6997							
U	2053	Town Car	FD	Refugee	6998							
V	2054	Town Car	FD	Refugee	6999							
W	2055	Town Car	FD	Refugee	7000							
X	2056	Town Car	FD	Refugee	7001							
Y	2057	Town Car	FD	Refugee	7002							
Z	2058	Town Car	FD	Refugee	7003							
AA	2059	Town Car	FD	Refugee	7004							
AB	2060	Town Car	FD	Refugee	7005							
AC	2061	Town Car	FD	Refugee	7006							
AD	2062	Town Car	FD	Refugee	7007							
AE	2063	Town Car	FD	Refugee	7008							
AF	2064	Town Car	FD	Refugee	7009							
AG	2065	Town Car	FD	Refugee	7010							
AH	2066	Town Car	FD	Refugee	7011							
AI	2067	Town Car	FD	Refugee	7012							
AJ	2068	Town Car	FD	Refugee	7013							
AK	2069	Town Car	FD	Refugee	7014							
AL	2070	Town Car	FD	Refugee	7015							
AM	2071	Town Car	FD	Refugee	7016							
AN	2072	Town Car	FD	Refugee	7017							
AO	2073	Town Car	FD	Refugee	7018							
AP	2074	Town Car	FD	Refugee	7019							
AQ	2075	Town Car	FD	Refugee	7020							
AR	2076	Town Car	FD	Refugee	7021							
AS	2077	Town Car	FD	Refugee	7022							
AT	2078	Town Car	FD	Refugee	7023							
AU	2079	Town Car	FD	Refugee	7024							
AV	2080	Town Car	FD	Refugee	7025							
AW	2081	Town Car	FD	Refugee	7026							
AX	2082	Town Car	FD	Refugee	7027							
AY	2083	Town Car	FD	Refugee	7028							
AZ	2084	Town Car	FD	Refugee	7029							
BA	2085	Town Car	FD	Refugee	7030							
BB	2086	Town Car	FD	Refugee	7031							
BC	2087	Town Car	FD	Refugee	7032							
BD	2088	Town Car	FD	Refugee	7033							
BE	2089	Town Car	FD	Refugee	7034							
BF	2090	Town Car	FD	Refugee	7035							
BG	2091	Town Car	FD	Refugee	7036							
BH	2092	Town Car	FD	Refugee	7037							
BI	2093	Town Car	FD	Refugee	7038							
BJ	2094	Town Car	FD	Refugee	7039							
BK	2095	Town Car	FD	Refugee	7040							
BL	2096	Town Car	FD	Refugee	7041							
BM	2097	Town Car	FD	Refugee	7042							
BN	2098	Town Car	FD	Refugee	7043							
BO	2099	Town Car	FD	Refugee	7044							
BP	2100	Town Car	FD	Refugee	7045							
BQ	2101	Town Car	FD	Refugee	7046							
BR	2102	Town Car	FD	Refugee	7047							
BS	2103	Town Car	FD	Refugee	7048							
BT	2104	Town Car	FD	Refugee	7049							
BU	2105	Town Car	FD	Refugee	7050							
BV	2106	Town Car	FD	Refugee	7051							
BW	2107	Town Car	FD	Refugee	7052							
BX	2108	Town Car	FD	Refugee	7053							
BY	2109	Town Car	FD	Refugee	7054							
BZ	2110	Town Car	FD	Refugee	7055							
CA	2111	Town Car	FD	Refugee	7056							
CB	2112	Town Car	FD	Refugee	7057							
CC	2113	Town Car	FD	Refugee	7058							
CD	2114	Town Car	FD	Refugee	7059							
CE	2115	Town Car	FD	Refugee	7060							
CF	2116	Town Car	FD	Refugee	7061							
CG	2117	Town Car	FD	Refugee	7062							
CH	2118	Town Car	FD	Refugee	7063							
CI	2119	Town Car	FD	Refugee	7064							
CJ	2120	Town Car	FD	Refugee	7065							
CK	2121	Town Car	FD	Refugee	7066							
CL	2122	Town Car	FD	Refugee	7067							
CM	2123	Town Car	FD	Refugee	7068							
CN	2124	Town Car	FD	Refugee	7069							
CO	2125	Town Car	FD	Refugee	7070							
CP	2126	Town Car	FD	Refugee	7071							
CQ	2127	Town Car	FD	Refugee	7072							
CR	2128	Town Car	FD	Refugee	7073							
CS	2129	Town Car	FD	Refugee	7074							
CT	2130	Town Car	FD	Refugee	7075							
CU	2131	Town Car	FD	Refugee	7076							
CV	2132	Town Car	FD	Refugee	7077							
CW	2133	Town Car	FD	Refugee	7078							
CX	2134	Town Car	FD	Refugee	7079							
CY	2135	Town Car	FD	Refugee	7080							
CZ	2136	Town Car	FD	Refugee	7081							
DA	2137	Town Car	FD	Refugee	7082							
DB	2138	Town Car	FD	Refugee	7083							
DC	2139	Town Car	FD	Refugee	7084							
DD	2140	Town Car	FD	Refugee	7085							
DE	2141	Town Car	FD	Refugee	7086							
DF	2142	Town Car	FD	Refugee	7087							
DG	2143	Town Car	FD	Refugee	7088							
DH	2144	Town Car	FD	Refugee	7089							
DI	2145	Town Car	FD	Refugee	7090							
DJ	2146	Town Car	FD	Refugee	7091							
DK	2147	Town Car	FD	Refugee	7092							
DL	2148	Town Car	FD	Refugee	7093							
DM	2149	Town Car	FD	Refugee	7094							
DN	2150	Town Car	FD	Refugee	7095							
DO	2151	Town Car	FD	Refugee	7096							
DP	2152	Town Car	FD	Refugee	7097							
DQ	2153	Town Car	FD	Refugee	7098							
DR	2154	Town Car	FD	Refugee	7099							
DS	2155	Town Car	FD	Refugee	7100							
DT	2156	Town Car	FD	Refugee	7101							
DU	2157	Town Car	FD	Refugee	7102							
DV	2158	Town Car	FD	Refugee	7103							
DW	2159	Town Car	FD	Refugee	7104							
DX	2160	Town Car	FD	Refugee	7105							
DY	2161	Town Car	FD	Refugee	7106							
DZ	2162	Town Car	FD	Refugee	7107							
EA	2163	Town Car	FD	Refugee	7108							
EB	2164	Town Car	FD	Refugee	7109							
EC	2165	Town Car	FD	Refugee	7110							
ED	2166	Town Car	FD	Refugee	7111							
EE	2167	Town Car	FD	Refugee	7112							
EF	2168	Town Car	FD	Refugee	7113							
EG	2169	Town Car	FD	Refugee	7114							
EH	2170	Town Car	FD	Refugee	7115							
EI	2171	Town Car	FD	Refugee	7116							
EJ	2172	Town Car	FD	Refugee	7117							
EK	2173	Town Car	FD	Refugee	7118							
EL	2174	Town Car	FD	Refugee	7119							
EM	2175	Town Car	FD	Refugee	7120							
EN	2176	Town Car	FD	Refugee	7121							
EO	2177	Town Car	FD	Refugee	7122							
EP	2178	Town Car	FD	Refugee	7123							
EQ	2179	Town Car	FD	Refugee	7124							
ER	2180	Town Car	FD	Refugee	7125							
ES	2181	Town Car	FD	Refugee	7126							
ET	2182	Town Car	FD	Refugee	7127							
EU	2183	Town Car	FD	Refugee	7128							
EV	2184	Town Car	FD	Refugee	7129							

Data Log **Brake Pressure Switch**

Jun-08	F07A0117	F100	K0	Reference	?
Apr-05	F07A0005	E020	LE	Reference	?
Jan-07	F07A0005	F100	LE	Reference	?
03	F0AC0001	Cross Via	PO	Reference	?
May-08	F07A0107	Exhaust	LA	Reference	?
May-08	F07A0000	F100	NO	Reference	?
Nov-05	F07A0000	F100	CA	Reference	?
Oct-05	F07A0000	Exp	LA	Reference	?
?	F0AC0001	Exhaust Manifold	TA	Reference	?
07	F0AC0001	?	CA	Reference	?
Mar-07	F07A0000	F100	NO	Reference	?
Oct-05	F07A0000	Exp	LE	Reference	?
03	F0AC0000	?	PO	Reference	?
07	F07A0000	Exp	LA	Reference	?
07	F07A0001	Exp	LA	Reference	?
08	F07A0000	Cross Via	TA	Reference	?
08	F0AC0001	Cross Via	TA	Reference	?

Findings							
Sample	VIN	Field Date Code	Condition	Headset, Washer, Cartridge, and Recept	Coils	Cup	Remanufactured Cavity/Contacts
Blackish (1983 Town Car)	1LNLM8W8PY	F2VC2055	Partially bowed.	Black residue containing glycol based material (probably brake fluid) and a metal particle. Indicates presence of brake fluid on field and switch sides of coils.	Environmental seal and gasket intact and appear to have had good sealing. All three Kapton seals are buckled and exhibit bubble cracks which most likely formed leak path. Damage appears to have initiated in seal closest to switch. Damaged Kapton chamber seal overlapped by silicone overhangs.	Green deposits on face of cup contain elements from brake contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product. Glycol based material (probably brake fluid) also detected in this area.	Once separated before crimp ring. Traveler pin and stationary contact missing. Stationary contact exhibits large of material due to expansion, evidence of displacement, stress corrosion cracking. Mass of stationary contact welded back into mold-wood between switch and terminal cavities. Appears to have occurred in later stages of event. Surfaces of terminals covered with black and green deposits which appear to be sulfur compounds of the terminal materials.
A (1983 Town Car, Houston)	1LNLM8W8PY	Y7YH2881	Skewed	Elements from contact material detected at fitting end of headset. Indicates possible flow of fluid back through seals. Traces of silicone detected.	Coiled and environmental seal missing. Cracked fragments Kapton seals visible.	Deposits on face of cup contain elements from brake contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product.	None, stationary contact, movable contact, and terminals missing.
B (1983 Town Car, Houston)	1LNLM8W8PY	F2VC2114	Skewed	Elements from contact material detected at fitting end of headset. Indicates possible flow of fluid back through seals.	Not permitted to disassemble switch.	Deposits on face of cup contain elements from brake contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product.	Traveler pin and movable contact missing. Stationary contact exhibits crack in chamber location as that in Reddish sample.
C (1983 Town Car, Houston)	1LNLM8W8PY	F2VC2055	Skewed	Elements from contact material detected at fitting end of headset. Indicates possible flow of fluid back through seals. Black deposit is only visible traces of hydrocarbon and silicone.	Coiled appears closed. Environmental seal missing. Damage to Kapton seals currently being evaluated.	Deposits on face of cup contain elements from brake contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product.	None, stationary contact, movable contact, and terminals missing.
D (1987 Crown Victoria)	2FALP71W7N5	F2VC2777	Apparent leakage.	Black residue containing glycol based material (probably brake fluid) and a metal particle. Indicates presence of brake fluid on field and switch sides of coils.	Environmental seal and gasket intact and appear to have had good sealing. Kapton seals exhibit damage similar to that found in Reddish sample. All three exhibit bubble cracks which most likely formed a leak path.	Dark green deposits on face of cup contain elements from brake contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product. Deposits appear to have formed a bridge between movable contact and cup. Liquid in interior and on face of cup is glycol based (probably brake fluid).	Switch cavity and terminal cavity contain glycol based material (probably brake fluid). Contacts appear intact. Dark green deposits on movable and stationary contacts contain elements from brake contact material. Terminals appear clean (no apparent deposits or corrosion).
E (1911 from survey)		F2VC2137	No leaks or other apparent problems.	Black residue containing glycol based material (probably brake fluid) and a metal particle. Indicates presence of brake fluid on field and switch sides of coils.	Environmental seal and gasket intact and appear to have had good sealing. Kapton seals exhibit deformation and buckling similar to that found in Reddish sample. Cracking on surface suggest localized damage is occurring.	Face of cup appears clean and dry.	Switch cavity and terminal cavity appear clean and dry. No apparent deposits or corrosion.
F	1LNLM8W8PY	F2VC2128	Apparent leakage	Black residue containing glycol based material (probably brake fluid) and a metal particle. Indicates presence of brake fluid on field and switch sides of coils.	Environmental seal and gasket intact and appear to have had good sealing. Kapton seals exhibit damage similar to that found in Reddish sample. All three exhibit bubble cracks which most likely formed a leak path.	Dark green deposits on face of cup contain elements from brake contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product. Liquid in interior and on face of cup is glycol based (probably brake fluid).	Switch cavity and terminal cavity contain glycol based material (probably brake fluid). Stationary contact is intact, but shows some stress corrosion cracking in program in bridge area (same location as in Reddish sample). Movable contact appears to have expanded as a result of loss of material (-0.02% of thickness) due to corrosion. No evidence of heating or arc damage. Dark green deposits on movable and stationary contacts contain elements from brake contact material, as well as sulfur. Terminals exhibit green deposits (currently being analyzed). Deposits extend in from both sides of field-end between switch and terminal cavities, but do not extend.

Summary of Brake Switch Analysis

Sample Information					Switch and Connector			Connector Only	Resistance Measurement, Ω				Switch at 100 psi				Function		
VM	Sample	Alt/Vehicle	Part/Date Code	Condition	OFFERD to ON	OFFERD to Hesper	OR to Hesper	OFFERD to ON	Spring Term. to Dist. Term.	Spring Term. to Hesper	Dist. Term. to Hesper	Seat to Hesper	Spring Term. to Dist. Term.	Spring Term. to Hesper	Dist. Term. to Hesper	Seat to Hesper	Opening Pressure	Closing Pressure	Proof Test at 500psi
PV00077	Maryale (200504)	1989 TC	P2VC/0000	Partially Insured	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
PV00084	A	1989 TC	77720201	Stained	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
NY746159	B	1989 TC	P2VC/0114	Stained	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
NY763799	C	1989 TC	P2VC/0008	Stained	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
VE148378	D	1987 CV	P2AC/7777	Apparent leakage	NP	NP	NP	NP	0.4-UM	NP	1.1-AP	NP	NP	NP	NP	NP	NP	NP	NP
NO789774	E (111)	TC	P2AC/2117	No leaks or other apparent problems	NP	NP	NP	NP	0.2-fully	NP	0.2-UM	NP	NP	NP	NP	NP	NP	NP	NP

NP - Not Performed
TBP - To Be Performed
TC - Town Car

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Summary of Brake Switch Analysis

Observational Findings

Veh	Connections				Switch				
	Engagement	Wire	Red Steel	Gray Steel	Haspot, Washer, Connector, Spacer, and Disc	Environmental Seal	Clutch/Kapton Seals	Cup	Base, Switch Cavity, Contacts, Terminals
PY022077	Could not determine.	Short length (~10) was no apparent exterior damage. Chalk-like or lustrous finish inspection.	Could not determine.	Appears intact. White residue in cavity contains elements typically found in dry cleaned line components.	Black residue containing glycol based material (probably brake fluid) and a metal particle. Indicates presence of brake fluid on field and switch sides of switch.	Intact. Appears to have had good sealing.	Gasket intact; appears to have had good sealing. All Kapton seals latched and exhibit little wear which most likely formed in leak path. Damage appears to have followed in seal closest to washer. Kapton observed and exhibited by witness inspection.	Green deposits on face of cup contain elements from brass contacts, indicating transfer of contact material to cup, possibly as a result of an electrical cell. Glycol based material (probably brake fluid) also present.	Cham exposed below clamp ring, appears to be a roller disengaged. Stationary contact exhibits deterioration, loss of material due to corrosion, and these corrosion cracking. Green deposit on terminal of stationary contact appears to be a MILG disengaged.
PY022078	Missing	Missing	Missing	Missing	Elements from contact material detected at filling end of haspot. Elements also detected.	Missing	Gasket missing. Charred fragments of Kapton seals visible.	Deposits on face of cup contain elements from brass contacts, indicating transfer of contact material to cup, possibly as an oxide, sulfide, or corrosion product.	Base, stationary contact, movable contact, transfer pin, and terminals missing.
NY702150	Missing	Missing	Missing	Missing	Elements from contact material detected at filling end of haspot.	Not permitted to disassemble switch.	Not permitted to disassemble switch.	Deposits on face of cup contain elements from brass contacts, indicating transfer of contact material to cup, possibly as an oxide, sulfide, or corrosion product.	Transfer pin and movable contact missing. Stationary contact exhibits crack in shifter location as that in Memphis (Blackbird) sample.
NY702155	Missing	Missing	Missing	Missing	Elements from contact material detected at filling end of haspot. Black residue in cavity contains traces of hydrocarbon and silicon.	Missing	Gasket appears charred. Kapton seals present, but riveted together. Could not separate for inspection.	Deposits on face of cup contain elements from brass contacts, indicating transfer of contact material to cup, possibly as an oxide, sulfide, or corrosion product.	Base, stationary contact, movable contact, transfer pin, and terminals missing.
NY702158	Missing	Missing	Missing	Missing	Black residue in haspot cavity, on washer, and connector contains glycol based material (probably brake fluid) and a metal particle.	Intact and appears to have had good seal.	Gasket intact and appears to have had good seal. Kapton seals exhibit damage similar to that found in Memphis (Blackbird) sample. All three switch cable areas which probably formed leak path.	Dark green deposits on face of cup contain elements from brass contacts indicating transfer of contact material to cup, possibly as an oxide, sulfide, or corrosion product. Liquid is visible and on face is glycol based (probably brake fluid).	Switch cavity and terminal cavity contain glycol based material (probably brake fluid). Contacts appear intact. Dark green deposits on movable and stationary contact contain elements from brass contact material. Terminals are clean (no apparent deposits or corrosion).
NY702174	Missing	Missing	Missing	Missing	Black residue in haspot contains glycol based material (probably brake fluid) and a metal particle. No apparent fluid on components inside cup.	Intact and appears to have had good seal.	Gasket intact and appears to have had good seal. Kapton seals exhibit deterioration and cracking similar to that found in Memphis (Blackbird) sample. Cracking on surfaces suggest delamination is occurring.	Face and interior of cup appear clean and dry.	Switch and terminal cavities appear clean and dry. No apparent deposits or corrosion on terminals.

Summary of Brake Switch Analysis

Sample Information					Conclusion/Comments
VIN	Sample	MNU/Make	Police Date Code	Condition	
PYVW027	Idempole (Vehicle)	1999 TC	F2VCA005	Partially burned	Examination and subsequent results in Kipton over formed back path for brake fluid to enter switch easily. Transfer of brake contact material to the cup suggests that an electrical coil formed between the hot (+) contacts and the grounded (-) cup. Brake fluid in switch cavity may have acted as electrolyte for the coil. Corrosion and stress corrosion cracking of stationary contact indicates that moisture and other compounds may have been present with brake fluid.
PYB0024	A	1993 TC	777D001	Burned	Transfer of brake contact material to cup suggests that electrical coil may have occurred. The badly damaged or deteriorated if Kipton tested or if brake fluid was present in switch cavity.
BY74016	B	1999 TC	F2VCA2114	Burned	Transfer of brake contact material to cup suggests that electrical coil may have occurred. The badly damaged or deteriorated if Kipton tested or if brake fluid was present in switch cavity.
WY76005	C	1993 TC	F2VCA005	Burned	Transfer of brake contact material to cup suggests that electrical coil may have occurred. The badly damaged or deteriorated if Kipton tested or if brake fluid was present in switch cavity.
YX14005	D	1997 CV	F2AC2777	Apparent damage	Examination and subsequent results in Kipton over formed back path for brake fluid to enter switch easily. Transfer of brake contact material to the cup suggests that an electrical coil formed between the hot (+) contacts and the grounded (-) cup. Brake fluid in switch cavity may have acted as electrolyte for the coil. Follow up appears similar to Idempole switch.
0000077	IE (R11)	TC	F2AC2137	No brake or other apparent problems	No apparent problem with switch other than incidental damage to Kipton made.

Summary of Brake Switch Analysis

Performance Measurement (I)

Sample Information					Switch and Connector			Connector Only	Switch				Switch at 100 psi				Function		
VN	Sample	MY/Vehicle	Police/Date Code	Condition	GROUND to OR	GROUND to Hesper	OR to Hesper	GROUND to OR	Spring Test to Stat. Term.	Spring Test to Hesper	Stat. Term. to Hesper	Base to Hesper	Spring Test to Stat. Term.	Spring Test to Hesper	Stat. Term. to Hesper	Base to Hesper	Opening Pressure	Closing Pressure	Proof Test at 500psi
NY	F	TC	224C22120	Approved leakage	NP	NP	NP	NP	NP	1.0M	NP	NP	NP	NP	NP	NP	NP	NP	NP
PY		2TC	2212	No leaks or other apparent problems	NP	NP	NP	NP	0.2 Inability	Inability		11.4 Inability	Inability	Inability	Inability		130	85	No apparent leak
PV		4TC	2045	No leaks or other apparent problems	NP	NP	NP	NP	0.2 Inability	Inability		1.0M	Inability	Inability	Inability	Inability	120	95	No apparent leak
PV		6TC	2084	No leaks or other apparent problems	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
PY		6TC	2025	No leaks or other apparent problems	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
PC		7TC	2205	No leaks or other apparent problems	NP	NP	NP	NP	0.2 Inability	Inability		7.8M	Inability	Inability	Inability	Inability	140	70	No apparent leak
PC		8TC	2025	No leaks or other apparent problems	NP	NP	NP	NP	0.2 Inability	Inability		12.6 Inability	Inability	Inability	Inability	Inability	130	80	No apparent leak
PV		6TC	2205	No leaks or other apparent problems	NP	NP	NP	NP	0.2 Inability	Inability		7.0M	Inability	Inability	Inability	Inability	140	112	No apparent leak
PV		10TC	2201	No leaks or other apparent problems	NP	NP	NP	NP	2.2 Inability	Inability		1.4M	Inability	Inability	Inability	Inability	130	60	No apparent leak
PY		18TC	2205	No leaks or other apparent problems	NP	NP	NP	NP	0.2 Inability	Inability		Inability	Inability	Inability	Inability	Inability	120	70	No apparent leak

NP = Not Performed
TSP = To Be Performed
TC = Town Car

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GM = Grand Marquis
CV = Crown Victoria
PC = Police

Summary of Brake Switch Analysis

Observation Findings									
VIN	Connection Wires				Switch				
	Engagement	Wires	Red Seal	Gray Seal	Hoop, Washer, Connector, Spacer, and Disc	Environmental Seal	Gasket/Kapton Seal	Cup	Base, Switch Cavity, Contacts, Terminals
					Black residue in hoop cavity, on washer, and connector contain glycol based material (probably brake fluid) and a metal catalyst.	Intact and appears to have had good seal.	Gasket intact and appears to have had good seal. Kapton seals exhibit damage similar to that found in Meropile (Paddock) sample. All three exhibit little damage which probably formed leak paths.	Dark green deposits on face of cup contacts elements from these contacts indicating transfer of contact material to cup probably as oxide, sulfide, or corrosion product. Liquid in interior and on face is glycol based (probably brake fluid).	Switch and terminal cavities contain glycol based material (probably brake fluid). Stationary contact intact; shows some corrosion cracking in progress in some locations on Meropile sample. Movable contact depressed, apparently due to loss of elasticity.
	Missing	Missing	Missing	Missing					(-80% of Meropile). No evidence of heating or arc damage. Dark green deposits on contacts contain elements from base material, as well as sulfur. Terminals exhibit green deposits that extend in from switch and terminal condition, but do not extend.
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP
	Missing	Missing	Missing	Missing	NP	NP	NP	NP	NP

Summary of Brake Switch Analysis

Sample Information					Conclusion/Comments
VIN	Sample	MP/Article	Part/Date Code	Condition	
NY	F	TC	F2408188	Apparent leakage	Enrichment and subsequent cracks in Kapton seal forced test path for brake fluid to enter switch cavity. Transfer of brass contact material to the cap suggests that an electrical cell formed between the hot (+) contacts and the grounded (-) cap. Brake fluid in switch cavity may have acted as electrolyte for the cell. Severe corrosion etching of stationary contact indicates that moisture and other compounds may have been present with brake fluid. Failure mode appears similar to Marquise switch.
PN		STC	2818	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		STC	2840	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		STC	2894	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		STC	2820	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
NO		7TC	2820	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		STC	2820	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		STC	2300	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		STC	2381	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PN		11TC	2820	No leaks or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.

Summary of Brake Switch Analysis

Sample Information					Resistance Measurement, Ω															Function		
					Switch and Connector			Connector Only	Switch				Switch at 180 psi									
VIN	Sample	MP/Vehicle	Part/Date Code	Condition	GRAND to OR	GRAND to Hespert	OR to Hespert	GRAND to OR	Spring Term. to Stat. Term.	Spring Term. to Hespert	Stat. Term. to Hespert	Stat. to Hespert	Spring Term. to Stat. Term.	Spring Term. to Hespert	Stat. Term. to Hespert	Stat. to Hespert	Opening Pressure	Closing Pressure	Pop Test at 60psi			
P2		2CV-PO	3832	No leaks or other apparent problems	0.4 Inhib	Inhib	Inhib		0.1 Inhib	Inhib	Inhib		0.1 Inhib	Inhib	Inhib		127		60psi apparent leak			
T2		2GM	3226	No leaks or other apparent problems	0.2 Inhib	Inhib	Inhib		0.2 Inhib	Inhib	17.2K		Inhib	Inhib	Inhib		128		60psi apparent leak			
P2		4CV-PC	3232	No leaks or other apparent problems	MP	MP	MP	MP	0.1 Inhib	Inhib	Inhib		Inhib	Inhib	17.2K	Inhib	130		60psi apparent leak			
P2		ETC	3232	No leaks or other apparent problems	0.2 Inhib	Inhib	MP		0.2 Inhib	Inhib	180K		Inhib	Inhib	Inhib		151		60psi apparent leak			
P2		ETC	77	Underhood Sec.	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP			
P2		7TC	3231	No leaks or other apparent problems	Inhib	Inhib	Inhib	Inhib	0.2 Inhib	Inhib	442K		Inhib	Inhib	Inhib		130		60psi apparent leak			
P2		ETC	2548	Underhood Sec.	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP	MP			

Connections					Observations/Findings				
VIN	Engagement	Wiring	First Seal	Gray Seal	Hanger, Washer, Character, Spacers, and Disc	Environmental Seal	Gasket/Kapton Bands	Cup	Beam, Bushin Cavity, Contacts, Terminals
2A	EXTENDED side not fully engaged	TOP	Intact. Impregnation uneven and off-center	Intact. When and cavity clean below seal except for trace of oil from seal. Seal left impregnation in wire insulation.	Black residue in filling end of hanger. Did not analyze. Apparent rust deposits on character, washer, and disc, as well as on interior surface of disc.	Environmental seal intact. In place, appears to have good adhesion.	Good. Intact and appears to have had good use. Kapton seal around hanger visible. Deformation and tears in center, but no apparent cracks in sealant. Other Kapton seals show no tears, cracks, or deformation. No apparent leak path.	Face of cup covered with rust colored deposits containing iron and zinc (probably corrosion product of cup material). Transfer pin leaves in place by corrosion product. No evidence of a cell occurring.	Base contains what appears to be evidence (suspension quickly moved exposed to atmosphere). Movable contact disintegrated, but not heavily corroded near cup. Feet of contacts and their bases appear clean. No apparent deposits or corrosion on terminals.
1C	Fully engaged	TOP	Intact. Impregnation even and deep all the way around	Intact. When and cavity clean below seal except for trace of oil from seal. Seal left impregnation in wire insulation.	Black residue in filling end of hanger. Did not analyze residue. Did not disassemble switch.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
2A	ON wire side of connector not fully engaged.	TOP	Intact. Impregnation even and deep all the way around	Intact. When and cavity clean below seal except for trace of oil from seal. Seal left impregnation in wire insulation.	Black residue with copper or rust colored globules in filling end of hanger. Did not analyze residue. Did not disassemble switch.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
2A	Fully engaged	TOP	Intact. Impregnation even and deep - 80% around. Off-center wear. Some damage to edge of switch beam.	Intact. When and cavity clean below seal except for trace of oil from seal. Seal left impregnation in wire insulation.	Flux colored deposit in filling end of hanger. Did not analyze deposit. Did not disassemble switch.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
2A	Missing	Missing	Missing	Missing	Black residue in filling end of hanger; did not analyze.	Missing	Did not disassemble	Exposed face covered with rust and greenish colored deposits; did not analyze.	Missing.
2A	Fully engaged	TOP	Intact. Impregnation even and deep all the way around	Intact. When and cavity clean below seal except for trace of oil from seal. Seal left impregnation in wire insulation.	Black residue with copper or rust colored globules in filling end of hanger. Did not analyze residue. Did not disassemble switch.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
2A	Missing	Missing	Missing	Missing	Oil attached to prep. wire; did not disassemble.	Did not disassemble	Did not disassemble	Exposed face covered with rust and greenish colored deposits; did not analyze.	Missing.

Summary of Brake Switch Analysis

Sample Information					Conclusions/Comments
VIN	Sample	MYA/Make	Prob/Date Code	Condition	
PC		2CV-PC	2003	No tests or other apparent problems	Switch did not open when pressed. Cap appears to have been corroded by water intrusion. Terminal pin loose in place by corrosion product. No evidence of brake fluid leakage or formation of electrolytic cell.
CV		30M	2003	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
PC		4CV-PC	2003	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
CV		BTC	2003	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
CV		BTC	??	Underhood fire	Severely damaged by fire. No further analysis performed.
CV		7TQ	2001	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
CV		BTC	2001	Underhood fire	Severely damaged by fire. No further analysis performed.

Summary of Brake Bulb Analysis

Sample Information					Resistance Measurement, Ω													Function		
					Switch and Connector			Connector Only	Switch				Switch at 140 psi							
VIN	Sample	MPV/Vehicle	Partial Date Code	Condition	GRNWD to CR	GRNWD to Hwport	OR to Hwport	GRNWD to CR	Spring Term. to Stat. Term.	Spring Term. to Hwport	Stat. Term. to Hwport	Base to Hwport	Spring Term. to Stat. Term.	Spring Term. to Hwport	Stat. Term. to Hwport	Base to Hwport	Opening Pressure	Closing Pressure	Proof Test at 500 psi	
2Y		8TC	2085	No leaks or other apparent problems		24.0M	4.1M	Infinitely	1.9-3.3M	0.4M		6.4	6.1	<370K	<370K	Infinitely	144	68	No apparent leak	
2Y		10CV	2107	No leaks or other apparent problems	0.4	Infinitely	Infinitely	Infinitely	0.4	Infinitely	Infinitely	6.4	Infinitely	Infinitely	Infinitely	Infinitely	135	108	No apparent leak	
2Y		11TC	2118	No leaks or other apparent problems	NP	NP	NP	NP	0.1	Infinitely	Infinitely	Infinitely	Infinitely	Infinitely	Infinitely	Infinitely	135	74	No apparent leak	
2Y		12TC	2085	No leaks or other apparent problems	0.3-20.3M	21.8M	Infinitely		0.3-0.6M	0.6M	65.4K		0.1	Infinitely	Infinitely	Infinitely	146	67	No apparent leak	
2Y		13TC	2085	No leaks or other apparent problems	0.3	Infinitely	Infinitely	Infinitely	0.2	Infinitely	Infinitely	7.5M	Infinitely	Infinitely	Infinitely	Infinitely	150	70	No apparent leak	
2Y	Coach	TC	2085	Dealership return, apparent leaks, fluid leak.	NP	NP	NP	NP	>750K	>250K	>350K	Infinitely	>5M	>650K	>400K	Infinitely	152	132	No apparent leak	

Summary of Brake Switch Analysis

Observations/Findings

FYTS000	Connector/Wires				Switch				
	Engagement	Wiring	Red Seal	Gray Seal	Harport, Washer, Connector, Spacer, and Clip	Disengagement Seal	Control/Kapton Seals	Cup	Base, Switch Gears, Contacts, Terminals
	Fully engaged	TIP	Intact. Impression even, but not deep or sharp. Not as pronounced as in other switches.	Intact. Wires and cavity clean below seal except for trace of oil from seal. Seal felt impregnated in wire insulation.	Still attached to prop. valve. Black residue in harport cavity; did not analyze. White deposits on washer, connector, clip, and interior of cup; did not analyze - probably oxidation product of wire shavings.	Intact and appears to have had good seal.	Seal intact and appears to have had good seal. Kapton seal around harport exhibits deterioration and possible tear in holes, but no apparent cracks in substrate. Other Kapton seals show no holes, cracks, or deterioration. No recovery leak path.	Face of cup covered with rust and white corrosion deposits containing iron and zinc (possibly oxidation product of cup material). Transfer pin broken in place by corrosion product. Appear to be disengaged (spitting). No evidence of a coil opening.	Moveable contact dislodged, but not heavily corroded near cup. Flats of contacts and their bases appear clean. Terminals exhibit some corrosion.
	Fully engaged	TIP	Intact. Impression even and deep.	Intact. Wires and cavity clean below seal except for trace of oil from seal. Seal felt impregnated in wire insulation.	Still attached to prop. valve. Did not disassemble.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
	Fully engaged	TIP	Intact. Impression even and deep.	Intact. Wires and cavity clean below seal except for trace of oil from seal. Seal felt impregnated in wire insulation.	Still attached to prop. valve. Did not disassemble.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
	Fully engaged	TIP	Intact. Impression even and deep.	Intact. Wires and cavity clean below seal except for trace of oil from seal. Seal felt impregnated in wire insulation.	Black residue in fitting and at harport; did not analyze at CL. Disassembled and analyzed by SFL.	Disassembled and analyzed by SFL.	Disassembled and analyzed by SFL.	Disassembled and analyzed by SFL.	Disassembled and analyzed by SFL. Terminals have light deposits on base.
	Fully engaged	TIP	Intact. Impression even and deep.	Intact. Wires and cavity clean below seal except for trace of oil from seal. Seal felt impregnated in wire insulation.	Black residue in fitting and at harport; did not analyze.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).
	Missing	Missing	Missing	Missing	Black residue in fitting and contains glycol ether based material (probably brake fluid), no cracks, and other material; possibly a hydrocarbon. No apparent burn on connector, washer, or harport.	Intact and appears to have had good seal.	Seal is intact and appears to have had good seal. Kapton seals exhibit characteristic tears in Teflon with radial and circumferential cracking in substrate. Appears to have formed leak path. Damage appears similar to that in Mariposa sample.	Face of cup covered with black residue and copper colored globules. Found a copper glycol based material (probably brake fluid) and possibly a hydrocarbon. Additional analysis of residue pending.	Switch cavity of base contains black sludge. Moveable contact appears to have been corroded away. Black residue is present in terminal cavity and at bases of terminals. Terminals appear clean otherwise.

Summary of Brake Switch Analysis

Sample Information					Conclusions/Comments
VM	Sample	MY/Vehicle	Profile Date Code	Condition	
NY	[REDACTED]	8TC	3000	No tests or other apparent problems	Switch did not open when depressed. Shows current leak path between contacts and ground. Cap has been cracked. Thereby the frame is placed by connector contacts. Moisture in cavity appears to have formed current leak path. No evidence of material transfer from contacts to cup. No evidence of leak in Kaptan seal. Appears to be different failure mode than Memphis switch.
PK	[REDACTED]	78CV	2472	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
NY	[REDACTED]	18TC	2110	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
NY	[REDACTED]	12TC	3000	No tests or other apparent problems	Switch did not open when depressed. Shows current leak path between contacts and ground. Analyzed by DFL.
NY	[REDACTED]	12TC	3000	No tests or other apparent problems	Examination, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.
NY	Qash	TC	2000	Debris in valve, apparent brake fluid leak.	Resistance measurements show current leak path between contacts and bottom contacts and ground. Kaptan seal appears to have formed leak path for brake fluid to enter switch cavity. Transfer of vented material in cup suggests electrical cell may occur between the hot (+) contacts and the grounded (-) cup. Brake fluid may have acted as electrolyte. Failure mode similar to Memphis switch.

Summary of Baseline Switch Analysis

Sample Information					Resistance Measurement, Ω															Function		
VM	Sample	SW/Vehicle	Probe/ Date Code	Condition	Switch and Connector			Connector Only	Switch				Switch at 100 psi				Opening Pressure	Closing Pressure	Final Test at 500 psi			
					GRNED to OR	GRNED to Hesport	OR to Hesport	GRNED to OR	Spring Term. to Stat. Term.	Spring Term. to Hesport	Stat. Term. to Hesport	Base to Hesport	Spring Term. to Stat. Term.	Spring Term. to Hesport	Stat. Term. to Hesport	Base to Hesport						
7	Qash	TC	2100	Deadweight linker, apparent linker field link	NP	NP	NP	NP	>180K	>17K	>30K	Infinitely	1.76K	>140K	>15K	Infinitely	No sound	No sound	No apparent link			
8	EAA	TC	2000	Unlabeled Sw.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP			
9	EAA	TC	2000	Unlabeled Sw.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP			
10	EAA	Unlabeled	7	Unlabeled Sw.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP			
11	EAA	Unlabeled	7	Unlabeled Sw.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP			
12	1TC			No links or other apparent connections	6.5	Infinitely	Infinitely	Infinitely	11.5	Infinitely	Infinitely	5.5	Infinitely	Infinitely	Infinitely	Infinitely	100		On No apparent link			

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NP = Not Performed
TSP = To Be Performed
TC = Team Car

GM = Grand Marquis
GV = Crown Victoria
PC = Police

Summary of Brake Switch Analysis

Observational Findings									
Connector/Wire					Switch				
VIN	Engagement	Wire	Red Seal	Gray Seal	Hasport, Washer, Connector, Spacers, and Disc	Environmental Seal	Gasket/Kapton Seals	Cap	Base, Switch Gears, Contacts, Terminals
1Y258128	Missing	Missing	Missing	Missing	Black residue in filling end of hasport contains glycol based material (probably brake fluid) and an anvil. Copper colored globules also present. No apparent tears on connector, washer, or hasport.	Intact and appears to have had good seal.	Gasket is intact and appears to have had good seal. Kapton seals exhibit circumferential tears in Teflon with radial and circumferential cracking in substrate. Appears to have formed leak paths. Damage appears similar to that in Memphis sample.	Face of cap covered with black residue and copper colored globules. Residue contains glycol based material (probably brake fluid) and possibly a hydrocarbon. Additional analysis of residue pending.	Switch cavity of base contains black sludge with copper colored globules. Movable contact appears to have been corroded away. Black residue is present in terminal cavity and on the terminals.
1Y258128	Missing	Missing	Missing	Missing	Black residue in filling end of hasport. Washer, connector, disc, and interior of cap are covered with rust colored deposits.	Missing	Gasket missing. Chipped fragments of Kapton seals remain.	Face of cap covered with rust colored deposits. Analysis pending.	Missing.
1Y258128	Missing	Missing	Missing	Missing	Black residue in filling end of hasport. Washer, connector, disc, and interior of cap are covered with rust colored deposits.	Missing	Gasket missing. Chipped fragments of Kapton seals remain.	Face of cap covered with rust colored deposits. Analysis pending.	Missing.
1Y258128	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing.
1Y258128	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing	Missing.
1Y258128	Fully engaged	TEP	Intact. Impression even and deep all the way around	Intact. Wire and cavity clean looking seal except for trace of oil from seal. Seal left impressions in wire insulation.	Black residue in filling end of hasport. Did not analyze.	Did not disassemble	Did not disassemble	Did not disassemble	Did not disassemble. Terminals clean (no apparent deposits or corrosion).

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Summary of Brake Switch Analysis

Sample Information					Conclusions/Comments
VIN	Sample	MP/Vehicle	Police/Date Code	Condition	
7-1	Q000	TC		Overhaul valve, apparent stall/brake fluid leak.	Resistance measurements show current leak path between contacts and between contacts and ground. Plasma arcing appears to have formed leak path for brake fluid to enter switch cavity. Transfer of contact material to cap suggests abnormal cell wear occurred between the hot (+) contacts and the grounded (-) cap. Brake fluid may have acted as electrolyte. Failure mode similar to hydraulic switch.
7-2	EA	TC	2000	Undersized fit.	Analysis in progress.
7-3	EA	TC	2000	Undersized fit.	Analysis in progress.
7-4	EA	Motor	7	Undersized fit.	Brake fluid only. No switch to replace.
7-5	EA	SM	7	Undersized fit.	Analysis in progress.
7-6		TC		No leaks or other apparent SWC problems.	Excitation, resistance and functional testing revealed no apparent problem with switch. No further analysis performed.

3713 2428

E MAIL 2
BACKGROUND
INFO

LaRouche, Steve (S.)

From: Frederick J. Porter [FPORTER.DRBN007@ovvm.gw.ford.com]
Sent: Friday, December 18, 1998 8:19 AM
To: WABRAMCZ.DRBN006@ovvm.gw.ford.com; BEGEN.DRBN007@ovvm.gw.ford.com;
RENGLI81.DRBN006@ovvm.gw.ford.com; JEVANS8.DRBN006@ovvm.gw.ford.com;
DGOEL.DRBN005@ovvm.gw.ford.com; JGREGOIR.DRBN005@ovvm.gw.ford.com;
KGRIBBLE.DRBN005@ovvm.gw.ford.com; NLAPPOINT.DRBN005@ovvm.gw.ford.com;
slarouch@mail.ford.com; JMCINERN.DRBN005@ovvm.gw.ford.com; JNEME.DRBN005
@ovvm.gw.ford.com; RNEVI.DRBN006@ovvm.gw.ford.com; GSTEVEN1.DRBN006
@ovvm.gw.ford.com; CTHOMAS5.DRBN006@ovvm.gw.ford.com; HWELFER3.DRBN006
@ovvm.gw.ford.com
Subject: Brake Pressure Switch Analysis



12/22/98 VCS

Requester: Frederick J. Porter
Date to be scheduled: 12/22/98
Starting time: 10:00 AM
Ending time: 12:00 PM
Recurrence: Single event

Location: Central Labs - Lobby Conference Room

Subject: Brake Pressure Switch Analysis

Purpose: Review brake pressure switch operation with Texas Instrument
Review available data and determine next steps.

Recurrence: Single event

LaRouche, Steve (S.)

From: Frederick J. Porter (fporter@gw.ford.com)
Sent: Friday, December 16, 1998 5:04 PM
To: wabramcz@gw.ford.com; began@gw.ford.com; renglis1@gw.ford.com; jevens8@gw.ford.com; dgoel@gw.ford.com; jgregoir@ccms1.dearborn.ford.com; kgribble@gw.ford.com; nlpoint@gw.ford.com; slarouch@mail.ford.com; jmcinem@gw.ford.com; jname@gw.ford.com; mevl@gw.ford.com; gsteven1@gw.ford.com; cthomas5@ccms1.dearborn.ford.com; lweller3@ccms1.dearborn.ford.com
Subject: 9F924 Update (19981218)

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

TEAM:

AVT ESE Chassis Electronics: Fred Porter x84-63722 fporter
AVT Chassis Engineering: Joe Evans x32-23832 jevens8
Barry Egen x32-39512 began
AVT ESE EOS: Rob English x33-73225 renglis1
AVT Design Analysis: Norm LaPointe x59-42886 nlpoint
AVT ESE OPE: Jim Gregoir x33-79992 jgregoir
E&SE Prod. Veh. Safety: William Abramczyk x32-23284 wabramcz
Ray Nevi x59-47688 mevl
Large Luxury VC Safety: John McInerney x32-20276 jmcinem
Joe Name x39-08133 jname
AVT Materials Engineering: Greg Stevens x32-36586 gsteven1
Ken Gribble x32-38856 kgribble
Clark Thomas x59-41313 cthomas5
Central Lab Services: Steve LaRouche x84-54875 slarouch

INFORMATION:

NHTSA letter: PE88-055

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

Warranty: A total of 89 warranty claims are identified in AWS on the F2VY-9F924-A for 1992 and 1993 Town Cars.

Two COIS reports (WJIAA135 & VDUAA322) mention underhood fire in connection with the brake pressure switch.
WJIAA135 occurred at 51,800 miles.
VDUAA322 occurred at 58,802 miles.

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

Contacts: Surfaces - Mike Thomas (248)643-8520 (HiLITE Industries)
TI - Rob Sharp (248)305-5729
TI - Russ Baumann (800)235-3314
TI - Charlie Douglas (508)235-3657

Function: The brake pressure switch is a redundant switch for turning off the speed control function.

X-Rays: Taken by Steve LaRouche, Norm LaPointe & Clark Thomas on 12/17/1998. Original photographs and part are in Steve LaRouche's possession.

ON-GOING ACTIVITY:

2 service parts have been ordered from Feltane Ford for X-ray and other testing by Central Lab Services.

Meeting with representatives of TI is planned for 12/22/1998 to discuss intended operation of the switch. The meeting will be at the Central Laboratory Conference room off of the lobby.

QUESTIONS: (In no particular order)

- 1) What is the normal current in the brake pressure switch?
- 2) Was cruise control standard on Town Car in 1992 and 1993?
- 3) Under what circumstances is brake fluid flammable?

According to Clark Thomas & Mary Haga, brake fluid is flammable at approximately 300 degrees F.

- 4) What is the repair history for vehicles that have exhibited a problem? Repair history for the two CQIS vehicles are being gathered by Fred Porter.
- 5) What other vehicles use this brake pressure switch? What are their electrical configurations?

MODEL YEAR	92	93	94	95	96	97	98
Town Car	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	
Crown Vic	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	
Grand Marquis	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	
Econoline	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Club Wagon	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
F-Series	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx
Bronco	xxxx	xxxx	xxxx	xxxx			
Taurus SHO	xxxx	xxxx	---				
Capri		xxxx	xxxx	---			
Windstar		xxxx	xxxx	xxxx	xxxx	xxxx	
Falcon			xxxx	xxxx	xxxx	xxxx	
Explorer			---	xxxx	xxxx		
Ranger			---	xxxx	xxxx		
Expedition				xxxx	xxxx		
Navigator					xxxx		

xxxx = used in model year
 --- = may have been used in model year

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

Charlie Douglas of TI is investigating the design changes that may have been implemented on the brake pressure switch beginning in 1992.

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

Regards,

Fred Porter CV - fporter fporter@ford.com
 Chassis E/E Systems Applications (313)846-3722
 Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax: 380-4145

Brake Pressure Switch
Review

12/22/98

NAME	ORGANIZATION	PHONE
FRED PORTER	FORD AVT EESC	(313) 845 3722
JOLA LOTT	AVT HALLS ENGINEERING	(313) 24-83641
ZANDRA DEERING	LVC - SAFETY EMERG	(313) 97-4163
Jim Gregoire	AVT EESC OPD	(313) 33-79962
STEVE LaROUCHE	FORD CENTRAL LABS	313 845 4876
NORMAN LATOINTE	AVT - DES. ANAL.	313 59/42686

LaRouche, Steve (S.)

From: Klass, Pete (P.F.)
Sent: Wednesday, December 23, 1998 1:23 PM
To: LaRouche, Steve (S.)
Subject: RE: Brake/Cruise Control Switch Failure Analysis

Thanks.

P. F. Klass
Ford Motor Co.
Room 220, Central Laboratory
313-322-1813, fax 313-322-1814
Internet: <mailto:pklass@ford.com>

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

From: LaRouche, Steve (S.)
Sent: Wednesday, December 23, 1998 12:31 PM
To: Guillen, Gayle (G.D.); Schumacher, Dan (D.B.); LaRouche, Steve (S.)
Cc: Klass, Pete (P.F.); Kosiarczyk, Richard (R.A.); Menor, James (J.R.)
Subject: Brake/Cruise Control Switch Failure Analysis

Gayle and Dan: We are going to have a meeting in the large conference room on January 4 to discuss what types of analyses we could perform on a brake/cruise control switch that was involved in a fire. Specifically we may need to identify corrosion products, brake fluid, and other materials which could have entered the switch. Norm LaPointe from Design Analysis will most likely attend. Please attend if you can, or let me know if you can send a substitute. ASO needs to respond to NHTSA by 1/15/99. If asked to perform analyses, we will probably need to respond by 1/7/99.
Thanks

Steve LaRouche (SLAROUCH)
Metallurgy Section
Central Laboratory, Room N410
(313) 845-4876
(313) 322-1814 FAX

3713 2432

LaRouche, Steve (S.)

From: Frederick J. Porter (fporter@gw.ford.com)
Sent: Tuesday, January 28, 1998 5:26 PM
To: nlapointe@gw.ford.com; slarouch@small.ford.com
Subject: (U) Brake Pressure Switch Material

The following is from TI drawings

Part	Material	Comments
Modified SAE J612 C10L10 Steel Export		Zinc Plating .0003 min thk w/yellow dichromate
Converter	1008 or 1010 C.R. Steel	Zinc Plating .0002-.0004 thk may have rust inhibitor
Washer	1050 CRS	Zinc Plate .0002-.0006 thk Heat treat austemper Rockwell 40-50
Cup	1010 or 1008 C.R.S.	Zinc Plating w/yellow chromate .0002-.0004 thk
Spring	Beryllium copper C17200	Mill hardened (Brush Wellman alloy 190 hm)
Kapton	Dupont 600 FN1313L	1 mil Teflon FEP 3 mil Kapton Type H 1 mil teflon FEP
Moveable Contact	Copper	Finish: DMC-133 OFHC Silver DMC-10 fine silver
Environmental Seal	Silicon JBL S7519	
Transfer Pin	L-3 Grade Steatite (DC-16E5) or L-3 Grade Steatite (DC-144E)	
Switch Rivet	CDA 280 Brass	
Gasket	Ethylene Propylene JBL Compound E-7104-70 JBL Part No. 6197E	
Spacer	Dupont Kapton 200H	.0017-.0023 thk
Crimp Ring	Aluminum 6052	
Thread Cap	LDPE	

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax: 380-4145

LaRouchs, Steve (S.)

From: Steve Raimers [BREIMERS.DRBN007@ovvm.gw.ford.com]
Sent: Thursday, February 04, 1999 8:29 AM
To: FPORTER.DRBN007@ovvm.gw.ford.com; DGOEL.DRBN006@ovvm.gw.ford.com;
LBROWN.DRBN006@ovvm.gw.ford.com; CSTEVEN7.DRBN003@ovvm.gw.ford.com;
JNEME.DRBN006@ovvm.gw.ford.com; cbudzyna@vision.com; pstakes@vision.com;
slarouch@mail.ford.com; RENGLIS1.DRBN005@ovvm.gw.ford.com; SSALTER.DRBN006
@ovvm.gw.ford.com; NLAPOINT.DRBN005@ovvm.gw.ford.com; TMASTERS.DRBN006
@ovvm.gw.ford.com; SREIMERS.DRBN007@ovvm.gw.ford.com; SCOLE1.DRBN006
@ovvm.gw.ford.com; JKAFATI.DRBN004@ovvm.gw.ford.com
Subject: Brake Pressure Switch



02-04-99 V08

Requester: Steve Raimers
Date to be scheduled: 02/04/99
Starting time: 02:00 PM
Ending time: 03:00 PM
Recurrence: Single event

Location: building 6 conf rm 3A039

Subject: Brake Pressure Switch

Purpose: Kick-off meeting for investigation of Brake Pressure switch
in response to NHTSA investigation.

1. Develop work plan
2. Identify addition team players
3. Establish meeting schedule and location.

Recurrence: Single event

SPRINT SHEET
OF SAMPLES
ANALYZED

LaFouche, Steve (S.)

From: Steve Reimers [sreimers@gw.ford.com]
Sent: Tuesday, March 16, 1999 5:28 PM
To: Porter, F.J.; gateven1@ecoma1.dearborn.ford.com; slarouch@mail.ford.com
Subject: RE: Ford Brake Fluid Questions

tyl

Steve Reimers building 5 3E008
AVT Chassis E/E System Applications mail drop 5011
39-03286 SREIMERS sreimers@ford.com fax 39-03286 ;>
*** Forwarding note from OW02LQ9P--EXTERNAL 03/16/99 15:28 ***
To: SREIMERS--FORDMAIL Reimers, Steve
cc: O2421WP1--EXTERNAL Kitt, Michael

From: Urbina, Scott (SA)
Subject: RE: Ford Brake Fluid Questions

From: "Urbina, Scott (SA)" <aurbina@dow.com>
cc: "Kitt, Michael" <mikitt@dow.com>

Steve, I know that Mike was out today and is on vacation tomorrow. I will follow up with him on your request as well.

A few comments....

1. It was my understanding from our recent meeting that it was unknown as to what brake fluid was in the vehicles in question. From a testing standpoint, is Ford wanting to look at the "world" of brake fluids that are in the market. The reason I ask this is that the brake fluid GM uses for factory fill is different from Chrysler which is different from Ford. In fact, the Japanese all use different fluids and chemistries as well. I had mentioned this to several folks after our meeting was over. There are several producers of brake fluids (some for OEM and others for aftermarket) and these all use different formulation chemistry.

2. Conductivity of brake fluid will be contingent upon a number of factors including the chemistry of the "nest" (unused/unadulterated) fluid, water content, and whether or not any impurities have entered the fluid (i.e.: metals from the brake system, etc.)

3. I'll let Mike address this. I am aware of the paper although I don't have a copy of it. The comments I made in number one are valid for this test as well.

I'm sorry if this seems to be confusing or muddles up anything Ford was looking at. It's important, though, to recognize that due to the various fluids in the market that it's difficult to come up with a test procedure. Once a vehicle leaves the assembly plant the type and "mixture" of brake fluid is up in the air. While brake fluid chemistries are "similar" they are not the same....and I don't just mean for corrosion inhibitors, etc. The actual base chemistry can be very different.

Let me know of any questions you may have and anything I can do to help further. Again, I'll put a call into Mike to help on this request.

Scott A. Urbina
Account Manager
Dow Automotive

Phone: 248-351-5557
Fax: 248-948-1706
surbina@dow.com

> -----
> From: Steve Reimers(SMTP:sreimers@ford.com)
> Sent: Tuesday, March 16, 1999 11:23 AM
> To: Urbina, Scott (SA)
> Subject: Ford Brake Fluid Questions
>
> TO: surbina@dow.com
>
> This is text of message I sent to Mike Kitt today.
> Subject: Ford Brake Fluid questions
> 1. When will Brake Fluid without inhibitors be available?
> 2. Need to know conductivity of Brake Fluid?
> 3. SAE 971007 describes a way to lab-age brake fluid. Can DOW help
> Ford get some
> of this lab-aged Brake Fluid? (is this the SAE paper you referred
> to in our
> meeting in Dearborn on 2/24/99?)
> thanks,
>
> Steve Reimers building 6 3E008
> AVT Chassis E/E System Applications mail drop 6011
> 39-03286 SREIMERS sreimers@ford.com fax 39-03286 >

LaRouche, Steve (S.)

From: Steve Reimers [sreimers@gw.ford.com]
Sent: Wednesday, March 24, 1999 9:13 AM
To: A.McGulrk, a-mcgulrk; Aziz Rahman, Texas; Porter, F.J.; slarouch@mail.ford.com
Subject: RE: Brake Fluid Shipping addresses

FYI.

Steve Reimers building 5 3E008
RVT Chassis E/E System Applications mail drop 5011
39-08296 SREIMERS sreimers@ford.com fax 39-04145 ;>
*** Forwarding note from 02421WP1-EXTERNAL 03/24/99 07:56 ***
To: SREIMERS-FORDMAIL 'Steve Reimers'
cc: GW0ZLO9P-EXTERNAL Urbina, Scott (SA)

From: Kitt, Michael (MB)
Subject: RE: Brake Fluid Shipping addresses

From: "Kitt, Michael (MB)"<mikitt@dow.com>
cc: "Urbina, Scott (SA)"<surbina@dow.com>

Steve,
Samples of the components used to make brake fluid were shipped to TI today. The blend should be produced by adding two (2) gallons of material from the container labeled as Dowanol 237 to the entire content of the container labeled Dowanol 238.
Please call me if you have any questions.
Mike Kitt

> -----
> From: Steve Reimers[SMTP:sreimers@ford.com]
> Sent: Tuesday, March 16, 1999 4:57 PM
> To: mikitt@dow.com
> Subject: Brake Fluid Shipping addresses
>
> TO: mikitt@dow.com
>
> please ship the 5 gallons of Ford formula brake fluid without
> inhibitors to:
> *****
> *****
> URGENT: Gerry Terino(508-236-3009)
> Texas Instruments Incorporated
> 34 Forest Street, MS-12-37
> Attleboro, Massachusetts 02703
> *****
> *****
> and 5 gallons to:
> Ford Motor Co.
> Central Laboratory
> 15000 Century Drive
> Commerce Park North
> Dearborn, MI 48120
> Attn: S. LaRouche
> *****
> *****
> Please reply to this email so I may set-up an ID for you.
> thanks,
>
> Steve Reimers building 5 3E008

> AVT Chassis E/E System Applications mail drop 5011
> 39-03286 BREMERS breimers@ford.com fax 39-03286 :>
>

LaRouche, Steve (S.)

From: LaRouche, Steve (S.)
Sent: Friday, April 18, 1998 5:15 PM
To: Porter, Fred (F.J.)
Cc: LaPointe, Norman (N.R.); Klass, Pete (P.F.); LaRouche, Steve (S.)
Subject: Brake Switches

Fred: I had a meeting this afternoon with two gentlemen (one was Roo Carter) from Scientific Research Laboratories to discuss brake switches. I showed them the results I have so far, and they felt that our testing was pretty comprehensive and that there was really not any more that they could contribute in terms of testing. We tried to come up with possible scenarios that would tie our findings to a cause of fire, but couldn't come up with anything. Here is a quick summary of our findings at Central Lab:

There appear to be two modes of failure occurring: One involving leakage of brake fluid through the Kapton seal and an apparent cell being set up between the contacts and steel cup; The other involving Ingression of water into the switch cavity, with no brake fluid leakage, and no evidence of a cell:

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Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1614 FAX

LaRouche, Steve (S.)

From: Frederick J. Porter [fporter@gw.ford.com]
Sent: Monday, April 19, 1999 8:17 PM
To: slarouch@mail.ford.com
Co: sreimers@gw.ford.com
Subject: RE: Brake Switches

At today's Technical Review Committee meeting, the question was asked "Can we tell which direction the brittleness and cracking is happening on the kapton switches?" We noted that in your chart the Reddick vehicle said that it started on washer side. I think this means that the cracking started on the electrical side and progressed to the hydraulic side of the kapton.

- 1) Please confirm that I am correct.
- 2) Can we make a statement in regards to which kapton layer started to crack first on the other leaky switches?

Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax 390-4145
*** Forwarding note from SLAROUCH-FORDNA1 04/19/99 07:57 ***
To: FPORTER --FORDMAIL Porter, Fred (F.J.)

From: LaRouche, Steve (S.)
Subject: RE: Brake Switches

Fred: We are currently investigating this. I hope to have an answer this week.

Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4676 (313) 322-1614 FAX

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

From: Frederick J. Porter [mailto:fporter@gw.ford.com]
Sent: Friday, April 16, 1999 8:16 PM
To: slarouch@mail.ford.com
Co: rlapoint@gw.ford.com; sreimers@gw.ford.com; pklass@mail.ford.com
Subject: Brake Switches

For clarification:

When you are done with the testing, do the switches from EAA show signs of a coil being formed?

Is there, or could there be, evidence of corrosion occurring on the EAA switches similar to the junkyard switches.

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

LaRouche, Steve (S.)

From: LaRouche, Steve (S.)
Sent: Monday, April 19, 1999 7:55 AM
To: Porter, Fred (F.J.)
Subject: RE: Brake Switches

Fred: We are currently investigating this. I hope to have an answer this week.

Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4576 (313) 322-1514 FAX

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

From: Frederick J. Porter [mailto:fporter@gw.ford.com]
Sent: Friday, April 16, 1999 8:15 PM
To: slarouch@mail.ford.com
Cc: nlapoint@gw.ford.com; sreimers@gw.ford.com; pklaas@mail.ford.com
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Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax 390-4145
*** Forwarding note from SLAROUCH-FORDNA1 04/16/99 17:14 ***
To: FPORTER -FORDMAIL Porter, Fred (F.J.)
cc: NLAPPOINT-FORDMAIL LaPointe, Norman (PKLAAS -FORDNA1 Klaas, Pete (P.F.)
SLAROUCH-FORDNA1 LaRouche, Steve (S)

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Steve LeRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 846-4876 (313) 322-1614 FAX

LaRouche, Steve (S.)

From: LaRouche, Steve (S.)
Sent: Tuesday, April 20, 1999 8:03 AM
To: Porter, Fred (F.J.)
Cc: LaRouche, Steve (S.)
Subject: RE: Brake Switches

Fred: You are correct for the Reddick switch. The damage was most severe on the washer side of the seal pack, which indicated that was where the cracking initiated. I don't think we can make a general statement about where the cracking/damage initiated for all the samples as it appears to have initiated at different locations in different samples (The cracking appears to have initiated on the fluid side of the seal in the two seals samples; the initiation point could not be determined in the other samples).

Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1614 FAX

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

From: Frederick J. Porter [mailto:fporter@gw.ford.com]
Sent: Monday, April 19, 1999 8:17 PM
To: slarouch@mail.ford.com
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Regards,
Fred Porter OV - fporter fporter@ford.com
Chassis E/E Systems Applications (313)845-3722
Bldg 5 - Mail Drop 8030 - Cubicle 3E004 fax: 390-4145
*** Forwarding note from SLAROUCH-FORDNA1 04/19/99 07:57 ***
To: FPORTER -FORDMAIL Porter, Fred (F.J.)

From: LaRouche, Steve (S.)
Subject: RE: Brake Switches

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Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1614 FAX

---Original Message---

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Sent: Friday, April 16, 1999 8:15 PM
To: slarouch@mail.ford.com
Cc: nilapoint@gw.ford.com; sreliners@gw.ford.com; pklaas@mail.ford.com
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Bldg 5 - Mail Drop 5030 - Cubicle 3E004 fax: 380-4148
*** Forwarding note from SLAROUCH-FORDNA1 04/16/99 17:14 ***
To: FPORTER -FORDMAIL Porter, Fred (F.J.)
cc: NILAPOINT-FORDMAIL LaPointe, Norman (PKLAAS -FORDNA1 Klaas, Pete (P.F.)
SLAROUCH-FORDNA1 LaRouche, Steve (S)

From: LaRouche, Steve (S.)
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Steve LaRouche (BLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4576 (313) 322-1614 FAX

LaFouche, Steve (S.)

From: Steve Reimers [sreimers@gw.ford.com]
Sent: Thursday, April 22, 1999 11:51 AM
To: slarouch@mail.ford.com
Subject: Brake Fluid In Non-leakers

Steve, Did any of the field samples that had connector and harness attached and were NON-Leakers have any Brake fluid in the terminal cavity. This would indicate whether Brake Fluid could be getting into the switch other than through the Kapton diaphragm.
thanks,

Steve Reimers building 5 SE008
RVT Chassis E/E System Applications mail drop 5011
39-03286 GREIMERS sreimers@ford.com fax 39-04145 ;>

LaRouche, Steve (S.)

From: LaRouche, Steve (S.)
Sent: Thursday, April 22, 1999 11:54 AM
To: Reimers, Steve (S.J.)
Subject: RE: Brittle Clarification

Steve:

The brittleness was determined on a qualitative basis by comparing the flexibility of the material at the crack with that of the material away from the crack. This was done by flexing the material with a small probe (dental pick). In other words, it was done by "feel". There is no way to quantify this on the seals removed from the switches since the damage is so localized. I suppose the properties could be quantified by exposing tensile test samples to brake fluid and determining elongation, etc. The problem with this is that we have no way of duplicating the exact environment to which the seals were exposed in the switches. Did Dupont or TI do this sort of thing before choosing this material for this application?

Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1614 FAX

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

From: Steve Reimers [mailto:areimers@gw.ford.com]
Sent: Thursday, April 22, 1999 10:05 AM
To: slarouch@mail.ford.com
Subject: Brittle Clarification

Your spread sheet mentions a brittle condition and cracking in some Kapton layers. Please clarify what brittle means. Is there a quantitative test you can do to compare "brittleness" of field returns versus virgin Kapton? I have some Kapton you may use or we can get some from TI or DuPont that has not been handled as much.

Steve Reimers building 5 3ED08
RVT Chassis E/E System Applications mail drop 5011
39-03266 SREIMERS areimers@ford.com fax 39-04145 >

LaRouche, Steve (S.)

From: LaRouche, Steve (S.)
Sent: Thursday, April 22, 1999 11:58 AM
To: Reimers, Steve (S.J.)
Subject: RE: Brake Fluid In Non-leakers

Steve: No non-leakers had brake fluid in the terminal cavity.

Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1814 FAX

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

From: Steve Reimers [mailto:sreimers@gw.ford.com]
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thanks,

Steve Reimers building 5 3E006
RVT Chassis E/E System Applications mail drop 5011
39-03255 SREIMERS sreimers@ford.com fax 39-04148 ;>

LaRouché, Steve (S.)

From: LaRouché, Steve (S.)
Sent: Wednesday, April 21, 1999 1:21 PM
To: Reimers, Steve (S.J.)
Subject: RE: BP switch part numbers

Steve: None of the switches on hand at Central Lab have a suffix of BA or AB. Three of the switches have prefixes other than F2VC. All three have a prefix of F2AC. One was a leaker and is sample D (97 Crown Vic) from one of the first groups we analyzed. The other two are not leakers. One is sample E (#11) from the same group as sample D; the other sample (PX151140) came from a junkyard and has not been analyzed.

Steve LaRouché (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1614 FAX

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

From: Steve Reimers [mailto:sreimers@gw.ford.com]
Sent: Wednesday, April 21, 1999 10:51 AM
To: slarouch@mail.ford.com
Subject: BP switch part numbers

Do any of the switches have received have a suffix of BA or BB? Are there any prefixes other than F2VC?
thanks,

Steve Reimers building 5 3E008
RVT Chassis E/E System Applications mail drop 6011
39-03286 SREIMERS sreimers@ford.com fax 39-04145 ;>

LaRouche, Steve (S.)

From: LaRouche, Steve (S.)
Sent: Thursday, April 22, 1999 1:35 PM
To: Reimers, Steve (S.J.)
Subject: RE: Water Ingress

Three of the samples from junkyards show evidence of water ingress and corrosion. Only one of these had tarnish or corrosion on the terminals. The terminals were clean in the other two switches. These samples showed no evidence of brake fluid leakage through the Kapton seals. They also showed no evidence of a cell (transfer of contact material to cup) like that found in the switches that leaked brake fluid or burned.

Steve LaRouche (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4875 (313) 322-1814 FAX

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

From: Steve Reimers [mailto:careimers@gw.ford.com]
Sent: Thursday, April 22, 1999 1:27 PM
To: slarouch@mail.ford.com
Subject: Water Ingress

How many field returns show signs of water ingress and water induced corrosion?
Is there any sign of water in the terminal cavity?

Steve Reimers building 5 3E006
RVT Chassis E/E System Applications mail drop 5011
38-03266 BREMERIS ereimers@ford.com fax 38-04145 >

LaRouchie, Steve (S.)

From: LaRouchie, Steve (S.)
Sent: Friday, April 23, 1999 9:36 AM
To: Reimers, Steve (S.J.)
Subject: RE: Metal transfer

Steve: Yes, we have seen this in all the switches (including the Memphis switch) that we have analyzed that have had brake fluid in the switch cavity. We can only do elemental analysis, but that, and the green appearance suggests that the transferred material has taken the form of a oxide or sulfur compound (according to Roc Carter from the Sci Lab, the green appearance indicates that these compounds have been hydrated, i.e., they have reacted with moisture). We have also found evidence of transferred material in the burned switches, but we could not confirm the presence of brake fluid because of the burned and exposed condition.

Steve LaRouchie (SLAROUCH)
Metallurgy Section, Central Laboratory, Room N410
(313) 845-4678 (313) 322-1614 FAX

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

From: Steve Reimers [mailto:sreimers@gw.ford.com]
Sent: Friday, April 23, 1999 8:03 AM
To: slarouch@mail.ford.com
Subject: Metal transfer

Do you see this in all field samples that have brake fluid in the switch cavity?
? What is it, oxide or and actual metal pitting or something else?

Steve Reimers building 5 SED08
RYT Chassis E/E System Applications mail drop 5011
39-03288 SREIMERS sreimers@ford.com fax 39-04145 >

LaRouche, Steve (S.)

To: Porter, Fred (F.J.)
Co: LaPointe, Norman (N.R.); Kias, Pete (P.F.); LaRouche, Steve (S.)
Subject: Brake Switches

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Metallurgy Section, Central Laboratory, Room N410
(313) 845-4878 (313) 322-1814 FAX

Ford Central Lab
1-11-99

- Hexport
 - + Sample black sludge id:
water - ~~cautious~~ to detect by IR. or KFR
brake fluid
unknown.
- Kapton (3-diaphan squares)
 - + Sample fluids -
 - water -
 - brake fluid -
 - unknown -
 - + Assess Kapton's sensitivity to water/brake fluid
- ~~Cap.~~ - steel convex side
 - + Sample heavy ^{brown} black deposits.
- Electrical Arc.
 - id black compound on one blade
 - id gray compound on 2nd blade
- Stationary Terminal
 - Remove 1/2 & ~~1/2~~ photo SEM $\Rightarrow$ clean
 - & determine fx mode.

[Minerals](#) | [By Name](#) | [By Class](#) | [By Groupings](#) | [Search](#) | [Silicates](#)

THE MINERAL MUSCOVITE

- **Chemistry:** $KAl_2(AlSi_3O_{10})(F, OH)_2$, Potassium aluminum silicate hydroxide fluoride.
- **Class:** Silicates
- **Subclass:** Phyllosilicates
- **Group:** Micas
- **Uses:** heat and electrical insulator for industrial purposes.
- **Specimens**

Muscovite is a common rock forming mineral and is found in igneous, metamorphic and detrital sedimentary rocks. Muscovite has a layered structure of aluminum silicate sheets weakly bonded together by layers of potassium ions. These potassium ion layers produce the perfect cleavage of muscovite. Although it has such easy cleavage, the cleavage sheets are quite durable and are often found in sands that have undergone much erosion and transport that would have destroyed most other minerals. The sheets of muscovite also have high heat and electrical insulating properties and are used to make many electrical components. Muscovite sheets were used for kitchen oven windows before synthetic materials replaced them.

Muscovite is not often valuable as a mineral specimen but is often associated with other minerals of extraordinary beauty and value. Some very nice muscovite crystals accompany such valuable minerals as tourmaline, topaz, beryl, almandine and others. A rare twin variety from Brazil forms yellow five pointed stars and is called "Star Muscovite". A deep green variety is called fuchsite and is colored by chromium impurities.

PHYSICAL CHARACTERISTICS:

- Color is white, silver, yellow, green and brown.
- Luster is vitreous to pearly.
- Transparency crystals are transparent to translucent.
- Crystal System is monoclinic; $2/m$
- Crystal Habits include tabular crystals with a prominent pinacoid termination. Muscovites four prism faces form diamond shaped "books" and if modified by another pinacoid they form pseudo-hexagonal crystal "books". The sides of the crystal often tend to taper. Also as lamellar rock forming masses and small flakes in detrital material. Twinned crystals can form flat five pointed stars.
- Cleavage is perfect in one direction producing thin sheets or flakes.
- Fracture is not readily observed due to cleavage but is uneven.
- Hardness is 2 - 2.5.
- Specific Gravity is approximately 2.8 (average)
- Streak is white.
- Associated Minerals are quartz, feldspars, beryl and tourmalines.
- Other Characteristics: cleavage sheets are flexible and elastic, meaning they can be bent and will flex back to original shape.
- Notable Occurrences include India, Pakistan, Brazil and many USA localities.
- Best Field Indicators are crystal habit, cleavage, elastic sheets, color and associations.

[Minerals](#) | [By Name](#) | [By Class](#) | [By Groupings](#) | [Search](#) | [Silicates](#)

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BLACK SLUDGE MATL. COATED CAVITY

BEVELED SURF'S COATED W/ BLACK-BROWN
VARNISH LIKE SMOOTH OILY MATL.
CLEAN EDGE

CONVEXITY CAVITY FILLED W/
BLACK COATING MATERIAL

PULL SURF OF
DISC CONTAMINATED
W/ BLACK GRIT & VARNISH
COATING
PULL FACE OF WASHER CONTAMINATED
W/ BLACK GRIT & VARNISH LIKE
COATING

GREEN OXIDE
LEAKAGE PATH
GREEN OXIDE

NOTES AFTER T.I. DISASSEMBLY

3713 2455

Muscovite - $KAl_2(Si_3Al)O_{10}(OH,F)_2$ Isinglass Potash Mica Fuchsite (Cr)

Chemical Composition (MW = 398.3081 gm)

Potassium	9.82 %	K
Aluminum	20.32 %	Al
Silicon	21.15 %	Si
Hydrogen	0.51 %	H
Oxygen	48.20 %	O

NAME ORIGIN: From Muscovy glass, alluding to the Russian province of Muscovy.**LOCALITY:** Common world wide.**ENVIRONMENT:** Granites and pegmatites.**DANA CLASSIFICATION NUMBER:** 71.2.2a.1 (71) Phyllosilicates Sheets of 6-membered rings with 2:1 layers (71.2) Mica Group (Muscovite subgroup) (71.2.2a)**STRUNZ CLASSIFICATION:** VII/H.10-30 - Silicates [Phyllosilicates (layered) Mica like layered silicates with $[Si_4O_{10}]^{4-}$ and related groups { Mica group, Muscovite series }]**CRYSTAL SYSTEM:** Monoclinic - Prismatic H-M Symbol (2/m)**CELL DIMENSIONS:** a = 5.19, b = 9.03, c = 20.05, Z = 4;**AXIAL RATIOS:** a:b:c = 0.5747:1:2.2203**HABITS:** Massive - Lamellar, Foliated, Micaceous**HARDNESS:** 2-2.5**DENSITY:** 2.77 - 2.88, Average = 2.82**CLEAVAGE:** {001} Perfect**FRACTURE:** Brittle - Sectile**DIAPHANEITY:** Transparent to translucent**LUSTER:** Vitreous (Glassy)**LUMINESCENCE:** None.**COLOR:** white, gray, silver white, brownish white, or greenish white.**STREAK:** white**OPTICAL DATA:** Biaxial (?), a=1.552-1.574, b=1.582-1.61, g=1.586-1.616, bire=0.0340-0.0420, 2V(Calc)=38-42, 2V(Meas)=30-47. Dispersion weak to distinct, r > v.**PLEOCHROISM (X):** colorless or robin egg blue.**PLEOCHROISM (Y):** colorless, very pale green, yellow, or pale yellowish green.**PLEOCHROISM (Z):** colorless, pale green, blue green, or bright chrome green.**REFERENCES:** NAME(ODonoghue90) PHYS. PROP.(Mason68) OPTIC PROP.(Heinrich65)**SEE ALSO:** Alkali Nuts**SEE ALSO:** Athens Mineralogy**SEE ALSO:** École des Mines de Paris**SEE ALSO:** The Mineral Gallery[Home](#)[Crystal](#)[Chem](#)[Data](#)[Strunz](#)[Determin](#)[A-Z](#)[Links](#)

September 25, 1991

To: Donna Meynihan 12-27
From: Beth Kill 10-16
Subject: Material Confirmation
TSL Request # 110632

Sample Descriptions:

P/N 74176-1 Seal Teflon and Kapton

Results:

DSC results confirm the presence of Teflon by the characteristic melt point at 316 - 319 degrees C.

Kapton is confirmed in the seal by the IR scan. It shows the same characteristic absorbances exhibited by the sample known to be Kapton. See the enclosed scan.

Finally, the Teflon is confirmed to be on the surface of both sides of the seal by EDAX analysis.

Regards,

Beth X2069

August 28, 1991

To: Donna Moynihan 12-27

From: Beth Kill 10-16

Subject: GP-3 Material Confirmation
TSL Request # 110822

Sample Description:

P/N 46515-2 Thermoplastic Polyester
Celanex 4300

Results:

	P/N 46515-2	Spec.
Glass Fill	32%	30%

TGA results confirm the base contains slightly high glass fill. DSC results confirm the base material to be a thermoplastic polyester with a melting point at 223 - 225 deg. C., and a glass transition at 50 - 60 deg. C., consistent with Celanex 4300.

Regards,

Beth X3069

Possible Brand fax transmittal memo 7871		2 of pages 2	
AL AMORE	AL AMORE	AL AMORE	AL AMORE
Ca	Ca	Ca	Ca
PCD	PCD	PCD	PCD
D.E.	D.E.	D.E.	D.E.
3582	3582	3582	3582

TABLE IV
QELANEX 4000 SERIES, TYPICAL PROPERTIES
ENGLISH UNITS

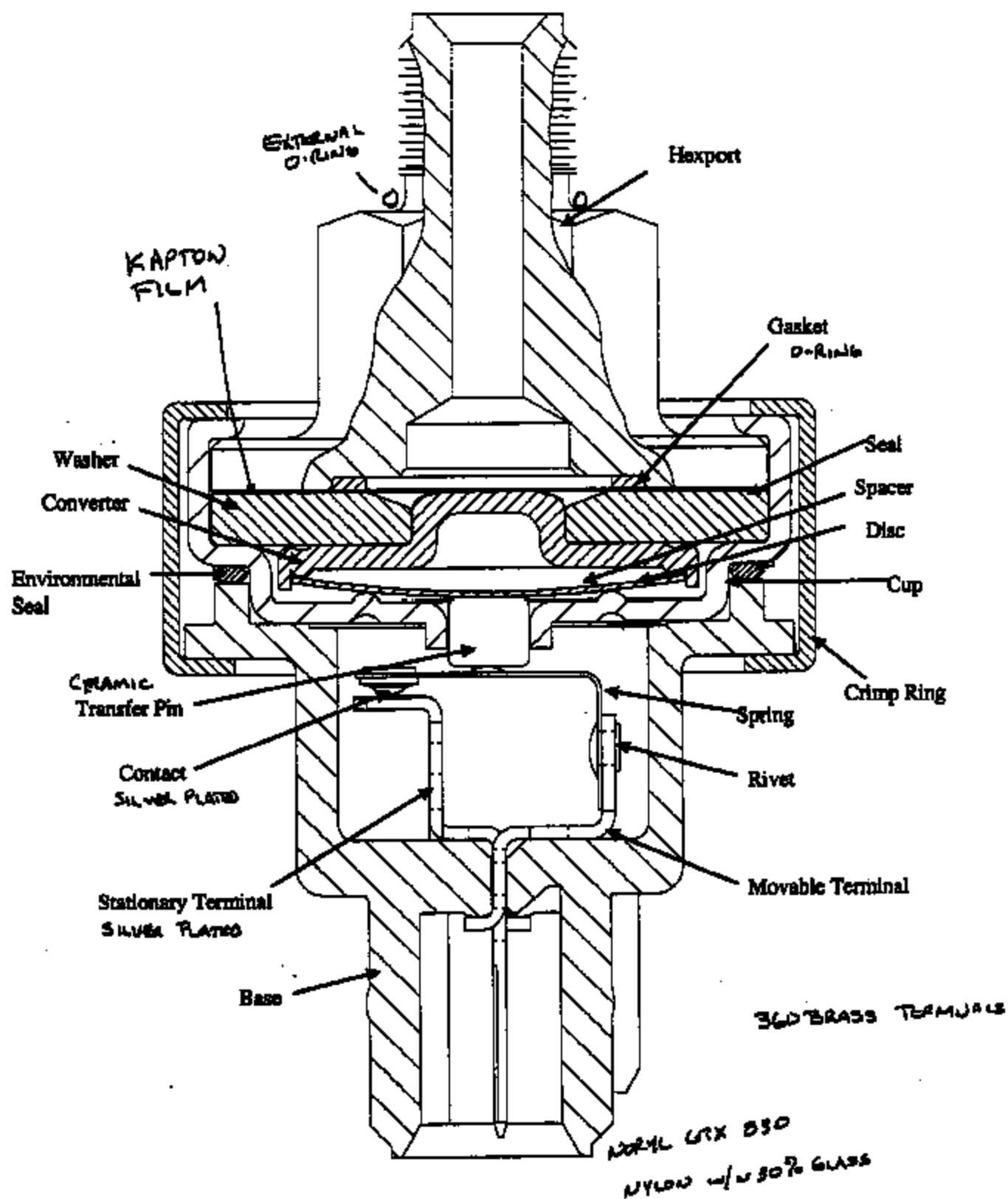
Property	ASTM Test Method	Units	4380	4330
SPECIFIC GRAVITY	D782	—	1.82	1.83
WATER ABSORPTION	D670	%	0.08	0.10
24 HOUR IMMERSION	—	in/in x 10 ⁻³	3-6	2.5-4.5
MOLD SHRINKAGE, FLOW DIRECTION, 1/8" THICKNESS	—	in/in x 10 ⁻³	3-6	2.5-4.5
MECHANICAL @ 73°F	—	—	—	—
TENSILE STRENGTH @ BREAK	D638	psi	18,000	14,000
TENSILE MODULUS	D638	10 ³ psi	1.2	1.2
ELONGATION @ BREAK	D638	%	2.7	3.1
FLEXURAL STRENGTH	D790	psi	27,000	22,000
FLEXURAL MODULUS	D790	10 ³ psi	1.2	1.0
COMPRESSIVE STRENGTH	D695	psi	20,800	—
COMPRESSIVE MODULUS	D695	10 ³ psi	0.9	—
SHEAR STRENGTH	D732	psi	5,100	6,400
IZOD IMPACT STRENGTH	D256	ft-lb/in	1.9	3.0
NOTCHED	—	ft-lb/in	9.3	12
UNNOTCHED	—	ft-lb/in	8.4	88
TENSILE IMPACT STRENGTH	D1832	ft-lb/in	28	42
TABER ABRASION	D1044	mg/1000 cycles	81	88
ROCKWELL HARDNESS	D785	M Scale	—	—
COEFFICIENT OF FRICTION AGAINST METALS	—	—	0.13-0.15	0.13-0.20
DYNAMIC	—	—	0.17-0.18	0.18-0.22
STATIC	—	—	—	—
THERMAL	—	—	—	—
HEAT DEFLECTION TEMPERATURE	D648	°F	433	424
66 psi	—	°F	388	378
264 psi	—	—	—	—
COEFFICIENT OF LINEAR THERMAL EXPANSION	D696	in/in°F x 10 ⁻³	0.6	0.8
TEMPERATURE RANGE: 32°F to 234°F	—	—	—	—
FLOW DIRECTION	—	—	—	—
DEFORMATION UNDER LOAD AT 122°F, 24 HOURS	D661	%	0.2	1.25
500 psi	—	%	0.5	4.31
4000 psi	—	—	—	—
ELECTRICAL	—	—	—	—
VOLUME RESISTIVITY	D257	ohm-cm	10 ¹²	4 x 10 ¹⁴
DIELECTRIC STRENGTH	D149	volts/mil	880	500
SHORT TERM, 1/8" THICKNESS	—	—	870	520
73°F, 50% RH	—	—	570	480
73°F, 90% RH	—	—	580	510
73°F, 6 WEEKS IN 73°F WATER	—	—	540	500
150°F, 50% RH	—	—	3.5	4.3
250°F, 50% RH	—	—	0.002	0.004
DIELECTRIC CONSTANT, 100 Hz	D189	—	—	—
DISSIPATION FACTOR, 100 Hz	—	—	—	—

4000 SERIES UNDERWRITERS LABORATORIES RATINGS

Rating or Property*	Units	4380	4330
TEMPERATURE INDICES	°C	185	130
ELECTRICAL	°C	130	180
MECHANICAL w/IMPACT	°C	140	140
MECHANICAL w/o IMPACT	seconds	125	125
ARC RESISTANCE	volts	800	580
COMPARATIVE TRACKING INDEX	seconds	95	121
HOT WIRE IGNITION	arc	98	23
HIGH AMP ARC IGNITION	in/min	0.6	0.5
HIGH VOLTAGE TRACK RATE	—	HB	HB
FLAMMABILITY @ 122°F UL94	—	AI	AI
COLOR RECOGNITION	—	—	—

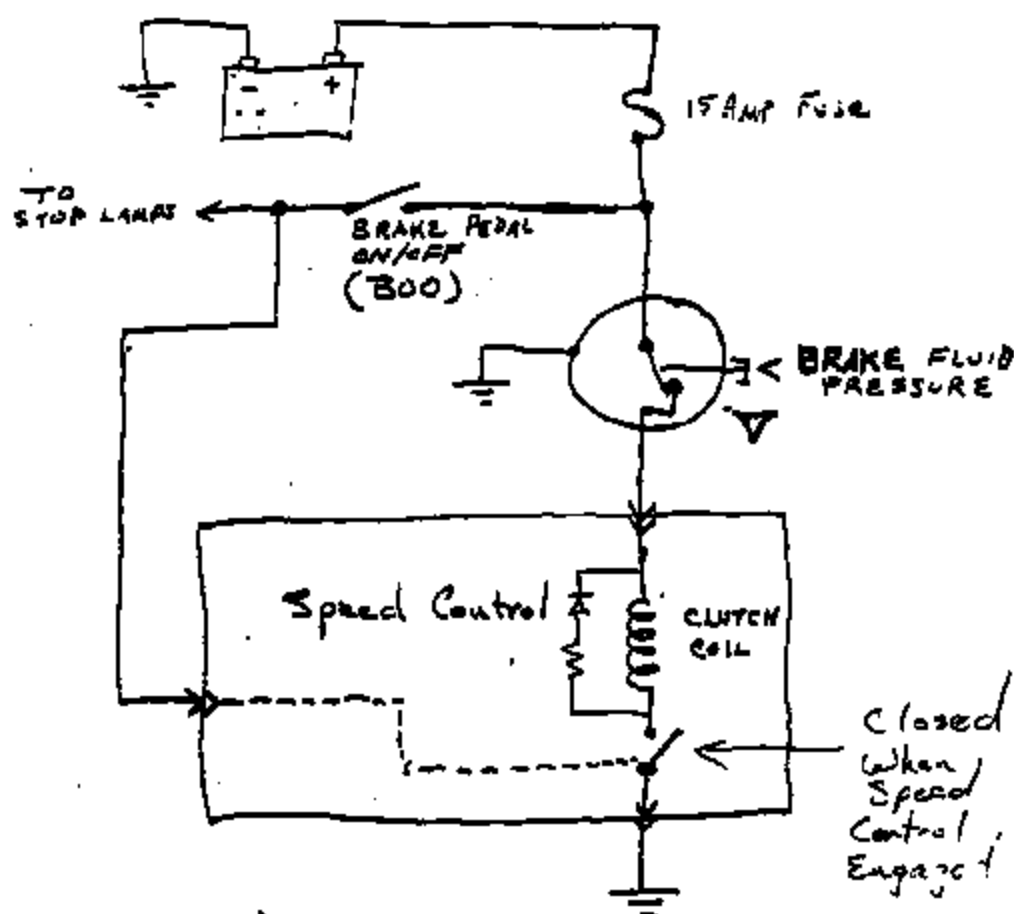
*At 0.125" thickness except where noted.

Hydraulic Pressure Switch Cross Section



Brake Pressure Switch Function-

- Provide power to Speed Control Clutch circuit.
Clutch engages servo-motor to pull throttle cable.
- Provide redundant sensing of brake application independent of the primary system deactivation mode by disconnecting power to clutch circuit causing servo-motor to release throttle cable.
 - Under Hard Braking only
 - Stop lamp signal is primary (normal braking)



**Brake Pressure Switch
F2VC-8Pas4-AB
Material List for MY 92/93**

Component Name	Material	Comments
Gasket	Elastomer Ethylene Propylene	JBL Compound # E-7104-70
Diaphragm	Kapton, Polyimide	Dupont 500 FN131L, 3 Diaphragms per switch
Base	PBT, Plastic	Grade Celanex 4300
Crimp Ring	Aluminum	Grade # 5052
Spacer	Kapton, Polyimide	Dupont #200H, Friction Reducer on Disc
Rivet	Brass	CDA 260
Transfer Pin	Ceramic	Steeble, L-3 Grade
Environmental Seal	Silicone	JBL Compound # S7519
Converter	Cold Rolled Steel	Grade # 1008
Washer	Cold Rolled Steel, Zinc Plated	Grade # 1050
Cup	Cold Rolled Steel	Grade 1010
Spring Arm	Beryllium Copper	Grade # C17200
Movable Contact	Silver Plated Copper	Oxygen Free Cu, Fine Silver
Stationary Terminal	Brass + Silver Inlay	CDA 260
Movable Terminal	Brass	CDA 260
Disc	Stainless Steel	Grade 302
Haxport	Cold Rolled Steel, Zinc Plated	C10L10
Thread Cap	LDPE, Plastic	

3713 2482

DOT
OKAYED

DESIGNS TO
MAKE 2 BEAK
3-5 P LOTS

NORMAN X (m) DROVE
CORROSION WITH
GAS IN HTD OPE

H/P
TERR
1000 - 1500 V
15 mA

ADD CAN
CORROSION & BEAK

CHAM AT THE
DISAPPEAR

BIGGER
FLUOR
THRU THRU
SULFON AFTER
CORROSION

POLY ESTER 3

CORROSION
SILICONE

CORROSION INSIDE
X OF TERMINALS

TERMINALS NOT CORRO

WITH AG PLATE

HOOPER
NEED 67X830
GLASS FILLS
HTD ~302

100%
THRU LIPS
INSIDE MOUNTED

BRASS
(300)

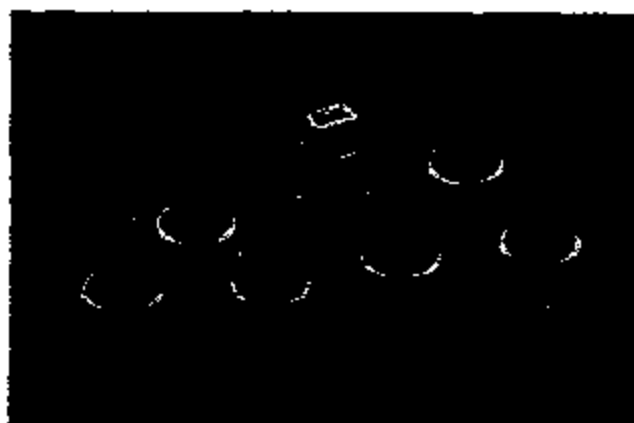
3 LOTS
RECOMMEND

WATER IN
BOTTLE FOR DIAL PII
BATED CAPTION

THAT
SHOULD NOT
BE IN HTD
BUT CAN WITH
GAS

Low Cost Automotive Hydraulic Line Mount Pressure Switches

TI's pressure switches provide low cost, on/off controls for many automotive systems. The snap action disc reacts to changing pressure by reversing its curvature and activating electrical switch contacts.



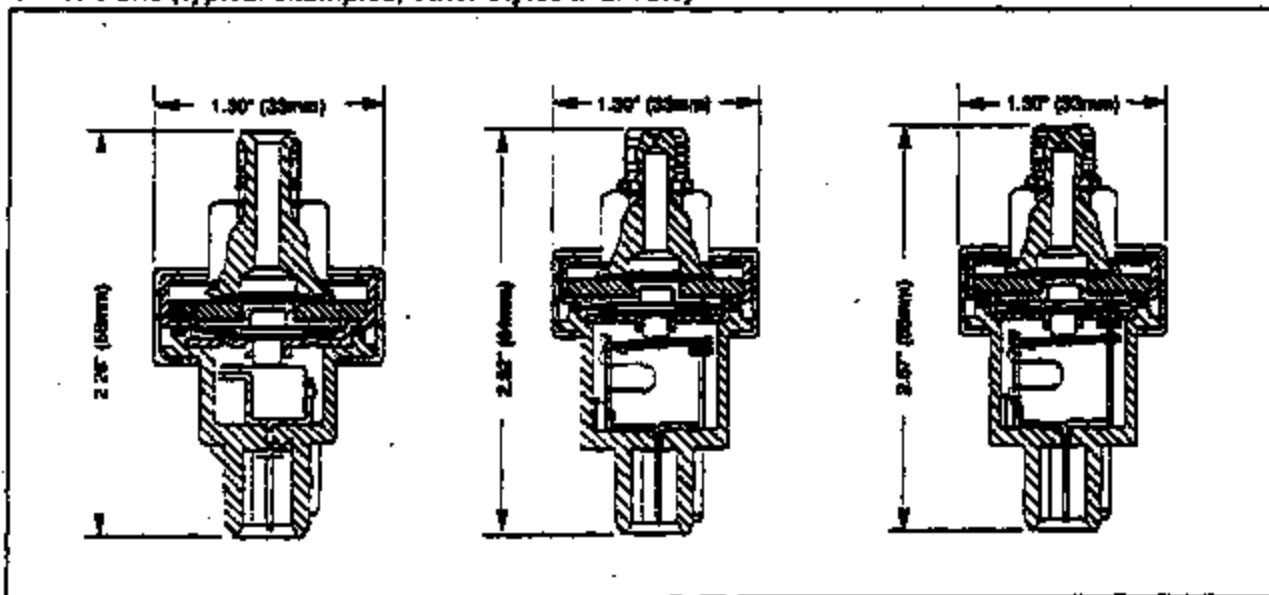
Key Features Include:

- Designed for underhood environment
- Low weight
- Custom packaging for specific application needs
- Automotive temperature range of -40 to 135°C
- Normally open and normally closed contact logic
- Industry proven since 1984

Typical Applications

- Power Steering Systems
- Cruise Control Systems
- Brake Systems
- Transmissions
- Suspension

Dimensions (typical examples, other styles available)



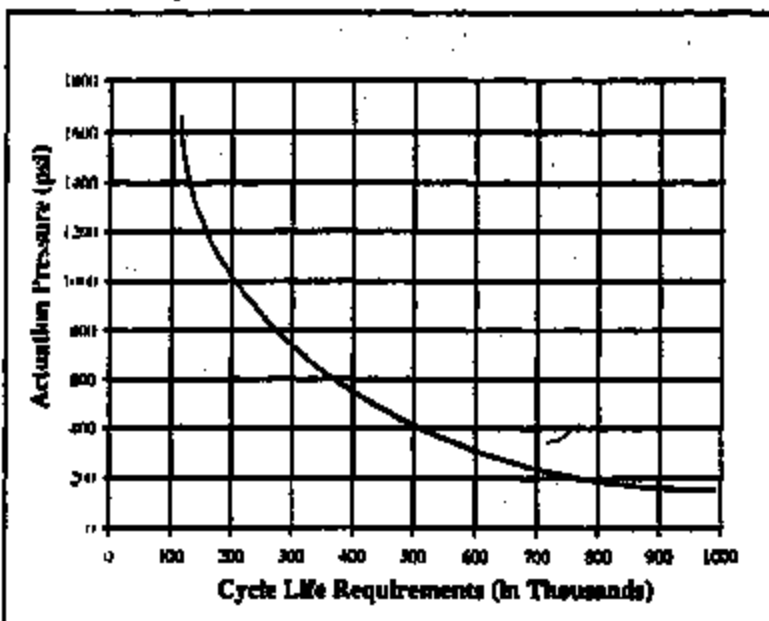


Technical Specifications

Electrical		Durability	
Supply Voltage	6 - 16 V	Cycle Life	
Supply Current	5 - 35 mA	Low/Mid Pressure Range	up to 1×10^4 cycles
Response Time ¹	10 ms maximum	High Pressure Range	up to 1.5×10^4 cycles
Environmental		Proof Pressure	1400 to 3000 psi
Operating Temperature	-40 to 135°C	Burst Pressure	
Full Scale Pressure Range		Low Pressure Range	7000 psi
Low Pressure Range	0 to 300 psi	Mid Pressure Range	4000 psi
Mid Pressure Range	0 to 800 psi	High Pressure Range	2500 psi
High Pressure Range	0 to 1600 psi		

¹Applicable on some devices

Pressure Switch Characteristics



For further information please write or call:

Texas Instruments Incorporated
Pressure Switch Marketing MS 23-01
P.O. Box 2964
Andover, MA 02703-0964
Phone 908 236-3510
Fax 908 236-1596

International Offices:

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Texas Instruments Japan Ltd.
105 Yamaguchi, Oiyama-Cho
Saito-Gun, Shizuoka-Ken 410-13
Oiyama, Japan
Phone (81) 550-78-1211
Fax (81) 550-78-0521

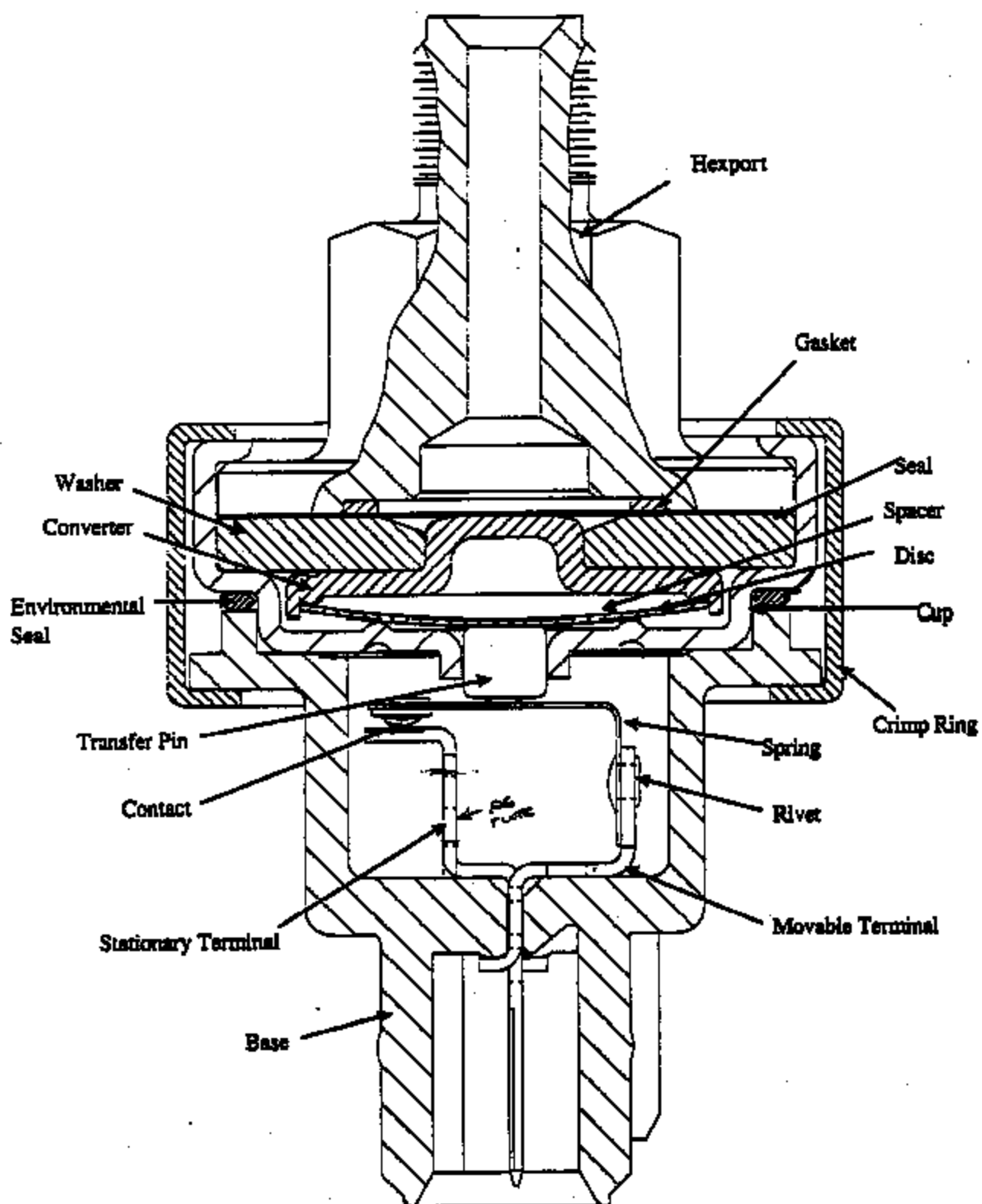
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Texas Instruments Holland B.V.
Automotive Marketing
P.O. Box 43
NL-7600 AA Almere
Holland
Phone (31) 546-879462
Fax (31) 546-844429

South America
Texas Instruments Eletronicos do Brasil Ltda
Rua Azarias de Melo, 688 - Taquara
Carapicua - SP - Brazil
CEP 13090-901
Phone (55) 192-541146
Fax (55) 192-518023

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Hydraulic Pressure Switch Cross Section

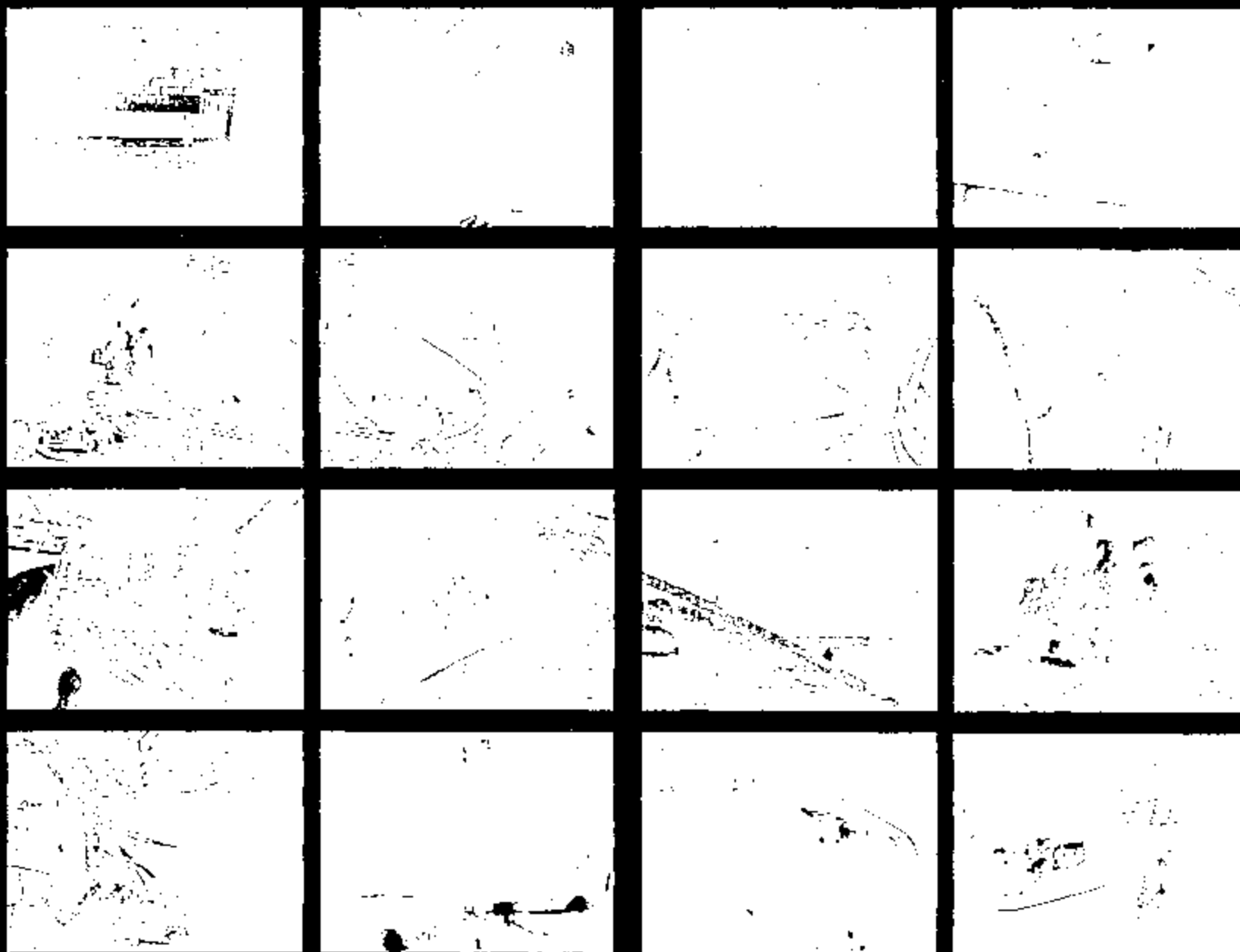


Muscovite - $KAl_2(Si_3Al)O_{10}(OH,F)_2$ Isinglass Potash Mica Fuchsite (Cr)

Chemical Composition (MW = 398.3081 gm)

Potassium	9.82 %	K
Aluminum	20.32 %	Al
Silicon	21.15 %	Si
Hydrogen	0.51 %	H
Oxygen	48.20 %	O

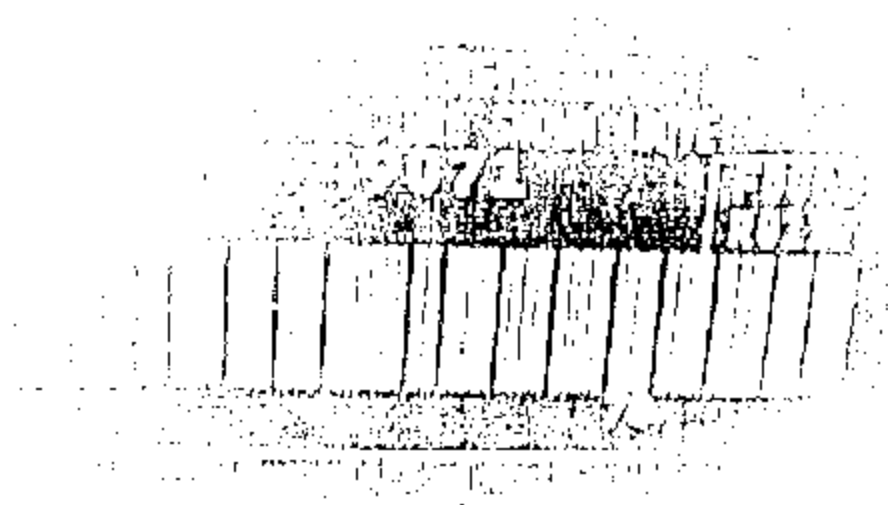
NAME ORIGIN: From Muscovy glass, alluding to the Russian province of Muscovy.**LOCALITY:** Common world wide.**ENVIRONMENT:** Granites and pegmatites.**DANA CLASSIFICATION NUMBER:** 71.2.2a.1 (71) Phyllosilicates Sheets of 6-membered rings with 2:1 layers(71.2) Mica Group (Muscovite subgroup)(71.2.2a)**STRUNZ CLASSIFICATION:** VIII/H.10-30 - Silicates [Phyllosilicates (layered) Mica like layered silicates with $[Si_4O_{10}]^{4-}$ and related groups { Mica group, Muscovite series }]**CRYSTAL SYSTEM:** Monoclinic - Prismatic H-M Symbol (2/m)**CELL DIMENSIONS:** a = 5.19, b = 9.03, c = 20.05, Z = 4;**AXIAL RATIOS:** a:b:c = 0.5747:1:2.2203**HABITS:** Massive - Lamellar, Foliated, Micaceous**HARDNESS:** 2-2.5**DENSITY:** 2.77 - 2.88, Average = 2.82**CLEAVAGE:** {001} Perfect**FRACTURE:** Brittle - Sectile**DIAPHANEITY:** Transparent to translucent**LUSTER:** Vitreous (Glassy)**LUMINESCENCE:** None.**COLOR:** white, gray, silver white, brownish white, or greenish white.**STREAK:** white**OPTICAL DATA:** Biaxial (?), a=1.552-1.574, b=1.582-1.61, g=1.586-1.616, bire=0.0340-0.0420, 2V(Calc)=38-42, 2V(Meas)=30-47. Dispersion weak to distinct, r > v.**PLEOCHROISM (X):** colorless or robins egg blue.**PLEOCHROISM (Y):** colorless, very pale green, yellow, or pale yellowish green.**PLEOCHROISM (Z):** colorless, pale green, blue green, or bright chrome green.**REFERENCES:** NAME(ODonoghue90) PHYS. PROP.(Mason68) OPTIC PROP.(Heinrich65)**SEE ALSO:** Alkali Nuts**SEE ALSO:** Athena Mineralogy**SEE ALSO:** Ecole des Mines de Paris**SEE ALSO:** The Mineral Gallery[Home](#)[Crystal](#)[Chem](#)[Dana](#)[Strunz](#)[Determin](#)[A-Z](#)[Links](#)



3713 2468

ILNLM92WXNY749071 1992 Lincoln Town Car - Dallas, TX, 99-Jan-13

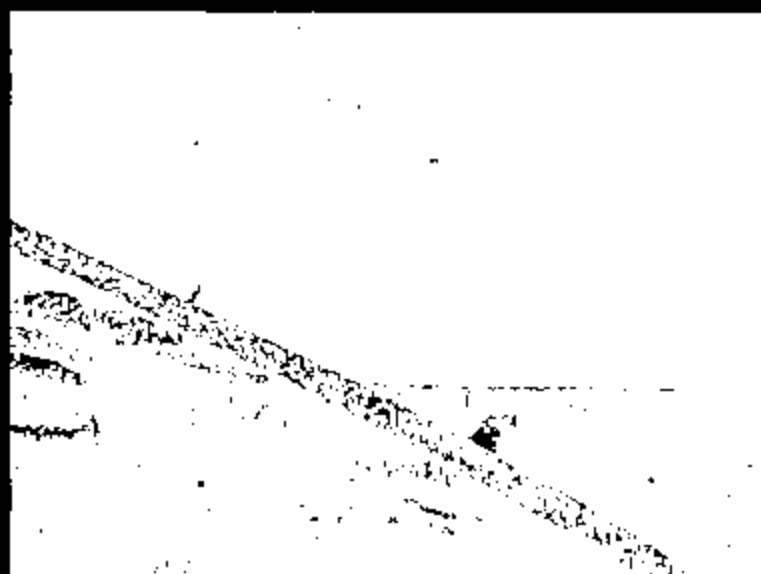
PE 98-055



3713 2469

1LNLM92WXNY749071 1992 Lincoln Town Car - Dallas, TX, 99-Jan-13

PE 98-055



3713 2470

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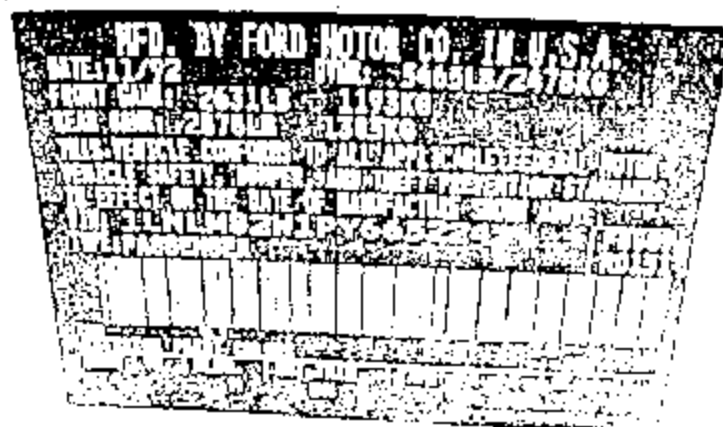
PC 98-055



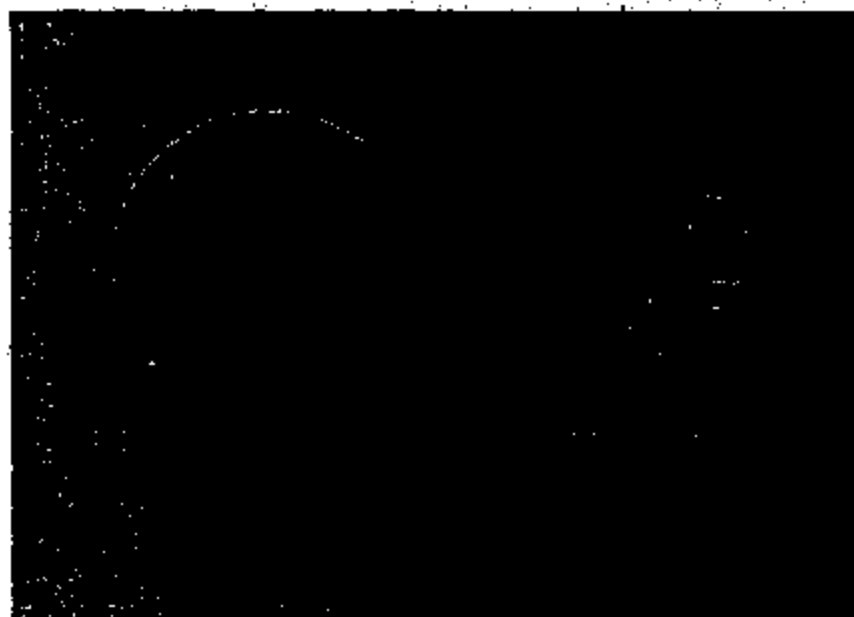
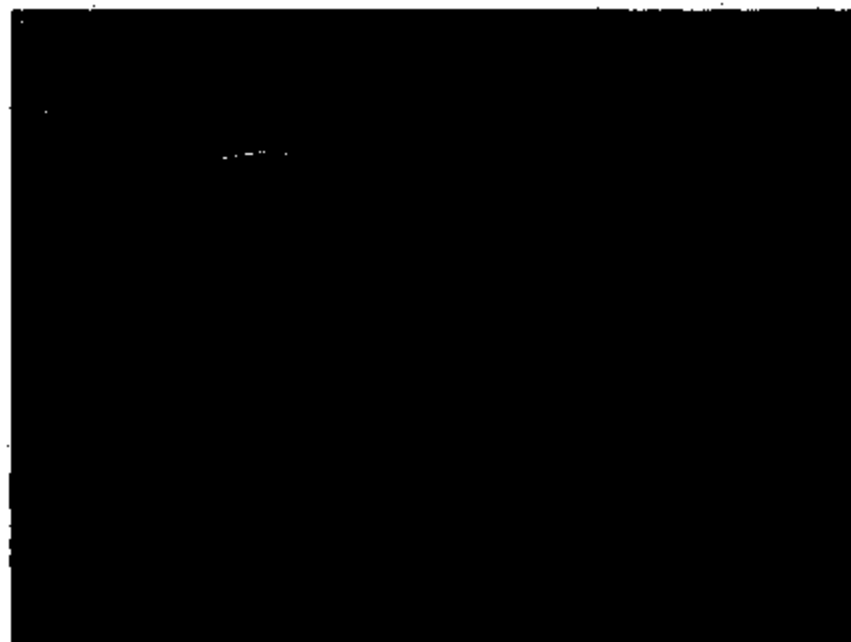
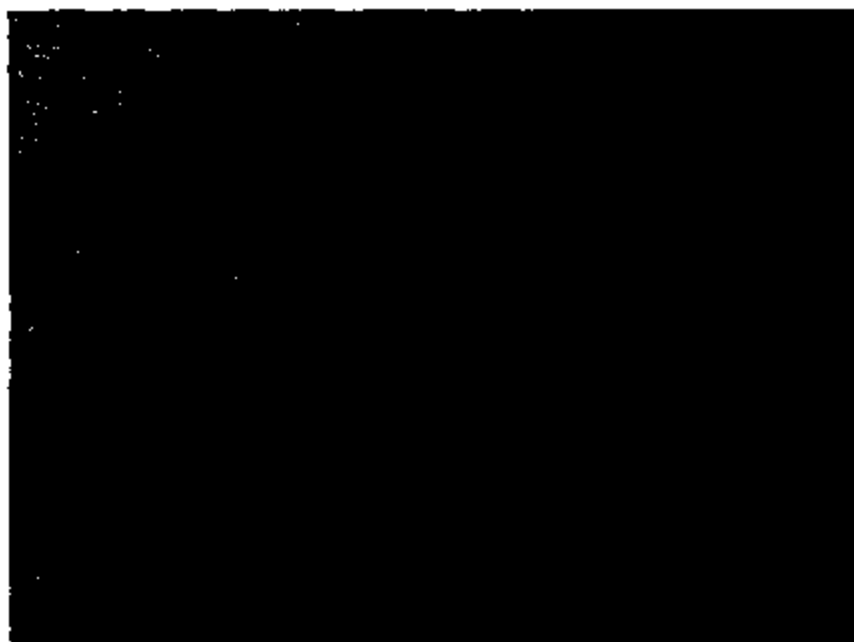
Switch A

3713 2471

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Switch A

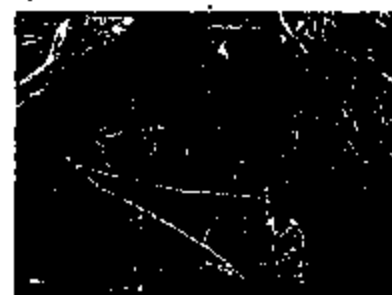
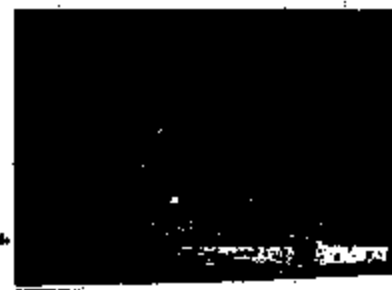
F2VC-9F924-AB 2281

3713 2473

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Switch B



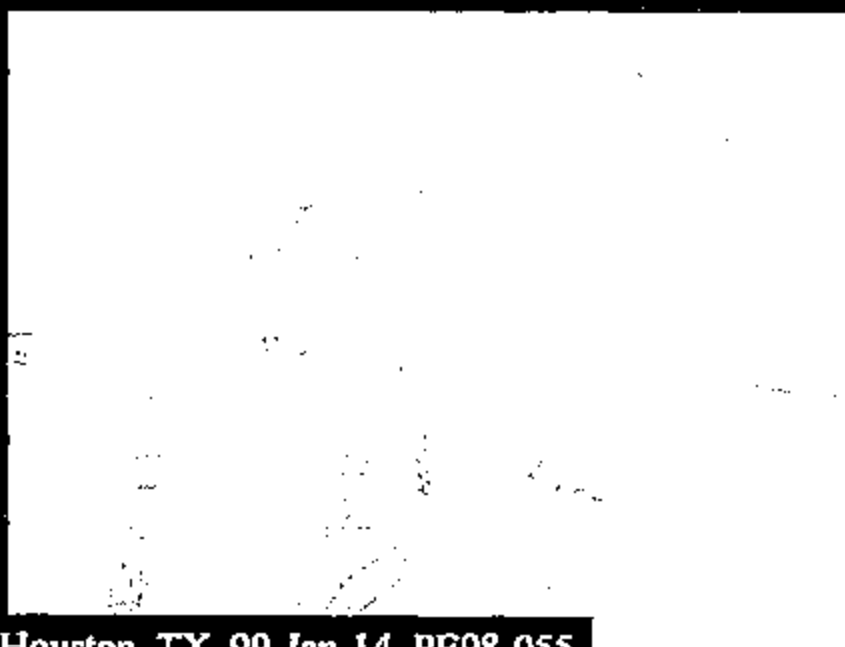
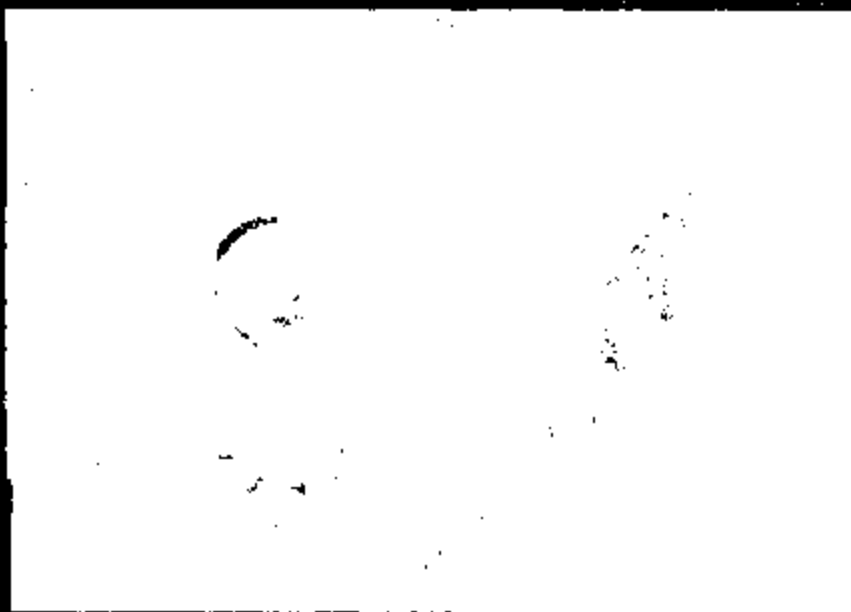
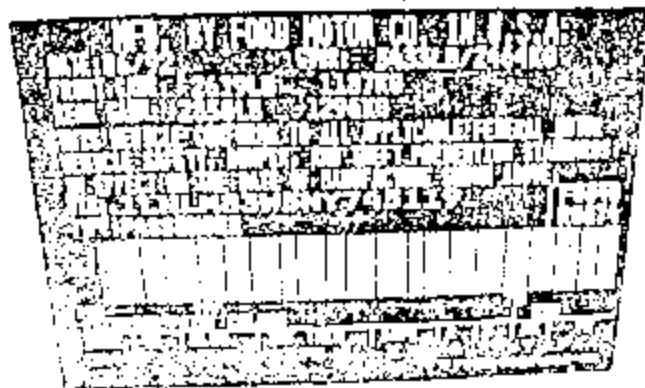
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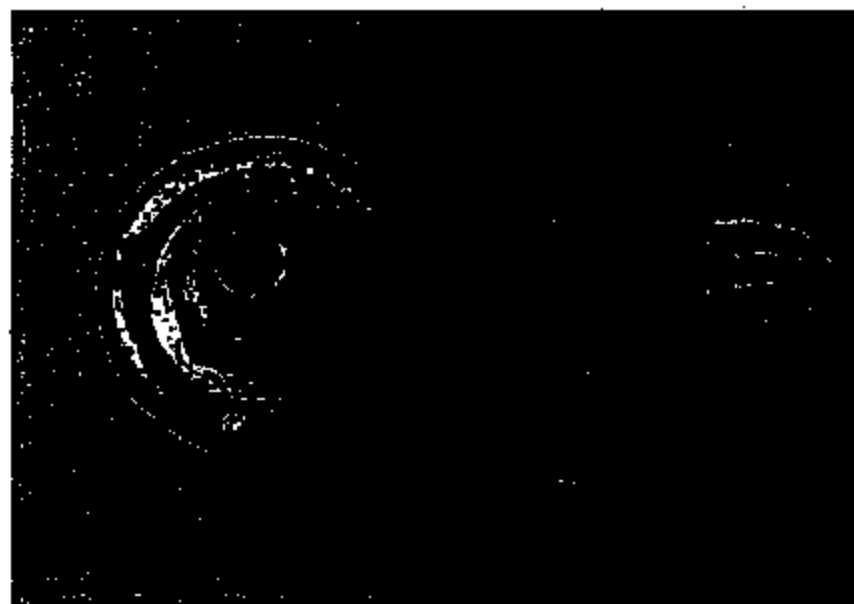
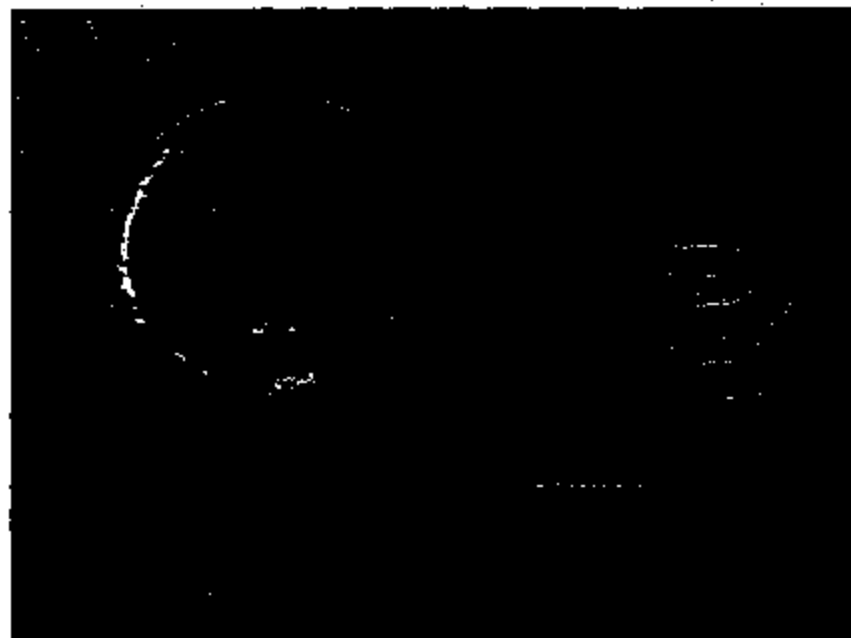
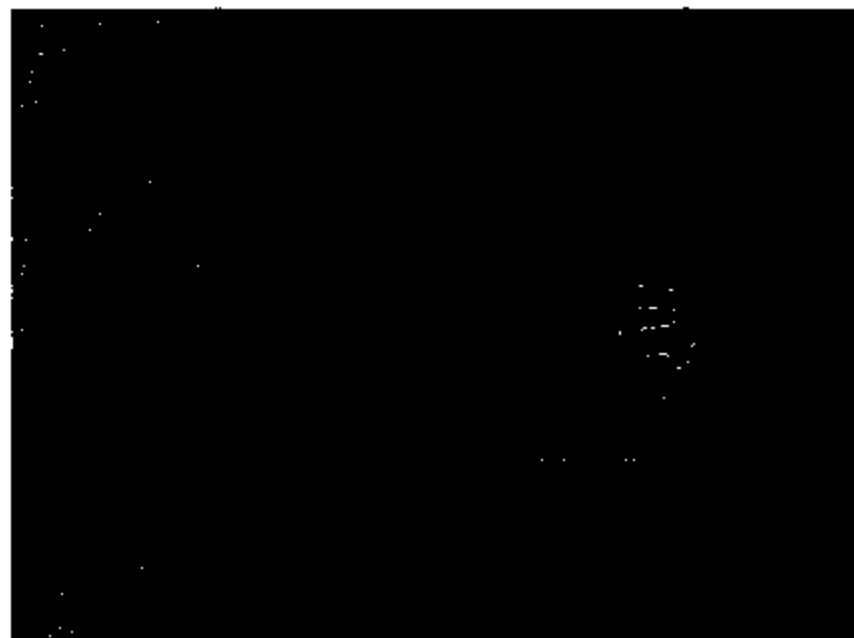
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3713 2476

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Switch B

F2VC-9F924-AB 2114

3713 2477

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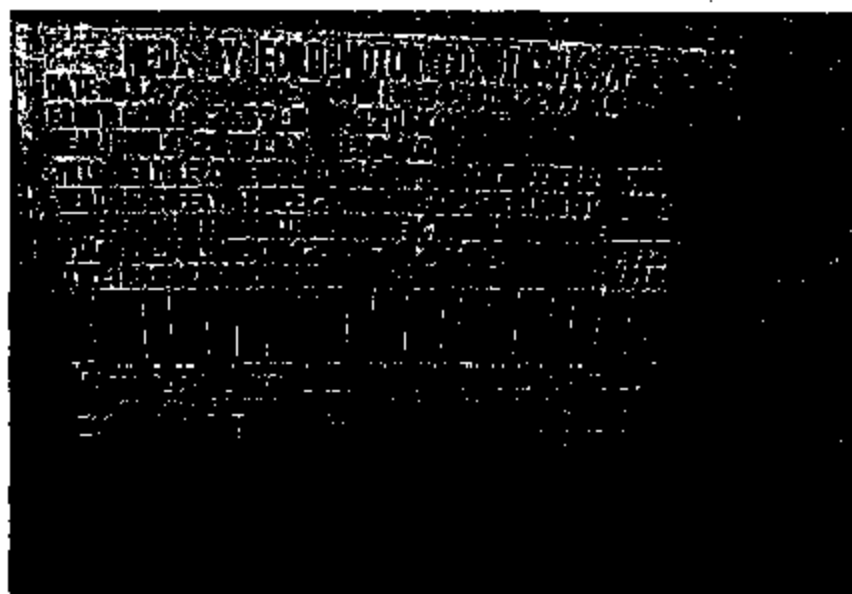


Switch B

F2VC-9F924-AB 2114

3713 2478

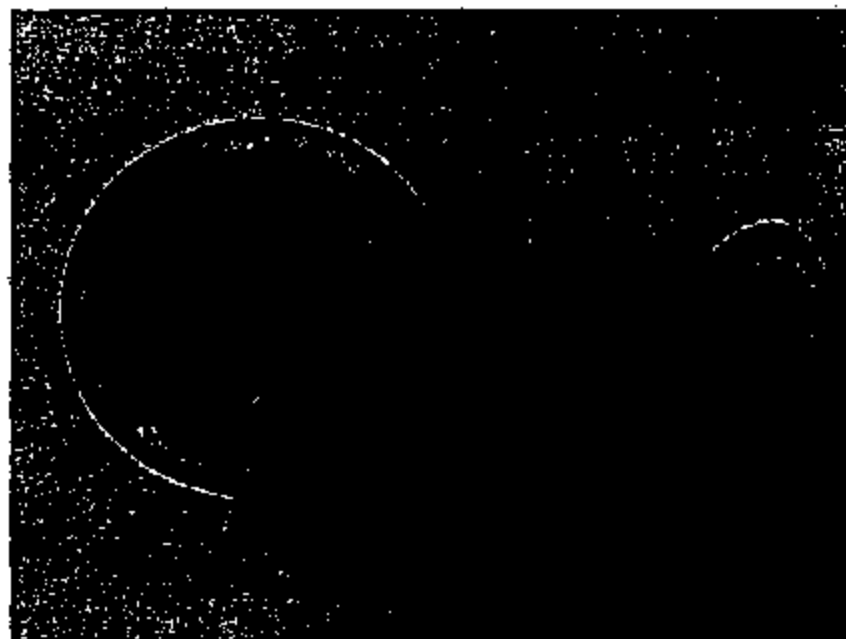
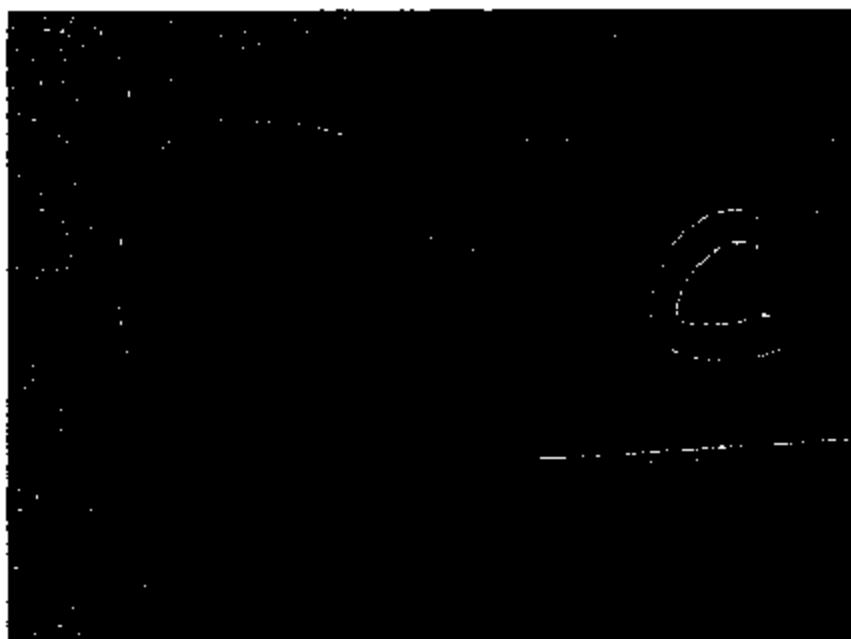
1LNLM83W5NY745119 1992 Lincoln Town Car - Houston, TX 99-Jan-14 PE98-055



Switch C

3713 2479

1LNLM81W2NY703705 1992 Lincoln Town Car - Houston, TX 99-Jan-14 PE98-055



Switch C

F2VC-9F924-AB 2003

8719 2480

ILNLM81W2NY703705 1992 Lincoln Town Car - Houston, TX 99-Jan-14 PE98-055



3713 2481

1LNLM82W7NY740537 1992 Lincoln Town Car - Houston, TX 99-Jan-14

7E98-055

Summary of Chemical Properties

3/2/99

The following pages were supplied by Dupont and show chemical and physical properties for Teflon and Kapton. In summary, water will degrade the mechanical properties of Kapton, but Teflon is unaffected by water. This is the reason why the Teflon-Kapton-Teflon system was selected for Texas Instruments switch diaphragm (3 mil thick Kapton layer coated with 1 mil Teflon on both sides). Page 1 (marked with "A") indicates that the Teflon is non-reactive with water. While page 2 shows Teflon has a relatively low vapor transmission rate (marked with "B"). Page 3 shows how the mechanical properties of Kapton degrade with water and temperature exposure (marked with "C").

End of document.

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3/2/99

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End of document.

Chemical Properties

DuPont FEP fluorocarbon film is chemically inert and solvent resistant to virtually all chemicals except molten alkali metals, fluorine at elevated temperatures, and certain complex halogenated compounds such as chlorine trifluoride at elevated temperatures and pressures.

In circumstances where end-use temperatures are close to the upper service limit 205°C (400°F), 80% rosin hydrides, metal hydrides, aluminum chloride, ammonia, and certain amines (R-NH₂) may attack the film in a manner similar to molten alkali metals. Special testing is required when such stresses reducing or modifying conditions are evident.

With these exceptions noted, DuPont FEP fluorocarbon films exhibit a very broad range of chemical and thermal serviceability.

Due to the many complex aspects of performance in severe environments, final selection should be based on functional evaluations or extensive and actual end-use conditions.

The chemical substances listed in Table 6 are representative of those with which DuPont FEP film has been found to be nonreactive.

Table 6
Typical Chemicals with Which DuPont FEP Film is Nonreactive*

Acetic acid	Cyclohexanone	Hydrofluoric acid	Phthalic acid
Acetic acid	Dibutyl phthalate	Hydrogen peroxide	Picric acid
Acetic anhydride	Dibutyl sebacate	Lard	Pip-eridine
Acetone	Diethyl carbonate	Magnesium chloride	Polycrylic acids
Acetophenone	Diethyl ether	Mercury	Potassium acetate
Acrylic anhydride	Dimethyl formamide	Methyl ethyl ketone	Potassium hydroxide
Allyl acetate	Di-isobutyl adipate	Methacrylic acid	Potassium permanganate
Allyl methacrylate	Dimethylformamide	Methanol	Pyridine
Aluminum chloride	Dimethylhydrazine, unsymmetrical	Methyl methacrylate	Sapon and detergents
Ammonia, liquid	Dioxane	Naphthalene	Solvent in dioxane
Ammonium chloride	Ethyl acetate	Naphthols	Sodium hypochlorite
Aniline	Ethyl alcohol	Nitric acid	Sodium peroxide
Boron trichloride	Ethyl ether	Nitrobenzene	Solvents, aliphatic and aromatic**
Benzoyl chloride	Ethyl hexanoate	Nitromethane	Tannic acid
Benzyl alcohol	Ethylene bromide	Nitrogen dioxide	Sulfur
Boric acid	Ethylene glycol	2-Nitro-2-methyl propanol	Sulfuric acid
Bromine	Ferric chloride	n-Octadecyl alcohol	Tetralon acetone
n-Butyl amine	Ferric phosphate	Oils, animal and vegetable	Tetrachloroethylene
Butyl acetate	Fluoronaphthalene	Ozone	Trichloroacetic acid
Butyl methacrylate	Fluoronitrobenzene	Perchloroethylene	Trichloroethylene
Calcium chloride	Formaldehyde	Pentachlorobenzonitrile	Trisopropyl phosphate
Carbon disulfide	Formic acid	Perfluorobenzonitrile	Triethanolamine
Cetane	Furane	Phenol	Vinyl methacrylate
Chlorine	Gasoline	Phosphoric acid	Water
Chloroform	Hexachloroethane	Phosphorus pentachloride	Xylene
Chlorosulfonic acid	Hexane		Zinc chloride
Chromic acid	Hydrazine		
Cyclohexane	Hydrochloric acid		

*Based on experiments conducted up to the boiling points of the liquids listed. FEP resins have normal service temperatures up to 205°C (400°F). Absence of a specific chemical does not mean that it is reactive with FEP film.

**Some halogenated solvents may cause moderate swelling.

Chemical Properties

DuPont FEP fluorocarbon film is chemically inert and solvent resistant to virtually all chemicals except molten alkali metals, fluorine at elevated temperatures, and certain complex halogenated compounds such as chlorine trifluoride at elevated temperatures and pressures.

In circumstances where end-use temperatures are close to the upper service limit 205°C (400°F), 30% sodium hydroxide, metal hydrides, aluminum chloride, ammonia, and certain amines (R-NH₂) may attack the film in a manner similar to molten alkali metals. Special testing is required when such extreme reducing or oxidizing conditions are evident.

With these exceptions noted, DuPont FEP fluorocarbon films exhibit a very broad range of chemical and thermal serviceability.

Due to the many complex aspects of performance in severe environments, final selection should be based on functional evaluations or experience and actual end-use conditions.

The chemical substances listed in Table 6 are representative of those with which DuPont FEP film has been found to be nonreactive.

Table 6
Typical Chemicals with Which DuPont FEP Film is Nonreactive*

Azelaic acid	Cyclohexanone	Hydrofluoric acid	Phthalic acid
Acetic acid	Dibutyl phthalates	Hydrogen peroxide	Picric acid
Acetic anhydride	Dibutyl sebacate	Lead	Pipridene
Acetone	Diethyl carbonate	Magnesium chloride	Potassium citrate
Acetophenone	Diethyl ether	Mercury	Potassium acetate
Adipic anhydride	Dimethyl formamide	Methyl ethyl ketone	Potassium hydroxide
Allyl acetate	Di- <i>tert</i> -butyl adipate	Metacrylic acid	Potassium permanganate
Allyl methacrylate	Dimethylformamide	Methanol	Pyridine
Aluminum chloride	Dimethylhydrazine, unsymmetrical	Methyl methacrylate	Soda and detergents
Ammonia, liquid	Oxane	Naphthalene	Sodium bromide
Ammonium chloride	Ethyl acetate	Naphthalene	Sodium hypochlorite
Aniline	Ethyl alcohol	Nitric acid	Sodium peroxide
Benzonitrile	Ethyl ether	Nitrobenzene	Solvents, aliphatic and aromatic**
Benzoyl chloride	Ethyl formate	Nitromethane	Sulfuric chloride
Benzyl alcohol	Ethylene bromide	Nitrogen dioxide	Sulfur
Borax	Ethylene glycol	2-Nitro-2-methylpropanol	Sulfuric acid
Boric acid	Ferric chloride	n-Octadecyl alcohol	Tetrahydrofuran
Bromine	Ferric phosphate	Oils, animal and vegetable	Tetrachloroethylene
n-Butyl amine	Fluoranthracene	Ozone	Trichloroethylene
Butyl acetate	Fluoranthracene	Perchloroethylene	Trichloroethylene
Butyl methacrylate	Formaldehyde	Pentafluorobenzamide	Trichloroethylene
Calcium chloride	Ferric acid	Perfluorooxylene	Trichloroethylene
Carbon disulfide	Purine	Phenol	Trichloroethylene
Casene	Gasoline	Phosphoric acid	Trichloroethylene
Chlorine	Hexachlorocyclopentadiene	Phosphorus pentachloride	Water
Chloroform	Hexane		Xylene
Chlorosulfonic acid	Hydrazine		Zinc chloride
Chromic acid	Hydrochloric acid		
Cyclohexane			

*Based on experiments conducted up to the boiling points of the liquids listed. FEP resins have normal service temperatures up to 205°C (400°F). Absence of a specific mention does not mean that it is reactive with FEP film.

**Some halogenated solvents may cause moderate swelling.

TEFLON FEP

Physical Properties

Absorption

Almost all plastics absorb small quantities of certain materials with which they come in contact. Submicroscopic voids between polymer molecules provide space for the material absorbed without chemical reaction. This phenomenon is usually marked by a slight weight increase and sometimes by discoloration.

DuPont FEP fluorocarbon films have unusually low absorption compared with other thermoplastics. They absorb practically no common acids or bases at temperatures as high as 200°C (392°F) and exposure of up to one year. Even the absorption of solvents is extremely small. Weight increases are generally less than 1% when exposed at elevated temperatures for long periods. In general, aqueous solutions are absorbed very little by DuPont FEP film. Moisture absorption is typically less than 0.01% at ambient temperature and pressure.

Permeability

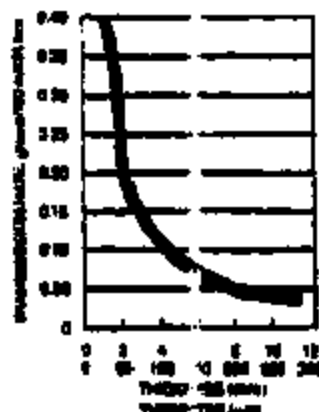
Many gases and vapors permeate FEP films at a much lower rate than for other thermoplastics (see Figure 13). In general, permeation increases with temperature, pressure, and surface contact area and decreases with increased film thickness. Table 6 lists rates at which various gases are transmitted through DuPont FEP fluorocarbon film, while Table 7 lists rates of vapor permeability for some representative substances. Note that the pressure for each material is its vapor pressure at the indicated temperature.

Table 6
Typical Gas Permeability Rates of DuPont FEP
Fluorocarbon Film, 25 μ m (1 mil) Thickness
(Test Method: ASTM D-1434 at 0°C (32°F))

Gas	Permeability Rate ^a cm ³ /(m ² ·s·atm)
Carbon Dioxide	28.6 × 10 ⁻¹⁰
Hydrogen	34.1 × 10 ⁻¹⁰
Nitrogen	5.0 × 10 ⁻¹⁰
Oxygen	11.5 × 10 ⁻¹⁰

^aTo convert to cm³/100 in² (4 h·atm), multiply by 2.6548.

Figure 13. Water Vapor Transmission Rate of DuPont FEP Film at 0°C (32°F) by ASTM E-96 (Modified)



Notes: Values are average only and not for specification purposes. To convert the permeation values for 100 in² to those for 1 m², multiply by 15.5.

Table 7
Typical Vapor Transmission Rates of DuPont FEP Fluorocarbon Film, 25 μ m (1 mil) Thickness
(Test Method: Modified ASTM E-96)

Vapor	Temperature		Vapor Transmission Rate	
	°C	°F	SI Units g/m ² ·s	English Units lb/100 in ² ·d
Acetic Acid	38	98	5.3	0.61
Acetone	35	95	14.7	0.98
Benzene	35	95	9.9	0.64
Carbon Tetrachloride	38	98	4.8	0.31
Ethyl Acetate	35	95	11.7	0.75
Ethyl Alcohol	38	98	10.7	0.68
Freon® F-12	23	73	372.0	24.0
Hexane	38	98	8.7	0.55
Hydrochloric Acid	25	77	40.2	2.51
Nitric Acid (Red Fuming)	25	77	100.0	10.3
Sodium Hydroxide, 50%	25	77	40.2	2.51
Sulfuric Acid, 98%	38	77	7 × 10 ⁻⁴	1 × 10 ⁻⁴
Water	38.8	102	7.0	0.45

TEFLON FEP

Physical Properties

Absorption

Almost all plastics absorb small quantities of certain materials with which they come in contact. Submicroscopic voids between polymer molecules provide space for the material absorbed without chemical reaction. This phenomenon is usually marked by a slight weight increase and sometimes by discoloration.

DuPont FEP fluorocarbon films have unusually low absorption compared with other thermoplastics. They absorb practically no common acids or bases at temperatures as high as 200°C (392°F) and exposures of up to one year. Even the absorption of solvents is extremely small. Weight increases are generally less than 1% when exposed at elevated temperatures for long periods. In general, aqueous solutions are absorbed very little by DuPont FEP film. Moisture absorption is typically less than 0.01% at ambient temperature and pressure.

Permeability

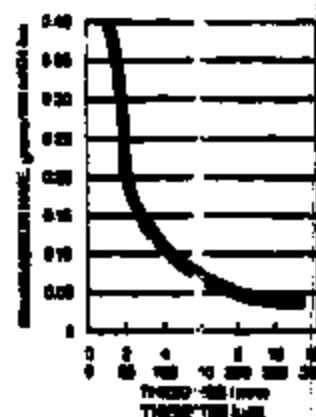
Many gases and vapors permeate FEP films at a much lower rate than for other thermoplastics (see Figure 13). In general, permeation increases with temperature, pressure, and surface contact area and decreases with increased film thickness. Table 6 lists rates at which various gases are transmitted through DuPont FEP fluorocarbon film, while Table 7 lists rates of vapor permeability for some representative substances. Note that the pressure for each material is its vapor pressure at the indicated temperature.

Table 6
Typical Gas Permeability Rates of DuPont FEP Fluorocarbon Film, 25 μ m (1 mil) Thickness
(Test Method: ASTM D-1634 at 0°C (32°F))

Gas	Permeability Rate* cm ³ /m ² ·s (cc/m ² ·s)
Carbon Dioxide	28.9 × 10 ⁻¹⁰
Hydrogen	34.1 × 10 ⁻¹⁰
Nitrogen	5.0 × 10 ⁻¹⁰
Oxygen	11.5 × 10 ⁻¹⁰

*To convert to cm³(100 in²) (cc/100 in²)·hr, multiply by 3.5248.

Figure 13. Water Vapor Transmission Rate of DuPont FEP Film at 0°C (32°F) vs ASTM D-56 (Modified)



Notes: Values are average only and not for specification purposes. To convert the permeation values for 100 in² to those for 1 in², multiply by 100.

Table 7
Typical Vapor Transmission Rates of DuPont FEP Fluorocarbon Film, 25 μ m (1 mil) Thickness
(Test Method: Modified ASTM D-56)

Vapor	Temperature		Vapor Transmission Rate	
	°C	°F	M Unit g/m ² ·hr	English Unit lb/100 in ² ·hr
Acetic Acid	35	95	0.3	0.41
Acetone	35	95	14.7	0.95
Benzene	35	95	9.9	0.94
Carbon Tetrachloride	35	95	4.8	0.31
Ethyl Acetate	35	95	11.7	0.78
Ethyl Alcohol	35	95	10.7	0.69
Freon® F-12	23	73	372.0	24.0
Heptane	35	95	6.7	0.59
Hydrochloric Acid	25	77	<0.2	<0.01
Nitric Acid (Red Fuming)	25	77	180.0	10.5
Sodium Hydroxide, 50%	25	77	<0.2	<0.01
Sulfuric Acid, 98%	25	77	2 × 10 ⁻⁴	1 × 10 ⁻⁴
Water	39.3	103	7.0	0.40

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High Performance Films**Kapton®**

Only by DuPont

General Specification KAPTON® polyimide film

1.0 Introduction

DuPont High Performance Films manufactures and sells a variety of high-quality plastic film products in conformance with ISO 9002 certification.

These specifications describe the values and tolerances for KAPTON® film properties. Where necessary for thorough understanding, test methods and procedures have been included.

Any aspects of the specifications that require further interpretation or clarification should be discussed with representatives of DuPont High Performance Films.

1.1 Types of Kapton® Polyimide Film

DuPont makes several types of KAPTON® film. Types HN, FN, and VN are used most commonly.

Types H, F, and V are alternative, special versions of these standard types. The specifications in this bulletin apply to them as well. In addition to these three types of KAPTON®, films are available with the following attributes:

- antistat
- thermally conductive
- polyimides for fine line circuitry
- cryogenic insulation
- corona resistant
- pigmented for color
- conformable
- other films tailored to meet customers' needs

Data for these films are covered in separate product bulletins, which can be obtained from your DuPont High Performance Films representative.

Type HN Film	Type FN Film	Type VN Film
KAPTON® Type HN is a tough, aromatic polyimide film, exhibiting an excellent balance of physical, chemical, and electrical properties over a wide temperature range, particularly at unusually high temperatures. Chemically, its polyimide polymer makeup is the result of a polycondensation reaction between pyromellitic dianhydride and 4,4diaminodiphenyl ether. KAPTON® HN is available in the following gauges: 30 mil (7.5 µm), 50 mil (12.7 µm), 100 mil (25.4 µm), 200 mil (50.8 µm), 300 mil (76.2 µm), and 500 mil (127 µm). Other gauges, such as 75 mil (19.1 µm) and 400 mil (102 µm), are available by special request.	KAPTON® Type FN film is a heat sealable grade that retains the unique balance of properties of KAPTON® Type HN over a wide temperature range. This is achieved by combining Type HN with DuPont TEFLON® FEP fluorocarbon resin in a composite structure. Table 1 (*) lists the common types of FN film available. Other combinations are available. Consult your DuPont High Performance Films marketing representative for further information.	KAPTON® Type VN is the same tough polyimide film as Type HN Film, exhibiting an excellent balance of physical, chemical, and electrical properties over a wide temperature range, with superior dimensional stability at elevated temperatures. This product is available in 50 mil (12.7 µm), 75 mil (19.1 µm), 100 mil (25.4 µm), 200 mil (50.8 µm), 300 mil (76.2 µm), and 500 mil (127 µm) gauges.

[Click here for \(*\) Table 1: Type FN Film \(KAPTON® FN Polyimide Film Types\)](#)

1.2 Certification

KAPTON® is certified to meet the requirements of the military specification MIL-P-46112 B and ASTM D-5213-95 in addition to the items covered by this specifications bulletin. Written confirmation is available with each delivery upon request.

1.3 Thermal Durability

The thermal durability of KAPTON® film depends on the environmental conditions under which it is aged and tested. Its lifetime depends on the criterion of failure. KAPTON® is routinely tested at the manufacturing site in the following manner:

Sheets of film 8.5" x 11" (216 mm x 279 mm) are freely suspended in an oven at a temperature of 400°C ±2°C (752°F ±3.6°F), monitored with a thermocouple to ensure accuracy. Sheets are removed after 2 hr (1 hr for 30 mil [7.6 µm] and 50 mil [12.7 µm] gauge film) and tested on an Instron Tensile Tester as described in Table 2. The elongation of the film at 23.5°C (74.3°F) should not be less than 10% after this aging at 400°C (752°F). This conforms to MIL-P-46112B "Elongation After Aging at 400°C" test (paragraph 4.4.5) and "Elongation, Percent, After Two Hour 400°C" requirement (Table 2).

In addition, KAPTON® conforms to ASTM D-5213-95, Standard Specification for Polymeric Resin Film for Electrical Insulation and Dielectric Applications.

Underwriters Laboratories, Inc. lists a thermal index of 200 to 220°C (392 to 428°F) (depending on gauge and type) for mechanical properties and 220 to 240°C (428 to 464°F) (depending on gauge and type) for electrical properties, under their file number E39505 for KAPTON® polyimide film.

1.4 Properties of Type FN Film

1.4.0 Heat Seal Strength

Film-to-Film Seals

The peel strength of heat seals between the coated and uncoated sides of one-side coated KAPTON® or between the coated sides of both one- and two-side coated KAPTON® is determined as follows.

Seals are made in a jaw sealer at 350°C (662°F), 20 psi (1.4 bar), with a 20sec dwell time. After cooling, the seals are cut into 1" (25.4mm) wide strips using a Thwing-Albert JDC sample cutter or its equivalent. The seal strength is measured with an Instron-type tensile tester. Seal strength is defined as the peak instantaneous strength occurring in each seal. Five specimen values are averaged.

The minimum peel strength between the coated sides of one- or two-side coated KAPTON® film will be 700 g/in (2.7 N/cm), except for 120FN616 and 120FN616B, which will be 450 g/in (1.7 N/cm). The minimum peel strength between the coated and uncoated side of one-side coated KAPTON® will be 450 g/in (1.7 N/cm).

Film-to-Copper Seals

The ability of FEP film to adhere to copper is measured using the same heat seal peel strength technique as described in "Film-to-Film Seals."

The peel strength is measured with the FEP side sealed to the untreated side of 1 mil (25.4 µm), 0.75 oz GT copper foil; it will be a minimum of 300 g/in (1.2 N/cm).

As-Received Strength (Cold Peel) of Bonds Between Kapton, Type HN and Teflon, Layers

The bond between the KAPTON® Type HN and TEFLON® fluorocarbon resin layers on all Type FN products except 120FN616 and 120FN616B will have a minimum peel strength of 225 g/in (0.87 N/cm), measured using an Instron-type tensile tester and a 180° peel.

[Click here for Table 2, Mechanical Properties of KAPTON® Type HN Polyimide Film](#)

[Click here for Table 3, Electrical Properties of KAPTON® Type HN Film](#)

[Click here for Table 4, Dielectric Strength of KAPTON® Type FN Polyimide Films](#)

1.5 General

1.5.0 Materials

KAPTON® Type HN and Type VN films are polyimide polymers in the form of a film. KAPTON® Type FN film is a combination of Type HN film with TEFLON® FEP fluorocarbon resin on one or both sides.

1.5.1 Uniformity

Material shall be uniform in composition and free from defects that impair serviceability and/or appearance in proven applications.

[Click here for Table 3. Shrinkage of KAPTON® Type VN Polyimide Film](#)

1.5.2 U.S. Cores

Cores shall be of sufficient strength to prevent collapsing from handling. Standard core internal diameters (I.D.) are nominally 3" and 6" (76 mm and 152 mm) with the following specifications:

Paper		
3" (76 mm) I.D.	3.032" ± 0.008"	(77.01 mm ± 0.2 mm)
6" (152 mm) I.D.	6.028" ± 0.010"	(153.11 mm ± 0.25 mm)
Plastic		
3" (76 mm) I.D.	3.024" ± 0.005"	(76.81 mm ± 0.1 mm)
6" (152 mm) I.D.	6.041" ± 0.010"	(153.44 mm ± 0.25 mm)

Core material will be plastic for 3" (76 mm) I.D. cores less than 5/8" (16 mm) wide. Core material will be fiber for 3" (76 mm) I.D. cores wider than 5/8" (16 mm) and for 6" (152 mm) I.D. cores. A split 3" (76 mm) I.D. fiber core is standard for all universal and Step-Pac™ rolls. If these cores are not suitable, further information on other options may be obtained from your DuPont High Performance Films representative.

Width Tolerance

The maximum variation in film width from that specified on the order shall be as follows:

Slit Width Range	Tolerances
1.5" (38 mm) or less	±0.005" (0.13 mm)
1.5" to 4" (38 mm to 102 mm)	±0.030" (0.76 mm)
>4" (>102 mm)	±0.060" (1.5 mm)

1.5.3 Luxembourg Supply

Cores shall be of sufficient strength to prevent collapsing from handling. DuPont Luxembourg supplies pad rolls in widths below 9.5" (240 mm) and universal wound rolls. Standard core internal diameter for Luxembourg is 3" (76 mm) (nominal 3" ±0.008" [76 mm ±0.2 mm]).

Standard cores for pad rolls are paper cores, except for widths below 0.5" (13 mm), where it will be plastic.

Standard universal: core length2.8" ± 0.08 " (70 mm ± 2 mm) (split core)**Wide universal: core length**4.3" ± 0.08 " (110 mm ± 2 mm) (non-split core)

A different put-up called Step-Pac™ is available from the U.S. Contact your DuPont High Performance Films representative for more information.

Width Tolerance

The maximum variation in film width from that specified on the order shall be as follows:

Slit Width Range	Tolerance
0.9" (22 mm) or less	0.008" (0.20 mm), Universal
6" (152 mm) or less	0.016" (0.40 mm), Pad rolls
6" to 9.5" (152 mm to 240 mm)	0.04" (1.00 mm), Pad rolls
Outside diameter tolerance: ± 0.4 " (10 mm)	

[Click here for Table 6. KAPTON® Polyimide Film Specifications and Tolerances](#)

1.5.4 Roll Types

KAPTON® polyimide film is supplied in three types of rolls: pad, universal, and Step-Pac™ wind.

Pad Roll Specifications

- Core width will be the film width $+0.125$ " ($+3.2$ mm), -0 .
- Core edges shall not project more than 0.0625 " (1.6 mm) beyond the roll face on either side.
- Core shall not be recessed on either side.
- The outside and starting ends of the film shall be fastened in a manner to prevent unwinding.
- "Dishing" or "cupping" may not exceed 0.0625 " (1.6 mm), measured with a straightedge across the diameter of the roll.

Universal and Step-Pac™ Roll Specifications

- The difference between the lengths of the projecting core on each side shall not exceed 0.1875 " (4.8 mm).
- Film shall not project from the main body of the roll more than 0.125 " (3.2 mm).
- The outside and starting ends of the film shall be fastened in a manner to prevent unwinding.
- Roll face depression, the difference between the highest and lowest points of the roll, unstressed, shall not exceed 0.1875 " (4.8 mm).

[Click here for Table 7, Reference Guide: Standard Length versus Roll O.D. \(U.S. Supply\)](#)

1.5.5 Splices

Description

Three types of splice are available.

- MYLAR® polyester film-based yellow tape (standard).
- KAPTON® polyimide film-based tape (special requirements only).
- Heat seal splice, 12" (305 mm) or less in width (Type FN).

Splices will be centered on the joint to $\pm 0.25"$ (± 6 mm). They will be smooth and wrinkle-free to avoid distortion of the adjacent film layers in the roll.

Tape Splices

Tape splices are standard on all gauges of HN and VN film and on all gauges of FN film more than 12" (305 mm) wide.

Tape splices are made with the butt edges of the film covered on both sides with pressure-sensitive adhesive tape. Two inch (50 mm) wide splicing tape is used.

Heat Seal Splices

Overlap heat seal splices are made on all FN films, except 250FN029, with an overlap that is a minimum of 0.375" (9.5 mm) wide.

On 250FN029, a butt splice is made using 120FN616 as the joining tape applied on the FEP surface. The butt splice is oriented with the 120FN616 tape on the top of the film as it unwinds from a universal put-up and on the bottom as it unwinds from a pad.

Overlap heat seal splices for one-side and two-side FEP composites are oriented with the leading edge of the new film on the bottom for universal and Step-Pac™ put-ups. Pad put-ups of one- or two-side FEP composites have the leading edge of the new film on the top.

1.6. Packaging and Marking

1.6.0 Packaging

KAPTON® polyimide film shall be adequately packed to prevent loss of contents or damage during shipment.

All film will be wrapped with a non-fibrous material.

1.6.1 Marking

KAPTON® is identified, as shown in Table 8, to allow complete traceability back to the raw materials and processing conditions.

Arrangements for special markings can be made (such as part or specification number).

Consult with your DuPont High Performance Films technical or customer service representative for details.

All package marking information is available with bar code labels.

[Click here for Table & Package Markings](#)

For further information about KAPTON® polyimide film, please contact your nearest DuPont Representative. The KAPTON® team is available to provide technical support to designer, fabricators and original equipment manufacturers.

The information given herein is based on data believed to be reliable, but the DuPont Company makes no warranties express or implied as to its accuracy and assumes no liability arising out of its use by others. This publication is not to be taken as a license to operate under, or recommendation to infringe upon, any patent.

Caution: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement", H-50102.

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High Performance Films

Kapton®

Only by DuPont

General Specification KAPTON® polyimide film
Table 2. Mechanical Properties of KAPTON® Type HN Polyimide Film

Property	Property Value - Film Thickness, mil (µm)					
	0.30 (7.6)	0.50 (12.7)*	1.00 (25.4)*	2.00 (50.8)*	3.00 (76.2)*	5.00 (127)*
Tensile Strength, psi (MPa) at 23°C (73°F). Machine Direction (MD) and Transverse Direction (TD), min.	16,000 (110)	20,000 (138)	24,000 (165)	24,000 (165)	24,000 (165)	24,000 (165)
Method	ASTM D-882-91, Method A, using an Instron Tensile Tester (specimen size: 0.5" x 6" [12.7 mm x 152 mm]; jaw separation: 4" [102 mm]; jaw speed: 2"/min [51 mm/min]). Calculate the average of five specimens based on original measured thickness.					
Elongation, %, MD and TD, min.	25	35	40	45	50	50
Method	Same as above.					
Shrinkage, %, MD and TD at 400°C (752°F), max.	4.0	4.0	2.5	2.5	2.5	2.5
Method	MIL-P-46112B. The percent and TD at 400°C shrinkage is obtained for either the MD or TD using the average of three measurements in either direction before and after conditioning. Prior to measurement the 3.5" x 11" (216 mm x 279 mm) specimen is conditioned by freely suspending it for 2 hr** in an oven controlled to 400°C (752°F).					
Moisture Absorption, %, max.	4.0	4.0	4.0	4.0	4.0	4.0
Method	ASTM D-570-92, using 24-hr immersion at 23°C (73°F). Average of three specimens.					

*Also applies to Type VN, except shrinkage, which is shown in Table 5.

**1 hr for 30 and 50 gauge film

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High Performance Films**Kapton®**

Only by DuPont

DuPont Media Statement: Polyimide Film In Aerospace Wire and Cable Insulation

**DuPont High-Performance Films: Tomorrow's Technology
for Today's Engineering Design Needs**

Formable Applications**KAPTON® polyimide film by
DuPont is an electrical insulation
material . . .**Electrical Insulation**. . . with outstanding thermal,
mechanical, chemical and
electrical properties.**Electronic Applications**KAPTON® has been used
successfully in field applications . .**Thermal Management

... where the environmental temperatures were as low as -269°C and as high as 400°C.



Automotive Applications



KAPTON® can be easily fabricated by a wide variety of techniques, ...

Bondable Applications

... including die cutting, punching and thermoforming. It offers excellent adhesive bondability as well.



Aerospace Applications



For further information, please look at one of the major application.

High-performance DuPont *Kapton*® stands up to both low and high temperature extrema.



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Imprint - Impressum

High Performance Films**Kapton®**

Only by DuPont

KAPTON® Polyimide Film for Thermal Management

*for innovative solutions to extreme temperature design engineering problems***Introduction**

Explore New Dimensions for Thermal Management Design with KAPTON®

Dynamic growth in the field of polyimide films encouraged an innovative boost not only in electrical insulation technology, but also for non-electrical applications.



The polyimide film KAPTON® by DuPont has proven itself as the material of choice in applications that involve very high and very low temperatures. Designers are finding that the application potential for this unique industrial material has barely been tapped.

KAPTON® polyimide film has been used successfully in various applications at temperatures from -269 °C to 400 °C.

Known for its outstanding thermal, mechanical, chemical and electrical properties, KAPTON® is an advanced electrical insulation material used by engineers in the automotive, aerospace and electronics industries, because it

- maintains its mechanical stability at very high and very low temperatures,
- resists high mechanical stress during assembly operations,
- has excellent electrical insulation and thermal properties,
- has outstanding resistance to most chemicals, solvents, lubricants and fuels,
- allows space and weight savings.

Types and Applications

Different types of KAPTON® for custom-tailored applications

The following KAPTON® types share the same unique balance of properties inherent in the standard material and allow various additional properties and abilities:

- KAPTON® MT, LT and MTB, thermally conductive film,
- KAPTON® FMT, heat sealable thermally conductive film,
- KAPTON® CR, for Corona Resistance and twice the thermal conductivity of standard polyimide film,
- KAPTON® KJ, heat-sealable polyimide adhesive film,
- KAPTON® HKJ, heat-sealable all polyimide composite,
- KAPTON® XC, tailored resistivity.

Many applications in industrial environments

The KAPTON® polyimide film is represented in many technical applications and industrial environments, where excellent thermal characteristics are required:



- Heating elements (irons and positive temperature coefficient PTC applications)
- Heat sink (insulation pads)
- Insulation for the linear accelerator in CERN
- Coil insulation
- Voice coil (loudspeaker)
- Smoke hoods
- Power supplies
- Heater circuits
- Copier belts
- Carrier belts

A typical application of KAPTON® as a heat conducting product is compact heating elements for a variety of different domestic appliances, including hot-plates and coffee pots. The heater can be fitted with a number of PTC resistors, thus allowing for variations in power output and surface temperatures.

DuPont's KAPTON® polyimide film ensures the optimal heat transfer between the film and the item (e.g. transistor in power supplies) and, together with its electrical insulation effect and dielectric strength, offers a high degree of functional reliability.

Continuing development of KAPTON® for a wide range of applications

For the past thirty years, KAPTON® has contributed to the innovative design and commercial success of a wide variety of new and improved products. The reason KAPTON® was selected for such demanding applications is its unique combination of outstanding thermal, mechanical, chemical and electrical properties and its ability to retain these properties over a wide range of temperatures, where other engineering materials do not

function.

DuPont has good contacts with the industries it serves, and resources are at work to develop new KAPTON® products to meet customer and industry needs. Our technical expertise is available to answer all questions relating to the optimal use of KAPTON®.



Application of Kapton® in speaker coil

Kapton® survives where other
materials fail.

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High Performance Films**Kapton®**

Only by DuPont

Automotive Applications

*for innovative solutions to extreme temperature design engineering problems***Introduction*****Explore New Dimensions for Automotive Design with KAPTON®***

KAPTON® small parts used in switches and other components

Dynamic growth in the field of polyimide films encouraged an innovative boost not only in electrical insulation technology, but also for non-electrical applications. The polyimide film KAPTON® by DuPont has proven itself as the material of choice in applications that involve very high and very low temperatures. Designers are finding that the application potential for this unique industrial material has barely been tapped.

KAPTON® has excellent abilities to maintain its properties in harsh environments and has been used successfully in various applications at temperatures from -269 °C to 400 °C

Known for its outstanding thermal, mechanical, chemical and electrical properties, KAPTON® is an advanced electrical insulation material used by engineers in the Automotive industries, which

- maintains its mechanical stability at very high and very low temperatures,
- resists high mechanical stress during assembly operations,
- has excellent electrical insulation and thermal properties,
- has outstanding resistance to most chemicals, solvents, lubricants and fuels,
- allows space and weight savings.

KAPTON® is very often used for diaphragms, insulators, gaskets and parts that must withstand harsh operating environments such as those found under the hood in *Automotive* applications.

Types and Applications

Different types of KAPTON® for custom-tailored applications

The following KAPTON® types have various additional properties and abilities besides those offered by the standard material, often according to some special applications in industry.

- KAPTON® HN, general purpose
- KAPTON® FN/HRN, with TEFLON® FEP
- KAPTON® XC, for tailored electrical conductivity
- KAPTON® MTB, for enhanced thermal conductivity
- KAPTON® FPC, for Flexible Printed Circuits
- KAPTON® JP/JPB, with forming properties
- KAPTON® RR, Radiation Resistance

Current and potential applications in automotive environments

KAPTON® polyimide film is represented in many technical applications and industrial environments, where excellent thermal characteristics are required. The following examples resume the different applications in *Automotive* industries:

- Alternator heat sink insulator pads
- Diaphragms; air bag, air conditioning system, fuel pressure regulator, oil pressure switch, power steering switch, pressure switch in brake systems (punched)
- Disposal pin carrier for PCB interconnections
- Flexible Circuit for dashboard
- Fuel pulsation dampener
- Fuse plane
- Gasket (under-the-hood, punched)
- Miniature pressure transducer
- Radiator plug
- Seals for air conditioning system
- Sensors: accelerator pedal, air conditioning system (pressure), automatic windshield wipers (membrane), brake pedal, brake system (pressure), clutch slave cylinder, door buzzer, memory seat, shock height, temperature, throttle position, transmission
- Spark plug boot

- Switches air; conditioning system (pressure, punched), button for under-the-hood thermostat (punched), transmission pressure, vacuum electrical
- Speaker parts; cones, domes, spiders, surrounds, voice coils
- Bar Code Labels

Continuing development of Kapton® for a wide range of applications



Automotive Sensors

For the past thirty years, Kapton® has contributed to the innovative design and commercial success of a wide variety of new and improved products. The reason Kapton® was selected for such demanding applications is its unique combination of outstanding thermal, mechanical, chemical and electrical properties and its ability to retain these properties over a wide range of temperatures, where other engineering materials do not function. DuPont has good contacts with the industries it serves, and resources are at work to develop new Kapton® products to meet customer and industry needs.

Our technical expertise is available to answer all questions relating to the optimal use of Kapton®.



Automotive Manifolds

KAPTON® survives where other materials fail.

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Kapton® Polyimide Film

General Information



KAPTON® polyimide film possesses a unique combination of properties previously unavailable among polymeric film materials. The ability of KAPTON to maintain its excellent physical, electrical and mechanical properties over a wide temperature range has opened new design and application areas to plastic films. KAPTON has proved to be especially useful in applications involving high operating temperatures.

KAPTON is synthesized by a polycondensation reaction between an aromatic dianhydride and an aromatic diamine. There is no known organic solvent for the film and it is infusible and flame resistant. The outstanding properties of KAPTON permit it to be used at both high and low temperature extremes

where other organic materials would not be functional.

Adhesives are available for bonding KAPTON to itself, to metals, to papers of various types and to other films.

Applications for KAPTON polyimide film include a variety of electrical and electronic insulation applications:

- Wire and Cable Tapes
- Formed Coil Insulation
- Substrates for Flexible Printed Circuits
- Motor Slot Liners
- Magnet Wire Insulation
- Transformers and Capacitor Insulation
- Magnetic and Pressure Sensitive Tapes and Tubing

Many of these applications are based on the excellent electrical properties of KAPTON, such as dielectric strength and dissipation factor, which remain nearly constant over a wide range of temperature and frequency. Other applications make use of the film's radiation resistance or chemical resistance at elevated temperatures. It is this combination of useful properties at extremes in temperatures that makes KAPTON a unique industrial material.

Du Pont makes three types of KAPTON:

- KAPTON Type H, an all purpose, all-polyimide film that has been used successfully in

applications at temperatures as low as 4K (-269°C) and as high as 673K (400°C). Type H film can be laminated, metalized, punched, formed or adhesive coated. It is available as 0.3, 0.5, 1, 2, 3, and 5 mil film.

- KAPTON Type V, an all-purpose, all-polyimide film with all of the properties of Type H, plus superior dimensional stability. Type V is available in 2, 3, and 5 mils.
- KAPTON Type F, a Type H film coated on one or both sides with TEFLON* FEP fluorocarbon resin to impart heat sealability, to provide a moisture barrier and to enhance chemical resistance. It is available in a variety of constructions.

KAPTON® Type H Film

Typical Electrical Properties

Property	Typical Value
Dielectric Strength	
1 mil	7000 v/mil
2 mil	5400 v/mil
3 mil	4600 v/mil
5 mil	3600 v/mil
Dielectric Constant	
1 mil	3.5
2 mil	3.6
3 mil	3.7
5 mil	3.7
Dissipation Factor	
1 mil	.0025
2 mil	.0025
3 mil	.0025
5 mil	.0027
Volume Resistance	
1 mil	1×10^{16} ohm*in
2 mil	8×10^{15} ohm*in
3 mil	5×10^{15} ohm*in
5 mil	1×10^{15} ohm*in

KAPTON polyimide films retain their physical properties over a wide temperature range. They have been used in field applications where the environmental temperatures have been as low as 4K (-269°C) and as high as 673K (400°C).

*Reg. U.S. Pat. Off.

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High Performance Films



Kapton®
Only by DuPont

General Specification KAPTON® polyimide film

Table 1: Type FN Film (KAPTON® FN Polyimide Film Types)

Designation	Construction, mil (µm)		
	FEP	EN	FEP
120FN616	0.10 (2.5)	1.00 (25.4)	0.10 (2.5)
120FN616M	0.15 (3.8)	1.00 (25.4)	0.15 (3.8)
150FN019		1.00 (25.4)	0.50 (12.7)
200FN919	0.50 (12.7)	1.00 (25.4)	0.50 (12.7)
200FN011		1.00 (25.4)	1.00 (25.4)
250FN029		2.00 (50.8)	0.80 (12.7)
300FN021		2.00 (50.8)	1.00 (25.4)
300FN929	0.50 (12.7)	2.00 (50.8)	0.50 (12.7)
400FN022		2.00 (50.8)	2.00 (50.8)
500FN131	1.00 (25.4)	3.00 (76.2)	1.00 (25.4)

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